CONTENT PAGE

TEST SPECIFICATION TABLE

No.	SUBJECT	PAPER 1 (4531/1)	PAPER 2 (4531/2	PAPER 3 (4531/3)
1	Types of instrument	Multiple choice questions	Subjective Test	Written Practical
2	Types of items	Objective: Multiple Choice	Subjective items: Section A: Sturctured items Section B: Limited response items and open response items Section C: Limited response items and open response items	Subjective items: Section A: Structured items Section B: Open response items
3	Number of questions	50 (Answer all)	Section A: 8 (answer all) Section B: 2 (Choose one) Section C: 2(Choose one)	Section A: 2 (answer all) Section B: 2(Choose one)
4	Total marks	50	100	40
5	Test duration	1 hr 15 minutes	2 hr 30 minutes	1 hr 30 minutes
6	Construct weightage	Knowledge: 28 % Understanding: 40 % Application : 32 %	Knowledge: 11% Understanding: 16% Application 18% Problem solving: 22% (Quantitative, Qualitative) Conceptualisation Decision making: 17%	Decision making : 100% (Experiment)
7	Sample item based on construct	Refer to sample instrument Paper 4531/1 and attachment 1	Refer to sample instrument Paper 4531/2 and attachment 2	Refer to sample instrument Paper 4531/3 and attachment 3
8	Marking	Dichotomous Mark 1 or 0	Analytical method of marking based on scoring rubric.	Analytical method of marking based on scoring rubric.
9	Scope of Context	Assessment is made for all constructs within field of studies	Assessment is made for all constructs within field of studies	Assessment is made for all constructs within field of studies
10	Difficulty level	L M H	L M H	L M H
		60% 24% 16%	38% 35% 27%	50% 30% 20%
	Low : L Medium: M High : H		Overall L : M : H = 5 : 3 : 2	
11	Additional accessory	Scientific calculator	Scientific calculator	Scientific calculator, Protractor ruler 30 cm, Compass

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ANALYSIS SPM PHYSICS QUESTIONS 2004 – 2007

CHAPTER	TOPIC	2004			2005			2006			2007			2008 [JSU : JUJ]		
		P 1	P 2	P 3	P 1	P 2	P 3	P 1	P 2	P 3	P 1	P 2	P 3	P 1	P 2	P 3
1.INTRODUCTION TO PHYSICS	1.1 Understanding Physics															
	1.2 Understanding Base Quantities and Derived Quantities	1									1			4		
	1.3 Undestanding scalar and vector quantities										2					
	1.4 Understanding Measurements	1	1A	1A	2	1A	1A		1A	1A	1			3	1A	
	1.5 Analysing Scientific Investigation	1		1A			1A									
2. FORCE AND MOTION	2.1 Analysing Linear Motion	1										11 C		2	2A	
	2.2 Analysing Motion Graph	1			1						1			1		
	2.3 Understanding Inertia	1		1A	1					B3		11 C				
	2.4 Analysing Momentum		2A		1							11 C		1		
	2.5 Understanding the Effects of a Force		5A				6A									
	2.6 Analysing Impulse and Impulsive Force				1						1					
	2.7 Being aware of the Need for safety feature in Vehicles										1				9B	
	2.8 Understanding Gravity				1						1			1		
	2.9 Analysing Force in Equalibrium	1			1				8A		3			2		
	2.10 Understanding Work, Energy, Power and Efficiency of devices	3			1			2	6A			4A		4		

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		2004			2005			2006			2007			2008 [JSU : JUJ]		
		P 1	P 2	P 3	P 1	P 2	P3	P1	P 2	P 3	P 1	P 2	P 3	P 1	P 2	P 3
	2.11 Appreciating the Importance of Maximising the Efficiency of Devices															
	2.12 Understanding Elasticity		3A		2			1					2A	1		
3. FORCE AND PRESSURE	3.1 Understanding pressure	1			1			1			1					
	3.2 Understanding Pressure in Liquids	1				5A		1			1	2A		1		3B
	3.3 Understanding Gas Pressure and Atmospheric Pressure	1			1						2			3	4B	
	3.4 Applying Pascal's Principle				1						1					
	3.5 Applying Archimedes' Principle	1			1						1					
	3.6 Understanding Bernoulli's Principle	1						1	5A		1	9B		1		
4. HEAT	4.1 Understanding Thermal Equilibrium	2			2			1	2A		2			2		1A
	4.2 Understanding Specific Heat Capacity	1	12 C	2A	2			1			1	3A		1		
	4.3 Understanding Specific Latent Heat								11C			3A				
	4.4 Understanding Gas Law	1			1		3B	2		1A	2			1	6A	
5. LIGHT	5.1 Understanding Reflection of Light	2	9B		1		3A	2			2			1		
	5.2 Understanding Refraction of Light	1						1			1		3B	1		
	5.3 Understanding Total Internal Reflection	1			1			1	4A		1	5A				
	5.4 Understanding Lenses	1	4A		1	11 C		1	9B		1			3	11 C	

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		2004			2005			2006			2007			2008 [JSU : JUJ]		
		P 1	P 2	P 3	P 1	P 2	P3	P 1	P 2	P 3	P 1	P 2	P 3	P 1	P 2	P 3
6. WAVE	6.1 Understanding waves	4			1			3		4B	1			4		
	6.2 Analysing Reflection of waves	1			2			1			2			1		
	6.3 Analysing Refraction of Waves				2			1			1				3A	
	6.4 Analysing Diffraction of Waves		6A		1	10 B						12 C				
	6.5 Analysing Interference of Waves	1			1	2A		2	$3A_s$		1					2A
	6.6 Analysing Sound Waves	1			1			1				1A				
	6.7 Analysing Electromagnetic Waves										1	12 C				
7. ELECTRICITY	7.1 Analysing Electric Field and Charge Flow	1			1						1			1	5A	
	7.2 Analysing the Relationship between Electric Current and Potential Difference						4B	2		2A	1		1A	1		
	7.3 Analysing Series and Parallel Circuits	2			2			2			1	6A		1	12 A	
	7.4 Analysing Electromotive Force and Internal Resistance	1			1						1					
	7.5 Analysing Electrical Energy and Power		8A	2B						2A			4B	1		
8. ELECTROMAGNETISM	8.1 Analysing the Magnetic Effect of o Current-carrying Conductor	1	8A						10 B		1			1		4B
	8.2 Understanding the Force on a Current-carrying Conductor in a Magnetic Field	1			1			1			1				7A	
	8.3 Analysing Electromagnetic Induction				1			1						1		
	8.4 Analysing Transformers		12 C		1			1			2	7A				

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		2004			2005			2006			2007			2008 [JSU : JUJ]		
		P 1	P 2	P 3	P 1	P 2	P 3	P 1	P 2	P 3	P 1	P 2	P 3	P 1	P 2	P 3
	8.5 Understanding the Generation and Transmission of Electricity					12 C					1					
9. ELECTRONIC	9.1 Understanding the Uses of the Cathode Ray Oscilloscope (CRO)				1						1			1		
	9.2 Understanding Semiconductor Diodes	1			1			1			1	10 B				
	9.3 Understanding Transistor	1						1			1	10 B		1		
	9.4 Analysing Logic Gates	2	7A		2	8A		1	7A		1			1	8A	
10. RADIOACTIVITY	10.1 Understanding the Nucleus of an Atoms	1			1			1			1			1		
	10.2 Analysing the Use Decay	2			1	7A		1	12C		1	8A		2		
	10.3 Understanding the Use of Radioisotopes		10 B					1	12C							
	10.4 Understanding Nuclear Energy		10 B								1				10 B	
	10.5 Realising the Importance of Proper Management of Radioactive Substance				2							8A				

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SPM PHYSICS CHECK LIST

	PHYSICAL QUANTITY / CHARACTERISTIC	FACTORS WHICH AFFECT IT		
1	Frequency of inertia balance			
2	Magnitude of impulsive force			
3	Acceleration of a rocket			
4	Stiffness of a spring			
5	Extension of a spring			
6	Surface tension of a liquid			
7	Pressure in a liquid			
8	Up thrust			
9	Sensitivity of a thermometer			
10	Rise of temperature of an object when heated			
11	Rate of evaporation			
12	Rate of boiling			
13	Power of a lens			
14	Characteristics of image formed by concave mirror			
15	Characteristics of image formed by convex mirror			
16	Critical angle			
17	Magnifying power of an astronomical telescope			
18	Speed of water waves in a ripple tank			
19	Frequency of water waves			
20	Wavelength of water waves			
21	Diffraction of waves through a slit			
22	Separation between adjacent bright fringes			
23	Loudness of sound			
24	Pitch of sound			
25	Number of images in a diffraction pattern			
26	Pattern of electric field			
27	Resistance of a metal conductor			
28	Potential difference across resistors in series			
29	Current for resistors in parallel			
30	Magnetic field pattern due to electric current			
31	Magnetic field strength (solenoid)			
32	Magnitude of magnetic force			
33	Speed of rotation of an electric motor			
34	Magnitude of induced e.m.f.			
35	Magnitude of induced current			
36	Direction of induced current			
37	Output voltage of a transformer			
38	Lost of electric power through a cable			
39	Output voltage of d.c. and a.c. generator			

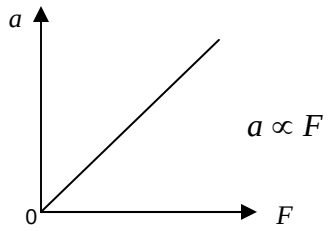
40	Sensitivity of a moving coil galvanometer			
41	Rate of emission of thermions			
42	Brightness of trace on the screen an O.S.K.			
43	Resistance of a semiconductor			
44	Flow of current through a semiconductor diode			
45	Collector current in a transistor			
46	Resistance of LDR			
47	Resistance of a thermistor			

LAWS AND PRINCIPLES

	Law or principle	Physical quantity	Relationship	Application / use
1	Newton's first law of motion			
2	Newton's second law of motion			
3	Newton's third law of motion			
4	Principle of conservation of momentum			
5	Kinetic theory of mater			
6	Hooke's law			
7	Pascal's principle			
8	Archimedes principle			
9	Bernoulli's principle			
10	Boyle's law			
11	Pressure law			
12	Charles's law			
13	Universal gas law			
14	Principle of conservation of energy			
15	Einstein's energy-mass relationship			
16	Snell's law			
17	Principle of superposition of wave			
18	Ohm's law			
19	Faraday's law			
20	Lenz law			

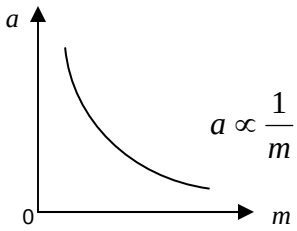
GRAPHS

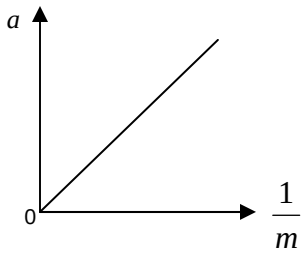
Quantities which are directly proportional		Condition		Quantities which are inversely proportional		Condition
Momentum	Velocity	Constant mass		Acceleration	Mass	Constant force
Acceleration	Force	Constant mass		Impulsive force	Time of collision	Constant momentum
Potential energy	Height	Constant mass		Density	Volume	Constant mass
Force	Extension	Elastic limit		Pressure	Area	
Liquid pressure	Depth	Same liquid		Gas pressure	Volume	Mass, Temperature constant
Liquid pressure	Density of liquid	Same depth		sin *c*	Refractive index	
Up thrust	Volume of displaced liquid			Power of lens	Focal length	
Rise of temperature	Heat absorbed	Constant mass		Frequency	Period	
Gas pressure	Absolute temperature			Wavelength	Frequency	
Volume	Absolute temperature			Fringe separation	Source separation	
sin *i*	sin *r*			Resistance	Area of cross-section	
Wave velocity	Wavelength					
Fringe separation	Wavelength					
Fringe separation	Double slit separation					
Potential difference	Current					
Resistance	Length of wire					



a is directly proportional to F

a berkadar terus dengan F





a is Inversely proportional to m
or
a is directly proportional to 1/m

Hubungan : a berkadar songsang dengan $\frac{1}{m}$

PHYSICS TERMINOLOGIES FOR PAPERS 2 AND 3

No.	TERM	VALUE	MEANING
1	Acceleration	Low / small	Slow increase of velocity
		High / big	Fast increase of velocity
2	Density	Low / small	Lighter / less compact
		High / large	Heavier / more compact
3	Force constant	Small	Spring is soft / easy to stretch
		Large / big	Spring is stiff / difficult to stretch
4	Specific Heat Capacity	Low / small	Easily heated up , short time to heat up Need less heat to raise temperature
		High / large	More difficult to heat up, takes more time to heat up Need more heat to raise temperature, use more fuel
5	Specific Latent Heat	Low / small	Need less heat to melt / vaporise Time to melt / vaporise is shorter
		High / large	Need more heat to melt / vaporise Time to melt / vaporise is longer
6	Melting point / Freezing point	Low	Melts at low temperature / Freezes at low temperature. Starts melting earlier / Starts freezing later
		High	Melts at higher temperature / Freezes at higher temperature. Starts melting latter / Starts freezing earlier

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No.	TERM	VALUE	MEANING
7	Boiling point	Low	Starts boiling at lower temperature Starts boiling earlier Slower to begin condensation
		High	Starts boiling at higher temperature Starts boiling latter Faster to begin condensation
8	Refractive index	Low / small	Substance that refracts light less
		High / large	Substance that refracts light more
9	Critical angle	Small	Easier for total internal reflection to occur
		Large / big	Difficult for total internal reflection to occur
10	Power (of a lens)	Low	Large / long focal length Refract light less
		High	Short focal length Refract light more
11	Focal length	Short	Higher power
		Large / long	Lower power
12	Frequency (of electromagnet wave)	High	Short wavelength High penetration power
13	Wavelength (for electromagnet wave)	Long / large	Low frequency Low penetration power
14	Frequency (sound)	High	High pitch Short wavelength Spreads out less
15	Resistivity	Low / small	Having lower resistance compared to wires of the same thickness and length.
		High / large	Having higher resistance compared to wires of the same thickness and length.
16	e.m.f. of cell	Large / big	Supply a larger current through the same resistance.
17	Power (of electrical device)	High / large	Uses more energy per second
18	Voltage (working voltage of electrical device)	High	Needs a smaller current to produce a fixed amount of power.

No.	TERM	VALUE	MEANING
19	Range (of an ammeter)	Big	Can measure large current Usually has a lower sensitivity
20	Range (of a voltmeter)	Big	Can measure higher voltage Usually has a lower sensitivity
21	Half-life	Short	Decays faster Reactivity decreases faster
		Long	Decays slowly Reactivity decreases slowly Radioactivity lasts longer
22	Rigidity	Low	Changes shape easily when acted upon by external force
		High	Does not change shape easily when acted upon by external force
23	Strength	Low	Breaks easily / breaks under small external force
		High	Difficult to break / Needs a large force to break
24	Surface tension	Low	Wet a surface (glass) easily
		High	Does not wet a surface easily
25	Rate of rusting	Low	Does not rust easily / quickly
		High	Rust easily / quickly

KEY WORDS IN EXAMINATION QUESTIONS

No.	Key word	Expected response
1.	*Estimate*	Give a quantitative value based on calculation or reasoning.
2.	*What*	Give required / specific information
3.	*How*	Describe / give explanation / method /condition / steps concerning an event
4.	*Compare*	Give similarity and difference between two things
5.	*How much/ what is the value*	Give a quantitative answer
6.	*Differentiate*	Give the difference / contrast between two or more things / events
7.	*When*	State the time or period
8.	*Construct*	Draw diagram / one that uses geometrical method / tools
9.	*Discuss*	Give views from various aspects
10.	*Prove*	Show truth using mathematical method / exampels / facts of physics
11.	*Suggest*	Give an idea / opinion
12.	*Find*	Give an answer without calculation / with simple calculation
13.	*Calculate*	Give answer through calculation
14.	*Describe*	To tell about something (story like) in detail and systematically.
15.	*Tabulate*	Arrange things/data according to specified aspects.
16	*Explain*	Give method/reason about something in order that it is easily understood.
17.	*Classify*	Separate into a few groups according to fixed characteristics.
18.	*Identify*	Pick out or determine something based on facts/descriptions given.

No.	Key word	Expected response
19.	*Shade*	Denote an area by colouring/filling/draw lines to cover the area
20.	*Draw*	Make figure such as chart/diagram/graph /shape using instruments according to scale and in detail
21.	*Why*	Give reason
22.	*Name*	Give name/terminology for something such as component/process/instrument
23.	*State*	Give facts without explanation /support
24.	*Predict*	Give/state forecast for something based on facts
25.	*List*	State facts/statements in point form.
26.	*Arrange*	Place according to fixed order
27.	*Define*	Give definition for the term given
28.	*Determine*	Find answer base on process/reasoning
29.	*Illustrate*	Give facts with support such as diagrams/reasons/explanation to make clear an idea.

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PRECAUTIONARY STEPS FOR INVESTIGATIVE EXPERIMENTS

No.	Type of experiment involving;	Precautions that can be taken
1	Light	a. Experiment must be carried out in darkened room. b. Lens, screen and object must be in line c. Avoid parallax error by placing the eye such that the line of view is perpendicular to the scale of the ruler.
2	Spring	a. Make sure the spring is not loaded beyond the elastic limit. (spring return to original length when load is taken off). b. Avoid parallax error by placing the eye such that the line of view is perpendicular to the scale of the ruler. c. Repeat the experiment 4 times and calculate the average.
3	Electric	a. All connections must be secure/tight. b. Off the switch after readings are taken to prevent wires from heating up (resistance increase) c. Avoid parallax error by placing the eye such that the line of view is perpendicular to the scale of the ammeter/ voltmeter. d. Repeat the experiment 4 times and calculate the average.
4.	Heat	a. Liquid must be stirred constantly so that temperature rises evenly. b. Alluminium block must be wrapped with insulating material to prevent heat lost. c. Thermometer bulb should be smeared with oil to give better thermal contact with the block. d. Avoid parallax error by placing the eye such that the line of view is perpendicular to the scale of the thermometer. e. Repeat the experiment 4 times and calculate the average.
5.	Sound wave inteference	a. Experiment must carry out at open space to avoid echo b. Repeat the experiment 4 times and calculate the average.

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TIPS FOR PAPER 2

Section A (Structure)

1. **Be able to interpret diagrams, photographs, tables and graphs to relate to physics concepts or principles.**
   Analisis rajah, gambar foto, jadual dan graf untuk dikaitkan dengan konsep dan prinsip Fizik yang berkaitan.

2. **Give short and concise answer.**
   Nyatakan jawapan yang ringkas dan tepat.

3. **Underline keywords such what, how etc.**
   Gariskan kata tugas dalam setiap soalan seperti Apakah, Bagaimanakah dll.

4. **Underline the important information given in questions.**
   Gariskan maklumat penting yang diberi dalam setiap soalan.

5. **Methods to solve calculation problems.**
   Kaedah untuk menyelesaikan masalah pengiraan.

   - **State the formula (*tulis rumus fizik yang berkaitan*)**
   - **Substitute the value for each quantity (*Gantikan nilai untuk setiap kuantiti*)**
   - **Answer with the correct unit.(*tulis jawapan dan unitnya yang betul*)**

6. **Pay attention to the marks allocated. The marks usually indicate the number of points required.**
   Beri perhatian kepada markah yang diperuntukkan untuk setiap soalan. Jumlah markah menunjukkan bilangan fakta jawapan yang diperlukan.

Section B (Essay)

1. **To answer the question of definition of the terms, concepts, principles or Physics law need to state in sentences. The answer in form of formula is not acceptable.**
   Maksud bagi mana-mana istilah, konsep , prinsip atau hukum Fizik perlu dinyatakan dalam bentuk ayat. Jawapan berbentuk rumus tidak diterima.

2. **To answer the questions of comparison, state the similarities and differences between the given diagrams.**
   Untuk menjawab soalan Perbandingan, jawapan mesti merangkumi persamaan dan perbezaan dari rajah-rajah yang diberi.

3. **Use diagrams or graphs whenever necessary to make the points clearer.**
   Rajah atau graf boleh disertakan untuk menjelaskan lagi jawapan..

4. **Pay attention to the marks allocated. The marks usually indicate the number of points required.**
   Beri perhatian kepada markah yang diperuntukkan untuk setiap soalan. Jumlah markah menunjukkan bilangan fakta jawapan yang diperlukan.

5. Answer in table form for suggested modifications. e.g
Bagi menjawab soalan cadangan pengubahsuaian, jawapan perlu dijadualkan.

Suggested modifications *Cadangan pengubahsuaian*	**Explanation** *Penerangan*
……	……..

Section C (Essay)

1. To answer question "explain the suitability of each characteristics and determine the most suitable …. .", detect 4 different characteristics from the given diagrams or table . The answer must be in table form.

Bagi menjawab soalan " Terangkan kesesuian setiap ciri dan pilih yang paling sesuai …..". kenalpasti 4 ciri yang berbeza daripada rajah atau jadual yang diberi.
Jawapan perlu dalam bentuk jadual.

Characteristic	**Explanation/ Reason**

. **….. is chosen because of ……..(repeat all the characteristic)**

STRATEGIES IN ANSWERING QUESTIONS PAPER 3
Section A : Question 1

1. **Test the students in using of scientific measuring instrument and make the readings.**
   Menguji murid menggunakan alat pengukur dan membuat bacaan

2. **The students should know how to make reading in several type of measuring instrument without error, tabulate the data and draw a graph based on the data.**
   Pelajar perlumengetahui bagaimana untuk mengambil bacaan beberapa alat pengukur tanpa ralat, menjadualkan data dan melukis graf berdasarkan nilai dalam data.

3. **The students have to write the reading in correct d.p as the accuracy of the instrument.**
   Pelajar dikehendaki menulis bacaan dengan bilangan t.p seperti kejituan alat pengukur.

4. **Draw a suitable graf based on the given title with the following ;**
   - **Correct quantities and their unit on both axes**
   - **Uniform scale at both axes**
   - **Points plotted correctly**
   - **Balance graph line**
   - **Size of graph 5 x 4 larger squares**

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- *Kuantiti kedua-dua paksi dengan unit yang betul*
- *Skala yang seragam sesuai dengan kuantiti dalam data*
- *Pindahan titik yang betul*
- *Garisan graf yang seimbang*
- *Saiz graf yang cukup besar (4 x 5 petak besar atas graf)*

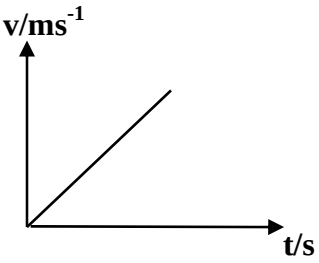
Section A Question 2 [12 marks]

1. **Question based on graph, conseptual or analysing the graph.**
   Soalan berhubung graf. Sama ada mengkonsepsi atau menganalisis graf yang diberi.

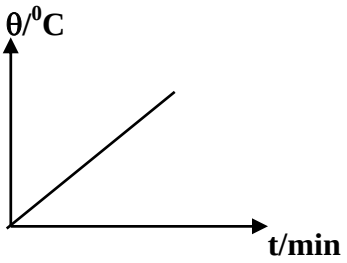
2. **Understanding the meaning for various shapes of graphs and their characteristics based on y-axis and x-axis.**
   Perlu menguasai maksud berbagai bentuk graf dan ciri-ciri pada graf merujuk paksi-x dan paksi-y .

The examples of graph for question 2
Contoh graf soalan 2

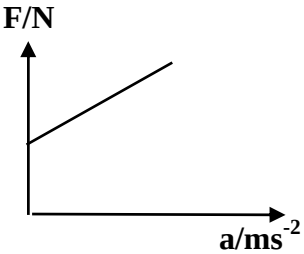
The meaning of graph's gradient based on graph shape and axis (refer to a suitable formula)
Maksud kecerunan merujuk bentuk graf dan kuantiti p-x dan p-y (rujuk formula yang sesuai)



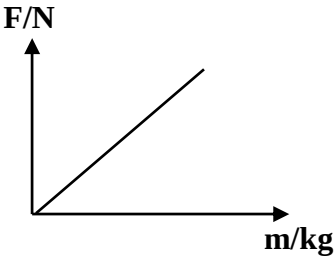
Gradient: acceleration
Kecerunan : Pecutan



Gradient: The rate of change of temperature
Kecerunan : Kadar perubahan suhu



Gradient: mass
Kecerunan : jisim



Gradient: acceleration
Kecerunan : Pecutan

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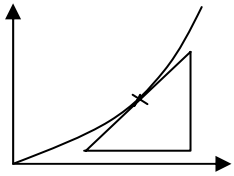
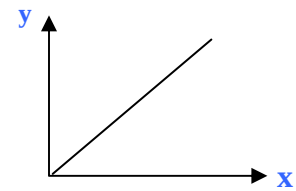
3. **Draw a smooth extrapolation line if you are asked to do so.**
Lukiskan dengan jelas garisan ekstrapolasi pada graf jika perlu.

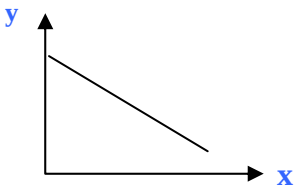
4. **Draw a large triangle to calculate the gradient (4 x 3 larger square)**
The triangle should be on tangent line for curve graph.
Lukiskan segitiga yang besar pada graf untuk kiraan kecerunan graf (4 x 3 petak besar)
Pastikan segitiga pada garis tangen jika graf melengkung.



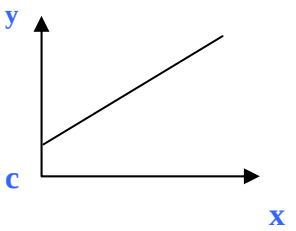
5. **Identifying the relationship between RV and MV from a graph:**
Mengenalpasti hubungan antara RV dan MV daripada graf



y directly propotional to x
y berkadar langsung dengan x



y is decreases linearly to x
y berkurang secara linear dengan x



If c ≥ 1 mm from origin
Jika c ≥ 1 mm from origin

y increases linearly/uniformly to x
y bertambah secara linear/seragam dengan x

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ANSWER FORMAT FOR PAPER 3B [12 MARKS]

(a) Inference	*Manipulated variable is influenced by the responding variable* *0r* *Responding variable depends on manipulated variable*
(b) Hypothesis	*The higher/larger/bigger the manipulated variable, the higher/smaller the responding variable*
(c) Aim	*To determine the relationship between manipulated variable and responding variable*
(d) Variables	(i) manipulated variable : (ii) responding variable : (iii) fixed variable : *only one fixed variable* **[give all the variable that can be measured].*
Apparatus / materials	*List up all importance apparatus for the expriment*
Method :	1. *Start the experiment with manipulated variable = …..… .unit (practical value)* 2 *The responding variable is measured ….* 3 *Repeat the experiment 4 times for manipulated variable* *____, ____ , ____ and ____*
Tabulation of data :	*manipulated variable* / *responding variable* ***Fill in the values of manipulated variable*** / ***blank*** *Results/RV is not required because students are asked to design and not to carry out the experiment.*
Analysis of data :	*State : Sketch a graph of responding variable against manipulated variable* *AND sketch a graph:* RV MV

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SOALAN SPM 2007
(KERTAS 2)

Section B
Bahagian B

[20 *marks*]
[20 *markah*]

Answer any **one** *question from this section.*

Jawab mana-mana **satu** *soalan daripada bahagian ini.*

9 (*a*) Diagram 9.1 shows a cross-section of a wing of a moving aeroplane. The wing of the aeroplane experiences a lift force.

Rajah 9.1 *menunjukkan suatu keratan rentas bagi sayap sebuah kapal terbang yang sedang bergerak. Sayap kapal terbang itu mengalami daya angkat.*

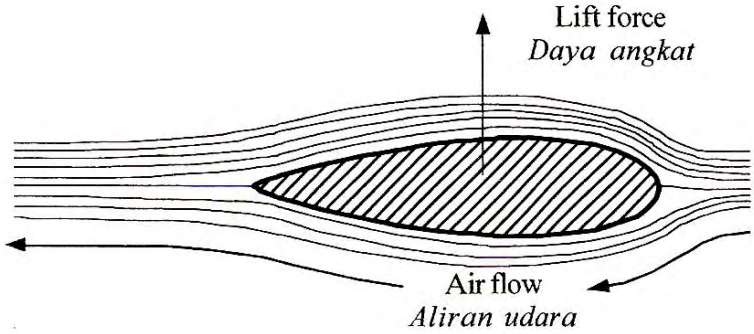

Diagram 9.1
Rajah 9.1

(i) Name the shape of the cross-section in Diagram 9.1 [1 *mark*]
Namakan bentuk keratan rentas dalam Rajah 9.1. [1 *markah*]

(ii) Explain why the lift force acts on the wing of the aeroplane. [3 *marks*]
Terangkan mengapa daya angkat bertindak pada sayap kapal terbang itu. [3 *markah*]

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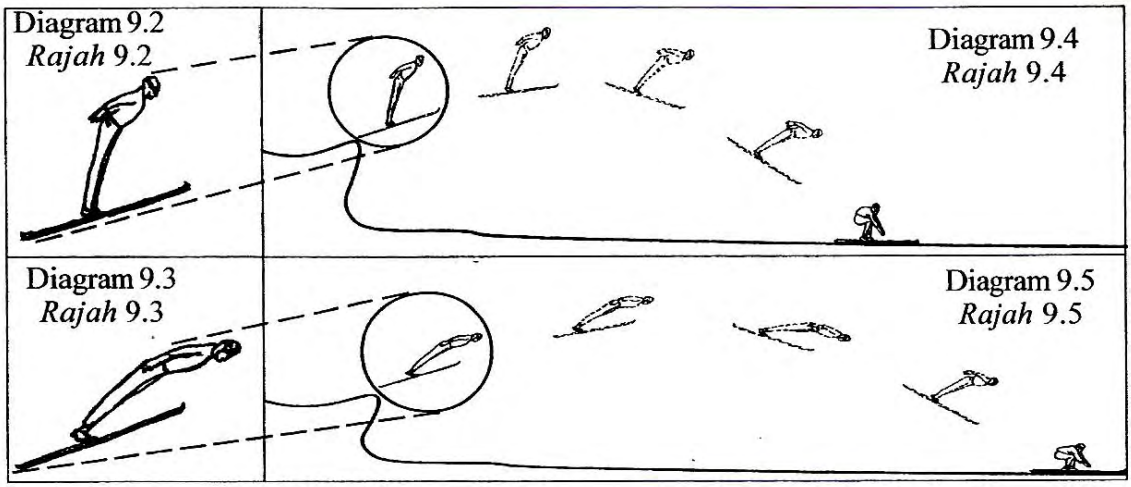
(*b*) Two ski jumpers ski down from a very high platform with the same take off velocity.
Diagram 9.2 and Diagram 9.3 show the posture of the two ski jumpers during take off from the platform.
Diagram 9.4 and Diagram 9.5 show the posture of the two ski jumpers in the air. They land on the ground at the same instant.

Dua orang peluncur ski berlepas dengan halaju yang sama ketika menuruni satu platform yang tinggi.
Rajah 9.2 *dan Rajah* 9.3 *menunjukkan keadaan badan bagi dua orang peluncur ski itu semasa berlepas dari platform.*
Rajah 9.4 *dan Rajah* 9.5 *menunjukkan keadaan badan dua peluncur ski itu semasa di udara. Kedua-dua peluncur itu mendarat di permukaan tanah pada ketika yang sama.*



(i) Based on Diagram 9.2 and Diagram 9.3, compare the posture of the two ski jumpers. [1 *mark*]

Berdasarkan Rajah 9.2 *dan Rajah* 9.3, *bandingkan keadaan badan kedua-dua peluncur ski itu.* [1 *markah*]

(ii) Based on Diagram 9.4 and Diagram 9.5, compare the landing distance of the two ski jumpers. [1 *mark*]

Berdasarkan Rajah 9.4 *dan Rajah* 9.5, *bandingkan jarak mendarat bagi kedua-dua peluncur ski itu.* [1 *markah*]

(iii) Based on Diagram 9.4 and Diagram 9.5, relate the lift force to the landing distance. [2 *marks*]

Merujuk kepada Rajah 9.4 *dan Rajah* 9.5, *hubungkaitkan antara daya angkat dan jarak mendarat.* [2 *markah*]

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(iv) Name **one** sport which uses the same principle of lift force as the ski jumper. Explain the similarities. [2 *marks*]

Namakan **satu** *sukan yang menggunakan prinsip daya angkat yang sama dengan peluncur ski itu.*
Jelaskan persamaan itu. [2 *markah*]

(*c*) Diagram 9.6 shows a sailboat.

Rajah 9.6 *menunjukkan sebuah perahu layar.*

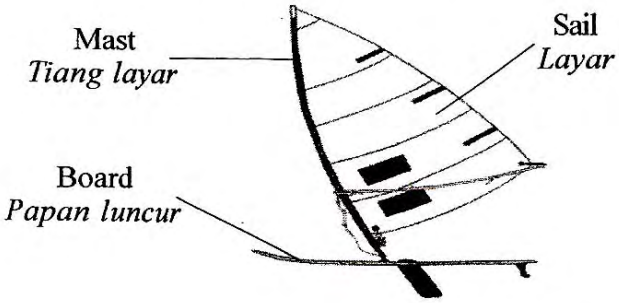

Diagram 9.6
Rajah 9.6

You are required to give some suggestions to design a sailboat which can travel faster.
Using the knowledge on motion, forces and the properties of materials, explain the suggestions based on the following aspects:

Anda dikehendaki memberi beberapa cadangan untuk mereka bentuk sebuah perahu layar yang boleh bergerak dengan lebih laju.

Menggunakan pengetahuan tentang gerakan, daya dan sifat-sifat bahan, terangkan cadangan itu yang merangkumi aspek-aspek berikut:

(i) the surface of the board
permukaan papan luncur

(ii) the shape of the board
bentuk papan luncur

(iii) material used for the board
bahan yang digunakan untuk papan luncur

(iv) material used for the sail
bahan yang digunakan untuk layar

(v) the size of the sail
saiz layar

[10 *marks*]
[10 *markah*]

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10 Diagram 10.1 and Diagram 10.2 show two electrical circuits containing semiconductor diodes.

Rajah 10.1 *dan Rajah* 10.2 *menunjukkan dua litar elektrik yang mengandungi diod semikonduktor.*

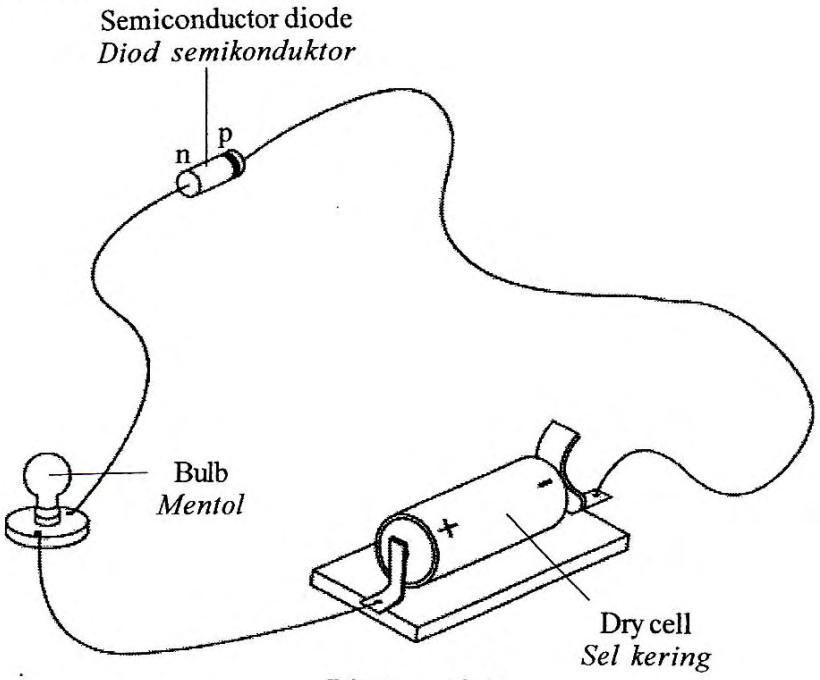

Diagram 10.1
Rajah 10.1

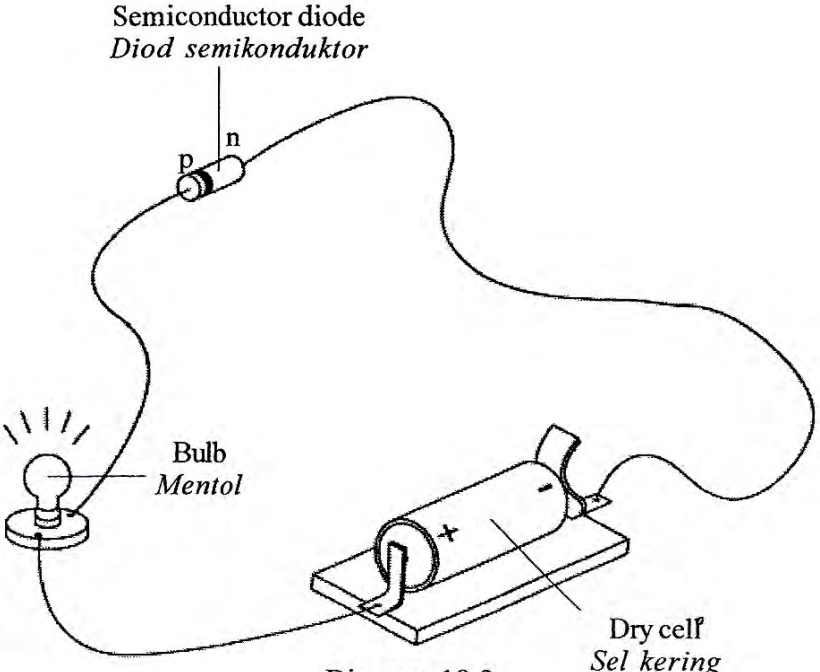

Diagram 10.2
Rajah 10.2

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(*a*) What is meant by a semiconductor? [1 *mark*]

Apakah yang dimaksudkan dengan semikonduktor? [1 *markah*]

(*b*) Using Diagram 10.1 and Diagram 10.2, relate the lighting of the bulbs, the current and the way the diode is connected to the terminals of the battery to deduce a relevant physics concept. [5 *marks*]

Menggunakan Rajah 10.1 *dan Rajah* 10.2, *hubungkaitkan nyalaan mentol, arus dan cara sambungan diod ke terminal bateri untuk menyimpulkan satu konsep fizik yang relevan.* [5 *markah*]

(*c*) Diagram 10.3 shows a full wave rectifier circuit.

Rajah 10.3 *menunjukkan litar rektifikasi gelombang penuh.*

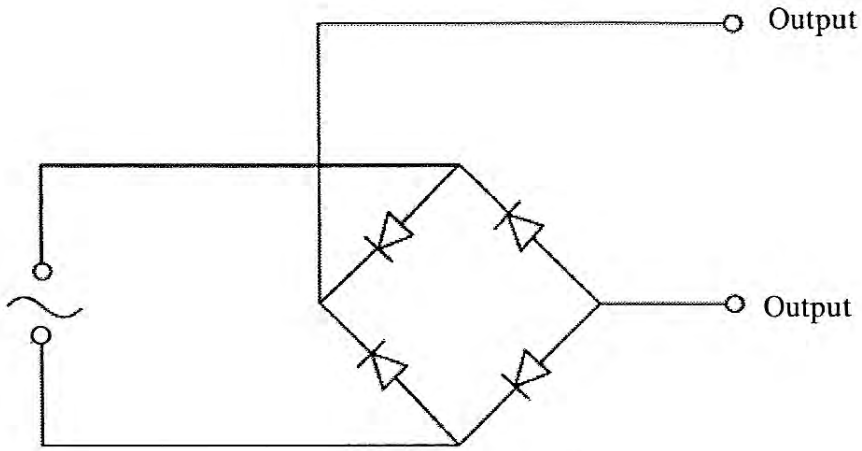

Diagram 10.3
Rajah 10.3

(i) Draw the wave form of a full wave rectification. [1 *mark*]

Lukis bentuk gelombang bagi rektifikasi gelombang penuh. [1 *markah*]

(ii) A capacitor is placed across the output to smooth the current.
Draw the wave form produced.
Explain how a capacitor is used to smooth the current. [3 *marks*]

Sebuah kapasitor diletakkan merentasi output untuk meratakan arus dalam litar itu.
Lukis bentuk gelombang yang dihasilkan.
Jelaskan bagaimana kapasitor digunakan untuk meratakan arus.
[3 *markah*]

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(*d*) Diagram 10.4 shows a circuit with a transistor that acts as an automatic switch.

Rajah 10.4 *menunjukkan litar yang mengandungi transistor yang bertindak sebagai suis automatik.*

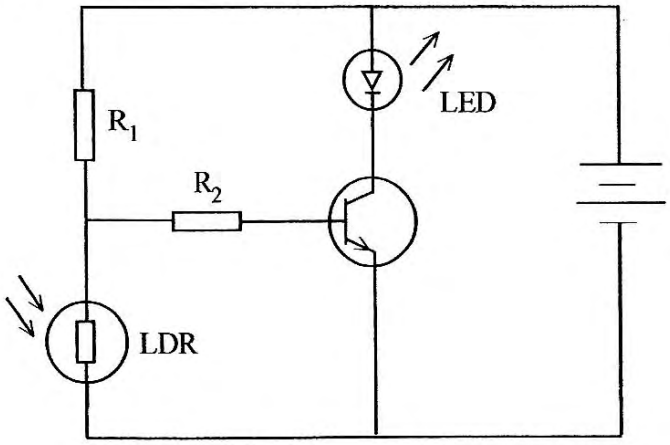

Diagram 10.4
Rajah 10.4

The transistor in the circuit causes the light emitting diode (LED) to light up when it is dark.
A technician wants a fan labelled 240 V, 100 W in a room to be automatically switched on when the room is hot.

Transistor dalam litar menyebabkan diod pemancar cahaya (LED) *menyala apabila keadaan gelap.*
Seorang juruteknik ingin sebuah kipas berlabel 240 V, 100 W *disebuah bilik dihidupkan secara automatik apabila bilik itu panas.*

Suggest modifications that can be made to the circuit in Diagram 10.4 so that the fan can be automatically switched on when the room is hot.
Draw the modified circuit.

Cadangkan pengubahsuaian yang boleh dilakukan pada litar dalam Rajah 10.4 *untuk membolehkan kipas itu dihidupkan secara automatik apabila bilik itu panas.*
Lukis litar yang diubahsuai itu.

State and explain the modifications based on the following aspects:

Nyatakan dan beri penerangan tentang pengubahsuaian itu berdasarkan aspek-aspek berikut:

– the electrical components that are needed to replace the LED and the light dependent resistor (LDR) in the circuit.

komponen-komponen elektrik yang perlu untuk menggantikan LED *dan perintang peka cahaya* (LDR) *dalam litar itu.*

– the positions of the electrical components in the circuit.

kedudukan komponen-komponen elektrik dalam litar itu.

[10 *marks*]
[10 *markah*]

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Section C
Bahagian C

[20 *marks*]
[20 *markah*]

Answer any **one** *question from this section.*

Jawab mana-mana **satu** *soalan daripada bahagian ini.*

11 Diagram 11.1 shows the speed limit and the load limit of heavy vehicles such as buses and lorries.

Rajah 11.1 *menunjukkan had laju dan had muatan bagi kenderaan berat seperti bas dan lori.*

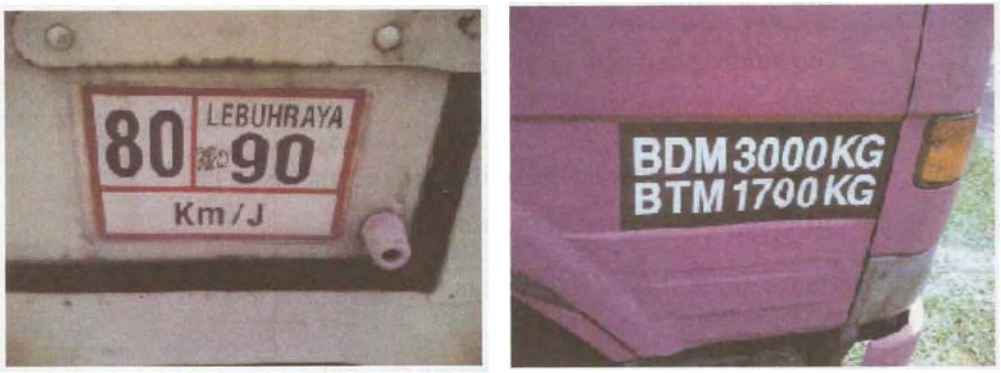

Diagram 11.1
Rajah 11.1

(*a*) What is meant by speed? [1 *mark*]

Apakah yang dimaksudkan dengan laju? [1 *markah*]

(*b*) Using the concepts of momentum and inertia, explain why the speed limit and the load limit must be imposed on heavy vehicles. [4 *marks*]

Dengan menggunakan konsep momentum dan inersia, terangkan mengapa had laju dan had muatan mesti dikenakan ke atas kenderaan berat. [4 *markah*]

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(*c*) Diagram 11.2 shows four tankers, P, Q, R and S, with different specifications. You are required to determine the most suitable tanker to deliver oil safely. Study the specifications of all the four tankers from the following aspects:

Rajah 11.2 *menunjukkan empat lori tangki*, P, Q, R *dan* S, *dengan spesifikasi yang berbeza.*
Anda dikehendaki menentukan lori tangki yang paling sesuai digunakan untuk menghantar minyak dengan selamat.
Kaji spesifikasi keempat-empat lori itu dari aspek berikut:

- The type of brakes
  Jenis brek
- The number of tyres
  Bilangan tayar
- The number and size of the tanks
  Bilangan dan saiz tangki
- The distance between the trailer and the tractor
  Jarak antara treler dan kepala lori

Explain the suitability of the aspects.
Justify your choice.

Terangkan kesesuaian aspek-aspek itu.
Beri sebab bagi pilihan anda.

[10 *marks*]
[10 *markah*]

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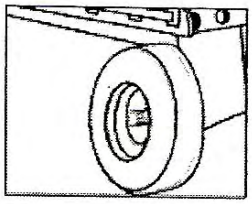
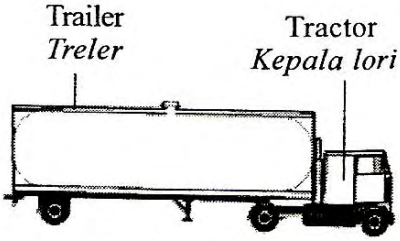
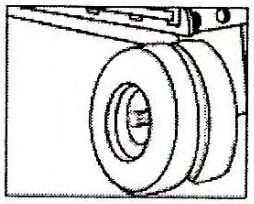
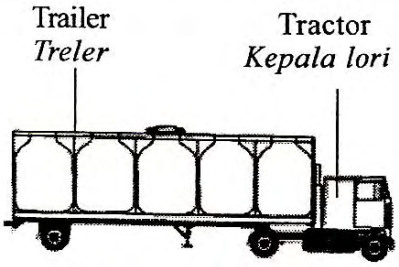
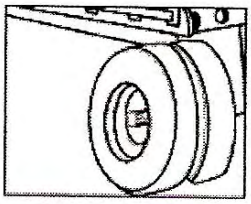
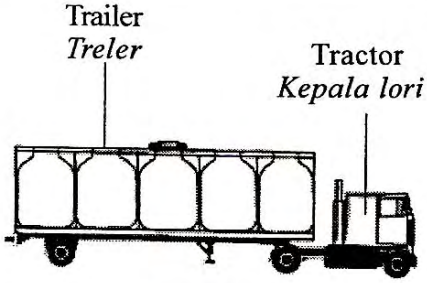
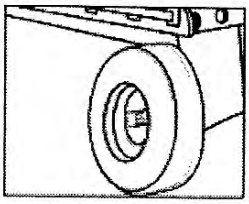
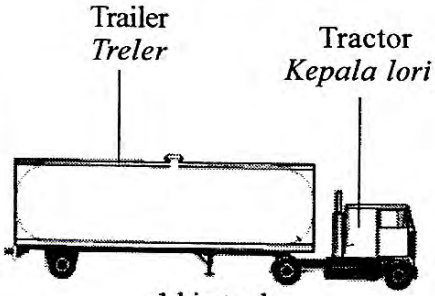
Tanker P *Lori tangki* P Type of brake: Air *Jenis brek* : *Udara*	 1 tyre 1 *tayar*  Trailer *Treler* Tractor *Kepala lori* 1 big tank 1 *tangki besar*
Tanker Q *Lori tangki* Q Type of brake: Air *Jenis brek* : *Udara*	 2 tyres 2 *tayar*  Trailer *Treler* Tractor *Kepala lori* 5 small tanks 5 *tangki kecil*
Tanker R *Lori tangki* R Type of brake: ABS *Jenis brek* : ABS (Antilock Brake System)	 2 tyres 2 *tayar*  Trailer *Treler* Tractor *Kepala lori* 5 small tanks 5 *tangki kecil*
Tanker S *Lori tangki* S Type of brake: ABS *Jenis brek* : ABS (Antilock Brake System)	 1 tyre 1 *tayar*  Trailer *Treler* Tractor *Kepala lori* 1 big tank 1 *tangki besar*

Diagram 11.2
Rajah 11.2

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(*d*) A tanker of mass 1 800 kg accelerates from rest to a velocity of 45 km h^{-1} in 10 s.

Sebuah lori tangki berjisim 1 800 kg *memecut dari pegun sehingga mencapai halaju* 45 km j^{-1} *dalam masa* 10 s.

(i) Calculate the acceleration of the tanker.

Hitung pecutan lori tangki itu.

(ii) Calculate the force acting on the tanker.

Hitung daya yang bertindak ke atas lori tangki itu.

[5 *marks*]
[5 *markah*]

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12 Diagram 12.1 shows an audio frequency generator connected to a speaker and placed near the corner of a wall. Three students, A, B, and C, are standing around the next corner.
The generator and speaker can produce sound with the same speed but different pitch.

Rajah 12.1 *menunjukkan penjana frekuensi audio disambung kepada pembesar suara dan diletakkan berdekatan satu penjuru dinding. Tiga orang murid,* A, B, *dan* C, *berdiri di penjuru yang bersebelahan.*
Penjana dan pembesar suara dapat menghasilkan bunyi pada kelajuan yang sama tetapi dengan kelangsingan yang berbeza.

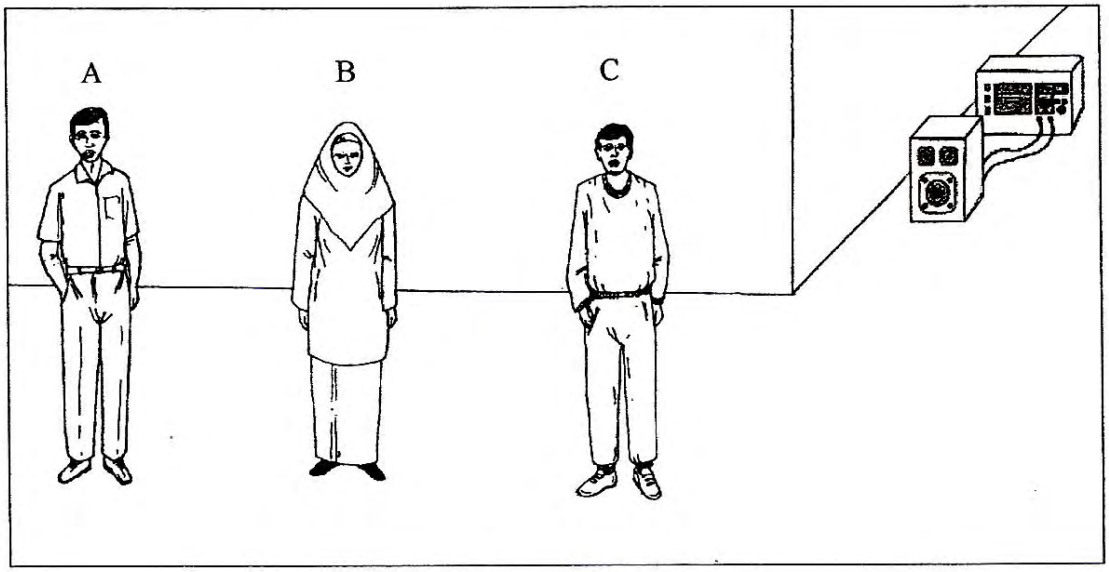

Diagram 12.1
Rajah 12.1

(*a*) State the physical quantity that affects the pitch of the sound. [1 *mark*]
Nyatakan kuantiti fizik yang mempengaruhi kelangsingan bunyi. [1 *markah*]

(*b*) When a high pitch sound is generated, only student C can hear the sound clearly. When a low pitch sound is generated, all the three students can hear the sound clearly.

Explain this situation. [4 *marks*]

Apabila bunyi dengan kelangsingan tinggi dijanakan, hanya murid C *dapat mendengar bunyi itu dengan jelas. Apabila bunyi dengan kelangsingan rendah dijanakan, ketiga-tiga murid itu boleh mendengar dengan jelas.*

Terangkan keadaan ini. [4 *markah*]

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(*c*) Diagram 12.2 shows a radar system at an airport. Signals are transmitted from the radar system to determine the position of an aeroplane.

Rajah 12.2 *menunjukkan sebuah sistem radar di sebuah lapangan terbang. Isyarat dihantar dari sistem radar untuk menentukan kedudukan kapal terbang.*

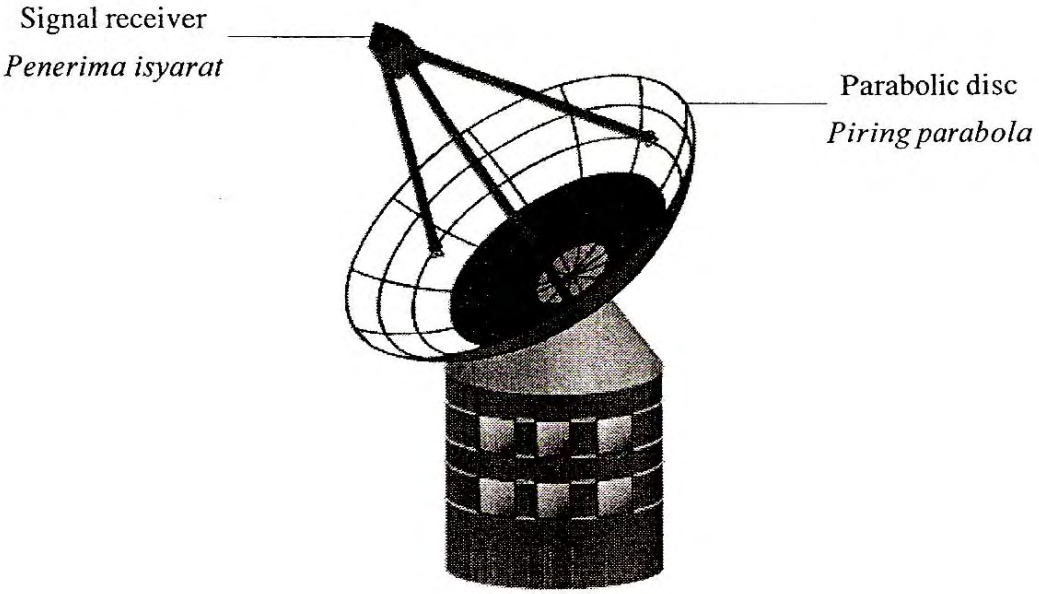

Diagram 12.2
Rajah 12.2

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Table 12.3 shows the specifications of four radar systems, K, L, M and N, that can be used to determine the position of an aeroplane.

Jadual 12.3 *menunjukkan spesifikasi empat sistem radar*, K, L, M *dan* N, *yang boleh digunakan untuk menentukan kedudukan kapal terbang.*

Radar system ***Sistem radar***	**K**	**L**	**M**	**N**
Diameter of the parabolic disc /m ***Diameter piring parabola /m***	10	5	7	12
Distance of the signal receiver from the centre of the parabolic disc ***Jarak penerima isyarat dari pusat piring parabola***	Same as the focal length *Sama dengan panjang fokus*	Less than the focal length *Kurang daripada panjang fokus*	Same as the focal length *Sama dengan panjang fokus*	Less than the focal length *Kurang daripada panjang fokus*
Types of wave transmitted ***Jenis gelombang yang dipancar***	Microwave *Gelombang mikro*	Microwave *Gelombang mikro*	Radiowave *Gelombang radio*	Radiowave *Gelombang radio*
Height of the parabolic disc from the ground ***Ketinggian piring parabola dari bumi***	High *Tinggi*	Low *Rendah*	Low *Rendah*	High *Tinggi*

Table 12.3
Jadual 12.3

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You are required to determine the most suitable radar system. Study the specifications of all the four radar systems based on the following aspects:

Anda diminta untuk mengenal pasti sistem radar yang paling sesuai. Kaji spesifikasi keempat-empat sistem radar itu berdasarkan aspek yang berikut:

- The diameter of the parabolic disc
  Diameter piring parabola
- The distance of the signal receiver from the centre of the parabolic disc
  Jarak penerima isyarat dari pusat piring parabola
- The types of wave transmitted
  Jenis gelombang yang dipancar
- The height of the parabolic disc from the ground
  Ketinggian piring parabola dari bumi

Explain the suitability of the aspects.

Terangkan kesesuaian aspek-aspek tersebut.

[10 *marks*]
[10 *markah*]

(*d*) The depth of a sea is 90 m. A ship transmits an ultrasonic wave of frequency 50 kHz to the seabed and receives an echo 0·12 s later.

Kedalaman suatu laut ialah 90 m. *Sebuah kapal memancar gelombang ultrasonik berfrekuensi* 50 kHz *ke dasar laut dan menerima gema* 0·12 s *kemudian.*

Calculate

Hitung

(i) the speed of the ultrasonic wave in the water,
laju gelombang ultrasonik dalam air,

(ii) the wavelength of the ultrasonic wave in the water.
panjang gelombang bagi gelombang ultrasonik dalam air.

[5 *marks*]
[5 *markah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

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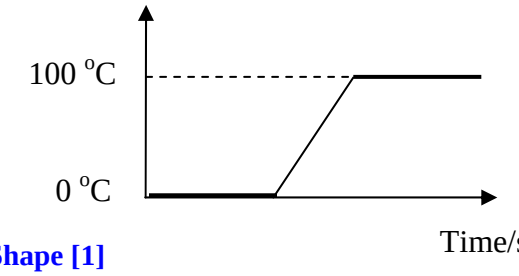
MARKING SCHEME PAPER 2 SPM 2007
SECTION A

No.	Answer	Mark
1(a)	Longitudinal	1
(b)	Compression / compress	1
(c)	Compression to compression // rarefaction to rarefaction	1
(d)	Increases/faster/higher/bigger	1
	TOTAL	4
2(a)	Force per area	1
(b)	1000 x 9.8 x 3 // 1000 x 10 x 3 29 400 Nm^{-2} // 30 000 Pa	1 1
(c)	Pressure at Q is higher // Pressure at P is lower // Q is bigger // P is lower	1
(d)	Depth at Q is higher // Depth at P is lower // P is nearer to water tank	1
	TOTAL	5
3(a)	Latent heat	1
(b)	The heat needed to break the bonds between molecules	1
(c)	1.0 x 4 200 x 100 420 000 J // 420 kJ	1 1
(d)	 Shape [1] Start flat at 0, increases for certain period and flat again at 100 [1]	2
	TOTAL	6
4(a)	Force x distance	1
(b)(i)	220 x 0.5 110 J // Nm// kg m^2 s^{-2}	1 1
(ii)	20 x 9.8 x 0.5 // 20 x 10 x 0.5 98 J // 100 J // Nm	1 1
(c)(i)	The work done by the man is more than the work done by the load.	1
(ii)	Friction // Weight of rope // energy lost // heat produced // sound produced	1
	TOTAL	7
5(a)	The angle of incidence when the angle of refraction is 90° (in box)	1
(b)	The angle of incidence is zero// i = 0 // r = 0 The incident ray is parallel to normal // light pass through at 90 °	1
(c)(i)	Prism P : Increase the angle of incidence //Rotate P anti clockwise// i > 45° Prism Q : Decrease the angle of incidence // Rotate Q clockwise// I < 45°	1 1
(ii)	Glass is more denser than air // glass is denser	1
(iii)	Figure 5.1 : refraction / Bending / Bend // away from normal Figure 5.2 : Reflection / Total internal reflection// totally reflected	1 1
(d)	Total internal reflection *(spelling must be right)*	1
	TOTAL	8

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6(a)(i)	Parallel	1
(ii)	The other bulbs will still light up	1
(b)(i)	A bulb that uses 240 V will release power at 60 W	1
(ii)	$I = \frac{60}{240} = 0.25$ A	1
(iii)	$R = \frac{240}{0.25} = 960$ $\frac{1}{R} = \frac{1}{960} + \frac{1}{960} + \frac{1}{960} = \frac{3}{960}$ R = 320 Ω	1 1 1
(iv)	Arrange the bulb in series	1
	TOTAL	8
7(a)(i)	Step down	1
(ii)	Easy to magnetised // Increase the magnetic field // to reduce hysterisis	1
(b)	$\frac{6x1000}{240}$ = 25	1 1
(c)(i)	0.1 x 240 x 0.75 = 18 W	1 1
(ii)	Use laminated soft iron core // use copper wire //use the low resistance coil // use thick wire	1
(d)(i)	Transformer supplies alternating current // TV cannot work on a.c.	1
(d)(ii)	Diode / rectifier / LED Series / correct diagram	1 1
	TOTAL	10
8(a)	Radioisotope is an unstable nuclei, decays to be stable by emitting radioactive particles	1
(b) (i)	Longer // 28.5 - can be used for a longer time // save cost// long lasting//no need to replace often	1 1
(ii)	Beta /β - penetrating power is moderate (middle/high) // can penetrate the cardboard // Less harmful // less dangerous	1 1
(iii)	Solid - easy to manage / handle /keep / carry / does not split	1 1
(c)	Strontium-90 // Sr-90 // Sr	1
(d)(i)	Decreases // reduce // lower // low	1
(ii)	Shorter distance between rollers // Rollers press harder // compress more	1
(e)	100 → 50 → 25 → 12.5 → 6.25 5.27 x 4 = 21.08	1 1
	TOTAL	12

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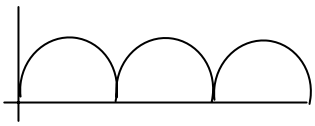
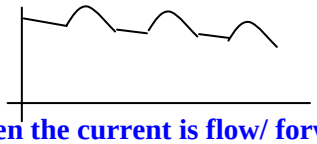
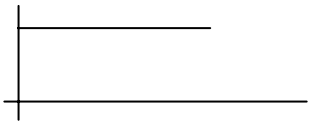
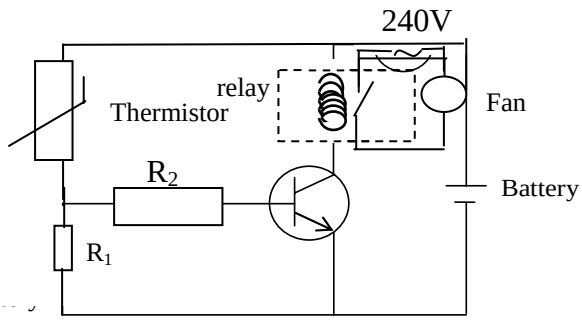
SECTION B

No	Answer	MARK
9(a)(i)	Aerofoil	1
(a)(ii)	1.Higher velocity on the upper surface 2.Lower pressure on the upper surface 3.Lift force = Difference in pressure x Area of surface // $F = (P_1 - P_2) A$	1 1 1
(b)(i)	In diagram 9.2 / 9.4 more upright // less bending // less slanting// In diagram 9.3/9.5 more bending / less upright // more slanting	1
(ii)	In diagram 9.3/9.5 futher landing distance // In diagram 9.2/9.4 shorter landing distance	1
(iii)	The higher the lift force, the further the landing distance// Lift force directly proportional to landing distance	2
(iv)	Long jump//triple jump // air glider//glider The higher the lift force, the further the landing distance // The lift force is directly proportional to the landing distance	1
(c)(i)	Smooth // Coat with wax - reduce water friction	1 1
(ii)	Streamline shape // aerodynamic//torpedo // aerofoil// diagram -reduce water friction	1 1
(iii)	Low density material/ strong material/ fiber glass/ carbon composite// wood// tough material -easy to float / not easy to break / can travel faster/ lighter/ not heavy	1 1
(iv)	Water proof // low density material // plastic// nylon//synthetic polymer// canvas// synthetic fiber -To avoid the sail absorbs water // sail lighter // not easy to tear off// small mass // small load// lighter	1 1
(v)	Wide // big // large - trap more wind // bigger force // increases resistance towards air	1 1
	TOTAL MARK	20

<table>
<tr><th>No</th><th>Answer</th><th>Mark</th></tr>
<tr><td>10(a)(i)</td><td>A material with an electrical conductivity between a conductor and an insulator</td><td>1</td></tr>
<tr><td>(b)</td><td>1.Bulb in diagram 10.1 not lights up
2.Bulb in diagrams 10.2 lights up
3.No current flow in the circuit in diagram 10.1
4.Current flow in the circuit in diagram 10.2
5.In diagram 10.1, positive terminal is connected to the n juntion / reverse biased // diagram
6.In diagram 10.2, positive terminal is connected to the p junction / forward biased // diagram
7.When diode is reverse biased, no current flow, the bulb not lights up
When diode is forward biased, the current flow, the bulb lights up</td><td>Max 5</td></tr>
<tr><td>(c)(i)</td><td>  </td><td>1</td></tr>
<tr><td>(ii)</td><td>  or 
When the current is flow/ forward biased, the capacitor charged up.
When no current / reverse biased, the capacitor discharge</td><td>1

1
1</td></tr>
<tr><td>(d)</td><td> 

<table>
<tr><th>Modification</th><th>Explanation</th></tr>
<tr><td>Relay//diagram
Relay at collector // diagram</td><td>To switch on the circuit/fan</td></tr>
<tr><td>Termistor // diagram</td><td>Sensitive to heat/temperature</td></tr>
<tr><td>Termistor replace R_1// diagram
R_1 replace LDR // diagram</td><td>V_T decrease // V_b increase
I_b flow // I_c flow</td></tr>
<tr><td>Fan and 240 V at secondary circuit in series// diagram</td><td>-</td></tr>
</table></td><td>3

2
2
2
1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>20</td></tr>
</table>

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SECTION C

No	Answer	Mark
11(a)(i)	$\frac{distance}{time}$	1
(b)	1. Momentum depends on mass and velocity 2. High momentum causes a high impulsive force 3. Inertia depends on mass// higher mass, higher inertia 4. Difficult to stop the lorry// (to move) when the mass is big	4
(c)	1. ABS // Air brake - Lorry does not stop immediately// can be controlled//does not skidded 2. Two tyres // many tyres // more than two tyres - better support// lower pressure acts on the tyres 3. 5 small tanks // many tanks - reduce inertia //does not shake// increase stability 4. Further distance // far // long // - Prevent collision between the trailer and the tractor// reduce force Tanker R is choosen Because have ABS brake system, two tyres, 5 small tanks and bigger distance between the trailer and the tractor	1 1 1 1 1 1 1 1 1 1 1
(d)(i)	1. $\frac{45 \times 10^3}{3\,600}$ // 12.5 // $\frac{10}{3\,600}$ // 0.0078 2. $\frac{12.5 - 0}{10}$ 3. 1.25 m s^{-2}	1 1 1
(ii)	1. 1 800 x 1.25 2. 2 250 N	1 1
	TOTAL MARK	20

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No	Answer	Mark
12(a)(i)	Frequency // f// wavelength // λ // lamda (*reject F*)	1
(b)	1. High pitch, has high frequency 2. Frequency is inversely proportional to wave length 3. Short wave length will diffract// spread out less // bend less 4. Sound easily diffracted / bending/ spread out	4
(c)	1. Large diameter - receives more signal 2. Same as the focal length - Signals are focused to the receivers // gives out a parallel beam 3. Microwave - has high frequency // high energy // short wave length // easily reflected 4. High - The signal is not blocked // cna detect signal K is choosen Because large diameter of parabolic disc, distance of signal receiver from the centre is the same as the cocal length , transmit microwave, high position.	1 1 1 1 1 1 1 1 1 1
(d)(i)	1. $v = \frac{2s}{t}$ 2. $\frac{2x90}{0.12}$ 3. 1 500 ms^{-1} 4. $\frac{1500}{50x10^{3}}$ 5. 0.03 m **method wrong, answer correct [X]*	5
	TOTAL MARK	20

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SAMPLE SCRIPT FOR PAPER 2B QUESTION 9

(a) aerofoil / aerodynamic (✓)

(ii) The lift force acts on the wing of the aeroplane because:

- the speed of air is high
- therefore it creates a region of low pressure (X no upper/lower)
- thus, the atmospheric pressure will it up and cause it to move upwards

(b) (i) Comparison: posture of the two ski jumpers:

- badan bagi peluncur pada rajah 9.3 adalah lebih condong ✓1 ke hadapan banding peluncur 9.2, manakala peluncur 9.2 kedudukan badannya lebih tegak

(ii) Comparison of the landing distance of the two ski jumpers:

- jarak pendaratan bagi peluncur 9.5 adalah lebih jauh ✓2 berbanding peluncur di rajah 9.4

(iii) relationship of lift force and lending distance:

-when the speed around the ski jumpers large
- it will create a region of low pressure, thus the atmospheric pressure will force the ski jumper upward which resulting based on lift force.
-thus the high lift force will gave a longer landing distance.
-In conclusion, the higher the lift force, ✓3 the longer the landing distance ✓4

(b) -lempar cakera (X) / lompat jauh ✓ (wrong cancel right : mark = 0)

-badan pemain mestilah condong ke hadapan untuk mencepatkan jarak daratan yang lebih jauh. (X)
(relationship is not given)

(c) Sailboat:

Characteristic	type	Explaination
Surface of board	Smooth ✓1	Reduce the air resistance, ✓2
Shape of board	Aerodynamic ✓3	Reduce the air friction ✓4
Material of the board	Low density ✓5	Reduce the mass ✓6
Size of board	Lebar dan panjang	To reach the stability during the sailing
Material for the sail	Nylon- strong ✓7	Strong and not easy torn ✓8
Size of materials	large ✓9	Can keep/captured the air surrounding and enable the motion of the sail move to the front and faster the movement X10 (must have word more)

Score : 14 marks

SAMPLE SCRIPT FOR PAPER 2B QUESTION 10

(a) Semiconductor:

An electronic device that can conduct the electricity or current when its temperature rises (X)

(wrong definition)

(b) • Lighting of the bulbs

- The bulb in diagram 10.1 is not lighted ✓1while the bulb in diagram 10.2 is lighted. ✓2

• Current

- Current in diagram 10.1 is not flow through conductor ✓3
- Current in diagram 10.2 is flow through conductor ✓4

• Connection of diodes

- The diode in reverse bias position to the terminal of battery for diagram 10.1 ✓5
- The diode in forward bias position to the terminal of battery for diagram 10.2 ✓6

[max: 5 marks]

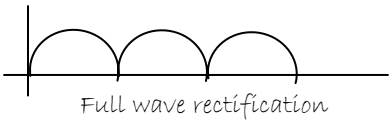
In diagram 10.1, the bulbs is not lighted because no current flow in the conductor as the diode in reverse bias position to the terminal of the battery.

In diagram 10.2, the bulb is lighted because current flow through the conductor as the diode in forward bias position to the terminal of the battery.

• Concept

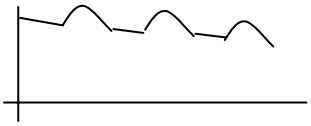
- P-type and n-type of semiconductor / the forward bias and reverse bias of diode.

(i)



Full wave rectification ✓

(ii)



Used capacitor ✓

- A capacitor is used to smooth the current
- The capacitor can be charged when there is flow of current ✓2
- Then the capacitor is discharged when there is no flow of current ✓3
- With the process of charging an discharging of capacitor, a steady current is produced. This smoothens the current.

Score : 9 marks

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SAMPLE SCRIPT FOR PAPER 2 QUESTION 11

(a) Speed is rate of change of distance traveled ✓

(b) - According to the concepts of momentum and inertia, an object which have higher mass will have higher inertia than the light object. ✓3

- Speed limit and load limit should be imposed on heavy vehicles to remind the drivers to drive the vehicles according to the speed stated.

- Objects with large mass such as the heavy vehicles is difficult to be stop when it is traveling because of its large inertia and more momentum. ✓4

(c) - The types of brakes that is most suitable is the ABS brake. ✓1
- ABS brake is more effective than air brake as it ensure the tanker from slipping the road while braking. X2 (not slipping but skidding)

- The numbers of tyres that should be used must be 2 or more. ✓3
- More tyres will increase the surface area of the tanker and the surface of road thus reducing it pressure and provide more stability to the tanker ✓4

- The number of tanker should be 5 or more and size of tanks should small ✓5
- This will help to reduce the inertia of tanker when it suddenly stop. ✓6

- The distance between the trailer and tractor should be further apart. ✓7
- This will avoid the oil from splitting and ensure that the oil tanks will not affected when head on head collision occurred which can lead to more serious accidents. ✓8

The most suitable tanker is tanker R ✓9
This is because it used ABS brake, 2 tyres, 5 small tanks and the distance between trailer and tractor is further. ✓10

Score : 12 marks

SAMPLE SCRIPT FOR PAPER 2B QUESTION 12

(a) Crest X

(b) Student C could hear the pitch clearly because he is the nearest among three with the coherent source. Different between with high and low pitch are that high pitch is a very soundless kind and low pitch is very loud.
So in this case, it because low pitch are very loud , that's why all three can hear clearly.

X (totally out)

(c) The most suitable are radar system K. ✓9 A diameter of 10 m can collect and transmitted signals easily. ✓2 Should be same as the focal length ✓3 .

X1 (reject value 10 m)

The frequency of microwave ✓5 are higher ✓6 than radiowave and medium λ .

The height of the parabolic disc from the ground should be high ✓7 because can easily detect ✓8 a signal from an aeroplane or UFO. ✓10

Score : 8 marks

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(KERTAS 3)

Section A
Bahagian A

[28 *marks*]
[28 *markah*]

Answer **all** questions in this section.
Jawab **semua** *soalan dalam bahagian ini.*

1 A student carries out an experiment to investigate the relationship between the length of a wire, *l*, and its resistance, *R*.

The arrangement of the apparatus is shown in Diagram 1.1. An ammeter, dry cells, a rheostat, a switch and a piece of constantan wire are connected in series.

A voltmeter is used to measure the potential difference, *V*, across the constantan wire between *P* and *Q*.

Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara panjang suatu dawai, l, dengan rintangan, R.

Susunan radas ditunjukkan pada Rajah 1.1. *Sebuah ammeter, sel kering, reostat, suis dan dawai konstantan disambung secara sesiri.*

Sebuah voltmeter digunakan untuk mengukur beza keupayaan, V, merentasi dawai konstantan antara P dan Q.

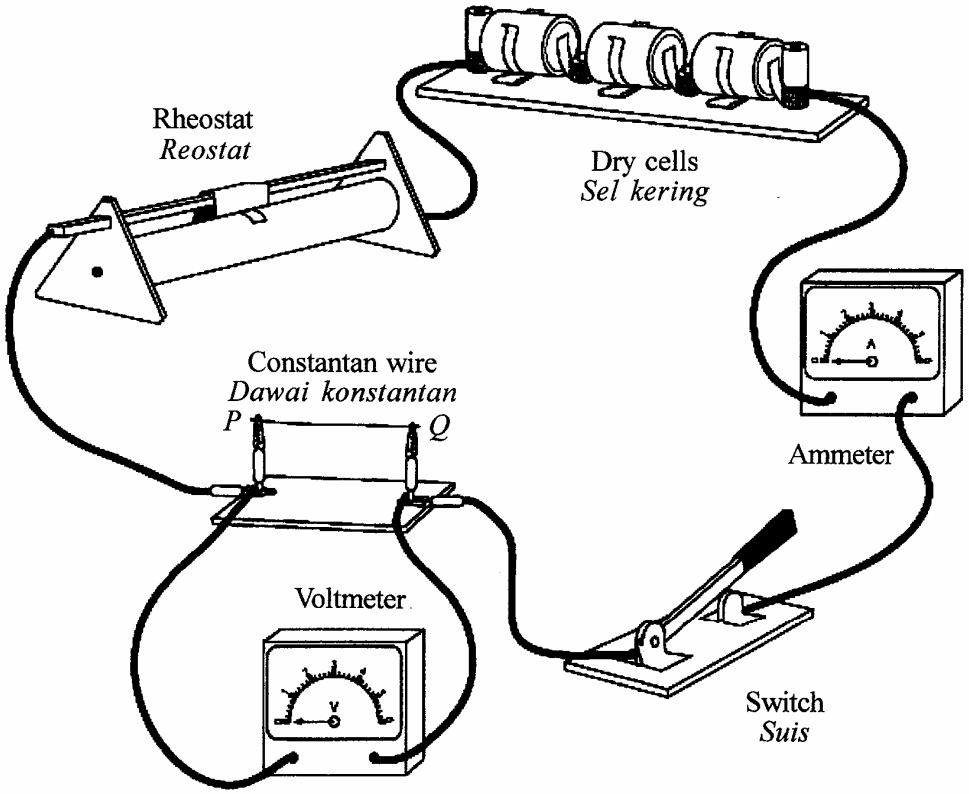

Diagram 1.1
Rajah 1.1

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A constantan wire of length, $l = 20 \cdot 0$ cm is connected between P and Q. When the switch is on, the rheostat is adjusted until the ammeter reading is $0 \cdot 50$ A. The voltmeter reading, V, is as shown in Diagram 1.2 on page 4.

The procedure is repeated with constantan wires of length, $l = 40 \cdot 0$ cm, $60 \cdot 0$ cm, $80 \cdot 0$ cm and $100 \cdot 0$ cm.

The corresponding voltmeter readings across P and Q are shown in Diagrams 1.3, 1.4, 1.5 and 1.6 on page 4.

Dawai konstantan yang mempunyai panjang, $l = 20 \cdot 0$ cm *disambung antara P dan Q. Apabila suis dihidupkan, reostat dilaraskan sehingga bacaan ammeter adalah* $0 \cdot 50$ A. *Bacaan voltmeter, V, adalah seperti yang ditunjukkan pada Rajah* 1.2 *di halaman* 4.

Prosedur diulangi dengan dawai konstantan yang mempunyai panjang, $l = 40 \cdot 0$ cm, $60 \cdot 0$ cm, $80 \cdot 0$ cm *dan* $100 \cdot 0$ cm.

Bacaan voltmeter yang sepadan, yang merentasi P dan Q, ditunjukkan pada Rajah 1.3, 1.4, 1.5 *dan* 1.6 *di halaman* 4.

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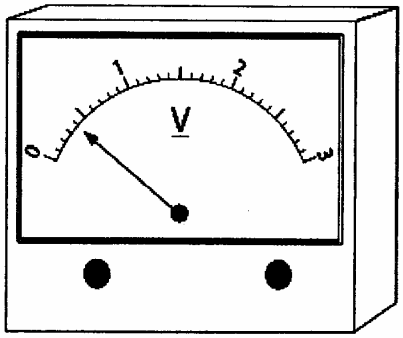
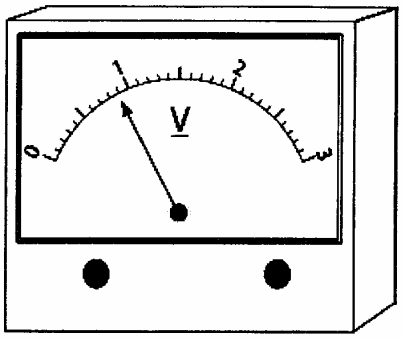


V = ...

Length of wire, *l* = 20·0 cm
Panjang dawai, *l* = 20·0 cm

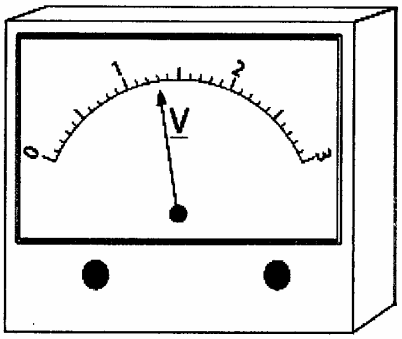
Diagram 1.2
Rajah 1.2



V = ...

Length of wire, *l* = 40·0 cm
Panjang dawai, *l* = 40·0 cm

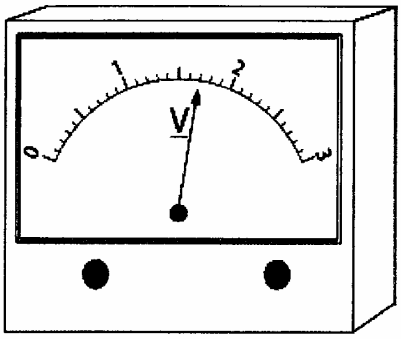
Diagram 1.3
Rajah 1.3



V = ...

Length of wire, *l* = 60·0 cm
Panjang dawai, *l* = 60·0 cm

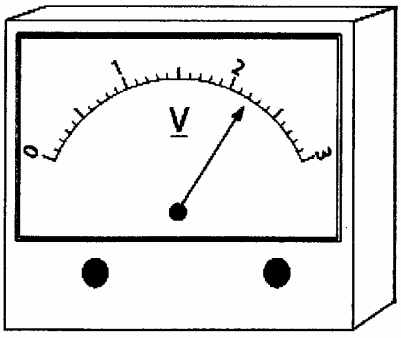
Diagram 1.4
Rajah 1.4



V = ...

Length of wire, *l* = 80·0 cm
Panjang dawai, *l* = 80·0 cm

Diagram 1.5
Rajah 1.5



V = ...

Length of wire, *l* = 100·0 cm
Panjang dawai, *l* = 100·0 cm

Diagram 1.6
Rajah 1.6

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(*a*) For the experiment described on pages 2 and 3, identify:
Bagi eksperimen yang diterangkan di halaman 2 *dan* 3, *kenal pasti*:

(i) The manipulated variable
Pembolehubah dimanipulasikan

.....

[1 *mark*]
[1 *markah*]

(ii) The responding variable
Pembolehubah bergerak balas

.....

[1 *mark*]
[1 *markah*]

(iii) The constant variable
Pembolehubah dimalarkan

.....

[1 *mark*]
[1 *markah*]

(*b*) Based on Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6 on page 4:
Berdasarkan Rajah 1.2, 1.3, 1.4, 1.5 *dan* 1.6 *di halaman* 4:

(i) Record the voltmeter readings, V, in the spaces provided on page 4.
Catatkan bacaan voltmeter, V, *dalam ruang yang disediakan di halaman* 4.

[2 *marks*]
[2 *markah*]

(ii) Calculate the values of R for each length of wire using the formula $R = \frac{V}{0{\cdot}5}$.

Hitung nilai-nilai R *bagi setiap panjang dawai menggunakan formula* $R = \frac{V}{0{\cdot}5}$.

[2 *marks*]
[2 *markah*]

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(iii) Tabulate your results for V and R for all values of l, in the space below.

Jadualkan keputusan anda bagi V dan R untuk semua nilai l, pada ruang di bawah.

[3 *marks*]
[3 *markah*]

(*c*) On the graph paper on page 7, plot a graph of R against l.

Pada kertas graf di halaman 7, *lukis graf R melawan l.*

[5 *marks*]
[5 *markah*]

(*d*) Based on your graph in **1**(*c*), state the relationship between R and l.

Berdasarkan graf anda di **1**(*c*), *nyatakan hubungan antara R dengan l.*

.....

[1 *mark*]
[1 *markah*]

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2 A student carries out an experiment to investigate the relationship between the mass, *m*, of a load placed on a spring and the length, *l*, of the spring. The student also determines the spring constant, k.

Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara jisim, m, bagi suatu beban yang diletakkan pada spring dengan panjang, l, bagi spring itu. Murid itu juga menentukan pemalar spring, k.

The results of this experiment is shown in the graph of *l* against *m* in Diagram 2.1 on page 9.

Keputusan eksperimen ini ditunjukkan oleh graf l melawan m pada Rajah 2.1 *di halaman* 9.

(*a*) Based on the graph in Diagram 2.1,

Berdasarkan graf pada Rajah 2.1,

(i) what happens to *l* as *m* increases?

apakah yang berlaku pada l apabila m bertambah?

.....

[1 *mark*]
[1 *markah*]

(ii) determine the value of *l* when *m* = 0 g.
Show on the graph, how you determine the value of *l*.

tentukan nilai l apabila m = 0 g.
Tunjukkan pada graf itu bagaimana anda menentukan nilai l.

l = ...

[2 *marks*]
[2 *markah*]

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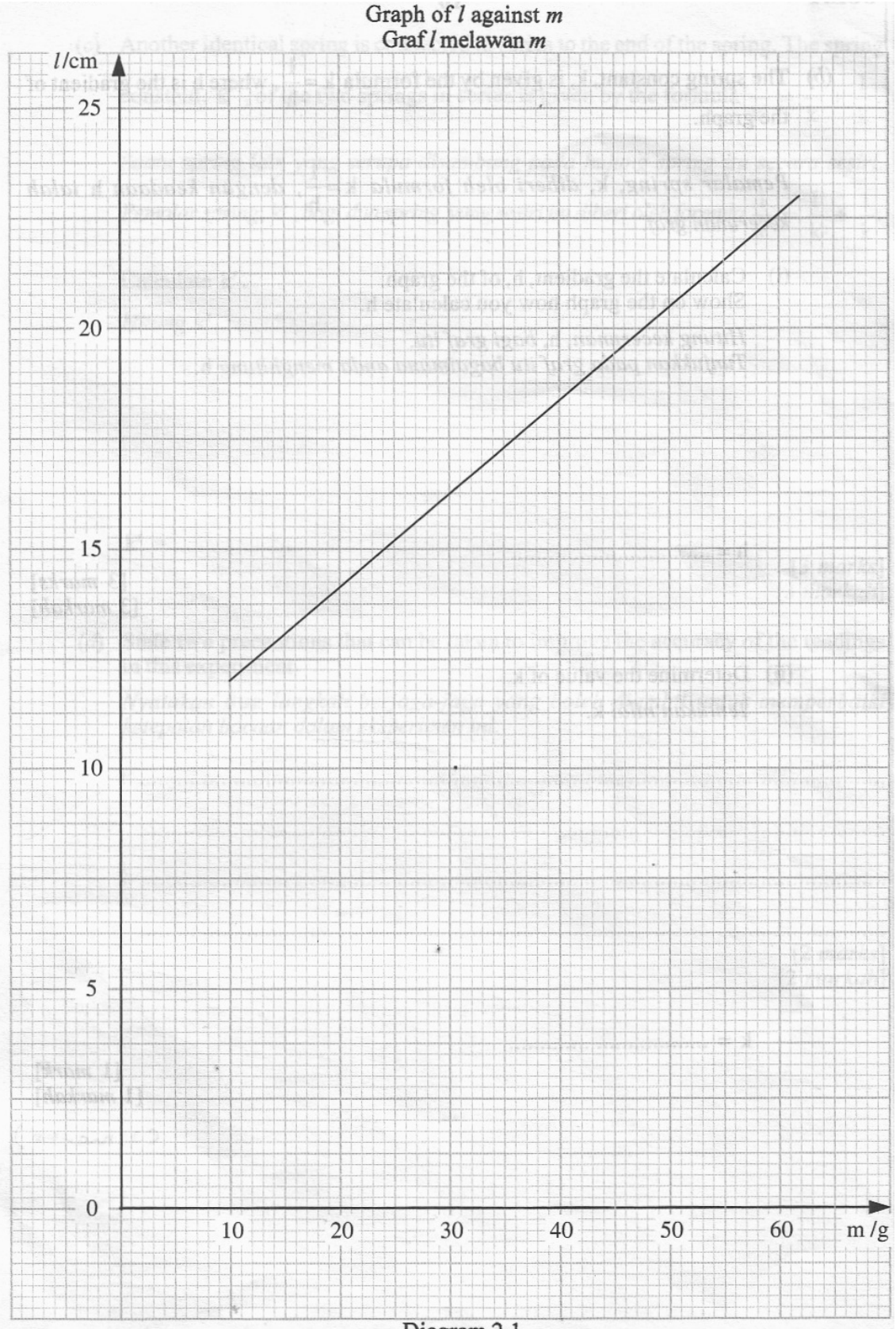

Diagram 2.1
Rajah 2.1

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(*b*) The spring constant, k, is given by the formula $k = \frac{1}{h}$, where h is the gradient of the graph.

Pemalar spring, k, *diberi oleh formula* $k = \frac{1}{h}$, *dengan keadaan* h *ialah kecerunan graf.*

(i) Calculate the gradient, h, of the graph.
Show on the graph how you calculate h.
Hitung kecerunan, h, *bagi graf itu.*
Tunjukkan pada graf itu bagaimana anda menghitung h.

h = ...

[3 *marks*]
[3 *markah*]

(ii) Determine the value of k.
Tentukan nilai k.

k = ...

[1 *mark*]
[1 *markah*]

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(*c*) Another identical spring is connected in series to the end of the spring. The spring constant, k', of the two springs in series is given by the formula $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Suatu spring lain yang serupa disambung pada hujung spring itu secara sesiri. Pemalar spring, k', *bagi dua spring yang sesiri ini diberi oleh formula* $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Calculate k'.

Hitung k'.

$k' =$ .....

[3 *marks*]
[3 *markah*]

(*d*) State **two** precautions that can be taken to improve the accuracy of the readings in this experiment.

Nyatakan **dua** *langkah berjaga-jaga yang boleh diambil untuk memperbaiki ketepatan bacaan dalam eksperimen ini.*

1 .....

.....

2 .....

.....

[2 *marks*]
[2 *markah*]

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Section B
Bahagian B

[12 *marks*]
[12 *markah*]

Answer any **one** question from this section.
Jawab mana-mana **satu** *soalan daripada bahagian ini.*

3 Diagram 3 shows two opaque cups, A and B, containing different amount of water. A similar coin is placed at the bottom of each cup.

When the coin is observed from the same position, the image of the coin in cup A cannot be seen, but the image of the coin in cup B can be seen.

Rajah 3 *menunjukkan dua cawan legap,* A *dan* B, *yang berisi air yang berlainan kuantiti. Sekeping syiling yang serupa diletakkan di dasar setiap cawan itu.*

Apabila syiling itu diperhati daripada kedudukan yang sama, imej syiling dalam cawan A *tidak boleh dilihat tetapi imej syiling dalam cawan* B *boleh dilihat.*

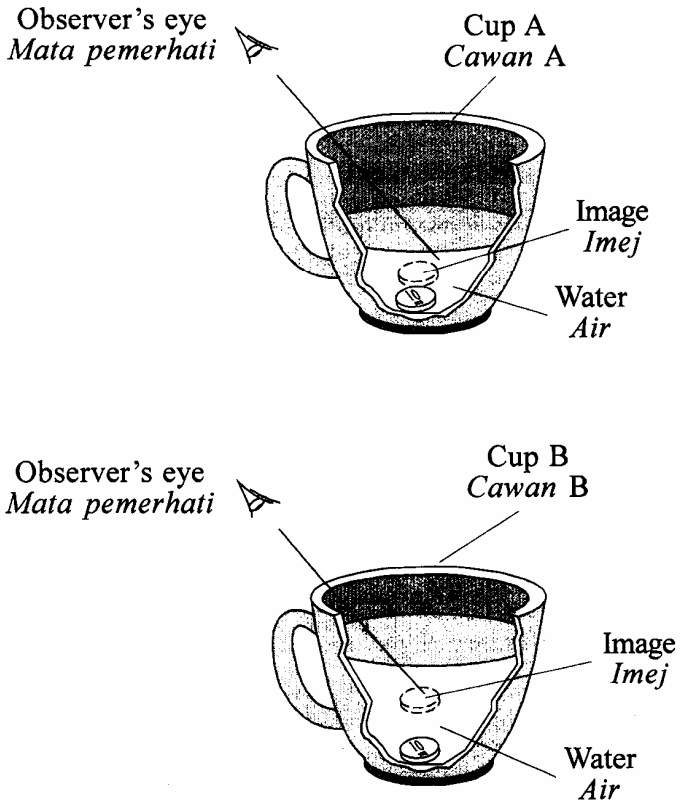

Diagram 3
Rajah 3

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Based on your observations on the depth of the water and the position of the images of the coins:

Berdasarkan pemerhatian anda tentang kedalaman air dan kedudukan imej syiling-syiling tersebut:

(*a*) State **one** suitable inference. [1 *mark*]

Nyatakan **satu** *inferens yang sesuai.* [1 *markah*]

(*b*) State **one** hypothesis that could be investigated. [1 *mark*]

Nyatakan **satu** *hipotesis yang boleh disiasat.* [1 *markah*]

(*c*) With the use of apparatus such as a tall beaker, pins and other apparatus, describe an experiment to investigate the hypothesis stated in **3**(*b*).

Dengan menggunakan radas seperti sebuah bikar yang tinggi, pin-pin dan radas lain, terangkan satu eksperimen untuk menyiasat hipotesis yang dinyatakan di **3**(*b*).

In your description, state clearly the following:

Dalam penerangan anda, jelaskan perkara berikut:

(i) The aim of the experiment.

Tujuan eksperimen.

(ii) The variables in the experiment.

Pembolehubah dalam eksperimen.

(iii) The list of apparatus and materials.

Senarai radas dan bahan.

(iv) The arrangement of the apparatus.

Susunan radas.

(v) The procedure used in the experiment.

Describe how to control and measure the manipulated variables and how to measure the responding variables.

Prosedur yang digunakan dalam eksperimen.

Terangkan bagaimana mengawal dan mengukur pembolehubah dimanipulasikan dan bagaimana mengukur pembolehubah bergerak balas.

(vi) The way to tabulate the data.

Cara untuk menjadualkan data.

(vii) The way to analyse the data.

Cara untuk menganalisis data.

[10 *marks*]
[10 *markah*]

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4 Diagram 4.1 shows Jason taking a shower on a very cold morning. After the water heater is switched on for a while, he still feels cold.

Diagram 4.2 shows that Jason no longer feels cold after the temperature control knob on the heater is turned.

Rajah 4.1 *menunjukkan Jason sedang mandi pada suatu pagi yang sangat sejuk. Selepas pemanas air dihidupkan beberapa ketika, dia masih terasa sejuk.*

Rajah 4.2 *menunjukkan Jason tidak lagi terasa sejuk selepas tombol kawalan suhu pada pemanas diputarkan.*

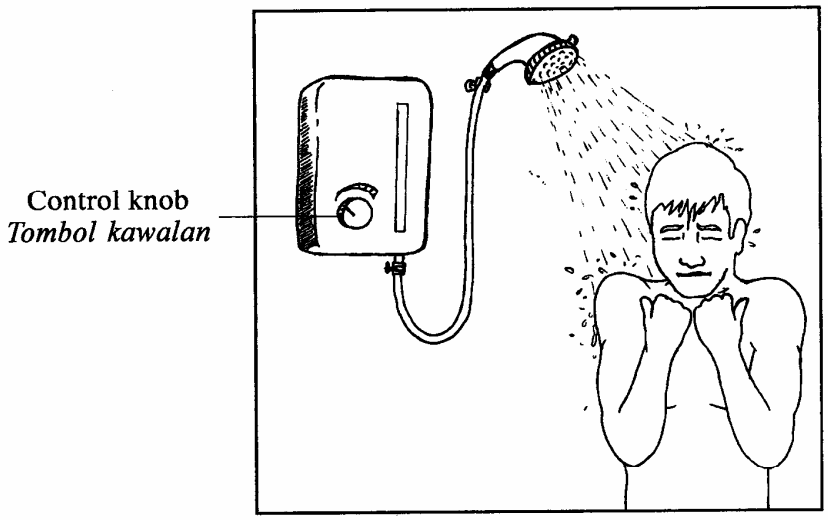

Diagram 4.1
Rajah 4.1

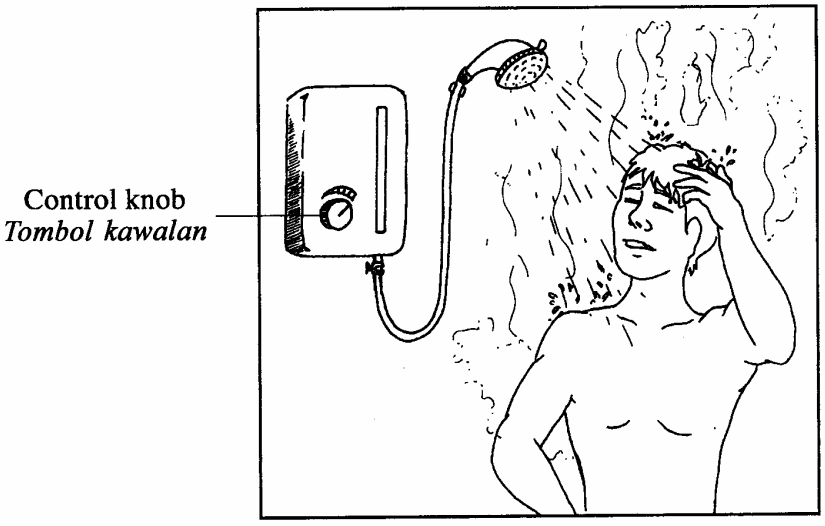

Diagram 4.2
Rajah 4.2

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Based on the observation on Diagram 4.1 and Diagram 4.2 and using your knowledge of the effect of current on heating:

Berdasarkan pemerhatian anda pada Rajah 4.1 *dan Rajah* 4.2 *dan menggunakan pengetahuan anda tentang kesan arus terhadap pemanasan*:

(*a*) State **one** suitable inference. [1 *mark*]

Nyatakan **satu** *inferens yang sesuai.* [1 *markah*]

(*b*) State **one** hypothesis that could be investigated. [1 *mark*]

Nyatakan **satu** *hipotesis yang boleh disiasat.* [1 *markah*]

(*c*) With the use of apparatus such as a beaker, an ammeter, an immersion heater and other apparatus, describe an experiment to investigate the hypothesis stated in **4**(*b*).

Dengan menggunakan radas seperti bikar, ammeter, pemanas rendam dan radas lain, terangkan satu eksperimen untuk menyiasat hipotesis yang dinyatakan di **4**(*b*).

In your description, state clearly the following:

Dalam penerangan anda, jelaskan perkara berikut:

(i) The aim of the experiment.

Tujuan eksperimen.

(ii) The variables in the experiment.

Pembolehubah dalam eksperimen.

(iii) The list of apparatus and materials.

Senarai radas dan bahan.

(iv) The arrangement of the apparatus.

Susunan radas.

(v) The procedure used in the experiment.

Describe how to control and measure the manipulated variables and how to measure the responding variables.

Prosedur yang digunakan dalam eksperimen.

Terangkan bagaimana mengawal dan mengukur pembolehubah dimanipulasikan dan bagaimana mengukur pembolehubah bergerak balas.

(vi) The way to tabulate the data.

Cara untuk menjadualkan data.

(vii) The way to analyse the data.

Cara untuk menganalisis data.

[10 *marks*]
[10 *markah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

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MARKING SCHEME PAPER 3 SPM 2007
SECTION A

Question	Answer	Marks
1 (a)(i)	**Length of wire** *Panjang dawai*	1
(ii)	**Resistance // Potential difference** *Rintangan // beza keupayaan*	1
(iii)	**Diameter of wire // type of wire //value of current** *Diameter dawai // jenis dawai // nilai arus*	1
(b) (i)	**Record five voltmeter readings correctly** *Mencatatkan lima bacaan voltmeter dengan betul* Diagram 1.2 : 0.4 V Diagram 1.3 : 0.9 V Diagram 1.4 : 1.3 V Diagram 1.5 : 1.7 V Diagram 1.6 : 2.2 V **Note : any three readings correct, award 1 mark** *Nota : mana-mana tiga bacaan betul, beri 1 markah*	2
(ii)	**Calculate the values of R correctly** *Mengira nilai-nilai R dengan betul* Diagram 1.2 : 0.8 Ω Diagram 1.3 : 1.8 Ω Diagram 1.4 : 2.6 Ω Diagram 1.5 : 3.4 Ω Diagram 1.6 : 4.4 Ω **Note : any three values correct, award 1 mark** *Nota : mana-mana 3 nilai betul, beri 1 markah*	2
(iii)	**Tabulate the results correctly** *Menjadualkan keputusan dengan betul* - **Values of *I*, V and R shown in the table** *Nilai I, V dan R ditunjukkan dalam jadual* - **State the units of I, V and R correctly** *Menyatakan unit I, V dan R dengan betul* - **The values of V and R are consistent to one decimal point** *Nilai I, V dan R tekal kepada 1 titik perpuluhan*	1 1 1

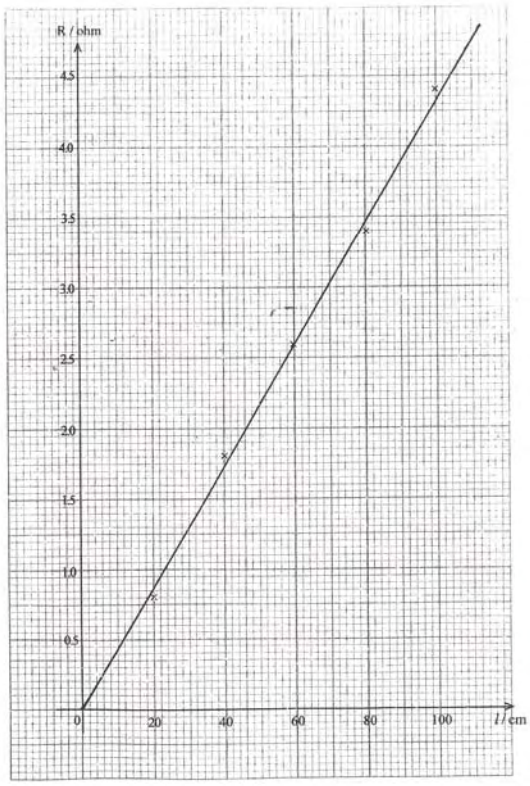
I / cm	V /V	R / Ω
20.0	0.4	0.8
40.0	0.9	1.8
60.0	1.3	2.6
80.0	1.7	3.4
100.0	2.2	4.4

1 (c)

Draw a complete graph of R against *l*

Melukis graf R melawan l yang lengkap

Graph of R against *l*
Graf R melawan l



Tick ✓ based on the following aspects :

Tandakan ✓berasaskan aspek-aspek berikut :

1. Show R on the vertical-axis and *l* on the horizontal-axis ***Tunjukkan R pada paksi-menegak dan l pada paksi-Mengufuk***	✓
2. State the units of the variables correctly ***Nyatakan unit-unit pembolehubah dengan betul***	✓
3. Both axes are marked with uniform scale ***Kedua-dua paksi ditandakan dengan skala seragam***	✓
4. All five points are plotted correctly ***Lima titik diplot dengan betul*** **Note : only three points plotted correctly, award ✓.** ***Nota : hanya tiga titik diplot dapat ✓***	✓✓

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	5. Best fit straight line is drawn *Satu garis lurus penyesuaian terbaik dilukis* 6. Show the minimum size of graph at least 5 x 4 (2 cm x 2 cm) square (counted from the origin until the furthest point) *Menunjukkan saiz minimum graf sekurang-kurangnya 5 x 4 (2 cm x 2 cm) persegi* *(dikira dari asalan hingga titik terjauh)* Score : Number of ✓ / *Bilangan ✓* — Score / *Skor* 7 — 5 5 – 6 — 4 3 – 4 — 3 2 — 2 1 — 1	✓ ✓ 5
(d)	State the correct relationship between R and *I* *Menyatakan hubungan yang betul antara R dengan I* Resistance of wire / R is directly proportional to the length of wire / *I* *Rintangan dawai / R berkadar terus dengan panjang dawai / I*	1
	Total mark	**16**
2 (a) (i)	Increases *Bertambah*	1
(ii)	- show graphical extrapolation correctly *Menunjukkan ekstrapolasi graf dengan betul* - state the value within acceptable range (9.5 – 10.5 cm) *Menyatakan nilai dalam julat yang boleh diterima (9.5 – 10.5 cm)*	1 1
(b) (i)	- Draw a sufficiently large triangle *Melukis segitiga yang cukup besar* - Correct substitution (follow candidates triangle) *Gantian yang betul (ikut segitiga calon)* - State the value / answer with correct unit *Menyatakan nilai / jawapan dengan unit yang betul* 0.208 cm g^{-1}	1 1 1
(ii)	- Correct substitution *Gantian yang betul* - State the value of k *Menyatakan nilai k* 4.81 g cm^{-1}	1 1

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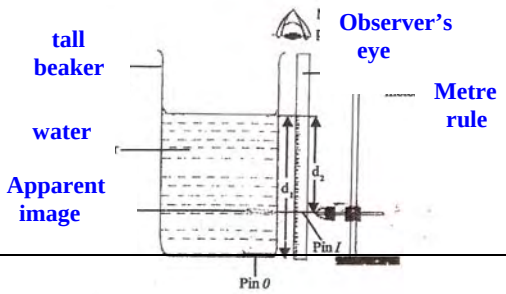
2 (c) (i)	- Correct substitution *Gantian yang betul* - State the value of k' *Menyatakan nilai k'* $2.41\ g\ cm^{-1}$	1 1
(d)	- Position of the eye must be align with the pin *Kedudukan mata setentang dengan pin* - Ensure the spring does not swing / at rest when reading is taken *Pastikan spring tidak berayun / dalam keadaan rehat ketika bacaan diambil* - Repeat readings and take average *Ulang bacaan dan ambil purata* (any two relevant responses) *(mana-mana dua jawapan relevan)*	1 1 1 Max 2
	Total mark	**12**

SECTION B

3 (a)	Depth of water affects the position of image // Position of image depends on the depth of water *Kedalaman air mempengaruhi kedudukan imej // kedudukan imej bergantung kepada kedalaman air*	1
(b)	The more the depth of water, the more the apparent depth of the image *Semakin bertambah kedalaman air, semakin bertambah dalam ketara imej*	1
(c) (i)	To investigate the relationship between the real depth and apparent depth *Mengkaji hubungan antara dalam nyata dan dalam ketara*	1
(ii)	Manipulated variable : real depth Responding variable : apparent depth *Pembolehubah dimanipulasi : dalam nyata* *Pembolehubah bergerak balas : dalam ketara* Constant variable : type of liquid // density of liquid *Pembolehubah dimalarkan : jenis cecair // ketumpatan cecair*	1 1
(iii)	Beaker, water, pins, set of retort stand, metre rule *Bikar, air, pin, set kaki retort, pembaris meter*	1
(iv)		

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	- a pin is placed at the base of the beaker - another pin is clamped to the retort clamp outside the beaker - *sebatang pin diletak dalam bikar pada dasar bikar* - *sebatang pin lain diapit pada pemegang retort di luar bikar*	1
(v)	State the method to control manipulated variable *Menyatakan kaedah mengawal pembolehubah manipulasi* - fill beaker with water to a depth of d_1 = 10 cm - *isikan air dalam bikar pada kedalaman d_1 = 10 cm* State the method to measure the responding variable *Menyatakan kaedah mengukur pembolehubah bergerak balas* - move the pin outside the beaker to obtain the apparent position of the pin in the beaker - measure the position of the pin from the surface of the water to the pin, h_1 - *gerak pin di luar bikar untuk mendapatkan kedudukan ketara pin dalam bikar* - *ukur kedudukan pin dari permukaan air ke pin, h_1* Repeat the experiment at least 4 times *Ulangi eksperimen sekurang-kurangnya 4 kali* - Repeat the experiment by increasing the depth of water : d_2, d_3, d_4, d_5 - Determine the corresponding apparent depth, h_2, h_3, h_4, h_5 - *Ulang eksperimen dengan menambah kedalaman air : d_2, d_3, d_4, d_5* - *Tentukan dalam ketara, h_2, h_3, h_4, h_5*	1 1 1
(vi)	<table><tr><th>Depth of water / cm</th><th>Apparent depth / cm</th></tr><tr><td>d_1</td><td>h_1</td></tr><tr><td>d_2</td><td>h_2</td></tr><tr><td>d_3</td><td>h_3</td></tr><tr><td>d_4</td><td>h_4</td></tr><tr><td>d_5</td><td>h_5</td></tr></table>	1
(vii)	Plot a graph of apparent depth against the depth of water *Plot graf dalam ketara melawan kedalaman air*	1
Total mark		12

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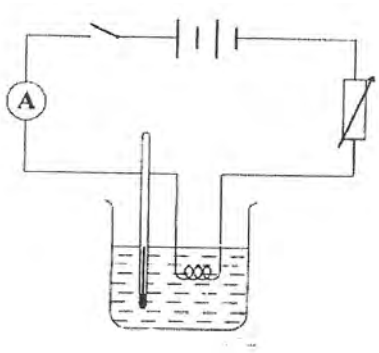
4 (a)	The temperature of water depends on the current *Suhu air dipengaruhi oleh arus*	1
(b)	The higher the current, the higher the temperature of the water *Semakin tinggi arus, semakin tinggi suhu air*	1
(c) (i)	The study the relationship between the current and the temperature of the water *Mengkaji hubungan antara arus dengan suhu air*	1
(ii)	Manipulated variable : current Responding variable : temperature *Pembolehubah dimanipulasikan : arus* *Pembolehubah bergerak balas : suhu* Constant variable : volume of water // time of heating *Pembolehubah dimalarkan : isipadu air // masa pemanasan*	1 1
(iii)	Thermometer, power pack, water, stopwatch *Thermometer, bekalan kuasa, air, jam randik*	1
(iv)	 Connect the heater, rheostat and ammeter in series with a power pack. Immerse the heater in a beaker of water *Sambungkan pemanas, rheostat, ammeter, bekalan kuasa secara bersiri. Masukkan pemanas ke dalam bikar yang mengandungi air.*	1
(v)	State the method to control manipulated variable *Menyatakan kaedah mengawal pembolehubah manipulasi* Measure the initial temperature of water, θ_0 Switch on the heater and adjust the rheostat to supply a current, I_1 *Catat suhu awal air, θ_0* *Hidupkan suis dan laraskan rheostat sehingga bacaan arus, I_1* State the method to measure the responding variable *Menyatakan kaedah mengukur pembolehubah bergerak balas* Record the final temperature, θ_1 after 5 minutes *Catat suhu akhir, θ_1 selepas 5 minit*	1 1

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<table>
<tr><td></td><td>Repeat the experiment at least 4 times
Ulangi eksperimen sekurang-kurangnya 4 kali

Repeat the experiment with I_2, I_3, I_4 and I_5 and measure the final temperature, θ_2, θ_3, θ_4, θ_5
Ulang eksperimen dengan I_2, I_3, I_4 dan I_5 dan catatkan suhu akhir air, θ_2, θ_3, θ_4, θ_5</td><td>1</td></tr>
<tr><td>(vi)</td><td><table><tr><th>Current / A</th><th>Final temperature / ^{0}C</th></tr><tr><td>I_1</td><td>θ_1</td></tr><tr><td>I_2</td><td>θ_2</td></tr><tr><td>I_3</td><td>θ_3</td></tr><tr><td>I_4</td><td>θ_4</td></tr><tr><td>I_5</td><td>θ_5</td></tr></table></td><td>1</td></tr>
<tr><td>(vii)</td><td>Plot graph of final temperature against current
Plot graf suhu akhir melawan arus</td><td>1</td></tr>
<tr><td colspan="2">Total mark / Jumlah markah</td><td>12</td></tr>
</table>

END OF MARKING SCHEME

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SAMPLE SCRIPT FOR PAPER 3A QUESTION 1 (CANDIDATE 1)

(*a*) For the experiment described on pages 2 and 3, identify:
Bagi eksperimen yang diterangkan di halaman 2 *dan* 3, *kenal pasti*:

(i) The manipulated variable
Pembolehubah dimanipulasikan

l ✓
.....

[1 *mark*]
[1 *markah*]

(ii) The responding variable
Pembolehubah bergerak balas

V ✓
.....

[1 *mark*]
[1 *markah*]

(iii) The constant variable
Pembolehubah dimalarkan

Diameter of wire ✓
.....

[1 *mark*]
[1 *markah*]

(*b*) Based on Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6 on page 4:
Berdasarkan Rajah 1.2, 1.3, 1.4, 1.5 *dan* 1.6 *di halaman* 4:

(i) Record the voltmeter readings, *V*, in the spaces provided on page 4.
Catatkan bacaan voltmeter, *V*, *dalam ruang yang disediakan di halaman* 4.

[2 *marks*]
[2 *markah*]

(ii) Calculate the values of *R* for each length of wire using the formula $R = \frac{V}{0{\cdot}5}$.

Hitung nilai-nilai R bagi setiap panjang dawai menggunakan formula $R = \frac{V}{0{\cdot}5}$.

[2 *marks*]
[2 *markah*]

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(iii) Tabulate your results for V and R for all values of l, in the space below.

Jadualkan keputusan anda bagi V dan R untuk semua nilai l, pada ruang di bawah.

l / cm	V / V	R / Ω
20	0.4	0.8
40	0.9	1.8
60	1.3	2.6
80	1.7	3.4
100	2.2	4.4

✓1 ✓2 ✓3 ✓4 ✓5 ✓6 ✓7

[3 *marks*]
[3 *markah*]

(*c*) On the graph paper on page 7, plot a graph of R against l.

Pada kertas graf di halaman 7, lukis graf R melawan l.

[5 *marks*]
[5 *markah*]

(*d*) Based on your graph in 1(*c*), state the relationship between R and l.

Berdasarkan graf anda di 1(*c*), *nyatakan hubungan antara R dengan l.*

Directly proportional ✗

.....

[1 *mark*]
[1 *markah*]

14

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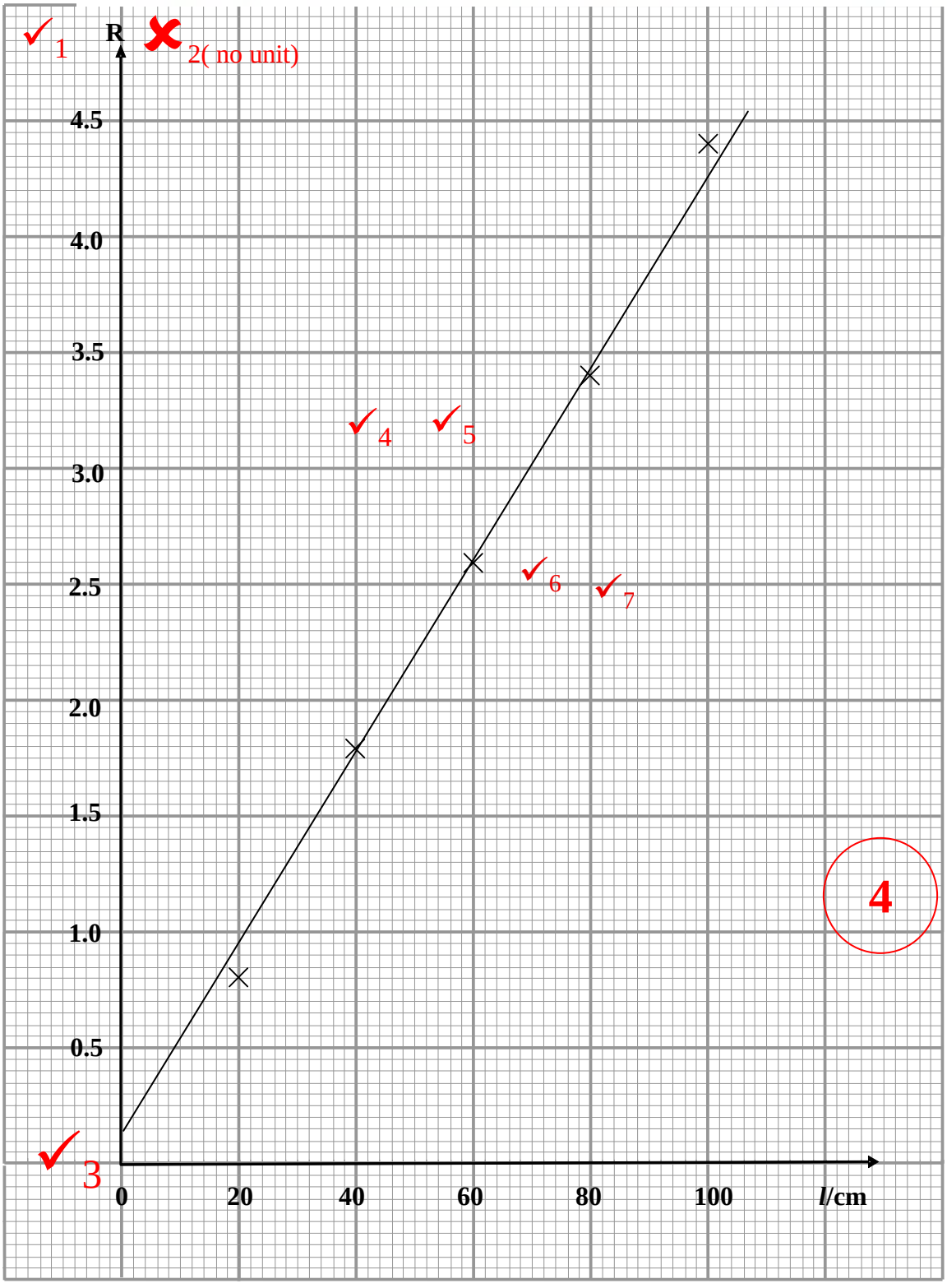
1
R
2(no unit)
4.5
4.0
3.5
4
5
3.0
2.5
6
7
2.0
1.5
4
1.0
0.5
3
0
20
40
60
80
100
l/cm

SAMPLE SCRIPT FOR PAPER 3A QUESTION 1 (CANDIDATE 2)

(*a*) For the experiment described on pages 2 and 3, identify:
Bagi eksperimen yang diterangkan di halaman 2 *dan* 3, *kenal pasti*:

(i) The manipulated variable
Pembolehubah dimanipulasikan

length ✓
.....
[1 *mark*]
[1 *markah*]

(ii) The responding variable
Pembolehubah bergerak balas

voltmeter ✗
.....
[1 *mark*]
[1 *markah*]

(iii) The constant variable
Pembolehubah dimalarkan

ammeter ✗
.....
[1 *mark*]
[1 *markah*]

(*b*) Based on Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6 on page 4:
Berdasarkan Rajah 1.2, 1.3, 1.4, 1.5 *dan* 1.6 *di halaman* 4:

(i) Record the voltmeter readings, V, in the spaces provided on page 4.
Catatkan bacaan voltmeter, V, *dalam ruang yang disediakan di halaman* 4.
[2 *marks*]
[2 *markah*]

(ii) Calculate the values of R for each length of wire using the formula $R = \frac{V}{0{\cdot}5}$.

Hitung nilai-nilai R *bagi setiap panjang dawai menggunakan formula* $R = \frac{V}{0{\cdot}5}$.

[2 *marks*]

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(iii) Tabulate your results for V and R for all values of l, in the space below.

Jadualkan keputusan anda bagi V dan R untuk semua nilai l, pada ruang di bawah.

l / cm	V/V	R
20	0.4	0.8
40	0.9	1.8
60	1.3	2.6
80	1.7	3.4
100	2.2	4.4

✓1 ✗2(no unit) ✓3 ✓4 ✓5 ✓6 ✓7

[3 *marks*]
[3 *markah*]

(*c*) On the graph paper on page 7, plot a graph of R against l.

Pada kertas graf di halaman 7, lukis graf R melawan l.

[5 *marks*]
[5 *markah*]

(*d*) Based on your graph in 1(*c*), state the relationship between R and l.

Berdasarkan graf anda di 1(*c*), *nyatakan hubungan antara R dengan l.*

Directly proportional ✓

[1 *mark*]
[1 *markah*]

12

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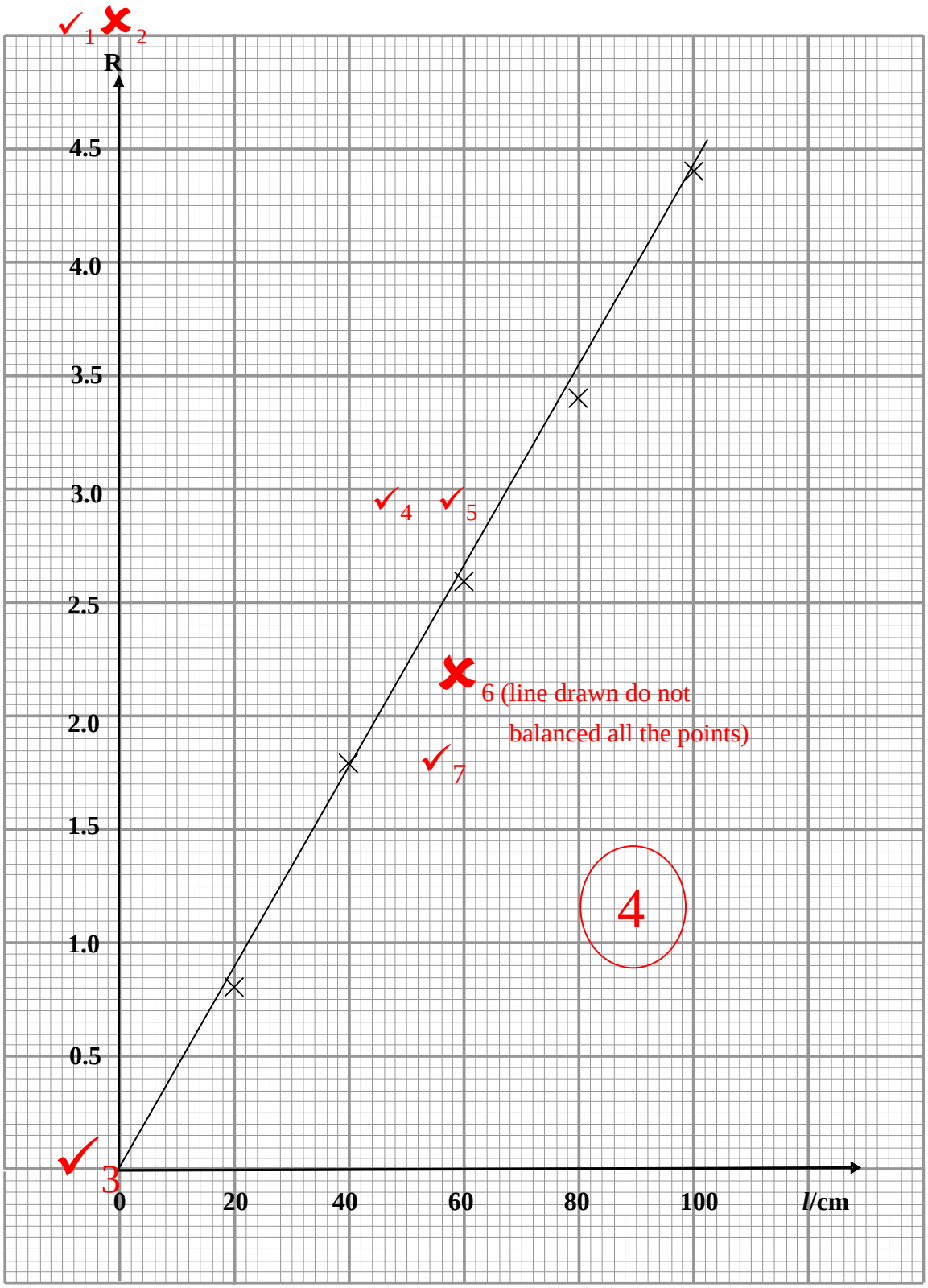
✓1 ✗2
R
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
✓3
0
20
40
60
80
100
l/cm
✓4
✓5
✗6 (line drawn do not balanced all the points)
✓7
4

SAMPLE SCRIPT FOR PAPER 3A QUESTION 2 (CANDIDATE 1)

2 A student carries out an experiment to investigate the relationship between the mass, *m*, of a load placed on a spring and the length, *l*, of the spring. The student also determines the spring constant, k.

Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara jisim, m, bagi suatu beban yang diletakkan pada spring dengan panjang, l, bagi spring itu. Murid itu juga menentukan pemalar spring, k.

The results of this experiment is shown in the graph of *l* against *m* in Diagram 2.1 on page 9.

Keputusan eksperimen ini ditunjukkan oleh graf l melawan m pada Rajah 2.1 *di halaman* 9.

(*a*) Based on the graph in Diagram 2.1,

Berdasarkan graf pada Rajah 2.1,

(i) what happens to *l* as *m* increases?

apakah yang berlaku pada l apabila m bertambah?

m will also increase ✓

.....

[1 *mark*]
[1 *markah*]

(ii) determine the value of *l* when *m* = 0 g.
Show on the graph, how you determine the value of *l*.

tentukan nilai l apabila m = 0 g.
Tunjukkan pada graf itu bagaimana anda menentukan nilai l.

l = 9.75 ✓1 ✓2 (accepted last year)

[2 *marks*]
[2 *markah*]

2

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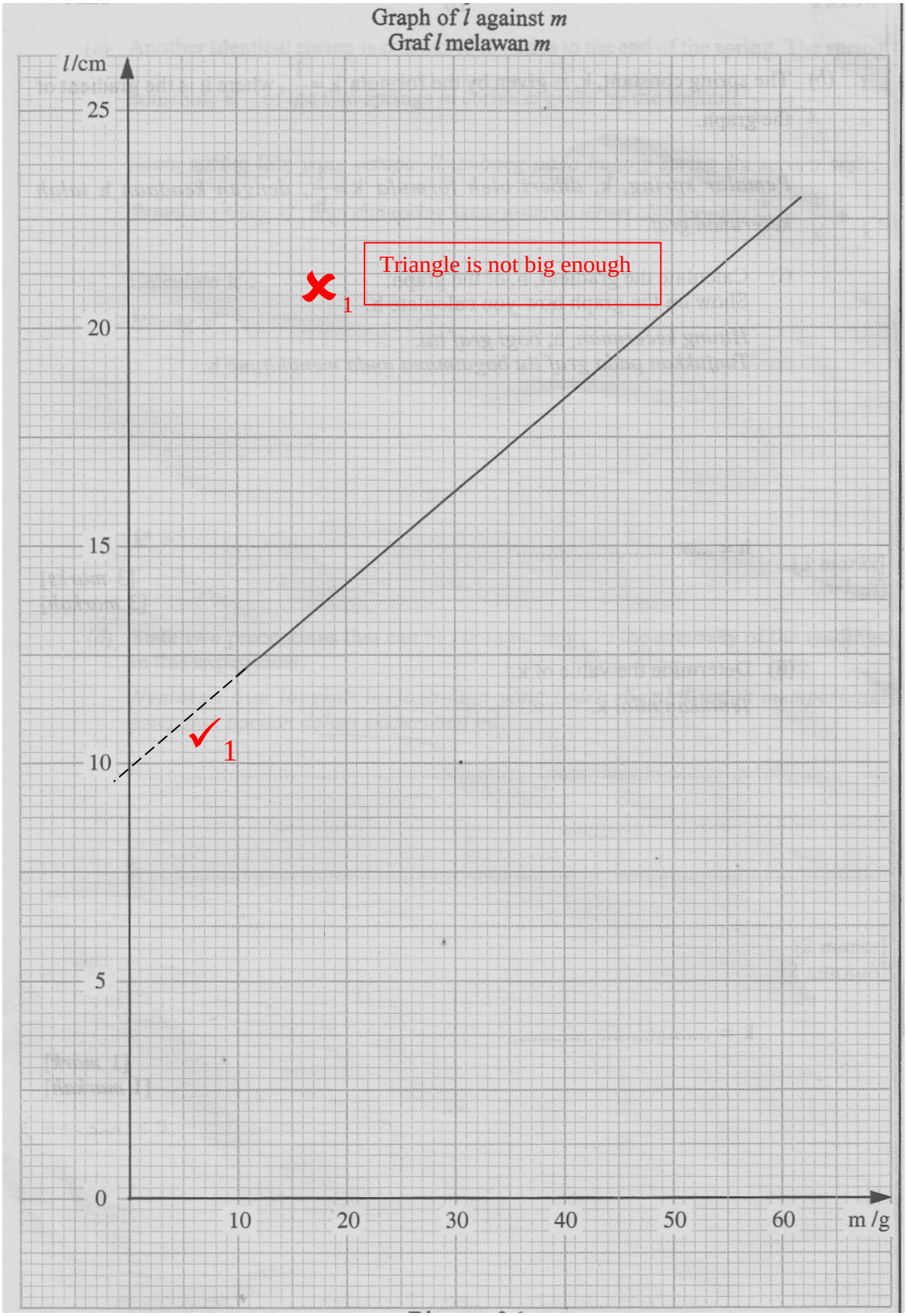

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(*b*) The spring constant, k, is given by the formula $k = \frac{1}{h}$, where h is the gradient of the graph.

Pemalar spring, k, *diberi oleh formula* $k = \frac{1}{h}$, *dengan keadaan* h *ialah kecerunan graf.*

(i) Calculate the gradient, h, of the graph.
Show on the graph how you calculate h.

Hitung kecerunan, h, *bagi graf itu.*
Tunjukkan pada graf itu bagaimana anda menghitung h.

$\frac{20 - 12}{48 - 10}$ ✗ 1 (because of smaller triangle)
✓ 2

1

$= 0.2105$

h = ... ✗ 3 unit

[3 *marks*]
[3 *markah*]

(ii) Determine the value of k.

Tentukan nilai k.

$\frac{1}{0.2105}$ ✓ 1

2

$= 4.75$ ✓ 2

k = ...

[1 *mark*]
[1 *markah*]

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(c) Another identical spring is connected in series to the end of the spring. The spring constant, k′ , of the two springs in series is given by the formula $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Suatu spring lain yang serupa disambung pada hujung spring itu secara sesiri. Pemalar spring, k′ *, bagi dua spring yang sesiri ini diberi oleh formula* $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Calculate k′ .

Hitung k′ .

$\frac{1}{k} = \frac{1}{4.75} + \frac{1}{4.75}$ ✓1

$= \frac{2}{4.75}$ ✗ 2 (no unit)

k′ = ...

[3 *marks*]
[3 *markah*]

(d) State **two** precautions that can be taken to improve the accuracy of the readings in this experiment.

Nyatakan **dua** *langkah berjaga-jaga yang boleh diambil untuk memperbaiki ketepatan bacaan dalam eksperimen ini.*

1 The eye must be parallel with the ruler ✗

.....

2 Repeat the experiment and calculate the mean ✓

.....

[2 *marks*]
[2 *markah*]

8

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SAMPLE SCRIPT FOR PAPER 3A QUESTION 2 (CANDIDATE 2)

2 A student carries out an experiment to investigate the relationship between the mass, *m*, of a load placed on a spring and the length, *l*, of the spring. The student also determines the spring constant, k.

Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara jisim, m, bagi suatu beban yang diletakkan pada spring dengan panjang, l, bagi spring itu. Murid itu juga menentukan pemalar spring, k.

The results of this experiment is shown in the graph of *l* against *m* in Diagram 2.1 on page 9.

Keputusan eksperimen ini ditunjukkan oleh graf l melawan m pada Rajah 2.1 *di halaman* 9.

(*a*) Based on the graph in Diagram 2.1,

Berdasarkan graf pada Rajah 2.1,

(i) what happens to *l* as *m* increases?

apakah yang berlaku pada l apabila m bertambah?

increase ✓

.....

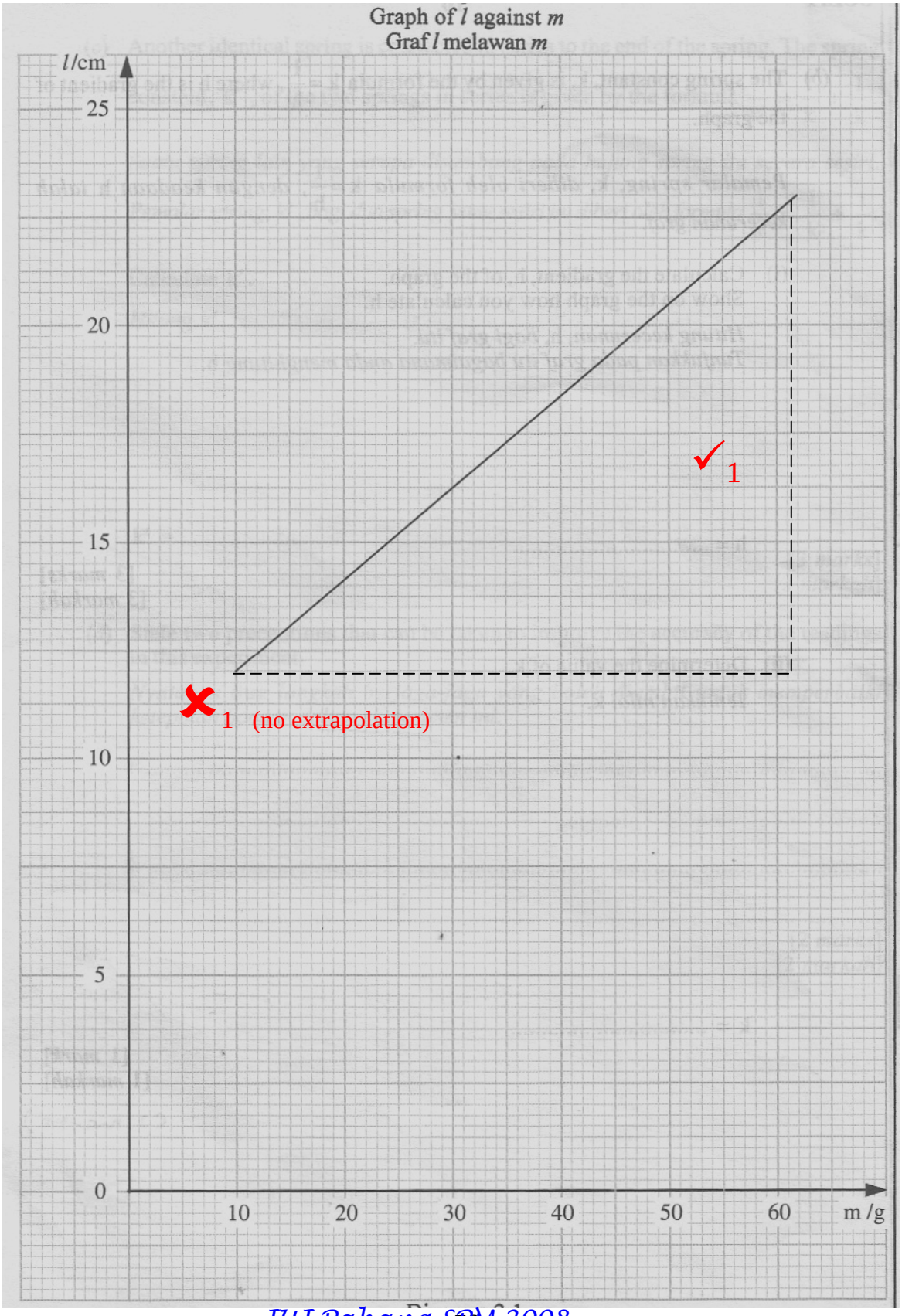
[1 *mark*]
[1 *markah*]

(ii) determine the value of *l* when *m* = 0 g.
Show on the graph, how you determine the value of *l*.

tentukan nilai l apabila m = 0 g.
Tunjukkan pada graf itu bagaimana anda menentukan nilai l.

l = 0 ✗1 ✗2

[2 *marks*]
[2 *markah*]


Graph of l against m
Graf l melawan m
l/cm
25
20
15
10
5
0
10
20
30
40
50
60
m /g
✓1
✗1 (no extrapolation)

(*b*) The spring constant, k, is given by the formula $k = \frac{1}{h}$, where h is the gradient of the graph.

Pemalar spring, k, *diberi oleh formula* $k = \frac{1}{h}$, *dengan keadaan* h *ialah kecerunan graf.*

(i) Calculate the gradient, h, of the graph.
Show on the graph how you calculate h.

Hitung kecerunan, h, *bagi graf itu.*
Tunjukkan pada graf itu bagaimana anda menghitung h.

$m = \frac{11}{52}$ ✗1

$= 0.2115$ ✗2 (no unit)

h = ...

[3 *marks*]
[3 *markah*]

(ii) Determine the value of k.

Tentukan nilai k.

$= \frac{1}{h}$

$= \frac{1}{0.2115}$ ✓1

$= 4.728$ ✓2

k = ...

[1 *mark*]
[1 *markah*]

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(*c*) Another identical spring is connected in series to the end of the spring. The spring constant, k′ , of the two springs in series is given by the formula $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Suatu spring lain yang serupa disambung pada hujung spring itu secara sesiri. Pemalar spring, k′ , *bagi dua spring yang sesiri ini diberi oleh formula* $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Calculate k′ .

Hitung k′ .

$\frac{1}{k'} = \frac{1}{4.728} + \frac{1}{4.728}$ ✓1

$= 0.4230$ ✗ 2 (no unit)

k′ = ...

[3 *marks*]
[3 *markah*]

(*d*) State **two** precautions that can be taken to improve the accuracy of the readings in this experiment.

Nyatakan **dua** *langkah berjaga-jaga yang boleh diambil untuk memperbaiki ketepatan bacaan dalam eksperimen ini.*

1 Avoid parallax error ✗.....

.....

2 Make sure the spring is not exceeded its elastic ✓ limit.....

.....

[2 *marks*]
[2 *markah*]

5

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SAMPLE [illegible]

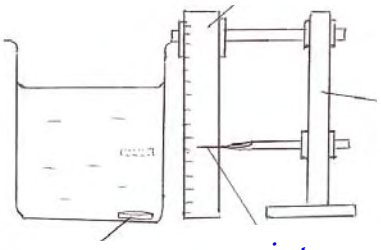
a) *Inference : Real depth effects the apparent depth of the image* ✓A

b) *Hypothesis : The higher the real depth, the higher the apparent depth of the image* ✓B

c) *Aim : To investigate the relationship between real depth and apparent depth*

Manipulated variable : real depth ✓1
Responding variable : apparent depth ✓2
Constant variable : density of water ✓3

Apparatus and materials : coin, beaker, water, retort stand ✓4 (Accepted because metre rule in diagram)



✓5

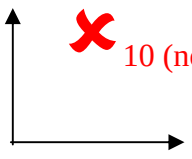
Procedures :
Fill the beaker with water for the depth of 5 cm ✓6
1) *Put a coin in the beaker and observe the image formed* ✓7
2) *Move the pin outside the beaker to position of the image and measure the height of image with meter rule*
3) *Repeat the experiment with the depth of water 10 cm, 15 cm and 20 cm*

Tabulate data : ✗8 (not enough readings)

Depth of water / cm	*Height of image / cm*
5	
10	
15	
20	

✓9

Analysis data :



✗10 (no responding variable)

10

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SAMPLE SCRIPT FOR PAPER 3A QUESTION 3 (CANDIDATE 2)

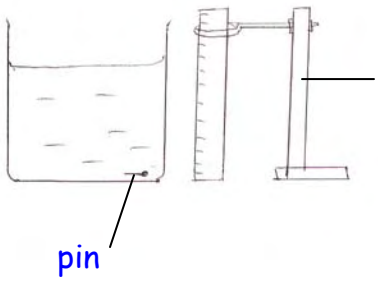
a) Inference : the level of water affects the position of image ✓A

b) Hypothesis : the higher the level of water, the higher the position of image ✓B

c) Aim : to investigate the relationship between the level of water and the position of image ✗1 (position cannot be measured so it being penalised one time only)

Manipulated variable : level of water ✓2
Responding variable : position of image
Constant variable : amount of water ✓3

Apparatus and material : beaker, water, ruler ✓4



✗5 (No pointer – not functionable)

Procedures

1) Fill the beaker with 10 cm of water ✓6
2) Measure the position of image formed ✗7 (not functionable)
3) Repeat the experiment

Data :

✓9

Level of water / cm	Position of image / cm
10	
20	
30	
40	
50	

✓8

Analysis data :

Draw a graph of level of water against position of image ✓10

8

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SAMPLE SCRIPT FOR PAPER 3A QUESTION 3 (CANDIDATE 3)

a) The amount of water effects the real depth ✗A

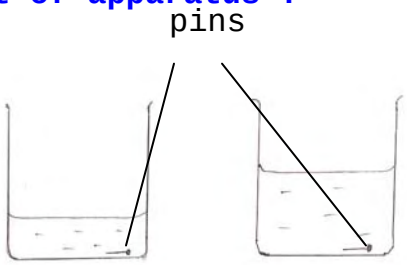
b) When the amount of water increase,the real depth also increase ✗B

c) Aim : to investigate the relationship between amount of water and real depth ✗1

Manipulated variable : volume of water ✓2
Responding variable : height of image
Constant variable : type of medium ✓3

Apparatus and materials : beaker, water, pins, metre rule ✓4

Arrangement of apparatus :



✗5

Not functionable

Procedur

1) Fill a beaker with 10 cm of water ✓6
2) Measure the height of image ✗7 (apparatus not functionable)
3) Fill another beaker with 20 cm of water
4) Repeat the experiment ✗8 (not enough readings)

Tabulation of data :

✗9

V / cm	Real depth
10	
20	

Analysis of data

Hypothesis s accepted. When the volume of water increase, the apparent depth also increase. ✗10 (no graph)

4

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SAMPLE SCRIPT FOR PAPER 3A QUESTION 4 (CANDIDATE 1)

a) *Jason no longer feels cold because the current is higher* ✓A

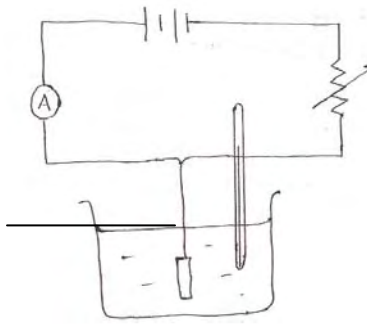
b) *The higher the current, the hotter the water* ✗B (cannot be measured)

c) i) *to investigate the relationship between current and temperature* ✓1

ii) *Manipulated variable : current flow*
Responding variable : temperature of water ✓2
Constant variable : volume of water ✓3

iii) *Thermometer, water, beaker, stopwatch, a.c power supply, rheostat* ✓4

iv)



✓5

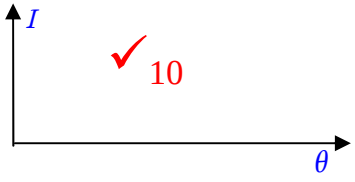
v) 1) *Fill the beaker with 50 ml of water.* ✓6
2) *Switch on the power supply and start the experiment with I = 2 A*
3) *After 5 minutes, record the temperature with thermometer* ✓7
4) *Repeat the experiment with increasing value of current supply*

vi)

I / A	θ / °C
2	
4	
6 ✓8	
8	
10	

✓9

vii)



✓10

11

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SAMPLE SCRIPT FOR PAPER 3A QUESTION 4 (CANDIDATE 2)

a) *Inference : the current flow effects the temperature of water* ✓A

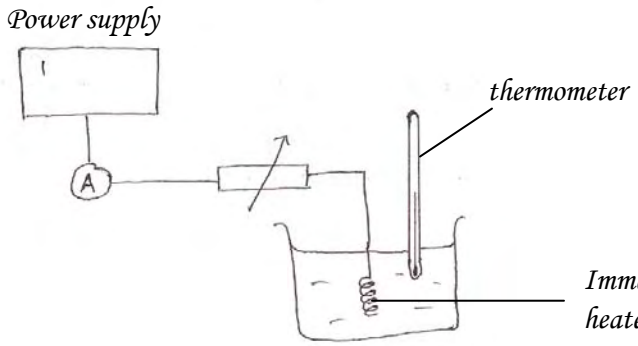
b) *Hypothesis : when the current flow is higher, the temperature is also higher* ✓B

c) *Aim : to study the effects of current on temperature* ✓1

Manipulated variable : current
Responding variable : temperature ✓2
Constant variable : time ✓3

Apparatus and materials : power supply, water, thermometer, beaker ✗4 (No stopwatch)

Arrangement of apparatus :



✗5
(not functionable so cannot get marks 6, 7 and 8)

Procedures :

1) *Set up the experiment as the diagram* ✗6
2) *Start the experiment with 2 A of current*
3) *Record the rate of change of thermometer* ✗7
4) *Repeat the experiment with 3 A, 4 A, 5A and 6A* ✗8

Data :

I / A	*θ / °C*
2	
3	
4	
5	
6	

✓9

Analysis of data :

A graph of I against θ is plotted ✓10

7

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SAMPLE

a) Inference : heats depends on the current supply ✓A

b) Hypothesis : when the heat is higher, the temperature is also higher

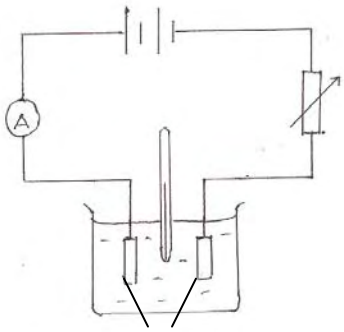
✗ B (both are responding variable)

c) Aim : to study the relationship between heat and temperature

✗1

Manipulated variable : heat ✗2
Responding variable : temperature
Constant variable : time ✓3

Apparatus and materials : power supply, beaker, water, stopwatch, thermometer, rheostat, ammeter, wires ✓4



✗5 (irrelevant so cannot get marks 6, 7 and 8)

Procedures :

1) Set up the apparatus like the diagram above
2) Switch on the power supply ✗6
3) After 5 minutes, record the temperature ✗7
4) Repeat the experiment with more power produced ✗8

Data :

✗9

Heat	Temperature

Analysis data :
Hypothesis is accepted ✗10 (no graph plotted / no statement about plotting the graph)

3

SPM PHYSICS CHECK LIST

	PHYSICAL QUANTITY / CHARACTERISTIC	FACTORS WHICH AFFECT IT		
1	Frequency of inertia balance			
2	Magnitude of impulsive force			
3	Acceleration of a rocket			
4	Stiffness of a spring			
5	Extension of a spring			
6	Surface tension of a liquid			
7	Pressure in a liquid			
8	Up thrust			
9	Sensitivity of a thermometer			
10	Rise of temperature of an object when heated			
11	Rate of evaporation			
12	Rate of boiling			
13	Power of a lens			
14	Characteristics of image formed by concave mirror			
15	Characteristics of image formed by convex mirror			
16	Critical angle			
17	Magnifying power of an astronomical telescope			
18	Speed of water waves in a ripple tank			
19	Frequency of water waves			
20	Wavelength of water waves			
21	Diffraction of waves through a slit			
22	Separation between adjacent bright fringes			
23	Loudness of sound			
24	Pitch of sound			
25	Number of images in a diffraction pattern			
26	Pattern of electric field			
27	Resistance of a metal conductor			
28	Potential difference across resistors in series			
29	Current for resistors in parallel			
30	Magnetic field pattern due to electric current			
31	Magnetic field strength (solenoid)			
32	Magnitude of magnetic force			
33	Speed of rotation of an electric motor			
34	Magnitude of induced e.m.f.			
35	Magnitude of induced current			
36	Direction of induced current			
37	Output voltage of a transformer			
38	Lost of electric power through a cable			
39	Output voltage of d.c. and a.c. generator			
40	Sensitivity of a moving coil galvanometer			

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41	Rate of emission of thermions			
42	Brightness of trace on the screen an O.S.K.			
43	Resistance of a semiconductor			
44	Flow of current through a semiconductor diode			
45	Collector current in a transistor			
46	Resistance of LDR			
47	Resistance of a thermistor			

LAWS AND PRINCIPLES

	Law or principle	Physical quantity	Relationship	Application / use
1	Newton's first law of motion			
2	Newton's second law of motion			
3	Newton's third law of motion			
4	Principle of conservation of momentum			
5	Kinetic theory of mater			
6	Hooke's law			
7	Pascal's principle			
8	Archimedes principle			
9	Bernoulli's principle			
10	Boyle's law			
11	Pressure law			
12	Charles's law			
13	Universal gas law			
14	Principle of conservation of energy			
15	Einstein's energy-mass relationship			
16	Snell's law			
17	Principle of superposition of wave			
18	Ohm's law			
19	Faraday's law			
20	Lenz law			

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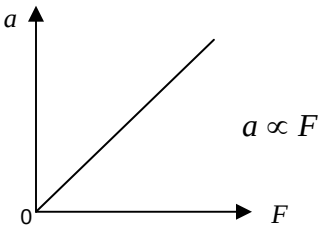
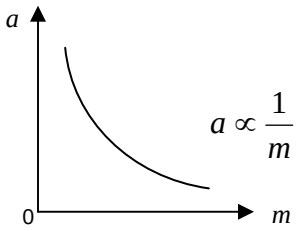
GRAPHS

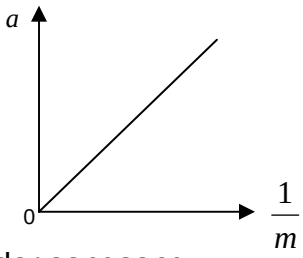
Quantities which are directly proportional		Condition		Quantities which are inversely proportional		Condition
Momentum	Velocity	Constant mass		Acceleration	Mass	Constant force
Acceleration	Force	Constant mass		Impulsive force	Time of collision	Constant momentum
Potential energy	Height	Constant mass		Density	Volume	Constant mass
Force	Extension	Elastic limit		Pressure	Area	
Liquid pressure	Depth	Same liquid		Gas pressure	Volume	Mass, Temperature constant
Liquid pressure	Density of liquid	Same depth		sin *c*	Refractive index	
Up thrust	Volume of displaced liquid			Power of lens	Focal length	
Rise of temperature	Heat absorbed	Constant mass		Frequency	Period	
Gas pressure	Absolute temperature			Wavelength	Frequency	
Volume	Absolute temperature			Fringe separation	Source separation	
sin *i*	sin *r*			Resistance	Area of cross-section	
Wave velocity	Wavelength					
Fringe separation	Wavelength					
Fringe separation	Double slit separation					
Potential difference	Current					
Resistance	Length of wire					



Hubungan : berkadar terus

a is directly proportional to F





Hubungan : berkadar songsang

a is Inversely proportional to m
or
a is directly proportional to 1/m

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PHYSICS TERMINOLOGIES FOR PAPERS 2 AND 3

No.	TERM	VALUE	MEANING
1	Acceleration	Low / small	Slow increase of velocity
		High / big	Fast increase of velocity
2	Density	Low / small	Lighter / less compact
		High / large	Heavier / more compact
3	Force constant	Small	Spring is soft / easy to stretch
		Large / big	Spring is stiff / difficult to stretch
4	Specific Heat Capacity	Low / small	Easily heated up , short time to heat up Need less heat to raise temperature
		High / large	More difficult to heat up, takes more time to heat up Need more heat to raise temperature, use more fuel
5	Specific Latent Heat	Low / small	Need less heat to melt / vaporise Time to melt / vaporise is shorter
		High / large	Need more heat to melt / vaporise Time to melt / vaporise is longer
6	Melting point / Freezing point	Low	Melts at low temperature / Freezes at low temperature. Starts melting earlier / Starts freezing later
		High	Melts at higher temperature / Freezes at higher temperature. Starts melting latter / Starts freezing earlier

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7	Boiling point	Low	Starts boiling at lower temperature Starts boiling earlier Slower to begin condensation
		High	Starts boiling at higher temperature Starts boiling latter Faster to begin condensation
8	Refractive index	Low / small	Substance that refracts light less
		High / large	Substance that refracts light more
9	Critical angle	Small	Easier for total internal reflection to occur
		Large / big	Difficult for total internal reflection to occur
10	Power (of a lens)	Low	Large / long focal length Refract light less
		High	Short focal length Refract light more
11	Focal length	Short	Higher power
		Large / long	Lower power
12	Frequency (of electromagnet wave)	High	Short wavelength High penetration power
13	Wavelength (for electromagnet wave)	Long / large	Low frequency Low penetration power
14	Frequency (sound)	High	High pitch Short wavelength Spreads out less
15	Resistivity	Low / small	Having lower resistance compared to wires of the same thickness and length.
		High / large	Having higher resistance compared to wires of the same thickness and length.
16	e.m.f. of cell	Large / big	Supply a larger current through the same resistance.
17	Power (of electrical device)	High / large	Uses more energy per second
18	Voltage (working voltage of electrical device)	High	Needs a smaller current to produce a fixed amount of power.

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19	Range (of an ammeter)	Big	Can measure large current Usually has a lower sensitivity
20	Range (of a voltmeter)	Big	Can measure higher voltage Usually has a lower sensitivity
21	Half-life	Short	Decays faster Reactivity decreases faster
		Long	Decays slowly Reactivity decreases slowly Radioactivity lasts longer
22	Rigidity	Low	Changes shape easily when acted upon by external force
		High	Does not change shape easily when acted upon by external force
23	Strength	Low	Breaks easily / breaks under small external force
		High	Difficult to break / Needs a large force to break
24	Surface tension	Low	Wet a surface (glass) easily
		High	Does not wet a surface easily
25	Rate of rusting	Low	Does not rust easily / quickly
		High	Rust easily / quickly

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KEY WORDS IN EXAMINATION QUESTIONS

No.	Key word	Expected response
1.	***Estimate***	Give a quantitative value based on calculation or reasoning.
2.	***What***	Give required / specific information
3.	***How***	Describe / give explanation / method /condition / steps concerning an event
4.	***Compare***	Give similarity and difference between two things
5.	***How much/ what is the value***	Give a quantitative answer
6.	***Differentiate***	Give the difference / contrast between two or more things / events
7.	***When***	State the time or period
8.	***Construct***	Draw diagram / one that uses geometrical method / tools
9.	***Discuss***	Give views from various aspects
10.	***Prove***	Show truth using mathematical method / exampels / facts of physics
11.	***Suggest***	Give an idea / opinion
12.	***Find***	Give an answer without calculation / with simple calculation
13.	***Calculate***	Give answer through calculation
14.	***Describe***	To tell about something (story like) in detail and systematically.
15.	***Tabulate***	Arrange things/data according to specified aspects.
16	***Explain***	Give method/reason about something in order that it is easily understood.
17.	***Classify***	Separate into a few groups according to fixed characteristics.
18.	***Identify***	Pick out or determine something based on facts/descriptions given.
19.	***Sketch***	Draw diagram/picture/graph (not according to scale)
20.	***Shade***	Denote an area by colouring/filling/draw lines to cover the area
21.	***Draw***	Make figure such as chart/diagram/graph /shape using instruments

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		according to scale and in detail
22.	***Why***	Give reason
23.	***Name***	Give name/terminology for something such as component/process/instrument
24.	***State***	Give facts without explanation /support
25.	***Predict***	Give/state forecast for something based on facts
27.	***List***	State facts/statements in point form.
28.	***Arrange***	Place according to fixed order
30.	***Define***	Give definition for the term given
31.	***Determine***	Find answer base on process/reasoning
32.	***Illustrate***	Give facts with support such as diagrams/reasons/explanation to make clear an idea.

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Physics
Module Critical

TIPS FOR PAPER 2
TIPS MENJAWAB KERTAS 2

Section A (Structure)
Bahagian A (Struktur)

1. Be able to interpret diagrams, photographs, tables and graphs to relate to physics concepts or principles.
   Analisis rajah, gambar foto, jadual dan graf untuk dikaitkan dengan konsep dan prinsip Fizik yang berkaitan.

2. Give short and concise answer .
   Nyatakan jawapan yang ringkas dan tepat.

3. Underline keywords such what , how etc.
   Gariskan kata tugas dalam setiap soalan seperti Apakah, Bagaimanakah dll.

4. Underline the important information given in a questions.
   Gariskan maklumat penting yang diberi dalam setiap soalan.

5. Methods to solve calculation problems.
   Kaedah untuk menyelesaikan masalah pengiraan.

   - State the formula (*tulis rumus fizik yang berkaitan*)
   - Substitute the value for each quantity (*Gantikan nilai untuk setiap kuantiti)*
   - Answer with the correct unit.(*tulis jawapan dan unitnya yang betul*)

6. Pay attention to the marks allocated. The marks usually indicates the number of points required.
   Beri perhatian kepada markah yang diperuntukkan untuk setiap soalan. Jumlah markah menunjukkan bilangan fakta jawapan yang diperlukan.

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Section B (Essay)
Bahagian B (Esei)

1. To answer the question of definition of the terms, concepts, principles or Physics law need to state in sentences. The answer in form of formula is not acceptable.
Maksud bagi mana-mana istilah, konsep , prinsip atau hukum Fizik perlu dinyatakan dalam bentuk ayat. Jawapan berbentuk rumus tidak diterima.

2. To answer the questions of comparison, state the similarities and differences between the given diagrams .
Untuk menjawab soalan Perbandingan, jawapan mesti merangkumi persamaan dan perbezaan dari rajah-rajah yang diberi.

3. Use diagrams or graphs whenever necessary to make the points clearer.
Rajah atau graf boleh disertakan untuk menjelaskan lagi jawapan..

4. Pay attention to the marks allocated. The marks usually indicates the number of points required.
Beri perhatian kepada markah yang diperuntukkan untuk setiap soalan. Jumlah markah menunjukkan bilangan fakta jawapan yang diperlukan.

5. Answer in table form for suggested modifications. e.g
Bagi menjawab soalan cadangan pengubahsuaian, jawapan perlu dijadualkan.

Suggested modifications *Cadangan pengubahsuian*	Explanation *Penerangan*
……	……..

Section C (Essay)
Section C (Esei)

1. To answer question " explain the suitability of each characteristics and determine the most suitable …. .", detect 4 different characteristics from the given diagrams or table . The answer must be in table form.
Bagi menjawab soalan " Terangkan kesesuian setiap ciri dan pilih yang paling sesuai …..". kenalpasti 4 ciri yang berbeza daripada rajah atau jadual yang diberi.
Jawapan perlu dalam bentuk jadual.

Characteristic	Explanation

. ….. is chosen because of …….(repeat all the characteristic)

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TIPS MENJAWAB SOALAN KERTAS 3

Section A : Question 1

Bahagian A : Soalan 1

1. Test the students in using of scientific measuring instrument and make the readings.
   Menguji murid menggunakan alat pengukur dan membuat bacaan

2. The students should know how to make reading in several type of measuring instrument without error, tabulate the data and draw a graph based on the data.
   Pelajar perlumengetahui bagaimana untuk mengambil bacaan beberapa alat pengukur tanpa ralat, menjadualkan data dan melukis graf berdasarkan nilai dalam data.

3. The students have to write the reading in correct d.p as the accuracy of the instrument.
   Pelajar dikehendaki menulis bacaan dengan bilangan t.p seperti kejituan alat pengukur.

4. Draw a suitable graf based on the given title with the following ;
   - Correct quantities and their unit on both axes
   - Uniform scale at both axes
   - Points plotted correctly
   - Balance graph line
   - Size of graph 5 x 4 larger squares
   -

   Melukis graf mengikut tajuk yang diarahkan dengan ciri-ciri berikut :
   - *Kuantiti kedua-dua paksi dengan unit yang betul*
   - *Skala yang seragam sesuai dengan kuantiti dalam data*
   - *Pindahan titik yang betul*
   - *Garisan graf yang seimbang*
   - *Saiz graf yang cukup besar (4 x 5 petak besar atas graf)*

Section A : Question 2

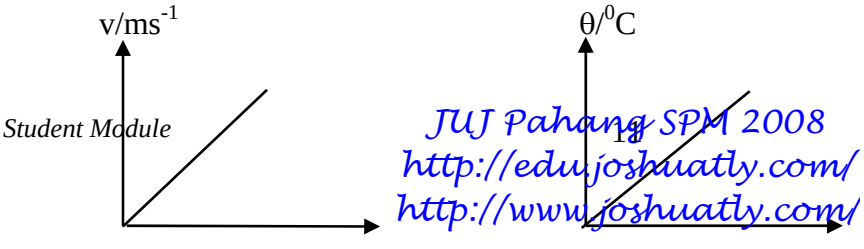
Bahagian A : Soalan 2

1. Question based on graph, conseptual or analysing the graph.
   Soalan berhubung graf. Sama ada mengkonsepsi atau menganalisis graf yang diberi.

2. Understanding the meaning for various shapes of graphs and their characteristics based on y-axis and x-axis.
   Perlu menguasai maksud berbagai bentuk graf dan ciri-ciri pada graf merujuk paksi-x dan paksi-y .

   The examples of graph for question 2
   Contoh graf soalan 2

   The meaning of graph's gradient based on graph shape and axis (refer to a suitable formula)
   Maksud kecerunan merujuk bentuk graf dan kuantiti p-x dan p-y (rujuk formula yang sesuai)



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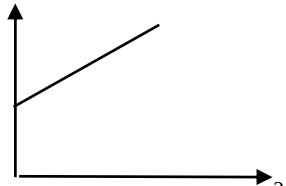
t/s

Gradient : acceleration

Kecerunan : Pecutan

F/N



Gradient : mass

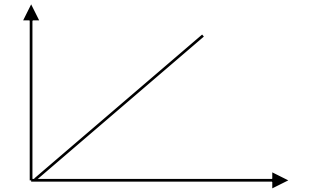
Kecerunan : jisim

t/min

Gradient : The rate of change of temperature

Kecerunan : Kadar perubahan suhu

F/N

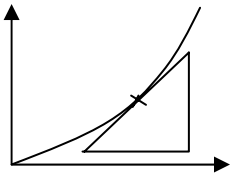


Gradient : acceleration

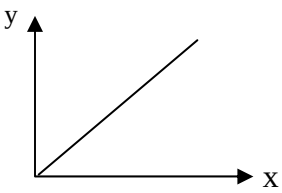
Kecerunan : Pecutan

3. Draw a smooth extrapolation line if you are asked to do so.
Lukiskan dengan jelas garisan ekstrapolasi pada graf jika perlu.

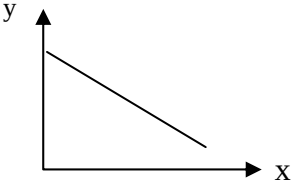
4. Draw a large triangle to calculate the gradient (4 x 5 larger square)
The triangle should be on tangent line for curve graph.
Lukiskan segitiga yang besar pada graf untuk kiraan kecerunan graf.(4 x 3 petak besar)
Pastikan segitiga pada garis tangen jika graf melengkung.



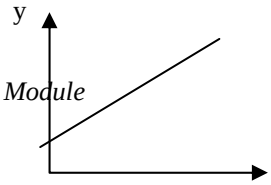
5. The relationship between RV and MV.
Hubungan antara RV dan MV.



y is directly propotional to x
y berkadar langsung dengan x



y is decreases linearly to x
y berkurang secara linear dengan x



If $c \geq 1$ mm from origin
Jika $c \geq 1$ mm from origin

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y increases linearly/uniformly to x
y bertambah secara linear/seragam dengan x

c

x

Section B : Question 3 and 4
Bahagian B : Soalan 3 dan 4

1. To test the skill how to determine the variables in the given situation.
Menguji kemahiran untuk menentukan pembolehubah-pembolehubah dalam situasi yang diberikan.

2. Design the experiment to test the appropriate hypothesis.
Merancang eksperimen untuk menguji hypothesis yang dipilih.

3. Draw a functional arrangement of the apparatus
Melukis susunan radas yang boleh berfungsi

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FORMAT TO ANSWER PAPER 3B [12 MARKS]

(a) Inference	*Manipulated variable influence the responding variable* *0r* *Responding variable depends on manipulated variable*
(b) Hypothesis	*The higher/larger/bigger the manipulated variable, the higher/smaller the responding variable*
(c) Aim	*To determine the relationship between manipulated variable and responding variable*
(d) Variables	(i) manipulated variable : (ii) responding variable : (iii) fixed variable : *only one fixed variable* **[give all the variable that can be measured].*
Apparatus / materials	*List up all importance apparatus for the expriment*
Method :	1. *Start the experiment with manipulated variable = …… .unit (practical value)* 2 *The responding variable is measured* …… 3 *Repeat the experiment 4 times for manipulated variable* ____, ____, ____ *and* ____
Tabulation of data :	*manipulated variable* | *responding variable* *Fill in the values of manipulated variable* | *blank*
Analysis of data :	*State : Sketch a graph of responding variable against manipulated variable* *AND sketch a graph:* *Responding variable* *Manipulated variable*

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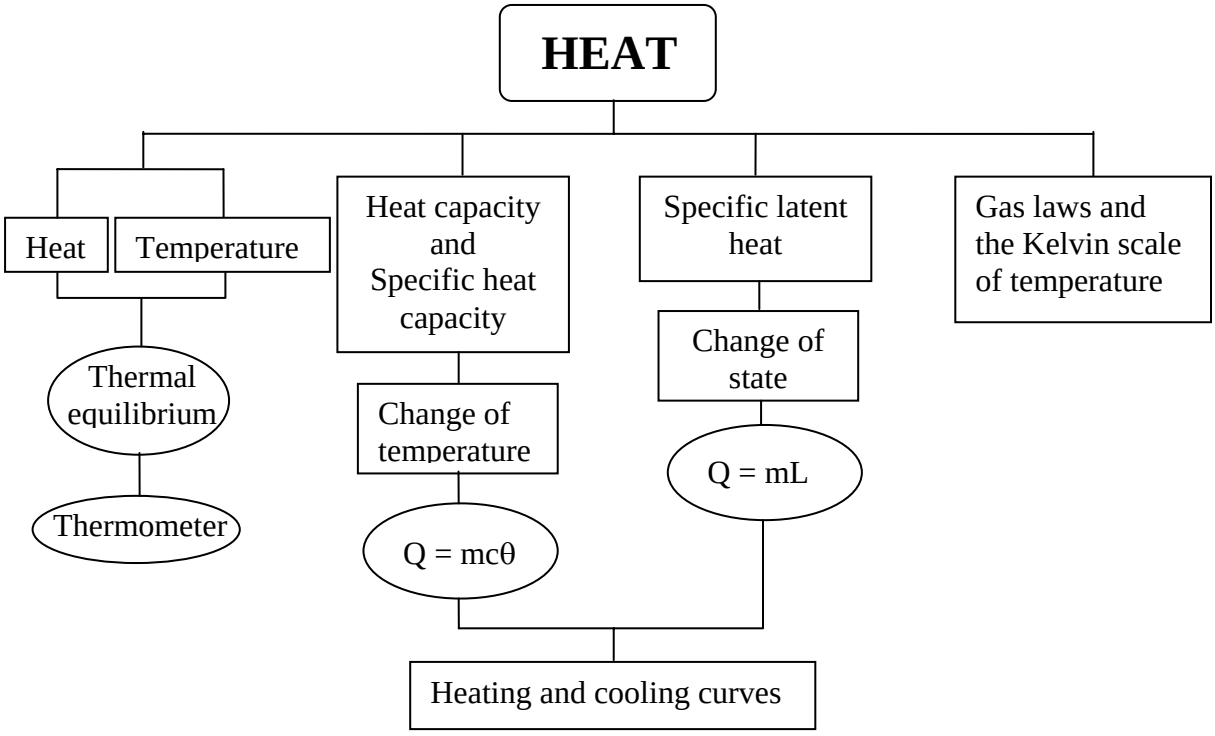
TOPIC 4 : HEAT

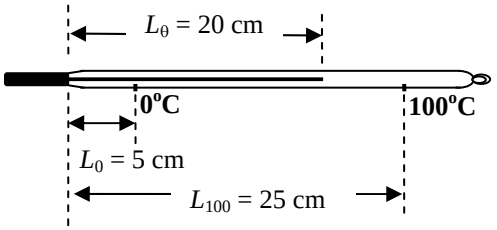


Notes:

Heat is a form of energy. In matter, heat is stored in the form of random kinetic energy and potential energy of the molecules (also called internal energy).
Temperature is a measure of the degree of hotness.
Thermal equilibrium between two bodies means that there is **no net heat flow** between them. At thermal equilibrium, both bodies have the **same temperature**.
Thermometric property is the physical property of a substance which varies linearly with temperature.
Celsius scale of temperature: The temperature, θ is defined as

$$\theta = \frac{\text{thermometric property at } \theta \text{ - thermometric property at ice point}}{\text{thermometric property at steam point - thermometric property at ice point}} \times 100\,^{o}\text{C}$$

Example: What is the temperature reading of the thermometer shown below?



$$\text{Temperature, } \theta = \frac{L_\theta - L_0}{L_{100} - L_0} \times 100$$

$$\theta = \frac{20 - 5}{25 - 5} \times 100$$

$$\theta = 75^{o}\text{C}$$

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Heat capacity of a body is the amount of heat required to raise the temperature of the body by 1^oC.

$$\text{heat capacity} = \frac{\text{heat}}{\text{change of temperature}}$$

$$C = \frac{Q}{\theta}$$ The S.I. units of heat capacity are J $^oC^{-1}$ or J K^{-1}

Specific heat capacity of a substance is the amount of heat required to raise the temperature of 1 kg of the substance by 1^oC.

$$\text{specific heat capacity} = \frac{\text{heat}}{\text{mass} \times \text{change of temperature}}$$

$$c = \frac{Q}{m\theta}$$ The S.I. units of heat capacity are J kg^{-1} $^oC^{-1}$ or J kg^{-1} K^{-1}

Latent heat is the heat absorbed or released at constant temperature during a change of phase of a substance.

Specific latent heat of fusion is the quantity of heat required to change 1 kg of a substance from solid state to liquid state without change of temperature.

$$\text{specific latent heat} = \frac{\text{heat to change substance from solid to liquid}}{\text{mass of the substance}}$$

$$L = \frac{Q}{m}$$ The S.I. units of specific latent heat of fusion is J kg^{-1}

Specific latent heat of vaporisation is the quantity of heat required to change 1 kg of a substance from liquid state to gaseous state without change of temperature.

$$\text{specific latent heat} = \frac{\text{heat to change substance from liquid to gas}}{\text{mass of the substance}}$$

$$L = \frac{Q}{m}$$ The S.I. units of specific latent heat of vaporisation is J kg^{-1}

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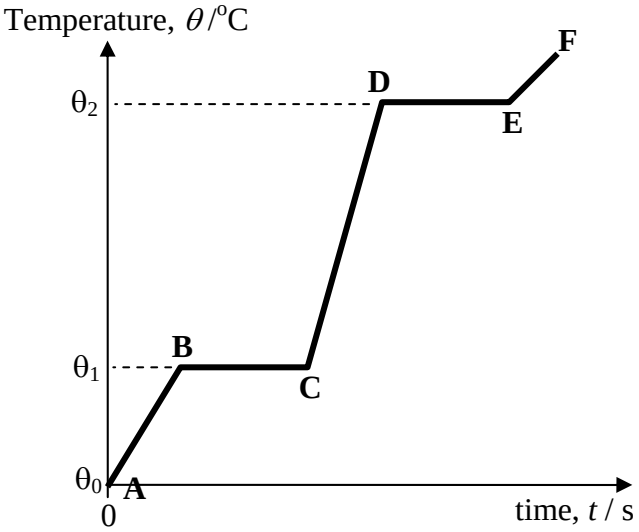
A **temperature-time graph** representing heating process. At **A**, the substance heated is in the solid state.



Important notes:

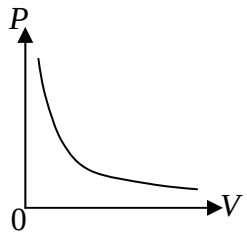
Part of graph	Phase of material	Formula for calculation of heat.
AB	solid	$Q = mc\theta$
BC	solid + liquid (melting)	$Q = mL$
CD	liquid	$Q = mc\theta$
DE	liquid + gas (boiling)	$Q = mL$
EF	gas	$Q = mc\theta$

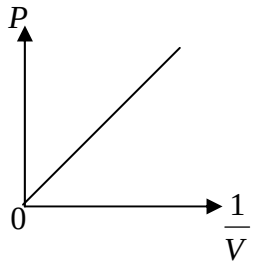
θ_1 is the **melting point** of the substance
θ_2 is the **boiling point** of the substance

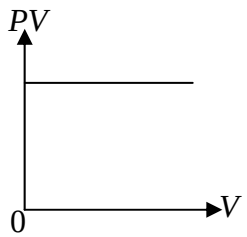
Gas Laws:

a) **Boyle's law**: ***PV* = constant** provided mass and temperature is kept constant.

Graphs of gases obeying Boyle's law.







b) **Charles'law**: $\frac{V}{T}$ = constant provided mass and pressure is kept constant.

Graphs of gases obeying Charles' law.

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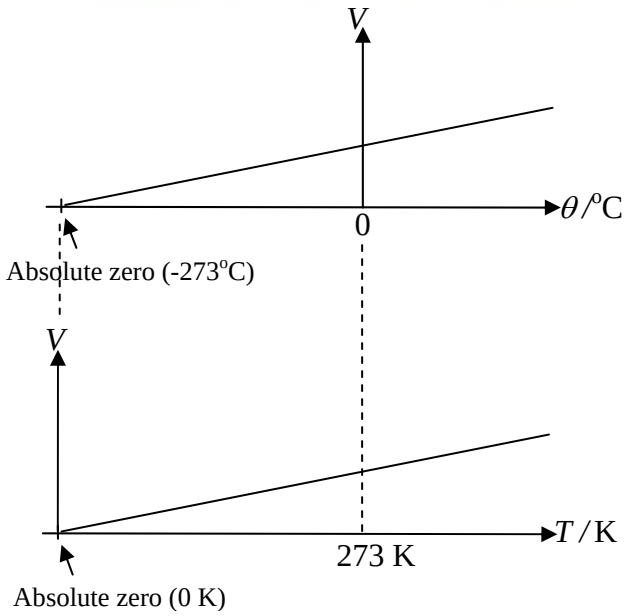
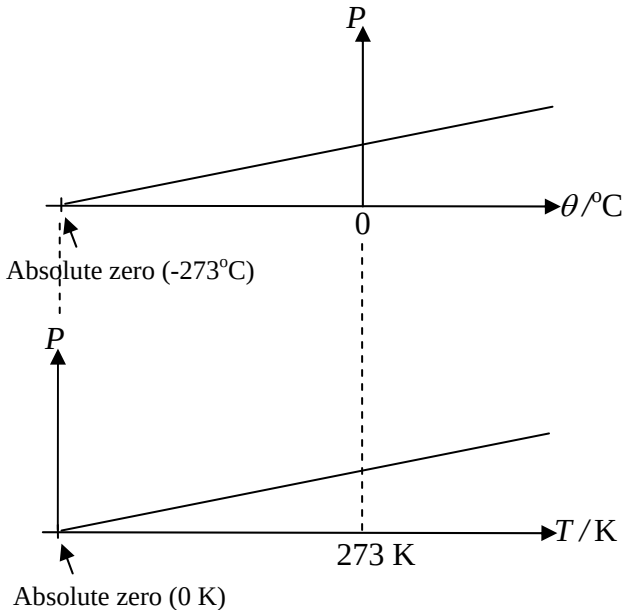


Note:
a) Zero Kelvin, 0 K = -273°C
b) Relationship between absolute temp. and Celsius temperature is given by

$T = \theta + 273$

c) **Pressure law**: $\frac{P}{T}$ = constant provided mass and volume is kept constant.

Graphs of gases obeying Pressure law.



Note:
a) Zero Kelvin, 0 K = -273°C
b) Relationship between absolute temp. and Celsius temperature is given by

$T = \theta + 273$

EXERCISE 1:
PART I

State whether the following statements are true or false.

a) Heat is a form of energy. (true / false)
b) A body at 0°C does not contain heat. (true / false)
c) Heat is stored in a body as internal energy. (true / false)

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d) Heat flows both from a hot body to a cold body as well as from a cold body to a hot body. (true / false)
e) When thermal equilibrium between two bodies is achieved, the flow of heat stops. (true / false)
f) Two bodies in thermal equilibrium must have the same temperature. (true / false)
g) The Celsius scale of temperature consists of 100 fixed points. (true / false)
h) The upper fixed point and the lower fixed point must be calibrated at atmospheric pressure. (true / false)
i) To calibrate the lower fixed point of a thermometer, it is placed in melting ice. (true / false)
j) To calibrate the upper fixed point of a thermometer, it is place in boiling water. (true / false)

PART II

State whether the following statements are true or false.

a) The amount of heat stored in a body is directly proportional to is mass. (true / false)
b) The amount of heat stored in a body is independent of the type of material it's made of. (true / false)
c) When the temperature of a body decreases, heat is released. (true / false)
d) If the specific heat capacity of a substance is high, it means it is easily cooled. (true / false)
e) When a solid is melting, its temperature remains the same even though heating continues. (true / false)
f) During the melting process, heat absorbed is used to increase the separation between molecules. (true / false)
g) When steam condenses to water at a fixed temperature of 100^{o}C, no heat is absorbed or released because there is no change of temperature. (true / false)
h) Sea and land breezes are caused by the differences between the specific latent heat of sea water and the specific latent heat of land material. (true / false)
i) To be scalded by steam is worse than to be scalded by boiling water even though their temperatures are the same. (true / false)
j) An accurate thermometer must have a large heat capacity. (true / false)
k) The thermometric property used in the mercury in glass thermometer is length. (true / false)
l) A frying pan should be made of material with high specific heat capacity. (true / false)
m) A thermometer must be made from materials which are poor heat conductors. (true / false)

PART III

State whether the following statements are true or false.

a) Boyle's law is always correct even if the temperature of the gas varies. (true / false)
b) According to Boyle's law, when pressure is doubled, the volume of gas is halved. (true / false)
c) Gas pressure exerted on the walls of a container is caused by the bombardments of the gas molecules on the walls. (true / false)
d) When temperature increases, the kinetic energy of gas molecules increases. (true / false)
e) According to **Charles' law**, the pressure of a gas increases when temperature increases. (true / false)

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f) According to **Pressure law**, the pressure of a gas is directly proportional to its temperature measured in degree Celsius. (true / false)

g) The pressure of air in a car tyre will increase after the car has traveled a long distance. (true / false)

EXERCISE 2:

PART 1:

1) The S.I. unit of heat energy is
   A. Watt B. Joule C. Ampere D. Coulomb

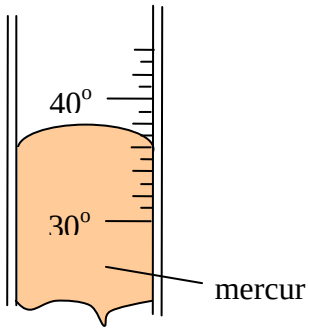
2) Heat is stored in a body as
   A. potential energy only B. kinetic energy only C. potential and kinetic energy

3) Two bodies P and Q are in thermal contact. The temperature of P is higher.
   A. Heat flows only from P to Q
   B. Heat flows only from Q to P
   C. Rate of heat flow from P to Q is greater than that from Q to P

4) Thermal equilibrium between two bodies is reached when
   A. both bodies have the same amount of internal energy
   B. the flow of heat between the two bodies stops
   C. both bodies looses heat to the surrounding at the same rate
   D. the rate of transfer of heat from each body to the other is the same

5) The sensitivity of a mercury in glass thermometer can be increased by
   A. using thicker glass to make the thermometer
   B. using a larger bulb for the thermometer
   C. using a larger bore for the capillary tube

6) What is the thermometer reading in the diagram?



   A. 36°C B. 37°C C. 38°C

7)

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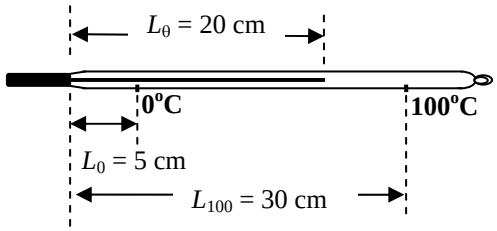
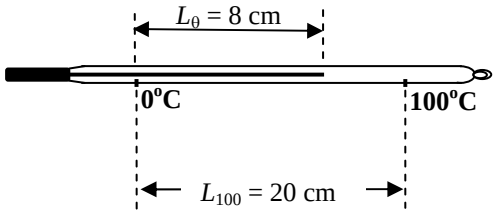


Based on the values shown in the diagram above, what is the temperature reading of the thermometer?

A. 30°C B. 40°C C. 50°C D. 60°C

8) Based on the values shown in the diagram above,



what is the temperature reading of the thermometer?
A. 30°C B. 40°C C. 50°C D. 60°C

9) When calibrating the lower fixed point for a mercury thermometer, the thermometer must be placed in

A. solid ice at atmospheric pressure
B. solid ice at any pressure
C. melting ice at atmospheric pressure
D. melting ice at any pressure

10) Which of the following is **not** the reason why mercury is suitable for making a laboratory thermometer?

A. high density
B. low freezing point
C. high boiling point
D. good conductor of heat
E. does not stick to glass

11) A substance with low specific heat capacity means

A. it melts easily when heated
B. it boils easily when heated
C. it expands quickly when heated
D. its temperature increases quickly when heated

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12) When 2000 J of heat is absorbed by 0.2 kg of substance X, its temperature increases from 20°C to 30°C. The specific heat capacity of substance X is

A. 1000 J kg^{-1} °C^{-1} B. 1500 J kg^{-1} °C^{-1} C. 2000 J kg^{-1} °C^{-1} D. 2500 J kg^{-1} °C^{-1}

13) It takes 3000 J of heat to melt 0.2 kg of substance Y at constant temperature. What is the specific latent heat of substance Y?

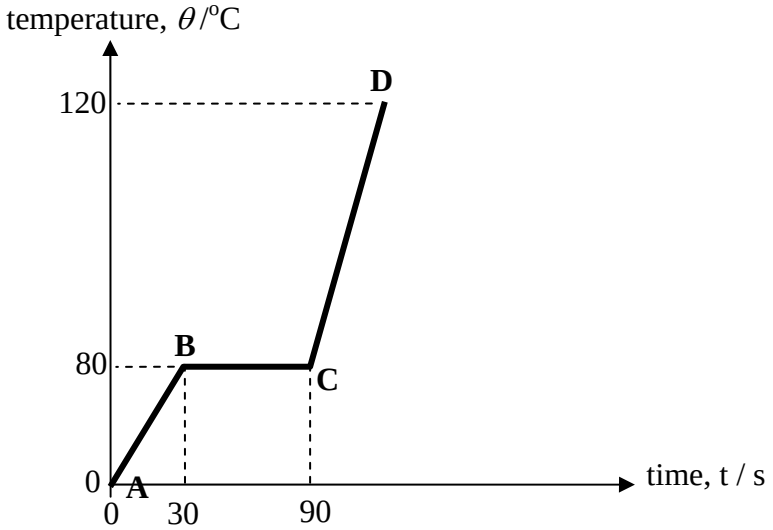
A. 6000 J kg^{-1} B. 9000 J kg^{-1} C. 12000 J kg^{-1} D. 15000 J kg^{-1}

14) The specific latent heat of vaporization of substance Z is 5000 J kg-1. What is the amount of heat required to vaporize 0.4 kg of substance Z at its boiling point?

A. 5500 J kg^{-1} B. 10500 J kg^{-1} C. 12500 J kg^{-1} D. 15500 J kg^{-1}

Questions 15 – 18 refers to the temperature-time graph given.

15)



0.01 kg of substance Q (solid) is heated at a constant rate. Its temperature rises as shown in the graph. If the specific latent heat of substance Q is 1200 J kg^{-1} oC^{-1}, how much heat is required to raise its temperature from 0^{oC} to its melting point?

A. 120 J B. 960 J C. 8000 J D. 12000 J

16) What is rate of heat supplied to substance Q in question 15?

A. 32 W B. 64 W 96 W 120 W

17) What is the amount of heat required to completely melt substance Q at constant temperature?

A. 1200 J B. 1920 J C. 3200 D. 6400 J E. 9600 J

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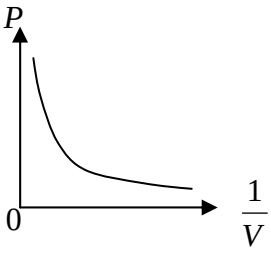
18) The specific latent heat of fusion of the substance Q is

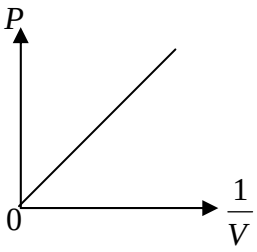
A. 19.2×10^4 J kg^{-1} B. 26.4×10^4 J kg^{-1} C. 32.0×10^4 J kg^{-1} D. 64.0×10^4 J kg^{-1}

19) Which of the following graphs is true of a gas which obeys Boyle's law?

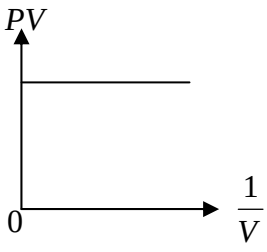
A.



B.

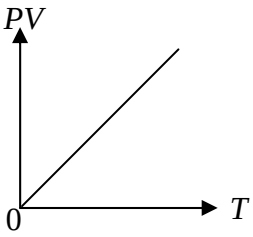


C.

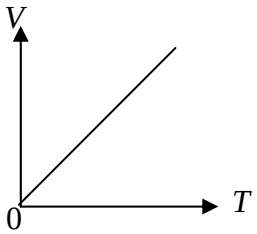


20) Which of the following graphs is true of a gas which obeys Charles' law?

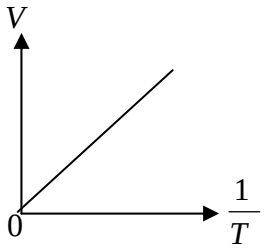
A.



B.



C.



21) Heat is supplied at the same rate to 100g of paraffin and to 100g of water in similar containers. Why does the temperature of paraffin rises more quickly?

A. The paraffin has a larger specific heat capacity than water
B. The paraffin has a smaller specific heat capacity than water
C. Paraffin is less dense than water
D. Paraffin is more dense than water

22) A new liquid is tested to decide whether it is suitable to be used in a liquid-in-glass thermometer. It is found that the liquid does not expand uniformly with change of temperature.
What will be the effect of this on the scale of the thermometer?

A. It has a short range
B. It is not linear
C. The markings are too close together
D. The markings are too far apart

23) Four mercury-in-glass thermometers are made with different dimensions.

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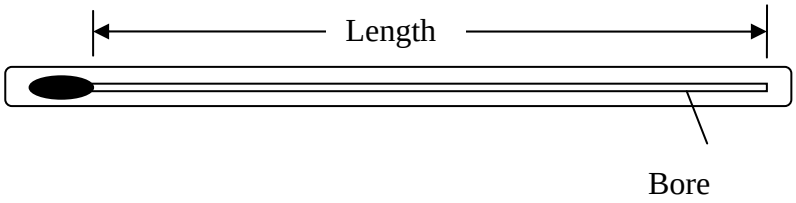


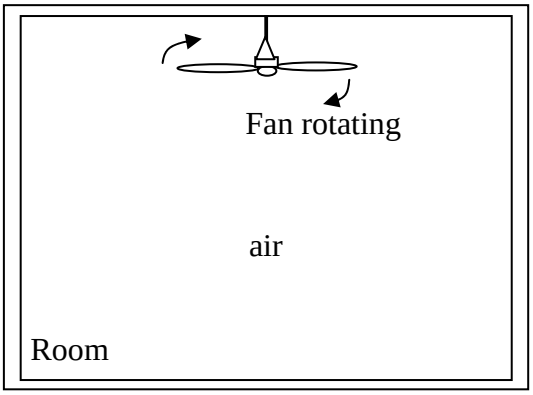
Which will have the greatest sensitivity?

A. 10 cm long and bore 0.75 mm wide
B. 15 cm long and bore 0.50 mm wide
C. 25 cm long and bore 0.10 mm wide
D. 30 cm long and bore 0.25 mm wide

24. The electric fan in an enclosed room is switched on.

If the walls of the room are made of good insulating materials, which is true about the temperature in the room after several hours?

A. increased
B. unchanged
C. decreased



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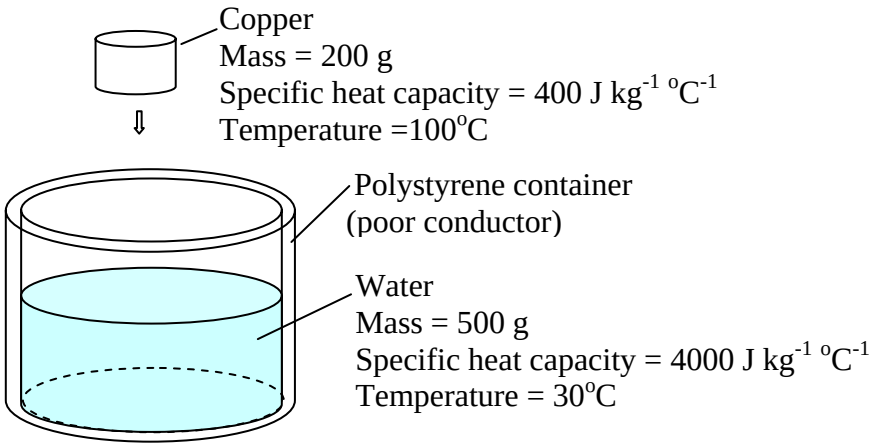
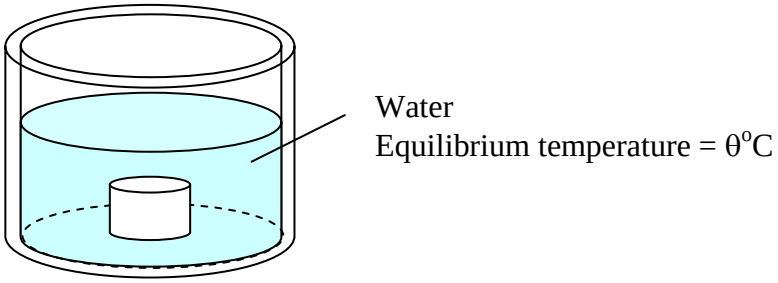
25. A copper weight is dropped into a polystyrene container which contains water.



Initial condition (before copper is dropped into water_



Final condition (after copper is dropped into water)

Based on the information given, what is the equilibrium temperature, θ?
(Assume no loss of heat to the surroundings).

A. 32.7 °C B. 36.2 °C C. 40.5 °C D. 65.4 °C

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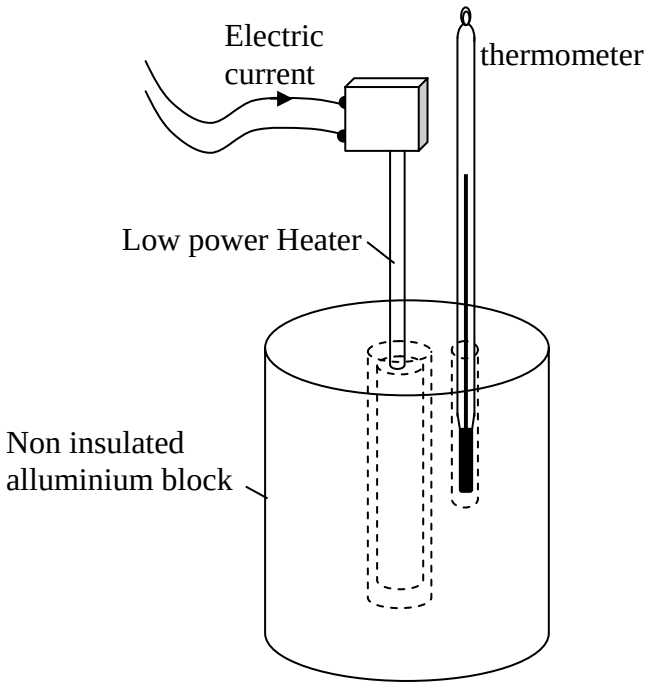
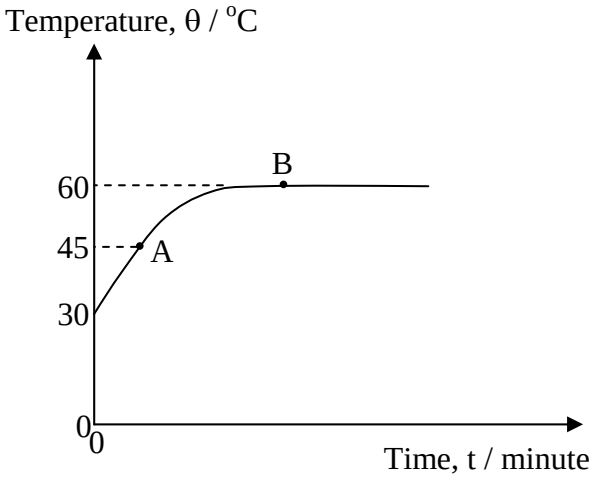
EXERCISE 2:

PART II:

1. A non-insulated alluminium block is heated at a constant rate using a low power immersion heater.

The result is shown by the temperature against time graph.





a) What is the room temperature?

……..

[1 mark]

b) Explain why the temperature becomes constant at 60°C even though heat is still supplied to the block?

……

……

[2 marks]

c) What does the gradient of the graph represent?

……

[1 mark]

d) Compare the rate of heat loss to the surroundings at point A and point B.

……

[1 mark]

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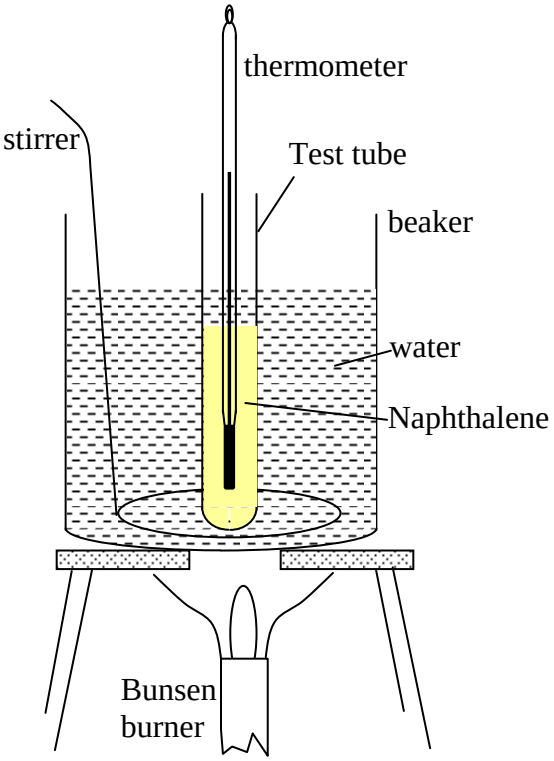
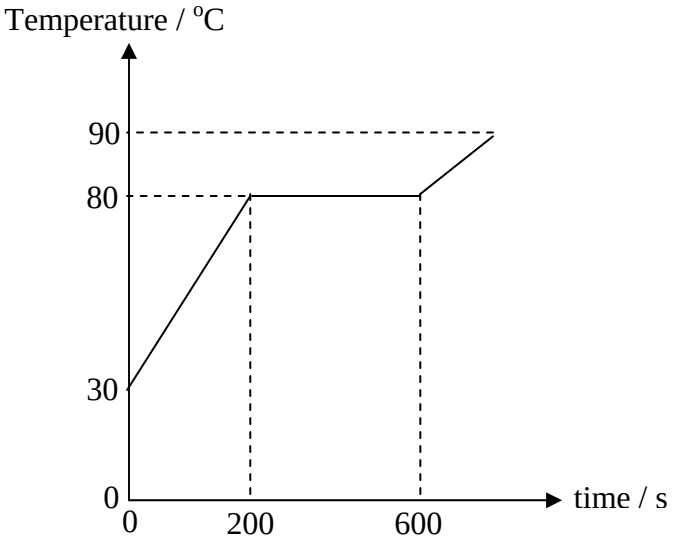
e) The specific heat capacity of aluminium is 900 J kg^{-1} °C^{-1} and the mass of the aluminium block is 1 kg. How much heat is required to raise the temperature of the block from 30°C to 60°C if there is no heat loss?

[2 marks]

2. Solid naphthalene is placed in a test tube and then heated as shown in the diagram. The graph shows how the temperature of the naphthalene changes with time.





a. What is the use of the stirrer?

……

[1 mark]

b. State the melting point of naphthalene.

……

[1 mark]

c. (i) What is happening to the state of the naphthalene between time 200 s and 600 s?

……

[1 mark]

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c. (ii) Explain why the temperature of the naphthalene is constant even though heat is still supplied

……

……

[2 marks]

d. Why does the temperature rise again after 600 s?

……

……

[2 marks]

e. If the rate of heat supplied to the naphthalene is constant at 100 W, and the mass of the naphthalene is 200 g, calculate the specific latent heat of fusion of naphthalene.

[3 marks]

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3. Diagram 1 shows two weights P and Q, of the same mass but of different materials, placed in a steam bath. On the right are two polystyrene cups containing the same amount of water. Diagram 2 shows the situation after the two weights are transferred into separate cups and thermal equilibrium is reached.

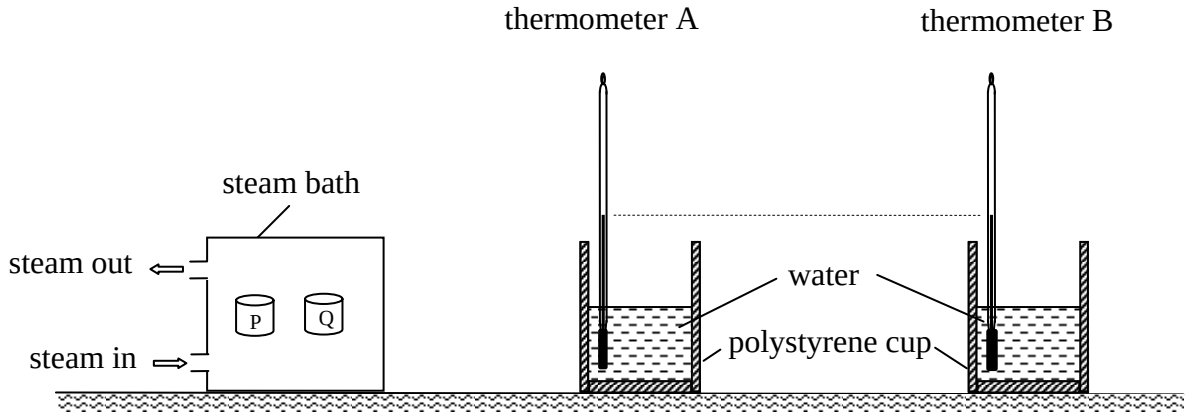

Diagram 1

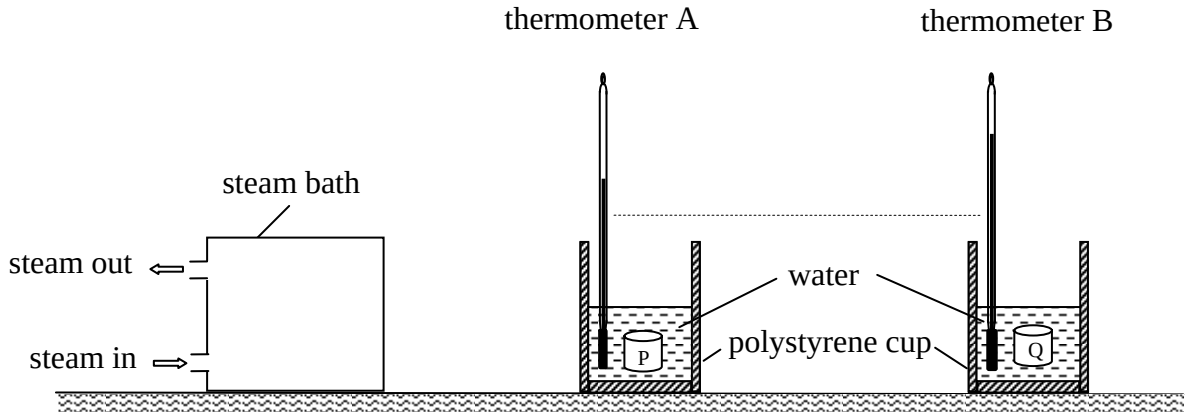

Diagram 2

a) What is meant by thermal equilibrium?

[1 mark]

b) Bases on Diagram 1 and Diagram 2, compare the temperature of the weights P and Q when they are in the temperature bath and when they are in the polystyrene cups. Relate the change of water temperature in each cup to the amount heat given out by P and Q. Hence determine which weight contains more heat and name the physics concept relating to the amount of heat stored in an object.

[5 marks]

c) i) When a cannon ball is dropped to the ground from a tall building, its temperature is found to be higher after hitting the ground. Explain why.

[1 mark]

ii) State the transformations of energy of the cannon ball.

[1 mark]

iii) What happens to temperature of the cannon ball after some time? Explain.

[2 marks]

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d. Diagram 3 shows an electric oven being used to roast a chicken. It is found that the chicken is not evenly cooked and the oven consumes too much electricity.

Suggest modifications that can be made to the oven so that the problem stated can be solved. Explain each medication suggested.

[10 marks]

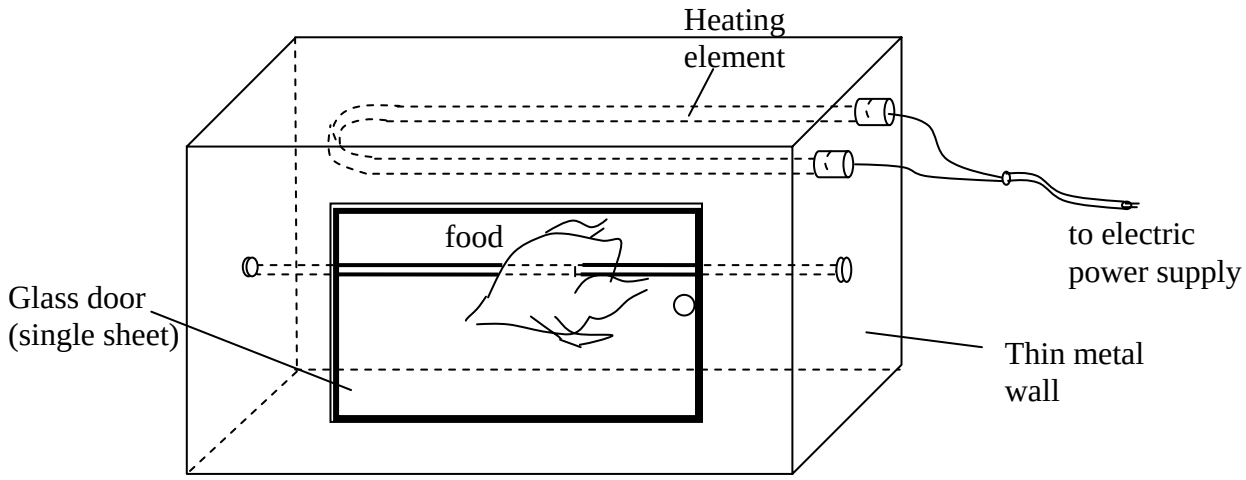

Diagram 3

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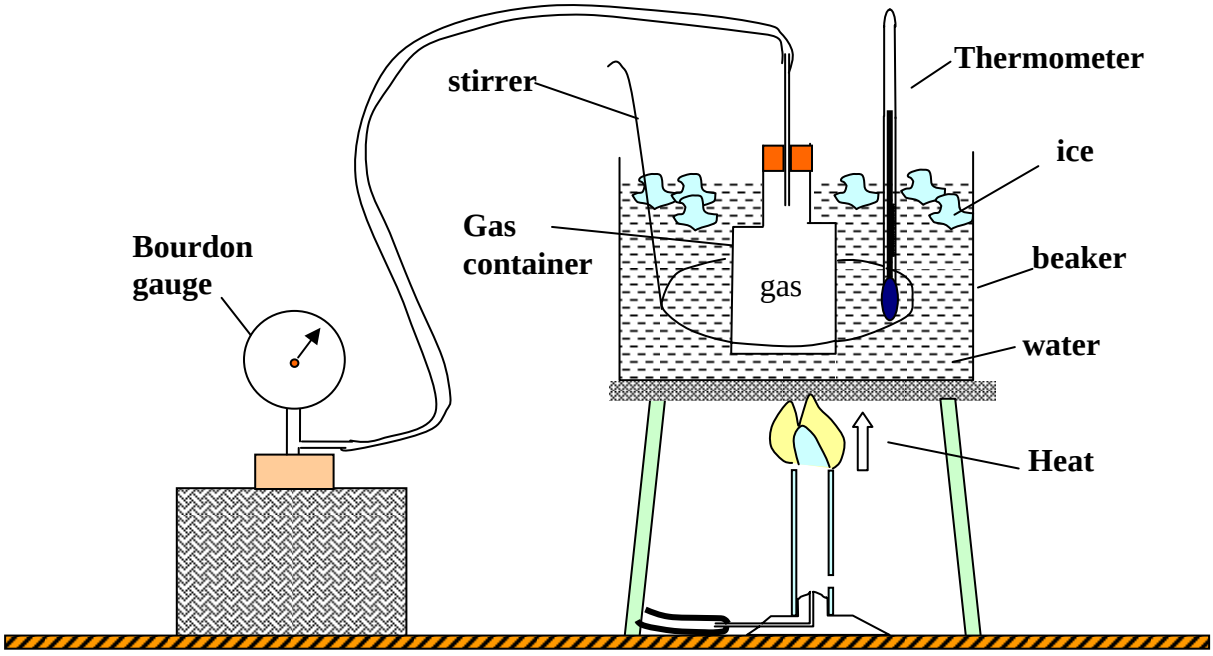
4. Diagram 4 shows the experimental setup to investigate the Pressure Law for gas.



Several types of gas containers are available for the above experiment as shown in the table. Study and explain the suitability of each property of the containers. Choose the most suitable container and give a reason for your choice.

Gas container	Properties of the material of the container			
	Conduction of heat	Specific heat capacity / J kg^{-1} $^{o}C^{-1}$	Expansion when heated	Thickness of wall
P	good	390	large	thick
Q	poor	900	large	thin
R	good	450	little	thin
S	poor	1200	little	thick

[10 marks]

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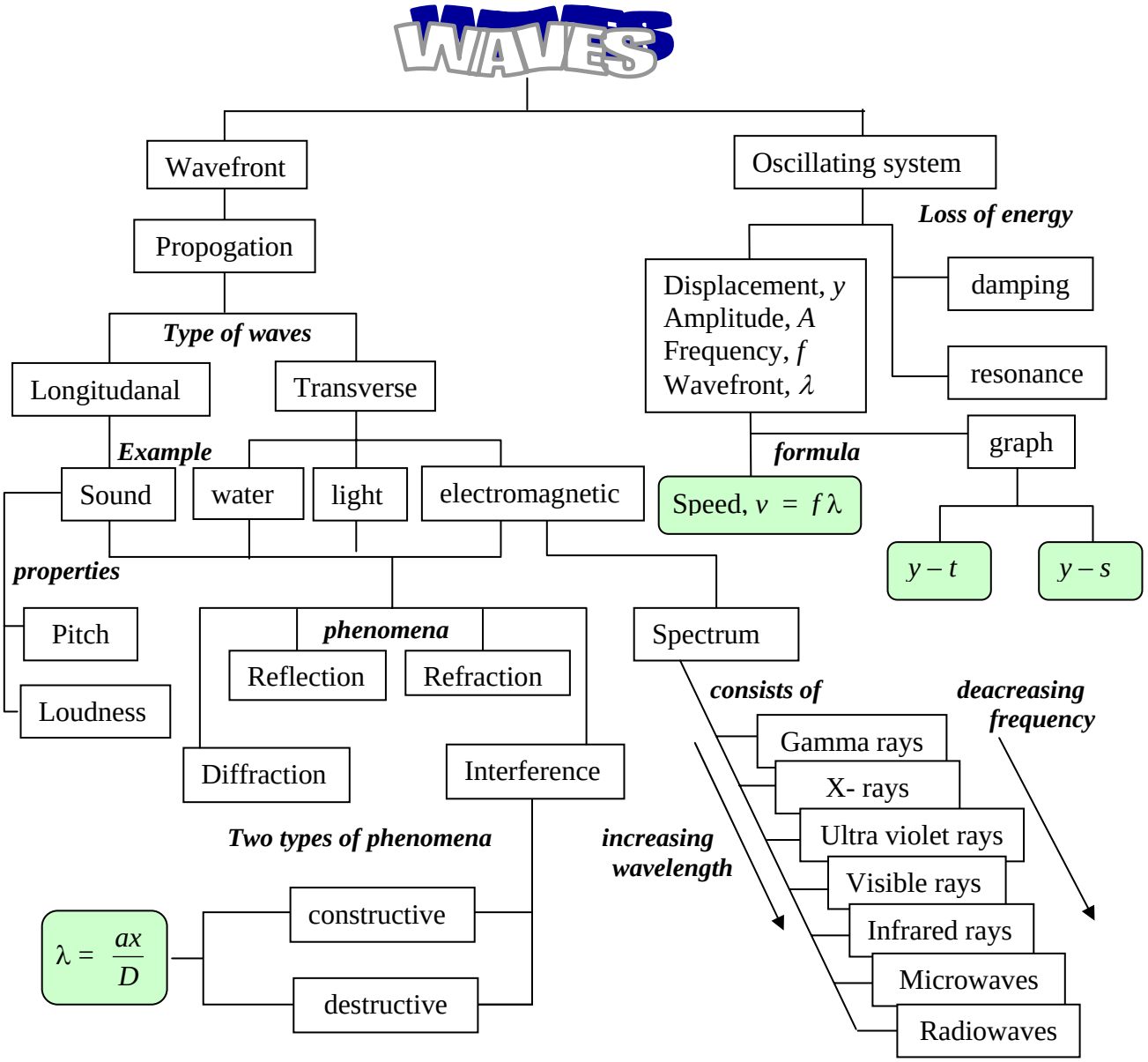
TOPIC 6 : WAVES



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6.1 Understanding Waves

1. Waves transfer energy without transferring matter.
2. There are two types of waves, transverse and longitudinal waves.
3. The direction of propagation of a wave is perpendicular to its wavefront.
4. The amplitude, A of an oscillation is the maximum displacement from the mean position.
5. The period, T of the oscillation is the time taken to complete one oscillation.
6. The frequency, f of the oscillation is the number of complete oscillations made in one second.
7. The wavelength, λ is the horizontal distance between two successive crests or troughs.
8. Wave speed , v

$$\boxed{v = f\lambda}$$

9. Damping is said to have occurred in an oscillating system when the system loses energy to the surroundings, usually in the of heat energy.
10. Resonance in an oscillating system occurs when it is driven at its natural frequency by a periodic force.

6.2 Analysing Reflection of Waves

1. Reflection of waves refers to the return of all or part of the waves when they encounter an obstacle.
2. In the reflection of waves, the angle of reflection is equal to the angle of incidence.
3. The wavelength, frequency and speed of the reflected waves are the same as that of the incident waves.

6.3 Analysing Refraction of Waves

1. Refraction of waves is a phenomenon where there is a change of direction in the propagation of waves when they move from one medium to another due to a change of speed.
2. The frequency of the refracted waves is the same as that of the incident waves.

6.4 Analysing Diffraction of Waves

1. Diffraction is the spreading out of waves when they move through a gap or round an obstacle.
2. The wavelength, frequency and speed of the diffracted waves are the same as that of the incident waves.
3. The amplitude of the incident waves is bigger than the diffracted waves.

6.5 Analysing Interference of Waves

1. The principle of superposition states that when two waves overlap, the resultant displacement is equal to the sum of the displacements of the individual wave.
2. Interference occurs when two wavefronts meet. The waves either interfere constructively or destructively.
3. The approximate formula for interference : $\lambda = \dfrac{ax}{D}$

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6.6 Analysing Sound Waves

1. Sound wave is a longitudinal wave.
2. Sound wave needs a medium for its propagation.
3. Loudness of sound increases if its amplitude increases.
4. Pitch of sound increases if its frequency increases.

6.7 Analysing Electromagnetic Waves

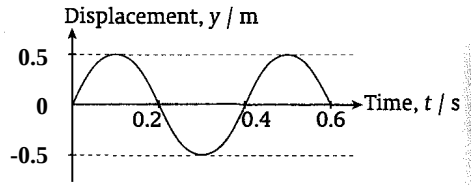
1. The electromagnetic spectrum consists of gamma rays, X-rays, ultraviolet rays, visible light, infrared rays, microwaves and radio waves.
2. All electromagnetic waves are transverse in nature and undergo the phenomena of reflection, refraction, diffraction and interference.
3. All electromagnetic waves do not carry any charge and travel through a vacuum with the speed of $c = 3.00 \times 10^8$ m s^{-1}
4. Electromagnetic waves consist of a combination of oscillating electric and magnetic fields perpendicular to each other.

Excercise

Section A : Master the concept

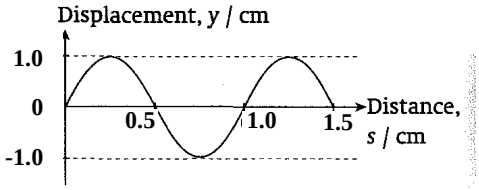
1. Base on the graph describes the motion of a particular wave.
Determine the

(a) amplitude,
(b) period,
(c) frequency of the wave.

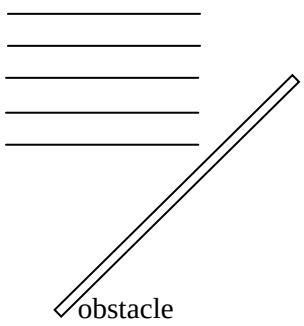


2. The displacement-distance graph in Figure 1.14 describes the motion of a particular wave with a frequency of 50 Hz. Determine the

(a) amplitude,
(b) wavelength,
(c) wave speed.



3. Figure below shows the wavefronts of a incident plane wave. Complete the diagram to show the refracted wavefronts. Your diagram should include the *normal*, *directions of propagation* of incident and reflected waves, and labels for *angle of incidence*, *i* and *angle of reflection*, *r*.



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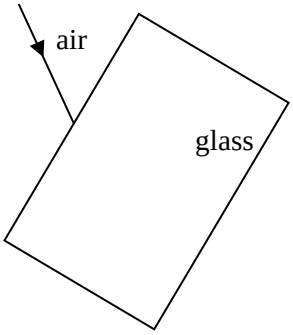
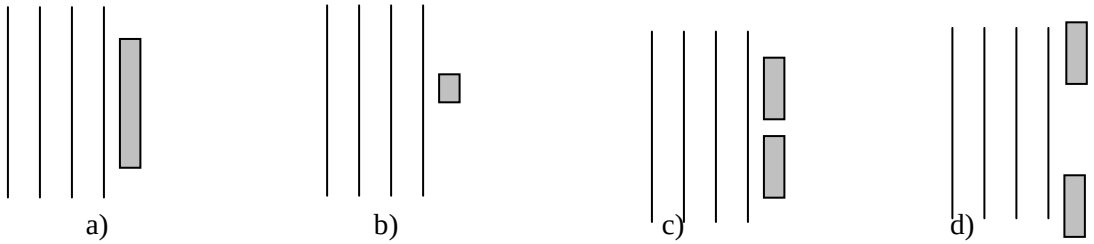
4. Complete the diagram below to show the refracted wave. Your diagram should include the *normal*, *directions of propagation* of incident and refracted waves, and labels for *angle of incidence, i* and *angle of refraction, r*

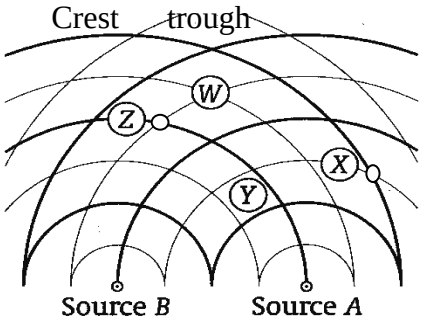


5. Complete the following diagrams by drawing the wavefronts to show the diffraction of caer waves.

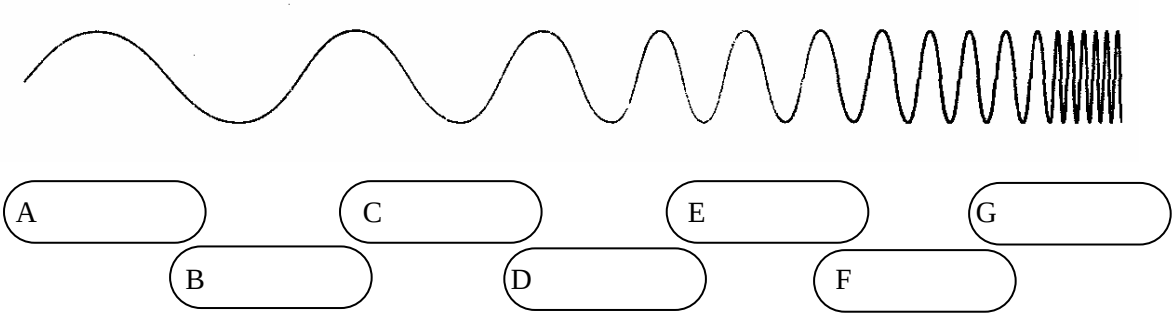


6. Complete the table by describing the state of motion of each bead and the type of interference that occurs at W, X, Y and Z.

Bead	State of motion	Type of interference
W		
X		
Y		
Z		



7. Figure shows the electromagnetic spectrum. Name A – G



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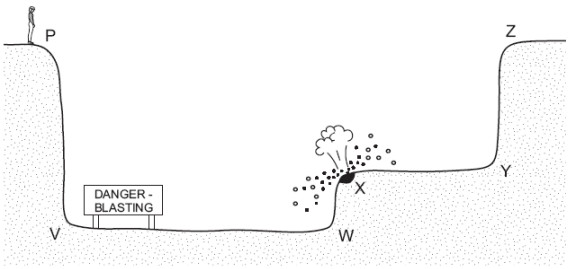
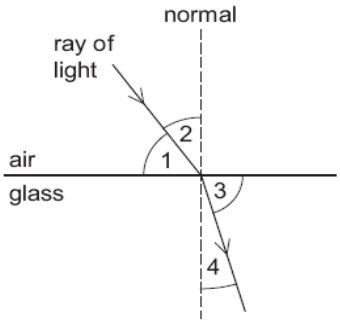
8. An engineer standing at P hears the sound of an explosion at X.
After the explosion, he hears two bangs.
One bang is heard a fraction of a second after the other.
The second bang is an echo from ……..



9.



Which number is

i) the incident angle : …….

ii) the refracted angle : ……

10. In a Young double-slit experiment, a student recorded the following data.

Distance between the double slits and the screen = 1.5 m Distance between two adjacent bright fringes = 1.8 mm Wavelength of the light waves = 600 nm

Calculate the distance of separation between the slits.

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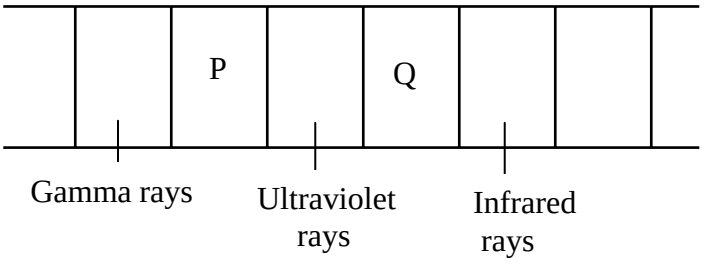
Section B : Objectif questions

1. Which of the following statements is true?

A Sound waves travel very slowly in vacuum
B Sound waves travel faster in air than in water
C Sound waves are transverse waves
D Sound waves travel faster in solid than in air

2. The figure shows an electromagnetic spectrum.



What are waves P and Q?

	P	Q
A	X-rays	Microwaves
B	X-rays	Visible lights
C	Microwaves	Visible lights
D	Visible light	Microwaves

3. The diagram shows a light ray which travels from air to glass.

What is the refractive index of the glass?

A $\frac{\sin S}{\sin Q}$ B $\frac{\sin P}{\sin R}$

C $\frac{\sin Q}{\sin R}$ D $\frac{\sin R}{\sin S}$

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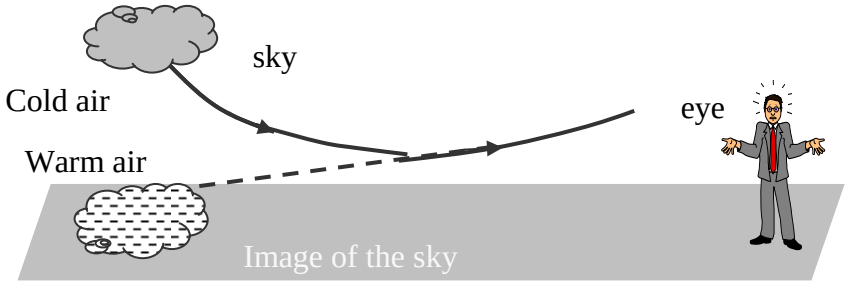
4.

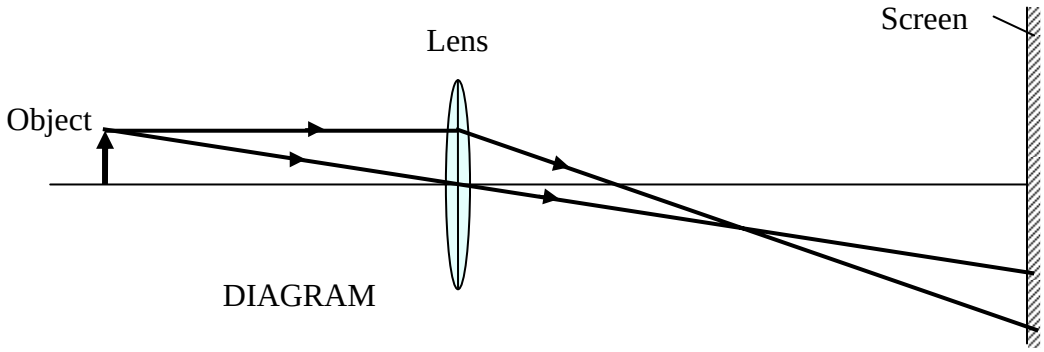


DIAGRAM

The diagram shows the mirages are formed on a hot day. What is the phenomenon involved?

A. Reflection
B. Refraction
C. Diffraction
D. Total internal reflection

5. In the following ray diagram, the image formed on the screen is not clear (not sharp).



DIAGRAM

Which of the following changes will produce a sharp image on the screen?

A. Replace the lens with another convex lens of longer focal length.
B. Replace the lens with another concave lens of shorter focal length.
C. Move the object further from the lens.
D. Move the screen further from the lens.

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6. Diagram shows the graph of displacement against time for a load which is oscillating at the end of a light spring in air.

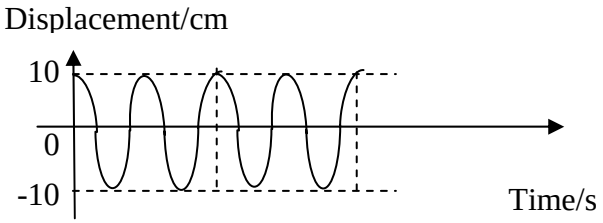
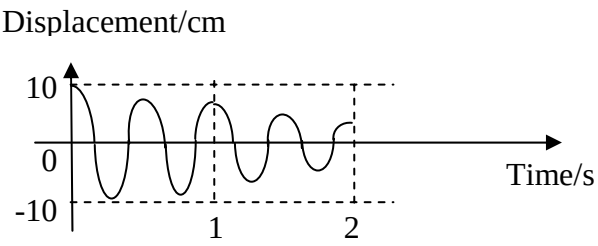


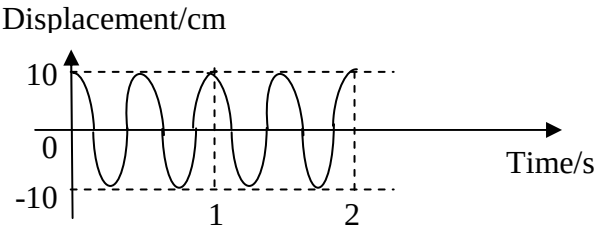
DIAGRAM 1

Which graph correctly shows the oscillating of the load when it is oscillating in water?

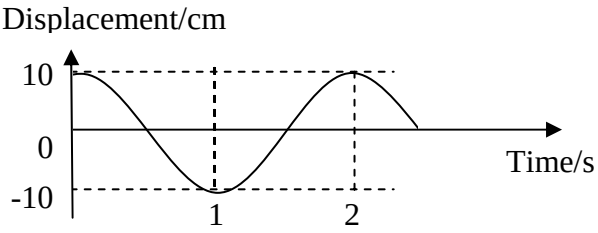
A



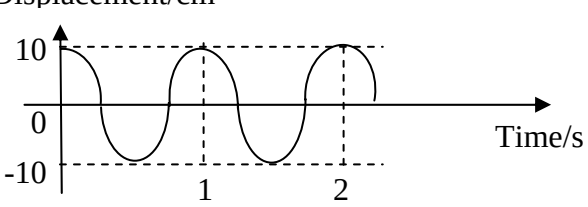
B



C



D



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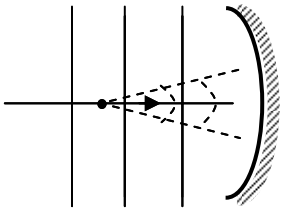
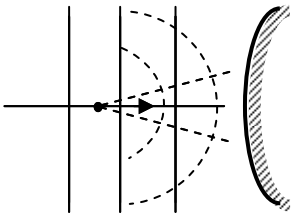
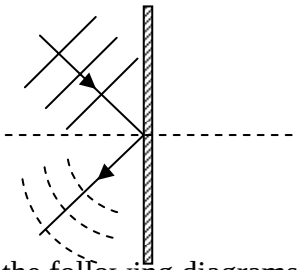
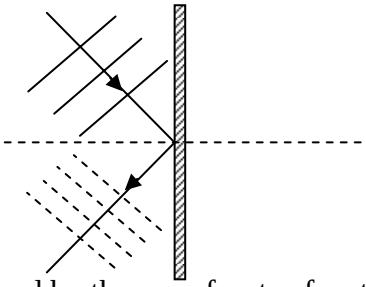
7. Which diagram shows the correct reflection pattern produced when plane water waves are incident on a barrier?

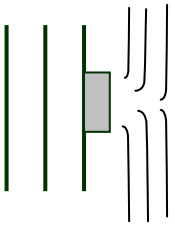
A 

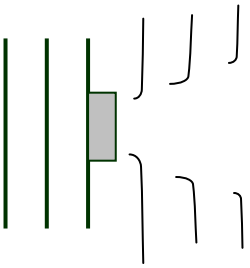
B 

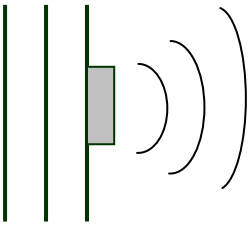
C 

D 

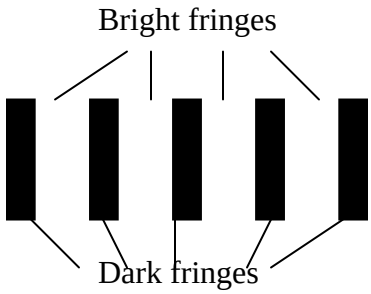
8 Which of the following diagrams show the pattern formed by the wavefronts of water waves passing by an obstacles?

A 

B 

C 

9. The diagram shows the fringe pattern produced from Young's double slit experiment using the monochromatic red light source.



What happens to the fringes if monochromatic yellow light source is used?

A The bright fringes are wider than the dark fringes
B The dark fringes are wider than the bright fringes
C The distance between consecutive fringes decrease
D The distance between consecutive fringes increase

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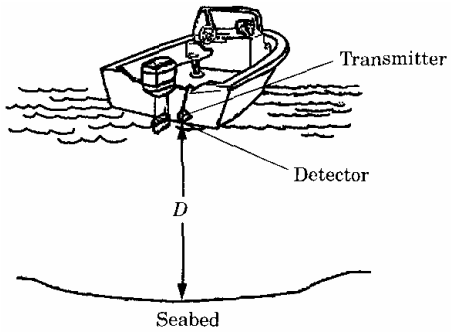
10. The diagram shows an ultrasonic waves transmitted from a boat to the seabed to determine the depth, D, of the sea. The speed of the ultrasonic waves in water is 1 500 m s^{-1}. The echo of the waves is received 2.0 s after the transmission.



What is the value of D

A	375 m	D	3 000 m
B	750 m	E	6 000 m
C	1 500 m		

Section C : Structure Question

1. (a) Fig. 1.1 shows a machine for making loud sounds. It is called a siren. This consists of a rotating disc with 25 holes. As each hole passes the jet, a puff of air passes through the hole

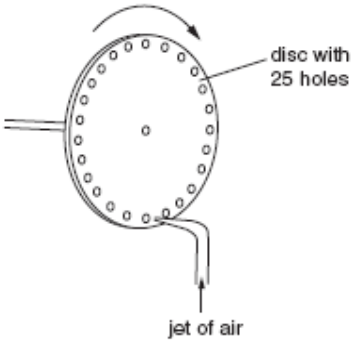


figure 1.1

(i) How many puffs of air will there be during one revolution of the disc?

(ii) The disc rotates 40 times per second. Calculate the frequency of the note produced by the siren.

(b) The siren described in **(a)** is located some distance from a large building, as shown in Fig. 1.2.

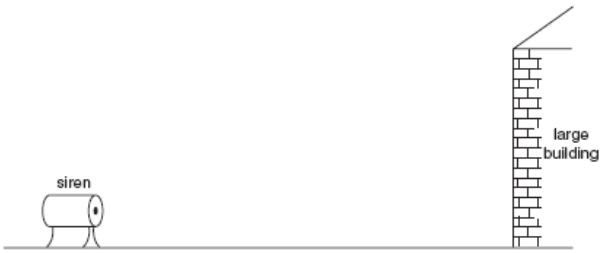


Figure 1.2

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The siren is briefly sounded once. A short time later, the sound is heard again.

(i) Why is this second sound heard?

.....

(ii) What is the frequency of this second sound?……

(iii) What is the amplitude of this second sound?……

2. Boy A throws a large stone into a large still pond, as illustrated in Fig. 2.1.

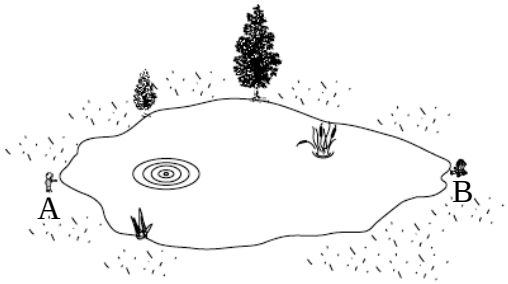

Figure 2.1

(a) Girl B hears the 'plop' sound of the stone entering the water a very short time after she sees the splash, but it is many seconds before the water wave reaches the edge of the pond where she is sitting.
Use this information to decide which wave travels fastest and which travels slowest.

……

(b) Based on answer in a. state each type of wave.

……..

(c) State the wave that do **not** need a substance as the medium to travel.…….

3. Fig.3.1 shows three wavefronts in a beam of yellow light passing through air. The wavefronts are one wavelength apart. The beam meets a glass surface. AB is a ray of light that shows the direction of travel of the wavefronts.

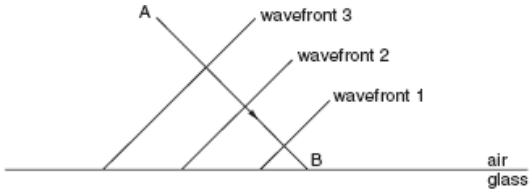

Figure 3.1

(a) Complete Fig. 3.1 by
(i) continuing the ray AB to show the ray inside the glass,
(ii) continuing wavefront 1 inside the glass.

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(b) State what happens to the speed and wavelength of the waves as the beam moves from the air to the glass.

(i) speed .....

(ii) wavelength .....[2]

(c) The glass in Fig. 3.1 is replaced with a denser glass.
Describe two ways in which the completed Fig. 3.1 would change.

1. .....

…….....

2. ….....

.....[2]

Section D : ESSAY

1. Diagram 1.1 and Diagram 1.2 show the water waves and sound waves propagating towards a reflector.

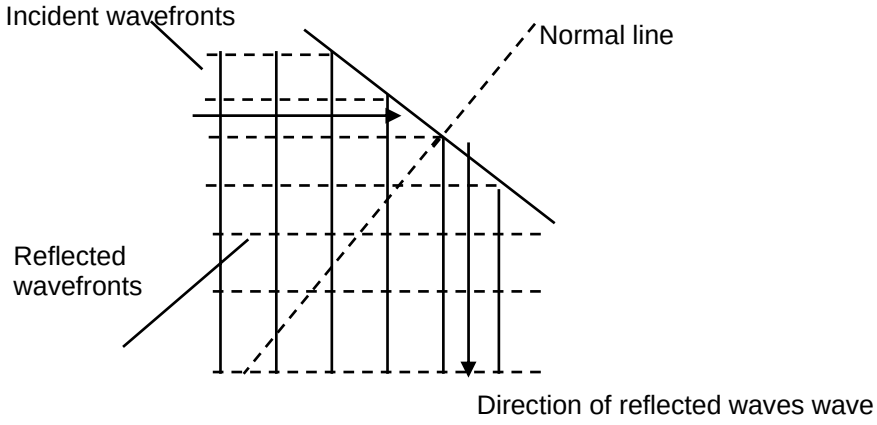

DIAGRAM 1.1

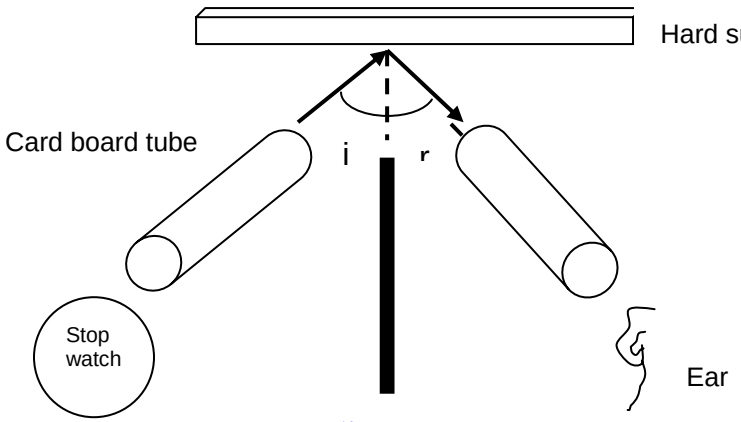

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DIAGRAM 1.2

(a) (i) What is meant by **reflected waves**? [1 *mark*]

(ii) With reference to Diagram 1.1 and Diagram 1.2, compare the incident and reflected angle, wavelength, frequency, speed and direction of propagation of the reflected wave.

[5 *marks*]

(iii) State the principle of reflection of waves.

[1 *mark*]

(b) Discuss on how you would use the sound wave to determine the depth of the sea.

[3 *marks*]

(c) You have been assigned as a consultant to assemble a speaker system and to improve the acoustics of a school hall. Using the appropriate physics concept explain how the installation of the speaker system and other modifications that can improve audible sound. In your explanation, elaborate on the following points:

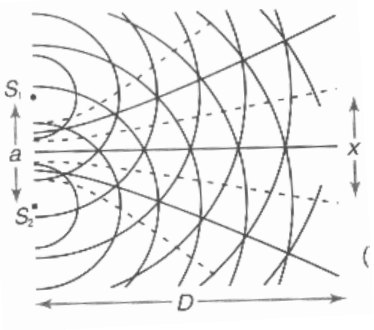
(i) The arrangement of the speakers.

(ii) Wall and floor finishing.

(iii) Power of the loud speakers [*10 marks*]

2. Diagrams 2.1 and 2.2 show interference patterns using coherent sources of waves, λ.

a.



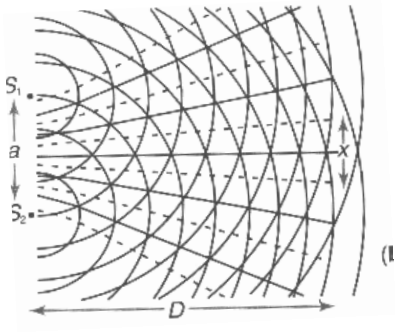


Diagram 2.1 Diagram 2.2

i) What is meant by coherent waves ?

(1 mark)

ii) Compare Diagrams 2.1 and 2.2
Relate λ and x to make a deduction regarding the relationship of both quantities.

(5 marks)

b) Two loudspeakers placed 1.5 m apart are connected to an audio signal generator adjusted to a frequency 600 Hz. When a student walks at a distance of 3.0 m infront of the loudspeakaers he hears four consecutive loud and 3 soft sounds

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Explain why? (4 marks)

c) i) Explain why the wavefronts in the sea follow the shape of the coastline as the water becomes shallower.

(4 marks).

ii) You plan to build a safe port for the convenience of the fishermen. Suggest relevant steps to be taken in order to build it.

(6 marks)

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ANSWERS
HEAT

EXERCISE 1:

PART I

a) true b) false c) true d) true e) false f) true g) false h) true i) true j) false

PART II

a) true b) false c) true d) false e) true f) true g) false h) false i) true j) false
k) true l) false m) false

PART III

a) false b) true c) true d) true e) false f) false g) true

EXERCISE 2:

PART I:

1) B 2) C 3) C 4) D 5) B 6) C 7) D 8) B 9) C 10) A

11) D 12) A 13) D 14) C 15) B 16) A 17) B 18) A 19) B 20) B

21) B 22) B 23) C 24) A 25) A

PART II:

1.
   a. 30^oC
   b. Rate of heat loss increases with temperature difference over the room temperature. At 60oC, the rate of heat loss = rate of heat supplied by the heater.
   c. rate of change of temperature
   d. the rate of loss of heat at B is greater than the rate of heat loss at A
   e. Heat = $mc\theta$
      = 1 x 900 x (60 – 30)
      = 27000 J

2.
   a. to keep the temperature uniform throughout the water
   b. 80^oC

c. i) changing from solid to liquid (melting)
ii) During melting, heat supplied is used only to separate/increase distance between the molecules to form liquid. Heat supplied is not used to increase the random kinetic energy of the molecules.

d. All the naphthalene has melted and energy supplied increases the kinetic energy of the molecules.

e. Heat supplied = 100 x 400 J = 40000 J
Heat supplied = mL
40000 = 0.2 L
L = 200000 J kg^{-1}.

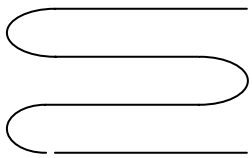
3.

a. No nett heat flow between 2 bodies

b. -In the steam bath both P and Q have the same temperature
-The temperature of P is lower than Q when they are in the cups
-The bigger the change of temperature, the larger the amount of heat given out by the weight
-Q contains more heat
-The concept of heat capacity- the larger the heat capacity of a body, the more heat is stored in the body at a certain temperature

c. i) The kinetic energy of the cannon ball is converted to heat after hitting the ground.
ii) Potential energy → kinetic energy → heat
iii) same as the surrounding temperature.
Thermal equilibrium is reached

d.

	Modification	Reason
1	Length and shape of heating element 	Covers larger area to spread heat more evenly
2	Have another heating element at the bottom	Bottom part of food is heated evenly
3	Inner-wall of the oven made of insulating heat resistant material	Less heat loss to surrounding – saves energy
4	Glass door made double layer with air in between.	Air is poor conductor -less heat loss – saves energy
5	Add electric motor to rotate the food	Chicken is roasted evenly

4.

Property of material suitable for gas container	Reason
Good conductor of heat	Gas in container absorbs heat quickly
Specific heat capacity must be low	Temperature of container attains the temperature of surrounding water quickly
Little expansion	Volume of gas in container kept constant
Wall of container must be thin	Heat quickly transferred to gas in container

Choose container R
Because its made of good conductor, low specific heat capacity, expand very little and has thin wall.

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Answer of exercises for critical topic.

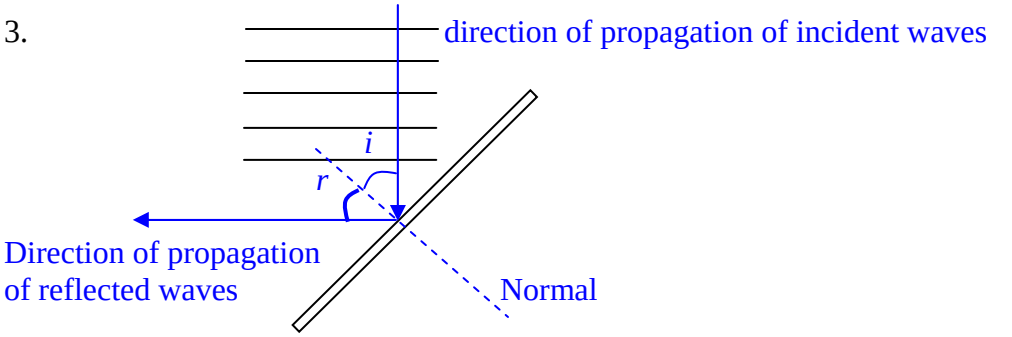
Topic 6 : Waves

Section A : Master the concept

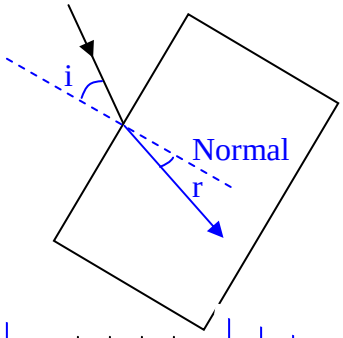
1. (a) 0.5 m (b) 0.4 s (c) 2.5 Hz

2. (a) 1.0 m (b) 1.0 m (c) 50 ms^{-1}

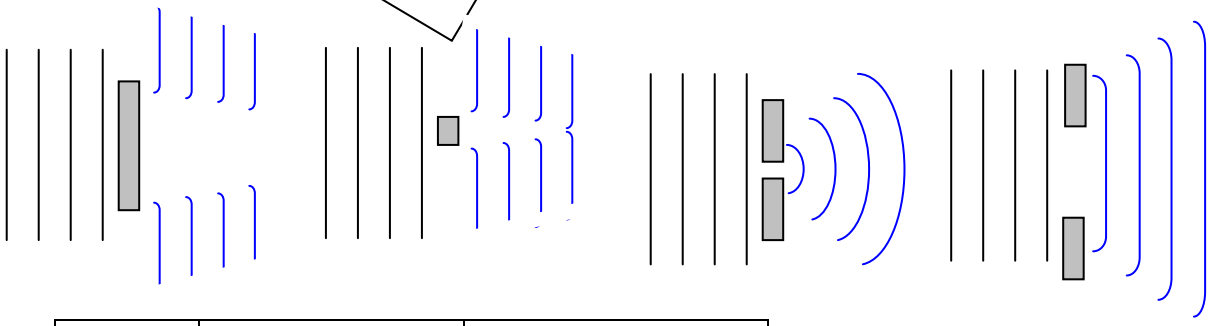
3.



4.



5.



6.

Bead	State of motion	Type of interference
W	Trough & trough	Constructive
X	Trough & crest	desructive
Y	Crest & crest	constructive
Z	Trough & crest	Destructive

7. A : radio waves B : microwaves C : Infrared D : visible light
E : Ultra violet F : X-rays G : Gamma rays

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8. YZ

9. i) 2 ii) 4

10. 5.0×10^{-8} m

Section B : Objectif question

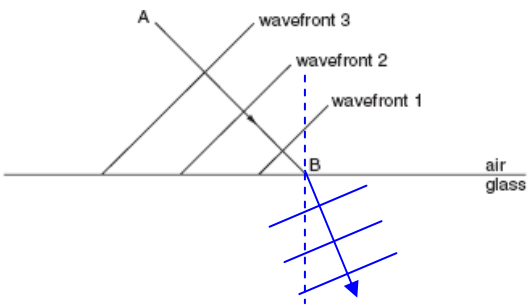
1. C 2. B 3. B 4. D 5. A 6. A 7. A 8. B 9. C 10. C

Section C : Structure Question

1. (a) (i) 25 times
   (ii) 25 x 40 = 1000 Hz
   (b) (i) Reflection
   (ii) 1000 Hz
   (iii) same with initial sound waves

2. (a) Light waves move faster
   (b) Light waves : transverse waves , Sound waves : longitudinal waves
   (c) Light waves

3. (a)



   (b) (i) speed : decrease
   (ii) wavelength : decrease (because $v = f\lambda$, f : unchanged & v decrease)

   (c) 1. decrease the angle of refraction
   2. decrease the distance between two wavefront (λ)

Section D : Essay

1. (a) (i) Waves that occurs when it strike the obstacle.
   (ii) - i = r
   - λ of incident wave = λ of refracted waves
   - f of incident wave = f of refracted waves
   - v of incident wave = v of refracted waves
   - Direction of incident wave is change
   (iii) - transmit the ultrasound with known velocity to the seabed

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- Take the time taken until the echo detected
- Calculate the sea depth, *d* by using the equation $2d = v \times$

(d)
- Two speakers arranged distance to each others
  - To get nearer position of constructive interference
- Two speakers arranged on the straight line in front of hall
  - Easier to find the louder point (constructive interference) as the audience position
- The surface of wall made by soft materials such as carpet or foam.
  - To reduce the effect of reflection
- Use the parquet as the floor
  - To reduce the effect of reflection
- Use powerful loud speaker
  - To get a good effect of sound and reduce the rate of energy lost.

2. a) i) Two waves that have same phase or same different phase // same frequency and amplitude.

ii)
- *a* for both diagram 2.1 and 2.2 are same
- D for both diagram 2.1 and 2.2 are same
- λ diagram 2.1 greater
- x diagram 2.1 greater
- the grater the λ the grater the x

b)
1. There are two coherent sources placed far to each others, then produced the good effect of interference.
2. The student walks far from the sources, to hear the effect of constructive interference and destructive interference.
3. The student hears 4 time of constructive interference as the louder sound.
4. Soft sounds are the destructive interference occurs in between the constructive interference.

c) i)
- The phenomenon of refraction occurs when the water becomes shallower.
- There are some normal line produced, depend on the shape of coastline.
- The refracted angle produce based on normal line and the change of the depth of water.
- The direction of propagation will change based on how it refract due to the shape of coastline.

ii)
- Build slanting barrier to reduce speed of wave
- Build the rough barrier to reduce reflection of the waves
- Build the new jetty at the bay because the water is calm at the bay
- Build the small opening surround the bay because diffraction happens at the opening
- Build the barrier at the bay because the wave is spread according to the shape of the bay

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Answers:

No.	Jwb	No.	Jwb	No.	Jwb	No.	Jwb	No.	Jwb
1	D (R)	11	A (S)	21	B (R)	31	A (R)	41	A (S)
2	D (S)	12	A (T)	22	A (S)	32	B (R)	42	B (R)
3	C (S)	13	C (R)	23	D (R)	33	C (S)	43	C (S)
4	B (T)	14	C (R)	24	B (S)	34	D (T)	44	D (S)
5	B (S)	15	D (R)	25	D (S)	35	C (S)	45	C (T)
6	C (R)	16	B (R)	26	C (R)	36	A (R)	46	D (S)
7	D (R)	17	C (S)	27	A (T)	37	D (S)	47	B (S)
8	A (S)	18	A (S)	28	C (R)	38	B (T)	48	C (R)
9	B (S)	19	D (R)	29	B (R)	39	C (S)	49	E (R)
10	B (T)	20	C (S)	30	D (S)	40	A (T)	50	A (R)

R = Aras rendah
S = Aras Sederhana
T = Aras Tinggi

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YAYASAN PAHANG

PROGRAM JAWAB UNTUK JAYA 2008

PRAKTIS BESTARI

FIZIK

KERTAS 1

Satu jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas ini mengandungi 50 soalan.*
2. *Jawab semua soalan. Tiap-tiap soalan diikuti oleh sama asa tiga, empat atau lima pilihan jawapan. Pilih satu jawapan yang terbaik bagi setiap soalan dan hitamkan ruangan yang sepadan pada kertas jawapan objektif anda.*
3. *Rajah yang dilukis adalah mengikut skala kecuali dinyatakan.*
4. *Penggunaan kalkulator saintifik yang tidak boleh diprogramkan adalah dibenarkan.*

Kertas soalan ini mengadungi dua puluh tiga halaman bercetak termasuk muka hadapan.

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INFORMAT

1. *This question paper consists of 50 questions.*
2. *Answer **all** questions.*
3. *Answer each question by blackening the correct space on the answer sheet.*
4. *Blacken only **one** space for each question.*
5. *If you wish to change your answer erase the blackened mark that you have made. Then blacken the space for the new answer.*
6. *The diagrams in the questions provided are not drawn to scale unless stated.*
7. *You may use a non-programmable scientific calculator.*
8. *A list of formulae is provided on page 3*

MAKLUMAT UNTUK CALON

1. *Kertas soalan ini mengandungi 50 soalan.*
2. *Jawab **semua** soalan.*
3. *Jawab setiap soalan dengan menghitamkan ruangan yang betul pada kertas jawapan.*
4. *Hitamkan satu ruangan sahaja bagi setiap soa/an.*
5. *Sekiranya anda hendak rnenukarkan jawapan. padamkan tanda yang telah dibuat. Kemudian hitamkan jawapan yang baru.*
6. *Gambar rajah yang mengiringi soalan tidak dilukiskan mengikut skala kecuali dinyatakan.*
7. *Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.*
8. *Satu senarai rumus disedialcan di halainan 3.*

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The follow

1. $a = \frac{v-u}{t}$
2. $v^2 = u^2 + 2as$
3. $s = ut + \frac{1}{2}at^2$
4. Momentum $= mv$
5. $F = ma$
6. Kinetic energy $= \frac{1}{2}mv^2$
7. Potential energy $= mgh$
8. Elastic potential energy $= \frac{1}{2}Fx$
9. $\rho = \frac{m}{V}$
10. Pressure, $P = h\rho g$
11. Pressure, $P = \frac{F}{A}$
12. Heat, $Q = mc\theta$
13. Hear, $Q = ml$
14. $\frac{PV}{T}$ = constant
15. $E = mc^2$
16. $v = f\lambda$
17. Power, $P = \frac{\text{energy}}{\text{time}}$
18. $\frac{1}{f} = \frac{1}{u} = \frac{1}{v}$
11. $\lambda = \frac{a\,x}{D}$
20. $n = \frac{\sin i}{\sin r}$
21. $n = \frac{\text{real depth}}{\text{apparent depth}}$
22. $Q = It$
23. $V = IR$
24. Power, $P = IV$
25. $\frac{N_S}{N_P} = \frac{V_S}{V_P}$
26. Efficiency $= \frac{I_S V_S}{I_P V_P} \times 100\%$
27. $g = 10\ m\ s^{-2}$.

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Each questic
then blacken the correct space on the answer sheet.

Tiap-tiap soalan diikuti oleh sama ada **tiga, empat** *atau* **lima** *pilihan jawapan. Pilih* **satu** *jawapan yang terbaik bagi setiap soalan dan hitamkan ruangan yang betul pada kertas jawapan anda.*

1. Which of the following is a derived physical quantity?
   Antara berikut, yang manakah kuantiti fizik terbitan?

   A. mass *Jisim* B. temperature *suhu* C. electric current *arus elektrik* D. weight *berat*

2. A physical quantity is defined as the product of velocity and time. What is the S.I. unit of this quantity?
   Suatu kuantiti fizik ditakrifkan sebagai hasildarab halaju dengan masa. Apakah Unit S.I. *kuantiti fizik ini?*

   A. kg m s^{-2}
   B. kg m s^{-1}
   C. m s^{-1}
   D. m

3. The power generated by a power station is 250 MW. This power is the same as
   Kuasa yang dijanakan oleh sebuah stesyen kuasa ia lah 250 MW. Kuasa ini sama dengan

   A. 2.50×10^{-3} W
   B. 2.50×10^{-6} W
   C. 2.50×10^{-8} W
   D. 2.50×10^{-9} W

4. Figure 1a shows the reading of a mercury barometer. A little while later, the reading becomes as shown in Figure 1b.
   Rajah 1a menunjukkan bacaan satu barometer merkuri. Sedikit masa kemudian, bacaannya menjadi seperti dalam Rajah 1b.

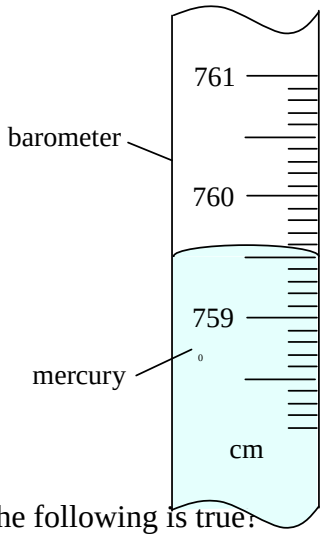

Figure 1a / *Rajah 1a*

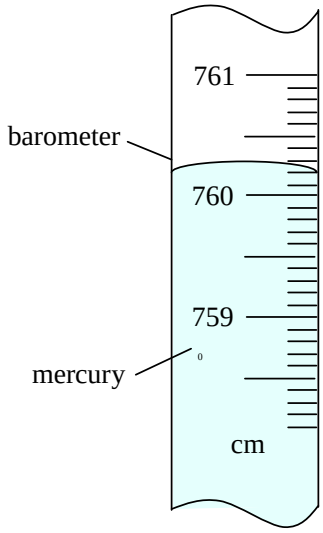

Figure 1b / *Rajah 1b*

Which of the following is true?
Antara berikut, yang manakah benar?

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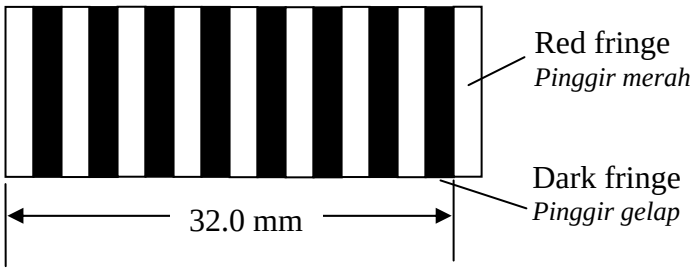
	Bacaan barometer dalam Rajah 1a	*Perubahan bacaan barometer*
A.	759.5 cm	0.7 cm
B.	759.6 cm	0.7 cm
C.	759.5 cm	0.8 cm
D.	759.6 cm	0.8 cm

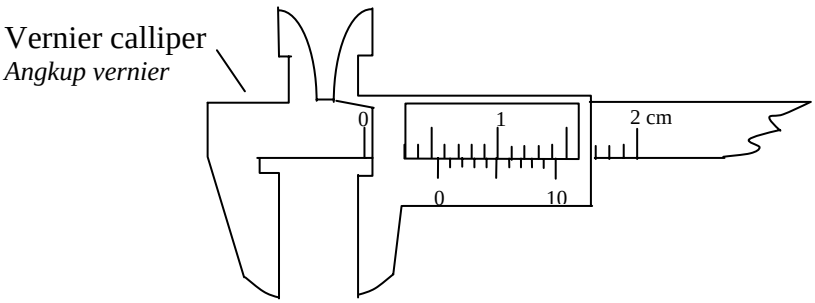
5. The diagram below shows a double slit interference pattern for red light.



The value of fringe separation is
Nilai jarak pemisahan antara pinggir ialah

A. 2.50 mm
B. 2.00 mm
C 1.88 mm

6.



The vernier calliper reading is
Bacaan angkup vernier ialah

A. 0.05 cm
B. 0.35 cm
C. 0.55 cm
D. 1.50 cm

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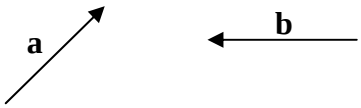
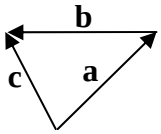
7. Which o
Antara alat-alat berikut, yang manakah akan anda gunakan untuk mengukur laju sebuah kereta mainan?

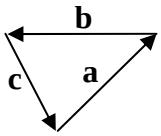
A stopwatch and spring balance
jam randik dan neraca spring
B spring balance and micrometer
neraca spring dan mikrometer
C measuring tape and micrometer
pita ukur dan mikrometer
D stopwatch and measuring tape
jam randik dan pita ukur

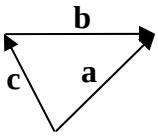
8. Shown below are two vectors **a** and **b**.
*Ditunjukkan adalah dua vector **a** dan **b**.*

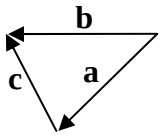


Which of the following correctly represents the vector addition of the vectors **a** and **b** which results in the resultant vector **c**?
*Antara berikut, yang manakah mewakili dengan betulnya tambahan vektor bagi vektor **a** dan **b** yang menghasilkan vektor paduan **c**?*

A.


B.


C.


D.


9. Between the following statements, which is **not true** about an object which is moving with constant acceleration?
*Antara pernyataan berikut, yang manakah **tidak benar** tentang suatu jasad yang sedang bergerak dengan pecutan sekata?*

A. The object is moving in a straight line
jasad sedang bergerak dalam satu garis lurus
B. No force is acting on the object
tiada sebarang daya bertikdak ke atas jasad
C. The resultant force on the object is greater than zero
paduan daya-daya yang bertindak ke atas jasad ialah lebih daripada sifar
D. The resultant force on the object is constant
Paduan daya ke atas objek itu adalah sekata

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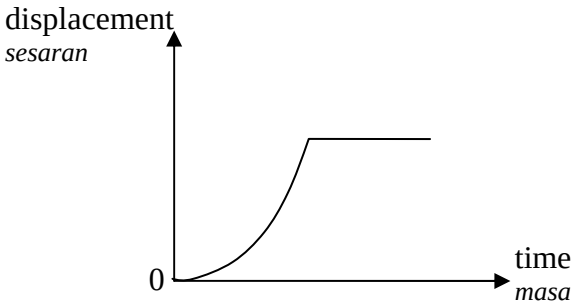
10. The dia

Rajah menunjukkan daya-daya yang sedang bertindak ke atas seorang pakar payung terjun. Berapakah pecutannya?
(g = 10 m s^{-2}).

A. 1.25 m s^{-2} B. 2.0 m s^{-2}
C. 5.0 m s^{-2} D. 10 m s^{-2}

11.

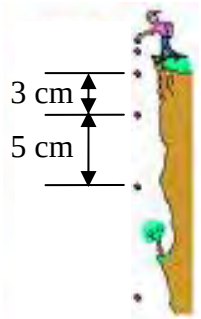


With reference to the graph above, which of the following best describes the motion represented by the graph?
Merujukkan graf di atas, yang manakah di antara pernyataan berikut paling baik menghuraikan gerakan yang diwakili oleh graf itu?

A. Accelerates, then suddenly stops
Memecut, kemudian berhenti secara tiba-tiba
B. Accelerates, then constant velocity
Memecut, kemudian bergerak dengan halaju sekata
C. Constant velocity, then stops
Halaju sekata kemudian berhenti

12.

A stroboscopic camera which takes 10 photos per second is used to record the positions of a piece of sponge dropped by a boy. Calculate the average acceleration of the piece of sponge using the distances measured.
Sebuah kamera berstroboskop yang mengambil 10 gambar sesaat digunakan untuk merekodkan kedudukan seketul span yang dijatuhkan oleh seorang budak. Kirakan pecutan purata span itu dengan menggunakan jarak-jarak yang diukur.



A. 200 cm s^{-2}
B. 400 cm s^{-2}
C. 800 cm s^{-2}
D. 1000 cm s^{-2}

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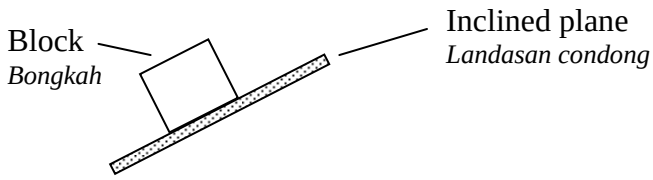
13. The grav
100 J. Tl
of the Moon is
Tenaga keupayaan graviti bagi suatu objek pada ketinggian 1 m dari permukaan bumi ialah 100J. Tenaga keupayaan gravity bagi objek yang sama pada ketinggian 1 m dari permukaan bulan ialah

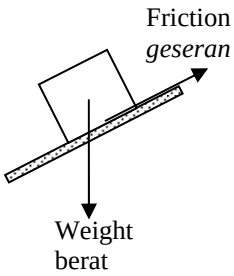
A. 100 J
B. Greater than 100 J
Lebih daripada 100 J
C. Less than 100 J
Kurang daripada 100 J

14. The diagram below shows a block resting in equilibrium on an inclined plane.
Rajah di bawah menunjukkan satu bongkah berada dalam keadaan keseimbangan di atas satu landasan condong.

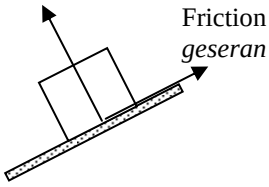


Which of the following force diagrams correctly shows the forces acting on the block?
Antara gambarajah daya berikut, yang manakah menunjukkan dengan betul daya-daya yang bertindak ke atas bongkah itu?

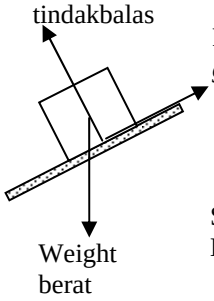
A.



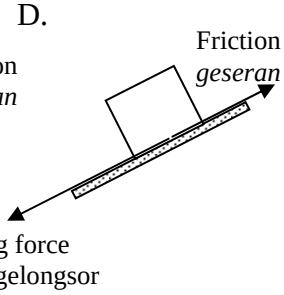
B.



C.



D.



15. Which of the following quantities is the same as the product of Force and Time?
Manakah di antara kuantiti berikut adalah sama dengan hasil darab Daya dengan Masa?

A. Energy
Tenaga
B. Power
Kuasa
C. Inertia
Inersia
D. Impulse
Impuls

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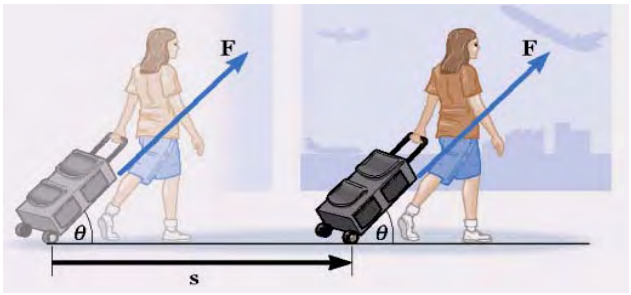
16. The tota
the kinet
other body?
Jumlah tenaga kinetik dua jasad sebelum berlanggar ialah 50 J. Jika perlanggaran itu adalah kenyal sepenuhnya, dan tenaga kinetik selepas perlanggaran salah satu jasad ialah 20 J, berapakah tenaga kinetik jasad yang satu lagi?

A. 2.5 J
B. 30 J
C. 70 J
D. 100 J

17. A constant force of 5 N acts on a body of mass 2 kg for 10 s. If no other force is acting, what is the change of momentum of the body?
Satu daya sekata 5 N bertindak ke atas suatu jasad berjisim 2 kg selama 10 s. Jika tiada daya lain yang bertindak, berapakah perubahan momentum jasad itu?

A. 10 kg m s^{-1}
B. 20 kg m s^{-1}
C. 50 kg m s^{-1}
D. 100 kg m s^{-1}

18. In the diagram below, if F = 20 N, s = 50 m and $\theta = 60^{o}$, what is the work done by the girl?
Dalam rajah di bawah, jika F= 20 N, s= 50m and $\theta = 60^{o}$, berapakah kerja yang dilakukan oleh perempuan itu?



A. 500 J
B. 1000 J
C. 1200 J
D. 3000 J

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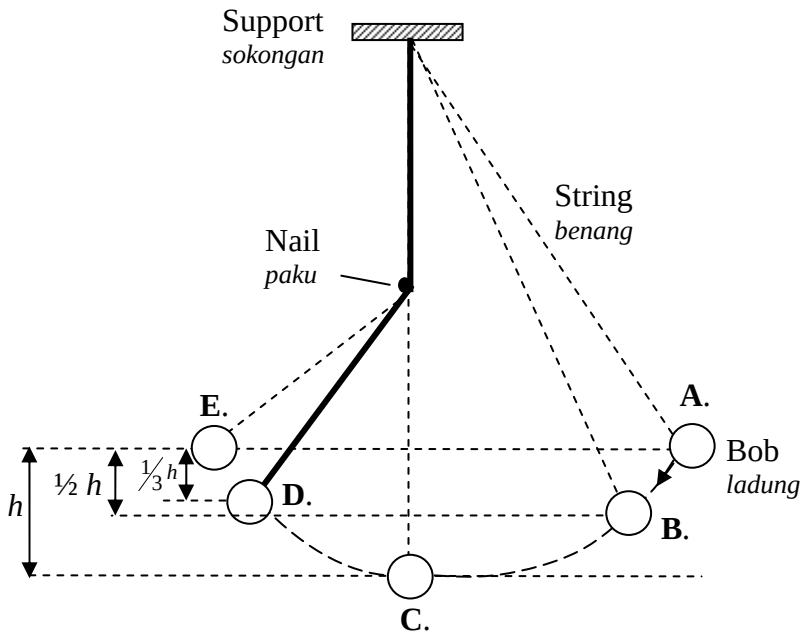
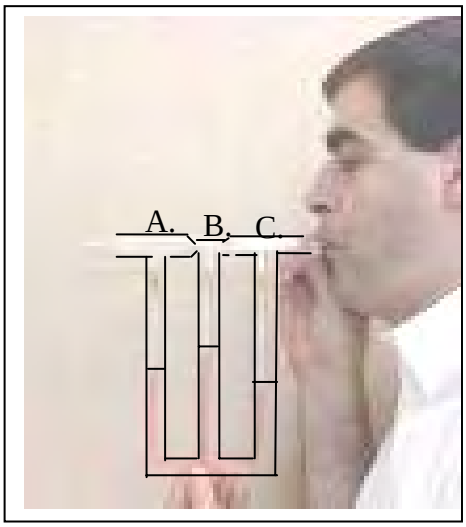
19.



In the diagram above, the bob of the simple pendulum initially at rest, swings from position A to position E. At which position is its kinetic energy **not zero** and the potential energy is the highest?

*Dalam rajah di atas, ladung bandul ringkas yang pada mulanya berehat, berayun dari kedudukan A ke kedudukan E. Pada kedudukan manakah tenaga kinetiknya **tidak sifar** dan tenaga keupayaannya paling tinggi?*

20. In the diagram on the below, which point in the tube has the highest air pressure?
Dalam rajah di bawah, yang mana satu titik dalam tiub itu mempunyai tekanan udara yang paling tinggi?



21. Which is the physics principle used to raise a hot air balloon.
Yang manakah prinsip fizik yang digunakan untuk apungan belon udara panas?

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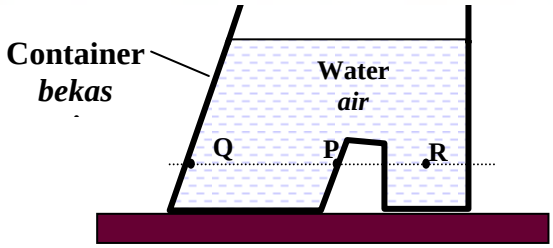
A. Pascal's principle
Prinsip Pascal
B. Archimedes principle
Prinsip Archimedes
C. Bernoulli's principle
Prinsip bernoulli
D. Principle of conservation of momentum
Prinsip keabadian momentum

22. The atmospheric pressure on top of a hill is 70 cm Hg.
What is this atmospheric pressure in N m^{-2}?
(g = 10 m s^{-2}; density of mercury = 13600 kg m^{-3})

Tekanan atmosfera di atas suatu bukit ia lah 70 cm Hg.
Berapakah tekanan ini dalam N m^{-2}?
(g = 10 m s^{-2}; ketumpatan merkuri = 13600 kg m^{-3})

A. 9.52×10^4
B. 9.52×10^5
C. 9.52×10^6
D. 9.52×10^7

23.



Which of the following is true of the pressure at P, Q and R?

Antara berikut, yang manakah benar tentang tekanan di P, Q dan R?

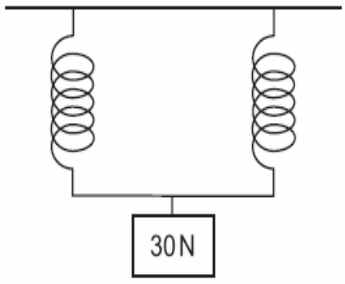
A. **Pressure at P > Pressure at Q > Pressure at R**
Tekanan di P > tekanan di Q > tekanan di R

B. **Pressure at P = Pressure at R > Pressure at Q**
Tekanan di P = tekanan di R > tekanan di Q

C. **Pressure at Q > Pressure at P = Pressure at R**
Tekanan di Q > tekanan di P = tekanan di R

D. **Pressure at Q = Pressure at P = Pressure at R**
Tekanan di Q = tekanan di P = tekanan di R

24. A spring extends 4 cm when 10 N is suspended from it. Two of this spring are used as shown to carry a 30 N load.
Satu spring memanjang sebanyak 4 cm apabila 10 N digantung daripadanya. Dua spring seperti ini digunakan untuk menyokong beban 30 N seperti ditunjukkan.



What is the extension of each spring?
Berapakah pemanjangan tiap spring?

A. 4 cm
B. 6 cm
C. 8 cm
D. 12 cm

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25. Diagra

Rajah (i), (ii) dan (iii) menunjukkan tiub rerambut yang sama dalam tiga orientasi yang berbeza.

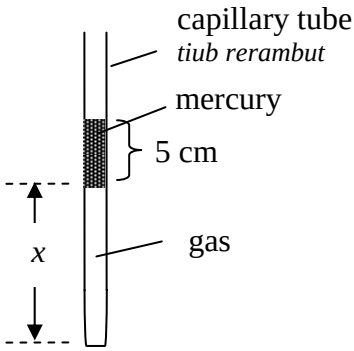

Diagram (i)
Rajah (i)

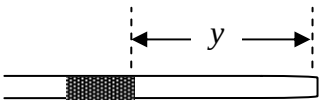

Diagram (ii)
Rajah (ii)

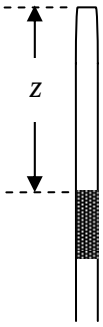

Diagram (iii)
Rajah (iii)

Which of the following is true about the length of the gas column?
Antara berikut, yang manakah benar tentang panjang turus gas itu?

A. $x = y = z$
B. $x < y = z$
C. $x > y > z$
D. $x < y < z$

26. Two bodies P and Q are in thermal contact. The temperature of P is higher.
Which of the following is true about P and Q?
Dua jasad P *and* Q *adalah dalam sentuhan terma. Suhu* P *adalah lebih tinggi.*
Antara berikut, yang manakah benar tentang P *dan* Q*?*

A. Heat flows only from P to Q
Haba mengalir dari P *ke* Q *sahaja*
B. Heat flows only from Q to P
Haba mengalir dari Q *ke* P *sahaja*
C. Rate of heat flow from P to Q is greater than that from Q to P
Kadar aliran haba dari P *ke* Q *lebih daripada haba dari* Q *ke* P

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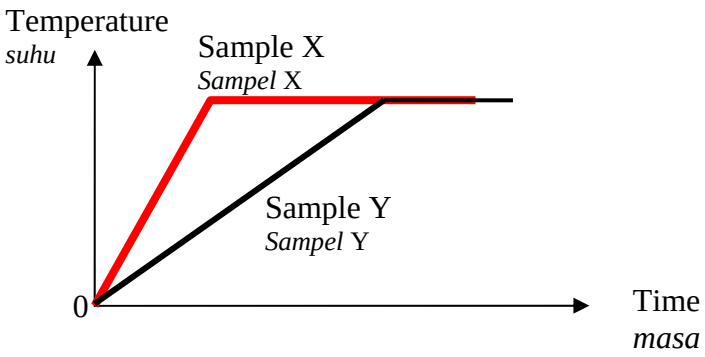
27. The diagram shows the temperature against time graphs of two samples of substances heated at the same rate.
Rajah menunjukkan graf suhu melawan masa bagi dua sampel bahan yang dipanaskan dengan kadar yang sama.



The conclusion that can be made is
Kesimpulan yang boleh dibuat ialah

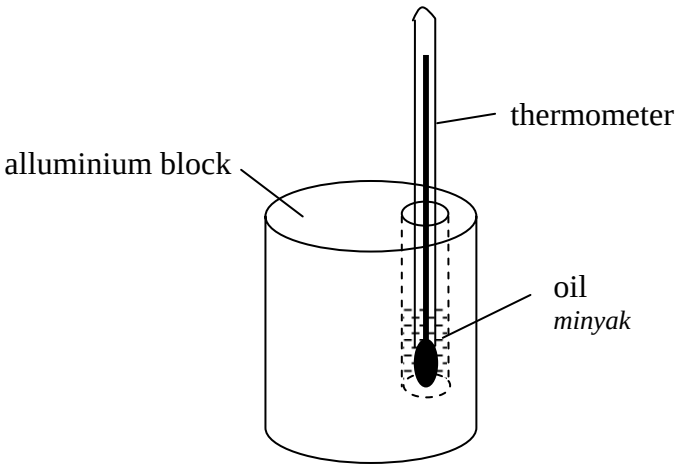
A. X and Y are of the same material and the mass of sample Y is greater than the mass of sample X
X *dan* Y *adalah bahan yang sama dan jisim sampel* Y *lebih daripada jisim sampel* X.

B. X and Y are of the same material and the mass of sample Y is less than the mass of sample X
X *dan* Y *adalah bahan yang sama dan jisim sampel* Y *kurang daripada jisim sampel* X.

C. X and Y are of the different material and the mass of sample Y is greater than the mass of sample X
X *dan* Y *adalah bahan yang berlainan dan jisim sampel* Y *lebih daripada jisim sampel* X.

D. X and Y are of the different material and the mass of sample Y is less than the mass of sample X
X *dan* Y *adalah bahan yang berlainan dan jisim sampel* Y *kurang daripada jisim sampel* X

28. When measuring the temperature of an aluminium block, a little oil is added into the hole which holds the thermometer.
Apabila mengukur suhu satu bongkah aluminium, sedikit minyak dimasukkan ke dalam lubang yang menampung termometer itu.



The use of the oil is

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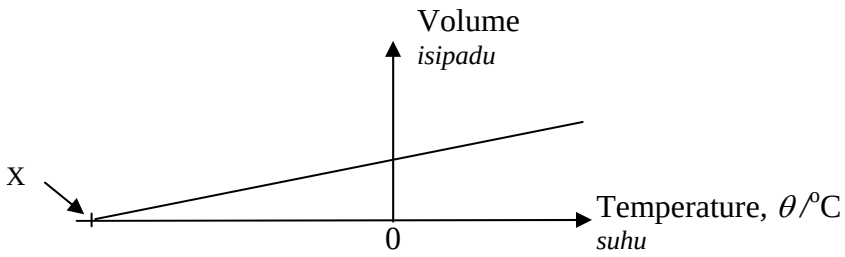
A. to prevent rust
untuk mengelakkan karat
B. to lubricate the hole
untuk melicinkan lubang itu
C. to provide better thermal contact
untuk sentuhan terma yang baik
D. to insulate the thermometer
untuk menebatkan termometer itu

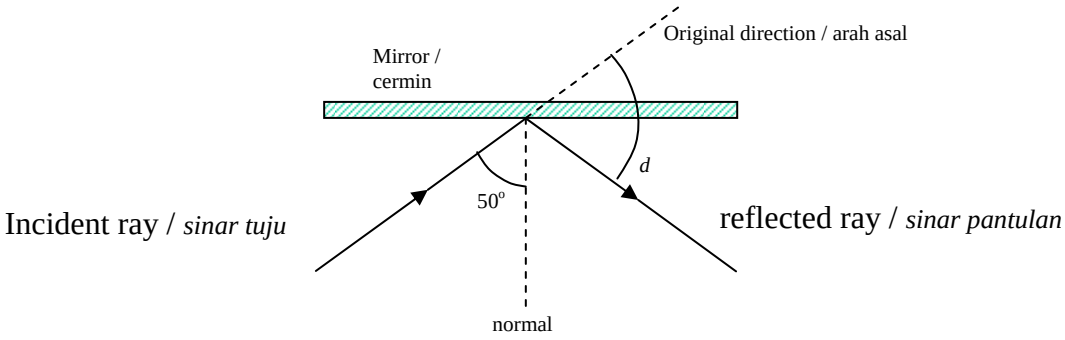
29. The graph shows the result of an experiment to investigate how volume varies with temperature for a fixed mass of gas at constant pressure.
Graf menunjukkan keputusan suatu eksperimen untuk mengkaji bagaimana isipadu berubah dengan suhu bagi satu gas berjisim tetap pada tekanan tetap.



What is the name given to the temperature at point X?
Apakah nama yang diberi kepada suhu pada titik X?

A. Zero temperature / *suhu sifar*
B. Absolute zero / *suhu sifar mutlak*
C. Thermodynamic temperature / *suhu termodinamik*
D. Zero volume temperature / *suhu pada isipadu sifar*

30.



In the ray diagram shown above, what is the angle of deviation, *d*?
Dalam rajah sinar di atas, berapakah sudut sisihan, d?

A. 40°
B. 50°
C. 60°
D. 80°

31. What phenomenon of light is used by a magnifying glass to concentrate sunlight onto the tip of a match to ignite it?

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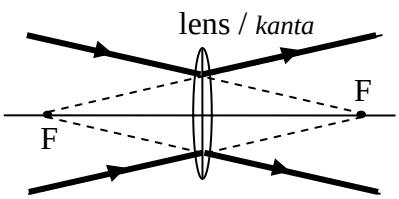
Apakah ...
sebatang

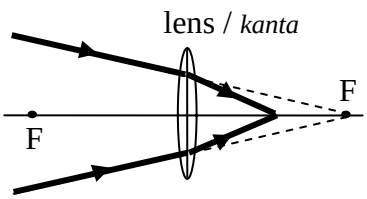
A. Refraction / *pembiasan*
B. Reflection / *pantulan*
C. Interference / *interferens*
D. Diffraction / *belauan*

32. Which of the following ray diagrams is correct?
Antara rajah sinar berikut, yang manakah betul?

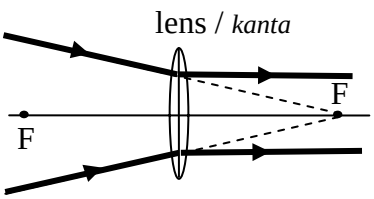
A.



B.



C.



33. The final image formed by an astronomical telescope in normal adjustment is always
Imej terakhir yang dibentukkan oleh satu teleskop astronomi dalam penyelerasan normal adalah sentiasa

A. real, inverted and magnified
nyata, songsang dan dibesarkan
B. virtual, inverted and diminished
maya, songsang dan dikecilkan
C. virtual, inverted and magnified
maya, songsang dan dibesarkan
D. real, upright and magnified
nyata, tegak dan dibesarkan

34. The following table shows the characteristics of the image formed by a concave mirror for various object distances. All symbols used have the usual meaning. Which of the following is **false?**
*Jadual berikut menunjukkan ciri-ciri imej yang dibentukkan oleh suatu cermin cekung bagi kedudukan objek yang berlainan. Semua simbol-simbol yang digunakan mempunyai maksud yang biasa. Antaranya, yang manakah **tidak** benar?*

Position of object ***Kedudukan objek***	**Characteristics of image** ***Ciri-ciri imej***
$u > 2f$	Diminished, inverted, virtual *Dikecilkan, songsang, maya*
$f < u < 2f$	Magnified, inverted, real *Dibesarkan, songsang, nyata*
$u = f$	Same size, inverted, real *Sama saiz, songsang, nyata*
$u < f$	Magnified, upright, virtual *Dibesarkan, tegak, maya*

35. In the following diagram, the frequency of the circular waves generated is 5 Hz.
Dalam rajah berikut, frequency gelombang bulat yang dijanakan ialah 5 Hz.

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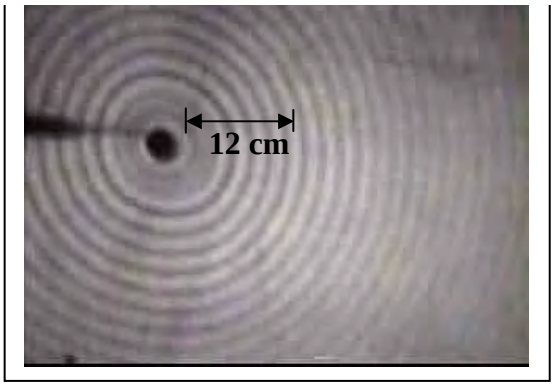
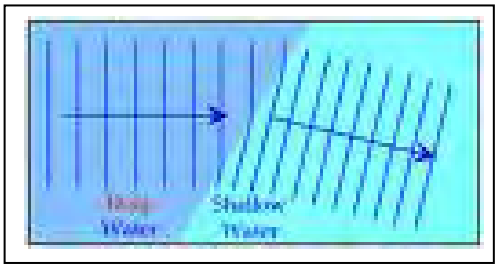
What is
Berapakah laju gelombang itu?



A. 2.5 cm s^{-1}
B. 5.0 cm s^{-1}
C. 10 cm s^{-1}
D. 15 cm s^{-1}

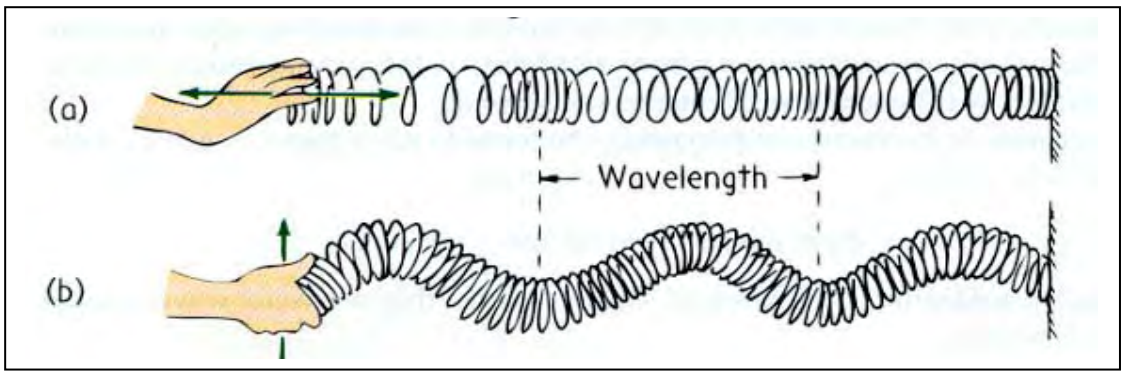
36.

The wave phenomenon shown on the right is
Fenomena gelombang yang ditunjukkan di sebelah kanan ialah



A. Refraction / *pembiasan*
B. Reflection / *pantulan*
C. Diffraction / *belauan*
D. Interference / *interferens*

37.



Which is true about the diagrams (a) and (b)?
Yang manakah benar tentang rajah (a) *dan* (b)?

A. (a) is transverse wave, (b) is longitudinal wave and both are non-mechanical waves
(a) *ialah gelombang melintang,* (b) *ialah membujur dan kedua-kedua bukan gelombang mekanikal*
B. (a) is transverse wave, (b) is longitudinal wave and both are mechanical waves
(a) *ialah gelombang melintang,* (b) *ialah membujur dan kedua-kedua adalah gelombang mekanikal*
C. (a) is longitudinal wave, (b) is transverse wave and both are non-mechanical waves
(a) *ialah gelombang membujur,* (b) *ialah melintang dan kedua-kedua bukan gelombang mekanikal*
D. (a) is longitudinal wave, (b) is transverse wave and both are mechanical waves
(a) *ialah gelombang membujur,* (b) *ialah melintang dan kedua-kedua adalah gelombang mekanikal*

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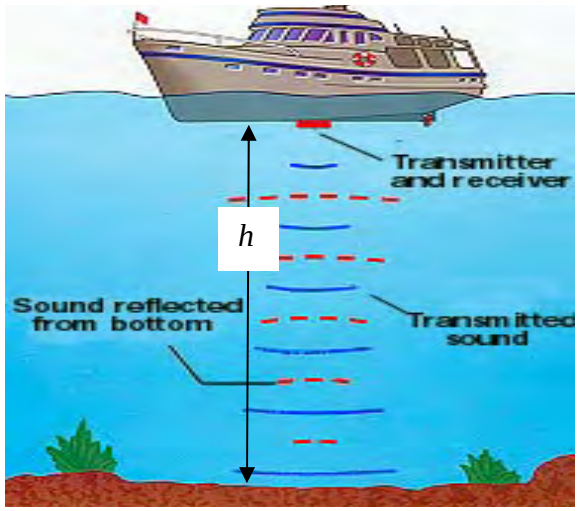
38.

Ultra sound of frequency 25,000 Hz and having a wavelength of 4.8×10^{-2} m is used to determine the depth of the sea. If the time taken for the ultra sound to be transmitted and then received again is 0.4 s, what is the depth, *h* of the sea?

Bunyi ultra sonik dengan frekuensi 25,000 Hz dan mempunyai panjang gelombang of 4.8×10^{-2} m digunakan untuk menentukan kedalaman laut. Jika masa untuk bunyi itu dipancar dan kemudian diterima semula ialah 0.4 s, berapakah kedalaman, h air laut itu?



A. 25 m
B. 240 m
C. 480 m
D. 2500 m

39. The potential difference across a filament of 5Ω is 10 V. How much electric charge flows across the filament in 8 s?

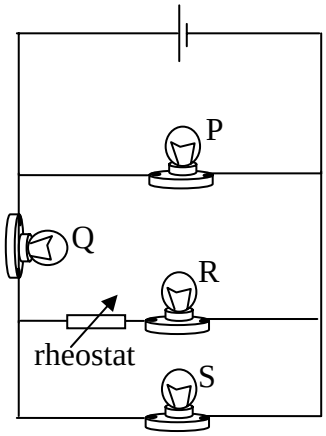
Beza keupayaan merentasi satu filamen berintangan 5Ω ialah 10 V. Berapakah cas elektrik yang mengalir melalui filament itu dalam 8 s?

A. 50 C
B. 100 C
C. 160 C
D. 320 C

40.

Which of the following is true about the brightness of the lamps P, Q, R and S when the resistance of the rheostat is changed? (neglect internal resistance of cell).

Yang manakah benar tentang kecerahan lampu-lampu P, Q, R dan S apabila rintangan reostat itu diubah? (abaikan rintangan dalam sel itu)



	Brightness unchanged *Kecerahan tidak berubah*	Brightness changed *Kecerahan berubah*
A.	P	Q, R and S
B.	P and R	Q and S
C.	P, Q, and S	R
D.	-	P, Q, R and S

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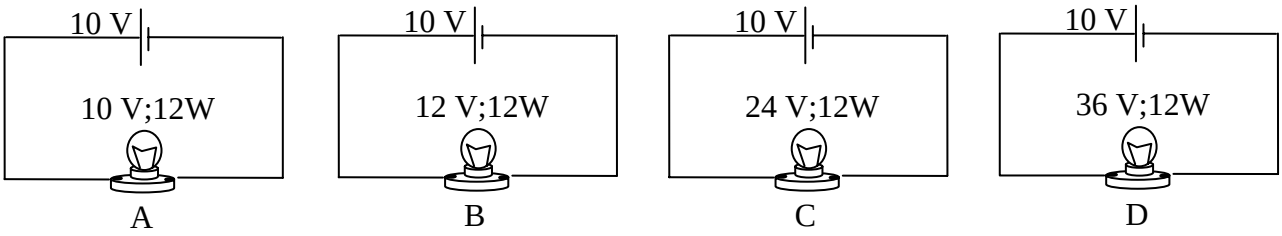
41. In the f

Dalam litar-litar berikut, yang mana satu lampu menggunakan kuasa yang paling tinggi?



42. Which of the following equations gives the definition of resistivity, ρ of a material? (all symbols have the usual meaning).

Antara persamaan berikut, yang manakah memberi takrifan bagi kerintangan, ρ suatu bahan?(semua simbol mempunyai maksud yang biasa)

A. $\rho = \dfrac{Rl}{A}$

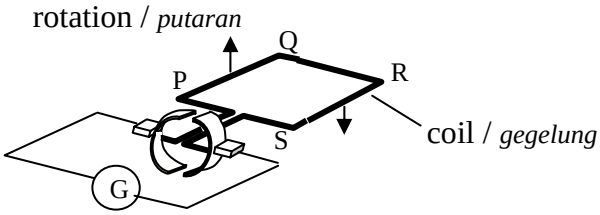
B. $\rho = \dfrac{RA}{l}$

C. $\rho = \dfrac{Al}{R}$

D. $\rho = RAl$

43. The diagram shows a simple generator placed in a uniform magnetic field (not shown).

Rajah menunjukkan satu penjana ringkas yang terletak dalam suatu medan magnet seragam.



The direction of the induced current in the coil is $P \rightarrow Q \rightarrow R \rightarrow S$.
What is the direction of the magnetic field?

Arah arus aruhan dalam gegelung ialah $P \rightarrow Q \rightarrow R \rightarrow S$.
Yang manakah arah medan magnet itu?

A. downwards / *ke bawah*
B. upwards / *ke atas*
C. left to right / *kiri ke kanan*
D. right to left / *kanan ke kiri*

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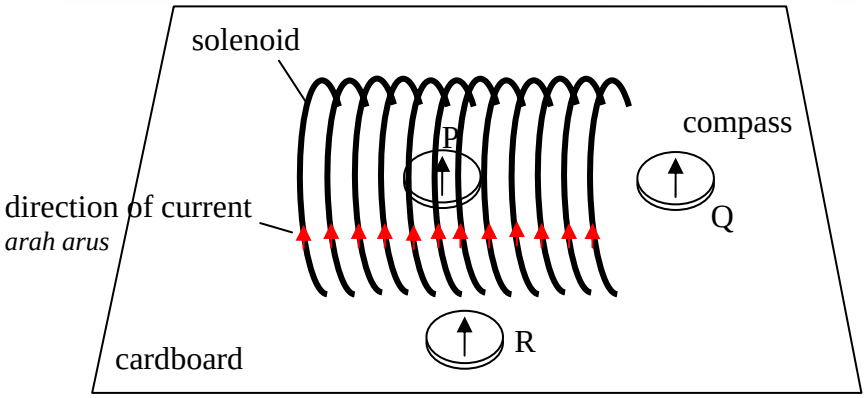
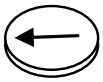
44.



Which of the following correctly shows the directions of the compass needles when the electric current flows as shown?

Antara berikut, yang manakah menunjukkan dengan betul arah jarum kompas apabila arus elektrik mengalir seperti ditunjukkan?

	Compass P	Compass Q	Compass R
A			
B			
C			
D			

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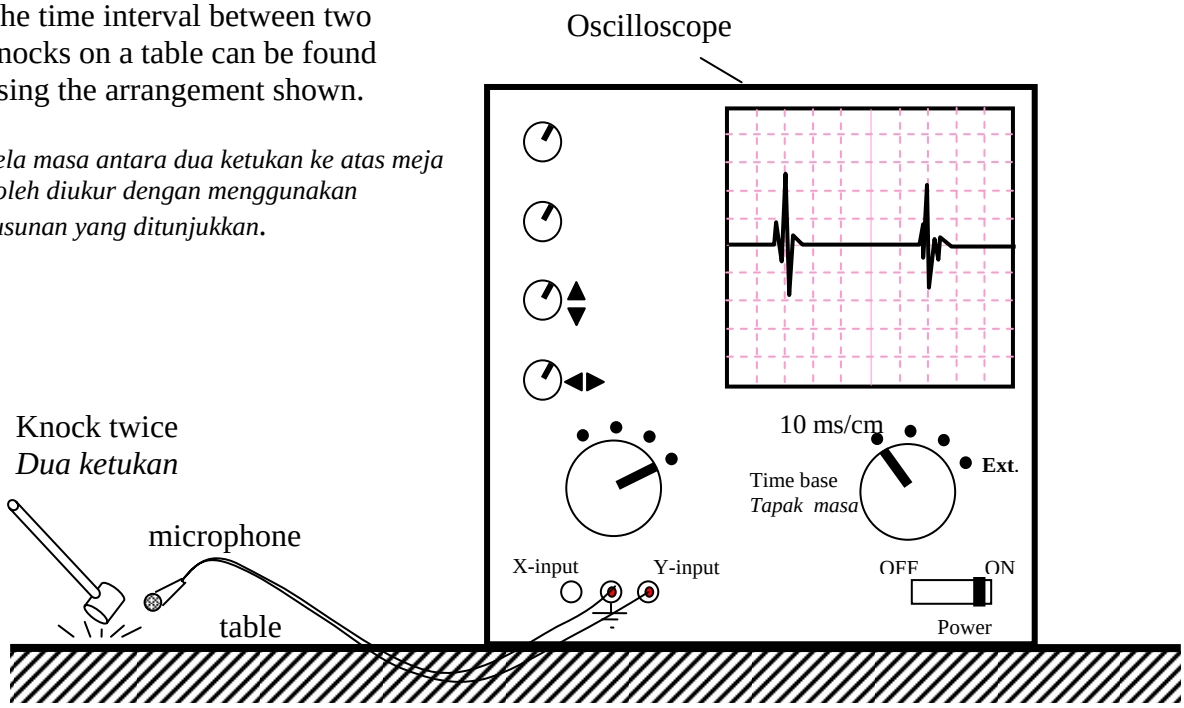
45.

The time interval between two knocks on a table can be found using the arrangement shown.

Sela masa antara dua ketukan ke atas meja boleh diukur dengan menggunakan susunan yang ditunjukkan.

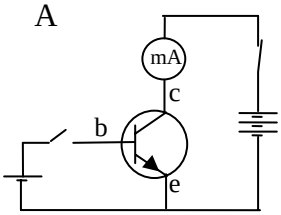


What is the time interval between the two knocks?
Berapakah sela masa antara dua ketukan itu?

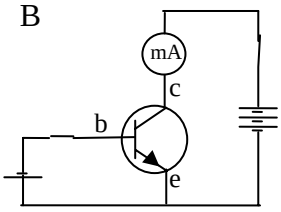
A. 5 ms
B. 10 ms
C. 50 ms
D. 100 ms

46. In which of the following circuits will the miliammeter show a **non-zero** reading?
*Dalam litar-litar berikut, yang mana satu miliammeter akan menunjukkan bacaan **bukan sifar**?*

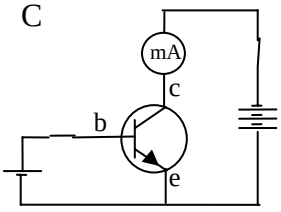
A



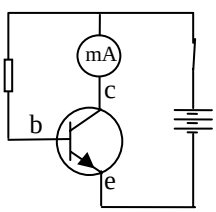
B



C



D



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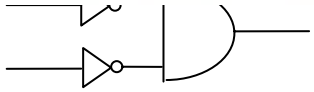
47.



Which of the following logic gates is equivalent to the one shown above?
Antara get-get berikut, yang manakah setara dengan get yang ditunjukkan di atas?

A B C D

48. Which type of radioactive radiation has high penetrating power and is not deflected by magnetic field or electric field?
Yang manakah jenis pancaran yang mempunyai kuasa penembusan tinggi dan tidak dipesong oleh medan magnet atau medan elektrik?

A. Alpha
Alfa
B. Beta
Beta
C. Gamma
Gama

49. The decay of a Uranium nucleus is represented by the following equation.
Reputan satu nukleus Uranium diwakili oleh persamaan berikut.

$$^{238}_{92}U \rightarrow ^{234}_{90}Th + X$$

What is X?
Apakah X?

A. $^{1}_{1}H$

B. $^{2}_{1}D$

C. $^{3}_{1}T$

D. $^{3}_{2}He$

E. $^{4}_{2}He$

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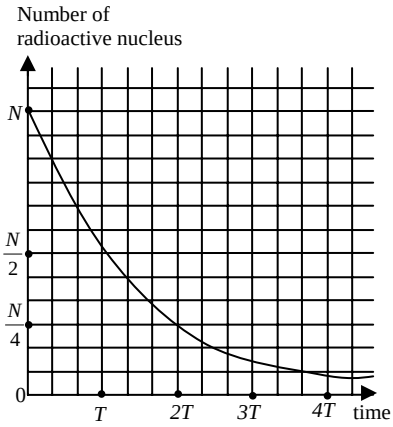
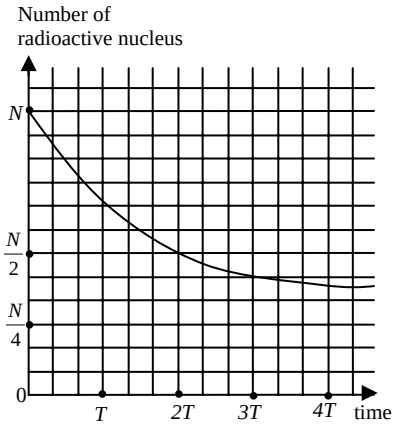
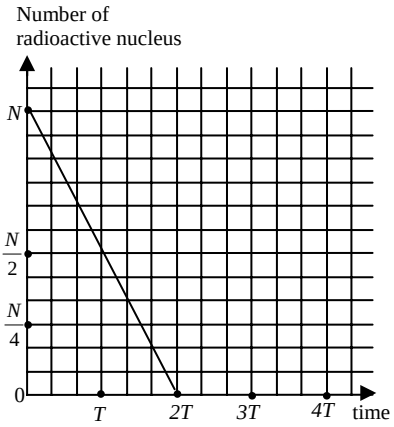
50. Which of the following graphs correctly shows how the number of radioactive nucleus in a radioactive sample changes with time?
Antara graf-graf berikut, yang manakah menunjukkan dengan betul bagaimana bilangan nucleus radioactif dalam satu sampel radioaktif berubah dengan masa?



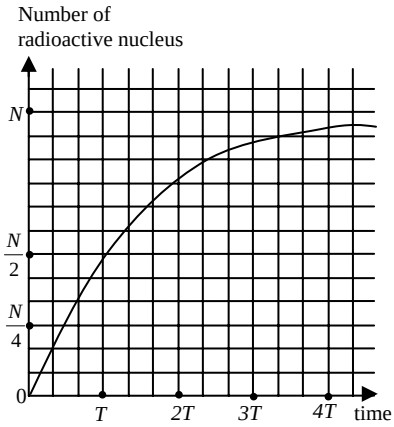
A



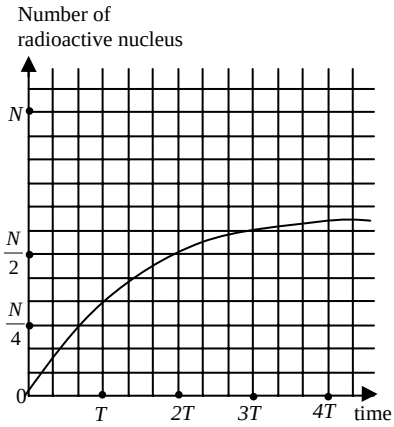
B



C



D



E

END OF QUESTION PAPER

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PRAKTIS BESTARI

PHYSICS

Paper 2
Section A / *Bahagian A*

NO.	MARKING CRITERIA / KRITERIA PEMARKAHAN	MARK SUB	MARK TOTAL
1a. (i)	External jaw / outside jaw *Rahang luar*	1	
(ii)	0.01 cm	1	
b.	3.04 – (-0.03) = 3.07 cm	1 1	**4**
2a.	Constant acceleration *Pecutan malar*	1	
b.	8 second / 8 s 8 *saat* / 8 s	1	
c.	$S_1 = \frac{16+8}{2} \times 25$ $S_2 = -\frac{1}{2}(12 \times 25)$ ✓1 $S = \left(\frac{16+8}{2} \times 25\right) - \frac{1}{2}(12 \times 25)$ ✓2 = 150 m ✓3	3	**5**
3a.	Refraction *Pembiasan*	1	
b.	Because the change of speed of wave *Kerana perubahan kelajuan gelombang*	1	
c.	v = 5 × 3 ✓1 = 15 cm s^{-1} / 0.15 m s^{-1} ✓2	2	
d. (i)	Decrease *Berkurang*	1	
(ii)	Speed of wave is directly proportional to its wavelength *Kelajuan gelombang adalah berkadar langsung kepada panjang gelombangnya*	1	**6**

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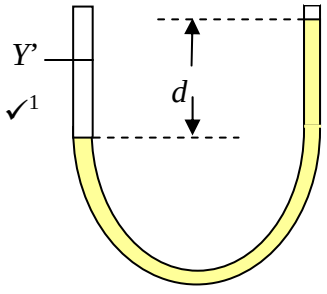
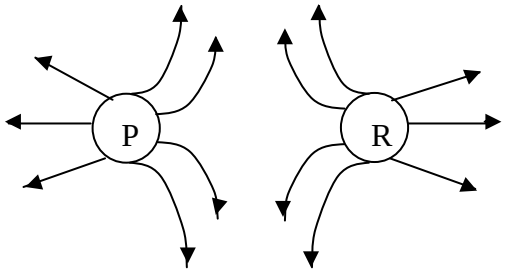
NO.	MARKING CRITERIA / KRITERIA PEMARKAHAN	SUB	TOTAL
4a.	Manometer	1	
b.	d = 8 cm ✓1 Pressure, P = 76 + 8 ✓2 = 84 cm Hg / 114 240 Pa / 114 kPa ✓3	3	
c. (i)		1	
(ii)	*d* decrease / shorter *d berkurang / lebih pendek*	1	
(iii)	Gas pressure in the cylinder decrease *Tekanan gas dalam silinder berkurang*	1	**7**
5a.	Electric current is the rate of charge flow in a circuit *Arus elektrik ialah kadar pengaliran cas dalam litar*	1	
b.		1	
c.	Dislike charged will attract each other *Cas berlainan akan menarik satu sama lain*	1	
d.	 shape ✓1 arrow ✓2	2	
e.	More electric field lines will be observed *Lebih garis medan elektrik akan diperhatikan*	1	
f.	$t = \frac{6.0\times10^{3}}{1.5\times10^{-1}}$ $= 4.0 \times 10^{4}$ s	1 1	**8**

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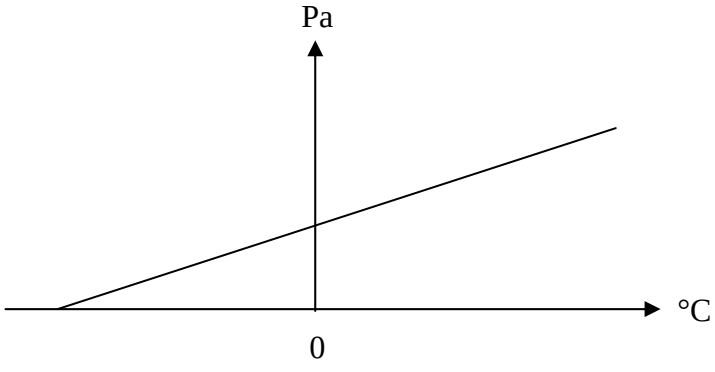
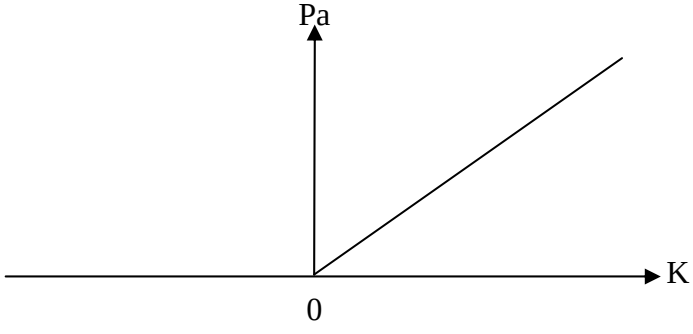
NO.	MARKING CRITERIA / KRITERIA PEMARKAHAN	SUB	TOTAL
6a.	An instrument for measuring gas pressure *Alat yang digunakan untuk mengukur tekanan gas*	1	
b.		1	
		1	
c.	27 °C = 300 K ; 57 °C = 330 K ✓1 $P = \frac{120 \times 330}{300}$ ✓2 = 132 Pa ✓3	3	
d.	Pressure Law *Hukum Tekanan*	1	
e.	The mass of gas in the flask is less / not constant *Jisim gas dalam flask berkurang / tidak malar*	1	**8**

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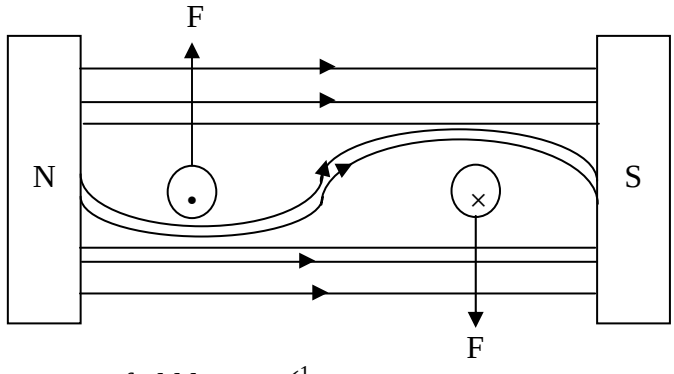
NO.	MARKING CRITERIA / KRITERIA PEMARKAHAN	SUB	TOTAL
7a.	✓ Direct current / *arus terus*	1	
b.	So that the pointer will only moves to one direction only *Supaya jarum hanya bergerak ke satu arah sahaja*	1	
c. (i)	 Magnetic field lines ✓1 Arrow ✓2 A pair of opposite direction forces ✓3	3	
(ii)	Catapult force *Daya kilas / Daya medan lastik*	1	
(iii)	Fleming's left hand rule *Peraturan tangan kiri Fleming*	1	
(iv)	Inverse both the direction of current ✓1 *Songsangkan arah kedua-dua arus* Exchange the position of permanent magnets ✓2 *Saling tukar tempat magnet kekal*	2	
d.	Increase the current / use stronger magnet *Menambah arus / guna magnet yang lebih kuat*	1	**10**

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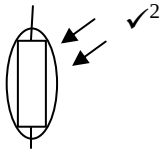
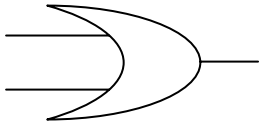
NO.	MARKING CRITERIA / KRITERIA PEMARKAHAN	SUB	TOTAL
8a.	Logic gate is the decision maker in electronic system; ✓1 with many inputs but only one output. ✓2 *Get logik ialah penentu dalam sistem elektronik* ✓1 *dengan beberapa input tetapi hanya satu output* ✓2	2	
b.	<table><tr><th>Input A</th><th>Input B</th><th>Output X</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td></td></tr><tr><td>1</td><td>0</td><td></td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>Four rows all correct ✓1✓2✓3 Three or two rows correct ✓1✓2 One row only correct ✓1	3	
c.(i)	C  ✓1 D  ✓2	2	
(ii)	E  ✓1	1	
d.(i)	Relay switch *Suis geganti*	1	
(ii)	A small current from logic gate circuit can control a large current in the air conditioner circuit *Satu arus yang kecil daripada litar get logik boleh mengawal satu arus yang besar dalam litar alat hawa dingin*	1	
e.	$I = \frac{1500}{240}$ ✓1 $= 6.25$ A ✓2	2	**12**

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SECTION B

9 (a)	Rate of change of momentum *Kadar perubahan momentum.*	1
9 (b)	A student bends his knees to increase the landing time *Seorang pelajar membengkokkan lututnya untuk memanjangkan masa pendaratan.* A softball pull his hand backward to increase the stopping time *Seorang pemain sofbol menarik tangannya ke belakang untuk menambahkan masa berhenti bola* Time taken is increased to stop the motions *Masa yang diambil dipanjangkan untuk menghentikan pergerakan.* From formula F *(Daripada formula F)* = $\frac{mv-mu}{t}$ When time taken (t) is increase, impulsive force (F) is reduce *Apabila masa yang diambil bertambah, daya impuls berkurang*	1 2 3 4 5
9 (c)	<table><tr><th>Characteristics *Ciri-ciri*</th><th>Explanation *Penerangan*</th></tr><tr><td>Safety belt</td><td>When the car decelerates suddenly, the passenger will be thrown forward due to his inertia. *Apabila kereta diberhentikan secara mengejut, penumpang akan terhumban ke hadapan disebabkan oleh inersianya.* Safety belt will hold the passenger back to his seat. *Tali pinggang keledar mengekalkan penumpang pada kedudukannya.*</td></tr><tr><td>Air bags</td><td>Provide a cushion absorbing impact. *Sebagai kusyen penyerap hentakan.* Prevent the passenger from hitting the steering wheel or windscreen. *Mengelakkan penumpang daripada terhentak pada stereng atau cermin hadapan.*</td></tr><tr><td>Shatter-proof windscreen</td><td>Will not break into small pieces upon impact. *Cermin hadapan tidak akan pecah berselerak ketika hentakan berlaku.* Reducing the risk of passengers being cut by the glass. *Mengurangkan risiko penumpang terkena kaca.*</td></tr></table>	1,2 3,4 5,6

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9 (d)(i)	The front and back of the car are made from soft metal	Easily collapse upon impact *Senang remuk apabila berlaku hentakan.* Lengthen the stopping time and reduce the impulsive force during collision *Memanjangkan masa perlanggaran dan mengurangkan daya impuls semasa perlanggaran berlaku.*	7,8
	The central portion consists of strong reinforced steel	Prevents the passenger chambers from collapsing easily *Mengelakkan ruang penumpang daripada remuk* Prevent the passenger from direct impact of the external force *Melindungi penumpang daripada terkena kesan hentakan*	9,10
9 (d)(ii)	Ft = mv- mu = 1 500 (0) – 1 500(10) = - 15 000 Ns F = $\frac{(mv - mu)}{t}$ = $\frac{1\,500\,(0) - 1500\,(10)}{2}$ = 7 500 N		1 2 1 2
		TOTAL MARK	**20**

10. (a)	Radioactive decay is the process in which an unstable nucleus to become stable nucleus by emitting the radioactive radiation and release the energy. *Proses pereputan nukleus yang tidak stabil untuk menjadi nukleus yang lebih stabil dengan memancarkan sinaran radioaktif dan membebaskan tenaga.*	1
10. (b)	The shape of the graph is exponential / curvely *Graf berbentuk eksponen/melengkung* Activity decreases with time *Keaktifan berkurang dengan masa* Activity become to be half in constant time interval *Keaktifan menjadi separuh dalam sela masa yang sama* Physics concept: Half life *Konsep fizik yang berkaitan: Separuh hayat* Time taken of activity become half from the initial activity. *Masa yang diambil untuk keaktifan menjadi separuh daripada keaktifan asal.*	1 2 3 4 5
10. (c) (i)	= (236.05 – 235.85)u.j.a = 0.2 u.j.a	

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	= 3.32 X 10^{-28} kg	2
10. (c) (ii)	E= mc^2 = 3.32 X 10^{-28} $(3X10^8)^2$ = 2.988X10^{-11} J	1 2

10. (d)

Characteristics *Ciri-ciri*	Explanation *Penerangan*
The thicker concrete wall *Dinding perisai plumbum yang tebal*	To avoid radioactive radiation released out *Sinar radioaktif tidak terbebas keluar*
Using remote control / robot to handle the radioactive substance *Menggunakan alat kawalan jauh / robot untuk menguruskan bahan radioaktif*	To prevent radioactive radiation expose continuously *Mengelakkan sinaran radioaktif terdedah secara berterusan*
Wear a film badge *Memakai lencana filem*	To detect the rate of exposure of radioactive radiation *Mengesan tahap dedahan sinaran radioaktif*
Use a special tank to store the radioactive waste *Menyediakan tempat menyimpan sisa radioaktif.*	Cannot pollute the environmental *Tidak mencemar alam sekitar*
Use an alarm / siren *Alat amaran kebocoran / siren*	As a reminder when the radioactive radiation leakage *Memberi amaran bila berlaku kebocoran sinaran radioaktif*
Wear a special safety clothes *Memakai pakaian pelindung khas*	To prevent the body expose directly to radioactive radiation *Mengelak badan daripada pendedahan sinaran radioaktif secara terus.*
Place a radioactive symbol at the radioactive room *Memasang pelekat simbol bahan radioaktif di luar bilik simpanan bahan radioaktif*	As a sign radioactive material stored inside that room. *Memberitahu / amaran kepada orang ramai bahawa terdapat bahan radioaktif tersimpan di dalam bilik tersebut.*

	TOTAL MARK	**20**

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<table>
<tr><th>SECTION C</th><th>Answer</th><th>Mark</th></tr>
<tr><td>11.(a)(i)</td><td>Distance between the optical centre and focal point.
Jarak di antara pusat optik dengan titik fokus</td><td>1</td></tr>
<tr><td>11.(a)(ii)</td><td>Arrange the lens and screen in parallel / diagram
Susun kanta dan skrin secara selari / rajah
Face the lens toward a distant object.
Halakan kanta kepada objek jauh
Adjust the screen until a sharp image is formed on the screen.
Laraskan skrin sehingga imej tajam terbentuk di atas skrin
Measure the distance between screen and optical centre.
Ukur jarak antara skrin dengan pusat kanta</td><td>1
2
3
4</td></tr>
<tr><td>11. (b)</td><td>
<table>
<tr><th>Characteristics
Ciri-ciri</th><th>Explanation
Penerangan</th></tr>
<tr><td>Focal length of object lens greater than focal length of eye lens.
Panjang fokus kanta objek lebih besar lebih besar daripada panjang fokus kanta mata.</td><td>Magnification power become higher
Supaya kuasa pembesaran tinggi</td></tr>
<tr><td>Object lens with big diameter
Diameter kanta objek yang besar</td><td>Can receive more light
Untuk menerima lebih banyak cahaya</td></tr>
<tr><td>Eye lens with small diameter
Diameter kanta mata kecil</td><td>Suitable for size of the eye to look the object
Sesuai dengan saiz mata untuk melihat objek</td></tr>
<tr><td>Distance between the two lenses = $f_0 + f_m$
Jarak antara dua kanta
= $f_0 + f_m$</td><td>Final image formed at infinity
Supaya imej akhir terbentuk di infiniti</td></tr>
</table>
Choose : Q
Pilih : Q

Reason : Focal length of object lens greater than focal length of eye lens, bigger diameter of the object lens, smaller diameter of eye lens and distance between two lens = $f_0 + f_m$</td><td>1,2
3,4
5,6
7,8
9
10</td></tr>
</table>

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	panjang fokus kanta mata, diameter kanta objek yang besar, diameter kanta mata kecil dan jarak antara dua kanta $= f_0 + f_m$	
11. (c) (i)	f = 20 cm v = 60 cm $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ $\frac{1}{20} = \frac{1}{u} + \frac{1}{60}$ u = 30 cm	1 2 3
11. (c) (ii)	m $= \frac{v}{u}$ $= \frac{60}{30}$ $= 2$	1 2
	TOTAL MARK	**20**

12. (a) (i)	If the voltage supplied is 12V, the power generated is 24W *Jika voltan yang dibekalkan 12 V kuasa yang dijana 24W*	1
12. (a)(ii)	To give out more heat energy *Untuk memberikan lebih banyak tenaga haba*	1
12. (a) (iii)	1. Length of conductor *Panjang konduktor* 2. Cross sectional area *Luas keratan rentas* 3. R is directly proportional to length, l *R berkadar terus dengan panjang,l* 4. R is inversely proportional to cross sectional area, A *R berkadar songsang dengan luas keratin rentas,A*	1 2 3 4
12. (b) (i)	$R_E = 4 + \frac{(4x4)}{4+4}$ $= 4 + 2$ $= 6\ \Omega$	1
12. (b) (ii)	V = IR = 2 x 4 = 8 V	1 2
12. (b) (iii)	$I = \frac{12}{6} = 2A$	1
	Characteristics *Ciri-ciri*: Connection to earth *Disambungkan ke bumi* Explanation *Penerangan*: To flows the excess / overload current to earth if the is short circuit *Untuk mengalirkan lebihan arus ke bumi untuk mengelakkan berlakunya litar pintas*	1,2

	coil is nichrome *Bahan gegelung pemanas ialah nikrom*	*Untuk menghasilkan tenaga haba yang tinggi*	
	High number of loop *Bilangan lilitan gegelung banyak*	To increase surface area so that more heat is released *Untuk menambahkan luas permukaan, maka lebih banyak haba dibebaskan*	5,6 7,8
	High power *Kuasa tinggi*	To produce more heat energy in the coil *Untuk menghasilkan lebih banyak tenaga haba dalam gegelung*	
	Choose : R *Pilih: R*		9
	Reason : because if is connected to earth, material is nichrome, high number of loop, and has high power. *Sebab: .kerana disambungkan ke bumi, bahan gegelung pemanas ialah nikrom, bilangan lilitan gegelung banyak dan kuasa tinggi.*		10
	TOTAL MARK		**20**

END OF MARKING SCHEME

Nama: .....

Physics
Kertas 2
2008
2 ½ jam

PSPN PAHANG
JPN PAHANG
YAYASAN PAHANG

PROGRAM JAWAB UNTUK JAYA 2008

PRAKTIS BESTARI

PHYSICS

Paper 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini mengandungi tiga bahagian:* **Bahagian A**, **Bahagian B** *dan* **Bahagian C**.
2. *Jawab* **semua** *soalan dalam* **Bahagian A**, **satu** *soalan daripada* **Bahagian B** *dan* **satu** *soalan daripada* **Bahagian C**.
3. *Jawapan kepada ketiga-tiga bahagian ini hendaklah diserahkan bersama-sama.*
4. *Jawapan kepada* **Bahagian A** *hendaklah ditulis dalam ruang yang disediakan dalam kertas soalan.*
5. *Jawapan kepada* **Bahagian B** *dan* **Bahagian C** *hendaklah ditulis pada ruang jawapan yang disediakan dalam kertas soalan ini. Dalam jawapan anda, persamaan, gambarajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda boleh digunakan.*
6. *Rajah tidak dilukis mengikut skala kecuali dinyatakan.*
7. *Markah maksimum yang diperuntukkan ditunjukkan dalam kurungan pada hujung tiap-tiap soalan atau bahagian soalan.*
8. *Penggunaan kalkulator saintifik yang tidak boleh diprogramkan adalah dibenarkan.*

Untuk Kegunaan Pemeriksa			
Bahagian	Soalan	Markah Penuh	Markah
A	1	4	
	2	5	
	3	6	
	4	7	
	5	8	
	6	8	
	7	10	
	8	12	
B	9	20	
	10	20	
C	11	20	
	12	20	
Jumlah			

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The followi

1. $a = \frac{v-u}{t}$
2. $v^2 = u^2 + 2as$
3. $s = ut + \frac{1}{2}at^2$
4. Momentum $= mv$
5. $F = ma$
6. Kinetic energy $= \frac{1}{2}mv^2$
7. Potential energy $= mgh$
8. Elastic potential energy $= \frac{1}{2}Fx$
9. $\rho = \frac{m}{V}$
10. Pressure, $P = \frac{F}{A}$
11. Pressure, $P = h\rho g$
12. Heat, $Q = mc\theta$
13. $\frac{pV}{T} = \text{constant}$
14. $E = mc^2$
15. $v = f\lambda$
16. Power, $P = \frac{Energy}{time}$
17. $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$
18. $\lambda = \frac{ax}{D}$
19. $n = \frac{\sin i}{\sin r}$
20. $n = \frac{real\ depth}{apparent\ depth}$
21. $Q = It$
22. $V = IR$
25. Power, $P = IV$
26. $\frac{N_S}{N_P} = \frac{V_S}{V_P}$
25. Efficiency $= \frac{I_S V_S}{I_P V_P} \times 100\%$
26. $g = 10\ \text{m s}^{-2}$

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Bahagian A

[60 *marks*]
[60 *markah*]

Answer **all** *questions in this section.*
Jawab **semua** *soalan dalam bahagian ini.*

1. Diagram 1.1 shows a pair of vernier callipers which can be used to measure the external diameter and internal diameter of a test tube.

Rajah 1.1 menunjukkan sebuah angkup vernier yang boleh digunakan untuk mengukur diameter luar dan diameter dalam suatu tabung uji.

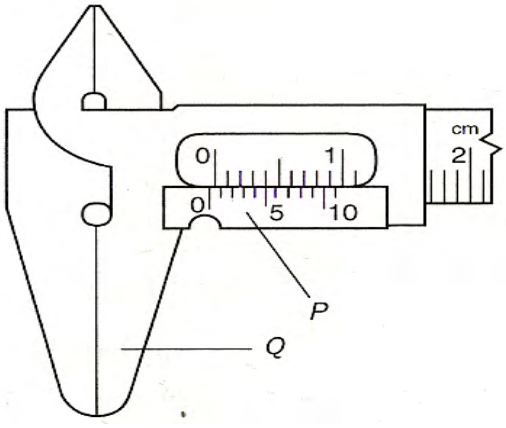

Diagram 1.1

(a) (i) Name the part labelled Q.
Namakan bahagian yang berlabel Q.

.....
[1 *mark*]

(ii) What is the smallest division on scale of P?
Apakah nilai satu bahagian terkecil pada skala P itu?

.....
[1 *mark*]

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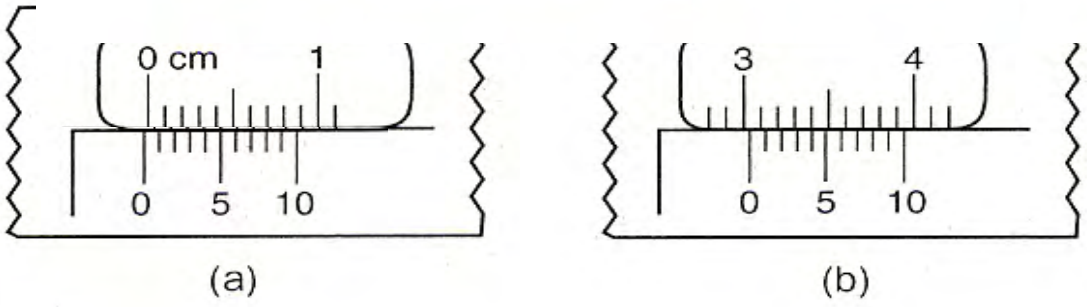

Diagram 1.2

(b) Diagram 1.2(a) shows the scale reading when part Q is closed. Diagram 1.2(b) shows the new position of the scale when the vernier callipers is used to measure external diameter of a test tube.

Rajah 1.2(a) menunjukkan skala semasa bahagian Q dirapatkan. Rajah 1.2(b) menunjukkan kedudukan baru skala angkup vernier semasa diameter luar suatu tabung uji diukur. Apakah diameter luar tabung uji itu?

[2 *marks*]

2. Diagram 2 shows a velocity-time graph for a car travels to east, and then travels backward after a while. To the east direction is considered as positive.

Rajah 2 menunjukkan satu graf halaju masa untuk sebuah kereta yang bergerak ke arah timur dan kemudian berpatah balik pada satu ketika. Arah ke timur dianggap sebagai positif.

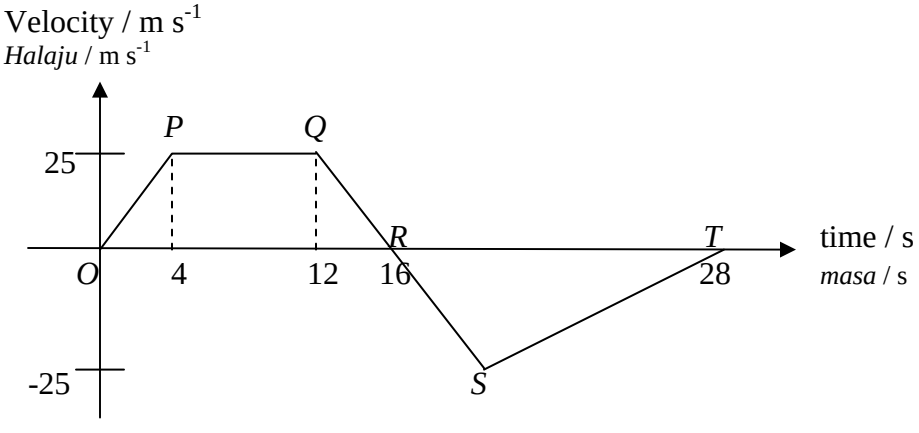

Diagram 2

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(a) What kind of motion of the car during the first four second?
Apakah jenis gerakan kereta pada empat saat pertama?

.....

[1 *mark*]

(b) How long the car travels with constant velocity?
Berapa lamakah kereta itu bergerak dengan halaju seragam?

.....

[1 *mark*]

(c) Refer to the graph, calculate the displacement of the car from *O* when it arrives *T*.
Merujuk kepada graf, hitungkan sesaran kereta daripada O apabila ia tiba di T.

[3 *marks*]

3. Diagram 3 shows the top view of incident water waves approaching a shallow area at centre of the diagram.

Rajah 3 *menunjukkan pandangan dari atas bagi suatu gelombang air yang menghala ke suatu kawasan cetek di tengah rajah*.

Diagram 3

(a) State the phenomenon observed.
Nyatakan fenomena yang diperhatikan.

……..……..

[1 *mark*]

(b) Why is this phenomenon occurs?
Mengapakah berlaku fenomena ini?

.....

[1 *mark*]

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(c) The frequency of the vibrating beam is 5 Hz, the wavelength of the waves in the deep area is 3 cm. Calculate the speed of waves in the deep area.

Frekuensi untuk pencelup satah ialah 5 Hz, *panjang gelombang semasa di kawasan dalam ialah* 3 cm. *Hitungkan kelajuan gelombang di kawasan dalam.*

[2 *marks*]

(d) The wavelength becomes shorter in the shallow area.
Panjang gelombang menjadi pendek di kawasan cetek.

(i) What will happen to the speed of waves in the shallow area?
Apakah yang akan berlaku kepada kelajuan gelombang di kawasan cetek?

.....
[1 *mark*]

(ii) Give a reason for your answer in 3(d)(i).
Beri sebab bagi jawapan anda di 3(d)(i).

.....
[1 *mark*]

4. Diagram 4 shows a U-tube connected to a cylinder of gas.
Rajah 4 *menunjukkan satu tiub-*U *yang disambungkan kepada satu silinder gas.*

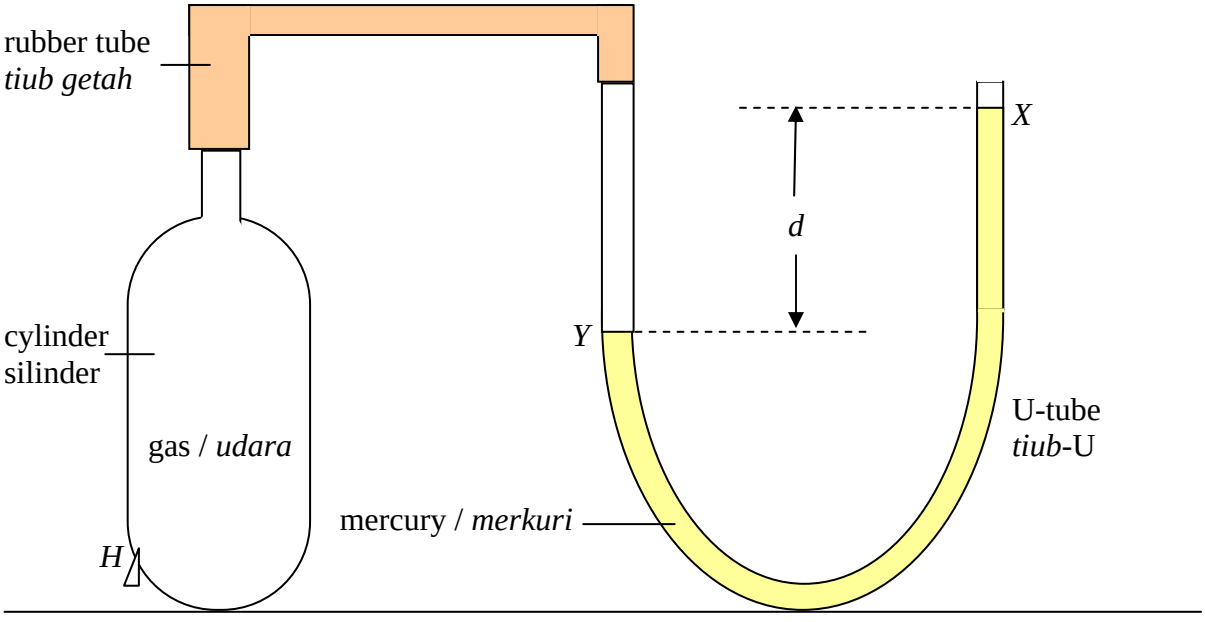

Diagram 4

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(a) Name the gas pressure instrument shown in Diagram 4.
Namakan alat pengukur tekanan gas yang ditunjukkan pada Rajah 4.

.....

[1 *mark*]

(b) Calculate the gas pressure in the cylinder if height of Y is 6 cm and height of X is 14 cm. [Atmospheric pressure = 76 cm Hg]

Hitungkan tekanan gas dalam silinder jika tinggi Y ialah 6 cm dan tinggi x ialah 14 cm. [Tekanan atmosfera = 76 cm Hg]

[3 *marks*]

(c) Gas begins to leak out from a hole at *H*.
Udara mula mengalir keluar dari lubang di H.

(i) In Diagram 4, mark the new level of *Y*, and label as *Y*'when gas in cylinder begins to leak out.

Pada Rajah 4, tandakan paras merkuri Y yang baru, dan label sebagai Y' apabila udara dalam silinder mula mengalir keluar.

[1 *mark*]

(ii) What will happen to the difference level of mercury, *d*?
Apakah yang akan berlaku kepada perbezaan paras merkuri, d?

.....

[1 *mark*]

(iii) State why there is a difference level of mercury before and after gas leaking out.
Nyatakan mengapa terdapat perbezaan paras merkuri sebelum dan selepas udara mengalir keluar.

.....

[1 *mark*]

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5. Diagram 5.1 shows three charged spheres P^+, Q^-, and R^+ are placed away to each other. P^+ and R^+ are positively charged, but Q^- is negatively charged.
Rajah 5.1 menunjukkan tiga sfera bercas P^+, Q^-, dan R^+ diletak berjauhan antara satu sama lain. P^+ dan R^+ adalah bercas positif, manakala Q^- bercas negatif.

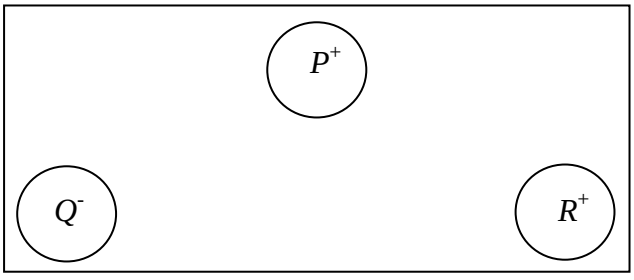

Diagram 5.1

(a) What is meant by electric current?
Apakah yang dimaksudkan dengan arus elektrik?

.....

[1 *mark*]

(b) Charged sphere P^+ is moved toward Q^- and R^+.
Tick (✓) in the box provided of the charged sphere which P^+ will be attracted to.

Sfera bercas P^+ digerakkan terhadap Q^- dan R^+.
Tandakan (✓) dalam petak yang disediakan untuk sfera bercas yang P^+ akan tertarik padanya.

[1 *mark*]

(c) Give a reason for your answer in 5(b).
Beri sebab jawapan anda di 5(b).

.....

[1 *mark*]

(d) Sketch the electric field line for the arrangement of charged spheres in Diagram 5.2.
Lakarkan garis medan elektrik untuk sfera bercas dalam susunan seperti di Rajah 5.2.

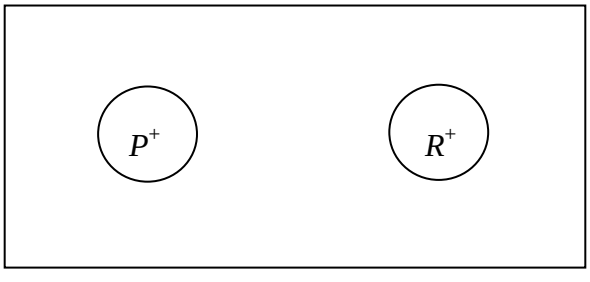

Diagram 5.2

[2 *marks*]

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(e) If bot
field line?
Jika kedua-dua P^+ *dan* R^+ *bertambah dengan cas yang sama, apakah akan berlaku pada garis medan elektrik*?

.....

[1 *mark*]

(f) Charged sphere P^+ is connected by a wire so as to discharge the sphere. Find the time taken to reduce the charges on the sphere by 6.0×10^3 C, given that the average current flow during the discharge is 1.5×10^{-1} A.
Sfera bercas P^+ *disambung dengan sebatang dawai untuk discas sfera. Hitungkan masa yang diambil untuk mengurangkan cas sebanyak* 6.0×10^3 C *pada sfera, diberi purata arus mengalir semasa discas ialah* 1.5×10^{-1} A.

[2 *marks*]

6. Diagram 6.1 shows an arrangement of apparatus used to investigate the relationship between pressure and temperature of a gas at constant volume.
Rajah 6.1 *menunjukkan susunan alat radas untuk menyiasat hubungan antara tekanan dan suhu bagi gas yang mempunyai isi padu malar*.

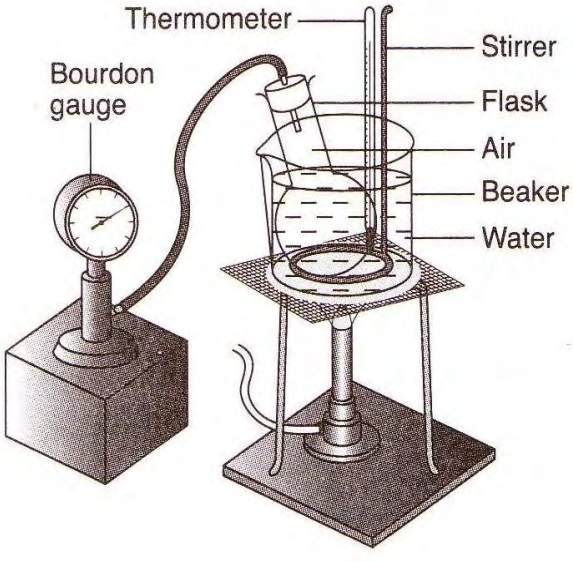

Diagram 6.1

(a) What is the function of a Bourdon gauge?
Apakah fungsi sebuah tolok Bourdon?

.....

[1 *mark*]

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(b) Diagram 6.2 and 6.3 show the pressure-temperature graph of the experiment. Sketch the graph which will be achieved by the experiment in Diagram 6.2 and Diagram 6.3.
Rajah 6.2 *dan Rajah* 6.3 *menunjukkan graf tekanan-suhu untuk eksperimen. Lakarkan graf yang dijangka akan dapati dalam eksperimen pada Rajah* 6.2 *dan Rajah* 6.3.

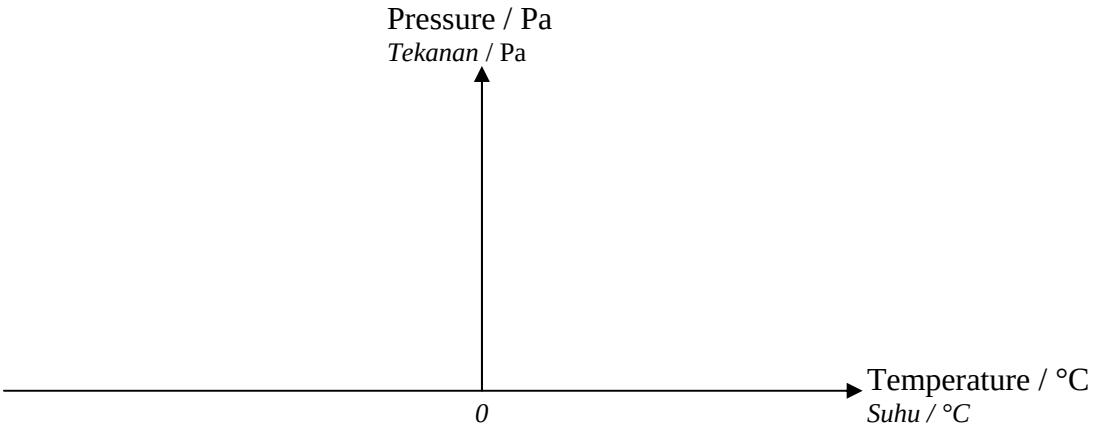

Diagram 6.2

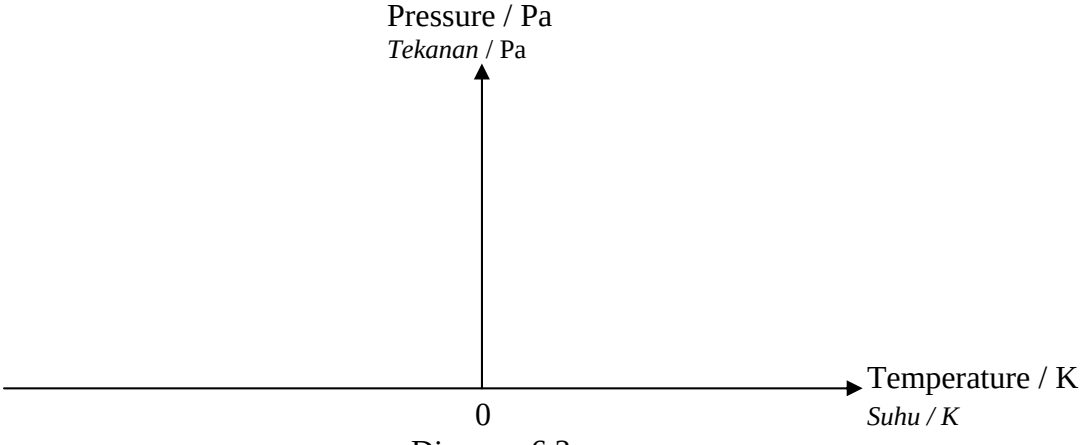

Diagram 6.3

[2 *marks*]

(c) The trapped air pressure in a flask is 120 Pa at a temperature of 27 °C. What is the air pressure in the flask when the temperature increases to 57 °C?
Tekanan gas terperangkap dalam flask pada suhu 27°C *ialah* 120 Pa. *Berapakah tekanan gas dalam flask apabila suhu meningkat kepada* 57 °C?

[3 *marks*]

(d) Name the gas law that describes the graph shape above.
Namakan hukum gas yang menerangkan bentuk graf di atas.

.....

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(e) If the flask is cracked, exists a small leakage, it found that gas pressure in the flask remains constant even though the Bunsen burner is keep heating the beaker. Explain why.
Jika flask meretak dan wujudnya satu lubang kecil, didapati bahawa tekanan gas dalam flask dimalarkan walaupun penunu Bunsen masih memanaskan bikar. Terangkan kenapa.

……

……

[1 *mark*]

7. Diagram 7.1 shows the internal parts of an ammeter commonly used in the school laboratory.
Rajah 7.1 *menunjukkan bahagian dalaman bagi suatu ammeter yang lazim digunakan dalam makmal sekolah.*

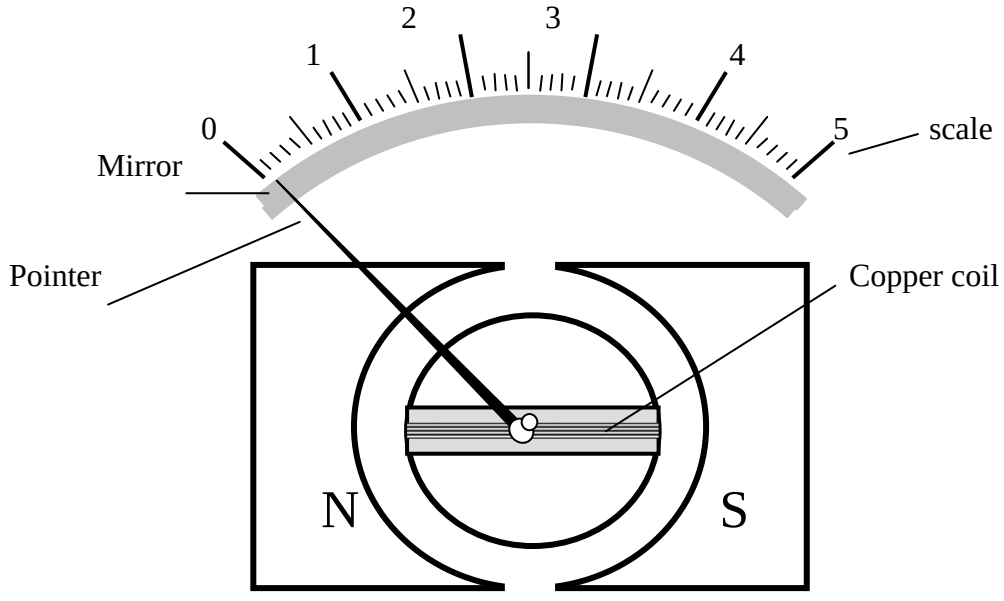

Diagram 7.1

(a) What is the current type that can be measured by this ammeter?
Tick (✓) the correct answer in the box provided.

Apakah jenis arus yang boleh diukur oleh ammeter ini?
Tanda (✓) jawapan yang betul dalam petak yang disediakan.

☐ Direct current / *Arus terus*

☐ Alternating current / *Arus ulangalik*

[1 *mark*]

(b) State why you chose such a current type as in 7(a).
Nyatakan mengapa anda memilih jenis arus sedemikian pada 7(a).

……

[1 *mark*]

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(c) Diagram 7.2 shows the permanent magnets and a pair of current-carrying conductor which current are flowing in opposite directions.

Rajah 7.2 menunjukkan magnet kekal dan sepasang konduktor membawa arus yang arusnya mengalir dalam arah bertentangan.

Diagram 7.2

⊙ Current out of the plane
Arus keluar dari satah

⊗ Current into the plane
Arus masuk ke dalam satah

(i) Draw and label clearly the direction of the magnetic field lines and hence, the resultant force on the Diagram 7.2.
Lukis dan label dengan jelas arah garis medan magnet, dan seterusnya daya paduan pada Rajah 7.2.

[3 *marks*]

(ii) Name the resultant force that produced in Diagram 7.2.
Namakan daya paduan yang dihasilkan pada Rajah 7.2.

.....

[1 *mark*]

(iii) Suggest another method or rule that can be used to determine the direction of the resultant force that produced.in Diagram 7.2.
Cadangkan satu lagi kaedah atau peraturan yang dapat menentukan arah daya paduan yang dihasilkan pada Rajah 7.2.

.....

[1 *mark*]

(iv) Suggest **two** ways of changing the direction of the resultant force.
*Cadangkan **dua** cara untuk menukarkan arah daya paduan.*

.....

.....

[2 *marks*]

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(d) Suggest a modification to the current-carrying coil so that increases the turning effect.
Cadangkan satu pengubahsuaian gegelung membawa arus untuk menambah kesan putaran.

.....

[1 *mark*]

8. Diagram 8.1 shows a model of an electronic control system to switch on an air conditioner automatically. The model consists of light sensor and heat sensor as the input. The control circuit is a logic gate circuit and the output device is the air conditioner.

Rajah 8.1 *menunjukkan satu model sistem kawalan elektronik untuk menghidupkan alat hawa dingin secara automatik. Model ini terdiri daripada pengesan cahaya dan pengesan haba sebagai input. Litar kawalan adalah satu litar get logik dan alat output ialah hawa dingin.*

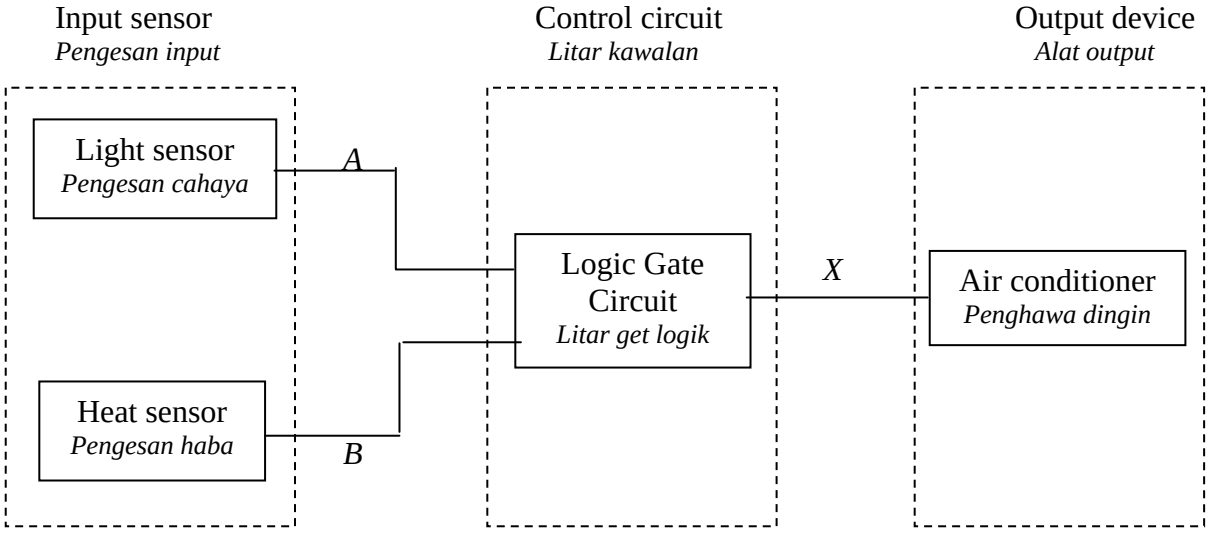

Diagram 8.1

A student is asked to design a logic gate circuit to switch on the air conditioner under the following conditions:

- The light sensor gives input *A* a logic '1' at daytime and logic '0' at night time.
- The heat sensor gives input *B* a logic '1' if the room is hot and logic '0' if cold.
- The air conditioner will only be on during daytime and during night time if it is hot.
- It is off if the night is cold.
- The logic gate circuit gives output *X* logic '1' to switch on the air conditioner.

Seorang pelajar diminta mereka satu get logik untuk menghidupkan alat hawa dingin dalam keadaan berikut:

- *Pengesan cahaya memberi input A logik* '1' *pada siang dan logik* '0' *pada malam.*
- *Pengesan haba memberi input B logik* '1' *jika bilik adalah panas dan logik* '0' *jika sejuk.*
- *Hawa dingin hanya akan hidup pada waktu siang dan waktu malam jika panas.*
- *Ia dimatikan jika malam sejuk.*
- *Litar get logik memberi output logik X* '1' *untuk menghidupkan alat hawa dingin*.

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(a) What
Apakah yang dimaksudkan get logik?

.....

.....

[2 *marks*]

(b) Table 8 is a truth table which shows the operation of the logic gate in an electronic control system to switch on an air conditioner automatically.

Jadual 8 *ialah jadual kebenaran yang menunjukkan operasi get logik bagi suatu sistem kawalan elektronik untuk menghidupkan alat hawa dingin secara automatik.*

Input *A*	Input *B*	Output *X*
0		
	1	
	0	
1		

Table 8

Complete the truth table in Table 8 to show the operation of the logic gate control system.
Lengkapkan jadual kebenaran pada Jadual 8 untuk menunjukkan operasi get logik sistem kawalan.

[3 *marks*]

(c) Diagram 8.2 shows the outline of the control circuit designed by the student.
Rajah 8.2 *menunjukkan lukisan ringkas bagi litar kawalan yang direka oleh pelajar.*

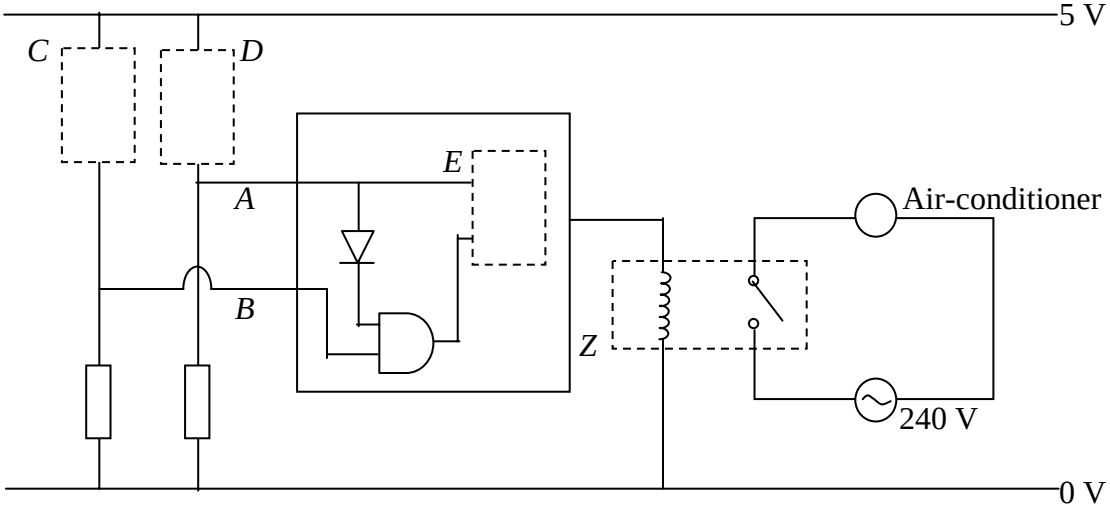

Diagram 8.2

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(i) D
designed.

Lukiskan simbol yang sesuai di petak C dan D pada Rajah 8.2, *berpandukan litar direka.*

[2 *marks*]

(ii) Draw a logic gate in box *E* in Diagram 8.2 to produce the result as in Table 8.

Lukiskan satu get logik in petak E pada Rajah 8.2 *untuk menghasilkan keputusan seperti dalam Jadual* 8.

[1 *mark*]

(d) *Z* is a device to control the operation of the air-conditioner.
Z ialah satu alat untuk mengawal operasi alat hawa dingin.

(i) Name the electronic device *Z*.
Namakan alat elektronik Z.

……..
[1 *mark*]

(ii) What is the advantage of using device *Z* to control the operation of the air-conditioner?
Apakah kelebihan menggunakan alat Z untuk mengawal operasi alat hawa dingin?

.....

.....
[1 *mark*]

(e) The air-conditioner is rated 240 V and 1500 W. Calculate the current at normal usage.
Alat hawa dingin ini dilabelkan 240 V *dan* 1500 W. *Hitungkan arus elektrik pada kegunaan normal.*

[2 *marks*]

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Section B
Bahagian B

[20 *marks*]
[20 markah]

Answer any **one** *question*
Jawab mana-mana ***satu*** *soalan.*

9. Diagram 9.1 shows a student bends his leg when landing on the ground. Diagram 9.2 shows a softball player pulls his hands backward before he stops the ball.

Rajah 9.1 menunjukkan seorang pelajar membengkokkan kakinya semasa mendarat di permukaan tanah. Rajah 9.2 menunjukkan seorang pemain sofbol menarik tangannya ke belakang sebelum dia memberhentikan bola itu.

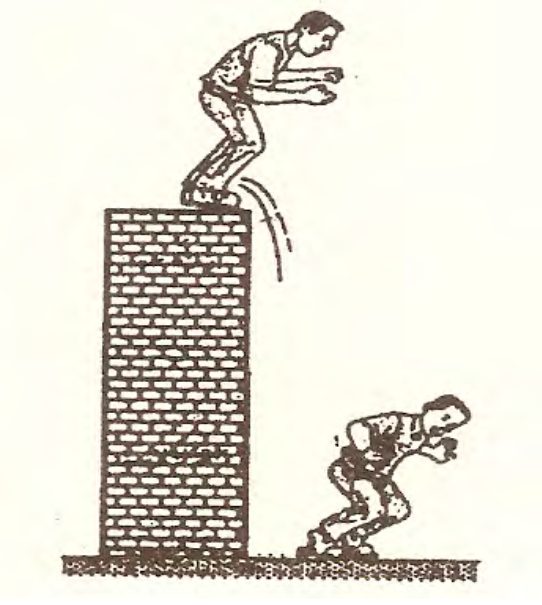

Diagram 9.1

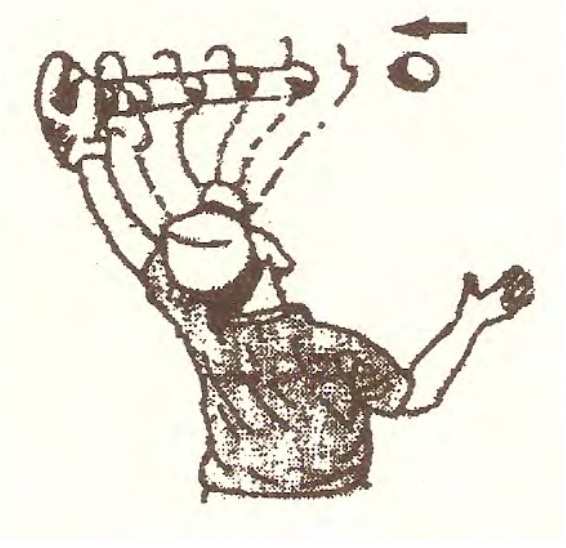

Diagram 9.2

a) What is meant by *impulsive force*?

Apa maksud daya impuls ?

[1 *mark*]

b) Based on physics concept, state the common characteristics in Diagram 9.1 and Diagram 9.2. Then relate those characteristics with the physics concept and state that concept.

Berdasarkan konsep fizik, nyatakan ciri-ciri sepunya di Rajah 9.1 dan Rajah 9.2. Kemudian hubungkaitkan ciri-ciri tersebut dengan konsep fizik itu dan nyatakan konsep tersebut.

[5 *marks*]

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c) A ca
from serious injury. State the characteristics are used to develop the car and its function.

Sebuah kereta dibina dengan ciri-ciri keselamatan yang boleh melindungi pemandu dan penumpang dari kecederaan serius. Nyatakan ciri yang digunakan untuk membina kereta itu dan fungsinya.

[10 *marks*]

d) A car with a mass 1 500 kg travels at a velocity $10ms^{-1}$ before it hit a tree.

Sebuah kereta yang berjisim 1 500 kg bergerak dengan halaju $10ms^{-1}$ sebelum ia berlanggar dengan sebatang pokok.

If the time impact is 2 seconds, find
Jika masa perlanggaran antara kereta dengan pokok itu ialah 2 saat, kira

a. the impulse
impuls

b. impulsive force exerted on the tree
daya impuls yang dikenakan pada pokok itu.

[4 *marks*]

10. Activity / counts per minute
Keaktifan / bil. per minit

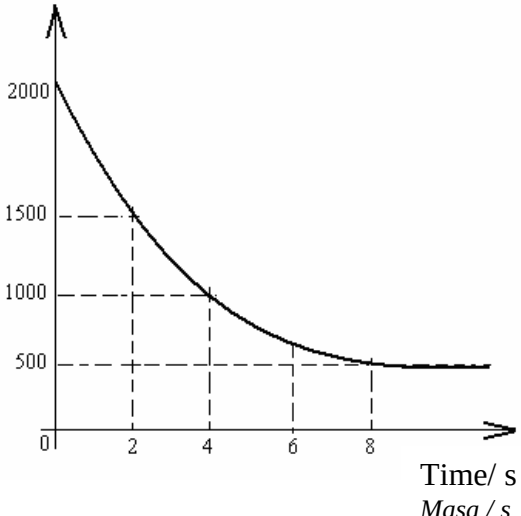

Diagram 10.1

Activity / counts per minute
Keaktifan / bil. per minit

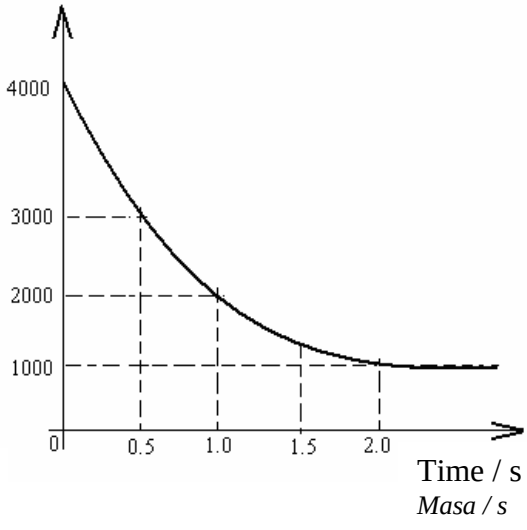

Diagram 10.2

a) What is meant by *radioactivity*?
Apa maksud keradioaktifan ?

[1 *mark*]

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b) Based
graphs. Then relate those characteristics to develop a physics concept.

Berdasarkan Rajah 10.1 dan Rajah 10.2 nyatakan ciri-ciri yang sama pada kedua-dua graf dan seterusnya hubungkaitkan ciri-ciri tersebut untuk membuat satu kesimpulan tentang konsep fizik yang berkaitan.

[5 *marks*]

c) This equation is a nucleus reaction.

Persamaan tindakbalas berikut merupakan satu tindakbalas nukleus

$$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{141}_{56}Ba + {}^{92}_{36}Kr + 3{}^{1}_{0}n + \text{energy}$$

(236.05 u.j.a) (235.85 u.j.a + energy)

From the above equation, calculate
Daripada persamaan di atas, hitungkan

i) the loss of mass in kilogram
jisim yang hilang dalam unit kilogram

(1 u.j.a = 1.66 X 10^{-27} kg)

ii) the energy released in joules
tenaga yang terbebas dalam unit joule

[4 *marks*]

d) Using an appropriate concept in physics, explain the modification should be made to the school laboratory and the inside instrument, so that the research work by using the radioactive material can be done safely. The modification should be based on

Menggunakan konsep fizik yang sesuai, terangkan pengubahsuaian yang perlu dilakukan kepada makmal sekolah dan peralatan didalamnya supaya kerja penyelidikan menggunakan sumber radioaktif dapat dijalankan dengan selamat. Pengubahsuaian mestilah berdasarkan

i) structure
binaan

ii) handling the radioactive material
pengendalian sumber radiaoktif

iii) how the exposure of radioactive radiation can be protected
bagaimana pendedahan sinaran radioaktif boleh dicegah.

[10 *marks*]

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Bahagian C

[20 *marks*]
[20 markah]

Answer any **one** *question*
Jawab mana-mana **satu** *soalan.*

11. Figure 11.1 shows a ray P,Q, R dan S have two convex lens with a certain focal length.

Rajah 11.1 menunjukkan gambar rajah sinar P,Q, R dan S masing-masing mempunyai dua buah kanta cembung dengan panjang fokus tertentu.

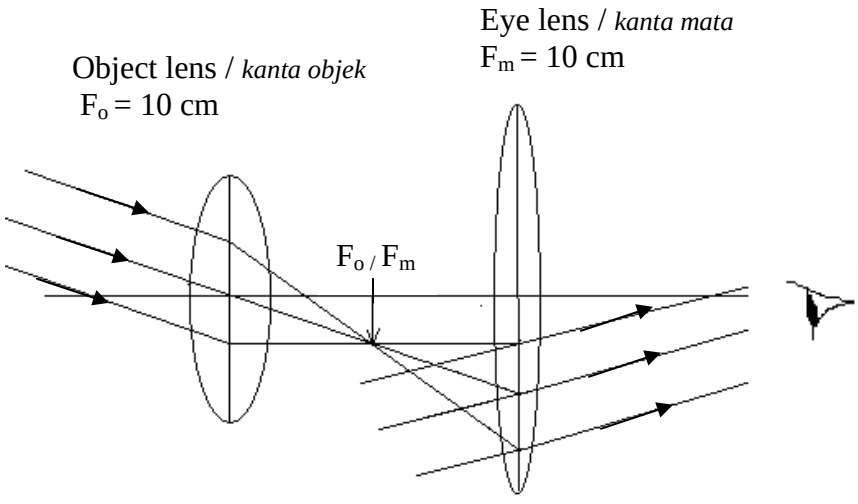

Diagram of P ray
Gambar Rajah Sinar P

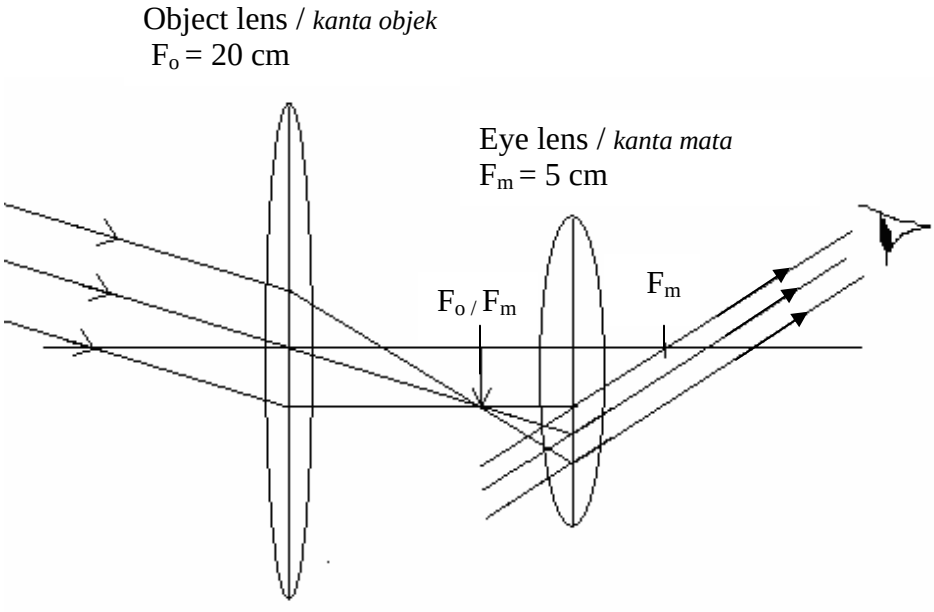

Diagram of Q ray
Gambar Rajah Sinar Q

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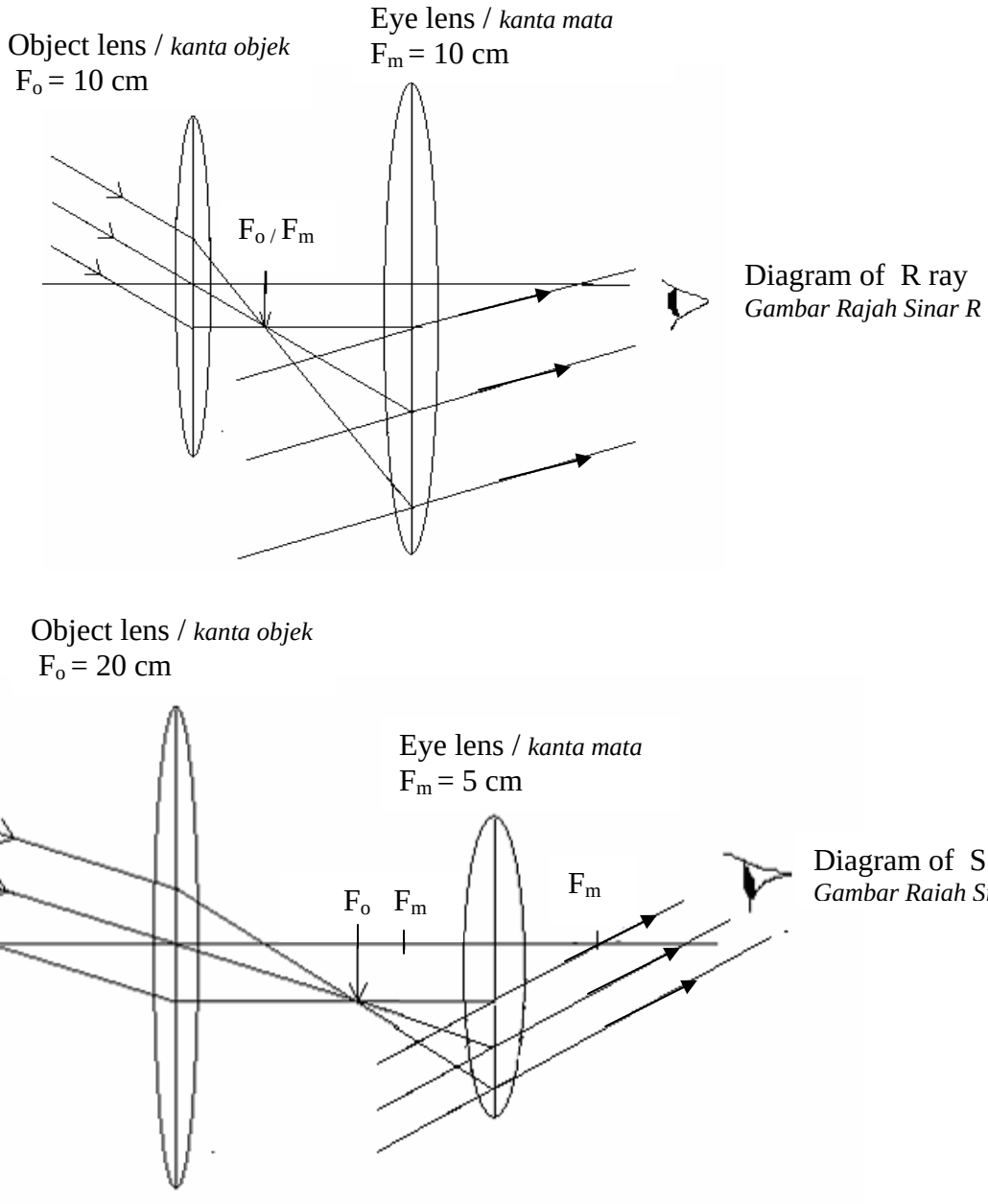

Diagram 11.1

a) (i) What is meant by *focal length ?*
Apa maksud panjang fokus ?

[1 *mark*]

(ii) Describe **one** method to estimate the focal length of convex lens.
*Terangkan **satu** kaedah untuk menganggarkan panjang fokus sebuah kanta cembung.*

[4 *marks*]

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b) You are asked to make an optical instrument that is use to view objects at a great distance. Chose a ray diagram in figure 11.1 P, Q, R and S which is the most suitable. Give explanation with emphasis on the following aspects.

Anda ditugaskan untuk membina satu alat optik yang boleh digunakan untuk melihat objek jauh. Kaji gambar rajah sinar P, Q ,R dan S dalam Rajah 11.1 serta pertimbangkan aspek-aspek berikut:

i) The focal length of eye lens and objective lens used
Panjang fokus kanta mata dan kanta objek yang digunakan

ii) Diameter of the objective lens used
Diameter kanta objek yang digunakan

iii) Diameter of the eyepiece used
Diameter kanta mata yang digunakan

iv) Distance between the two lenses
Jarak antara dua kanta

Explain the suitability of each aspect in figure 11.1 and hence determine which are most suitable to be used to make a telescope.
Justify your choice.

Terangkan kesesuaian aspek-aspek itu dan seterusnya tentukan gambar rajah sinar yang paling sesuai untuk membina alat optik itu.
Berikan sebab bagi pilihan anda.

[10 *marks*]

c) A convex lens with focal length 20 cm produces an image on the screen which is located at 60 cm from the lens.

Sebuah kanta cembung mempunyai panjang fokus 20 cm menghasilkan satu imej pada skrin yang diletakkan pada jarak 60 cm dari kanta itu.

Calculate
Hitungkan

(i) distance between object and lens
jarak antara objek dengan kanta

(ii) magnification of the image produced
pembesaran imej yang terhasil

[5 *marks*]

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12. Diagram 12.1 shows a bulb labelled 12V, 24W.
Rajah 12.1 menunjukkan satu mentol berlabel 12V 24W.

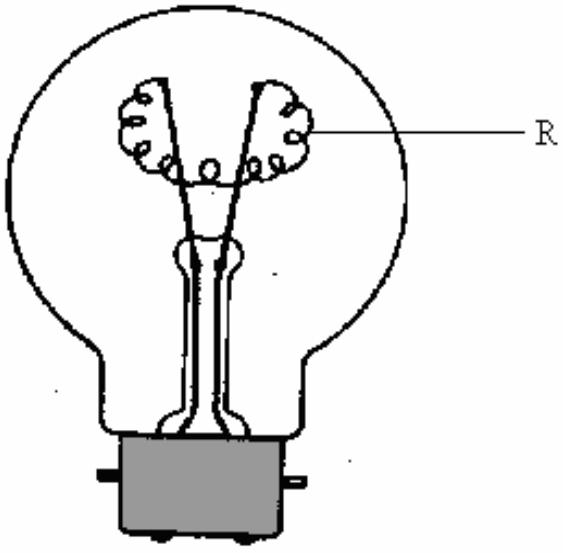

Diagram 12.1

a) (i) What is meant by 12V, 24 W.
Apakah yang dimaksudkan dengan 12V, 24W?

[1 *mark*]

(ii) Why is R made of high resistance conductor
Mengapa R dibuat daripada konduktor berintangan tinggi?

[1 *mark*]

(iii) State 2 factors that affect the resistance of the conductor .
Describe how the factors can affect the resistance of conductor.

Nyatakan 2 faktor yang mempengaruhi rintangan konduktor.
Huraikan bagaimana faktor-faktor itu mempengaruhi rintangan konduktor itu.

[4 *marks*]

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b) Diagram
supply voltage of 12 V.

Rajah 12.2 menunjukkan tiga perintang yang serupa dalam satu litar elektrik yang disambungkan kepada bekalan elektrik 12 V

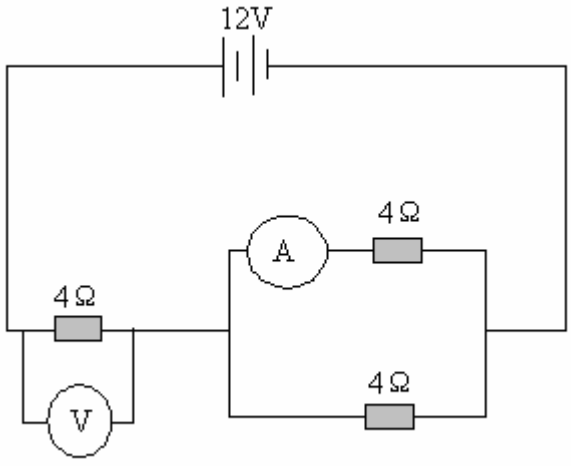

Diagram 12.2

(i) Calculate the effective resistance in circuit
Hitungkan rintangan berkesan dalam litar itu.

[1 *mark*]

(ii) What is the reading of the voltmeter?
Berapaah bacaan voltmeter ?

[2 *marks*]

(ii) What is the reading of the ammeter?
Berapakah bacaan ammeter ?

[1 *mark*]

c) You are assigned to investigate the characteristics of the power of a heating coil and the design of the heating element is an electric kettle.

Anda ditugaskan untuk mengkaji ciri-ciri kuasa perintang dalam alat pemanas dan reka bentuk alat pemanas sebuah cerek elektrik.

Explain the suitability of every characteristics in the table and the determine the most suitable electric kettle to be used to boil the water fast and safely.

Terangkan kesesuaian setiap ciri dalam jadual dan seterusnya tentukan cerek elektrik yang manakah paling sesuai digunakan untuk memanaskan air supaya ianya cepat dan selamat.

Give reason for your answer.
Beri sebab untuk jawapan anda.

[10 *marks*]

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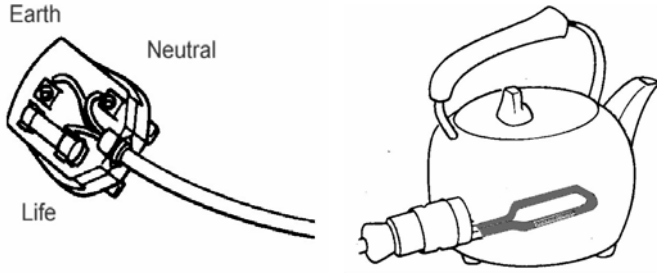
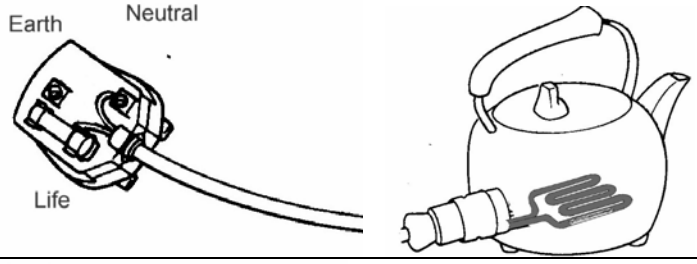
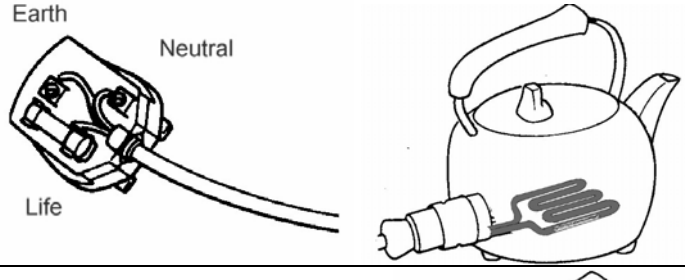
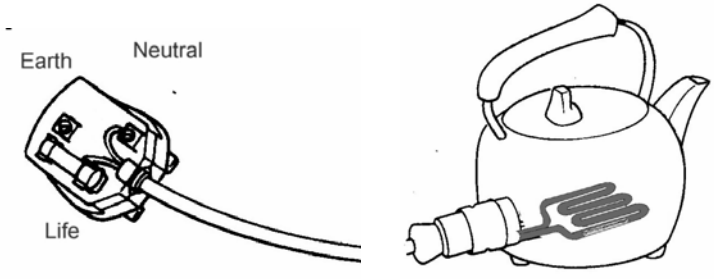
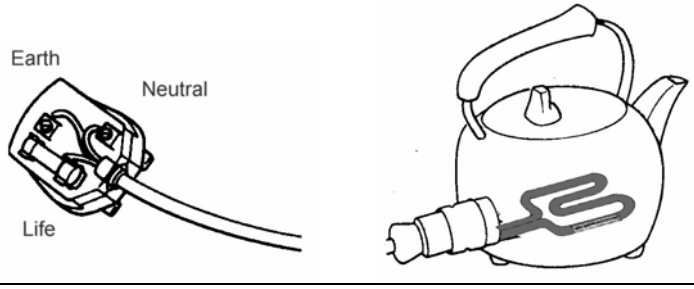
	Earthing system *Sistem pembumian*	Number of loop *Bilangan Gegelung*	Material of heating coil *Bahan gegelung pemanas*	Power of heating coil *Kuasa gegelung pemanas*
P			Constantan *Konstantan*	Power *Kuasa* 1000W Voltage *Voltan* 240V
Q			Nicrom *Nikrom*	Power *Kuasa* 1 000 W Voltage *Voltan* 240 V
R			Nicrom *Nikrom*	Power *Kuasa* 1500 W Voltage *Voltan* 240V
S			Constantan *Konstantan*	Power *Kuasa* 1500 W Voltage *Voltan* 240V
T			Nicrom *Nikrom*	Power *Kuasa* 1000 Voltage *Voltan* 240V

END OF QUESTION PAPER

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MARKING SCHEME
PAPER 3

PRAKTIS BESTARI
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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1 (a) (i)</td><td>Time
Masa</td><td>1</td></tr>
<tr><td>1 (a) (ii)</td><td>Temperature // Increase in temperature
Suhu //peningkatan suhu</td><td>1</td></tr>
<tr><td>1 (a) (iii)</td><td>Mass of the water, power of the heater
Jisim air, kuasa alat pemanas</td><td>1</td></tr>
<tr><td>1 (b)</td><td>The eye should be at the same horizontal level as the meniscus of the mercury column
Mata pada aras yang sama dengan meniskus turus merkuri</td><td>1</td></tr>
<tr><td>1 (c) (i)</td><td>$\theta_0 = 25\ ^{o}C$</td><td>1</td></tr>
<tr><td>1 (c) (ii)</td><td>Table for t, θ and $\Delta\theta$
Jadual untuk t, θ and Δθ
<table>
<tr><th>t / s</th><th>θ / ^{o}C</th><th>$\Delta\theta$ / ^{o}C</th></tr>
<tr><td>20</td><td>32</td><td>7</td></tr>
<tr><td>40</td><td>39</td><td>14</td></tr>
<tr><td>60</td><td>46</td><td>21</td></tr>
<tr><td>80</td><td>53</td><td>28</td></tr>
<tr><td>100</td><td>60</td><td>35</td></tr>
</table>
Give a tick (✓) based on the following:
Beri tanda(✓)berdasarkan yang berikut;
A • Columns t, θ and Δθ ✓
Lajur t, θ dan Δθ
B • Correct units for t, θ and Δθ ✓
Unit untuk t, θ dan Δθ betul
C • All 5 values of θ correct ✓✓
Semua 5 nilai θ betul
[Note : 3 or 4 values of θ correct : ✓]
[Catatan : 3 atau 4 nilai θ betul ; ✓]
D • All 5 values of Δθ correct ✓✓
Semua 5 nilai Δθ betul
E • All values of θ and Δθ written as whole numbers or consistent to 1 d.p. ✓
Semua nilai θ and Δθ ditulis seragam kepada 1 t.p</td><td>5</td></tr>
</table>

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	Marks awarded / *markah diberi* **:** Number of / *bil* ✓ | Marks / *markah* 7 ✓ | 5 5 - 6 ✓ | 4 3 - 4 ✓ | 3 2 ✓ | 2 1 ✓ | 1	
1 (d)	**Graph of $\Delta\theta$ against *t* /** *Graf $\Delta\theta$ melawan t* Give a tick (✓) based on the following: **A** • $\Delta\theta$ at the *y*-axis and *t* at the *x*-axis ✓ *$\Delta\theta$ pada paksi-y dan t pada paksi-x* **B** • Correct units at both axes ✓ *Kedua-dua unit pada paksi betul* **C** • Uniform scale at both axes ✓ *Skala pada paksi seragam* **D** • 5 points plotted correctly ✓✓ [**Note : 4 points plotted correctly** : ✓] *5 titik diplot dengan betul* *[Catatan : 4 titik titik diplot dengan betul ; ✓]* **E** • Straight line through the origin ✓ *Garis lurus melalui titik asalan* **F** • Minimum size of graph 5 x 4 larger squares ✓ *Saiz minima graf 5 x 4 petak besar* (larger square */ petak besar* **:** 2 cm x 2 cm) (From the origin to the last point / *daripada titik asalan ke Titik akhir*) **Marks awarded** */ markah diberi*: Number of ✓ | Marks 7 ✓ | 5 5-6 ✓ | 4 3-4 ✓ | 3 2 ✓ | 2 1 ✓ | 1	5
1 (e)	$\Delta\theta$ is directly proportional to *t* / *$\Delta\theta$ berkadar terus dengan t*	1
1 (f)	The water is stirred continuously so that the temperature is uniform *Air dikacau berterusan supaya suhu menjadi seragam*	1
	TOTAL MARKS	16
Question	**Answer**	**Marks**
2 (a) i)	Directly proportional / increase uniformly *Berkadar terus / bertambah secara seragam*	1
ii)	Shows the, $1/a = ¼ = 0.25\ m^{-1}$ when a = 4 m *Menunjukkan $1/a = ¼ = 0.25\ m^{-1}$ when a = 4 m*	1

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	Marks on graph / *tanda pada graf* Answer , x = 0.425 m / *Jawapan , x = 0.425 m*	1 1 (3)
iii)	Shows on graph, x = 1.5 m / *menunjukkan di atas graf, x = 1.5 m* Answer, a = 1.59 m / *Jawapan , a = 1.59 m*	1 1 (2)
2 (b) (i)	Draw a sufficiently large triangle (size of triangle > 4 x 5 Larger square) *Melukis segitiga dengan saiz secukupnya (saiz segitiga >4 x 5 petak besar)* Substitution method , gradient / *kaedah gantian, kecerunan* = $\frac{2.25-0}{0.9-0}$ Answer with correct unit, gradient / *Jawapan dg. unit yang betul* = 2.5 m^2	1 1 1 (3)
(ii)	Substitution method (refer the triangle) / *kaedah gantian*, $\lambda = \frac{ax}{D} = \frac{2.5}{5}$ Answer / *jawapan* , λ = 0.5 m	1 1 (2)
2 (c)	The experiment should be done at wider location // *Eksperimen dijalankan di kawasan lapang* The track line to detect the sound effect is parallel with the arrangement of two coherent sources. *Garisan laluan untuk mengesan bunyi selari dengan susunan dua sumber yang koheren*	1
	TOTAL MARKS	**12**

Question	Answer	Marks
3 (a)	**State a suitable inference / *Menyatakan inferen yang sesuai*** The volume of balloon depends on the depth of water *Isipadu belon bergantung kepada kedalaman air*	1
(b)	**State a relevant hypothesis / *menyatakan hipotesis yang berkenaan*** When the depth increase the pressure will be increase *Apabila kedalaman bertambah , tekanan akan bertambah*	1
(c) (i)	**State the aim of experiment / *menyatakan tujuan eksperimen*** To investigate the relationship between the depth of water and the pressure. *Untuk mengkaji hubungan antara kedalaman air dan tekanan*	1
(ii)	**State the suitable manipulated variable and responding variable** ***Menyatakan pembolehubah dimanipulasikan dan pembolehubah bergerakbalas*** **(Quantity that can be measured / *pembolehubah yang boleh diukur*)** Manipulated variable: depth/high of water *Pembolehubah manipulasi : kedalaman/ketinggian air* Responding variable : pressure/different high of liquid in U-tube *Pembolehubah bergerakbalas : tekanan / beza ketinggian cecair dalam tiub-U*	1

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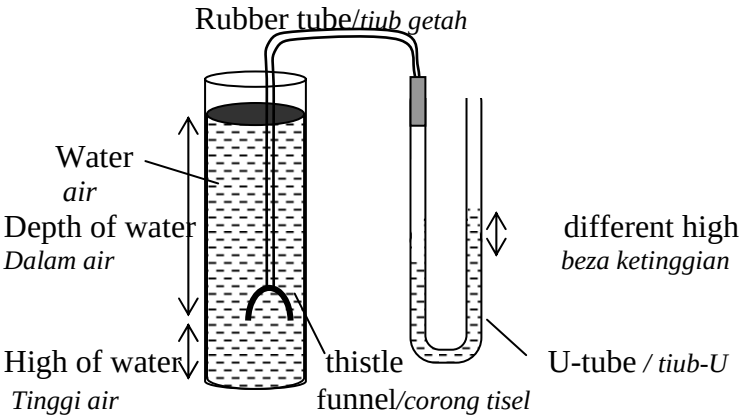
(iii)	**State the constant variable** / ***menyatakan pembolehubah yang dimalarkan*** Density/type of liquid / *ketumpatan/jenis cecair*	1
(iv)	**State the complete list of apparatus and materials** ***Menyatakan senarai lengkap radas dan bahan*** Ruler, U-tube, thistle funnel, rubber tube, water, paraffin and tall beaker *Pembaris, tiub-U, corong tisel, tiub getah, air, paraffin dan bikar*	1
(v)	**Draw the functional arrangement of the apparatus** ***Melukis susunan radas yang boleh berfungsi***  	1
(vi)	**State the method to control the manipulated variable** ***Menyatakan cara mengawal pembolehubah manipulasi*** Adjust the depth of water, d = 10 cm / *Melaras kedalaman air, d = 10 cm*	1
(vii)	**State the method to measure the responding variable** / ***menyatakan cara mengukur pembolehubah bergerakbalas*** Measure the different of high of paraffin in U-tube. *Mengukur beza ketinggian paraffin dalam tiub-U*	1
(viii)	**Repeat the experiment at least 4 times with different values** / ***mengulangi sekurang-kurangnya 4 kali eksperimen dengan milai yang dinyatakan*** Repeat the experiment as the d = 20 cm, 30 cm, 40 cm and 50 cm	1
(xi)	**State how the data tabulated with the title MV and RV** / ***Menyatakan bagaimana data dijadualkan dengan tajuk PM dan PB*** d/cm: 10.0, 20.0, 30.0, 40.0, 50.0 Different high of paraffin/cm	1

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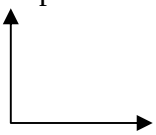
(x)	**State how the data is analyse, plot a graph RV against MV /** ***menyatakan bagaimana data dianalisa*** Different high of paraffin / *beza ketinggian parafin*  depth / *kedalaman* **Total Marks**	1 **12**

Question	Answer	Marks
4 (a)	**State a suitable inference** The strength of electromagnetism is influenced by the current *Kekuatan electromagnet dipengaruhi oleh arus*	1
(b)	**State a relevant hypothesis** The higher the current the higher the strength of electromagnetism *Semakin tinggi arus aemakin tinggi kekuatan electromagnet*	1
(d) (i)	**State the aim of experiment** To investigate the relationship between the current and the strength of electromagnetism *Untuk mengkaji hubungan antara arus dan kekuatan elektromagnet*	1
(ii)	**State the suitable manipulated variable and responding variable (Quantity that can be measured)** Manipulated variable / *pembolehubah manipulasi* : current / *arus* Responding variable / *pembolehubah bergerakbalas*: numbers of pin attracted / *bilangan pin tertarik*	1
(iii)	**State the constant variable** Number of turns of coil / *Bilangan lilitan gegelung*	1
(iv)	**State the complete list of apparatus and materials** Solenoid, ammeter, pins, rheostat, beaker, iron rod, power supply/ batteries, connecting wire *Solenoid, ammeter, pin, rheostat, bikar, rod besi, bekalan kuasa/bateri dan wayar penyambung.*	1

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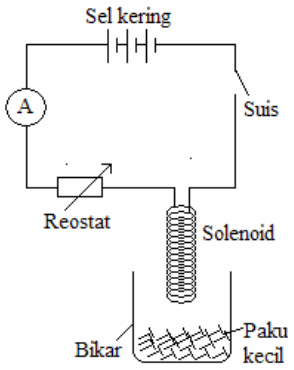
(v)	**Draw the functional arrangement of the apparatus**  	1
(vi)	**State the method to control the manipulated variable** Switch on the circuit and adjust the rheostat as the current = 0.2 A *Hidupkan litar dan laraskan rheostat sehingga arus = 0.2 A*	1
(vii)	**State the method to measure the responding variable** Touch the solenoid to the pins and determine the numbers of pins attracted. *Sentuhkan solenoid kepada pin dan kira bilangan pin yang tertarik.*	1
(viii)	**Repeat the experiment at least 4 times with different values** Repeat the experiment as the current 0.3 A, 0.4 A , 0.5 A and 0.6A. *Ulang eksperiment dengan arus 0.3 A, 0.4 A, 0.5 A dan 0.6 A.*	1
(xi)	**State how the data tabulated with the title MV and RV** I / A: 0.2, 0.3, 0.4, 0.5, 0.6 Number of pins attracted / *bilangan pin tertarik*	1
(x)	**State how the data is analyse, plot a graph RV against MV** Number of pins attracted / *bilangan pin tertarik* I / A **Total Marks**	1 **12**

END OF MARKING SCHEME

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NAMA : …… Kelas : ……

PSPN PAHANG
JPN PAHANG
YAYASAN PAHANG

PROGRAM JAWAB UNTUK JAYA 2008

PRAKTIS BESTARI

FIZIK

KERTAS 3

Satu jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tuliskan nama dan kelas anda pada ruang yang disediakan.*
2. *Kertas soalan ini adalah dalam dwibahasa.*
3. *Soalan dalam bahasa Inggeris adalah yang sepadan dengan soalan dalam bahasa Melayu.*
4. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Melayu atau bahasa Inggeris.*
5. *Calon dikehendaki membaca maklumat di halaman 2 atau halaman 3*

Bahagian	Soalan	Markah Penuh	Markah Diperolehi
A	1	16	
	2	12	
	JUMLAH MARKAH A		
B	1	12	
	2	12	
JUMLAH			

Kertas soalan ini mengadungi lima belas halaman bercetak termasuk muka hadapan.

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INFORMATION FOR CANDIDATES

1. *This question paper consists of 2 sections:* **Section A** *and* **Section B.**.
2. *Answer* ***all*** *questions in* **Section A.** *Write your answer for* **Section A** *in the spaces provided in the question paper.*
3. *Answer* **one** *question from* **Section B**.
   Write your answer for **Section B** *on the 'helaian tambahan' provided by the invigilators.*
   Answer questions in **Section B** *in detail.*
   Answer should be clear and logical.
   You may use equations, diagrams, tables, graph and other suitable methods to explain your answer.
4. *Show your working, it may help you to get marks.*
5. *If you wish to change your answer, neatly cross out the answer that you have done. Then write down the new answer.*
6. *The diagrams in the questions are not drawn to scale unless stated.*
7. *Marks allocated for each question or part question are shown in brackets.*
8. *A booklet of four-figure mathematical tables is provided.*
9. *You may use a non-programmable scientific calculator.*
10. *The time suggested to complete* **Section A** *is 60 minutes and* **Section B** *is 30 minutes.*
11. *Hand in your answer sheets at the end of the examination.*

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MAKLUMAT UNTUK CALON

1. *Kertas soalan ini mengandungi dua bahagian :* **Bahagian A** *dan* **Bahagian B** .
2. *Jawab semua soalan dalam Bahagian A. Tulis jawapan bagi Bahagian A dalam ruang yang disediakan dalam kertas soalan.*
3. *Jawab* **satu** *soalan dariada* **Bahagian B.**
   Tulis jawapan bagi **Bahagian B** *pada helaian tambahan yang dibekalkan oleh pengawas peperiksaan. Jawab* **Bahagian B** *dengan terperinci.*
   Jawapan mestilah jelas dan logik.
   Anda boleh menggunakan persamaan, rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda.
4. *Tunjukkan kerja mengira, ini membantu anda mendapatkan markah.*
5. *Sekiranya anda hendak menukar jawapan batalkan dengan kemas jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.*
6. *Rajah mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.*
7. *Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.*
8. *Buku sifir matematik empat angka disediakan.*
9. *Anda dibenarkan menggunakan kalkulator saintifik yang tidal boleh diprogramkan.*
10. *Masa yang dicadangkan untuk menjawab* **Bahagian A** *ialah 60 minit dan* **Bahagian B** *ialah 30 minit.*
11. *Serahkan kertas jawapan anda di akhir peperiksaan.*

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SECTION A

1. A student carries out an experiment to investigate how the temperature of water increases with the time of heating. Diagram 1.1 shows the set up of the apparatus for the investigation. Before the heater is switched on the initial temperature, θ_0 of the water is measured. Diagram 1.2 shows meniscus of the mercury column in the thermometer.

Seorang murid menjalankan eksperimen untuk mengkaji bagaimana suhu air meningkat terhadap masa pemanasannya. Rajah 1.1 menunjukkan susunan radas untuk eksperimen berkenaan. Suhu awal air sebelum alat pemanas dihidupkan ialah, θ_0. Rajah 1.2 menunjukkan meniskus turus merkuri dalam termometer.

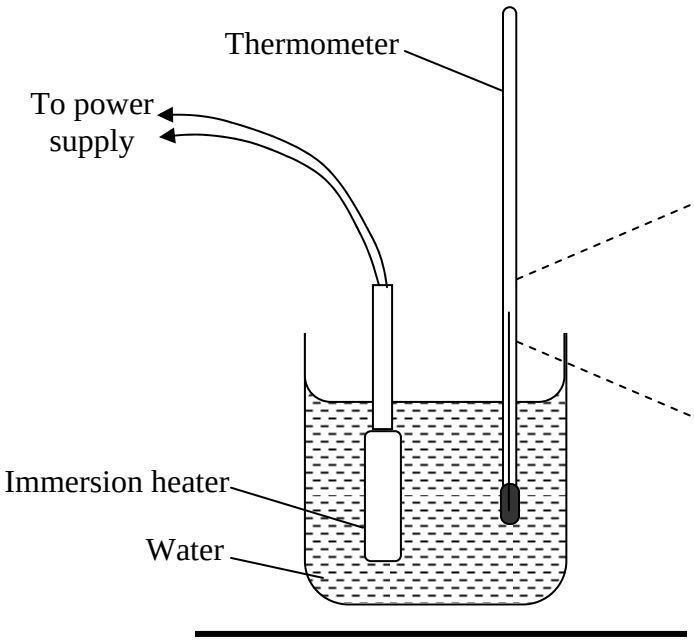

DIAGRAM 1.1
Rajah 1.1

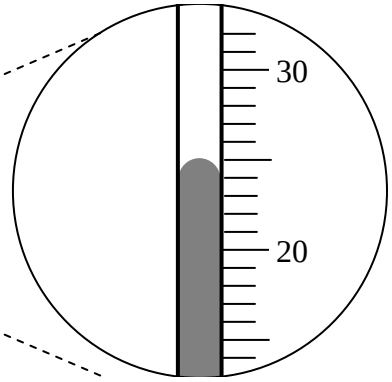

DIAGRAM 1.2
Rajah 1.2

A stopwatch and the heater is switched on simultaneously. At time, t = 20 s, the temperature, θ, of the water is read on the thermometer. Diagram 1.3 shows the meniscus of the mercury column in the thermometer.

Jam randik dan alat pemanas dihidupkan serentak. Pada masa, t = 20 s, suhu air, θ dibaca pada termometer seperti ditunjukkan dalam Rajah 1.3.

The procedure is repeated for heating time, t = 40 s, 60 s, 80 s and 100 s. The corresponding positions of the meniscus of the mercury column in the thermometer are shown in Diagrams 1.4, 1.5, 1.6 and 1.7.

Eksperimen diulang dengan masa pemanasan, t = 40 s, 60 s, 80 s dan 100s. Meniskus merkuri dalam termometer pada setiap keadaan ditunjukkan dalam rajah 1.4, 1.5, 1.6 dan 1.7.

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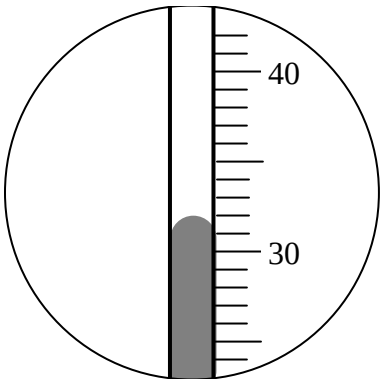

DIAGRAM 1.3
Rajah 1.3

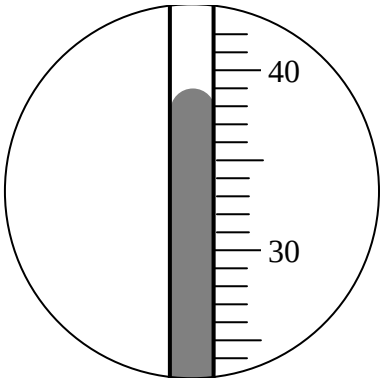

DIAGRAM 1.4
Rajah 1.4

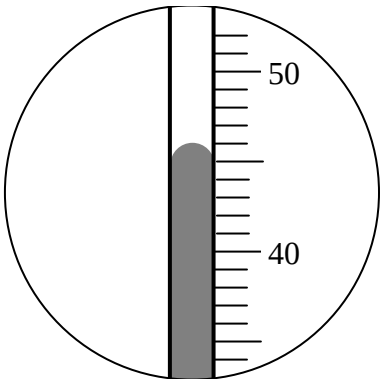

DIAGRAM 1.5
Rajah 1.5

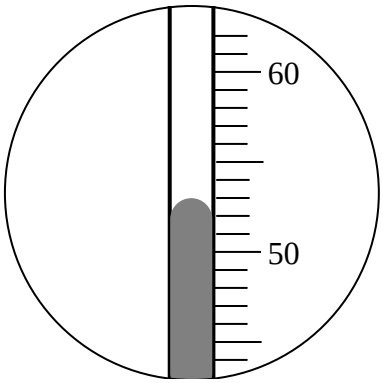

DIAGRAM 1.6
Rajah 1.6

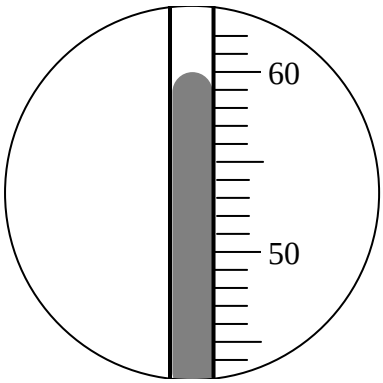

DIAGRAM 1.7
Rajah 1.7

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(a) For the experiment described above, identify:
Berdasarkan eksperimen di atas, tentukan

(i) the manipulated variable
pembolehubah dimanipulasikan.

…….
[1 *mark*]

(ii) the responding variable
pembolehubahan bergerakbalas

…….
[1 *mark*]

(iii) a fixed variable
pembolehubah dimalarkan

…….
[1 *mark*]

(b) Explain how parallax error can be reduced when the reading of the thermometer is taken.
Terangkan bagaimana ralat paralaks boleh dikurangkan semasa mengambil bacaan termometer.

…….
[1 *mark*]

(c) (i) Based on Diagram 1.2, determine the initial temperature, θ_0, of the water.
Berdasarkan rajah 1.2 tentukan bacaan awal suhu air, θ_0

Initial temperature, θ_0 = …….

(ii) Based on Diagrams 1.3, 1.4, 1.5, 1.6 and 1.7, determine the temperature, θ, for the corresponding values of heating time, t.
Berdasarkan rajah 1.3, 1.4, 1.5, 1.6 and 1.7, tentukan suhu, θ pada setiap masa pemanasan, t yang bersesuaian.

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Tabulate your results for t, θ and $\Delta\theta$ in the space below.
Jadualkan keputusan anda bagi setiap masa pemanasan, t, suhu, θ dan perubahan suhu, $\Delta\theta$ pada ruangan yang disediakan di bawah.

$\Delta\theta$ is the increase in temperature.
$\Delta\theta$ adalah kenaikan suhu.

$\Delta\theta$ is calculated using the formula, $\Delta\theta = \theta - \theta_0$
$\Delta\theta$ dikira menggunakan formula, $\Delta\theta = \theta - \theta_0$

[5 *marks*]

(d) On the graph paper, plot a graph of $\Delta\theta$ against t.
Di atas kertas graf yang disediakan, lukiskan graf $\Delta\theta$ lawan t.

[5 *marks*]

(e) Based on your graph, state the relationship between $\Delta\theta$ and t.
Berdasarkan graf yang anda lukiskan, nyatakan hubungan antara $\Delta\theta$ dan t.

…….

[1 *mark*]

(f) State one precaution that should be taken to obtain accurate readings of θ.
Nyatakan langkah berjaga-jaga yang perlu diambil untuk mendapatkan bacaan θ yang lebih jitu.

…….

…….

[1 *mark*]

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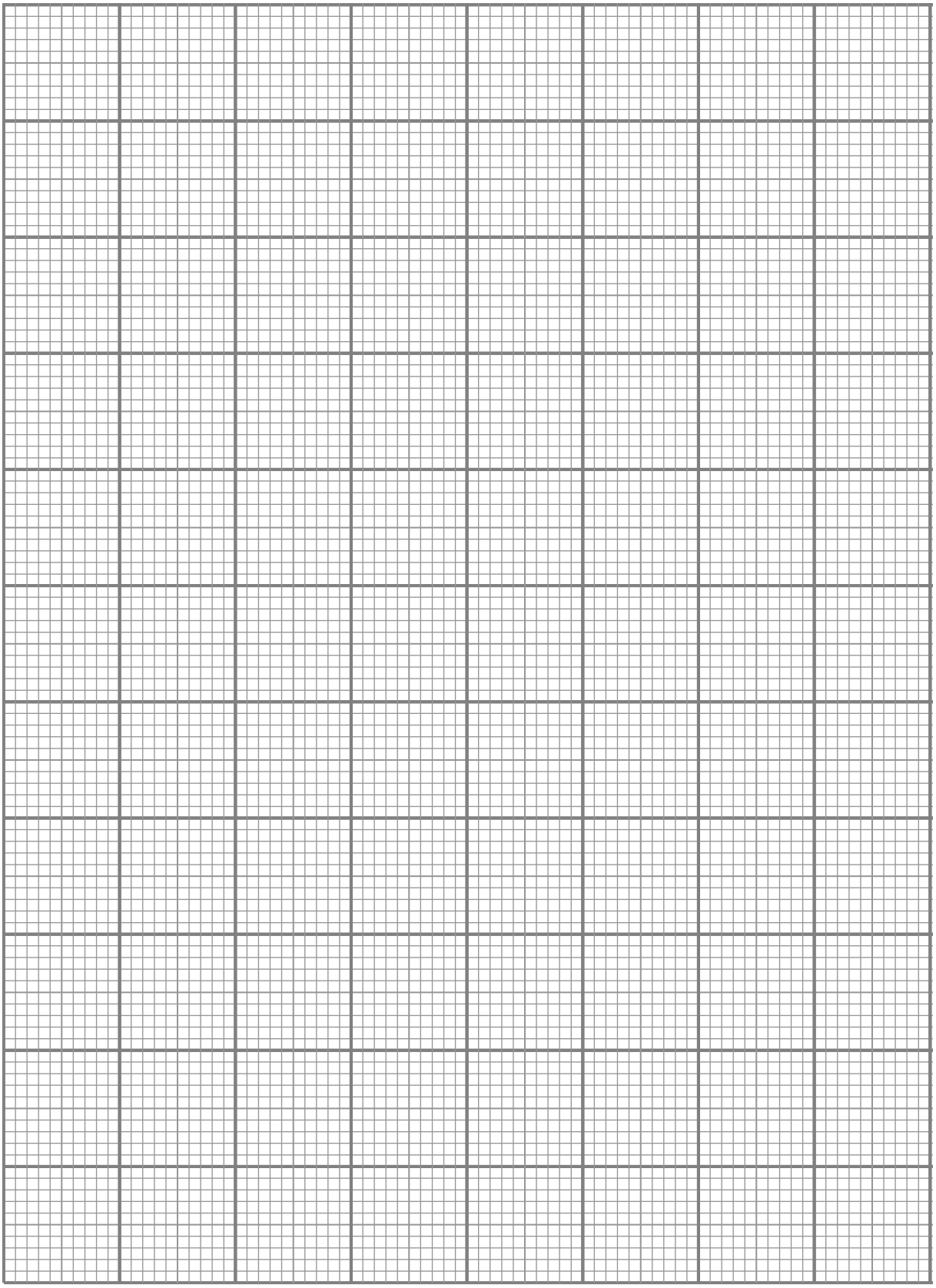
graph of $\Delta\theta$ against t



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2 A student carries out an experiment to study the interference of sound waves. He wants to investigate the relationship of the distance between two coherent sources of sound waves, *a*, and the distance between two consecutives of constructive interference, x. The distance between the sources and the location where the sound is detected, D, is 5 m. The results of the experiment is shown in the graph of x against $\frac{1}{a}$ as in Diagram 2.1.

Seorang murid menjalankan eksperimen untuk mengkaji kesan interferens gelombang bunyi. Dia ingin menentukan hubungan antara jarak dua sumber bunyi yang koheren, a dengan jarak dua interferen membina yang berturutan, x. Jarak antara sumber bunyi dan kedudukan bunyi dikesan, D adalah 5 m. Keputusan eksperimen ditunjukkan dalam graf x melawan $\frac{1}{a}$

(a) Based on the graph in diagram 2.1.
Berdasarkan graf dalam rajah 2.1,

(i) State the relationship between x and 1/a.
Nyatakan hubungan antara x dan 1/a

……...

[1 *mark*]

(ii) Determine the value of x if a = 4 m.
Tentukan nilai x, jika a = 4 m.

[3 *marks*]

(iii) Determine the value of *a* if x = 1.5 m
Tentukan nilai a jika x = 1.5 m

[2 *marks*]

(b) The wavelength of sound waves, λ, is given by the equation
Jika panjang gelombang bunyi, λ, diberi menggunakan persamaan di bawah

$$\lambda = \frac{ax}{D}$$

(i) Calculate the gradient of the graph x against $\frac{1}{a}$.

Kirakan kecerunan graf x melawan $\frac{1}{a}$.

[3 marks]

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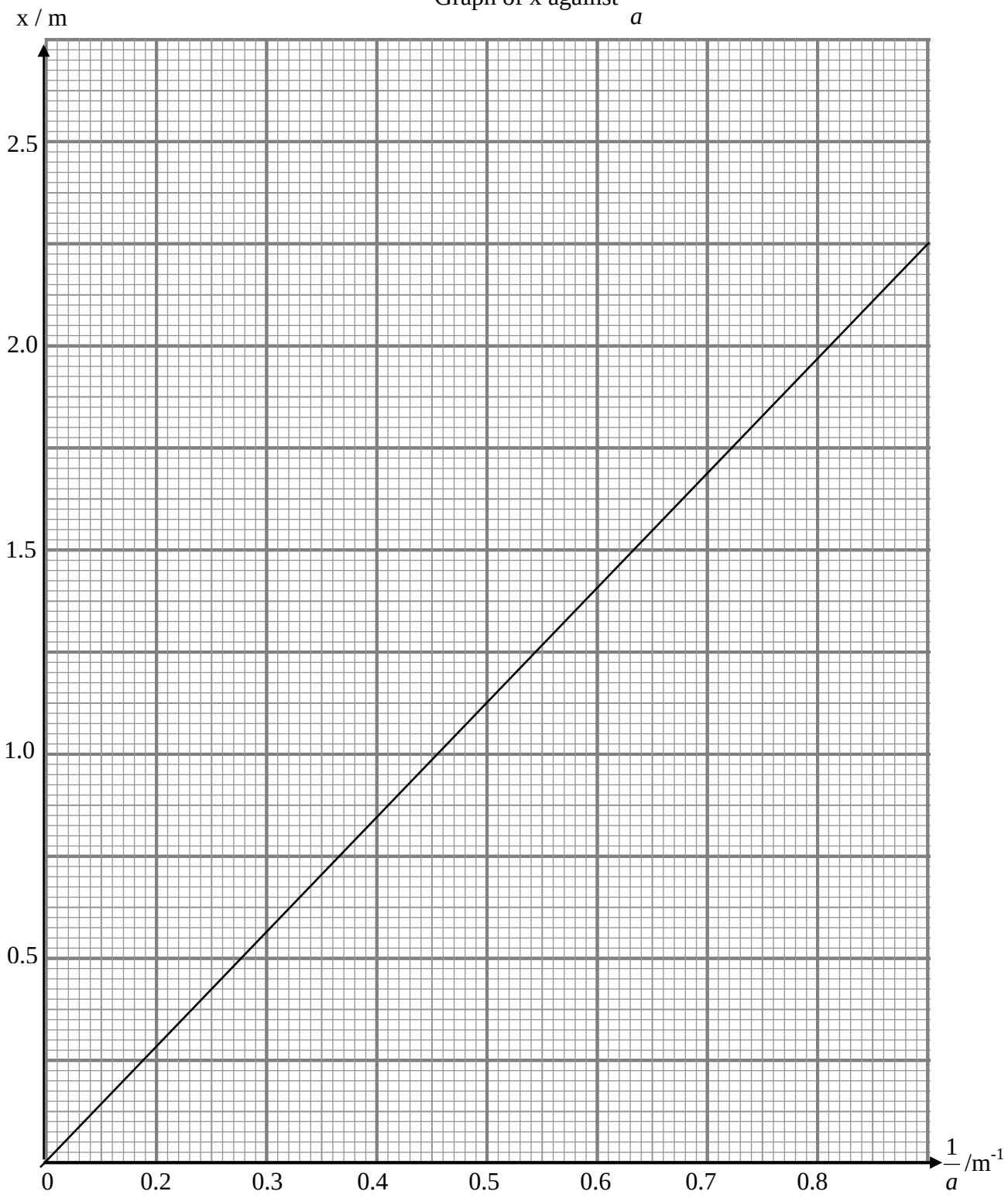
Graph of x against $\frac{1}{a}$



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(ii) By using equation $\lambda = \frac{ax}{D}$ and the value of the gradient obtained in b (i), calculate the wavelength of sound waves, λ, used in this experiment.

Menggunakan persamaan, $\lambda = \frac{ax}{D}$ dan nilai kecerunan yang telah diperolehi dalam b(i), kirakan panjang gelombang bunyi, λ yang digunakan dalam eksperimen ini.

[2 marks]

(c) State one precaution that should be taken to improve the results of this experiment.
Nyatakan langkah berjaga-jaga untuk meningkatkan keputusan eksperimen ini.

……

……

[1 mark]

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SECTION B
Bahagian B

3 Diagram 3.1 shows a student pushed the balloon under the surface of water. When she push the balloon downward, she noticed that the balloon becomes smaller as it moves deeper as shown in Diagram 3.2.

Rajah 3.1 menunjukkan seorang murid menolak sebuah belon ke bawah permukaan air. Apabila dia menolak belon semakin ke bawah di dalam air, dia mendapati saiz belon menjadi semakin kecil seperti yang ditunjukkan dalam rajah 3.2.

DIAGRAM 3.1
Rajah 3.1

DIAGRAM 3.2
Rajah 3.2

Based on the information above:
Berdasarkan keterangan di atas:

(*a*) Make **one** suitable inference.
Nyatakan satu inferens yang sesuai.

(*b*) State **one** appropriate hypothesis that could be investigated.
Nyatakan satu hipotesis yang sesuai untuk kajian ini.

(*c*) Design an experiment to investigate the hypothesis in (b).
Rangkakan satu eksperimen untuk mengkaji hipotesis dalam (b)

Choose suitable apparatus such as a U-tube, rubber tube, thistle funnel, tall beaker and others.
Pilih radas yang sesuai seperti tiub-U, Tiub getah, corong tisel, bikar dan lain-lain radas yang sesuai.

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In your description, state clearly the following;
Dalam penjelasan anda jelaskan penerangan yang berikut;

(i) Aim of the experiment,
Tujuan eksperimen.

(ii) Variables in the experiment ,
Pembolehubah-pembolehubah yang terlibat,

(iii) List of apparatus and materials,
Senarai radas dan bahan,

(iv) Arrangement of the apparatus,
Susunan radas,

(v) The procedure of experiment, which includes the method of controlling the manipulated variable and the method of measuring the responding variable,
Prosedur eksperimen termasuk kaedah pengawal pembolehubah dimanipulasikan dan pembolehubah bergerak balas.

(vi) The way you would tabulate the data,
Penjadualan data,

(v) The way you would analyse the data.
Cara menganalisis data. [10 *marks*]

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4. Diagram 4.1 shows an electromagnetic crane that is able to lift heavy scrapped iron. When the current flow through the electromagnet was decreased, the quantities of scrapped iron lifted were decreased.

Rajah 4.1 menunjukkan kren elektromanet yang boleh mengangkat besi terbuang yang berat. Apabila arus mengalir melalui electromagnet dikurangkan, kuantiti besi terbuang yang boleh diangkat oleh kren berkurang.

Diagram 4.1
Rajah 4.1

Based on the information above:
Berdasarkan keterangan di atas:

(*a*) Make **one** suitable inference.
Nyatakan satu inferens yang sesuai.

(*b*) State **one** appropriate hypothesis that could be investigated.
Nyatakan satu hipotesis yang sesuai untuk kajian ini.

(*c*) Design an experiment to investigate the hypothesis in (b).
Rangkakan satu eksperimen untuk mengkaji hipotesis dalam (b)

Choose suitable apparatus such as some of pins, iron rod, rheostat and others.
Pilih radas yang sesuai seperti pin, rod besi, reostat dan lain-lain radas yang sesuai.

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In your description, state clearly the following;
Dalam penjelasan anda jelaskan penerangan yang berikut;

(i) Aim of the experiment,
Tujuan eksperimen.

(ii) Variables in the experiment ,
Pembolehubah-pembolehubah yang terlibat,

(iii) List of apparatus and materials,
Senarai radas dan bahan,

(iv) Arrangement of the apparatus,
Susunan radas,

(v) The procedure of experiment, which includes the method of controlling the manipulated variable and the method of measuring the responding variable,
Prosedur eksperimen termasuk kaedah pengawal pembolehubah dimanipulasikan dan pembolehubah bergerak balas.

(vi) The way you would tabulate the data,
Penjadualan data,

(v) The way you would analyse the data.
Cara menganalisis data. [10 *marks*]

END OF THE QUESTION PAPER
KERTAS SOALAN TAMAT

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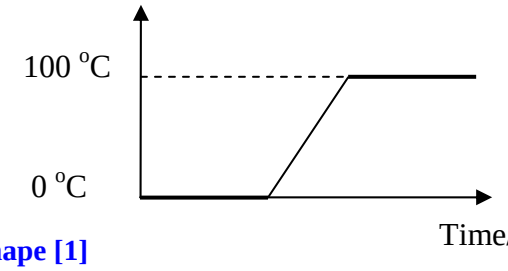
MARKING SCHEME PAPER 2 SPM 2007

SECTION A

No.	Answer	Mark
1(a)	Longitudinal	1
(b)	Compression / compress	1
(c)	Compression to compression // rarefaction to rarefaction	1
(d)	Increases/faster/higher/bigger	1
	TOTAL	4
2(a)	Force per area	1
(b)	1000 x 9.8 x 3 // 1000 x 10 x 3 29 400 Nm^{-2} // 30 000 Pa	1 1
(c)	Pressure at Q is higher // Pressure at P is lower // Q is bigger // P is lower	1
(d)	Depth at Q is higher // Depth at P is lower // P is nearer to water tank	1
	TOTAL	5
3(a)	Latent heat	1
(b)	The heat needed to break the bonds between molecules	1
(c)	1.0 x 4 200 x 100 420 000 J // 420 kJ	1 1
(d)	 Shape [1] Start flat at 0, increases for certain period and flat again at 100 [1]	2
	TOTAL	6
4(a)	Force x distance	1
(b)(i)	220 x 0.5 110 J // Nm// kg m^2 s^{-2}	1 1
(ii)	20 x 9.8 x 0.5 // 20 x 10 x 0.5 98 J // 100 J // Nm	1 1
(c)(i)	The work done by the man is more than the work done by the load.	1
(ii)	Friction // Weight of rope // energy lost // heat produced // sound produced	1
	TOTAL	7
5(a)	The angle of incidence when the angle of refraction is 90° (in box)	1
(b)	The angle of incidence is zero// i = 0 // r = 0 The incident ray is parallel to normal // light pass through at 90 °	1
(c)(i)	Prism P : Increase the angle of incidence //Rotate P anti clockwise// i >45° Prism Q : Decrease the angle of incidence // Rotate Q clockwise// I < 45°	1 1
(ii)	Glass is more denser than air // glass is denser	1
(iii)	Figure 5.1 : refraction / Bending / Bend // away from normal Figure 5.2 : Reflection / Total internal reflection// totally reflected	1 1
(d)	Total internal reflection *(spelling must be right)*	1
	TOTAL	8

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6(a)(i)	Parallel	1
(ii)	The other bulbs will still light up	1
(b)(i)	A bulb that uses 240 V will release power at 60 W	1
(ii)	$I = \frac{60}{240} = 0.25$ A	1
(iii)	$R = \frac{240}{0.25} = 960$ $\frac{1}{R} = \frac{1}{960} + \frac{1}{960} + \frac{1}{960} = \frac{3}{960}$ R = 320 Ω	1 1 1
(iv)	Arrange the bulb in series	1
	TOTAL	8
7(a)(i)	Step down	1
(ii)	Easy to magnetised // Increase the magnetic field // to reduce hysterisis	1
(b)	$\frac{6x1000}{240}$ = 25	1 1
(c)(i)	0.1 x 240 x 0.75 = 18 W	1 1
(ii)	Use laminated soft iron core // use copper wire //use the low resistance coil // use thick wire	1
(d)(i)	Transformer supplies alternating current // TV cannot work on a.c	1
(d)(ii)	Diode / rectifier / LED Series / correct diagram	1 1
	TOTAL	10
8(a)	Radioisotope is an unstable nuclei, decays to be stable by emitting radioactive particles	1
(b) (i)	Longer // 28.5 - can be used for a longer time // save cost// long lasting//no need to replace often	1 1
(ii)	Beta /β - penetrating power is moderate (middle/high) // can penetrate the cardboard // Less harmful // less dangerous	1 1
(iii)	Solid - easy to manage / handle /keep / carry / does not split	1 1
(c)	Strontium-90 // Sr-90 // Sr	1
(d)(i)	Decreases // reduce // lower // low	1
(ii)	Shorter distance between rollers // Rollers press harder // compress more	1
(e)	100 → 50 → 25 → 12.5 → 6.25 5.27 x 4 = 21.08	1 1
	TOTAL	12

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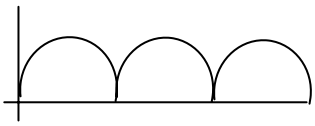
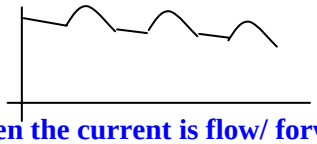
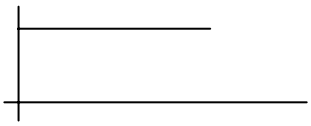
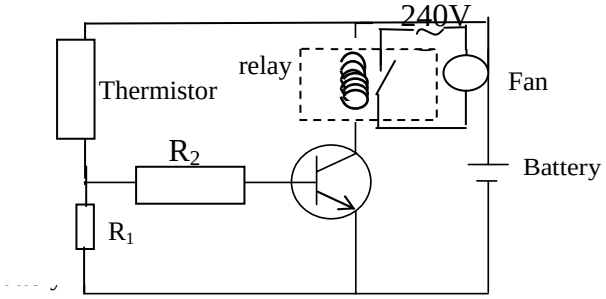
SECTION B

No	Answer	Mark
9(a)(i)	Aerofoil	1
(a)(ii)	1.Higher velocity on the upper surface 2.Lower pressure on the upper surface 3.Lift force = Difference in pressure x Area of surface // $F = (P_1 - P_2) A$	1 1 1
(b)(i)	In diagram 9.2 / 9.4 more upright // less bending // less slanting// In diagram 9.3/9.5 more bending / less upright // more slanting	1
(ii)	In diagram 9.3/9.5 futher landing distance // In diagram 9.2/9.4 shorter landing distance	1
(iii)	The higher the lift force, the further the landing distance// Lift force directly proportional to landing distance	2
(iv)	Long jump//triple jump // air glider//glider The higher the lift force, the further the landing distance // The lift force is directly proportional to the landing distance	1
(c)(i)	Smooth // Coat with wax - reduce water friction	1 1
(ii)	Streamline shape // aerodynamic//torpedo // aerofoil// diagram -reduce water friction	1 1
(iii)	Low density material/ strong material/ fiber glass/ carbon composite// wood// tough material -easy to float / not easy to break / can travel faster/ lighter/ not heavy	1 1
(iv)	Water proof // low density material // plastic// nylon//synthetic polymer// canvas// synthetic fiber -To avoid the sail absorbs water // sail lighter // not easy to tear off// small mass // small load// lighter	1 1
(v)	Wide // big // large - trap more wind // bigger force // increases resistance towards air	1 1
	TOTAL MARK	20

SECTION C

No	Answer	Mark
10(a)(i)	A material with an electrical conductivity between a conductor and an insulator	1
(b)	1.Bulb in diagram 10.1 not lights up 2.Bulb in diagrams 10.2 lights up 3.No current flow in the circuit in diagram 10.1 4.Current flow in the circuit in diagram 10.2 5.In diagram 10.1, positive terminal is connected to the n juntion / reverse biased // diagram 6.In diagram 10.2, positive terminal is connected to the p junction / forward biased // diagram 7.When diode is reverse biased, no current flow, the bulb not lights up When diode is forward biased, the current flow, the bulb lights up	Max 5
(c)(i)		1
(ii)	 or  When the current is flow/ forward biased, the capacitor charged up. When no current / reverse biased, the capacitor discharge	1 1 1
(d)		

Modification	Explanation	
Relay//diagram Relay at collector // diagram	To switch on the circuit/fan	3
Termistor // diagram	Sensitive to heat/temperature	2
Termistor replace R_1// diagram	V_T decrease // V_b increase	2
R_1 replace LDR // diagram	I_b flow // I_c flow	2
Fan and 240 V at secondary circuit in series// diagram	-	1

	TOTAL MARK	20

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No	Answer	Mark
11(a)(i)	$\frac{distance}{time}$	1
(b)	1. Momentum depends on mass and velocity 2. High momentum causes a high impulsive force 3. Inertia depends on mass// higher mass, higher inertia 4. Difficult to stop the lorry// (to move) when the mass is big	4
(c)	1. ABS // Air brake - Lorry does not stop immediately// can be controlled//does not Skidded 2. Two tyres // many tyres // more than two tyres - better support// lower pressure acts on the tyres 3. 5 small tanks // many tanks - reduce inertia //does not shake// increase stability 4. Further distance // far // long // - Prevent collision between the trailer and the tractor// reduce force Tanker R is choosen Because have ABS brake system, two tyres, 5 small tanks and bigger distance between the trailer and the tractor	1 1 1 1 1 1 1 1 1 1
(d)(i)	1. $\frac{45 \times 10^3}{3\,600}$ // 12.5 // $\frac{10}{3\,600}$ // 0.0078 2. $\frac{12.5 - 0}{10}$ 3. 1.25 m s^{-2}	1 1 1
(ii)	1. 1 800 x 1.25 2. 2 250 N	1 1
	TOTAL MARK	20

No	Answer	Mark
12(a)(i)	Frequency // f// wavelength // λ // lamda *(reject F)*	1
(b)	1. High pitch, has high frequency 2. Frequency is inversely proportional to wave length 3. Short wave length will diffract// spread out less // bend less 4. Sound easily diffracted / bending/ spread out	4
(c)	1. Large diameter - receives more signal 2. Same as the focal length - Signals are focused to the receivers // gives out a parallel beam 3. Microwave - has high frequency // high energy // short wave length // easly reflected 4. High - The signal is not blocked // cna detect signal K is choosen Because large diameter of parabolic disc, distance of signal receiver from the centre is the same as the cocal length , transmit microwave, high position.	1 1 1 1 1 1 1 1 1 1
(d)(i)	1. $v = \frac{2s}{t}$ 2. $\frac{2x90}{0.12}$ 3. 1 500 ms^{-1} 4. $\frac{1500}{50x10^{3}}$ 5. 0.03 m **method wrong, answer correct [X]*	5
	TOTAL MARK	20

MARKING SCHEME SPM 2007
PAPER 3

Question	Answer	Marks
1 (a)(i)	**Length of wire** ***Panjang dawai***	**1**
(ii)	**Resistance // Potential difference** ***Rintangan // beza keupayaan***	**1**
(iii)	**Diameter of wire // type of wire //value of current** ***Diameter dawai // jenis dawai // nilai arus***	**1**
(b) (i)	**Record five voltmeter readings correctly** ***Mencatatkan lima bacaan voltmeter dengan betul*** **Diagram 1.2 : 0.4 V** **Diagram 1.3 : 0.9 V** **Diagram 1.4 : 1.3 V** **Diagram 1.5 : 1.7 V** **Diagram 1.6 : 2.2 V** **Note : any three readings correct, award 1 mark** ***Nota : mana-mana tiga bacaan betul, beri 1 markah***	**2**
(ii)	**Calculate the values of R correctly** ***Mengira nilai-nilai R dengan betul*** **Diagram 1.2 : 0.8 Ω** **Diagram 1.3 : 1.8 Ω** **Diagram 1.4 : 2.6 Ω** **Diagram 1.5 : 3.4 Ω** **Diagram 1.6 : 4.4 Ω** **Note : any three values correct, award 1 mark** ***Nota : mana-mana 3 nilai betul, beri 1 markah***	**2**
(iii)	**Tabulate the results correctly** ***Menjadualkan keputusan dengan betul*** **- Values of *I*, V and R shown in the table** ***Nilai I, V dan R ditunjukkan dalam jadual*** **- State the units of I, V and R correctly** ***Menyatakan unit I, V dan R dengan betul*** **- The values of V and R are consistent to one decimal point** ***Nilai I, V dan R tekal kepada 1 titik perpuluhan***	**1** **1** **1**

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I / cm	V /V	R / Ω
20.0	0.4	0.8
40.0	0.9	1.8
60.0	1.3	2.6
80.0	1.7	3.4
100.0	2.2	4.4

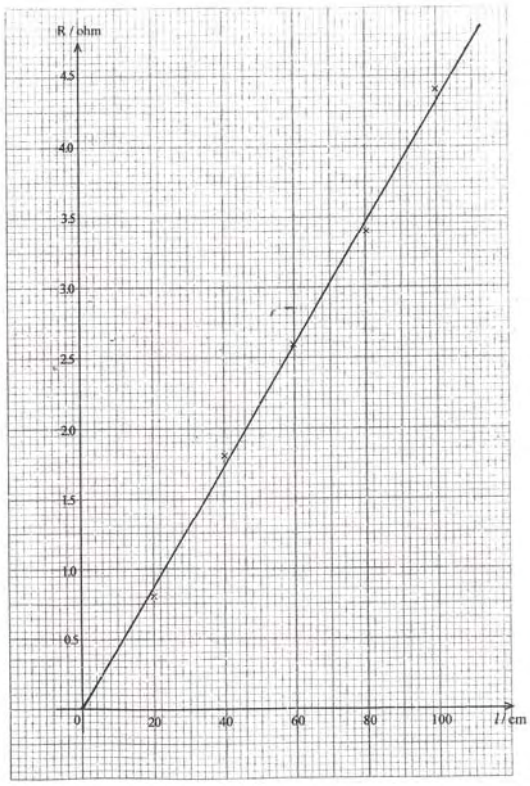
1 (c)

Draw a complete graph of R against *l*

Melukis graf R melawan l yang lengkap

Graph of R against *l*

Graf R melawan l



Tick ✓ based on the following aspects :

Tandakan ✓berasaskan aspek-aspek berikut :

1. **Show R on the vertical-axis and *l* on the horizontal-axis** ✓
   Tunjukkan R pada paksi-menegak dan l pada paksi-Mengufuk
2. **State the units of the variables correctly** ✓
   Nyatakan unit-unit pembolehubah dengan betul
3. **Both axes are marked with uniform scale** ✓
   Kedua-dua paksi ditandakan dengan skala seragam
4. **All five points are plotted correctly** ✓✓
   Lima titik diplot dengan betul

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	Note : only three points plotted correctly, award ✓ . *Nota : hanya tiga titik diplot dapat ✓* **5. Best fit straight line is drawn** *Satu garis lurus penyesuaian terbaik dilukis* **6. Show the minimum size of graph at least 5 x 4 (2 cm x 2 cm) square** **(counted from the origin until the furthest point)** *Menunjukkan saiz minimum graf sekurang-kurangnya 5 x 4 (2 cm x 2 cm) persegi* *(dikira dari asalan hingga titik terjauh)* **Score :** **Number of ✓** / *Bilangan ✓* — **Score** / *Skor* 7 — 5 5 – 6 — 4 3 – 4 — 3 2 — 2 1 — 1	✓ ✓ 5
(d)	**State the correct relationship between R and *I*** *Menyatakan hubungan yang betul antara R dengan I* **Resistance of wire / R is directly proportional to the length of wire / *I*** *Rintangan dawai / R berkadar terus dengan panjang dawai / I*	1
	Total mark	**16**
2 (a) (i)	**Increases** *Bertambah*	1
(ii)	**- show graphical extrapolation correctly** *Menunjukkan ekstrapolasi graf dengan betul* **- state the value within acceptable range (9.5 – 10.5 cm)** *Menyatakan nilai dalam julat yang boleh diterima (9.5 – 10.5 cm)*	1 1
(b) (i)	**- Draw a sufficiently large triangle** *Melukis segitiga yang cukup besar* **- Correct substitution (follow candidates triangle)** *Gantian yang betul (ikut segitiga calon)* **- State the value / answer with correct unit** *Menyatakan nilai / jawapan dengan unit yang betul* **0.208 cm g^{-1}**	1 1 1
(ii)	**- Correct substitution** *Gantian yang betul* **- State the value of k** *Menyatakan nilai k* **4.81 g cm^{-1}**	1 1

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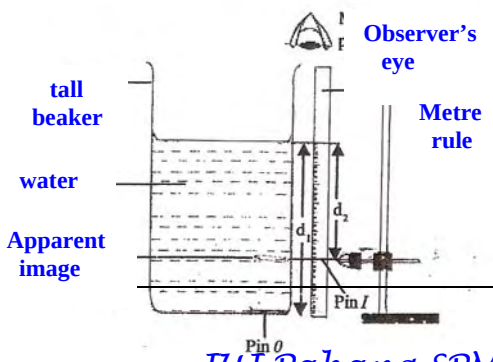
2 (c) (i)	- Correct substitution *Gantian yang betul* - State the value of k' *Menyatakan nilai k'* 2.41 g cm^{-1}	1 1
(d)	- Position of the eye must be align with the pin *Kedudukan mata setentang dengan pin* - Ensure the spring does not swing / at rest when reading is taken *Pastikan spring tidak berayun / dalam keadaan rehat ketika bacaan diambil* - Repeat readings and take average *Ulang bacaan dan ambil purata* (any two relevant responses) *(mana-mana dua jawapan relevan)*	1 1 1 Max 2
	Total mark	16
3 (a)	Depth of water affects the position of image // Position of image depends on the depth of water *Kedalaman air mempengaruhi kedudukan imej // kedudukan imej bergantung kepada kedalaman air*	1
(b)	The more the depth of water, the more the apparent depth of the image *Semakin bertambah kedalaman air, semakin bertambah dalam ketara imej*	1
(c) (i)	To investigate the relationship between the real depth and apparent depth *Mengkaji hubungan antara dalam nyata dan dalam ketara*	1
(ii)	Manipulated variable : real depth Responding variable : apparent depth *Pembolehubah dimanipulasi : dalam nyata* *Pembolehubah bergerak balas : dalam ketara* Constant variable : type of liquid // density of liquid *Pembolehubah dimalarkan : jenis cecair // ketumpatan cecair*	1 1
(iii)	Beaker, water, pins, set of retort stand, metre rule *Bikar, air, pin, set kaki retort, pembaris meter*	1
(iv)		1

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	- a pin is placed at the base of the beaker - another pin is clamped to the retort clamp outside the beaker - *sebatang pin diletak dalam bikar pada dasar bikar* - *sebatang pin lain diapit pada pemegang retort di luar bikar*	
(v)	**State the method to control manipulated variable** ***Menyatakan kaedah mengawal pembolehubah manipulasi*** - **fill beaker with water to a depth of d_1 = 10 cm** - *isikan air dalam bikar pada kedalaman d_1 = 10 cm* **State the method to measure the responding variable** ***Menyatakan kaedah mengukur pembolehubah bergerak balas*** - **move the pin outside the beaker to obtain the apparent position of the pin in the beaker** - **measure the position of the pin from the surface of the water to the pin, h_1** - *gerak pin di luar bikar untuk mendapatkan kedudukan ketara pin dalam bikar* - *ukur kedudukan pin dari permukaan air ke pin, h_1* **Repeat the experiment at least 4 times** ***Ulangi eksperimen sekurang-kurangnya 4 kali*** - **Repeat the experiment by increasing the depth of water : d_2, d_3, d_4, d_5** - **Determine the corresponding apparent depth, h_2, h_3, h_4, h_5** - *Ulang eksperimen dengan menambah kedalaman air : d_2, d_3, d_4, d_5* - *Tentukan dalam ketara, h_2, h_3, h_4, h_5*	**1** **1** **1**
(vi)	<table><tr><th>Depth of water / cm</th><th>Apparent depth / cm</th></tr><tr><td>d_1</td><td>h_1</td></tr><tr><td>d_2</td><td>h_2</td></tr><tr><td>d_3</td><td>h_3</td></tr><tr><td>d_4</td><td>h_4</td></tr><tr><td>d_5</td><td>h_5</td></tr></table>	**1**
(vii)	**Plot a graph of apparent depth against the depth of water** ***Plot graf dalam ketara melawan kedalaman air***	**1**

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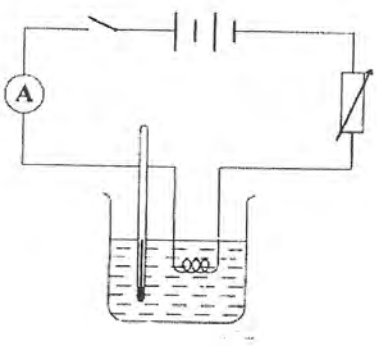
	Total mark	12
4 (a)	**The temperature of water depends on the current** ***Suhu air dipengaruhi oleh arus***	**1**
(b)	**The higher the current, the higher the temperature of the water** ***Semakin tinggi arus, semakin tinggi suhu air***	**1**
(c) (i)	**The study the relationship between the current and the temperature of the water** ***Mengkaji hubungan antara arus dengan suhu air***	**1**
(ii)	**Manipulated variable : current** **Responding variable : temperature** ***Pembolehubah dimanipulasikan : arus*** ***Pembolehubah bergerak balas : suhu*** **Constant variable : volume of water // time of heating** ***Pembolehubah dimalarkan : isipadu air // masa pemanasan***	**1** **1**
(iii)	**Thermometer, power pack, water, stopwatch** ***Thermometer, bekalan kuasa, air, jam randik***	**1**
(iv)	 **Connect the heater, rheostat and ammeter in series with a power pack. Immerse the heater in a beaker of water** ***Sambungkan pemanas, rheostat, ammeter, bekalan kuasa secara bersiri. Masukkan pemanas ke dalam bikar yang mengandungi air.***	**1**
(v)	**State the method to control manipulated variable** ***Menyatakan kaedah mengawal pembolehubah manipulasi*** **Measure the initial temperature of water, θ_0** **Switch on the heater and adjust the rheostat to supply a current, I_1** ***Catat suhu awal air, θ_0*** ***Hidupkan suis dan laraskan rheostat sehingga bacaan arus, I_1*** **State the method to measure the responding variable** ***Menyatakan kaedah mengukur pembolehubah bergerak balas*** **Record the final temperature, θ_1 after 5 minutes**	**1** **1**

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<table>
<tr><td></td><td>Catat suhu akhir, θ_1 selepas 5 minit

Repeat the experiment at least 4 times
Ulangi eksperimen sekurang-kurangnya 4 kali

Repeat the experiment with I_2, I_3, I_4 and I_5 and measure the final temperature, θ_2, θ_3, θ_4, θ_5
Ulang eksperimen dengan I_2, I_3, I_4 dan I_5 dan catatkan suhu akhir air, θ_2, θ_3, θ_4, θ_5</td><td>1</td></tr>
<tr><td>(vi)</td><td><table><tr><th>Current / A</th><th>Final temperature / ^{0}C</th></tr><tr><td>I_1</td><td>θ_1</td></tr><tr><td>I_2</td><td>θ_2</td></tr><tr><td>I_3</td><td>θ_3</td></tr><tr><td>I_4</td><td>θ_4</td></tr><tr><td>I_5</td><td>θ_5</td></tr></table></td><td>1</td></tr>
<tr><td>(vii)</td><td>Plot graph of final temperature against current
Plot graf suhu akhir melawan arus</td><td>1</td></tr>
<tr><td colspan="2">Total mark / Jumlah markah</td><td>12</td></tr>
</table>

END OF MARKING SCHEME

1. CHAPTER 1

Diagram 8

(a) Diagram 8 shows a parachute attached to a man's body whose weight is 65 kg when he jumps off from the plane. The ropes used are very light, strong, 3.5 m long and do not occupy a big space. The table 8 below shows a few types of ropes which could be used to make the parachute.

Ropes	Length	Density	Snapping force	Diameter
J	3.6×10^{2} mm	1.2 gcm^{-3}	450 N	0.30 cm
K	3.6×10^{-3} km	1.5 gcm^{-3}	950 N	7.0×10^{-3} m
L	3.6×10^{2} cm	4.8 gcm^{-3}	650 N	0.50 cm
M	3.6 dm	3.5 gcm^{-3}	1050 N	15 mm

Table 8

(i) What is meant by standard form in writing a numerical value?

[1*mark*]

(ii) You are required to state the most appropriate characteristics of the rope to be used for the parachute. Then, determine which rope from the table above perfectly fits the characteristics that you have given. Justify your answer.

[10 *mark*]

(b) (i) What is meant by scalar and vector quantity.

(ii) Give one example each for scalar and vector quantity.

[3 *mark*]

(c) A coconut falls from a height of 20 m with the increasing rate of velocity 10 ms^{-1} for every second.

(i) Calculate the time taken for the coconut to reach the ground.

(ii) Sketch a graph to show the movement of the coconut for each of the following;
-Velocity against time
- Acceleration against time

[6 *mark*]

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2. CHAPTER 2

(*a*) Spiderman find that when he jumped down from a high building without bending his legs, a loud sound is produced as shown in Diagram 9.1.
But if upon landing, he bends his legs, a soft sound is produced as shown in Diagram 9.2.

'Spiderman' mendapati bahawa apabila beliau terjun dari bangunan yang tinggi tanpa membengkokkan kakinya, bunyi yang kuat dihasilkan seperti ditunjukkan pada Rajah 9.1.
Sebaliknya, jika beliau membengkokkan kaki semasa mendarat, bunyi yang perlahan dihasilkan seperti ditunjukkan pada Rajah 9.2.

Loud landing sound
Mendarat dengan bunyi yang kuat

DIAGRAM 9.1

Soft landing sound
Mendarat dengan bunyi yang perlahan

DIAGRAM 9.2

(i) What is meant by momentum?
Apakah yang dimaksudkan dengan momentum?

[1 *mark*]

(ii) Using Diagram 9.1 and 9.2, compare the time for change of momentum for Spiderman.
Menggunakan Rajah 9.1 dan 9.2, bandingkan kadar perubahan momentum 'Spiderman'.

Relate the time for change of momentum and the force acting on the Spiderman, deduce a relevant physics concept.
Hubungkaitkan masa perubahan momentum,dan kadar perubahan momentum'Spiderman', untuk menyimpulkan satu konsep fizik yang sesuai.

[5 *marks*]

(iii) Name the physics quantity that explain the two situations above.
Namakan kuantiti fizik yang sesuai bagi menerangkan kedua-dua situasi di atas.

[1 *mark*]

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(*b*) In two separate boxing ring, a kick-boxer from Thailand fights without wearing boxing gloves whereas a boxer from Malaysia fights with a pair of boxing gloves.

Dalam dua gelanggang tinju yang berasingan, peninju daripada Thailand berlawan tanpa menggunakan sarung tangan peninju, manakala peninju daripada Malaysia berlawan dengan menggunakan sarung tangan peninju.

Explain who will cause more injury to their opponent if both boxers punch with the same force.

Terangkan peninju yang manakah akan mengakibatkan kecederaan yang teruk kepada lawannya jika kedua-dua peninju mengenakan daya yang sama.

[3 *marks*]

(*c*) Diagram 9.3 shows a model of a school bus.
Rajah 9.3 menunjukkan model sebuah bas sekolah.

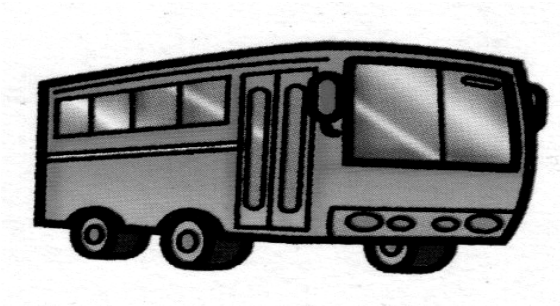

DIAGRAM 9.3

Explain the modification to the bus to help to improve the safety of the passengers and will be more comfortable.
Emphasise your explanation in the following aspects:
(i) the shape of the bus body,
(ii) safety features of the bus.

Terangkan pengubahsuaian pada bas yang boleh meningkatkan keselamatan dan keselesaan penumpang.
Dalam penerangan anda berikan penekanan bagi aspek-aspek berikut:
(i) bentuk badan bas.
(ii) ciri-ciri keselamatan dalam bas.

[10 *marks*]

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3. CHAPTER 2

Figure 9.1 shows a goal keeper catch a ball using a pair of gloves. The ball is stopped within 0.5 s. Figure 9.2 shows a taut racket string is used to hit a tennis ball. The time taken by the racket to hit the ball is 0.01 s. The ball moves at high velocity.

Rajah 9.1 menunjukkan seorang penjaga gol menangkap bola menggunakan sarung tangan. Bola dihentikan dalam masa 0.5 saat.
Rajah 9.2 menunjukkan tali raket yang tegang sedang digunakan untuk memukul bola tenis. Masa yang diambil untuk raket memukul bola adalah 0.01 saat. Bola bergerak dengan halaju yang tinggi.

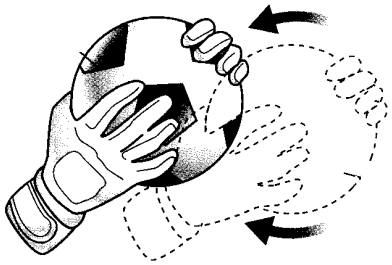

FIGURE 9.1

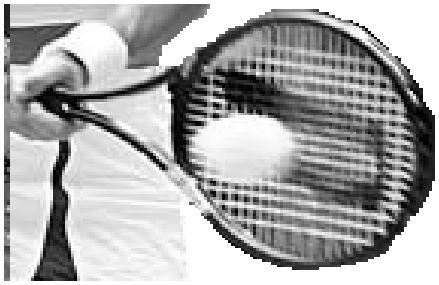

FIGURE 9.2

(a) What is meant by velocity?
Apakah yang dimaksudkan dengan halaju?

[1 *mark*]

(b) Based on Figure 9.1 and Figure 9.2, compare the types of surface used to catch and hit a ball with the time taken. Relate the reaction time and the force to deduce a relevant physics concept.

Berdasarkan kepada Rajah 9.1 dan Rajah 9.2, bandingkan jenis permukaan yang digunakan untuk menangkap dan memukul bola dengan masa yang diambil. Hubungkaitkan masa tindakan dan daya untuk membuat kesimpulan satu konsep fizik.

[5 *marks*]

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(c) Before starting a volleyball match, the ball that will be used must have suitable air pressure. Explain why a low pressured ball is not suitable to be used in volleyball match.

Sebelum memulakan suatu perlawanan bola tampar, bola yang akan digunakan mestilah mempunyai tekanan udara di dalamnya yang sesuai. Terangkan mengapa bola yang kurang tekanan udara di dalmnya tidak sesuai digunakan dalam suatu perlawanan bola tampar.

[5 *marks*]

FIGURE 9.3

(d) Figure 9.3 shows a model of a car. As an engineer, you are given a task to modify the car to be a racing car for a Formula One Grand Prix at Sepang Circuit.
Suggest modifications that need to be done on the car so that

Rajah 9.3 menunjukkan model sebuah kereta. Sebagai seorang jurutera anda ditugaskan untuk membuat pengubahsuaian ke atas model kereta tersebut untuk dijadikan sebuah kereta lumba untuk pertandingan Formula One di litar Sepang. Cadangkan pengubahsuaian yang perlu dilakukan ke atas kereta tersebut supaya

(i) The car can move faster and stable while it is being driven
kereta boleh bergerak dengan lebih laju dan stabil semasa pemanduan

(ii) The car is comfortable and does not bounce when passes bumpy track
kereta selesa dan tidak melambung apabila melalui trek yang tidak rata

(iii) The car's driver is safe if any accident happens.
pemandu kereta selamat jika berlaku kemalangan.

[10 *marks*]

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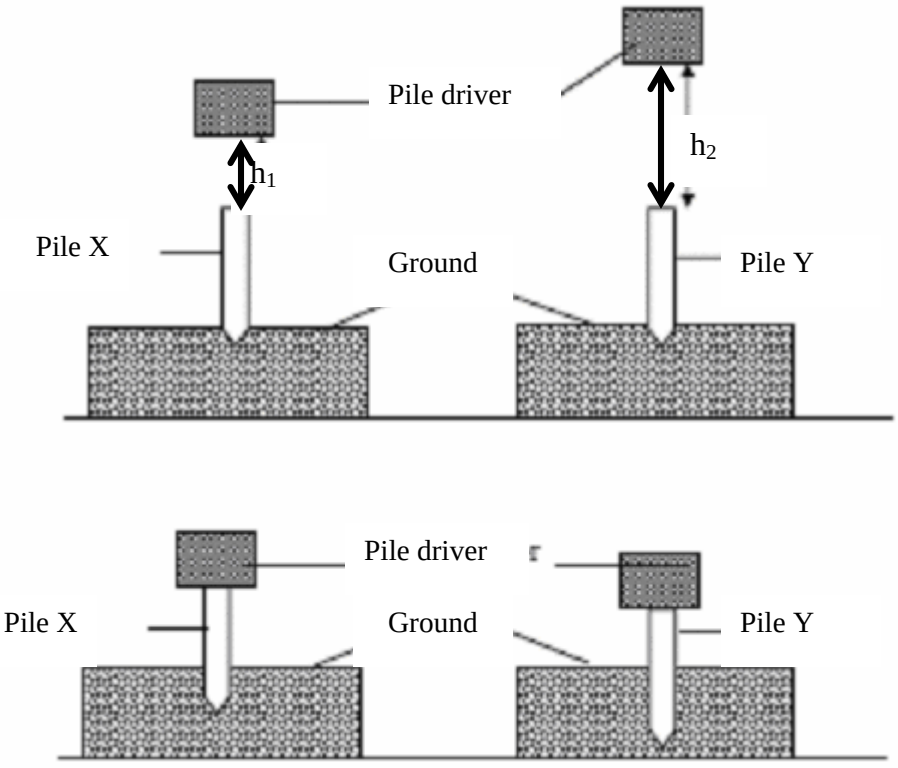
4. CHAPTER 2

Figure 9.1 shows a pile driver being released from different heights to hit a pile which is placed perpendicularly to the ground. The impact causes the pile to sink to different depths into the ground, as shown in figure 9.2.



(a) What is meant by *momentum* ?

[1 mark]

(b) Using figure 9.1 and figure 9.2,

(i) Compare the height from which the pile driver is released.
(ii) Compare the depth the pile is driven into the ground
(iii) State the relationship between the height from which the pile driver is released and the force exerted on the pile.

[5 marks]

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(c) Figure 9.3 shows a worker cutting grass by pushing a lawn mower.

Figure 9.3

Using Physics concept, compare the difficulty of the job when the worker:
(i) pushes the lawn mower
(ii) pulls the lawn mower
(You may use diagrams and label the forces act on the lawn mower)

[4 marks]

(d) Figure 9.4 shows a student pushes a lawn mower of mass 5 kg with a force of 30 N along the handle of the lawnmower. The friction between the lawnmower and the ground is 12 N.

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5. CHAPTER 2

(a) Figure 10.1 shows a spring with a spring constant of 40 Nm^{-1} is being compressed by a trolley of mass 2.5 kg. When the trolley is released, the spring will pushed the trolley forward and causes the trolley to move forward

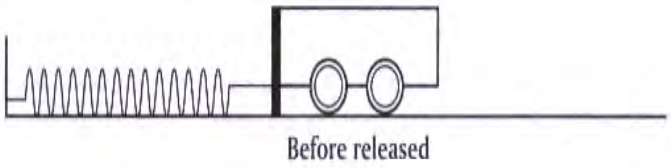

Figure 10.1

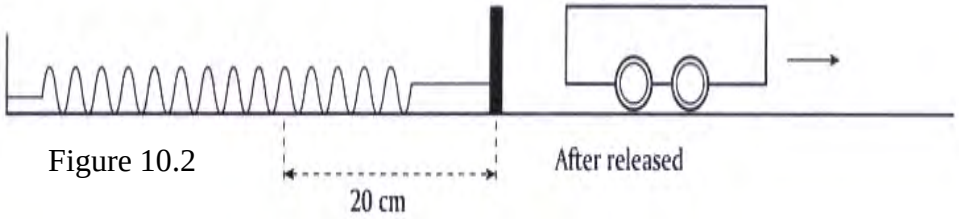

Figure 10.2

(i) Calculate the force that compresses the spring in Figure 10.1.

[3 marks]

(ii) Calculate the potential energy stored in the spring in Figure 10.1.

[3 marks]

(iii) Determine the initial speed of the trolley when it is released.

[3 marks]

(iv) What assumption have you made in part (iii) above ?

[2 marks]

(v) If the trolley stops in 5 s, calculate the average deceleration of the trolley.

[3 marks]

(b) A man of mass 62 kg walks up a flight of staircase which has 50 steps and each steps is 16 cm high in 20 s. Determine…..

(i) the work done by the man [3 marks]

(ii) the power output of the man [3 marks]

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6. CHAPTER 2

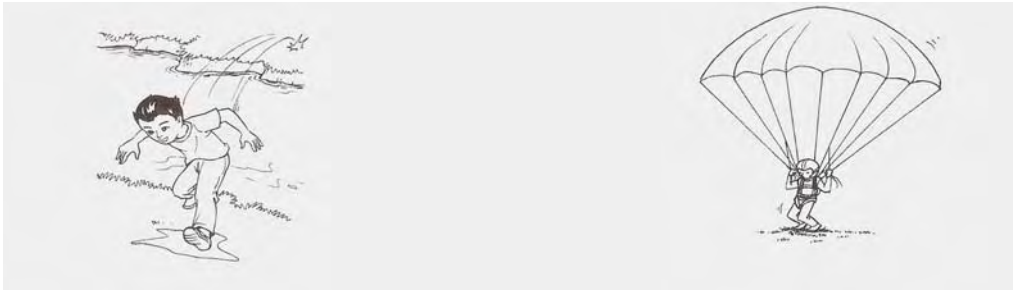

Figure 10.1 Figure 10.2

Figure 10.1 and Figure 10.2 show a student and a parachutist landing.

(a) Based on your observation on Figure 10.1 and Figure 10.2, compare the way student and the parachutist land. Then state the relationship between the two ways.

[5 *marks*]

(b) Safety barriers are put up along certain stretches of highway as shown in Figure 10.3.

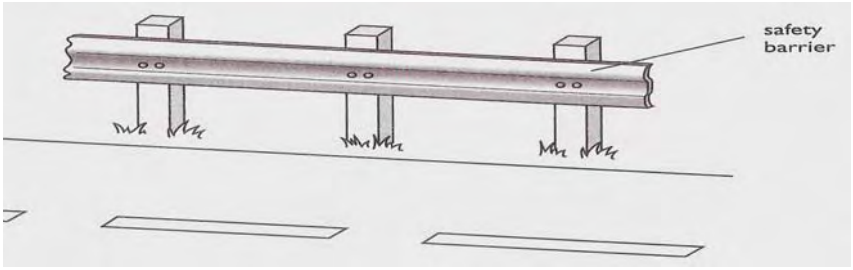

Figure 10.3

(i) Why are the barriers made of metal and not wood?

[1 *mark*]

(ii) Why are the metal barriers corrugated as shown in Figure 10.4 and not flat pieces as in Figure 10.5

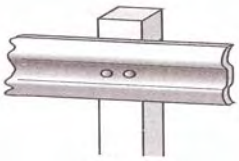

Figure 10.4

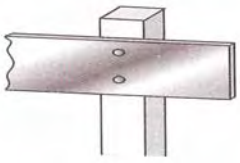

Figure 10.5

[2 *marks*]

(iii) Explain what will happen to the kinetic energy of a car when it collides with a safety barrier.

[2 *marks*]

(c) When a car travelling at a high speed crashes into a barrier, the car driver gets a serious injury. Suggest modifications that can be made to the car to reduce driver injury in a car crash. Explain your answer.

[10 *marks*]

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7. CHAPTER 3

Diagram 9.1 and Diagram 9.2 show how water spurts out from its container when the valve is opened.

Rajah 9.1 dan Rajah 9.2 menunjukkan bagaimana air memancut keluar daripada bekasnya apabila injap dibuka.

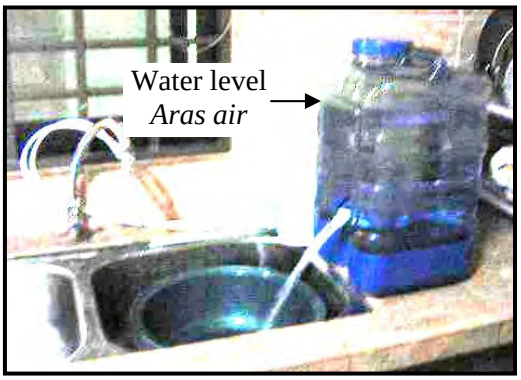

DIAGRAM 9.1 / *RAJAH 9.1*

DIAGRAM 9.2 / *RAJAH 9.2*

When a liquid is held in a container, it exerts pressure on the container.

Apabila cecair diisikan ke dalam suatu bekas, ia mengenakan tekanan pada bekas itu.

(a) What is meant by **pressure**?

*Apakah yang dimaksudkan dengan **tekanan**?*

[1 *mark*]

(b) With reference to Diagram 9.1 and Diagram 9.2, compare the depth of the water in both containers, the rate at which water spurts out and the distance travelled by the water that spurts out.

Merujuk kepada Rajah 9.1 dan Rajah 9.2, bandingkan kedalaman air di dalam kedua-dua bekas, kadar air memancut keluar dan jarak pancutan air yang memancut keluar.

Relate the distance travelled by the water that spurts out to the depth of the water. Hence make a conclusion regarding the relationship between the pressure and the depth of the water.

Hubungkaitkan jarak pancutan air yang memancut keluar dengan kedalaman air. Seterusnya, buat satu kesimpulan tentang hubungan antara tekanan dengan kedalaman air.

[5 *marks*]

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(c) A small bubble of air is released from the bottom of a lake.

Satu gelembung udara kecil dilepaskan daripada dasar sebuah tasik.

(i) Explain what happens to the size of bubble as it rises to the surface of the water.

Jelaskan apa yang berlaku kepada saiz gelembung udara itu semasa ia naik ke permukaan air.

[2 *marks*]

(ii) Explain how this change affects the upward motion of the bubble.

Jelaskan bagaimana perubahan ini mempengaruhi gerakan gelembung itu ke atas.

[2 *marks*]

(d) Diagram 9.3 and Diagram 9.4 show the side view of two different models of a dam made from bricks and concrete.

Rajah 9.3 dan Rajah 9.4 menunjukkan pandangan tepi dua model empangan yang berlainan yang dibuat daripada bata dan konkrit.

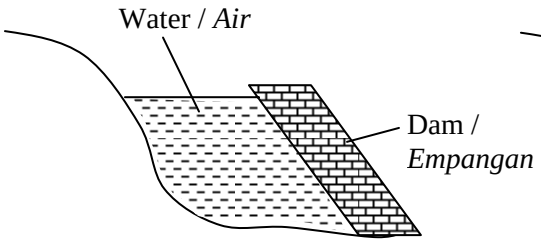

DIAGRAM 9.3 / *RAJAH 9.3*

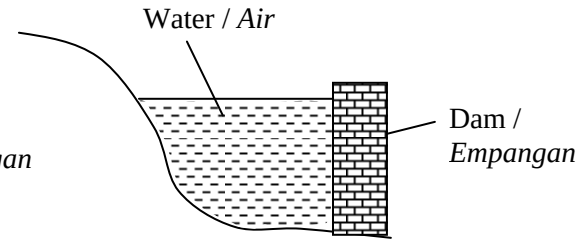

DIAGRAM 9.4 / *RAJAH 9.4*

(i) Which model is preferable? Explain your answer.

Model yang manakah lebih diutamakan? Jelaskan jawapan anda.

[2 *marks*]

(ii) Suggest two uses of the water in the dam.

Cadangkan dua kegunaan air di dalam empangan itu.

[2 *marks*]

(iii) Explain the modifications that need to be made to the dam to enable it to store more water safely.

Terangkan pengubahsuaian yang perlu dilakukan kepada empangan supaya membolehkannya menyimpan lebih banyak air dengan selamatnya.

[6 *marks*]

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8. CHAPTER 3

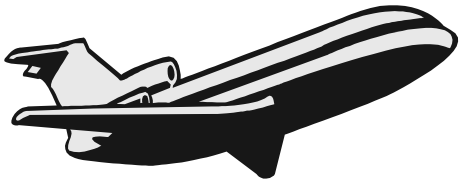

FIGURE 10.1

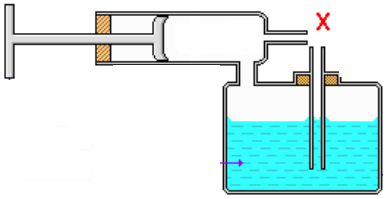

FIGURE 10.2

Figure 10.1 shows an aircraft with wings and body structure that enable it to fly.
Figure 10.2 shows a spray of insecticide that sprays through small hole.

(a) (i) Name the shape of the wing and body of the aircraft.

[1 mark]

(ii) Using Figure 10.1 and 10.2, compare the velocity and pressure of fluid in both situations. Relate the pressure and lift force produced to deduce a relevant physics concept.

[5 marks]

(b) Using a labeled diagram, show four forces acting on an aircraft during a horizontalflight. State the relationship between the four forces when the aircraft flies at constant velocity

[4 marks]

(c) There are good and bad effects from the phenomenon in (a). A roof that is lifted due to strong winds and working principle of a vacuum cleaner are examples of the effects.

(i) Why can a roof be lifted during strong wind?

(ii) Explain how the roof can be modified so that the disaster can be reduced and it can last longer.

[10 marks]

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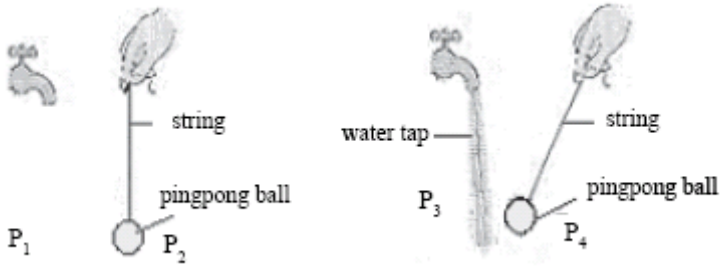
9. CHAPTER 3

(a) Figure 9.1 shows the position of the ping pong ball before the water tap is turned on. Figure 9.2 shows the position of the ping pong ball after the water tap is turned on. P_1, P_2, P_3 and P_4 are atmospheric, while P_3 is air pressure.



(i) What does atmospheric pressure mean?

(ii) Compare the position of the ping pong ball in figure 9.2. Then compare the pressure of P_1, P_2 , P_3 and P_4.
Describe the relationship between pressure water flow from the water tap and the position the ping pong ball to deduce an appropriate physics concept.

[5 *marks*]

(iii) Name the physics prinsiple that explain the situation above.

[1 *mark*]

(b) An aeroplane can fly by using the wings in the form of an aerofoil
(i) Explain how an aeroplane is lifted to the air when it moves with great speed on the runaway.

[3 *marks*]

(c) Figure 9.3 shows an insecticide sprayer.

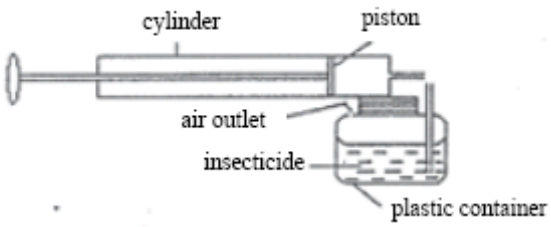


Figure 9.3

Using the appropriate physics concepts to explain how the insecticide-sprayer can be modified to become a car paint sprayer. In your expalaination justify the:
(i) ways to have continuous flow of the spray.
(ii) Velocity of the spray
(iii) Durability and mobility
(iv) Sufficient volume of the paint

[10 *marks*]

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10. CHAPTER 4

Figure 9.1(a)

Figure 9.2 (b)

Figure 9.1(a) shows a boy pouring hot coffee into a cup. The hand of the boy is not scalded by the coffee droplets that are spattered from the kettle. Figure 9.1.(b) shows hot coffee spilling over and getting onto his hand and his hand gets scalded because of the heat capacity in it.

Rajah 9.(1)(a) menunjukkan seorangudak lelaki sedang menuang kopi ke dalam cawan Tangan budak tersebut tidak melecur apabila terpercikair kopi yang panas itu.. Rajah 9.1(b) menunjukkan kopi panas tertumpah ke atas tangannya dan tangannya melecur kerana terdapat muatan haba di dalamnya.

a) What is meant by *heat capacity?* (1 mark)
Apakah maksud muatan haba

b) Using diagrams 9.1(a) and 9.1(b) , compare the situations , when the coffee droplets spatters on his hand and when the hot coffee from the kettle spills onto his hand.
Menggunakan rajah 9.1(a) dan 9.1(b) bandingkan situasi apabila titik-titik air kopi mengenai tangan budak tersebut dan apabila air kopi panas tertumpah ke atas tangannya.

State the relationship between the heat capacity and the mass .
Nyatakan hubungan diantara muatan haba dengan jisim

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(5 marks)

a) Explain why water is normally used as a cooling agent in a car engine.
Terangkan mengapa air digunakan bahan penyejuk dalam enjin kereta

(4 marks)

b) An aluminium pan of mass 500 g is heated from 25° C to 105 ° C . How much heat is absorbed by the pan ?
(The specific heat capacity of almunium is 910 Jkg^{-1} $°C^{-1}$)

Satu kuali almunium berjisim 500 g dipanaskan daripada 25° C ke 105 ° C Berapakah haba yang diserap oleh kuali itu.
(Muatan haba tentu aimunium ialah 910 Jkg^{-1} $°C^{-1}$)

(4 marks)

c) As a researcher, you wish to produce an ideal cooking pan which saves gas for the purpose of cooking. Using the appropriate physic concepts, suggest and explain the modifications required.

Sebagai seorang penyelidik anda ingin mencipta suatu kuali , yang boleh menjimatkan gas apabila memasak. Menggunakan konsep fizik yang sesuai ' cadangkan dan terangkan perubahan –prrubahan yang perlu dilakukan.

(6 marks)

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11. CHAPTER 4

Diagram 9.1 shows an ice cube melting when heat is absorbed from the surrounding.
Diagram 9.2 shows a kettle of water boiling when heat is absorbed from the fire.
Rajah 9.1 menunjukkan seketul ais melebur apabila haba diserap dari sekeliling.
Rajah 9.2 menunjukkan secerek air sedang mendidih apabila haba diserap dari api.

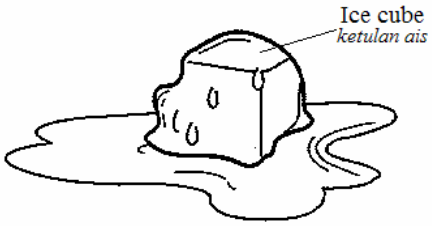

DIAGRAM 9.1

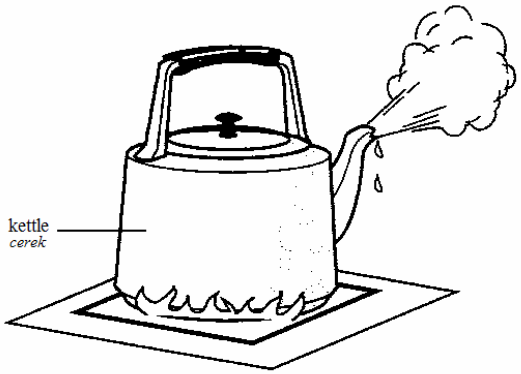

DIAGRAM 9.2

(a) What is meant by heat?
Apakah yang dimaksudkan dengan haba?

[1 *mark*]

(b) Using Diagram 9.1 and Diagram 9.2, compare the processes that take place in both situations and the type of heat needed for both processes to occur.
Relate the processes with the type of heat needed to deduce a relevant physics concept. Name the physics concept involved.
Menggunakan Rajah 9.1 dan Rajah 9.2, bandingkan proses yang berlaku di dalam kedua – dua situasi dan jenis haba yang diperlukan bagi kedua-dua proses itu berlaku.
Hubungkaitkan kedua-dua proses dengan jenis haba yang diperlukan untuk meyimpulkan satu konsep fizik yang sesuai. Namakan konsep fizik yang terlibat.

[5 *marks*]

(c) (i) Your body sweats when you are feeling hot. How does sweating helps to cool down your body?
Badan anda berpeluh apabila panas. Bagaimanakah berpeluh membantu menyejukkan badan anda?

[2 *marks*]

(ii) Explain why a scald from steam is more serious than the one from boiling water?
Terangkan mengapa kesan lecur dari stim lebih serius dari air yang mendidih?

[2 *marks*]

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(d) Diagram 9.3 shows a simple solar water–heating system. Energy from the Sun falls on the solar panel. Water is pumped around the system so that a store of hot water is made available in the tank.

Rajah 9.3 menunjukkan satu sistem pemanasan air yang ringkas. Tenaga dari matahari memancar ke atas panel solar. Air dipam mengelilingi sistem itu supaya simpanan air panas tersedia di dalam tangki.

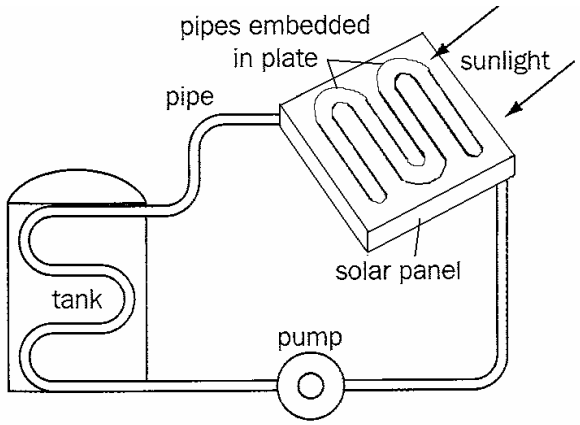

DIAGRAM 9.3

Using suitable physics concepts, explain the required modification needed in designing an efficient solar water-heating system. The modification should include the following aspects:

Dengan menggunakan konsep fizik yang sesuai , terangkan pengubahsuaian yang diperlukan dalam mereka bentuk sistem pemanasan air solar yang cekap. Pengubahsuaian hendaklah mengikuti aspek-aspek berikut:

(i) pipes design
rekabentuk paip

(ii) material used
bahan yang digunakan

(iii) heat absorption
penyerapan haba

[10 *marks*]

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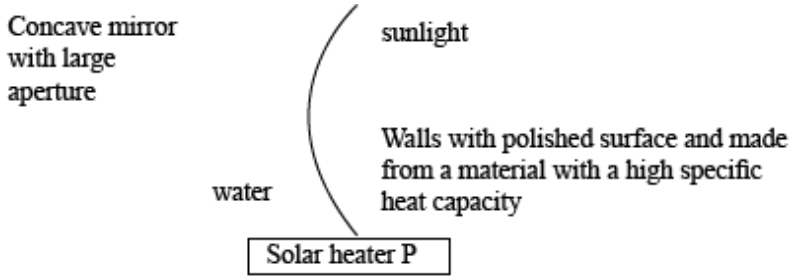
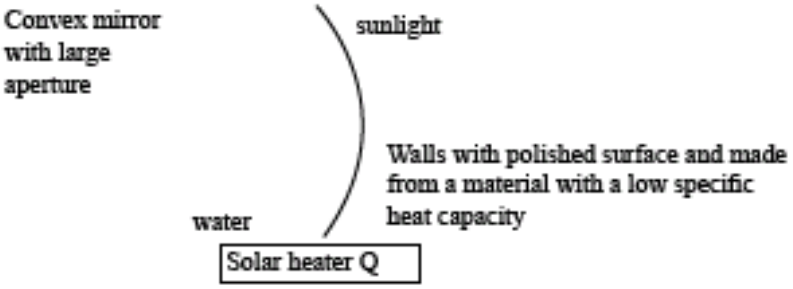
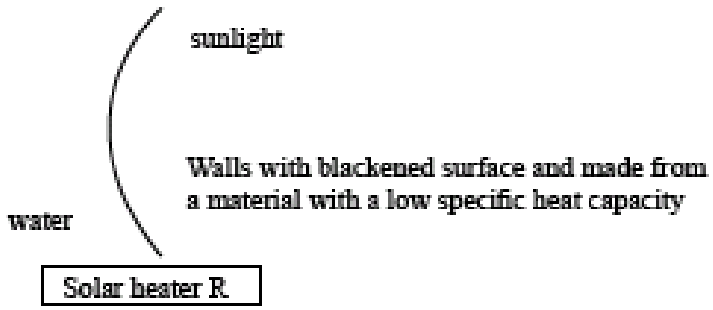
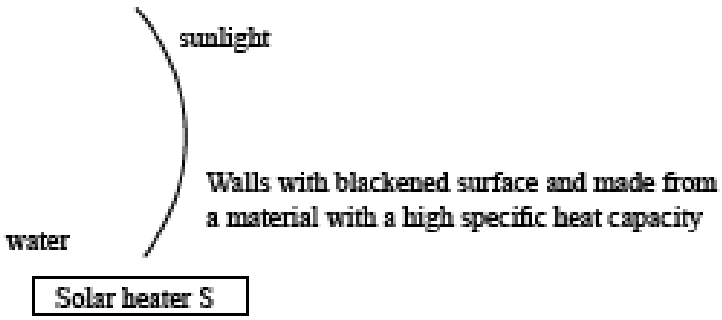
12. CHAPTER 5

You are asked to conduct an experiment on solar energy for the Friends of the Environment Club. You are given the task of designing a solar heater to heat water in a container. You are required to choose one of the four solar heaters P, Q, R, and S shown in Figure 11.1









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(a) State the energy changes that take place in the solar heater.

[1 *mark*]

(b) Based on Figure 11.1,

(i) explain the properties of a solar heater which can quickly heat water.

(ii) determine the most suitable solar heater to quickly heat water and give your reason.

[10 *marks*]

(c) State the advantage of using solar energy over fossil fuels in Malaysia.

[4 *marks*]

(e) 2.0 kg metal tin contins 1.5 kg water at a temperature of 28 ^{o}C. The temperature of the tin and the water increases to 34 ^{o}C after heated for 10 minutes with a 0.08 kW, 240 V heater
[specific heat capacity of water = 4 200 Jkg^{-1o}C^{-1}]

Calculate:

(i) the quantity of heat received by the water

(ii) the specific heat capacity of the metal

[5 *marks*]

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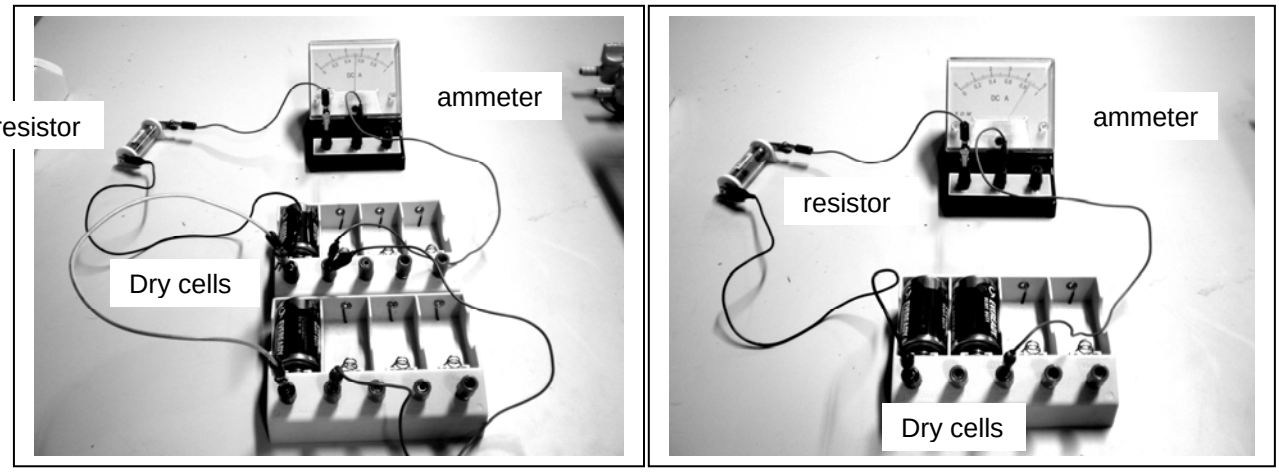
13. CHAPTER 7

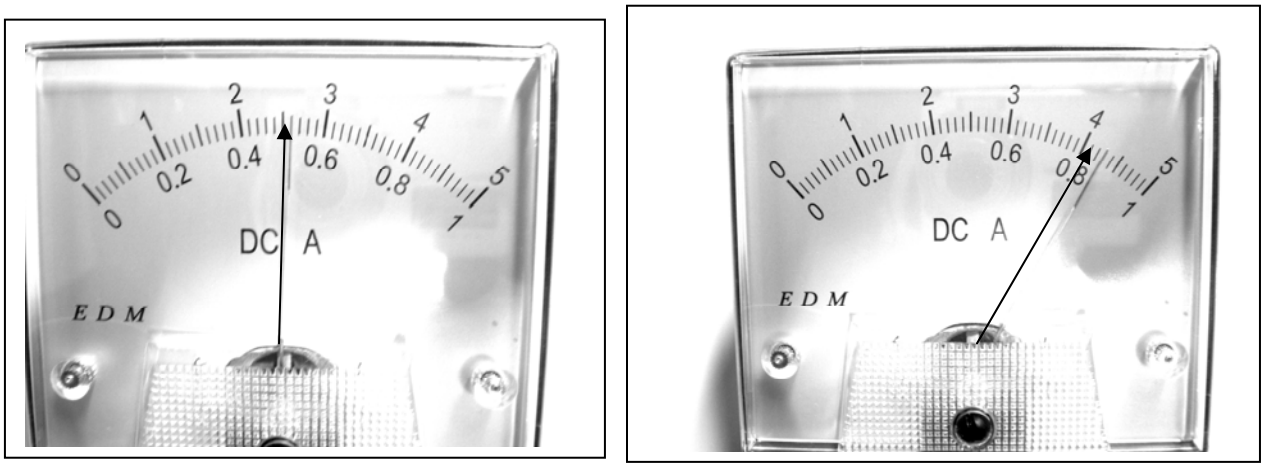
Figure 10.1(a) and Figure 10.1(b) show photographs of two electric circuits. Each circuit contains two identical new dry cells marked 1.5 V, a 2 ohm resistor and an ammeter.
Figure 10.2(a) and Figure 10.2(b) show the reading of the ammeter for each circuit respectively.

Rajah 10.1(a) dan Rajah 10.1(b) menunjukkan fotograf bagi dua litar elektrik. Setiap litar mengandungi dua sel baru yang serupa bertanda 1.5V, satu perintang 2 ohm dan satu ammeter.
Rajah 10.2(a) dan Rajah 10.2(b) menunjukkan bacaan ammeter untuk litar elektik masing-masing.



(a) (b)

FIGURE10.1



(a) (b)

FIGURE 10.2

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(a) State the energy transformations that take place in the dry cell.
Nyatakan perubahan tenaga yang berlaku pada sel kering

[1 *mark*]

(b) Observe Figure 10.1 and Figure 10.2. Compare the arrangement of dry cells in the circuit, the voltage supplied and the reading of the ammeter.

State the relationship between the energy transferred to flow the electric charges around the circuit and
(i) the voltage supplied
(ii) the current flowing around the circuit

Perhatikan Rajah 10.1 dan Rajah 10.2. Bandingkan susunan sel-sel kering di dalam litar, voltan yang dibekalkan dan bacaan ammeter.

Nyatakan hubungan di antara tenaga yang dipindahkan untuk menggerakkan cas elektrik di dalam litar dengan
(i) voltan yang dibekalkan
(ii) arus yang mengalir di dalam litar

[5 *marks*]

(c) Explain why it is more dangerous to touch the live wire of a mains supply, rather than the neutral wire.
Terangkan mengapa adalah lebih merbahaya memegang wayar hidup daripada bekalan utama berbanding dengan wayar neutral.

[4 *marks*]

(d) Diagram 10.3 shows a cabin wiring consisting of a filament lamp, an air conditioner and an electric kettle. The electric supply enters the cabin via meter and fuse box.
Rajah 10.3 menunjukkan pendawaian di satu kabin yang terdiri daripada satu lampu filamen, satu penyaman udara dan satu cerek elektrik. Bekalan elektrik kepada kabin melalui meter dan kotak fius.

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14. CHAPTER 5

Diagram 9.1 shows light ray travelling in an optical fibre. The density of the outer cladding is different compared to the density of the inner core.
Diagram 9.2 shows a driver seeing a puddle of water appearing on the road a short distance ahead of him.

Rajah 9.1 menunjukkan sinar cahaya merambat di dalam sejalur fiber optik. Ketumpatan lapisan pelindung luaran adalah berlainan berbanding dengan ketumpatan pada lapisan teras dalaman.
Rajah 9.2 menunjukkan seorang pemandu melihat setompok air wujud di atas jalanraya pada suatu jarak yang dekat dihadapannya.

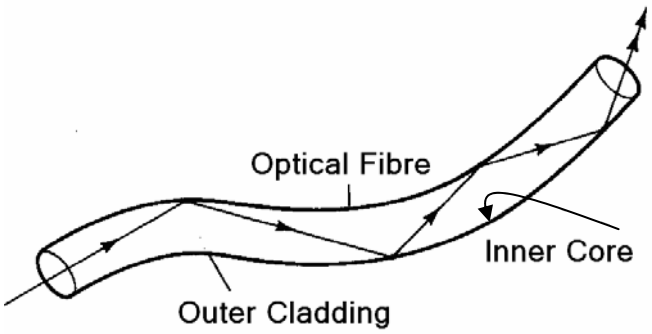

Diagram 9.1/ *Rajah 9.1*

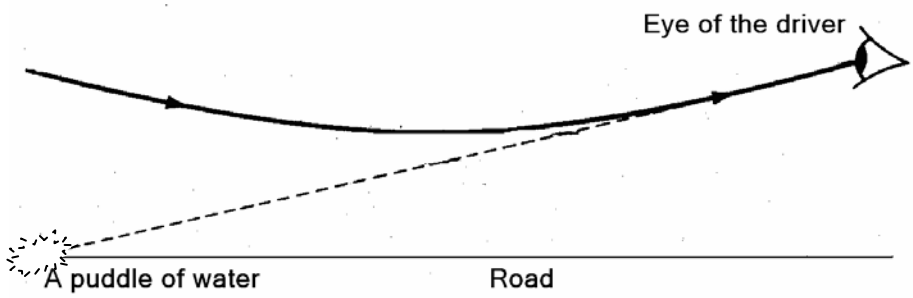

Diagram 9.2 / *Rajah 9.2*

(a) (i) What is meant by density?
Apa yang dimaksudkan dengan ketumpatan?

[1 mark]

(ii) With reference to Diagram 9.1 and Diagram 9.2, compare the densities of the mediums for light propagation and the direction of the light propagation.

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Relate the angle of incidence with the angle of reflection and make a deduction regarding the relationship between the density of the medium for light propagation and angle of incidence.

Merujuk kepada Rajah 9.1 dan Rajah 9.2, bandingkan ketumpatan bagi medium perambatan cahaya dengan arah perambatan cahaya.

Hubungkaitkan antara sudut tuju dengan sudut pantulan untuk membuat satu kesimpulan tentang hubungan antara ketumpatan bagi medium perambatan cahaya dengan sudut tuju.

[5 marks]

(b) Explain how the binoculars is used by a bird watcher to see a bird in the sky.
Terangkan bagaimana binokular digunakan oleh seorang peminat burung untuk melihat seekor burung yang berada di langit.

[4 marks]

(c) You are given two identical prisms and a long pipe to build a simple periscope.

Anda dibekalkan dua prisma yang sama dan satu paip yang panjang untuk membina sebuah periskop yang ringkas.

(i) Using the materials given, describe how you are going to build the simple periscope.

Dengan menggunakan bahan yang diberi, terangkan bagaimana anda akan membina periskop ringkas tersebut.

[8 marks]

(ii) Suggest a modification that can be made to the periscope to produce a bigger image.
Cadangkan pengubahsuaian yang perlu dilakukan terhadap periskop itu untuk menghasilkan imej yang lebih besar.

[2 marks]

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15. CHAPTER 6

Diagram 10.1 shows a bat in a cave is producing a sound wave. The sound wave is received again by the bat after a while.
Diagram 10.2 shows a boy clapping his hands in front of a high wall. The sound is heard again by the boy after a while.

Rajah 10.1 menunjukkan seekor kelawar di dalam sebuah gua menghasilkan gelombang bunyi. Selepas seketika, gelombang bunyi itu diterima semula oleh kelawar tersebut.
Rajah 10.2 menunjukkan seorang budak menepuk tangannya di hadapan sebuah dinding yang tinggi. Selepas seketika, bunyi tepukan tangan itu didengari semula oleh budak tersebut.

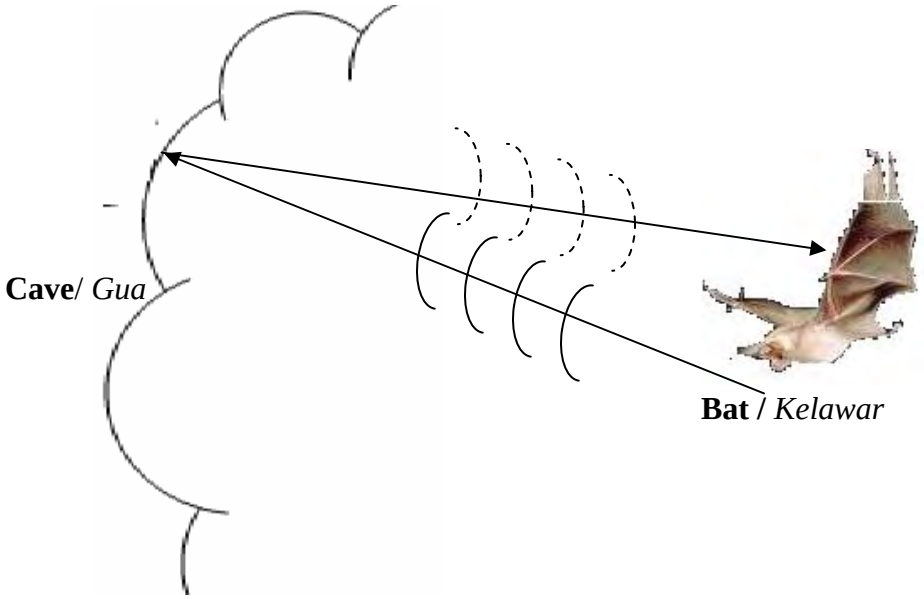

Diagram 10.1

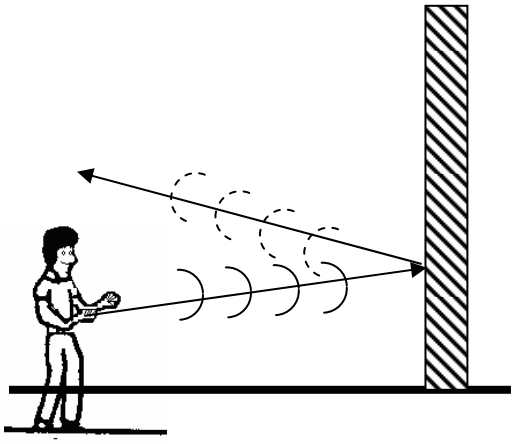

Diagram 10.2

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(a) (i) State a characteristic of sound wave.
Nyatakan satu ciri gelombang bunyi.

[1mark]

(ii) With reference to Diagram 10.1 and Diagram 10.2, compare the wavelength and frequency of the sound waves which strikes the surfaces and received again by the bat and the boy.

Relate the angle of incidence to the angle of reflection and make a deduction regarding the relationship between the wave phenomena and the surface.

Merujuk kepada Rajah 10.1 dan Rajah 10.2, bandingkan panjang gelombang dengan frekuensi gelombang bunyi yang ditujukan kepada permukaan dan diterima semula oleh kelawar dan budak tersebut.

Hubungkaitkan antara sudut penujuan, sudut penerimaan dengan satah untuk membuat satu kesimpulan tentang hubungan antara fenomena gelombang dengan permukaan .

[5 marks]

(b) Explain how a ship can use the Sonar technology to detect objects under the water.
Terangkan bagaimana sebuah kapal boleh menggunakan teknologi Sonar untuk mengesan objek di bawah air.

[4 marks]

(c) Diagram 10.3 shows the side view of a transmitting tower. You are assigned by your company to build a transmitting tower for a local radio station. Before starting the construction, a few aspects of the transmitting waves and materials used in the construction need to be considered. The aspects involved are:

- location of tower;
- size of the transmitting disc;
- the distance between the transmitting disc and the transmitter
- type of wave used for the transmission;
- wavelength for the transmitted wave.

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Anda ditugaskan oleh syarikat anda untuk membina sebuah menara pemancaran bagi siaran radio tempatan. Sebelum memulakan pembinaan tersebut, beberapa aspek berkaitan gelombang pemancaran dan bahan binaan perlu diambilkira. Aspek-aspek yang terlibat ialah:

- *lokasi untuk membina menara pemancaran itu;*
- *saiz untuk cakera pemancaran;*
- *jarak antara pemancar dengan cakera pemancaran;*
- *jenis gelombang yang digunakan untuk pemancaran;*
- *panjang gelombang bagi gelombang pemancar.*

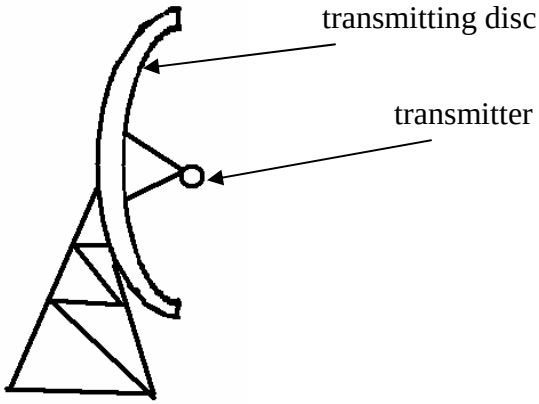

Diagram 10.3

Using the aspects given, describe how you are going to build the transmitting tower.

Dengan menggunakan aspek-aspek yang diberikan, terangkan bagaimana anda akan membina menara pemancar tersebut.

[10 marks]

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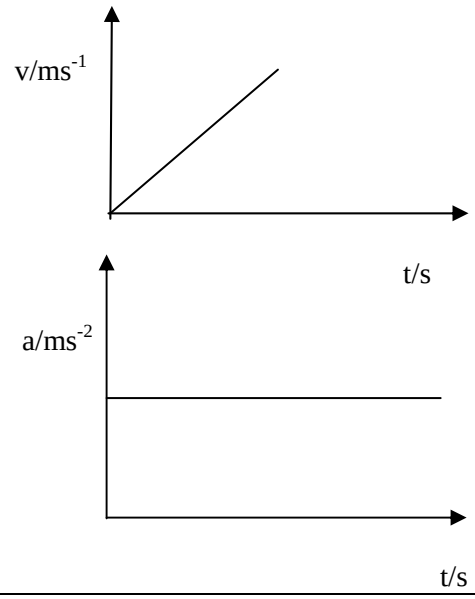
QUESTION 1(CHAPTER 1)

a (i)	A way of representing a numerical value in the form of A X 10^n, where $1 \leq A < 10$ and n is an integer	1
(ii)	- The length of the rope is approximately same as the length needed so that the length is not too long or too short. - The density of the rope has to be small to make it light - The hardness of the rope should be more than the weight of parachutist to ensure that the rope is not easily break. - The diameter of the rope has to be moderate to make it comfortable to hold while controlling the parachute. - The best choice is K because the length is approximately the same as needed, low density, snapping force is bigger than the load and moderate diameter	2 2 2 2 2
b.(i)	Scalar quantity is a physical quantity with magnitude only Vector quantity is a physical quantity with magnitude and direction.	1 1
(ii)	Any example for Vector quantity – Displacement, acceleration Scalar quantity – Distance , speed	1
c.(i)	$20 = 0 + ½ (10)t^2$ t = 2 s	1 1
(ii)		2 2
	TOTAL	**20**

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2. CHAPTER 2

<table>
<tr><td>(a)(i)</td><td>Mass x velocity //product of mass & velocity</td><td>1</td></tr>
<tr><td>(a)(ii)</td><td>
Diagram 9.1 – time for change of momentum is shorter
Diagram 9.2 – time for change of momentum is longer.
Rate of change of momentum produces impulsive force.
Both diagram are involve the impulsive force//change of momentum is involve in the both diagram
Time for change of momentum is longer so the impulsive force is smaller // vice versa</td><td>1
1
1
1
1</td></tr>
<tr><td>(a)(iii)</td><td>Impulsive force</td><td>1</td></tr>
<tr><td>(b)</td><td>Thai boxer
Without wearing boxing gloves, the time for change of momentum is shorter.
The impulsive force is larger</td><td>
1
1
1</td></tr>
<tr><td>(c)(i)</td><td>
<table>
<tr><th>characteristics</th><th>explanation</th></tr>
<tr><td>Reinforced passenger compartment</td><td>The passenger should remain intact during a collision.
It is made of high tensile strength steel that is able to withstand large forces</td></tr>
<tr><td>Crumple zones/ zon mudah remuk
These are specific points at the front and back portion of the car that are made to crumple progressively</td><td>Lengthen the time of collision, hence reduces the impulsive force on the bus.</td></tr>
<tr><td>Safety belt</td><td>Prevent passenger from jerking forward when the bus stop suddently</td></tr>
<tr><td>airbag</td><td>Lengthen the time of collision</td></tr>
<tr><td>Shatter roof windscreen.
Cermin antipecah berderai</td><td>Break into small pieces with blunt edges.</td></tr>
<tr><td>Shape– aerodynamic/streamline</td><td>Reduce the air resistance</td></tr>
<tr><td>Narrower at the front shape</td><td>To decrease air friction</td></tr>
<tr><td>By high strength
and high rigidity of material</td><td>To withstand from break
To withstand from dented</td></tr>
</table>
</td><td>10</td></tr>
<tr><td></td><td>TOTAL</td><td>20</td></tr>
</table>

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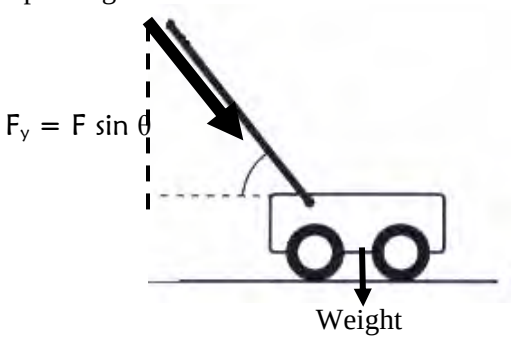
3. CHAPTER 2

(a)	Rate of change of displacement	1
(b)	Figure 9.1 Soft gloves, Figure 9.2 Taut or strain racket string Figure 9.1 Longer time of reaction, Figure 9.2 Shorter time of reaction The *longer time of reaction, The smaller the force exerted //* Impulsive Force Impulsive force is inversely proportional to the time of reaction	1 1 1 1 1
(c)	Low air pressure ball will cause longer time of reaction between ball and hands. Longer time of reaction will decrease the impulsive force because F α 1/t Smaller impulsive force causes the ball to move at low speed and short distance.	1 1 1
(d)	1. Build the car with low density materials -Small mass 2. Lower the car's body - Lower the gravity centre 3. Fix a spoiler to the side, in front and at the back of the car -Give pressure to the bottom (Bernoulli effect) when car is moving at high speed / avoid the car from lifting. 4. Use a strong spring for suspension system -Decrease the vibration when passing bumpy street 5. Build the car's body with hard durable material such as carbon composite -So that the car cannot easily crumple	2 2 2 2 2
	TOTAL	**20**

4. CHAPTER 2

NO. 1	EXPLANATION	MARKS
(a)	The product of mass and velocity	1
(b) (i)	The pile driver of pile Y is higher than pile X	5
(ii)	Pile Y immersed deeper into the ground	
(iii)	→ The higher the height of pile driver released → The greater its velocity before it hit the pile → The greater its momentum changed → The greater the force exerted on the pile	
(c) (i)	When pushing:  	2
(ii)	Resultant vertical component : F sin θ + weight When pulling: Resultant vertical component : weight - F sin θ Resultant vertical component when pulling is smaller than when pushing, hence pulling the lawn mower is easier.	2
(d) (i)	$F_x = F \cos \theta$ $= 30 \cos 52^0$ $= 18.5$ N	2
(ii)	$F = ma$ $18.5 - 12 = 5(a)$ $a = 1.3$ ms^{-2}	2
(iii)	- Label R - Label W	2
(iv)	Normal reaction, R = F sin θ + mg = 30 sin 52 + 50 = 73.6 N	2
(v)	F_x = Friction F cos 52 = 12 F = 19.5 N	2
	TOTAL	**20**

5. CHAPTER 2

1	(a)	(i) F = kx	1
		= 40 x 0.2	1
		= 8.0 N	1
		(ii) Elastic potential energy = 1/2 Fx	1
		= 1/2 x 8 x 0.2	1
		= 0.8 J	1
		(iii) ½ mv^2 = 0.8	1
		½ x 2.5 x v2 = 0.8	1
		v = 0.41 ms^{-1}	1
		(iv) All the elastic potential energy are converted	1
		to kinetic energy	1
		(v) From : v = u + at	1
		0.41 = 0 + 5a	1
		a = 0.082 ms^{-2}	1
	(b)	(i) Work = F x s = mg x h	1
		= 62 x 10 x (50 x 0.16)	1
		= 4.96 kJ	1
		(ii) Power = $\frac{W}{t}$	1
		= 4960 / 20	1
		= 248 W	1
		TOTAL	**20**

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6. CHAPTER 2

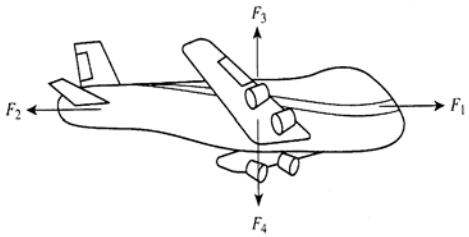
2(a)	- both persons bend their knees when landing - both of them stop - to increase the time of contact when landing - impulsive force is acted - increasing the time of contact will reduce the Impulsive force.	1 1 1 1 1
(b)(i)	The safety barriers are stronger.	1
(ii)	Increase the strength	1
(iii)	Kinetic energy ⟶ heat energy + sound Work is done to bend the safety barriers.	2 1
(c)	1. seat belt for all passengers 2. to prevent from thrown forward during collision. 3. Fit air bags for the driver and passengers 4. to prevent head and body injuries. 5. Crumple zone for front and rear 6. to reduce impulsive force. 7. Shatter-proof windscreen 8. to prevent the windscreen from shattering. 9. Strong steel struts 10. to prevent the collapse of the front and back of the car into the passengers. Also give good protection from a side-on collision.	10

7. CHAPTER 3

(a)	Force exerted per unit area	1
(b)	The depth of the water in Diagram 9.1 is higher than that in Diagram 9.2	1
	The water spurts out in Diagram 9.1 at a higher rate than that in Diagram 9.2	1
	The water spurts out further in Diagram 9.1 than that in Diagram 9.2	1
	The deeper the water, the further the distance of water spurt	1
	The deeper the water, the higher the pressure of the water	1
(c)(i)	The pressure of water increases with the depth of the water	1
	The bubble expands upon reaching the surface of the water//The volume of air bubble increases as the depth of water decreases	1
(ii)	Buoyant force increases as the volume of the bubble increases	1
	The air bubble moving with increasing acceleration	1
(d)(i)	Diagram 9.3	1
	The weight of the dam is supported by the force exerted by the water	1
(ii)	Water in the dam can be filtered and chlorinated to be used as public water supply	1
	To drive turbines for the generation of hydroelectricity// For irrigation//Recreation centre	1
	6 correct suggestion	6
	TOTAL	**20**

8. CHAPTER 3

(a)	Aerofoil	1
(b)	1.High velocity of flow air above the wing and body of an airplane and at the X part of the aerosol *Aliran udara dengan halaju tinggi di bahagian atas kepak dan badan kapal terbang, dan di bahagian muncung X alat penyembur racun serangga.* 2.Pessure above the wing of aero plane and at the X part become lower *Tekanan bahagian atas kepak kapal terbang dan di bahagian muncung X menjadi rendah* 3. Pressure at the bottom of the wing of aero plane and in the aerosol tin becomes higher. *Tekanan di bahagian bawah kepak kapal terbang dan di bahagian dalam bekas cecair racun tinggi* 4. Different pressure will give a lift force to the plane and liquid will push out from the X part. *Perbezaan tekanan ini akan menyebabkan wujudnya daya angkat pada kapal terbang dan cecair ditolak keluar melalui muncung halus X.* 5. The physics concept is fluid pressure will decrease if the velocity of fluid is higher. Concept: Bernoulli's Principle *Konsep fizik tersebut ialah tekanan bendalir akan berkurang jika halaju bendalir tinggi.* *Konsep : Prinsip Bernoulli*	1 1 1 1 1 1 1

(c)	 F1 = Thrust *F1 = Daya tujah ke hadapan* F2 = Drag *F2 = Daya seretan* F3 = lift *F3 = Daya angkat* F4 = weight *F4 = Berat* During horizontal flight at constant speed **Weight = lift** **Drag = thrust** *Semasa penerbangan mengufuk dengan kelajuan malar* *berat = daya angkat* *daya seretan = daya tujah ke hadapan*	 1 1 1 1

(d)	An aerofoil roof will be easily lifted by strong wind. Pressure above and under the roof will be different when the air flows at high velocity and produces lift force to the roof. *Bumbung yang berbentuk aerofoil akan mudah terangkat oleh angin kencang. Beza tekanan antara atas dan bawah bumbung apabila udara bergerak dengan halaju tinggi akan menghasilkan daya angkat pada bumbung itu.* 1. Build an extra shape on the top of the roof to slow down the flow of air. This method can decrease the pressure effect under the roof. *Membina bentuk tambahan di bahagian atas agar dapat memperlahankan aliran angin di bahagian atas bumbung. Ini dapat mengurangkan kesan tekanan di bahagian bawah bumbung.* 2. Firmly fix the roof with firm material to prevent it from break and crack *Bumbung dikukuhkan bahan yang mempunyai kekuatan tinggi agar tidak pecah dan retak.* 3. Firmly fix the roof with modest density material which is not too light or heavy to avoid it from being flown away by wind or collapse during strong wind. *Bumbung dibina dari bahan berketumpatan sederhana supaya tidak terlalu ringan yang akan diterbangkan oleh angin dan tidak terlalu berat menyebabkan runtuh apabila angin kuat* 4. Build the roof from corrugated material to let the rain water flow passing through it. *Bumbung diperbuat daripada bahan beralun /berlekuk-lekuk dan agar aliran air hujan boleh mengalir melaluinya.* 5. Lean the roof to avoid accumulation of rain water. Firmly fix the roof with screw and nail which is suitable with the beam to withstand blowing wind. *Bumbung dicondongkan agar air hujan tidak dapat bertakung* *Bumbung dikukuhkan dengan memasang skru dan paku yang kuat dan sesuai dengan keadaan kayu alang agar menahan tiupan angin.*	1 1 1 1 1 1 1 1 1 1
	TOTAL	**20**

9. CHAPTER 3

Number	Answer	Mark
(a)(i)	The pressure because of air mass /atmospheric	1

(ii)	1.The ping pong in figure 9.2 is pushes to the water flow
	2.P1 = P2 // atmospheric pressure.
	3.P3 < P4
	4.When air is flowing the surrounding pressure was reduced
	5.P3 > P4
	6.The ping pong ball is pushed to low pressure / to water flow
	7.Bernoulli's principle
		Max 5

(iii)	Bernoulli's principle	1
(b)	1. The upwards air velocity of the wing / aerofoil is greater 2. The upwards pressure of the wing / aerofoil is higher 3. The different between upwards and downwards of the wing produced lifted force.	3
(c)	1. Used air gun – to obtain continuous air flow 2. The narrow of the jet/ the thin air gun – air flow is greater 3. Paint container made from metal – not easy to break 4. Used the low density of metal – light and mobility/ easy to manage 5. The volume of the paint container is bigger – no need to refill	10
	TOTAL MARK	**20**

10. CHAPTER 4

a) The total amount of heat in a body
b) 1. the temperature of oil droplet = the temperature of oil poured on the hand
2. the oil droplets have smaller heat capacity
3. the oil poured on the hand has greater heat capacity
4. the heat capacity of droplets transferred to the hand is smaller compared to that of the poured oil
5. The bigger the mass of an object, the bigger the heat capacity of the object

c) 1. It doesn't react to the inner part of the engine
2. high specific heat capacity
3. can absorb large amount of heat energy
4. cheap and easily available

d) 1.& 2. : Q = 0.5 x 910 x 80
3 & 4 :. Q= 364 J

e)

Modification	Reasons
1 .low heat capacity 3. the lid of the pan designed to lower the air pressure inside the pan 5. the lid of the pan made of substance which has weak conductivity of heat	2. the pan can get hot quickly 4. the boiling point of water decreased 6. heat will not absorbed by the lid, so heat will not lost to surrounding

11. CHAPTER 4

Number	Answer	Mark
9 (a)	Heat is the quantity of energy that is transformed from one hot object to a cold object.	1
(b)	1-Figure 9.1 shows a situation where a solid changes into liquid / 2- Figure 9.2 shows a situation where a liquid change into gas 3-Both processes require heat. 4-The heat absorbed is not to raise the temperature, to overcome the force between the molecule particles during the physical change. 5-Concept involved is Latent Heat	1 1 1 1 1
(c)(i)	1-Water evaporates from the skin when we sweat. 2-for water to evaporate it absorb heat from the body	1 1
(ii)	1-Steam has more heat than boiling water 2- due to latent heat of vaporization	1 1
(d)	<table><tr><th>Suggestion</th><th>Explanation</th><th></th><th></th></tr><tr><td>Use insulator behind the absorber panel</td><td>To prevent the loss of heat energy // heat from entering home</td><td>2</td><td></td></tr><tr><td>Use an absorber panel which is painted black.</td><td>A black surface is a good absorber of radiation so it will absorb heat faster</td><td>2</td><td></td></tr><tr><td>The pipe inside the plate must be made of metal / copper</td><td>Metal is a good heat conductor, so it will transmit heat to water easily</td><td>2</td><td></td></tr><tr><td>Increase the number of coil of pipe embedded in plate</td><td>Increase in surface area helps heat to be absorbed faster.</td><td>2</td><td></td></tr><tr><td>Increase the number of coil pipe in the water tank</td><td>More heat is released in the water Tank</td><td>2</td><td></td></tr><tr><td>Lower specific heat capacity of liquid in the pipe</td><td>Liquid heats up and transfer heat to water in tank faster.</td><td></td><td></td></tr><tr><td>High boiling point liquid in pipe</td><td>Liquid does not vaporize easily</td><td></td><td></td></tr><tr><td>Use glass cover on the top of the panel</td><td>Tap trap heat energy. (energy Radiated in, but cannot radiate out again)</td><td></td><td></td></tr></table>Any five suggestions and explanation[10 marks]	
	TOTAL MARK	20

12. CHAPTER 4

<table>
<tr><td>(a)</td><td>Solar energy → heat energy</td><td>1</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><td>Characteristic</td><td>Reason</td></tr>
<tr><td>Used concave mirror</td><td>Reflecting and converging solar energy to solar heater</td></tr>
<tr><td>Concave mirror with small curvature aperture</td><td>Short focal length /more converged</td></tr>
<tr><td>Wall with blackened surface</td><td>Rate of absorption of solar heat is high</td></tr>
<tr><td>Low specific heat capacity</td><td>Container is easy to hot and easy to transfer heat to water</td></tr>
</table>
R is choosen

Because of it used concave mirror, Concave mirror with small curvature aperture, Wall with blackened surface and low specific heat capacity</td><td>10</td></tr>
<tr><td>(c)</td><td>1. It's easy to renew
2. Cheap
3. Pollution is not happened
4. Malaysian have a sun light fot the hold year</td><td>4</td></tr>
<tr><td>(d)(i)</td><td>Q = 1.5 x 4 200 x 6
= 37 800 J</td><td>2</td></tr>
<tr><td>(ii)</td><td>80 x 600 = 48 000 J
48 000 – 37 800 = 10 200
$Q = \frac{1.2 \times 10^6 \text{ J}}{400} = 850 \text{ J}$</td><td>3</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>20</td></tr>
</table>

13. CHAPTER 7

<table>
<tr><th>NO.</th><th>Answer</th><th>Mark</th></tr>
<tr><td>10 (a)</td><td>Chemical energy → electrical energy</td><td>1</td></tr>
<tr><td>(b)</td><td>1 Figure 10.1(a): The dry cells connected in parallel,
Figure 10.1(b): The dry cells connected in series
2 The voltage supplied in Figure 10.1(a) is smaller
3 The ammeter reading in Figure 10.2(a) is smaller
4 The greater the voltage supplied, the greater the energy transferred to flow the electric charges around the circuit // directly proportional
5 The greater the current flowing around the circuit, the faster that the energy is transferred</td><td>1

1
1
1

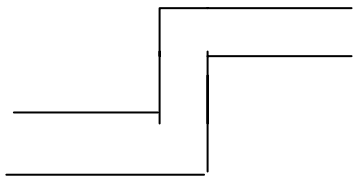
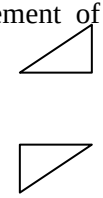
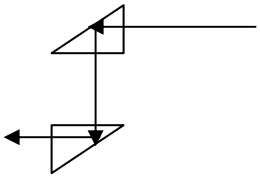
1</td></tr>
<tr><td>(c)</td><td>1 Our bodies are at earth potential (0V)
2 If we touch the live wire, there will be a large potential difference (p.d) the live wire and our body. A large current flow through it, probably fatal.
3 The neutral wire stays at earth potential (0V), roughly at the same potential as our bodies.
4 If we touch the neutral wire, there is no p.d. across us and so no current flows.</td><td>2

2</td></tr>
<tr><td>(d)</td><td><table>
<tr><th>Suggestion</th><th>Explanation</th></tr>
<tr><td>The electric appliances are connected in parallel//diagram</td><td>If one broke down the others can still function</td></tr>
<tr><td>Fit a switch in series with the appliance</td><td>Allow each electric appliances to be switched on and off independently</td></tr>
<tr><td>Fit fuse at the live wire in the fuse box //diagram// Use miniature circuit breakers (mcb’s)</td><td>To stop the flow of current by melting when a high voltage of electric current flows through the circuit // switches itself off very quickly if the current exceeds e.g. 15A (for 15A mcb)</td></tr>
<tr><td>Earth connection to the metal case of electrical appliances</td><td>Earth wire connected to earth, so that when a fault occurs and a current flows through the live wire and the earth wire, the fuse in the live wire will blow and cut off the supply. It will protect a person who may touch a faulty or live appliance</td></tr>
<tr><td>Use low power lamps / install fluorescent lamp / Regularly cleaning and removing dust from the air filters of air conditioners / Do not put more water in a kettle than needed for hot drinks</td><td>To save the electrical energy</td></tr>
</table></td><td>2

2

2

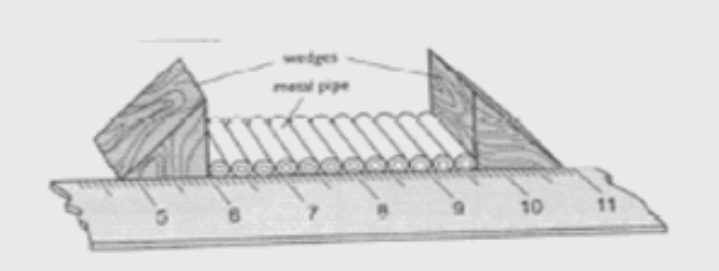
2</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>20</td></tr>
</table>

<table>
<tr><td></td><td>14. CHAPTER 5</td><td></td></tr>
<tr><td>(a)</td><td>(i) Density = force / volume</td><td>1</td></tr>
<tr><td></td><td>(ii)
1. Light travels from an optically denser medium to a less optically denser medium
2. angle of incidence > critical angle
3. total internal reflection occurs
4. angle of incidence = angle of reflection
5. Total internal reflection occurs when the angle of incidence > critical angle and light travels from an optically denser medium to optically less dense medium</td><td>5</td></tr>
<tr><td>(b)</td><td>Answer from the diagram drawn by the student
1. Two prisms
2. angle in the prism = 45°
3. angle of incidence > critical angle
4. Total internal reflection occurs twice for each prism</td><td>4</td></tr>
<tr><td>(c)</td><td>
<table>
<tr><th>Suggestion</th><th>Explanation</th></tr>
<tr><td>1. Shape of the pipe
  </td><td>2. light follows the path</td></tr>
<tr><td>3. angle in the prism = 45°</td><td>4. angle of incidence > critical angle</td></tr>
<tr><td>5. Arrangement of prisms
  </td><td>6. light follows the path after total internal reflection</td></tr>
<tr><td>7. Mark given to the light path
  </td><td>8. show the direction of the light</td></tr>
</table>
</td><td>10</td></tr>
<tr><td>(ii)</td><td>- Add a convex lens
- The object distance is less than f</td><td>2</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>20</td></tr>
</table>

15. CHAPTER 6

<table>
<tr><td>(a)</td><td>Longitudinal wave / needs a medium to propagate</td><td>1</td></tr>
<tr><td>(b)</td><td>1. Wavelength before and after reflection is the same.
2. Frequency before and after reflection is the same.
3. Reflection occurs
4. Angle of incidence = angle of reflection
5. Reflection can occur when wave is incident on a reflective surface</td><td>5</td></tr>
<tr><td>(c)</td><td>1. Ultrasonic wave is used
2. must have transmitter and receiver
3. Reflection occurs
4. Distance of the object = ½ vt, v = velocity of the wave, t = time taken for transmitting the wave</td><td>4</td></tr>
<tr><td>(d)</td><td><table><tr><th>Suggestions</th><th>Reason/Explanation</th></tr><tr><td>Location : hill</td><td>Can receive more wave</td></tr><tr><td>Size of the disc : Big</td><td>Receives more information</td></tr><tr><td>Distance = f</td><td>Waves transmitted are parallel</td></tr><tr><td>Microwave is used</td><td>Higher frequency / can travel further</td></tr><tr><td>Long wavelength</td><td>Diffracts easily /Clear transmission over a long distance.</td></tr></table></td><td>10</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>20</td></tr>
</table>

1. MEASUREMENT (CHAPTER 1)



The figure above shows the arrangement of apparatus to determine the external diameter of a metal pipe.

(a) (i) What is meant by *diameter?*

[1 mark]

(ii) Explain the function of the wedges used in the set up of the apparatus shown in the figure above.

[2 marks]

(b) The table below shows the characteristics of some instruments of measurement K, L, M and N that are used for measuring a quantity of length.

Instrument	Smallest division on the scale	Range of measurement	Ability to measure diameter	Level of sensitivity
K	0.1 cm	A few metres	Able with the help of set squares	Low
L	0.01 mm	Less than 2 cm	Able	High
M	0.1 cm	Up to 1 m	Able with the help of set squares	Low
N	0.01 cm	Up to 10 cm	Able	Average

Based on the table, explain the suitability of the characteristic of the instruments for measuring the internal diameter of a beaker. Determine which instrument is most for measuring the internal diameter of the beaker. Justify your choice.

[10 marks]

(c) You are given a piece of copper wire, glass rod and a meter rule.

(i) Explain how the diameter of the copper wire can be determined

[4 marks]

(ii) A few turns of the copper wire produced a displacement of water of volume 0.5 cm^3 when the wire is placed in water. Calculate the length of copper wire used if the diameter of wire is 0.1 mm

[3 marks]

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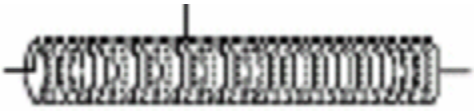
2. SPRING (CHAPTER 2)

Figure shows a spring A with a spring constant of 10 Ncm^{-1} and a spring B with a spring constant of 8 Ncm^{-1}.

Spring A

Spring B



(a) (i) State *Hooke's Law*?

[1 mark]

(ii) If a force of equal magnitude is applied to both spring A and spring B, which spring would be more difficult to compress? Give reasons for your answer.

[2 marks]

(iii) If both spring A and spring B obey Hooke's law, sketch a force, *F* against extension, *x* graph.

[2 marks]

(b) Table 2 shows the characteristics of springs R, S, T and U which are of the same diameter and length.

Metal spring	Density/ kg m^{-3}	Spring constant/ Ncm^{-1}	Rate of rust	Metal characteristic
R	8000	400	High	Elastic
S	7900	500	Intermediate	Rigid
T	8900	300	Intermediate	Rigid
U	7500	200	intermediate	Elastic

List and explain the suitable characteristic needed for a spring to be used as a shock absorber of a car that could withstand a maximum mass of 1 500 kg. Then, determine the most suitable spring to be used to make a shock absorber and state your reasons.

[10 marks]

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3. ARCHIMEDES PRINCIPLE CHAPTER 3)

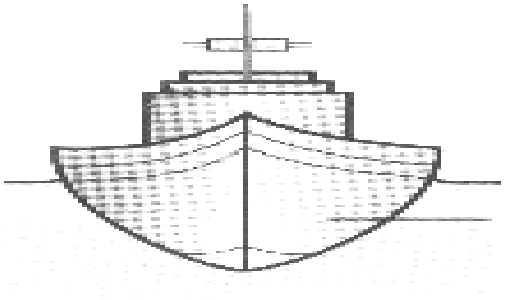

Diagram 11

As a researcher in a boat manufacturing company. , you are assigned to study metal characteristics used to make the boat as in diagram 11,
Sebagai seorang penyelidik anda dikehendaki menyiasat sifat-sifat logam yang digunakan untuk membuat bot seperti rajah 11, di kilang membuat bot

a) i) State the *Archimedes Principle.* (1 mark)
Nyatakan *Prinsip Archimedes*

A wooden cube with sides of 30 cm floats in a tank of water with 1/ 3 of its volume above the surface of the water.

Satu bongkah kiub kayu bersisi 30 cm terapung dengan 1/3 daripada isipadunya berada di atas permukaan air.

The density of water $= 1000\ kg\ m^{-3}$.
Ketumpatan air $= 1000\ kg\ m^{-3}$

Calculate the upthrust acting on the block.
Kirakan daya tujah keatas yang bertindak ke atas bongkah itu.

What is the density of the cube.
Berapakah ketumpatan bongkah itu? (4 marks)

b) You are given four choices of metals P, Q, R and S. The table below shows the characteristics for the four metals.

Anda di berikan empat jenis logam P,Q,R dan S. Jadual di bawah menunjukkan ciri-ciri logam tersebut.

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Metal *Logam*	Shape *Bentuk*	Density *Ketumpatan* kgm^{-3}	Specific Heat Capacity *Muatan haba tentu*	Strength *Kekuatan*
P	Streamlined *Larus*	900	Low	High
Q	Oval *Bujur*	452	High	High
R	Circle *Bulat*	387	Low	High
S	Streamlined *Larus*	500	High	High

Table 1

Based on table 1

i) Explain the suitable characteristics of the metal to be used as the material to make the boat.
Terangkan ciri-ciri logam yang sesuai yang digunakan untuk membuat bot
(8 marks)

ii) Determine the most suitable metal to be used as the material to make the boat and give your reasons.
*Tentukan logam manakah yang paling sesuai untuk membuat bot d*an berikan sebab anda.

(2 marks)

c) The forms of water transport are purposely designed so that the upthrust produced is greater. Explain why the captain of a ship should be careful not to overload the ship?
Rekabentuk pengangkutan air direka sedemikian rupa supaya daya apungan lebih besar. Terangkan mengapa kapten kapal mesti berhati-hati untuk mengisi muatan kapal. (2 marks)

d) Explain why a ship may sink when it sails from sea water to fresh water
Terangkan mengapa sebuah kapal akan tenggelam apabila belayar dari laut ke sungai (3 marks)

4 **ARCHIMEDES PRINCIPLE CHAPTER 3)**

Diagram 11.1 shows an apparatus which is used to determine the density of a liquid. These apparatus is an application of Archimedes' Principle.
Rajah 11.1 menunjukkan satu radas yang digunakan untuk mengukur ketumpatan cecair. Radas ini merupakan aplikasi Prinsip Archimedes.

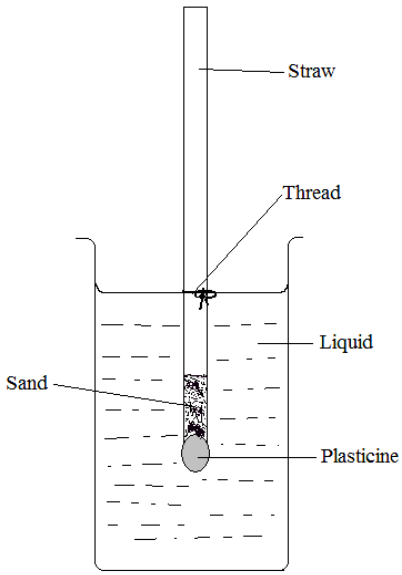

DIAGRAM 11.1

(a) State the Archimedes' Principle
Nyatakan Prinsip Archimedes.

[1 *mark*]

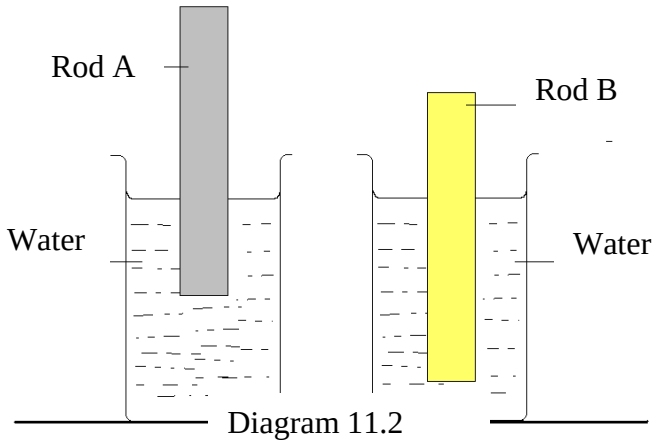

Diagram 11.2

(b) Diagram 11.2 shows rod A and rod B of different densities are immersed in water. Explain why the rods float in water and why B sinks deeper than A.
Rajah 11.2 menunjukkan rod A dan rod B yang mempunyai ketumpatan yang berbeza direndam di dalam air. Jelaskan mengapa kedua-dua rod terapung di dalam air dan jelaskan mengapa B tenggelam lebih dalam berbanding A.

[4 *marks*]

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(c) You are required to build a hydrometer that can be used to measure densities of concentrated acids.
Anda ditugaskan untuk membina sebuah hydrometer yang boleh digunakan untuk mengukur ketumpatan asid pekat.

Table 11.1 shows the characteristics of 4 types of hydrometers L, M, N and O.

Hydrometer *Hidrometer*	Type of material of hydrometer *Jenis bahan untuk hidrometer*	Diameter of capillary tube/ cm *Diameter tiub kapilari/cm*	Density of shots/ kgm^{-3} *ketumpatan bebuli /kgm^{-3}*	Diameter of bottom bulb/ cm *Diameter bebuli kaca/ cm*
L	Plastic/*Plastik*	0.5	1000	1.0
M	Plastic/*Plastik*	2.0	1300	3.0
N	Glass / *kaca*	0.5	9800	3.0
O	Glass/ *kaca*	2.0	8000	1.0

Table 11.1

Based on the table 11.1;

(i) Explain the suitable characteristics of the hydrometer so that it can be used to measure different densities of acids.
Terangkan kesesuaian ciri-ciri hidrometer itu yang boleh digunakan untuk mengukur ketumpatan asid yang berbeza.

(ii) Decide which hydrometer is most suitable and give reasons.
Tentukan hidrometer yang paling sesuai dan berikan sebab

[10 *marks*]

(d) Diagram 11.3 shows a boat which has a safety limit line, L. The volume of the boat under the line L is 4 m^3. The mass of the boat is 250 kg.
[density of water : 1000 kgm^{-3}]
Rajah 11.3 menunjukkan sebuah bot yang mempunyai garisan had keselamatan, L. Isipadu bot dibawah garisan L adalah 4 m^3. Jisim bot ialah 250 kg.
[ketumpatan air : 1000 kgm^{-3}]

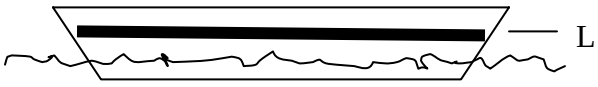

Diagram 11.3

(i) Calculate the volume of water displaced by the boat.
Hitungkan isipadu air yang disesarkan oleh bot.

(ii) What is the maximum load that can be carried safely by the boat?
Berapakah jisim maksimum beban yang boleh dibawa oleh bot dengan selamat?

[5 *marks*]

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5. DENSITY (CHAPTER 3)

Metal	Maximum pressure	Density / kgm $^{-3}$	Compression	Corrosion time
P	10 kPa	2700	Easy to compress	3 years
Q	50 kPa	7860	Difficult to compress	4 years
R	10 kPa	892	Difficult to compress	8 years
S	90 kPa	4507	Difficult to compress	20 years
T	70 kPa	11300	Moderate	4 years
U	150 kPa	19300	Very difficult to compress	20 years

TABLE 12.1

As the engineer, your duty is to do research of the characteristics of the metal as shown in the Table 12.1 which is use to make the submarine's body.

.

a) (i) What is meant by density?

[1 mark]

(ii) Explain the suitable characteristics from diagram above and then determine the most suitable metal to make the submarine's body.

[10 marks]

b) Explain the different between the compression of solid and gas by using kinetic theory of molecule.

[4 marks]

c) A submarine of mass 2.25×10^{7} kg is floating at the sea with 10 % of its volume above the water level. Calculate the mass of the sea water that have to be in ballast tank, therefore the submarine will fully submerge.
[Density of sea water = 1025 kgm $^{-3}$]

[5 marks]

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6. PRESSURE (CHAPTER 3)

(a) Figure 11.1 shows the hydraulic brake system of a car.

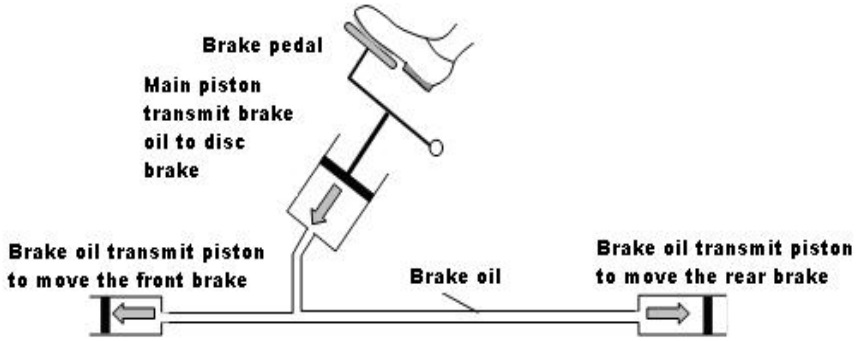

FIGURE 11.1

(i) What is meant by pressure?

[1 mark]

(ii) Explain why the football player wear a shoes with stud at shoe sole in a football match.

[4 marks]

(b) Table 11.1 shows the characteristics of five types of hydraulic brake systems which could be used in the hydraulic brake system of a car.
Jadual 11.1 menunjukkan ciri-ciri bagi lima jenis sistem brek hidraulik yang digunakan dalam sistem brek hidraulik sebuah kereta.

TABLE 11.1

System	Boiling point / ^{o}C	Density / kg m^{-3}	Ratio of cross sectional areas of the big piston to the small piston	Rate of evaporation of hydraulic fluid
P	78	950	4 : 1	High
Q	357	13600	2 : 1	Medium /
R	316	900	5 : 1	Low
S	128	800	1 : 1	High
T	100	1000	3 : 1	Medium

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You are asked to investigate the characteristics of the five types of hydraulic brake system in Table 11.1 which could be used in the hydraulic brake system of a car as in Figure 11.1.
Explain the suitability of characteristic in Table 11.1 and hence determine which system is most suitable to be used.

[10 marks]

(c) A hydraulic brake system has a small piston and big piston with cross-sectional areas of 1.50 cm^2 and 7.20 cm^2 respectively. The driver applies of force of 9.0 N on the brake pedal.

(i) What is the pressure on the small piston?

[2 marks]

(ii) Calculate the force applied on the brake shoe.

[3 marks]

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7. SPECIFIC HEAT CAPACITY (CHAPTER 4)

. (a) As a researcher, you are asked to investigate the characteristics of several metals in Table 1 to be used as a material for making a high quality cooking pot.

Figure 11

metal	Specific heat capacity/ J kg^{-1} $^0C^{-1}$	Melting point/ ^0C	Density/ kg m^{-3}	Rate of rusting
P	450	1 540	7 873	High
Q	880	660	2 698	High
R	510	1 620	7 800	Does not rust
S	398	961	10 500	Moderate
T	377	978	8 400	Does not rust

(i) What is meant by *specific heat capacity*?

[1 mark]

(ii) For **each** characteristic of the metal in Table 1, explain the suitability of the characteristic of the metal as a material to make a cooking pot. Hence, determine which metal is most suitable as the material to used as a cooking pot. Justify your choice.

[10 marks]

(b) Sketch a graph to show the change in temperature with respect to time for a solid metal to melt completely. Then, explain the changes that occur to the molecules in the metal during the heating process.

[5 marks]

(c) The specification of an electric wok is 240 V, 1000 W.
Calculate the time taken for the wok to heat 800 g of cooking oil from 30^0C to 120^0C.

Assume all the electrical energy is used only to increase the temperature of the cooking oil and no heat is lost to the surroundings.
[specific heat capacity of cooking oil is 2 000 J kg^{-1} $^0C^{-1}$]

[4 marks]

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8. SPECIFIC HEAT CAPACITY CHAPTER 4)

(a) Figure 14 shows a portable snack box that can keep the snack inside the box cold or warm. The box is able to maintain the temperature of snack for a long time.

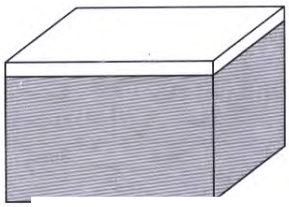

Figure 14

Table 1 below shows the characteristics ot material which could be used to make the snack container.

Characteristic / Material	Density	Specific heat capacity	Melting point	Thermal conductivity
A	4000	780	2000	High
B	2500	650	1300	Low
C	1000	1415	250	Low
D	900	1528	30	Low
E	2800	620	945	High

(i) What is meant by *specific heat capacity* ?

[2 marks]

(ii) You are required to investigate the characteristics of the materials in Table 1 which could be used to make the snack container in Figure 14. Explain the suitability of each characteristic in Table 1.
Hence, determine which material is most suitable to be used to make the snack container. Justify your choice.

[8 marks]

(b) 400 g of hot water at 80°C is poured into a plastic cup and is allowed to cool down to room temperature of 30°C.

(i) Sketch a temperature-time graph for the cooling process of the hot water. Use your graph to explain the process.

[4 marks]

(ii) Determine the amount of heat lost from the hot water. The specific heat of water is 4200 Jkg-1K-1 [3 marks]

(iii) Hot water is poured into a glass which has a small crack. It is observed that the size of the crack increases. Explain this observation.

[3 marks]

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9. PERISCOPE (CHAPTER 5)

(*a*) Diagram 11.1 and Diagram 11.2 shows two incomplete periscopes R and S.
Periscope R uses two plane mirrors to reflect the light.
Periscope S uses two prisms to enable total internal reflection of light.
Rajah 11.1 dan Rajah 11.2 menunjukkan dua periskop R *dan* S *yang tidak lengkap.*
Periskop R *menggunakan dua cermin satah untuk memantulkan cahaya.*
Periskop S *menggunakan dua prisma yang membenarkan cahaya merambat secara pantulan dalam penuh.*

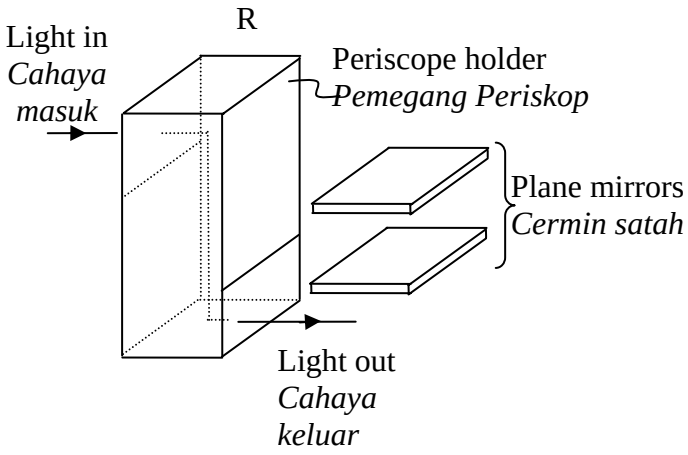

DIAGRAM 11.1

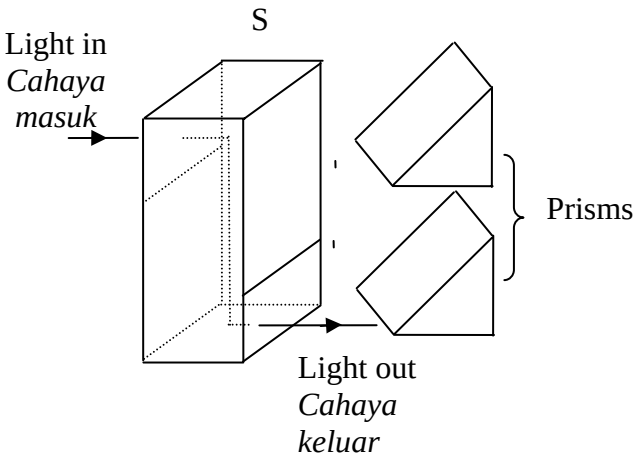

Diagram 11.2

(i) Define total internal reflection of light.
Jelaskan maksud pantulan dalam penuh.

[1 *mark*]

(ii) Which periscope produces clearer image?
Give a reason for your choice.
Periskop yang manakah menghasilkan imej yang jelas?
Beri sebab bagi pilihan anda.

[2 *marks*]

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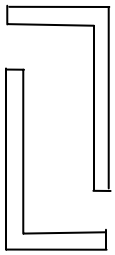
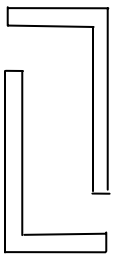
(iii) Complete the diagrams below to show the positions of the plane mirrors in periscope R and the prisms in periscope S.
Draw the ray diagram to show the reflection of light in periscopes R and S.
State a condition that enables total internal reflection of light in the prism of the periscope S.
Lengkapkan rajah di bawah untuk menunjukkan kedudukan cermin satah di dalam periskop R *dan kedudukan prisma dalam periskop* S.
Lukiskan gambar rajah sinar yang yang menggambarkan pantulan cahaya di dalam periskop R *dan* S. *Nyatakan satu syarat yang membolehkan pantulan dalam penuh berlaku pada prisma dalam periskop* S.

[5 *marks*]

R



S



(iv) The velocity of light in air is 3.0×10^8 m s^{-1}. If the wavelength of the red light is 8×10^{-7} m, calculate the frequency of the red light.
Halaju cahaya di udara ialah 3.0×10^8 *m* s^{-1}. *Jika panjang gelombang cahaya merah ialah* 8×10^{-7} *m, kirakan frekuensi bagi cahaya merah tersebut.*

[2 *marks*]

(*b*) Diagram 11.3, 11.4 and 11.5 show the reflection of light by three types of mirrors.
Rajah 11.3, 11.4 dan 11.5 menunjukkan pantulan cahaya bagi tiga jenis cermin.

Plane mirror
Cermin satah

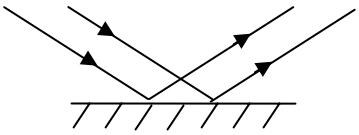


Diagram 11.3

Convex mirror
Cermin cembung

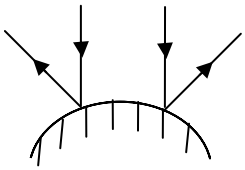


Diagram 11.4

Concave mirror
Cermin cekung

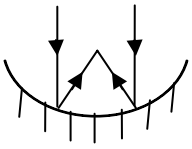


Diagram 11.5

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As a scout, you intend to design a solar cooker that can be used to boil water using direct sun light.
Diagram 11.6 shows three different design of the solar cooker.
Sebagai seorang pengakap, anda perlu mereka sebuah alat untuk memasak air yang menggunakan kuasa solar secara terus.
Rajah 11.6 menunjukkan tiga reka bentuk alat memasak menggunakan kuasa solar yang berlainan.

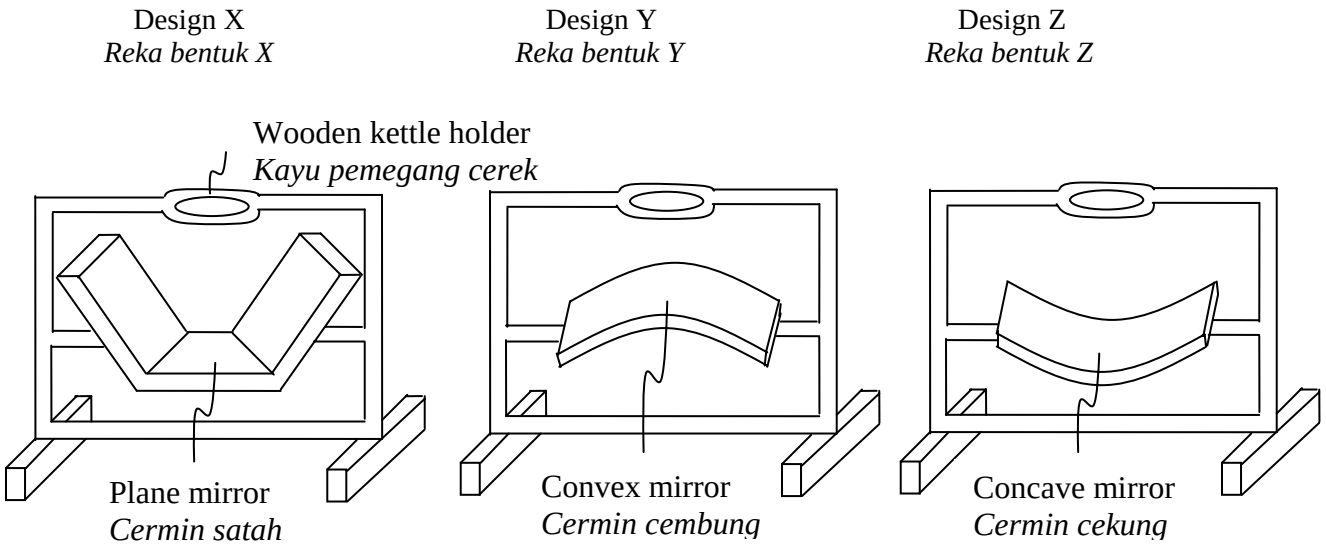

Diagram 11.6

(i) Choose the most suitable design in Diagram11.6 that can boiled water in the shortest time and explain the suitability of the design.
Pilih satu reka bentuk yang sesuai dalam Rajah 11.6 yang membolehkan air dimasak dalam masa yang paling singkat dan terangkan kesesuaian rekabentuk tersebut.

(ii) Suggest and explain two ways to improve the design you chose in (*b*)(i).
Cadang dan terangkan dua cara untuk memperbaiki reka bentuk yang anda pilih dalam b(i).

(iii) Give two reasons why the above solar cooker is said to be environmental friendly?
Beri dua sebab kenapa alat memasak yang menggunakan kuasa solar mesra alam?

(iv) Give two reasons why the solar energy is not widely used?
Beri dua sebab mengapa tenaga solar tidak digunakan secara meluas?

[10 *marks*]

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10 REFRACTIVE INDEX(CHAPTER 5)

(a) Table 11.1 shows 5 materials which can be used to make an optical fibre.

Jadual 11.1 menunjukkan 5 jenis bahan yang boleh digunakan untuk membina serabut optik.

Material *Bahan*	Refractive index *Indeks biasan*	% of light energy absorbed *% tenaga cahaya yang diserap*	Rigidity *Ketegaran*	Strength *Kekuatan*
P	1.75	2 %	Strong	Weak
Q	1.80	10 %	Weak	Strong
R	1.70	2 %	Weak	Strong
S	1.52	3 %	Strong	Strong
T	1.48	10 %	Weak	Weak

TABLE 11.1

(i) Write an equation for finding the refractive index of a material in term of velocity of light?

Tuliskan satu persamaan untuk menentukan indeks biasan satu bahan dalam sebutan halaju cahaya.

[1 *mark*]

(ii) With the help of a diagram, explain the working principle of an optical fibre.

Dengan bantuan gambar rajah, jelaskan prinsip kerja satu serabut optik.

[4 *marks*]

(iii) You are asked to investigate the characteristics of the materials in Table 11.1 which could be used to make the optical fibre.
Explain the suitability of **each** characteristic and hence, determine the most suitable material to be used to make the optical fibre.
Give a reason for your choice.

Anda ditugaskan untuk mengkaji ciri-ciri bahan dalam Jadual 11.1 untuk digunakan bagi membuat satu serabut optik.
Terangkan kesesuaian setiap ciri dan seterusnya tentukan bahan yang paling sesuai untuk membuat serabut optik itu.
Berikan satu sebab untuk pilihan anda.

[10 *marks*]

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(b) Diagram 11.1 shows a coin at the bottom of a tall empty cup.
Diagram 11.2 shows the coin at the bottom of the cup when the cup is filled with water.

Rajah 11.1 menunjukkan satu duit syiling di dasar sebuah cawan kosong yang tinggi.
Rajah 11.2 menunjukkan duit syiling itu di dasar cawan apabila cawan itu diisi dengan air.

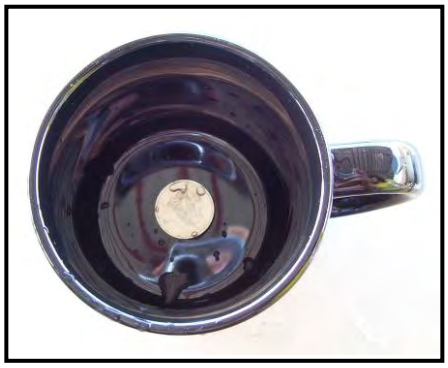

DIAGRAM 11.1

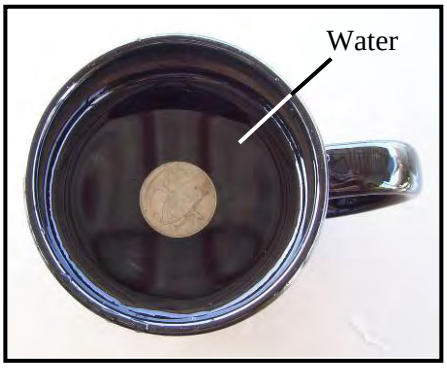

DIAGRAM 11.2

(i) Compare the size of the coin in Diagram 11.1 and Diagram 11.2, as seen by an observer above the cup.
State the phenomenon that caused the difference in size of the coin in seen in Diagram 11.1 and Diagram 11.2.

Bandingkan saiz duit syiling di Rajah 11.1 dan Rajah 11.2 sebagaimana dilihat oleh seorang pemerhati dari atas cawan itu.
Nyatakan fenomena yang menyebabkan perbezaan saiz duit syiling yang dilihat di Rajah 11.1 dan Rajah 11.2

[2 *marks*]

(ii) The depth of water in Diagram 11.2 is 16 cm. Calculate the apparent depth of the coin when viewed directly from above by the observer.

Kedalaman air di Rajah 11.2 ialah 16 cm*. Hitungkan dalam ketara duit syiling itu apabila dilihat tegak dari atas cawan oleh pemerhati itu..*

[Refractive index of water / *indeks biasan air* = $\frac{4}{3}$]

[2 *marks*]

(c) Suggest one method that will make the coin appear nearer to the observer than in (b)(i).

Cadangkan satu kaedah yang akan menjadikan syiling itu kelihatan lebih dekat dengan pemerhati berbanding dengan di (b)(i).

[1 *mark*]

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11 . ELECTRICITY (CHAPTER 7)

(a) (i) Draw a diagram to show how 3 resistors can be connected in series.

Lukis satu gambar rajah untuk menunjukkan bagaimana 3 *perintang disambungkan secara bersiri.*

[1 *mark*]

(ii) Explain the advantages of connecting household appliances in parallel.

Jelaskan kelebihan menyambung perkakas elektrik rumah secara selari.

[4 *marks*]

(b) A student plans to fix a lamp in his room. Table 12.1 shows the features of 4 different types of lamps.

Seorang pelajar bercadang untuk memasang sebuah lampu di dalam biliknya. Jadual 12.1 menunjukkan sifat-sifat 4 jenis lampu yang berlainan.

Type of lamp *Jenis lampu*	Power *Kuasa*	Efficiency *Kecekapan*	Life Span *Tempoh hayat*	Price *Harga*
Compact fluorescent lamp *Lampu pendarflour padat*	18 W	50 %	7000 hours 7000 *jam*	High *Tinggi*
Filament lamp *Lampu filamen*	75 W	12 %	1000 hours 1000 *jam*	Low *Rendah*
Long fluorescent lamp *Lampu pendarflour panjang*	20 W	45 %	14000 hours 14000 *jam*	Medium *Sederhana*
Round fluorescent lamp *Lampu pendarflour bulat*	24 W	40 %	10000 hours 10000 *jam*	High *Tinggi*

Table 12.1

Explain the suitability of each feature in Table 12.1 and then determine the most suitable lamp to be used. Give a reason for your choice.

Terangkan kesesuaian ***setiap*** *sifat dalam Jadual 12.1 dan tentukan lampu yang paling sesuai digunakan. Berikan satu sebab bagi pilihan anda.*

[10 *marks*]

(c) A 5 Ω resistor and a 10 Ω resistor are connected in parallel to a 9 V power supply.

Satu perintang 5 Ω *dan satu perintang* 10 Ω *disambungkan secara selari kepada bekalan kuasa* 9 V.

Calculate / *Hitungkan*

(i) the effective resistance, / *rintangan berkesan,*
(ii) the current in the 5 Ω resistor, / *arus melalui perintang* 5 Ω,
(iii) power dissipated by the 10 Ω resistor. / *kuasa terlesap oleh perintang* 10 Ω.

[5 *marks*]

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12. RESISTANCE (CHAPTER 7)

(a) i) What is meant by *effective resistance* ?
Apakah dimaksudkan dengan rintangan berkesan (1 mark)

ii)

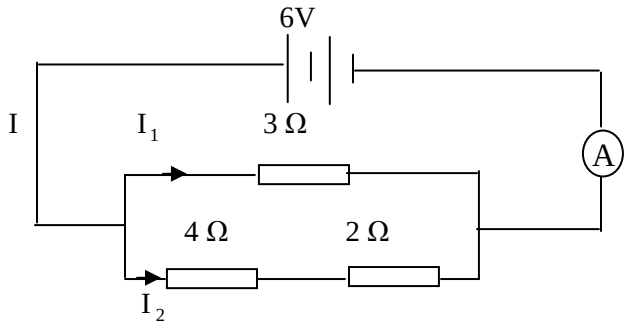

Figure 11

Three resistors with resistance 2 Ω , 3 Ω , and 4 Ω respectively are connected to a 6V battery as shown in figure 11.

Tiga perintang 2 Ω , 3 Ω , dan 4 Ω disambungkan kepada bateri 6V seperti rajah11.

If the resistance of the ammeter A can be neglected, what is the effective resistance in the circuit?

Jika rintangan ammeter A boleh diabaikan,apakah rintangan berkesan dalam litar.

Find the values of I_1 and I_2.
Tentukan nilai I_1 and I_2 (4 marks)

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b) As a researcher , your duty is to study the characteristics of a material to make a water heater. You are given four choices of metal type T, U,V and W. The table below shows the characteristics of the four metals.

Sebagai seorang penyelidik anda ditugaskan untuk mengkaji ciri –ciri bahan yang digunakan untuk membuat pemanas air. Anda diberikan empat jenis logam T,U,V dan W. Jadual di bawah menunjukkan ciri-ciri logam tersebut.

Metal *Logam*	The cross sectional area *Luas keratan rentas*	Melting Point *Takat lebur*	Specific Heat Capacity *Muatan haba tentu*	Length *panjang*
T	Smaller	Low	High	Long
U	Larger	High	Low	Short
V	Smaller	High	Low	Long
W	Larger	High	Low	Short

Table 2

Based on table 2,
Berdasarkan jadual 2,

i) Explain the suitable characteristics of the metal to be used to make a heater .

Terangkan ciri – ciri logam yang sesuai yang boleh digunakan untuk membuat pemanas air

(8 marks)

ii) Determine the most suitable metal to be used as the material to make the heater and give your reasons.

Tentukan logam yang paling sesuai dan berikan sebab anda

(2 marks)

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13 TRANSFORMER (CHAPTER 8)

Diagram 12.1 shows two transformers P and Q.
Rajah 12.1 menunjukkan 2 tranformer P dan Q

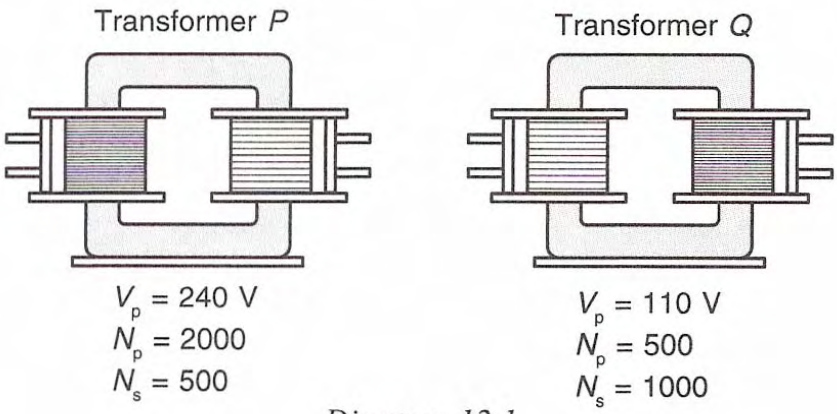

Diagram 12.1

(a) (i) What is meant by a transformer?
Apakah yang dimaksudkan dengan transformer.

[1 *mark*]

(ii) Based on Diagram 12.1, which transformer is a step-up transformer? Give one reason for your choice.
Berdasarkan Rajah 12.1, yang manakah merupakan transformer injak naik? Beri satu sebab atas pilihan anda.

[2 *marks*]

(b) Calculate the output voltage of
(i) transformer P
(ii) transformer Q
Hitungkan voltan output pada
(i) transformer P
(ii) transformer Q

[4 *marks*]

(c) Practically a transformer is not 100% efficient. Some energy is lost in the transformer. List the factors that cause the energy loss in a transformer.
Secara praktik kecekapan transformer bukanlah 100%. Terdapat tenaga yang hilang dalam transformer. Senaraikan faktor-faktor yang menyebabkan tenaga hilang dalam transformer.

[3 *marks*]

(d) The transmission of electricity over the National Grid Network uses high voltage cables. You are assigned to study the characteristics of cables which could be used as transmission cable. Table 12 shows the characteristics of four transmission cables.

Penghantaran tenaga elektrik melalui Rangkaian Grid Nasional menggunakan kabel yang mempunyai voltan yang tinggi. Anda diminta unuk mengkaji ciri-ciri kabel yang sesuai digunakan sebagai kabel penghantaran.. Jadual 12 menunjukkan ciri-ciri bagi 4 jenis kabel penghantaran.

Cable	Resistivity /Ωm^{-1}	Density / kg m^{-3}	Cost	Rate of thermal expansion
P	3.0×10^{-7}	5×10^{5}	Low	High
Q	1.8×10^{-8}	2×10^{3}	Medium	Low
R	7.5×10^{-7}	8×10^{2}	High	Medium
S	7.0×10^{-8}	4×10^{3}	Medium	High

Table 12

Based on the table 12;
Berdasarkan jadual 12;

(i) Explain the suitability of the characteristics of the cables to be used as transmission cable.
Jelaskan ciri-ciri kabel yang sesuai dijadikan kabel penghantaran.

(ii) Determine the most suitable transmission cable to be used and give reasons for your choice.
Tentukan kabel yang paling sesuai digunakan sebagai kabel penghantaran dan beri sebab atas pilihan anda.

[10 *marks*]

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14. SEMICONDUCTOR DIODE (CHAPTER 9)

A semiconductor diode is made from combination of an n-type semiconductor and p-type semiconductor.
Diod semikonduktor diperolehi dengan mencantumkan semikonduktor jenis–n dan semikonduktor jenis-p.

(*a*) Explain how an n-type semiconductor is produce.
Terangkan bagaimana semikonduktor jenis-n dhasilkani.

[2 *marks*]

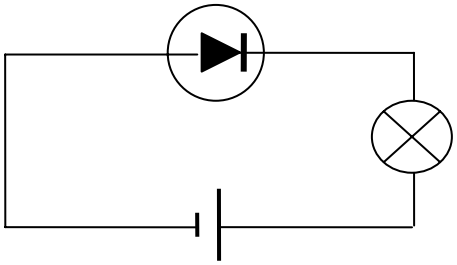

Diagram 12.1

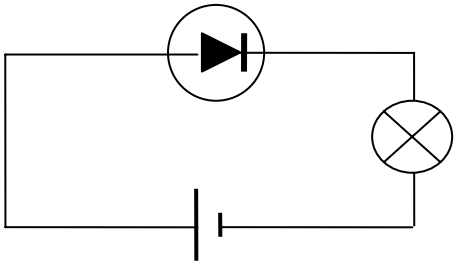

Diagram 12.2

(*b*) Diagram 12.1 and 12.2 shows a circuit consisting of a diode and a bulb.
Rajah 12.1 dan 12.2 menunjukkan litar yang disambungkan kepada diod dan mentol.

(i) Based on Diagram 12.1 and Diagram 12.2, which bulb will light up?
Berdasarkan Rajah 12.1 dan Rajah 12.2, mentol yang manakah akan menyala?

[1 *mark*]

(ii) Explain how the bulb will light up.
Terangkan bagaimana mentol boleh.

[3 *marks*]

(*c*) You are required to set up a battery charge for your handphone by using lower a.c input voltage as in Diagram 12.3 and in Table 12.1.
Anda dikehendaki untuk menyediakan satu pengecas bateri telefon bimbit dengan menggunakan voltan ulang alik yang rendah dengan menggunakan maklumat seperti dalam Rajah 12.3 dalam Jadual 12.1.

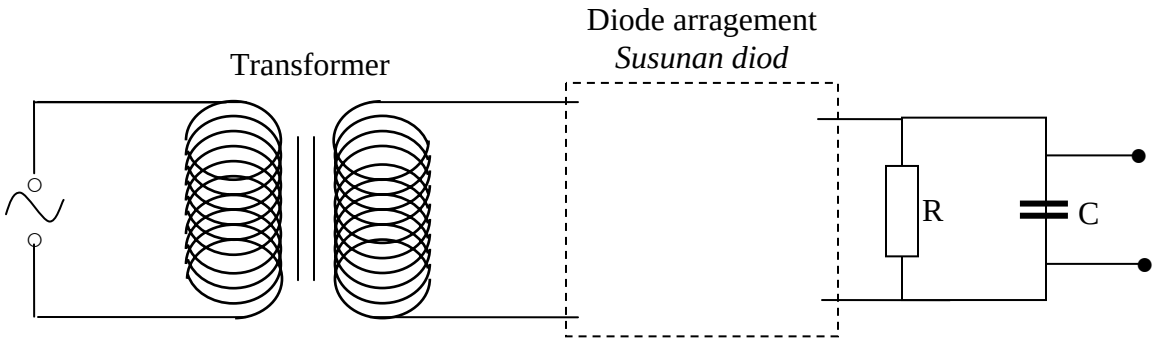

Diagram 12.3

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Ratio $N_p:N_s$ *Nisbah* $N_p:N_s$	Type of transformer core *Jenis teras transformer*	Diode arrangement *Susunan diod*
100 80 60 40 20	Solid copper core *Teras kuprum* Laminated copper core *Teras kuprum berlamina* Solid soft iron core *Teras besi lembut* Laminated soft iron core *Teras besi lembut berlamina*	Half-wave rectification curcuit. *Litar rektifikasi gelombang separuh.* Full-wave rectification curcuit. *Litar rektifikasi gelombang penuh.*

Table 12.1

Study the information in Diagram 12.3 and Table 12.1 determine:
Kaji maklumat dalam Rajah 12.3 dan Jadual 12.1 tentukan:

(i) the number of turns in the primary coil and the secondary coil of the transformer and justify your choice.
bilangan lilitan dalam gegelung primer dan bilangan lilitan dalam gegelung sekunder bagi transformer dan jelaskan pilihan anda.

(ii) the type of core you will use in the transformer and justify your choice.
jenis teras yang anda akan gunakan bagi transformer itu dan jelaskan pilihan anda.

(iii) the diode arrangement you will use and justify your choice.
susunan diod yang akan anda gunakan dan jelaskan pilihan anda.

[6 *marks*]

(*d*) (i) Draw a circuit to produce full-wave rectification and show the input voltage and the output voltage wave forms.
Lukiskan litar yang digunakan untuk menghasilkan rektifikasi gelombang penuh dan tunjukkan bentuk gelombang bagi voltan input dan voltan output

(ii) Explain why a capacitor is connected in the Diagram 12.3 and how it functions.
Terangkan mengapa kapasitor disambungkan dalam Rajah 12.3 dan bagaimana ia berfungsi.

[8 *marks*]

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15. ELECTORMAGNETIC RELAY (CHAPTER 8)

Diagram 12.1 shows an electromagnetic relay
Rajah 12.1 menunjukkan sebuah geganti elektromagnet.

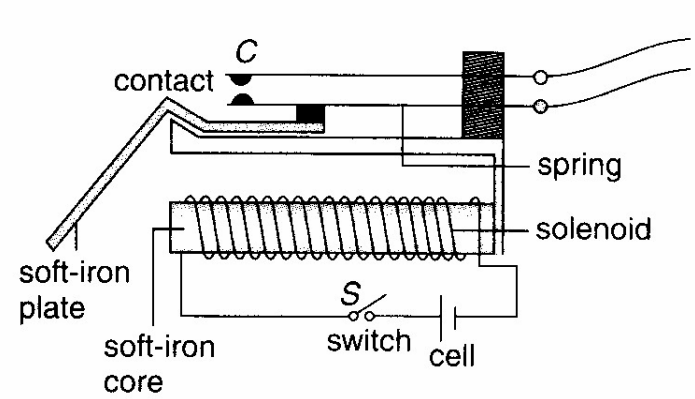

Diagram 12.1

(a) (i) State a function of a electromagnetic relay.
Nyatakan fungsi satu geganti electromagnet.

[1 mark]

(ii) **Explain how the electromagnetic relay functions to open an automatic door in the supermarket when a boy closes the door.**
Jelaskan bagaimana geganti elektromagnet berfungsi untuk membuka sebuah pintu automatik dalam pasaraya apabila seorang budak berada dekat dengan pintu itu..

[5 marks]

(b) The electromagnetic relay in Diagram 12.1 has been modified by increasing the number of coils of the solenoid.
Geganti electromagnet dalam Rajah 12.1 telah dubahsuaikan dengan menambahkan bilangan lilitan pada solenoid itu.

(i) What is the change to the movement of the automatic door if the boy stands close to the door? Give a reason for your answer.
Apakah perubahan kepada pergerakan pintu automatik itu jika budak itu berdiri dekat dengan pintu tersebut? Berikan satu sebab bagi jawapan anda.

[2 marks]

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(ii) What will happen if the spring is replaced by another spring with a higher spring constant? Give a reason for your answer.
Apakah yang akan berlaku jika spring itu digantikan dengan spring lain yang nilai pemalar springnya lebih tinggi? Berikan satu sebab bagi jawapan anda.
[2 marks]

(c) Diagram 12.2 shows an electric bell. Modifications need to be done on the electric bell so that it will produce a loud and high pitch sound.
Rajah 12.2 menunjukkan sebuah loceng elektrik. Pengubahsuaian perlu dilakukan supaya ia dapat menghasilkan bunyi yang kuat dan kelangsingan yang tinggi.

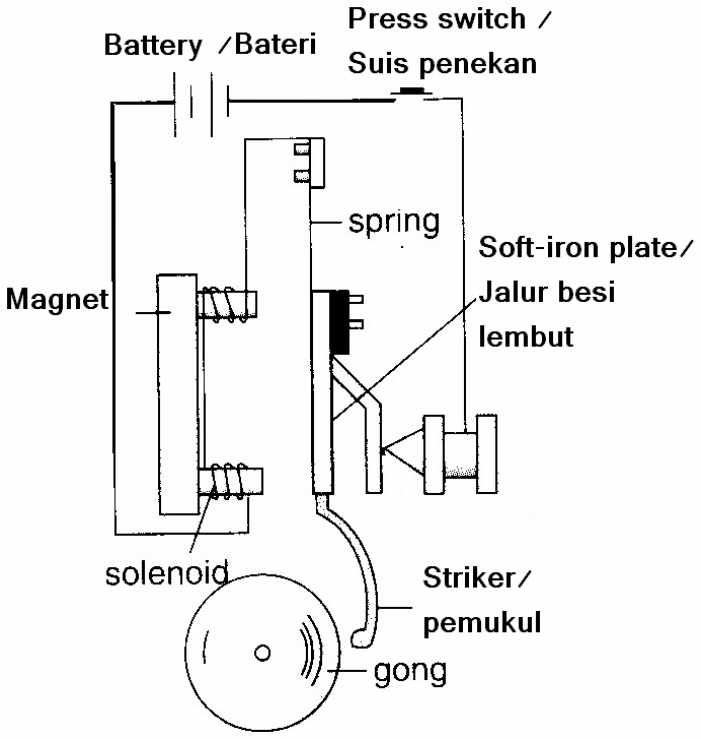

Diagram 12.2

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Table 12.1 shows the characteristics of five electric bells.

Jadual 12.1 menunjukkan ciri-ciri bagi empat loceng elektrik.

Electric bell/ *Loceng elektrik*	**Characteristics of electric bell/** *ciri-ciri loceng elektrik*			
	Size of the gong / *Saiz gong*	**Material of the striker/** *Bahan binaan pemukul*	**Stiffness of the spring /** *Kekerasan spring*	**Number of battery /** *Bilangan bateri*
M	**Big /** *Besar*	**Wooden bar /** *Jalur Kayu*	**High /** Tinggi	Increases/ *Bertambah*
N	**Small /** *Kecil*	**Wooden bar /** *Jalur Kayu*	Low / *Rendah*	**Decreases /** *Berkurang*
O	**Big /** *Besar*	**Steel/** *Keluli*	**High /** Tinggi	**Increases/** *Bertambah*
P	**Small /** *Kecil*	**Steel/** *Keluli*	**Low /** *Rendah*	**Decreases /** *Berkurang*
Q	**Big /** *Besar*	**Wooden bar /** *Jalur Kayu*	**Low /** *Rendah*	**Increases/** *Bertambah*

Table 12.1

Explain the suitability of the characteristics of the electric bell and then determine the most suitable electric bell to be chosen.
Give a reason for your choice.

Terangkan kesesuaian setiap ciri bagi loceng elektrik itu dan seterusnya tentukan loceng electrik yang paling sesuai dipilih.
Berikan sebab bagi pilihan anda.

[10 marks]

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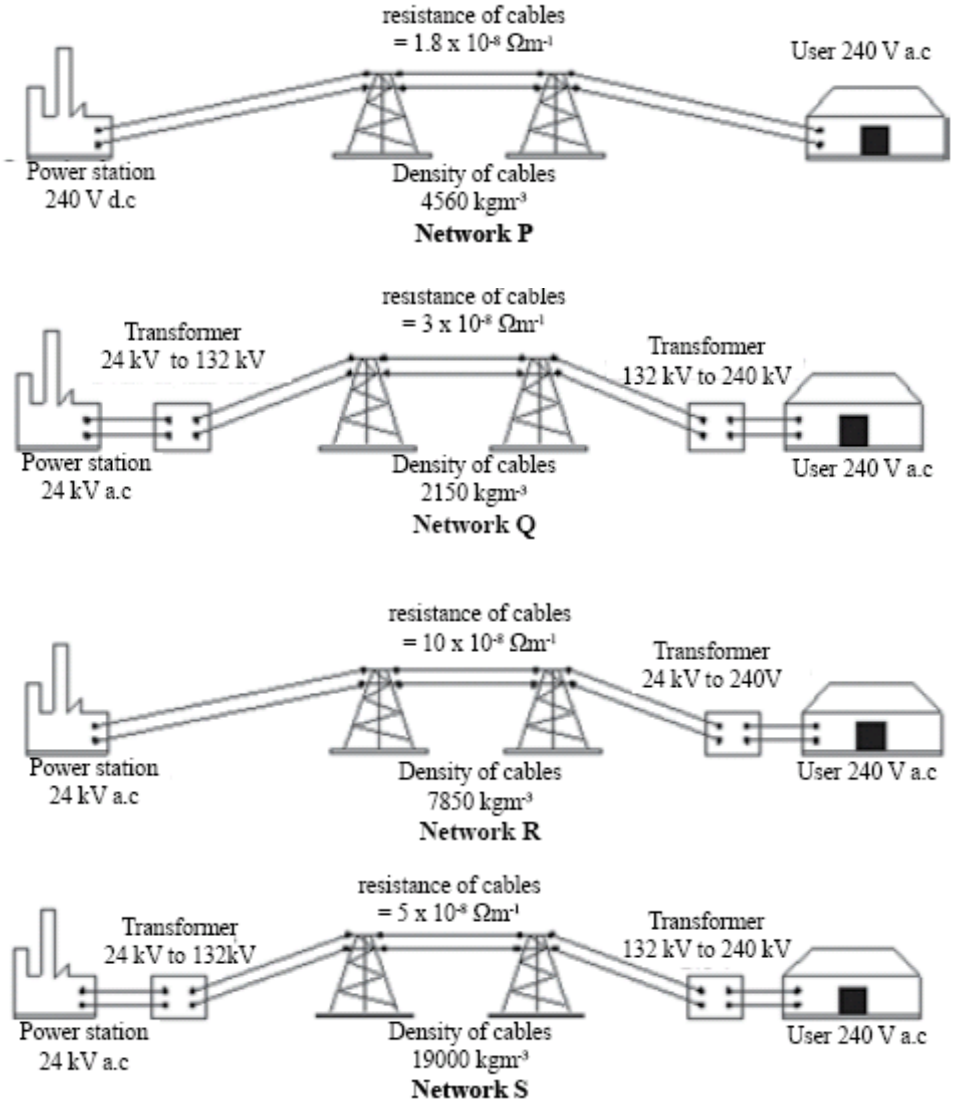
16. ELECTRICITY (CHAPTER 8)

A network system of cables is used to transmit electricity from the power station to the users. Figure 12.1 shows models of network cables for P, Q, R and S.



(a) (i) State the defination of electrical resistance.

[1 *mark*]

(ii) Describe the operating principle of a transformer

[4 *marks*]

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(i) You are required to set up a network of electricity transmission cables from the power station to the users who need a voltage of 240 V . Observe the models of the network cables, P, Q, R and S in firgure 12.1. Consider the aspects given:

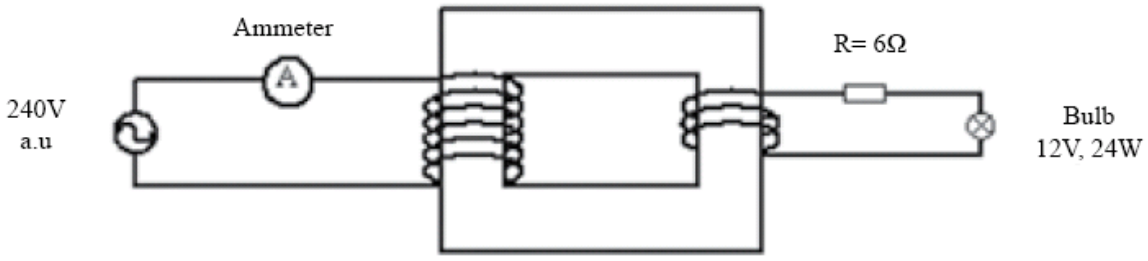
(a) type of generated current
(b) the voltage of the cables
(c) the density of the cables
(d) the resistance of the cables

Explain the suitable of each set of network cables by considering the aspects given above and hence determine the most suitable network for electricity transmission. Justify your choice.

[10 *marks*]

(b) Figure12.2 shows a bulb of 12V, 24 W and a resistor of 6Ω that are connected in parallel to the secondary coil of a transformer. The bulb lights up with normal brightness and the reading of the ammeter is 0.25 A

Figure 12.1



(i) What is the value of the current in the secondary coil?

[1 *mark*]

(ii) Determine the efficiency of the transformer.

[4 *marks*]

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1. MEASUREMENT (CHAPTER 1)

NO 1	EXPLANATION	MARKS
(a) (i)	The distance between two sides of a sphere through the centre of the sphere	1
(ii)	To bring the sides of the pipe cleser to one another To show that the reading of the side of the pipe is vertically straight to the scale of the ruler	2
(b)	1.The small reading of the scale 0.01 cm is chosen - Because it is suitable for the internal diameter of the beaker to be measured 2.The range of measurement from 0 to 10 cm - Is the suitable range for the use to measure diameter of the beaker 3.Able to measure the diameter directly - Without the help of squares 4.The level of sensitivity is average -Therefore suitable to measure the diameter Therefore the choice of the measuring insturment that is suitable is N This is because its range of measurement is 0 -10 cm, it is able to measure the diameter without the help of set squares, the level of sensitivity is average and the smallest division on the scale is 0.01 cm which is not too big.	1 1 1 1 1 1 1 1 1 1
(c) (i)	A piece of wire tound closely to the glass rod until its length is big enough Using a meter rule measure the length wire wound at the glass rod = x cm Then calculate the number of wire wound around the glass rod = y cm The diameter of the wire can be determined , x/y cm Using the formula $V = \pi (d/2)^2 l$ $V = 0.5\ cm^3$ $\pi (d/2)^2 l = 0.5$ $l = 6.37 \times 10^3$ cm	1 1 1 1 1 1 1
	TOTAL MARK	**20**

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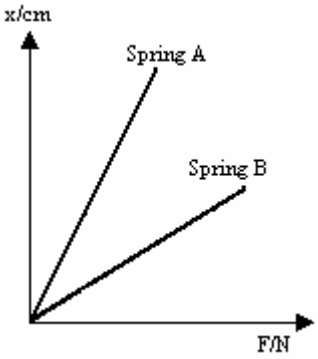
2. SPRING (CHAPTER 2)

<table>
<tr><th>NO 2</th><th>EXPLANATION</th><th>MARKS</th></tr>
<tr><td>(a) (i)</td><td>Hooke's law states that the extension of the extension of a spring is directly proportional to the applied force provided the elastic limit is not exceeded.</td><td>1</td></tr>
<tr><td>(ii)</td><td>- Spring A is harder to compress
- Spring A has higher spring constant</td><td>2</td></tr>
<tr><td>(iii)</td><td> 
</td><td>2</td></tr>
<tr><td>(b)</td><td colspan="2"><table>
<tr><th>MARKS</th><th>Characteristic</th><th>Explanation</th></tr>
<tr><td>1,2</td><td>A low density</td><td>It is not heavy // smaller mass</td></tr>
<tr><td>3,4</td><td>A high spring constant</td><td>Smoother ride // the car is not bumpy // can withstand heavier weight</td></tr>
<tr><td>5,6</td><td>An intermediate rate of rust</td><td>It will last longer</td></tr>
<tr><td>7,8</td><td>Elastic</td><td>It can absorb vibration</td></tr>
<tr><td>9</td><td colspan="2">U is chosen</td></tr>
<tr><td>10</td><td colspan="2">Because it has low density, high spring constant, intermediate rate of rust and the metal is elastic.</td></tr>
</table></td></tr>
<tr><td>(c) (i)</td><td>x = (18.0 – 10.0) cm
= 8.0 cm</td><td>1</td></tr>
<tr><td>(ii)</td><td>F = kx
= (2)(8)
= 16 N

Thus, mass = 1.6 kg</td><td>2</td></tr>
<tr><td>(iii)</td><td>Elastic potential = ½ Fx
= ½ (16)(0.08)
= 0.64 J</td><td>2</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>20</td></tr>
</table>

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3. ARCHIMEDES PRINCIPLE (CHAPTER 3)

11. a)i) Buoyant force equal to the weight of the fluid displaced

ii) W = ρVg = 1000 x 2/3 (0.3 x 0.3 x 0.3) x 10 = 180 N

m, cube= W/g = 180/10 = 18 kg

$\rho = m / V = 18 / (0.3 \times 0.3 \times 0.3) = 666.67 \text{ kg m}^{-3}$

b)

Characteristic/ciri	Reason/Sebab
1.Streamline / larus	2. reduce the resistance of water/ kurangkan rintangan air
3. Density /ketumpatan rendah	4. higher buoyant force/ daya apungan tinggi
5. Specific heat capacity high / muatan haba tentu tinggi	6. absorbs heat slowly/serap haba dengan perlahan
7. High strength / Kekuatan tinggi	8. Difficult to damage / sukar rosak

S, because its streamline,low density, high specific heat capacity and high strength
S, sebab ia adalah larus,ketumpatan rendah,muatan haba tentu tinggi dan kuat.

c) Buoyant force always greater than the load weight,so that the ship will not sink.
Daya apungan sentiasa lebih besar daripada berat beban,supaya kapal tidak tenggelam

d) 1. In the sea, buoyant force > weight of the ship
Di laut, daya apungan > berat kapal ,kapal timbul
2. When the ship in the river,density of water< density of sea,so buoyant force decrease
Bila kapal di sungai, ketumpatan sungai < ketumpatan laut,daya apungan menjadi kurang
3. The weight of the the ship > the buoyant force ,so the ship will sink
Berat kapal > daya apungan ,kapal tenggelam

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4. ARCHIMEDES PRINCIPLE (CHAPTER 3)

<table>
<tr><td>(a)</td><td>When an object is immersed in a fluid, the buoyant force on the object is equal in size to the weight of fluid displaced by the object.
Apabila objek terendam didalam bendalir, daya tujah ke atas yang dikenakan keatas objek itu adalah sama dengan berat bendalir yang disesarkan.</td><td>1</td></tr>
<tr><td>(b)</td><td>- B is denser than A.
- B lebih tumpat dari A.
- The weight of water displaced is the same of the weight of the rod.
- Berat air disesarkan sama dengan berat rod.
- Weight of B is greater than weight of A
- Rod B lebih berat dari rod A
- B will displace more volume of water
- B menyesarkan isipadu air yang lebih banyak.</td><td>1

1

1

1</td></tr>
<tr><td>(c)</td><td><table><tr><th>Characteristic</th><th>Explanation</th></tr><tr><td>Material made from glass</td><td>Glass does not corrode with acid</td></tr><tr><td>Small diameter of capillary tube</td><td>To increase the sensitivity of the hydrometer</td></tr><tr><td>High density of shots</td><td>Makes the hydrometer stays upright</td></tr><tr><td>Big diameter of bottom bulb</td><td>To obtaine a bigger upthrust.</td></tr></table>Choice: Hydrometer N
Reasons: Material made from glass, small diameter of capillary tube, high density of shots and big diameter of bottom bulb.</td><td>2

2

2

2

1
1</td></tr>
<tr><td>(d)(i)</td><td>Weight of boat = weight of water displaced
2500 N = 1000 x V x 10
V = 0.25 m^3</td><td>1

1</td></tr>
<tr><td>(d)(ii)</td><td>Maximum weight = maximum water displaced

= 1000 x 4 x 10
= 40000 N

maximum mass = 4000 kg
maximum load = 4000 – 250 = 3750 kg.</td><td>

1
1

1</td></tr>
<tr><td></td><td>Total</td><td>20</td></tr>
</table>

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5. DENSITY (CHAPTER 3)

a)(i) Density of the object is mass per unit volume — 1

(ii)

The characteristic of metal	Reason	
Maximum pressure is high	Can hold the high pressure when moving at low sea level.	2
High density	Not have the high volume for certain mass.	2
Very difficult to compress	Hard and not easy to change the shape.	2
The time of corrosion are long	Can be use last longer without corrosion.	2

The suitable metal to use is metal U, because it have high pressure, high density, difficult to compress and the time of corrosion are long. — 2

b) Atom / molecule arrangement in solid are closely packed. — 1
Attraction and repulsion force of molecule in gas are very weak. — 1
The compressions of gas are bigger than solid. — 1
The spaces between gas molecules are bigger than solid. — 1

c) Weight of submarine = $2.25 \times 10^{7} \times 10 = 2.25 \times 10^{8}$ N. — 1
The volume of water that displace = $2.25 \times 10^{8} / (1025 \times 10) = 2.195 \times 10^{4}\ m^3$. 90% of the submarine = $2.195 \times 10^{4}\ m^3$ — 1
So, the 10% volume of the submarine = $2.439 \times 10^{3}\ m^3$. — 1
Mass of the sea water that has to be in ballast tank, therefore the submarine will fully submerge $=1025 \times 2.439 \times 10^{3} = 2.5 \times 10^{6}$ kg — 1

TOTAL — **20 marks**

5.

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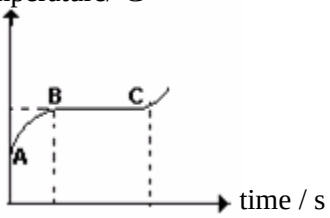
6. PRESSURE (CHAPTER 3)

(a) (i)	Pressure is mass per unit area	1
(a) (ii)	- Studs have a small surface area - Pressure exerted to the ground is high - The shoe will have high grip to the ground - The player will run faster	1 1 1 1
(b)	- Higher boiling point. - It does not boil and change into vapour under hot conditions. - Lower density. - Less weight and flows more easily. - Higher ratio of cross-sectional areas of the big cylinder to the small cylinder. - A large force can be applied on the disc brake. - Lower rate of evaporation. - Avoids the formation of bubbles of vapour in the pipes. - System R is the most suitable because it has a high boiling point, lower density, highest ratio of cross-sectional area and low rate of evaporation.	1 1 1 1 1 1 1 1 2
(c) (i)	Pressure = 9.0 / 1.50 = 6.0 N cm^{-2}	1 1
(c) (ii)	Pressure = 6.0 N cm^{-2} Force = 6.0 x 7.20 = 43.2 N	1 1 1
	TOTAL	**20 marks**

7. SPECIFIC HEAT CAPACITY (CHAPTER 4)

<table>
<tr><th>NO 1</th><th>EXPLANATION</th><th>MARKS</th></tr>
<tr><td>(a)
(i)</td><td>Specific heat capacity is the amount of heat required to raise the temperature of 1 kg of a a substance by 1 ^{0}C</td><td>1</td></tr>
<tr><td colspan="3">
<table>
<tr><th>MARKS</th><th>Characteristic</th><th>Explaination</th></tr>
<tr><td>1,2</td><td>A low specific heat capacity</td><td>The cooking pot is easily hot // the transfer of heat is faster.</td></tr>
<tr><td>3,4</td><td>A high melting point</td><td>It does not not melt easily at high temperatures</td></tr>
<tr><td>5,6</td><td>A high density //

A low density</td><td>So that the cooking pot is heavy and more stabil // not easily crack

So that the cooking pot is not heavy</td></tr>
<tr><td>7,8</td><td>Does not rust</td><td>It will last longer without corrosion // Food will not be contaminated</td></tr>
<tr><td>9</td><td colspan="2">R // T is chosen</td></tr>
<tr><td>10</td><td colspan="2">Because it has low specific heat capacity, high density, a high // low density and does not rust.</td></tr>
</table>
</td></tr>
<tr><td>(b)</td><td>Temperature/^{0}C
 

AB
- Heat energy is used to increase the kinetic energy of the molecules
- Temperature increases
BC
- Heat energu is used to break the bonds between molecules
- The kinetic energy remain unchanged // Temperature remains constant</td><td>2

2

2</td></tr>
<tr><td>(c)</td><td>Pt = mcθ
(1000) t = 0.8(2000)(90)
t = 144 s</td><td>3</td></tr>
<tr><td colspan="2">TOTAL MARK</td><td>20</td></tr>
</table>

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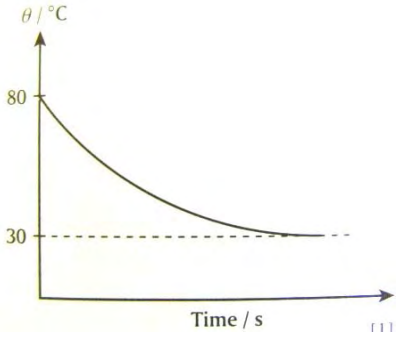
8. SPECIFIC HEAT CAPASITY (CHAPTER 4)

(a)	(i) Specific heat capacity is the amount of heat required to raise the temperature of 1 kg of a substance by 1 ^{o}C @ 1 Kelvin.	1 mark
	(ii) *Characteristic* — *Explanation*	
	- Thermal conductivity must low — - so that heat transfer between the box interior and the exterior surrounding is low	1mark 1 mark
	- Density must low — - so the container not so heavy.	2 marks
	- Specific heat capacity must high temperature — - so the container slower increase in	2 marks
	- Melting point is moderate — - so the container will not topple over easily	2 marks
(b)	(i) 	1 mark
	- Evaporation occurs at the surface of the water. Evaporation causes cooling.	1 mark
	- Conduction of heat occurs through the wall of the cup to the surrounding.	1 mark
	- These processes causes the water to lose energy. Temperature of water decreases.	1 mark
	- The lowest temperature reached by the water is 30^{o}C (Room temperature)	1 mark
	(ii) $Q = mc\Delta\theta$	1 mark
	$= 0.4 \times 4200 \times (80 - 30)$	1 mark
	$= 84$ kJ	1 mark
	(iii) - When hot water is poured into the glass, the glass becomes hotter	1 mark
	and expands.	1 mark
	- This causes the crack to get bigger	1 mark
	TOTAL MARK	**20**

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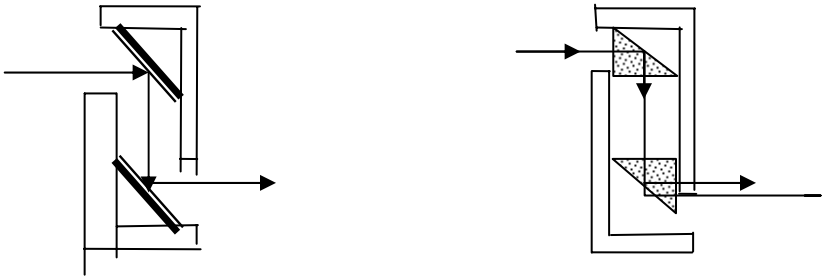
9. PERISCOPE (CHAPTER 5)

NO	ANSWER	MARK
11(a)(i)	When light ray travels from optically dense medium to optically less dense medium and the angle of incidence is greater than the critical angel then the light will be totally reflected	1
(ii)	Periscope S All the light is reflected into the eyes of the viewer through total internal reflection.	1 1
(iii)	R S  Position of mirror//position of prisms Ray diagram for R and S Condition: Light ray travels from optically dense medium to optically less dense medium, or angle of incidence more than critical angle	2 2 1
(iv)	$v = f\lambda$ $3.0 \times 10^{8} = f(8.0 \times 10^{-7})$ $f = 3.75 \times 10^{14}$ Hz	 1 1
(b)(i)	Design Z Concave mirror converges all the light to the focal point	1 1
(ii)	Use spherical disc of concave mirror so that more light is converge to the focal point, hence the intensity of light is high The kettle holder is made of iron Which is a good conductor of heat.	1 1 1 1
(iii)	No pollution Renewable	1 1
(iv)	Restriction of the weather High cost Need a large area Difficult to stop and transfer to ac form	1 1
	TOTAL MARK	**20**

10. REFRACTIVE INDEX(CHAPTER 5)

11(a)	(i)	1	$refractive\ index = \frac{speed\ of\ light\ in\ vacuum}{speed\ of\ light\ in\ the\ mediujm}$
	(ii)	1	**Diagram shows a curved optical fibre (with outer and internal layer) with at least two total internal reflection**
		2	The refractive index of the internal layer of the optical fibre is greater than that of the external layer or air
		3	Angle of incidence, i > critical angle, c
		4	Total internal reflection occur
	(iii)		**States a suitable refractive index and reason**
		1	High refractive index
		2	Total internal reflection can occur easily
			State a suitable % of light energy absorbed and reason
		3	Small amount of light energy being absorbed by the material
		4	The object under observation can be seen clearly // more light can be transmitted
			State a suitable rigidity of the material and reason
		5	Material with weak rigidity
		6	The optical fibre can be bent easily
			State a suitable strength of the material and reason
		7	Material with great strength
		8	The optical fibre can last longer/not easily spoil
			Choose the most suitable material and justify the choice
		9	Material R
		10	High refractive index, low % of light energy absorbed, weak rigidity and great strength
(b)	(i)	1	The coin appears bigger when seen by observer B
		2	The coin is nearer to the observer B
	(ii)	3	Making a correct substitution $\frac{4}{3} = \frac{16}{x}$
		4	Correct answer with unit 12 cm
		20	**TOTAL MARK**

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11 ELECTRICITY(CHAPTER 7)

(a)	(i)	**1**	**Diagram shows the connection correctly** Three resistors are connected one after another
	(ii)	**1**	**State the current through each appliance correctly** The current through each electrical appliance is higher//The bulbs in the parallel circuit light up brighter compared to the same bulbs in series circuit// Effective resistance is much smaller when connected in parallel circuit
		2	**State that each electrical appliance is independent of the other** If any devices/components broke down, others can still be used
		3	**State the installation of circuit breaker** The circuit breaker / fuse can be connected to each path for safety
		4	**State that the electrical appliances can be operated separately** Only certain devices that are not in use can be switched off. The current can still flow through the other path
(b)			**State a suitable power and reason**
		1	Low power lamp
		2	Safe cost//electric bill
			State a suitable efficiency and reason
		3	High efficiency
		4	The room looks brighter//high output power//less power wastage
			State a suitable life span and reason
		5	Long life span
		6	No need to replace often
			State a suitable price and reason
		7	Low price
		8	Save money/cost
			Choose the most suitable lamp and justify the choice
		9	Long fluorescent
		10	Low power with highest efficiency, long hours of life span and medium price
		20	**TOTAL MARK**

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12. RESISTANCE(CHAPTER 7)

a) i) The total resistace in the circuit / jumlah rintangan dalam litar

ii) 1. 1/3 + 1/ 2+4
2. total resistance = 2 ohm
3. I_1 = 2 A
4. I_2 = 1 A

b) i)

Characteristic/ ciri-ciri	Reasons/sebab
1. Smaller surface area 3.High melting point 5. Low specific heat capacity 7. Long (coiled) metal	2. the resistance is higher 4. not easy to melt 6. the temperature arises shortly 8. to increase the resistance

ii) V is chosen
because it has,smaller surface area, high melting point, low specific heat capacity and long metal.

13. TRANSFORMER (CHAPTER 8)

12 (a)(i)	A transformer is a device that steps up or steps down the voltage of an alternating current. [1]	1	
(ii)	Transformer Q Ns>Np	1 1	
(b)(i)	$V_s = \frac{N_s V_p}{N_p} = \frac{500 \times 240}{2000}$ $= 60V$	1 1	
	Vs = $\frac{1000 \times 110}{500}$ = 220 V	1 1	
(c)	• Heating effect in the coils • Eddy currents in the coils • Leakage of magnetic flux • The magnetisation and demagnetisation of the core Maximum 3	1 1 1	
	Choice: Cable Q Reasons: Low resistivity, low density, medium cost, low rate of thermal expansion	2 2 2 2 1 1	
	TOTAL MARK	**20**	

Characteristic	Explanation
Low resistivity	To reduce heat loss in the cables
Low density	The cables will be lighter
Low cost	Cost of project will be lower
Low rate of thermal expansion	The cables will not expand under hot weather

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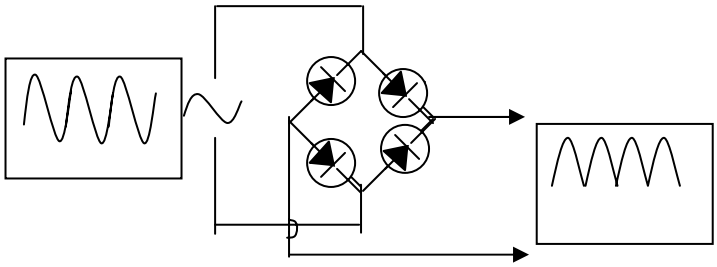
14. SEMICONDUCTOR DIODE (CHAPTER 9)

Question No	MARKING SCHEME		MARK
12(a)	Silicon crystal is doped with pentavalent atoms A free electron is available as a charge carrier.		1 1
(b)(i)	Bulb in Diagram 12.2		1
(b)(ii)	When the potential difference supplied by the dry cell exceeds the junction voltage (barrier potential), a large current flows through the diode. The depletion layer is narrow, and the resistance of the diode is small. Electrons in the n-type semiconductor are attracted to the positive terminal (the holes in the p-type semiconductor are attracted to the negative terminal) resulting in an electron current flow from the n-type to the p- type semiconductor.		1 1 1
(c)(i)	Ratio $N_p : N_s = 20$	The smaller the ratio $N_p : N_s$ is, the higher the secondary voltage// output voltage will be.	2
(ii)	Laminated soft iron core	can be magnetized and demagnetized easily // reduce energy loss	2
(iii)	Full-wave rectification circuit.	To allow current to flow in a complete cycle and the same direction	2
(d)(i)	 Diode arrangement is correct Input wave form is correct Output wave form is correct		3
(ii)	To get the smoothed direct current. During the forward peaks (positive half-cycles), the capacitor is charged up, energy is stored in the capacitor. In between the forward peaks (negative half-cycles), the capacitor releases its charge // discharges. The energy stored in the capacitor acts as a reservoir and maintains the potential difference across the load.		1 1 1 1 1
	TOTAL MARK		**20**

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15. ELECTROMAGNETIC RELAY

<table>
<tr><td>12 (a)(i)</td><td>Switch on the secondary circuit which needs a bigger current</td><td>1</td></tr>
<tr><td>(ii)</td><td>1. Close the switch S
2. Soft-iron core becomes an electromagnet
3. Soft-iron plate is attracted by the electromagnet
4. The second circuit switches on when the 2 contacts touch each other
5. A bigger current can flow in the second circuit and opens the door</td><td>5</td></tr>
<tr><td>(b)(i)</td><td>- Door will open faster
- the strength of the electromagnet increases</td><td>2</td></tr>
<tr><td>(ii)</td><td>- Door can close faster
- Spring with higher stiffness can disconnect the circuit faster</td><td>2</td></tr>
<tr><td>(c)</td><td>
<table>
<tr><th>Characteristics</th><th>Explanation</th></tr>
<tr><td>1. Size of the gong :
Big</td><td>2. Can produce a loud sound</td></tr>
<tr><td>3. Material of the striker :
Steel</td><td>4. can produce sound with a high pitch</td></tr>
<tr><td>5. Stiffness of the spring :
High</td><td>6. increase number of strikes in 1 second / The striker can rebound faster to the original position</td></tr>
<tr><td>7. Number of battery : Increase</td><td>8. Increases the strength of the electromagnet</td></tr>
</table>
9. O is chosen
10. because of Size of gong is big, striker made from steel, high stiffness of the spring and increase the number of battery</td><td>10</td></tr>
<tr><td></td><td>TOTAL</td><td>20</td></tr>
</table>

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16. ELECTRICITY (CHAPTER 7)

(a)(i)	The ratio of potential difference (V) across the conductor to the current(I)	1
(ii)	1. Alternating current flows through the primary coil and induced the magnetic Field 2. The iron core becomes electromagnetic 3. The alternating current produced the changing in the polarity of the magnetic field 4. Changes in the magnetic flux occur in the secondary coil 5. The changes in the magnetic flux produces an induced electromotive force Or current across the secondary coil	Max 4
(c)	1. The type of current generated is a.c. - the potential difference of the a.c. supply can be raised /lower using Transformer 2. A high voltage transmission -by reducing the current in the cables, the loss of the electrical power will be less 3. By using the low density of cables - so that it is lighter /easier to support 4. the resistance of the cables should be low reduce the energy loss Q is chosen Because of the type of current generated is a.c., A high voltage transmission, using the low density of cables, the resistance of the cables is low	10
(b)(i)	Secondary current = 2A	1
(ii)	Output power , P = I2R + 24 = 48 W Input power , P = IV = 60 W Efficiency = (output /input power) x 100 = 80 %	4
	TOTAL MARK	**20**

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1. CHAPTER 2

A student carries out an experiment to study the relationship between the increase in length, y, for successive ticker strips and the runway's inclined angle, θ , to the horizontal. The student arranges a runway with an inclined angle, θ which is measured by a protractor as shown in Figure 1.1.The student start off with $\theta = 20^0$.

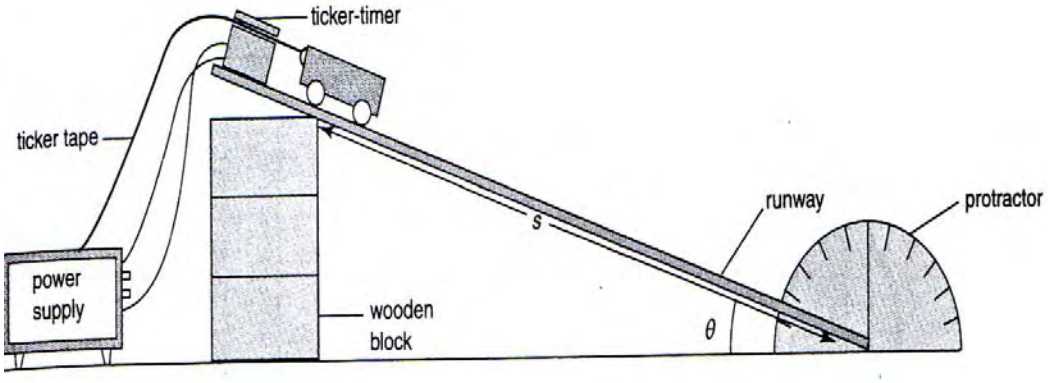

Figure 1.1

The ticker-timer is switched on the trolley is allowed to run down the run away.The ticker tape obtained is cut into 5- tick strips to form a tape chart. The above procedure is repeated with angles of inclination 25^0, 30^0, 35^0, and 40^0.
The actual size of the tape chart are shown in Figure 1.2 (a), 1.2 (b), 1.2 (c), 1.2 (d) and 1.2 (e).
The value for the increase in length, y for successive strips of each tape chart (y_1 as shown) is measured and the corresponding values of θ are recorded.

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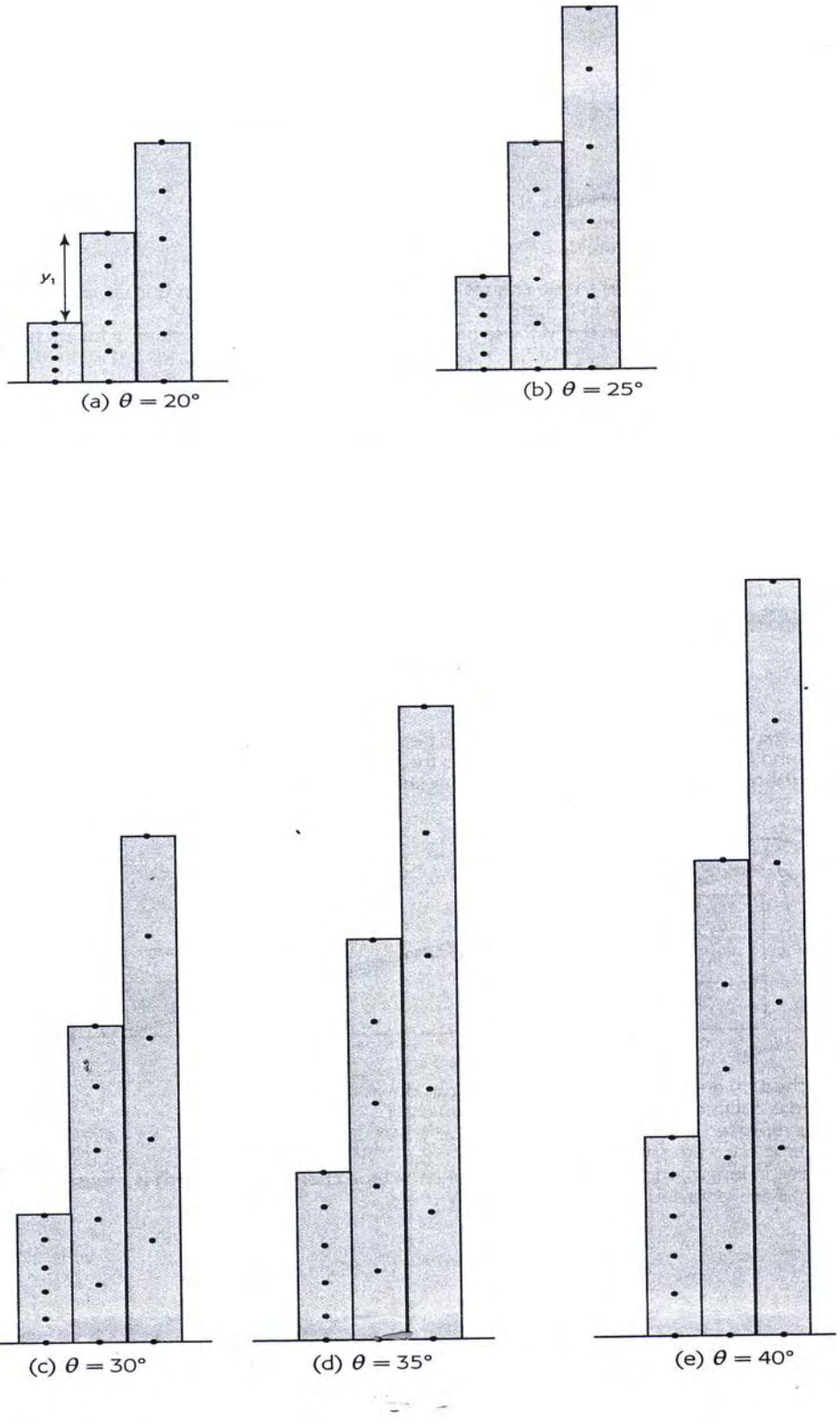

e)

Figure 1.2

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a. Based on the aim of the experiment, identify:

(i) The manipulated variable

…… (1 mark)

(ii) The responding variable

…… .(1mark)

(iii) The constant variable

……..(1 mark)

b. The length of each strip in tape chart is a measurement of velocity, in unit cm per five ticks. What does y, increase in lengths for successive strips represent?

……..(1 mark)

c. Tabulate the result for sin θ and the increase in length of successive strips, y for each value of θ.

(6 marks)

d. On a graph paper, draw a graph of y against sin θ

(5 marks)

e. Use your graph in (d) to state the relationship between y and sin θ .

……

(1 mark)

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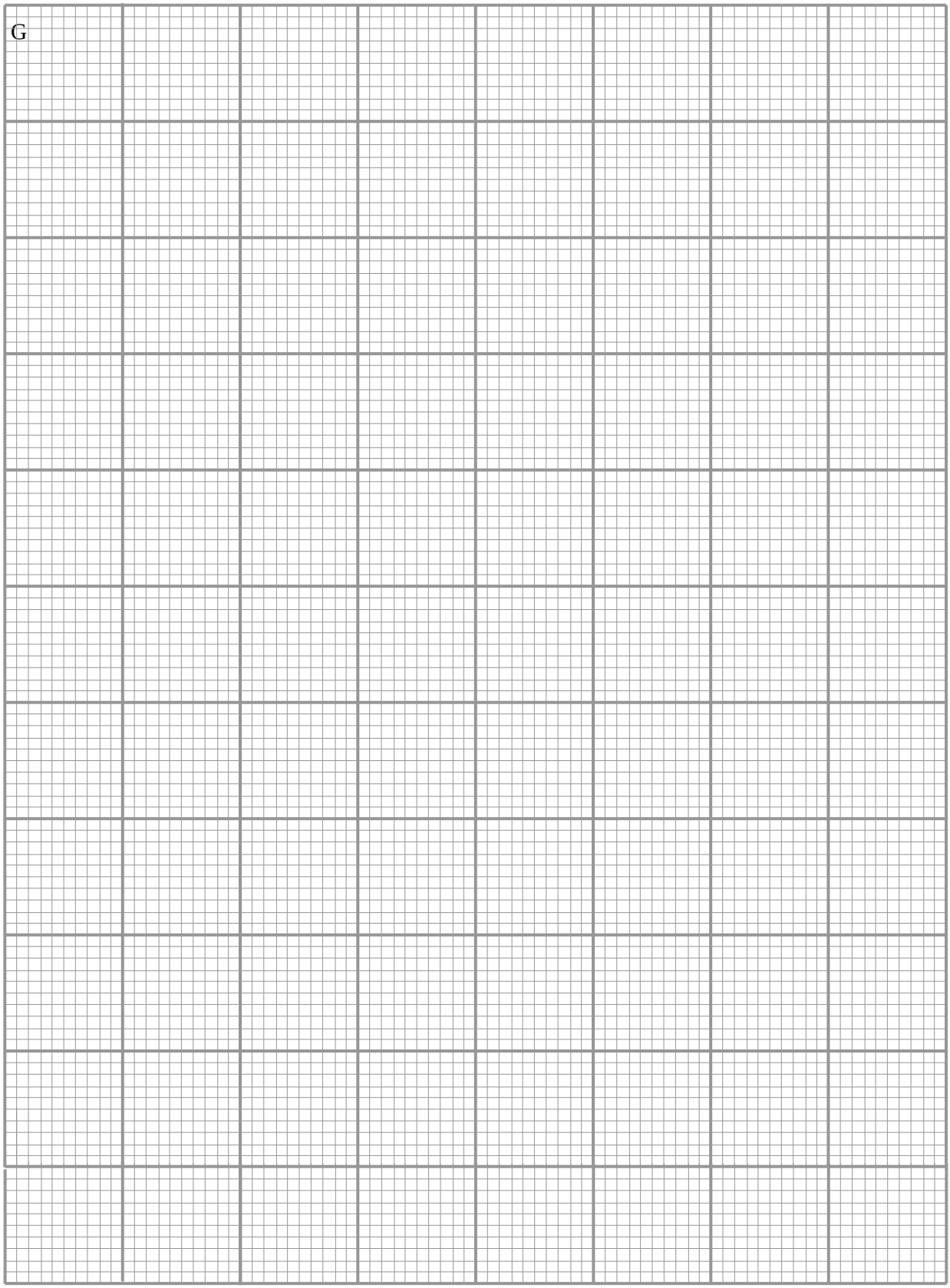
Graph of y against $\sin\theta$



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2 CHAPTER 2

A student carries out an experiment to find out the relationship between mass, m and the oscillation period, T, of an inertia balance. A piece of jigsaw blade is clamped at one end and a plasticine ball with mass 10.0 g is fixed at the other end. The distance from plasticine ball to the clamp is 30.0 cm. The arrangement of the apparatus for the experiment is shown in Figure 1.1

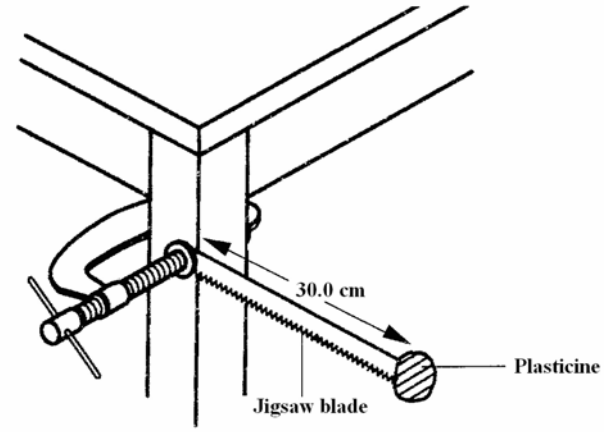

Figure 1.1

The jigsaw blade is displaced horizontally to one side and the released so that it oscillates. The time for 10 oscillations, t_1 is taken using a stop watch. The jigsaw blade is oscillates two times again to obtain the time for 10 oscillations, t_2, for the second time and t_3, for the third time. The actual reading of t_1, t_2 and t_3 are shown on page 6.

The experiment is repeated by using plasticine balls with mass 20.0 g, 30.0 g, 40.0 g, and 50.0 g. The readings of the stop watch are shown in Figure 1.3, 1.4, 1.5 and 1.6 as shown on pages 6, 7 and 8.

The period of oscillation, T, of the jigsaw blade is given by the following equation

$$T = \frac{t_{mean}}{10}$$

Where $t_{mean} = \frac{t_1 + t_2 + t_3}{3}$

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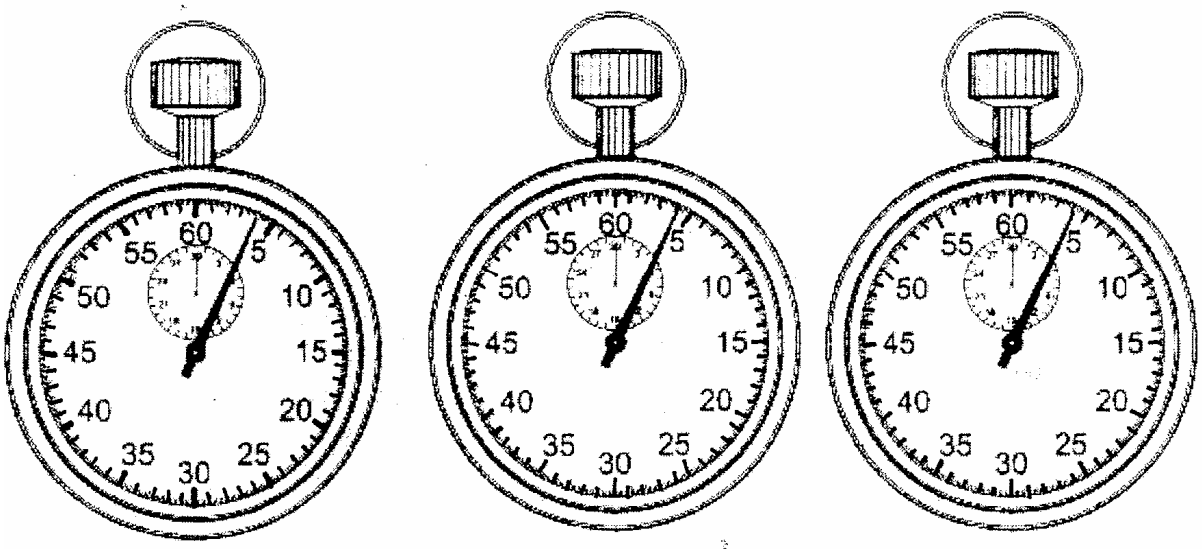
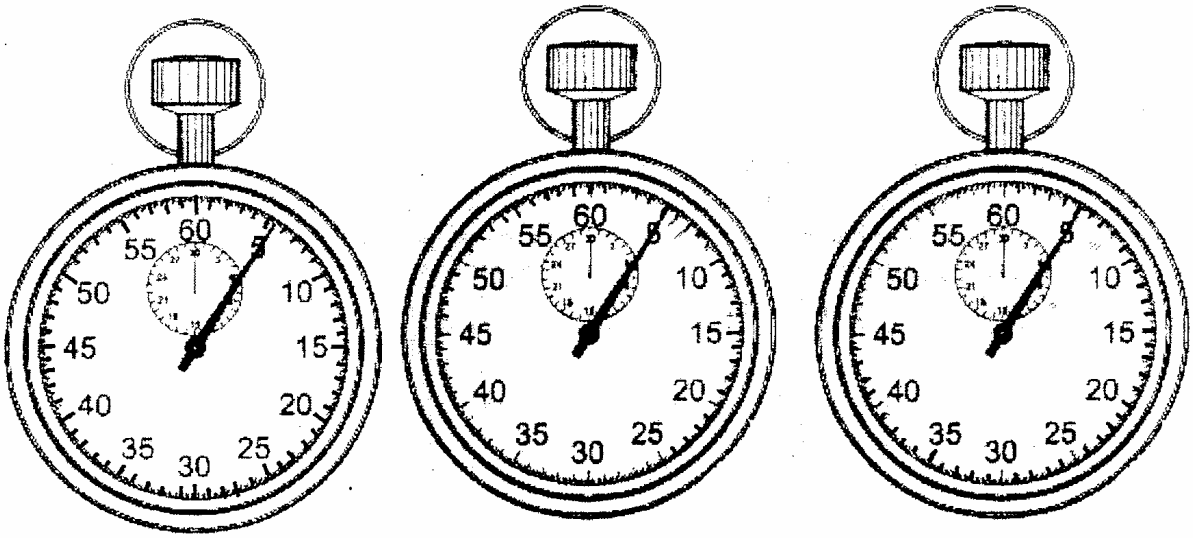


(First reading) (a) (Second reading) (b) (Third reading) (c)

Figure 1.2: Mass of plasticine = 10.0 g



(First reading) (a) (Second reading) (b) (Third reading) (c)

Figure 1.3: Mass of plasticine = 20.0 g

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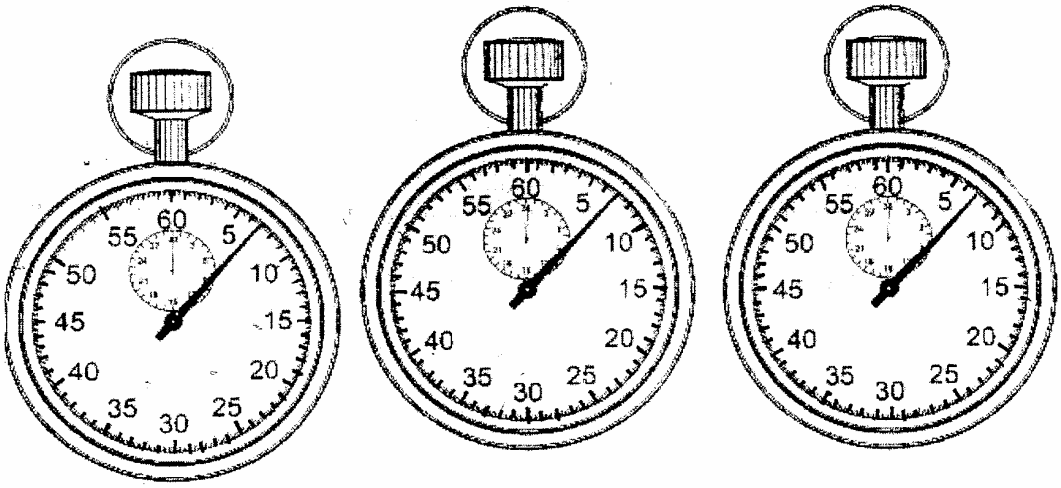
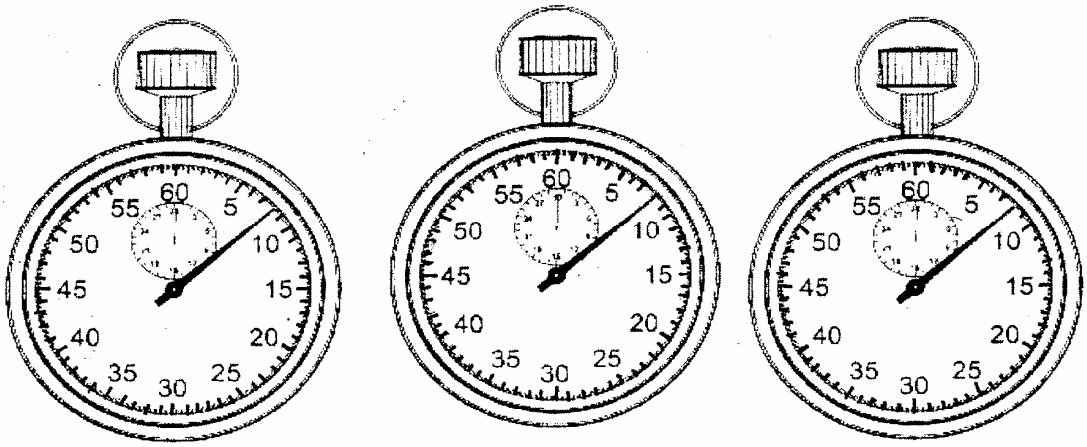


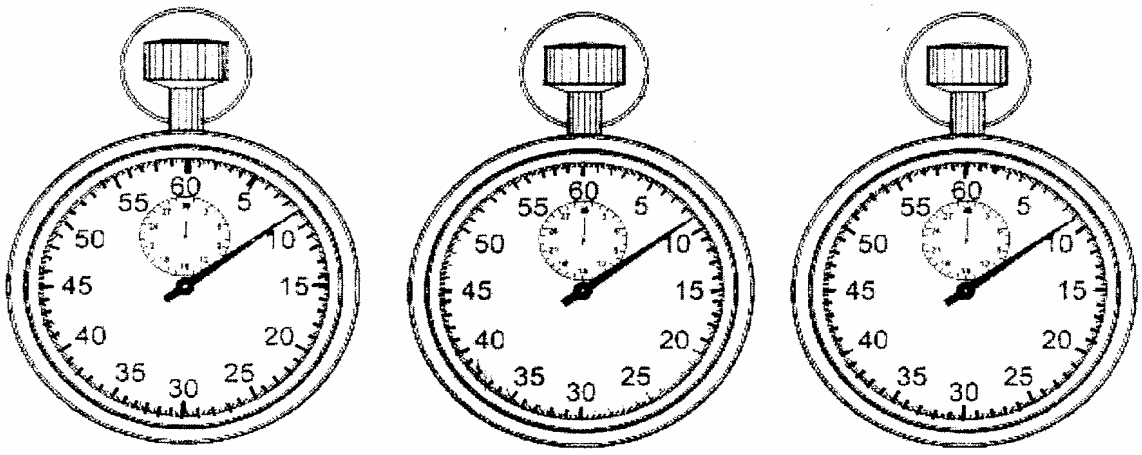
(First reading) (a) (Second reading)(b) (Third reading)(c)

Figure 1.4: Mass of plasticine = 30.0 g



(First reading) (a) (Second reading) (b) (Third reading) (c)

Figure 1.5: Mass of plasticine = 40.0 g



(First reading) (a) (Second reading)(b) (Third reading) (c)

Figure 1.6: Mass of plasticine = 50.0 g

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(a) For the experiment described on page 5, identify;

(i) the manipulate variable,

……

[1 *mark*]

(ii) the responding variable,

……

[1 *mark*]

(iii) a constant variable.

……

[1 *mark*]

(b) Based on Figure 1.2, 1.3, 1.4, 1.5 and 1.6 on pages 6, 7 and 8, determine t_1, t_2, t_3, t_{mean}, T and T^2 when m is equal to 10.0 g, 20.0 g, 30.0 g and 50.0 g.

Tabulated your results for t_1, t_2, t_3, t_{mean}, T and T^2 for each value of m in the space.

[7 *marks*]

(c) On the graph paper on page 11, plot a graph of T^2 against m.

[5 marks]

(d) Use your graphs to state the relationship between T and m.

……

[1 *mark*]

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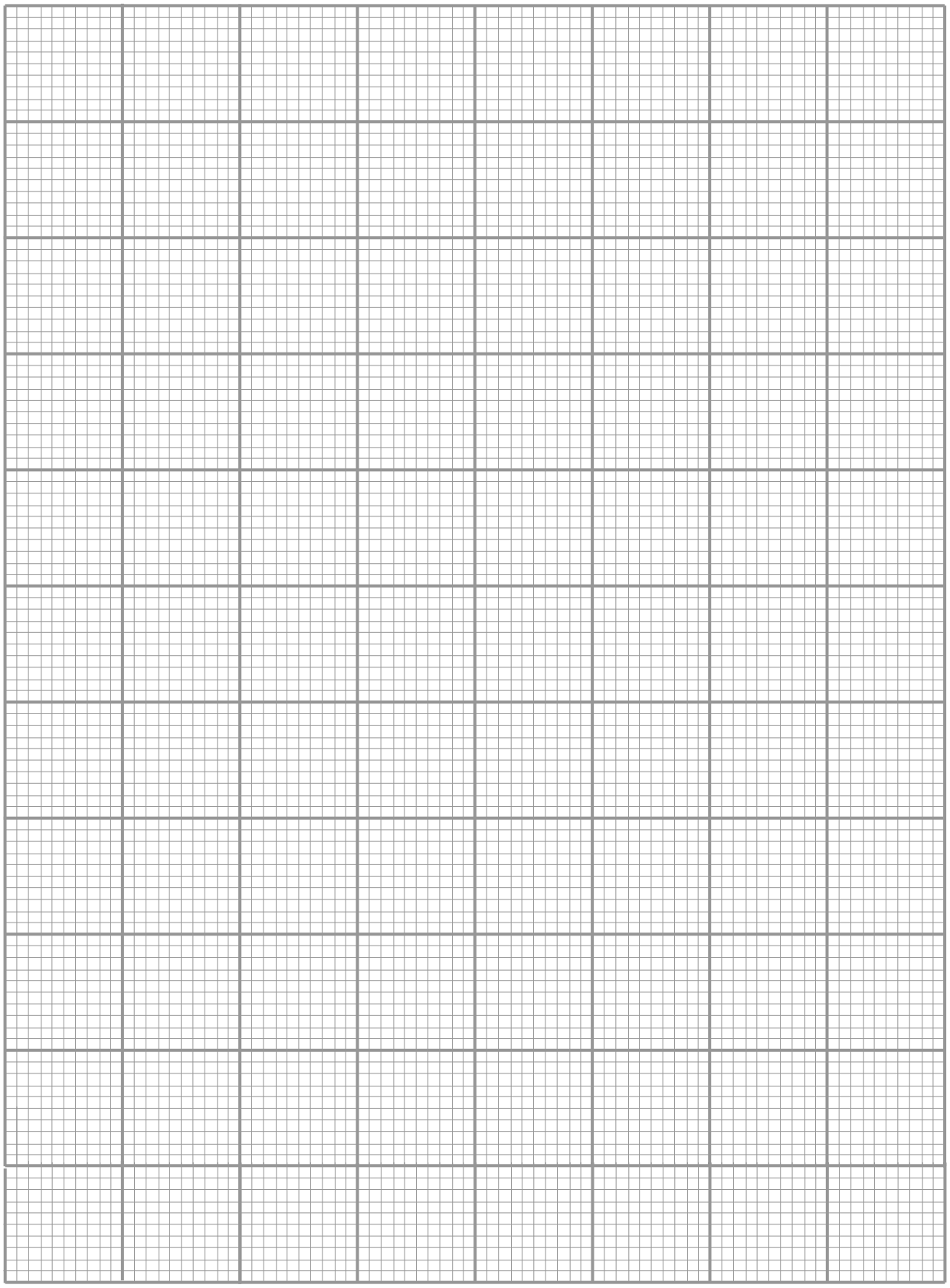
Graph of T^2 against m



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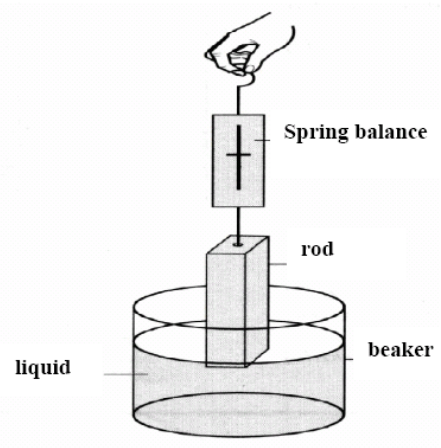
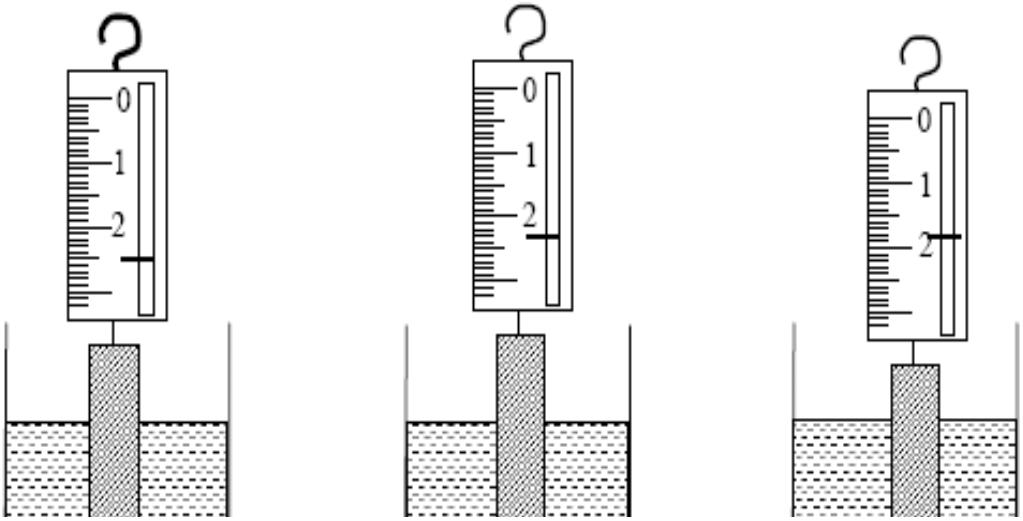
3. CHAPTER 3

The experiment is carried out to study Archimedes principle. A rod which is 10 cm long is marked at intervals of 1 cm and suspended from the hook of spring balance. The rod is lowered into a liquid as shown in Figure1. The length of rod below the liquid level is measured and the reading on the spring balance is recorded. The experiment is started by lowering the rod to a depth of 5.0 cm and the reading on the spring balance, W/N is recorded. The experiment is repeated by lowering the rod to different depth, i.e h = 6.0 cm, 7.0 cm, 8.0 cm, 9.0 cm and 10.0 cm





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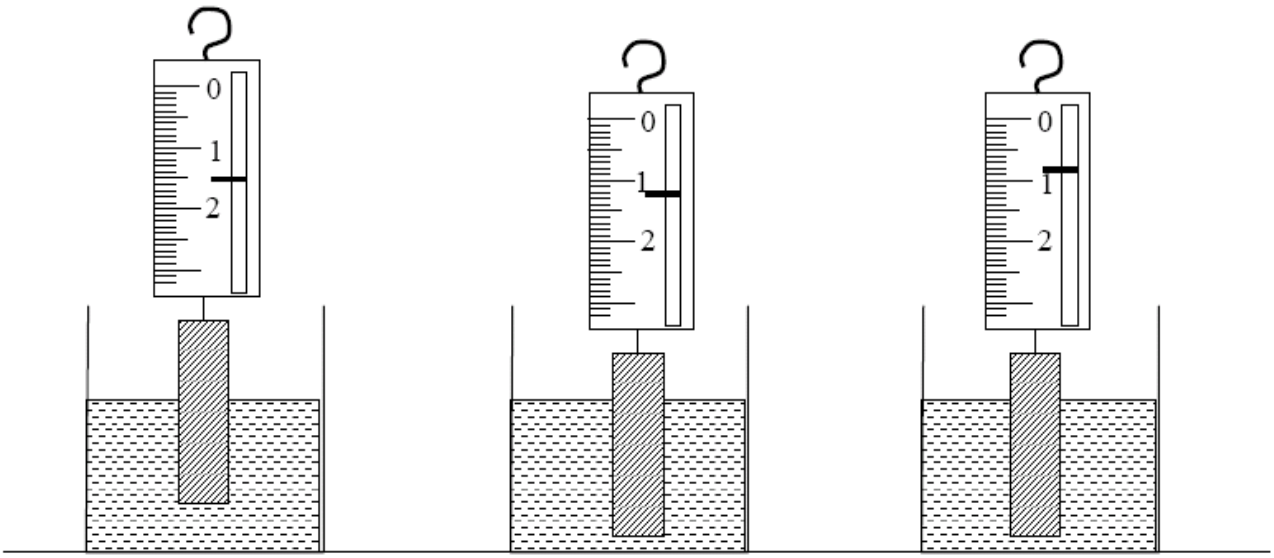

2(d) h = 8.0 cm 2(e) h = 9.0 cm 2(f) h = 10.0 cm

Figure 2(a), 2 (b), 2(c), 2(d) , 2(e) and 2(f) shows the result of experiment.

(a) Base on the aim of the experiment, identify :

(i) The manipulated variable

…… …….

[1 mark]

(ii) The respoding variable

……

[1 mark]

(iii) The constant variable

……

[1 mark]

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(b) Base on Figure 2(a), 2 (b), 2(c), 2(d) , 2(e) and 2(f), determine the readings on the spring balance., W when h is equal to 5.0 cm, 6.0 cm, 7.0 cm, 8.0 cm, 9.0 cm and 10.0 cm.
Tabulate your reading in the space below.

[6 marks]

(c) On the graph paper, draw a graph of a spring balance reading, W against the depth of rod, h

[5 marks]

(d) Use your graph in (c) to state the relationship between W and h.

.....[1 mark]

(e) State one step precaution that should be taken when conducting this experiment

.....[1 mark]

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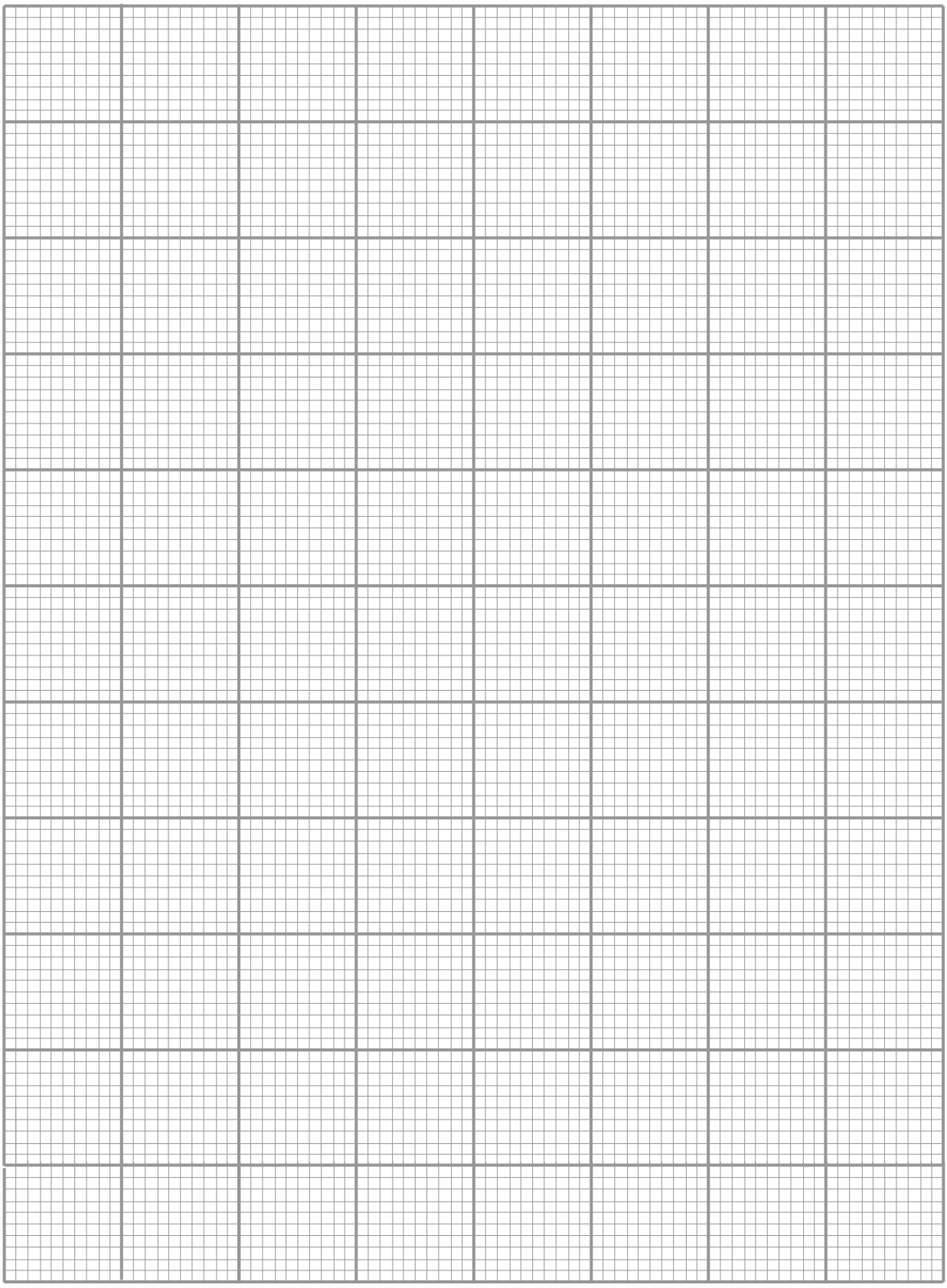

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4. **CHAPTER 4**

A student carries out an experiment to investigate how the temperature of water increases with the time of heating. Diagram 2.1 shows the set up of the apparatus for the investigation. Before the heater is switched on the initial temperature, θ_0 of the water is measured. Diagram 2.2 shows meniscus of the mercury column in the thermometer.

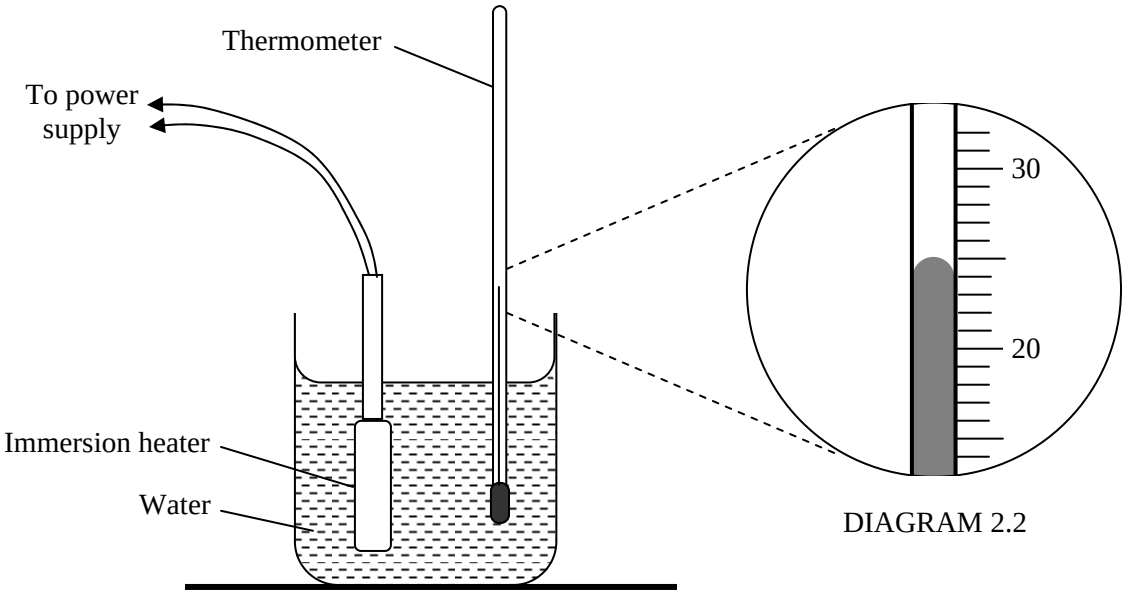

DIAGRAM 2.1

DIAGRAM 2.2

A stopwatch and the heater is switched on simultaneously. At time, t = 20 s, the temperature, θ, of the water is read on the thermometer. Diagram 2.3 shows the meniscus of the mercury column in the thermometer.

The procedure is repeated for heating time, t = 40 s, 60 s, 80 s, 100 s and 120 s. The corresponding positions of the meniscus of the mercury column in the thermometer are shown in Diagrams 1.3, 1.4, 1.5, 1.6 and 1.7.

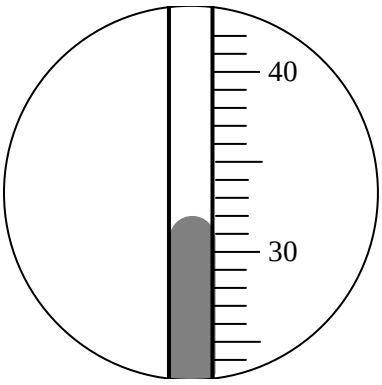

DIAGRAM 2.3

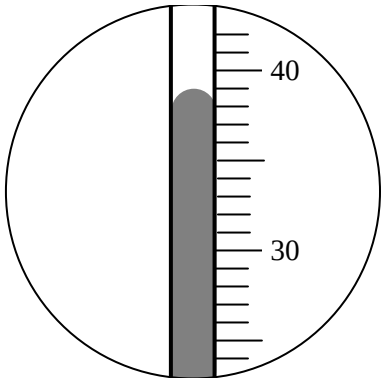

DIAGRAM 2.4

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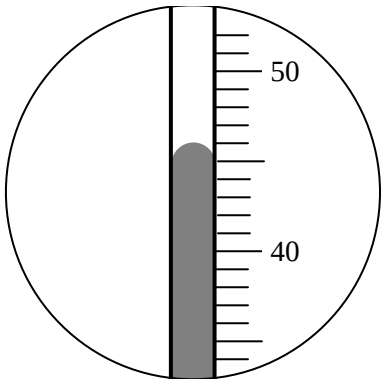

DIAGRAM 2.5

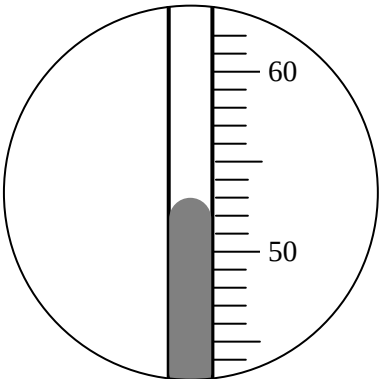

DIAGRAM 2.6

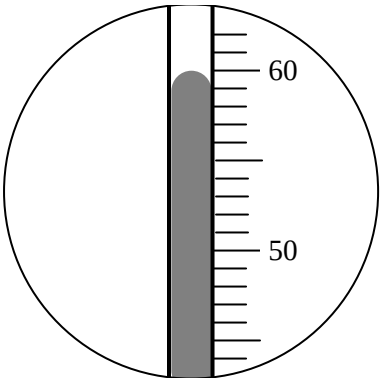

DIAGRAM 2.7

(a) For the experiment described above, identify:

(i) the manipulated variable

……

[1 *mark*]

(ii) the responding variable

……

[1 *mark*]

(iii) a fixed variable

……

[1 *mark*]

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(b) Explain how parallax error can be reduced when the reading of the thermometer is taken.

……..…….

[1 *mark*]

(c) (i) Based on Diagram 2.2, determine the initial temperature, θ_0, of the water.

Initial temperature, θ_0 = …….

(ii) Based on Diagrams 2.3, 2.4, 2.5, 2.6 and 2.7, determine the temperature, θ, for the corresponding values of heating time, t.

Tabulate your results for t, θ and $\Delta\theta$ in the space below.

$\Delta\theta$ is the increase in temperature.

$\Delta\theta$ is calculated using the formula, $\Delta\theta = \theta - \theta_0$

[5 *marks*]

(d) On the graph paper, plot a graph of $\Delta\theta$ against t.

[5 *marks*]

(e) Based on your graph, state the relationship between $\Delta\theta$ and t.

……..…….

[1 *mark*]

(f) State one precaution that should be taken to obtain accurate readings of θ.

……..…….

……..…….

[1 *mark*]

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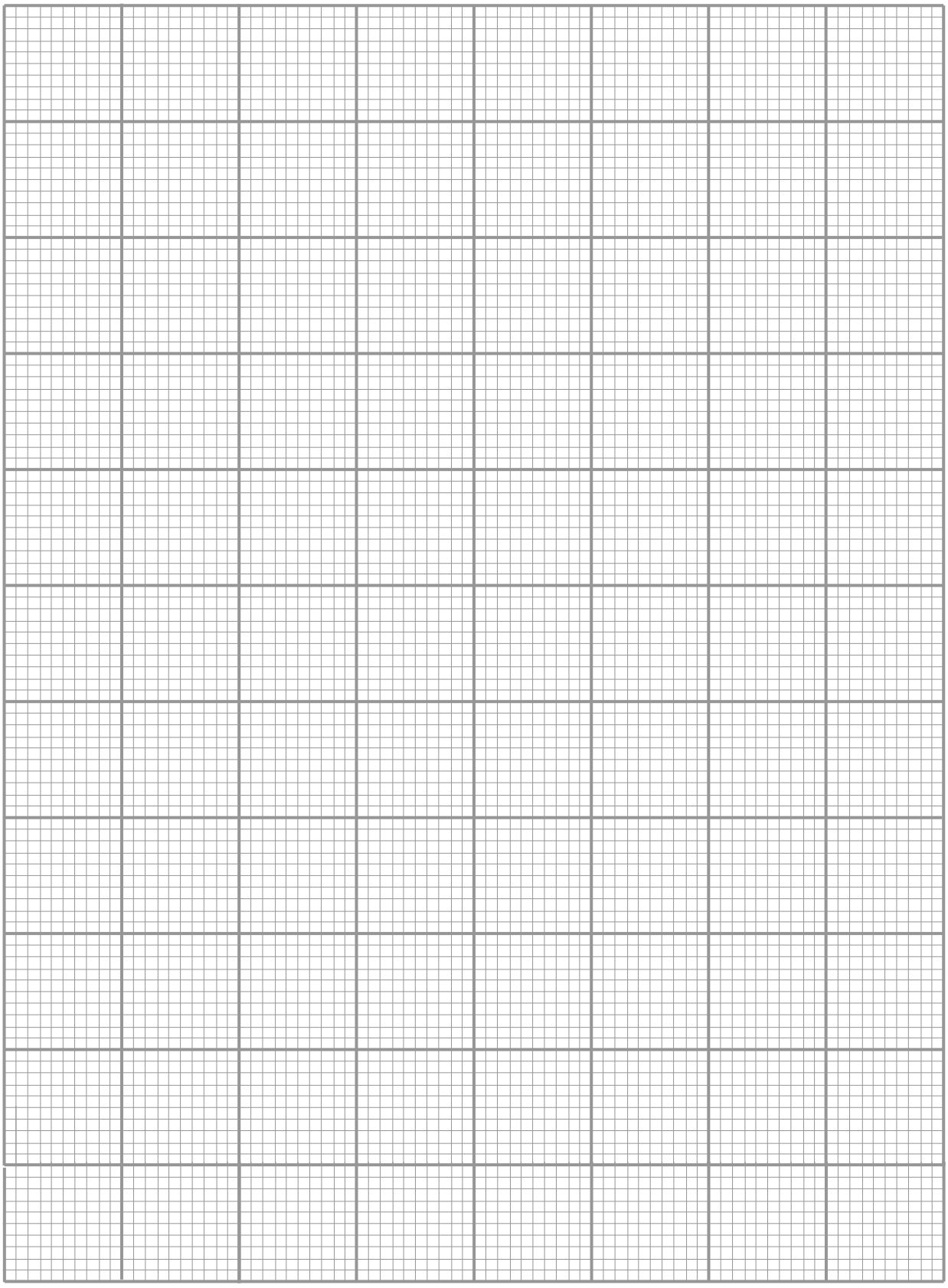
Graph $\Delta\theta$ against t.



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5. **CHAPTER 4**

A student carries out an experiment to investigate the relationship between the temperature, θ and the electric current, I through a pure metal. The arrangement of the apparatus is shown in diagram 1.1.

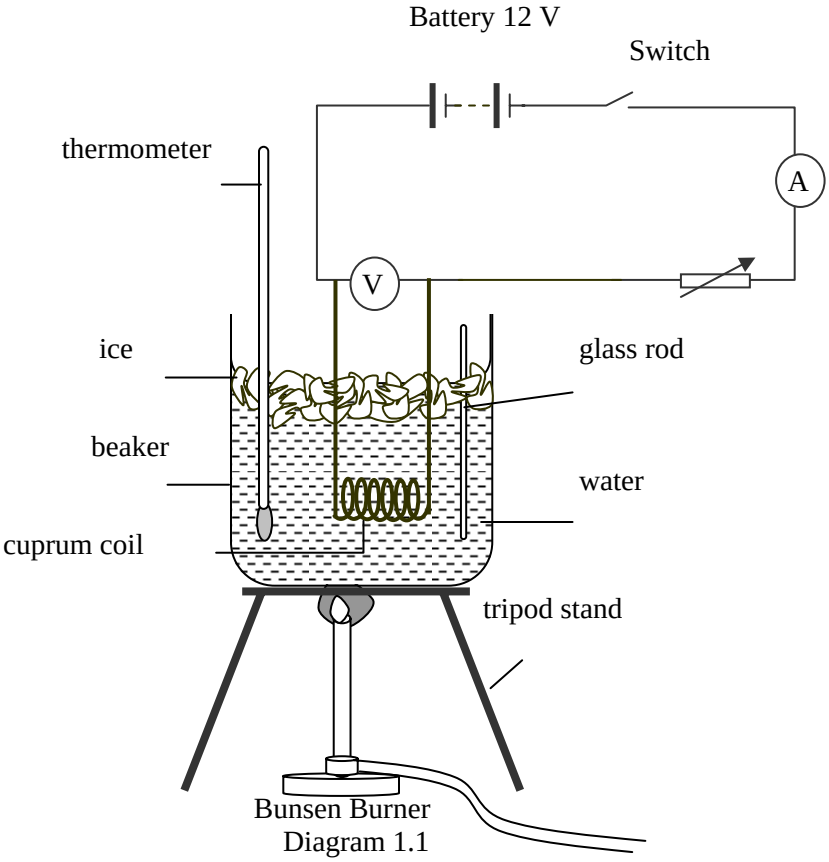
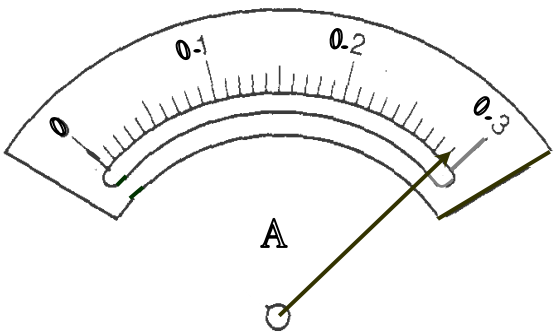


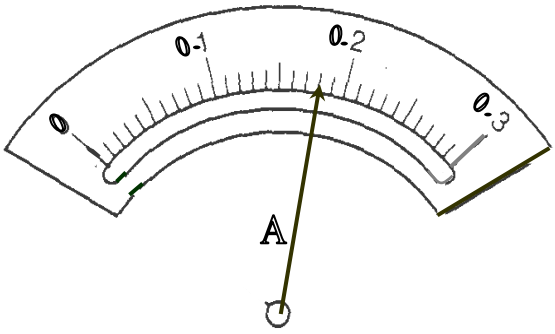
Diagram 1.1

The switch-on and ammeter reading will record when the temperature of water, θ is 10^0C. Then the water will heat slowly and ammeter reading will be recorded after the increasing of temperature is 10^0C. The actual corresponding readings of ammeter, I to each temperature are shown in diagram 1.2, 1.3, 1.4, 1.5 and 1.6.



θ = 20 ^{0}C I = ……A

Diagram 1.2



θ = 10 ^{0}C I = ……A

Diagram 1.3

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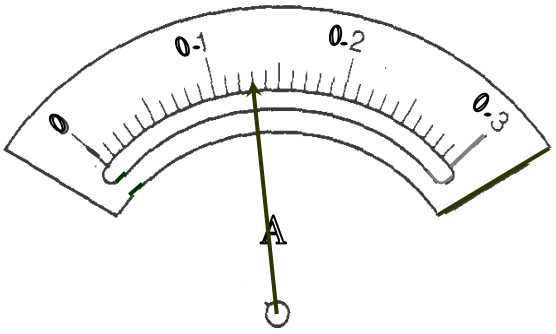
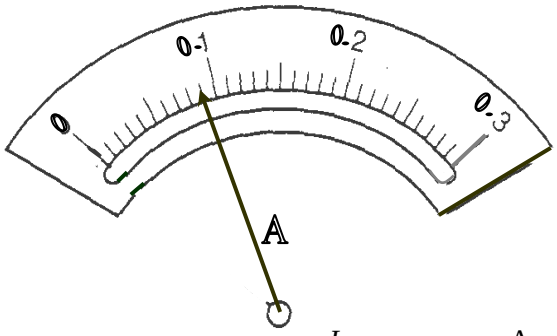


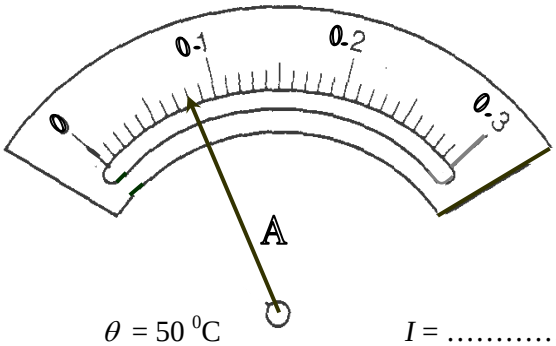
θ = 40 ^{0}C I = ……...A

Diagram 1.4



θ = 30 ^{0}C I = ……...A

Diagram 1.5



θ = 50 ^{0}C I = ……A

Diagram 1.6

(a) Base on the aim of the experiment, identify :

(iv) The manipulated variable

……. …….

[1 mark]

(v) The respoding variable

……

[1 mark]

(vi) The constant variable

……

[1 mark]

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(b) Based on diagram 1.2, 1.3, 1.4, 1.5 and 1.6, determine the readins of ammeter, I, and their corresponding temperature, θ

Tabulate your results for temperature, θ, I and $\frac{1}{I}$ in the space below.

[7 marks]

(c) On the graph paper on page 5, plot a graph $\frac{1}{I}$ against θ

[5 marks]

(d) Based on your graph, state the relationship between $\frac{1}{I}$ and θ

……

[1mark]

(c) Why the reading of ammeter decreased when the temperature decreased.

.....

[1 mark]

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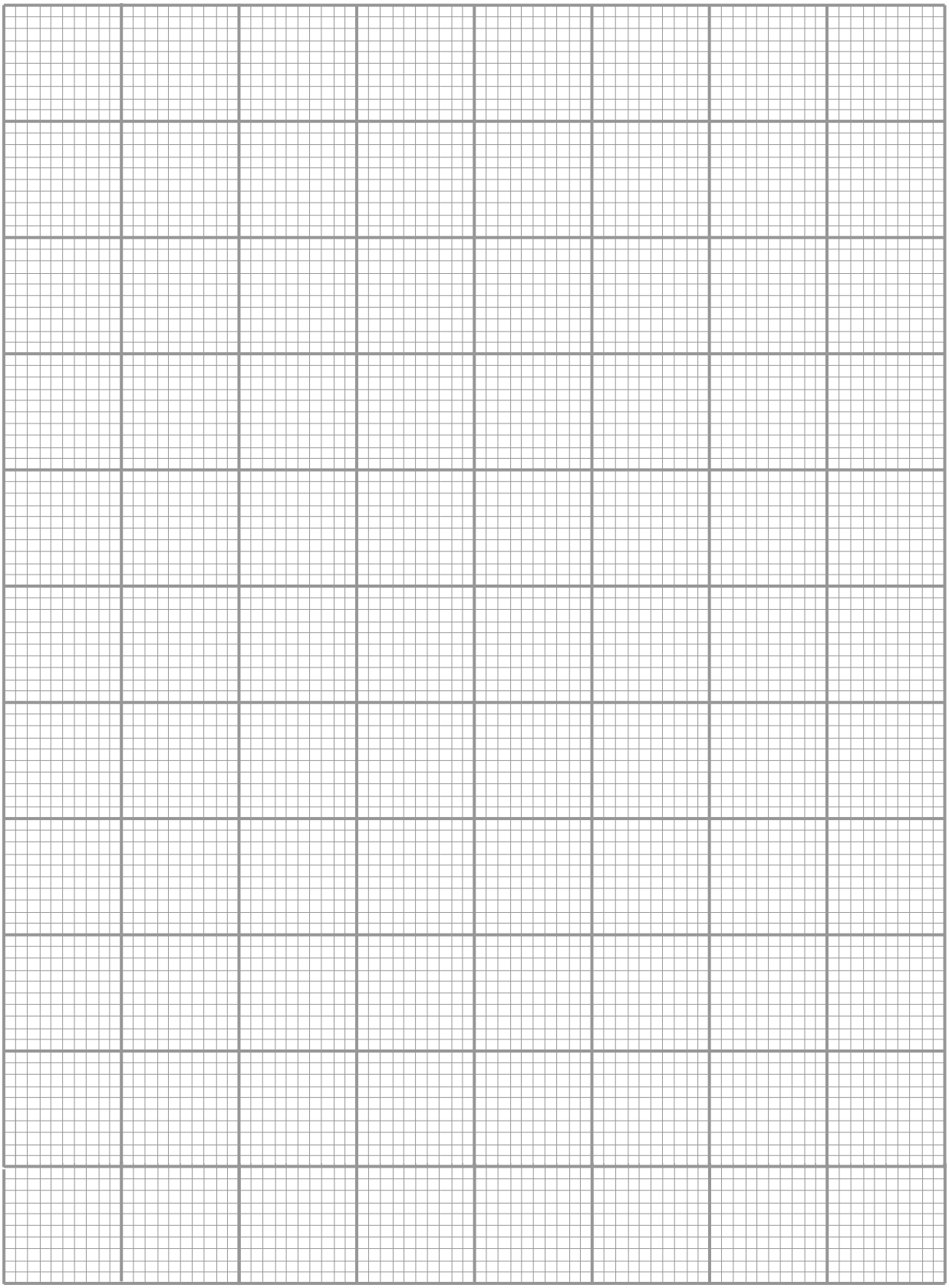
Graph $\frac{1}{I}$ against θ



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6. CHAPTER 4

Abdullah carried out an experiment to study the relationship between the rise in temperature of water, θ and the mass of water, m . He measured 50 cm^3 of water using a measuring cylinder. Then he poured the water into a 1000 ml beaker. The arrangement of the apparatus for the experiment is shown in Figure 1.

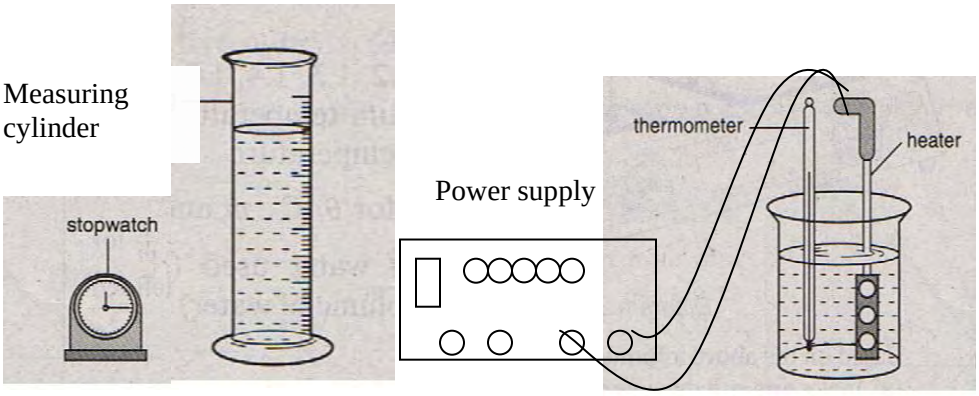
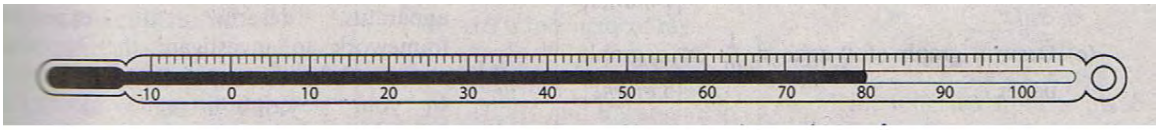


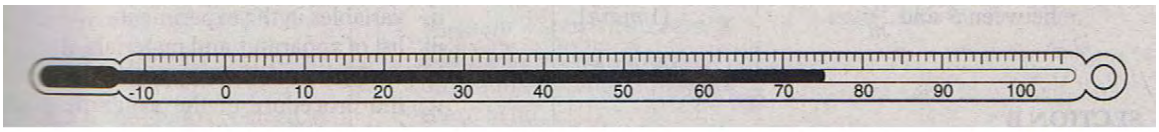
FIGURE 1

He measured the initial temperature of the water and recorded it as t_0 = 25° C. Then he switched on the power supply and stirred the water slowly. After 5 minutes he switched off the power supply and continued to stir the water slowly until the maximum temperature was reached as shown in Figure 1.

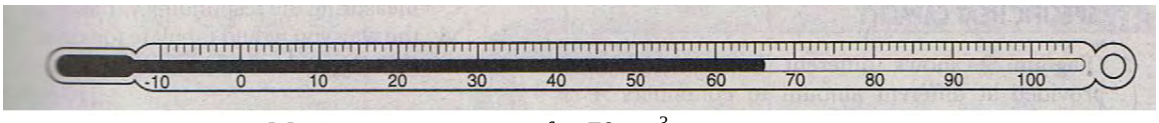
He repeated the experiment using 60 cm^3 , 70 cm^3 , 80 cm^3 , and 90 cm^3 of water. The maximum thermometer readings obtained are as shown in Figure 2.



Maximum temperature for 50 cm^3 water.



Maximum temperature for 60 cm^3 water.



Maximum temperature for 70 cm^3 water.

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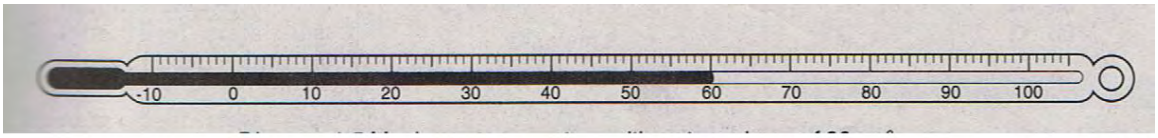
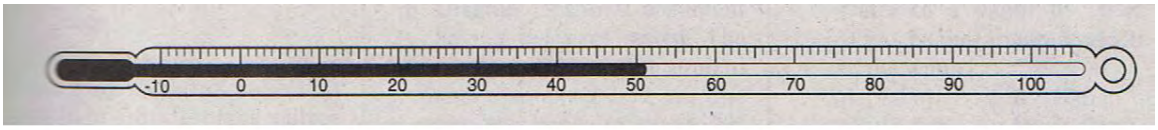


Maximum temperature for 80 cm^3 water.

.



Maximum temperature for 90 cm^3 water.

.

FIGURE 2

(a) Based on the experiment described above, identify :
the manipulated variable

_____

[1 mark]

ii. the responding variable

_____

[1 mark]

iii. the fixed variable

_____

[1 mark]

(b) If the density of water is 1 g cm^{-3} , state the equivalent mass of the water, *m* for each volume given in Figure 2 and determine the corresponding maximum temperature, *T* . Calculate the rise in temperature , θ using the following formula:

$$\theta = T - t_0$$

Tabulate your result for *m, 1/m* , *T* and θ for each of the volume, *V* of water given.

[7 marks]

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(c) Draw a graph of θ against 1/m on the graph paper provided.

[5 marks]

(d) Based on your graph, state the relationship between θ and m.

_____

[1 mark]

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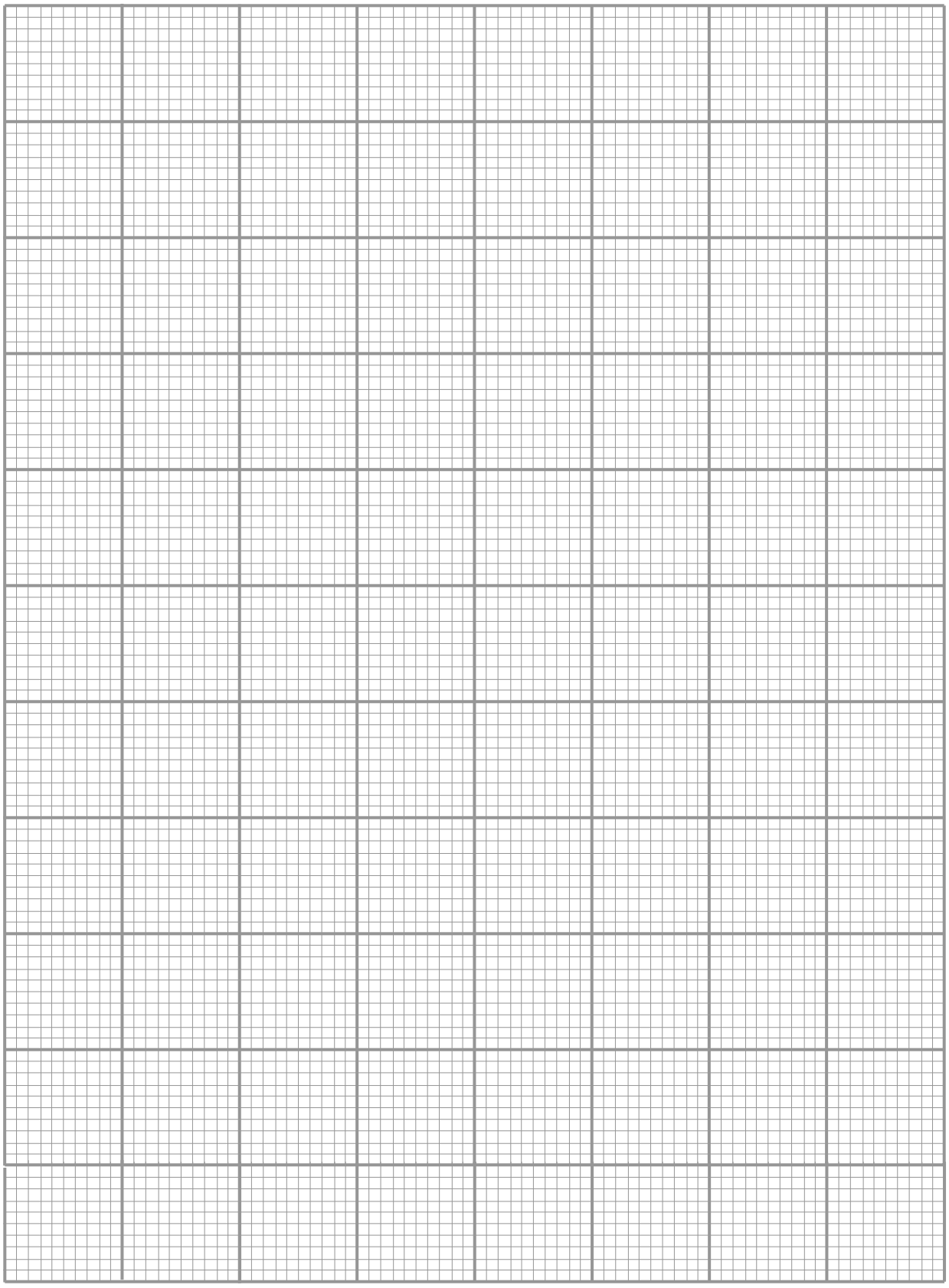
Grat θ against 1/m



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7. CHAPTER 5

A student carries out an experiment to investigate the relationship between the angle of incidence, *i* and angle of refraction, *r*, in the air by using a semi-circular glass block.

The semi-circular glass block is placed on a piece of white paper and a light ray is directed to the centre of the glass block, O as shown in figure 1.1.

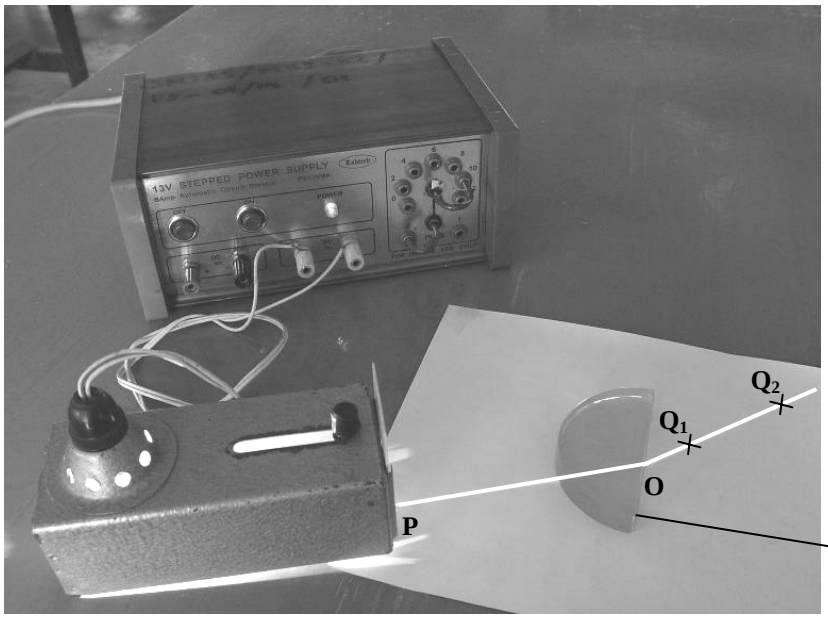

FIGURE 1.1

A light ray, PO is directed to the centre of the glass block, O making an angle of incidence, $i = 15^o$ and the refracted light is marked with two crosses (x) at point Q_1 and Q_2 respectively. The refracted light is traced by connecting points Q_1 and Q_2 . The angle of refraction, *r*, is measured. Figure 1.2 shows the result of the experiment.

The experiment is repeated with various angle of incidence, $i = 20^o$, 25^o, 30^o dan 35^o and the refracted light rays are marked with points R_1 and R_2, S_1 and S_2, T_1 and T_2 and U_1 and U_2.
Figure 1.3, 1.4, 1.5 and 1.6 show the result of the experiment.

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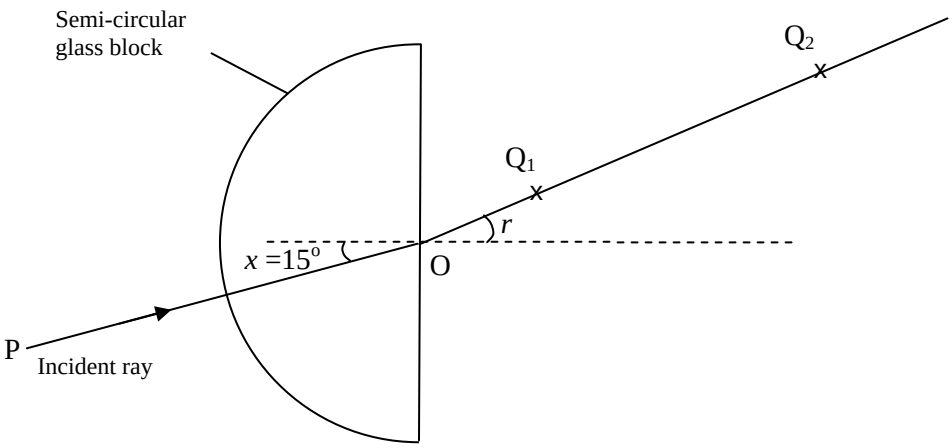
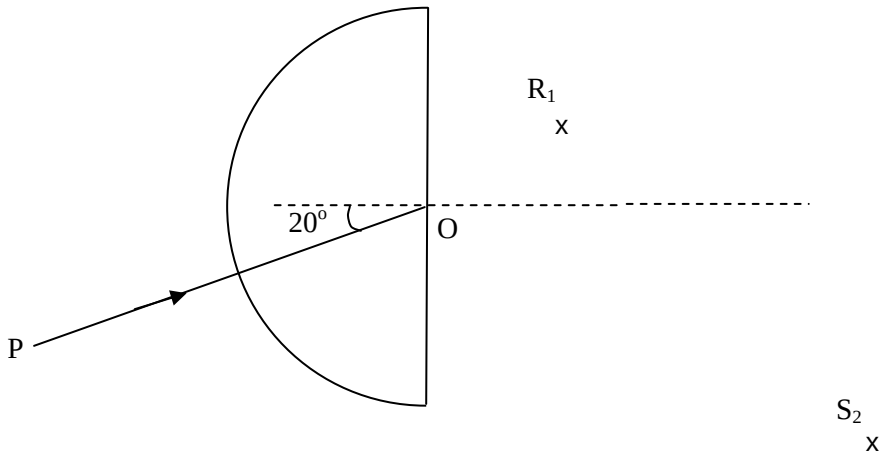


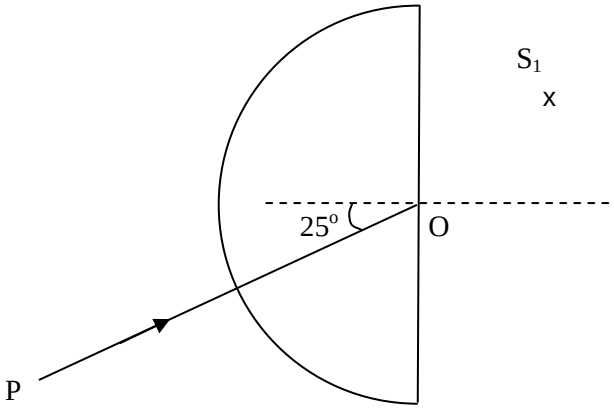
Angle of incidence, $i = 15^o$, angle of refraction, r = ...

FIGURE 1.2



Angle of incidence, $i = 20^o$, angle of refraction, r = ...

FIGURE 1.3



Angle of incidence, $i = 25^o$, angle of refraction, r = ...

FIGURE 1.4

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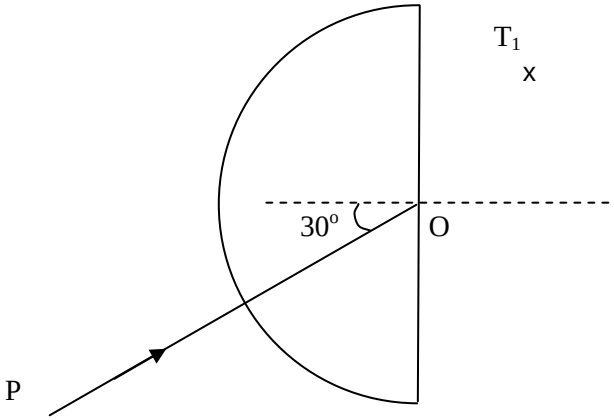
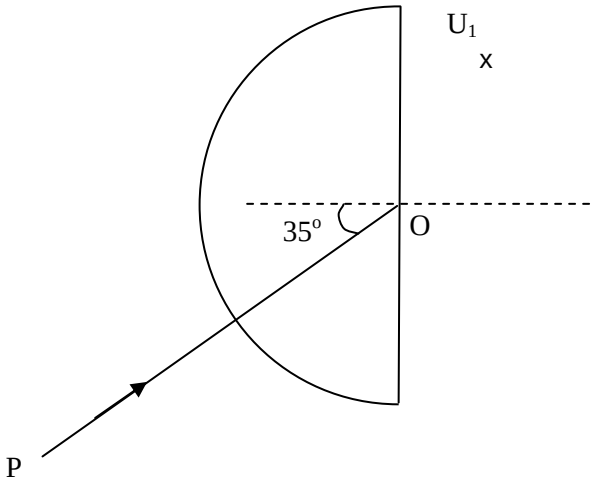
x



Angle of incidence, $i = 30^o$, angle of refraction, r = ...

FIGURE 1.5

U_2
x



Angle of incidence, $i = 35^o$, angle of refraction, r = ...

FIGURE 1.6

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(a) Based on the information given, state

(i) the manipulated variable

.....

[1 *mark*]

(ii) the responding variable

.....

[1 *mark*]

(iii) the fixed variable

.....

[1 *mark*]

(b)(i) Based on figure 1.3, 1.4, 1.5 and 1.6, draw a straight line passes points , R_1 and R_2, S_1 and S_2, T_1 and T_2, U_1 and U_2. Mark the angle of refraction, r and by using a protactor, measure the angle of refraction, *r*. Record the data in the space given.

(ii) Tabulate your results for *i*, *r*, *sin i* and *sin r* in the space below.

[7 *marks*]

(c) Based on your results listed in the table, draw a graph of *sin r* against *sin i* on the graph paper provided.

[5 *marks*]

(d) State the relationship between *sin r* and *sin i*.

……

[1 *mark*]

(e) State one precaution that should be taken to obtain the accurate readings of *i*.

……..... [1 *mark*]

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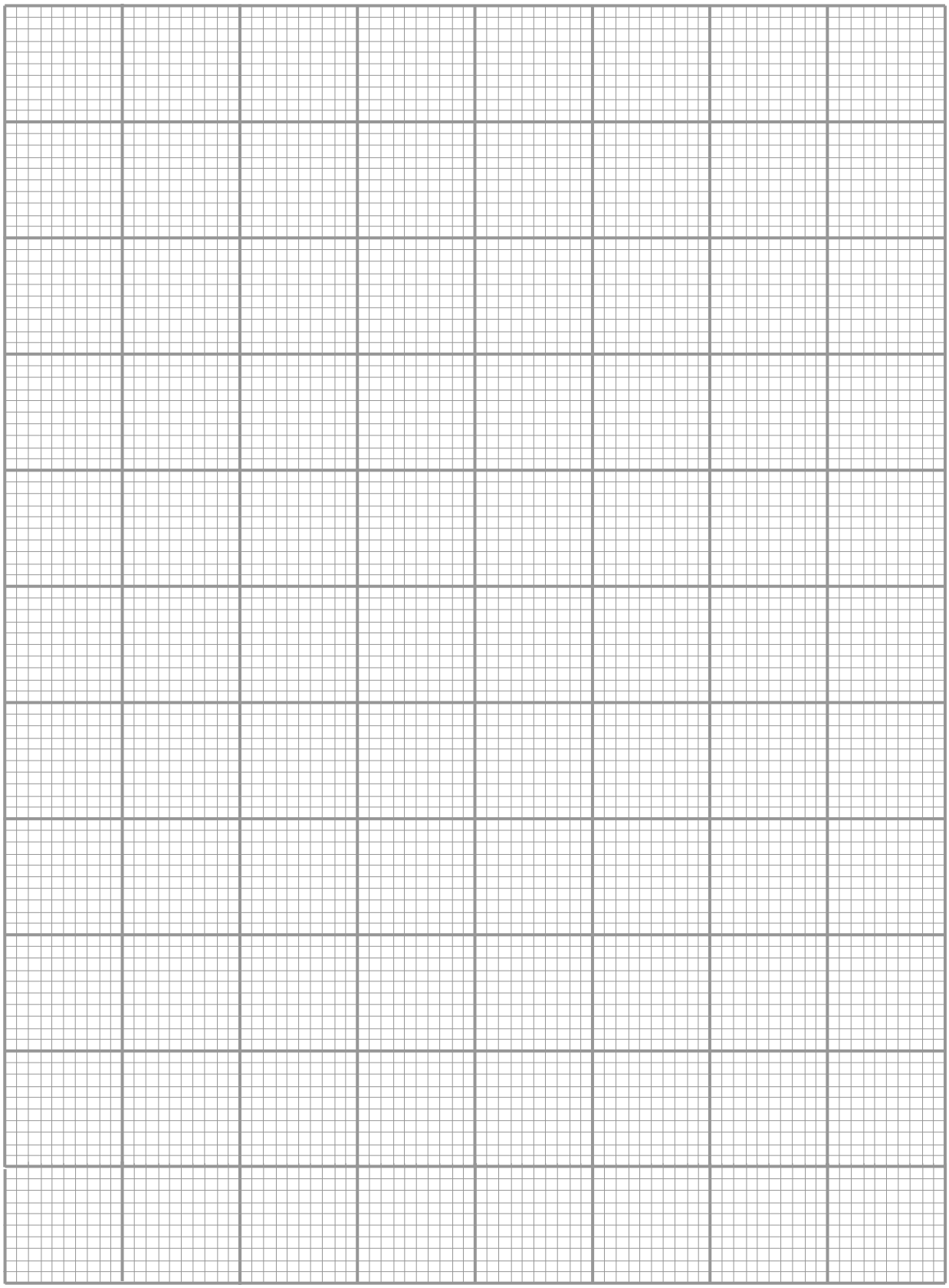
Graph of $\sin Y$ against $\sin t$



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8. **CHAPTER 5**

A student carries an experiment to investigate the relationship between the sin of angle of incident, i and the sin of the angle of reflection, r of a glassblock.
The arrangement of the apparatus for the experiment is shown in Figure 1.1

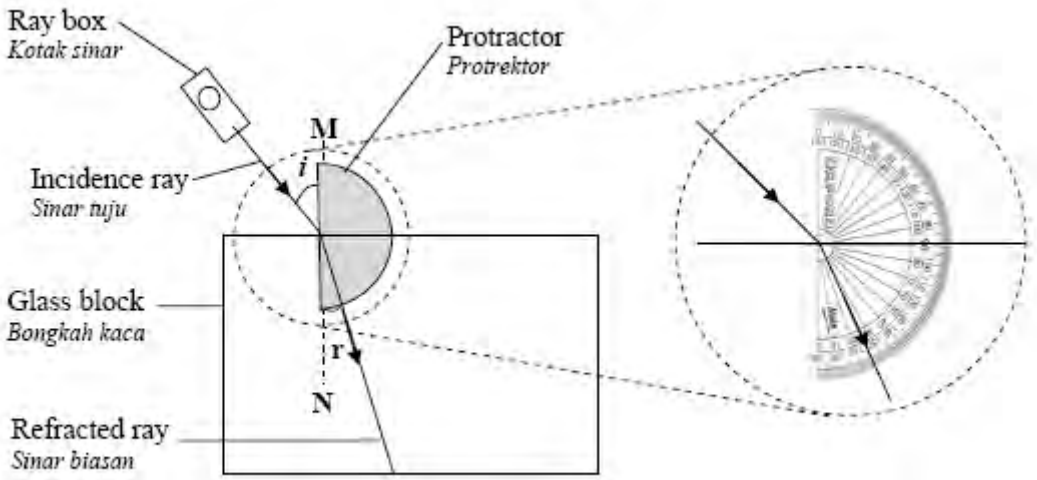

FIGURE 1.1

A ray of light is directed along the angle of incident , I = 200 and forms the angle of reflection, r. The angle of reflection is measured by using a protractor. The corresponding reading of r1, is shown in Figure 1.2 on page 5.

The experiment is repeated by varying the angle of incident , I to 300, 400, 500 and 600. The corresponding angles of reflection, r are shown in Figures 1.3, 1.4, 1.5 and 1.6 on pages 6 and 7 respectively.

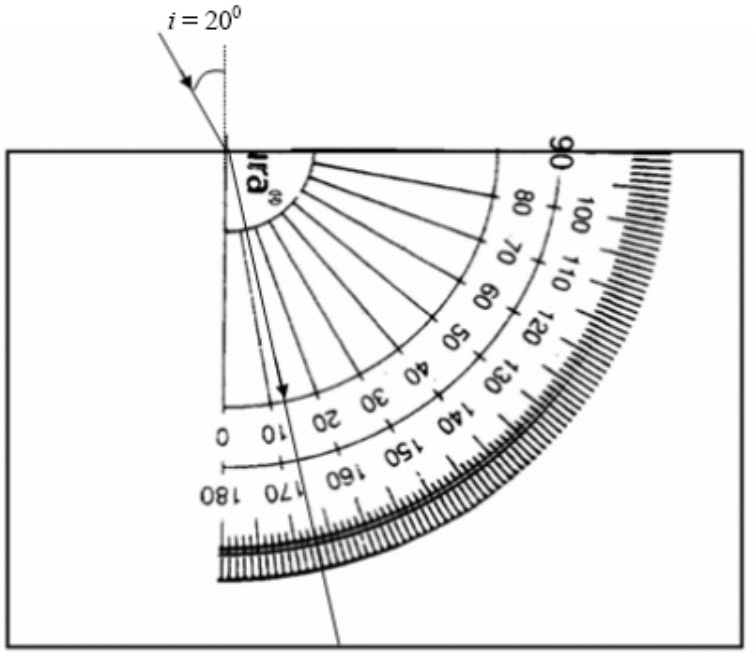

FIGURE 1.2
RAJAH 1.2

The reading of the angle of refraction, r when $i = 20^0$

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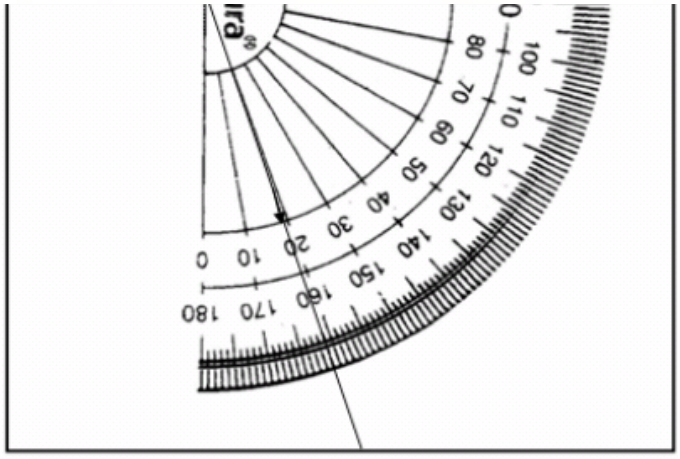

FIGURE 1.3
RAJAH 1.3

The reading of the angle of refraction, r when i = 30^0

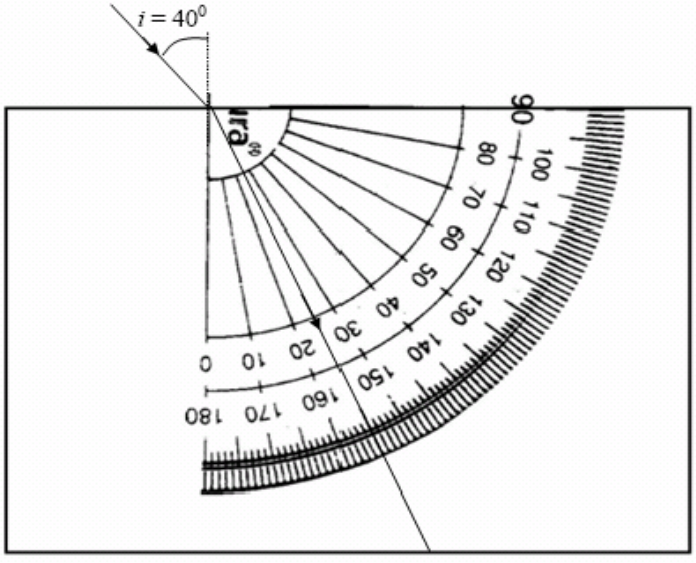

FIGURE 1.4
RAJAH 1.4

The reading of the angle of refraction, r when $i = 40^0$

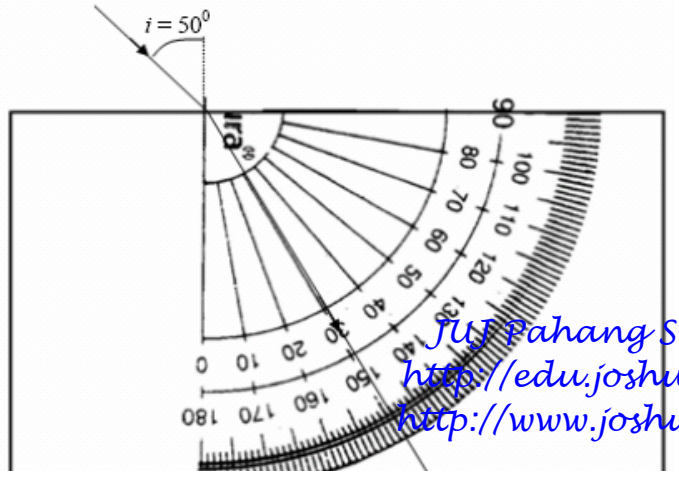

FIGURE 1.5
RAJAH 1.

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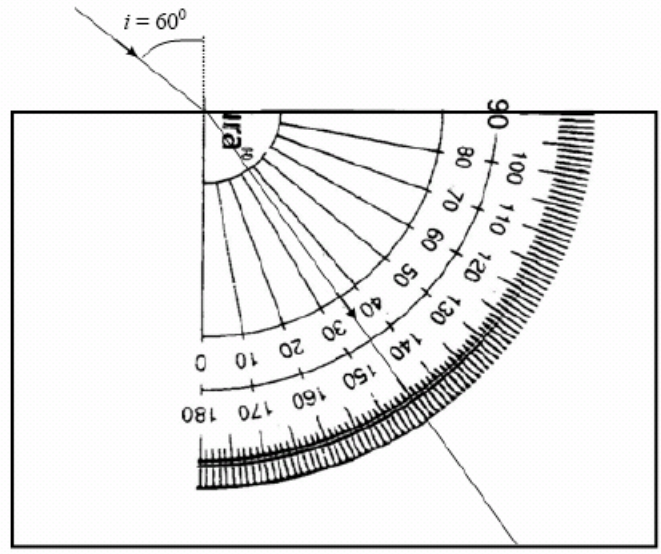

FIGURE 1.6
RAJAH 1.6

The reading of the angle of refraction, r when $i = 60^0$

(a) For the experiment described on page 4, identify

(i) the manipulated variable

..... [1 *mark*]

(ii) the responding variable

..... [1 *mark*]

(iii) the constant variable

…….....[1 *mark*]

(b) Determine the angle of incident , i and the corresponding angle of reflection, *r*, for Figures 1.2, 1.3, 1.4, 1.5 and 1.6 . Tabulate your results for *i*, r, sin *i*, and sin *r* in the space below.

(c) On the graph paper on page 10, plot a graph of sin r against sin i.

(d) Base on your graph, state the relationship between sin r and sin i.

…….....[1 *mark*]

(e) State one precaution that should be taken to obtain the accurate readings of *i*.

…….....[1 *mark*]

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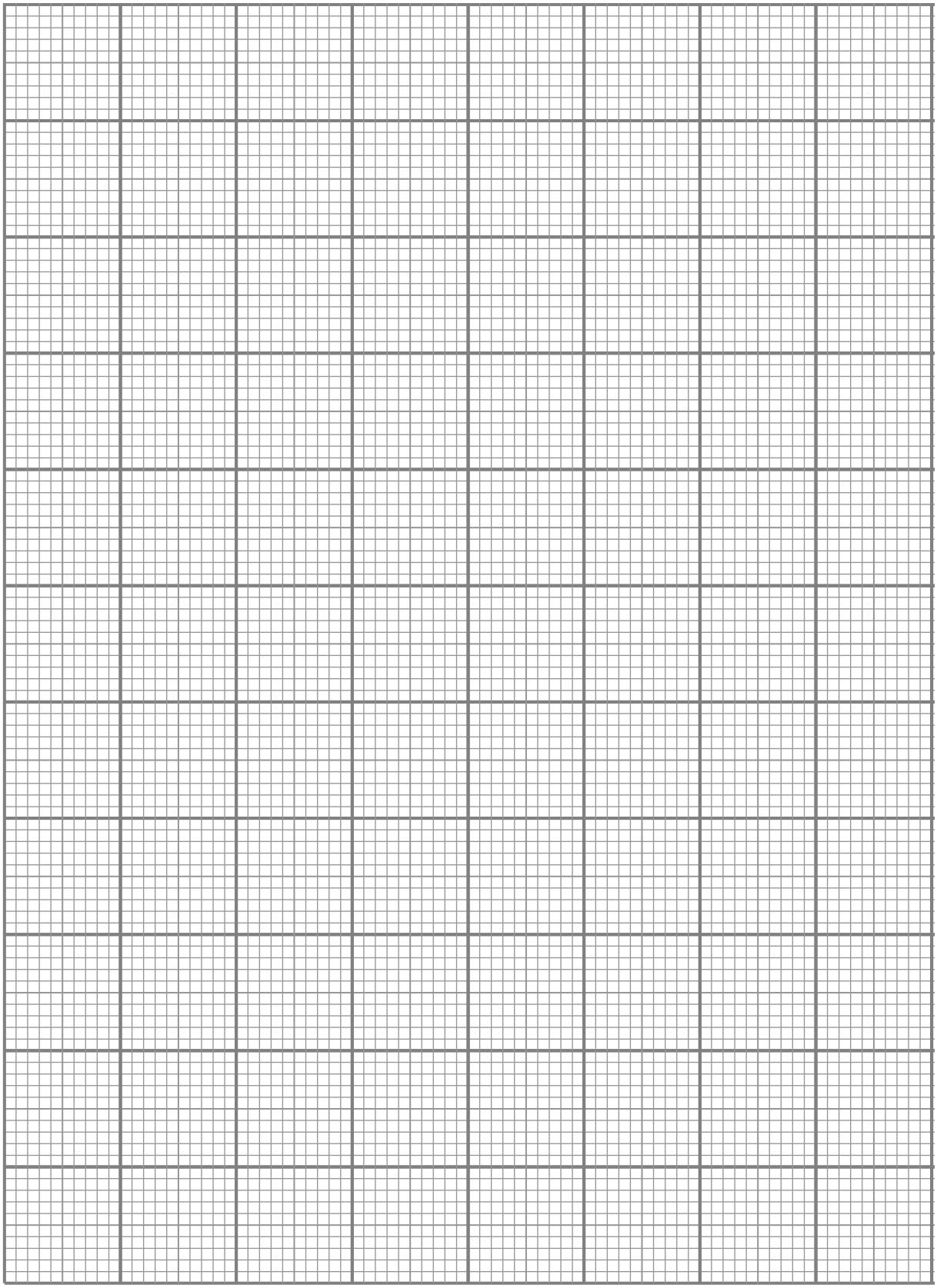

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9. **CHAPTER 5**

An experiment is carried out to study the relationship between real depth, H and apparent depth, h. The arrangement of the apparatus for the experiment is shown as in Figure 1.1

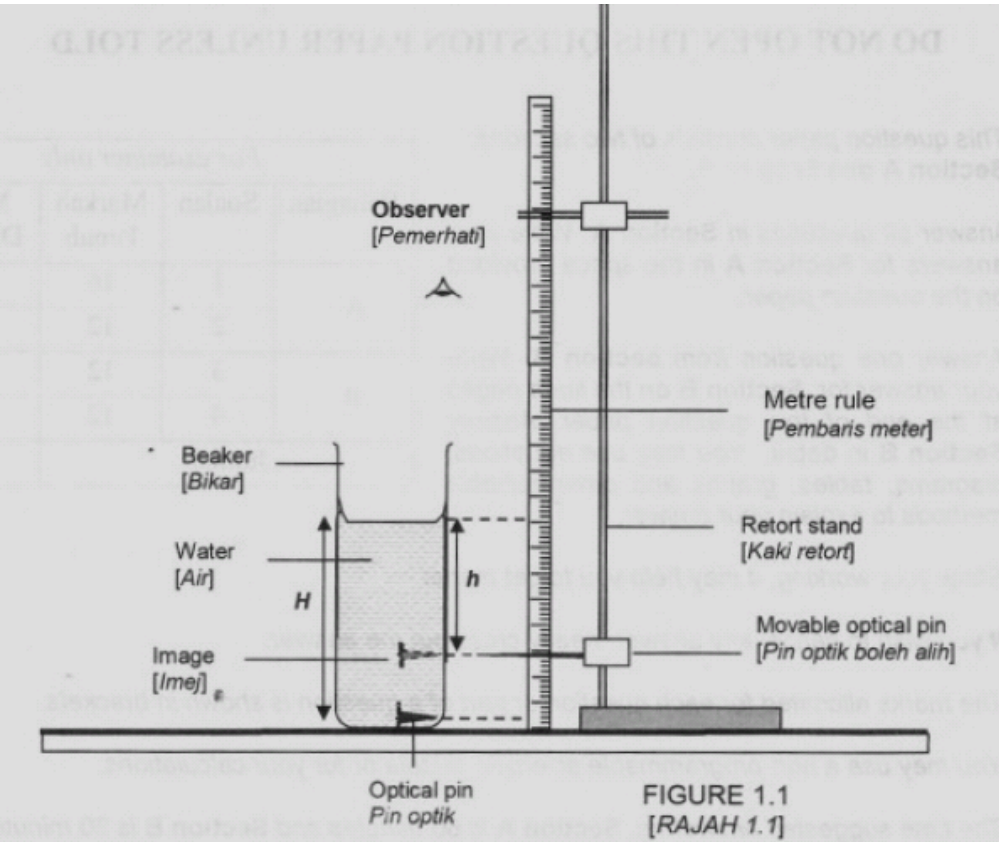

FIGURE 1.1
[RAJAH 1.1]

An optical pin placed in the beaker. Water is poured into the beaker so that the real depth, H of the optical pin is 4.0 cm.

Looking from above, an image of the optical pin is observed. The location of the image is determined using a movable optical pin, using the non-parallax method. In this way, apparent depth, h can be measured.

The experiment is repeated by adding water so that H is 6.0 cm, 8.0 cm, 10.0 cm and 12.0 cm.The corresponding apparent depth, h obtained is as shown in Figures 1.2, 1.3, 1.4, 1.5 and 1.6 on pages 4 and 5.

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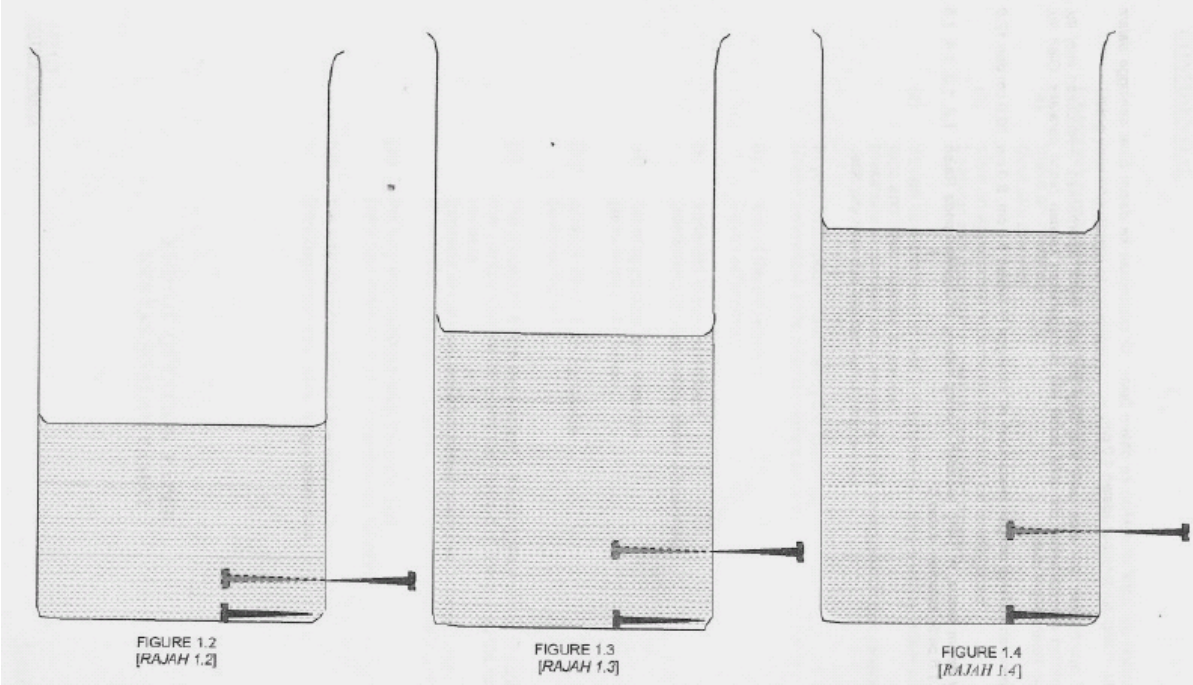

FIGURE 1.2
[RAJAH 1.2]

FIGURE 1.3
[RAJAH 1.3]

FIGURE 1.4
[RAJAH 1.4]

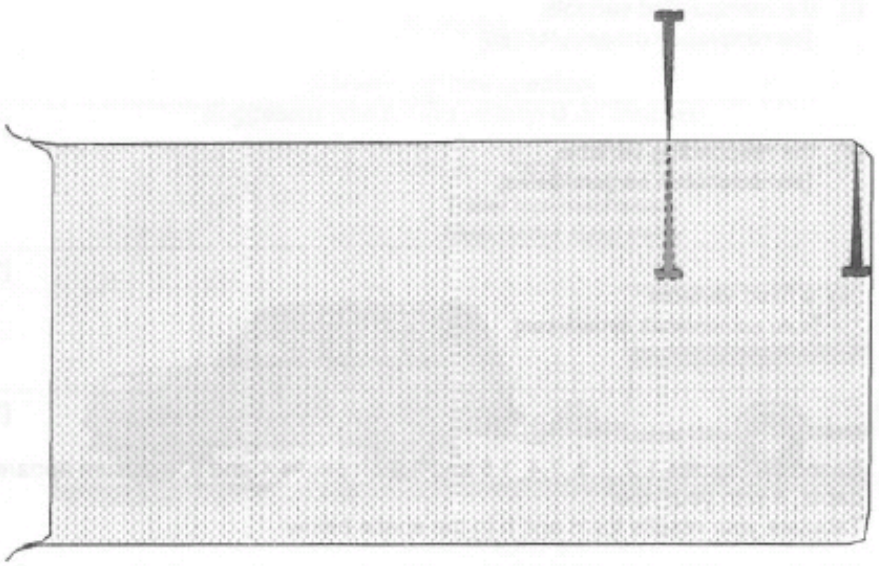

FIGURE 1.6

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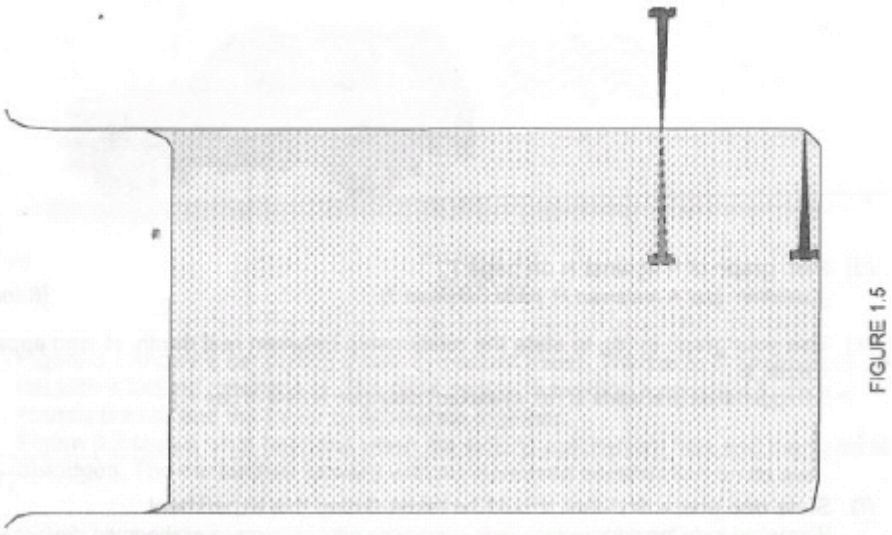

FIGURE 1.5

(*a*) For the experiment described above, identify:

(i) The manipulated variable

……

[1 *mark*]

(ii) The responding variable

……

[1 *mark*]

(iii) The constant variable

……

[1 *mark*]

(b) Base on the figure 1.2, 1.3, 1.4, 1.5 and 1.6 , measure apparent depth , h with your ruler. Tabulate your result for H and h in the space below.

[6*marks*]

(c) Plot graph h against H on page 7. [5*marks*]

(d) Use your graph in (c) to state the relationship between real depth, H and apparent depth, h.

.....[1 mark]

(f) State one precaution that should be taken during this experiment.

…….

[1 *mark*]

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10. CHAPTER 5

A student carries out an experiment to investigate the relationship between the object distance, ***u*** and the image distance, ***v***, of a convex lens with focal length, ***f***,. The apparatus is set up as shown in Diagram 1.1

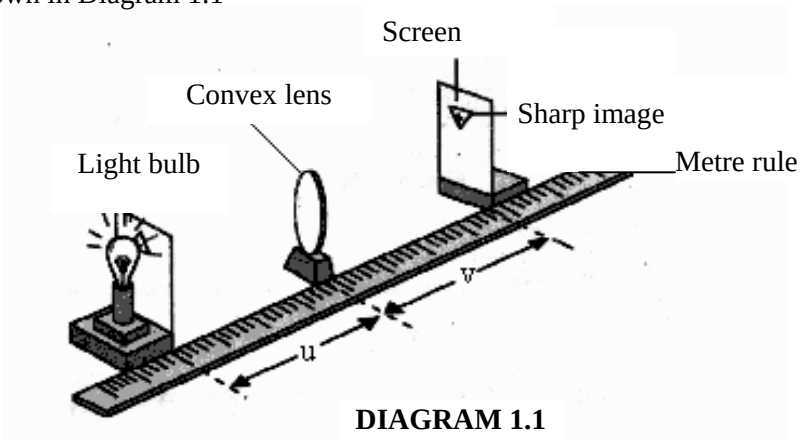

DIAGRAM 1.1

The object distance is fixed at ***u*** = 34 cm, 30 cm, 26 cm, 20 cm and 16 cm. The convex lens is placed at the "*zero*" mark on the scale of the metre rule when the image distance, ***v***, is measured.

(*a*) For the experiment described above, identify:

(iv) The manipulated variable

……

[1 *mark*]

(v) The responding variable

……

[1 *mark*]

(vi) The constant variable

……

[1 *mark*]

Diagram 1.2, 1.3, 1.4, 1.5 and 1.6 showed the end part of metre rule when the image distance, ***v***, is measured.

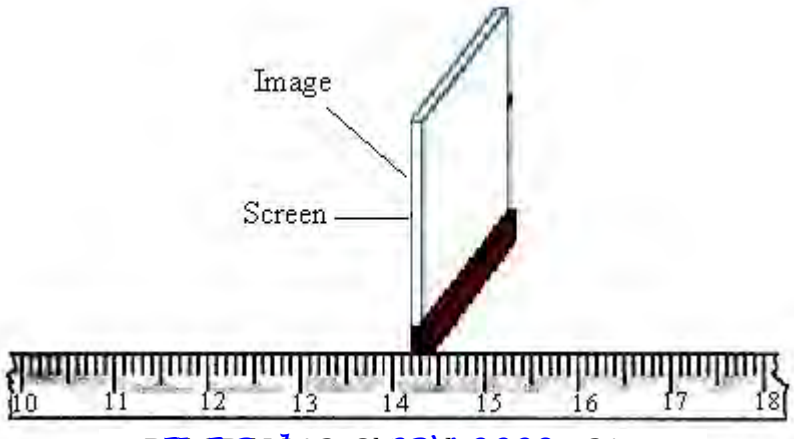

DIAGRAM 1.2: Object distance ***u*** = 34 cm

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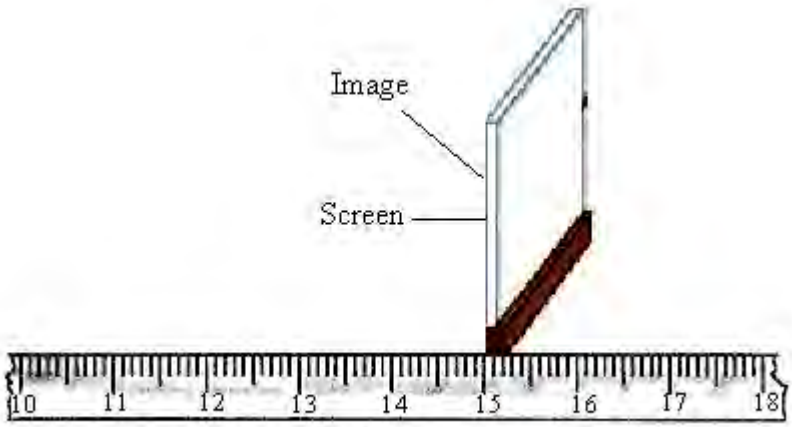

DIAGRAM 1.3: Object distance, ***u*** = 30 cm

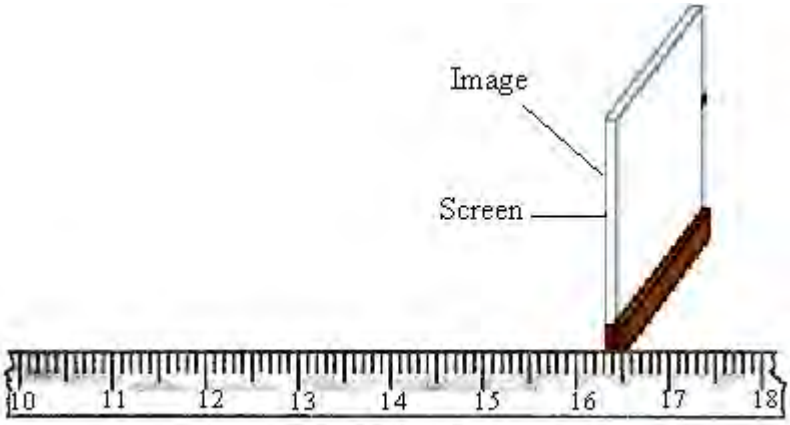

DIAGRAM 1.4: Object distance, ***u*** = 26 cm

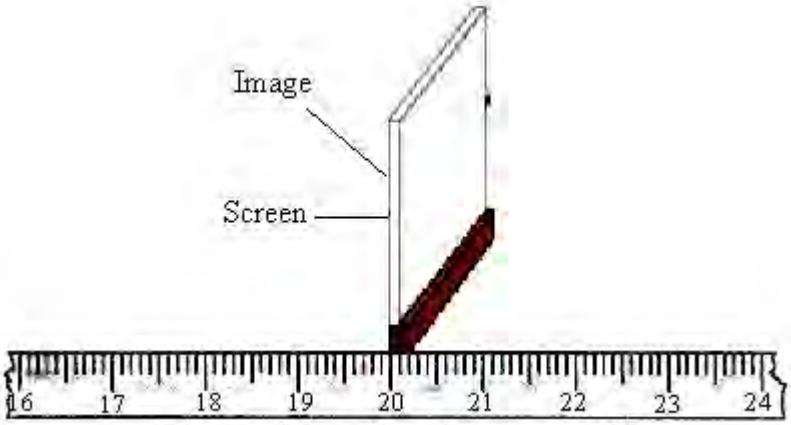

DIAGRAM 1.5: Object distance,***u*** = 20 cm

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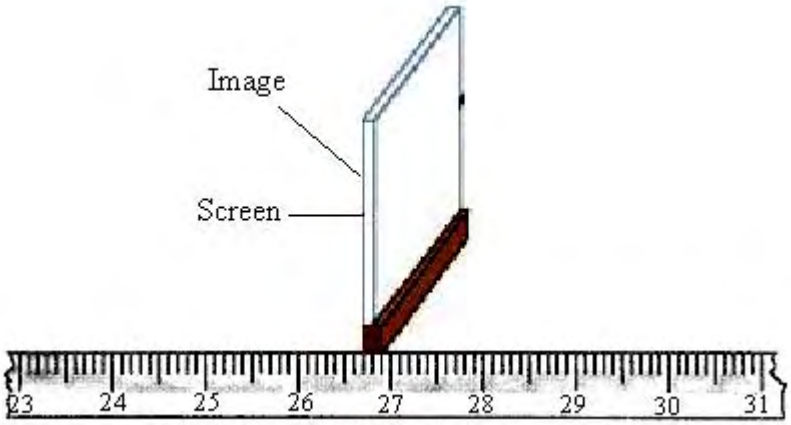

DIAGRAM 1.6: Object distance,***u*** = 16 cm

(*b*) Based on diagram 1.2, 1.3, 1.4, 1.5 and 1.6, determine the magnitude of ***v***, $\frac{1}{\boldsymbol{u}}$ and $\frac{1}{\boldsymbol{v}}$, when ***u*** is equal to 34 cm, 30 cm, 26 cm, 20 cm and 16 cm.

Tabulate the values of ***u***, ***v***, $\frac{1}{\boldsymbol{u}}$ and $\frac{1}{\boldsymbol{v}}$ in the space below.

[6 *marks*]

(*c*) On the graph paper, plot a graph of $\frac{1}{\boldsymbol{v}}$ against $\frac{1}{\boldsymbol{u}}$.

[5 *marks*]

(*d*) Based on your graph, state the relationship between $\frac{1}{\boldsymbol{v}}$ and $\frac{1}{\boldsymbol{u}}$.

……

[1 *mark*]

(*e*) State **one** precaution that should be taken to obtain the accurate result.

……

[1 *mark*]

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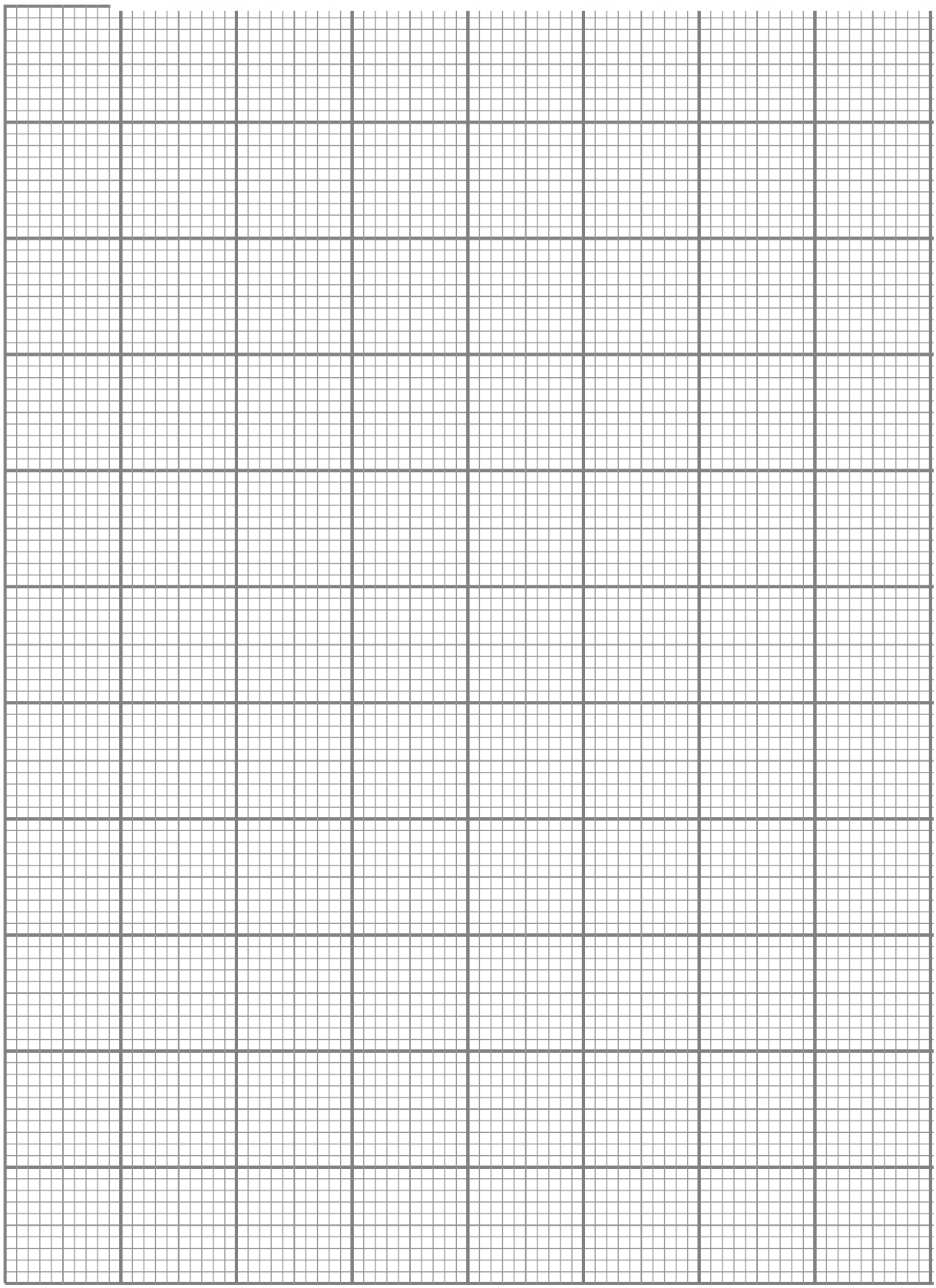

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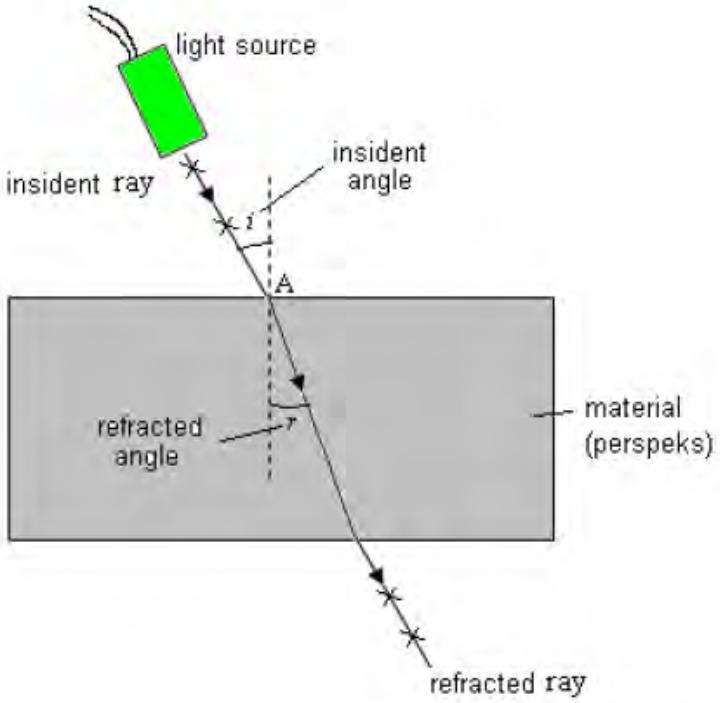
11. CHAPTER 5

A student carries out an experiment to investigate the relationship between the refractive index, n and the refracted angle, r.

The experiment begin with puts a Perspex block on a plane paper. This Perspex block has refrective index 1.49.

Turned on the light source and itu adjusted to produce a single and thin beam of light incident on the Perspex block. This incident beam is directed to A at 30^0. The refracted angle are measured using a protractor.

The experiment is repeated with using another transparent materials block like crown glass, zircon, diamond, rutile and gallium phosphide with same incident angel of Perspex block. Their refracted index are 1.49, 1.3, 1.4, 1.5 and 1.6.



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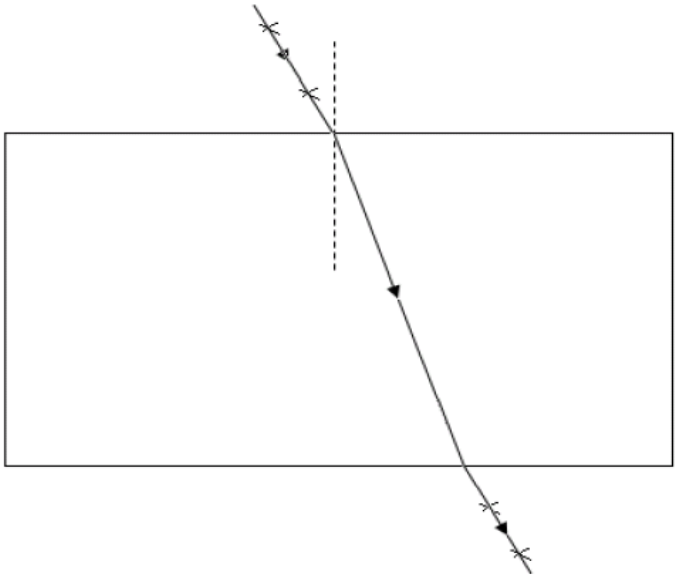

DIAGRAM 1.1
Perspeks, $n = 1.49$

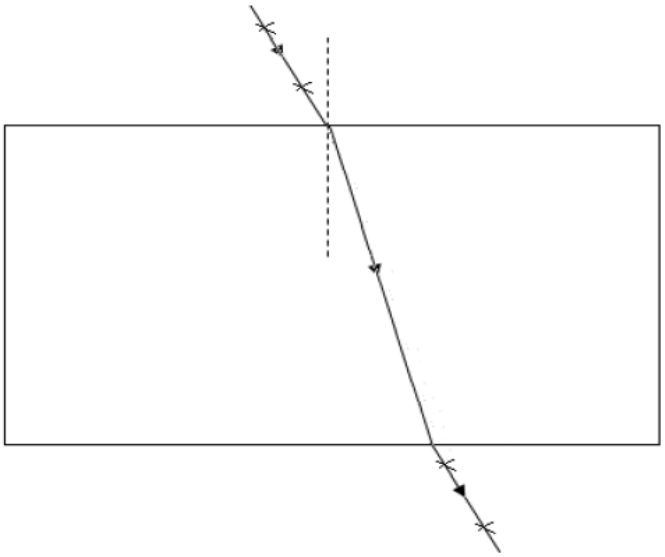

DIAGRAM 1.2
Zicron, $n = 1.92$

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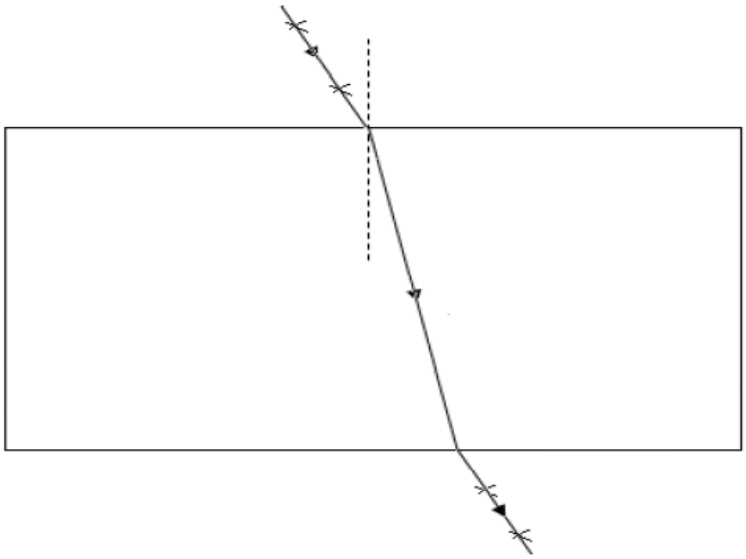

DIAGRAM 1.3

Diamond, $n = 2.42$

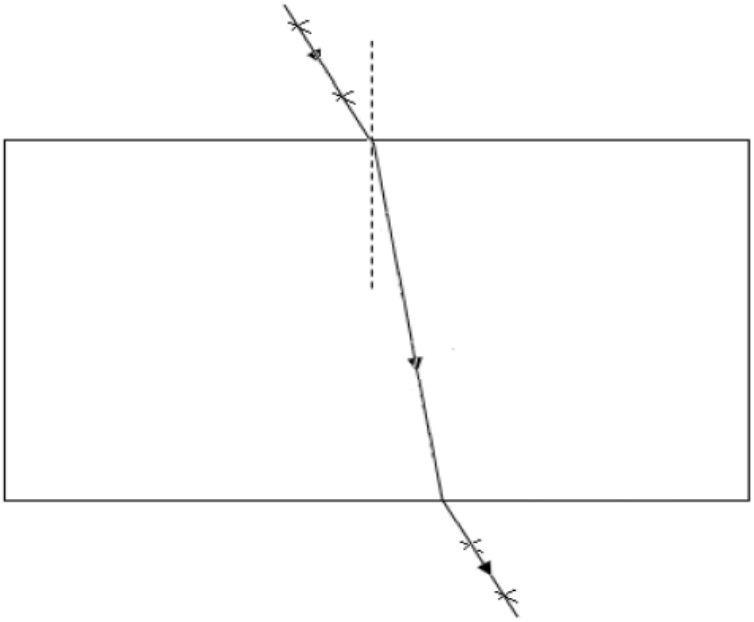

DIAGRAM 1.4

Rutile, $n = 2.91$

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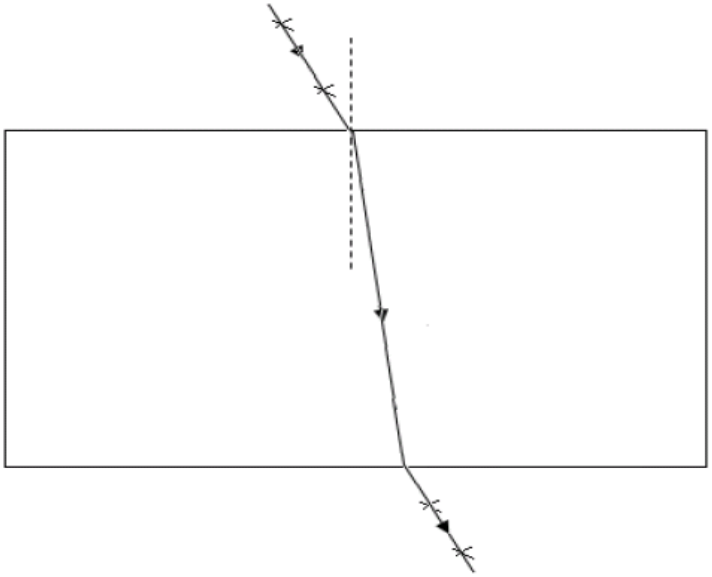

DIAGRAM 1.5
Gallium phosphide, $n = 3.50$

(*a*) For the experiment described above, identify:

(vii) The manipulated variable

……

[1 *mark*]

(viii) The responding variable

……

[1 *mark*]

(ix) The constant variable

……

[1 *mark*]

Based on Diagram 1.1,1.2,1.3,1.4 and 1.5 on pages 5,6 and 7, determine the value of refracted angle , r, sin r, and 1/sin r for each transparent material with refractive index 1.49,1.92,2.42,2.91 and 3.50 and tabulate your result for n, r, sin r and 1/sin r

[7 *marks*]

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(c) Plot graph of n against 1/ sin r on page 9.

[5 *marks*]

(d) Using your graph, state the relationship between n and 1/sin r

.....

[1 *mark*]

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12. CHAPTER 7

A student carries out an experiment to investigate the relationship between the potential difference, *V*, across a wire and the length, *L*, of the wire.
Diagram 1.1 shows the circuit used in the experiment.

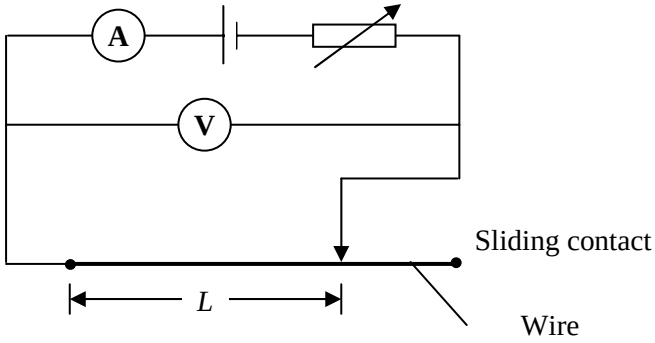
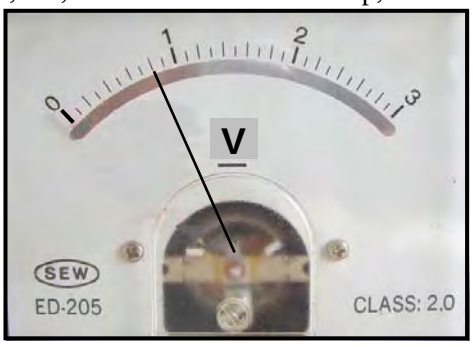


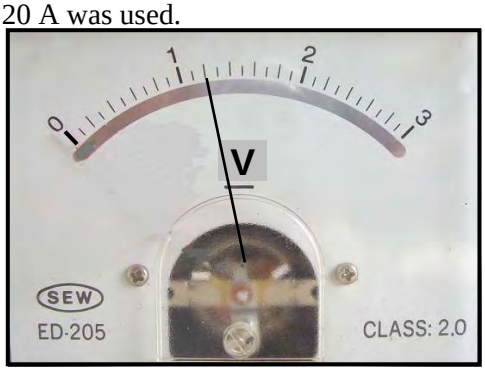
DIAGRAM 1.1

The position of the sliding is adjusted until the length of the wire in the circuit is, *L* = 20.0 cm. The rheostat is adjusted to obtain a current of 0.20 A. The potential difference, *V* across the wire is measured by a voltmeter. Diagram 1.2 shows the reading of the voltmeter.

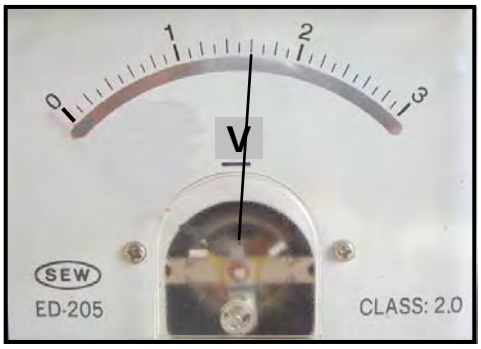
The procedure is repeated for lengths of the wire, *L* = 30.0 cm, 40.0 cm, 50.0 cm and 60.0 cm. The corresponding readings of the ammeter and voltmeter are shown in Diagrams 1.3, 1.4, 1.5, 1.6 and 1.7. For each step, a current of 0.20 A was used.



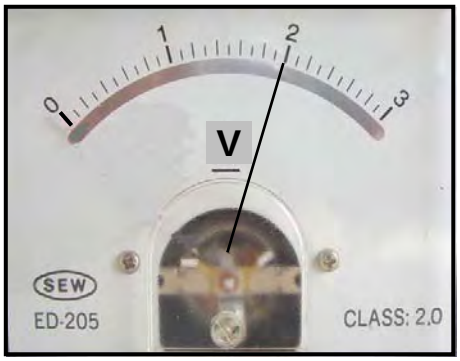
L = 20.0 cm
DIAGRAM 1.2



L = 30.0 cm
DIAGRAM 1.3



L = 40.0 cm
DIAGRAM 1.4



L = 50.0 cm
DIAGRAM 1.5

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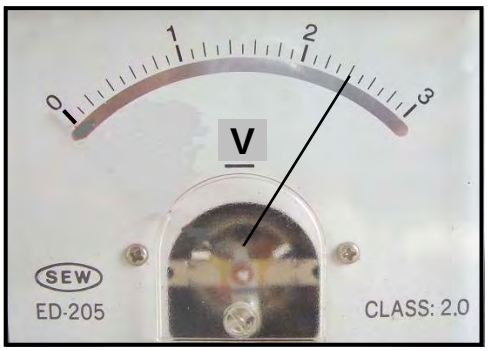
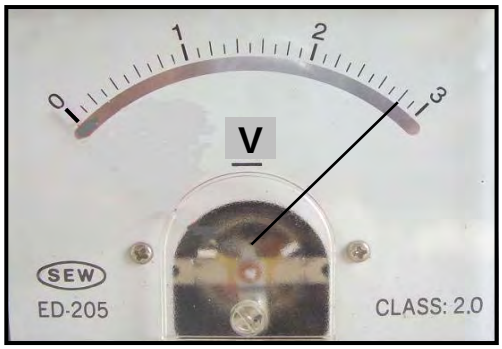


L = 60.0 cm
DIAGRAM 1.6



L = 60.0 cm
DIAGRAM 1.7

(a) For the experiment described on page 3, identify:

(i) the manipulated variable

……

[1 *mark*]

(ii) the responding variable

……

[1 *mark*]

(iii) a fixed variable

……

[1 *mark*]

(b) What is the use of the strip of mirror next to the scale of the voltmeter?

……

[1 *mark*]

(c) Based on Diagrams 1.2, 1.3, 1.4, 1.5, 1.6 and 1.7 on pages 4 and 5, determine the potential difference, V for the corresponding lengths of wire, L.
Tabulate your results for L, and V in the space below.

[5 *marks*]

(d) On the graph paper on Page 7, plot a graph of V against L.

[5 *marks*]

(e) Based on your graph, state the relationship between V and L.

……

[1 *mark*]

(f) State one precaution that should be taken to obtain accurate readings of V.

……

[1 *mark*]

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13. TRIAL SBP 2007 (CHAPTER 7)

A student carries out an experiment to study the relationship between the length of a conductor, ℓ, with the resistance, R. The circuit is connected as shown in Diagram 1.1.

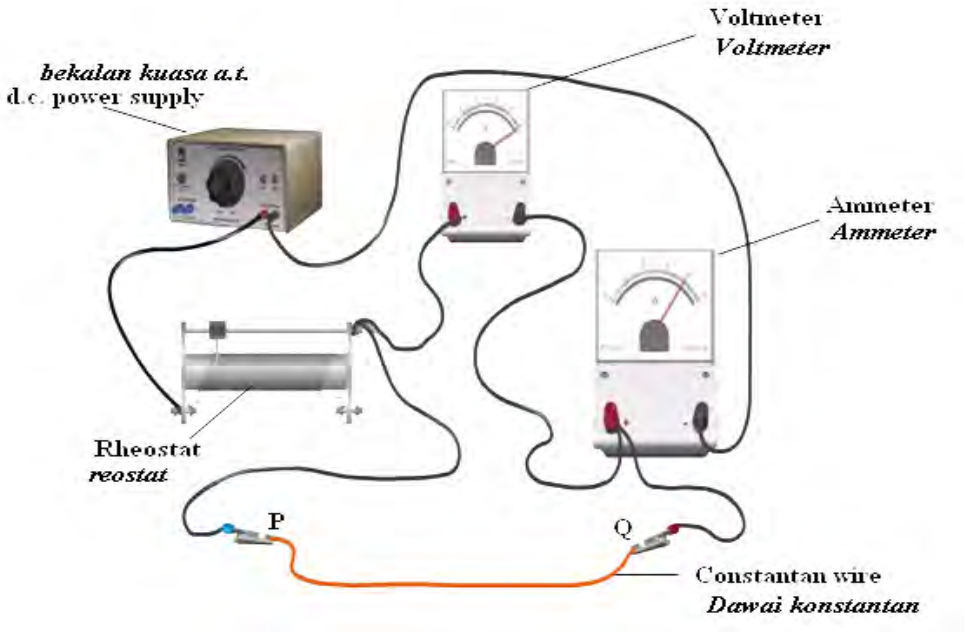

DIAGRAM 1.1

The length of the constantan wire between P and Q is adjusted so that its length, ℓ = 20.0 cm. The switch is on and the rheostat is adjusted until the current, I, flowing in the circuit is 0.2 A. The potential difference, V, across the wire is recorded.

The procedure is repeated by varying the values of ℓ to be 30.0 cm, 40.0 cm, 50.0 cm and 60.0 cm. For each length of wire used, the rheostat is adjusted so that the current is at a constant value of 0.2 A. The corresponding readings of the voltmeter are shown in Diagram 1.2, 1.3, 1.4, 1.5 and 1.6.

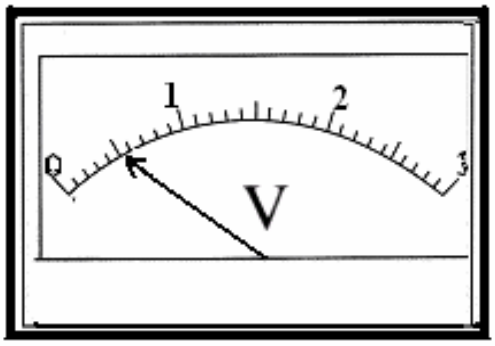

Diagram 1.2
ℓ = 20.0 cm

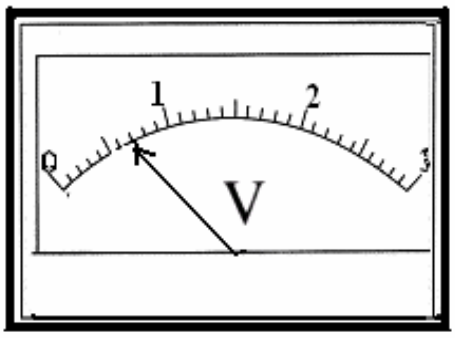

Diagram 1.3
ℓ = 30.0 cm

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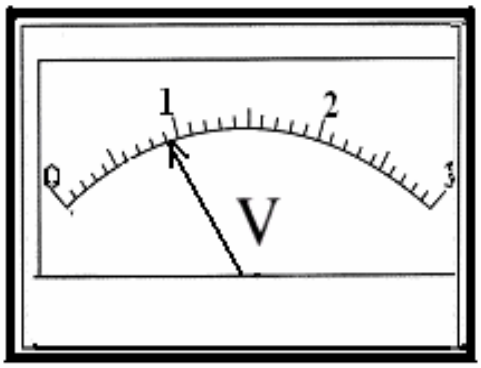

Diagram 1.4
ℓ = 40.0 cm

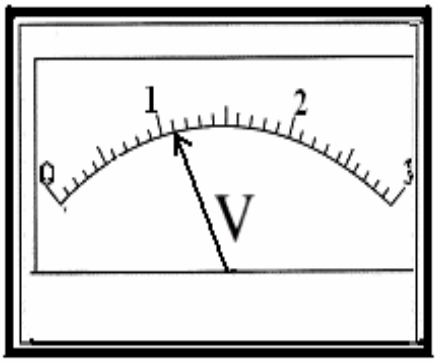

Diagram 1.5
ℓ = 50.0 cm

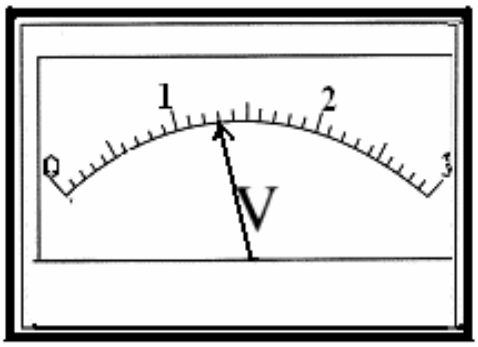

Diagram 1.6
ℓ = 60.0 cm

(a) Based on the aim and the procedure of the experiment state the

(i) The manipulated variable

.....

[1 *mark*]

(ii) The responding variable

.....

[1 *mark*]

(iii) The constant variable

.....

[1 *mark*]

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(b) Record the reading of the voltmeter, V in Diagram 1.2, 1.3, 1.4, 1.5 and 1.6 when different length of wires, ℓ are used. In each case, calculate the resistance, R of the wire where:

$$R = \frac{V}{I}$$

Tabulate your results for ℓ, V, I and R in the space below.

.

[6 *marks*]

(c) On the graph paper on page 6, plot a graph of R against ℓ.

[5 *marks*]

(d) Based on your graph, state the relationship between R and ℓ.

.....

[1 *mark*]

(e) State **one** precaution that should be taken to obtain the accurate readings of V.

.....

.....

[1 *mark*]

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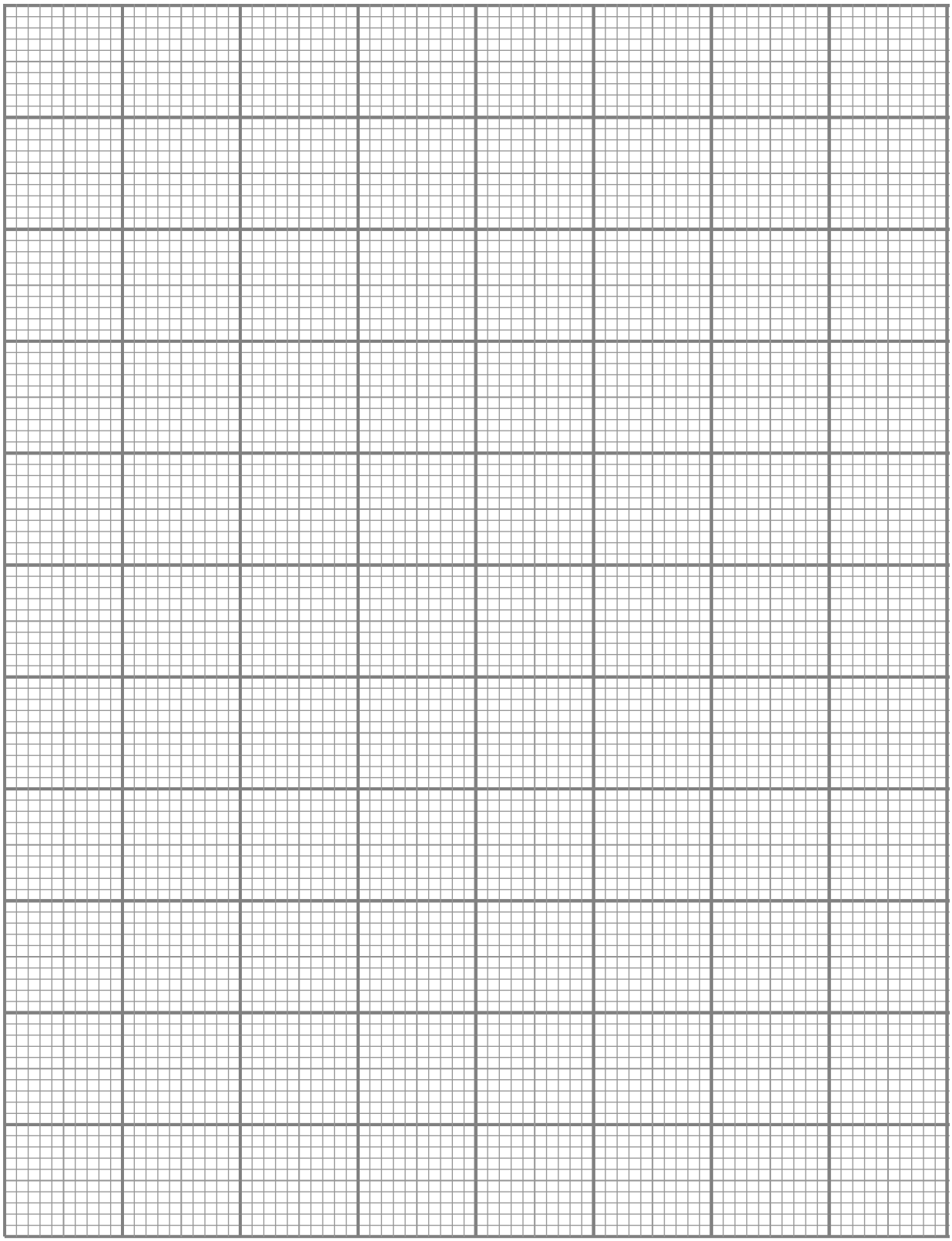

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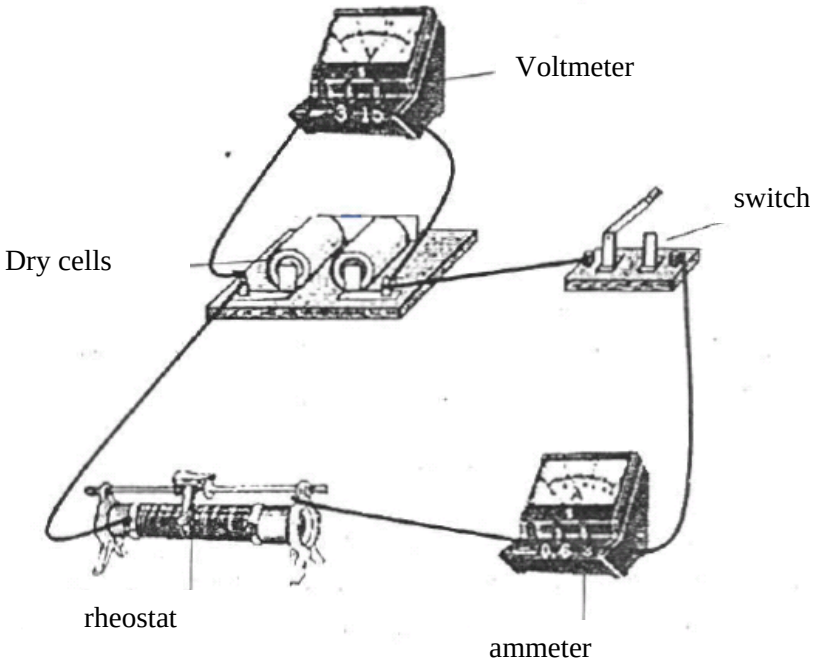
14 CHAPTER 7

A student carries out an experiment to study the relationship between the electromotive force (emf) , *E* and internal resistance, r, of the dry cells. The arrangement of the apparatus for the experiment is shown in Figure 1.1



When the switch is closed, the rheostat is adjusted so that the reading of the ammeter, I = 0.1 A. The reading of the voltmeter, V_1 is shown in Figure 1.2 .

The experiment is repeated by adjusting the rheostat to obtain the readings of the current, I = 0.2 A, 0.3 A, 0.4 A and 0.5 A. .

The reading of the voltmeter are shown in Figure 1.3, 1.4, 1.5 and 1.6.

When the cells are connected to a circuit, the emf of the cells, E and its internal resistance, r can be determined by the formula;

$$E = V + Ir$$

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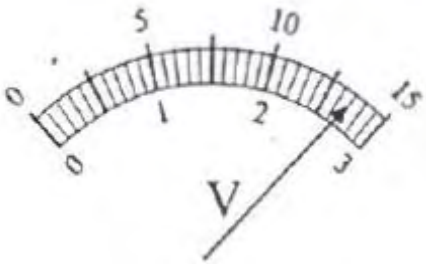
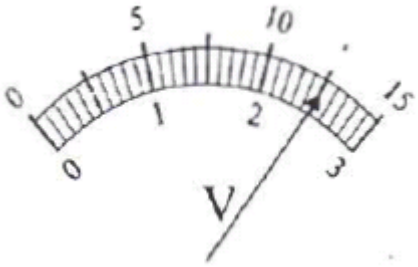
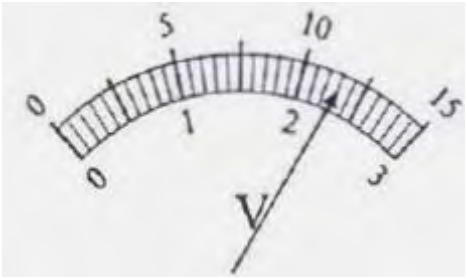


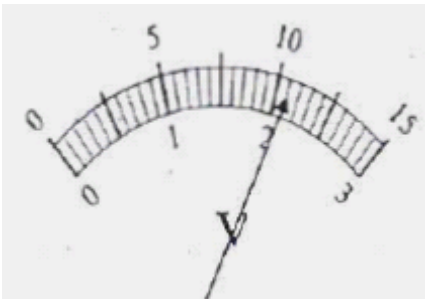
Current = 0.10 A
Figure 1.2



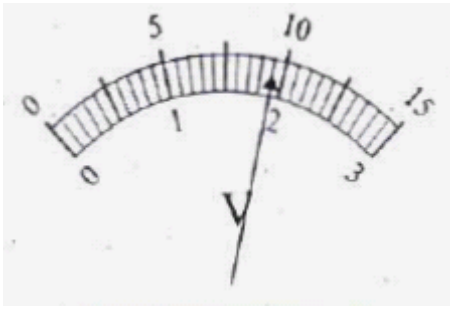
Current = 0.20 A
Figure 1.3



Current = 0.30 A
Figure 1.4



Current = 0.40 A
Figure 1.5



Current = 0.50 A
Figure 1.6

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(a) Based on the aim and the procedure of the experiment state the

(i) The manipulated variable

.....

[1 *mark*]

(ii) The responding variable

.....

[1 *mark*]

(iii) The constant variable

.....

[1 *mark*]

(b) Based on Figure 1.2,1.3,1.4 ,1.5 and 1.6, determine the values for V_1, V_2, V_3, V_4 and V_5 when I = 0.10 A, 0.20A, 0.30A, 0.40A and 0.50 A.

Tabulate your results for I and V in the space below.

[7 *marks*]

(c) On the graph paper , plot a graph of V against I.

.....

[5 *marks*]

(d) Based on your graph, state the relationship between V and I

.....

[1 *mark*]

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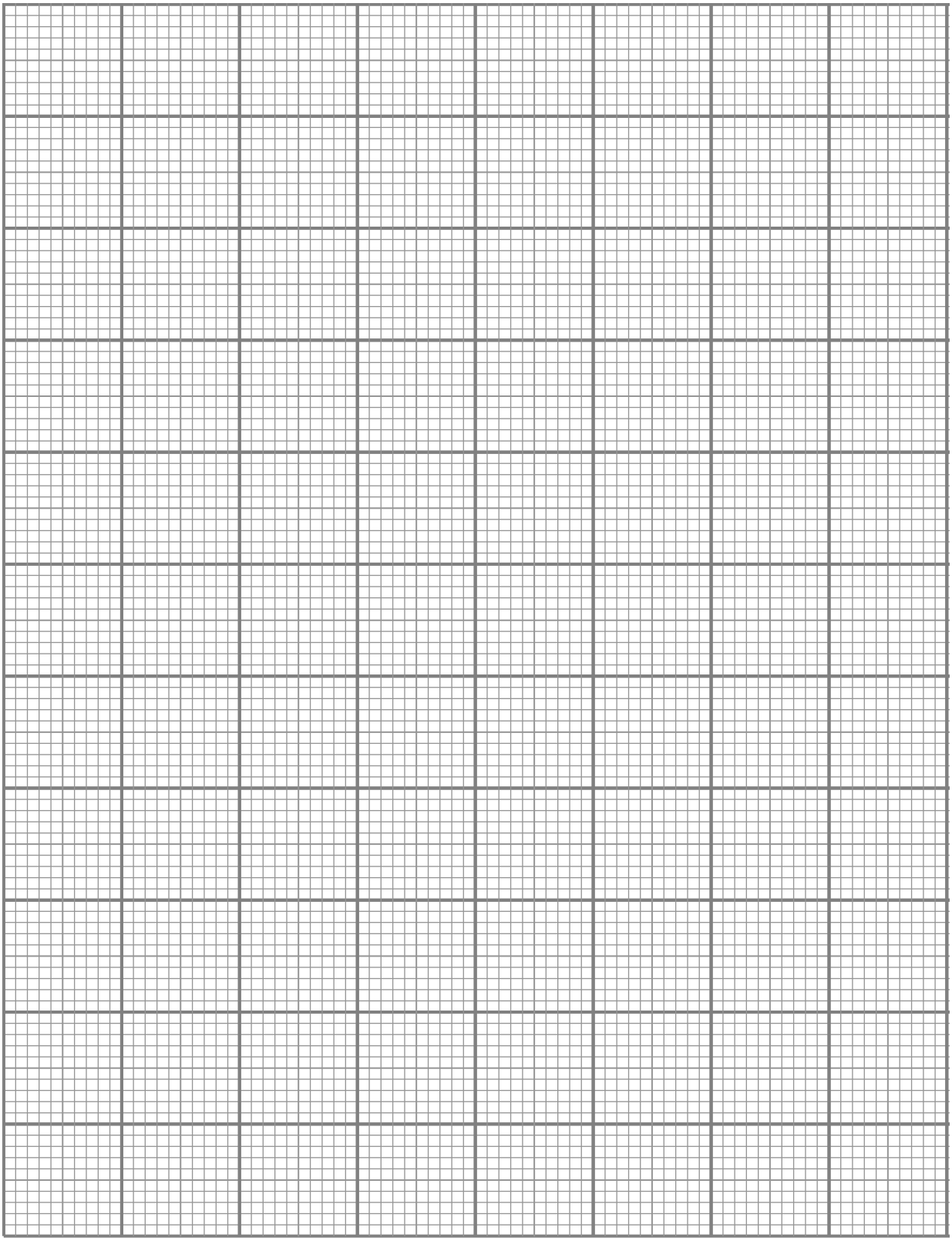
Graph of V against I



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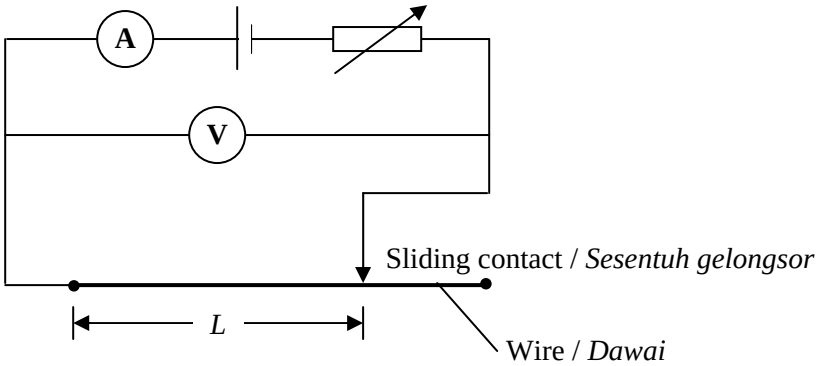
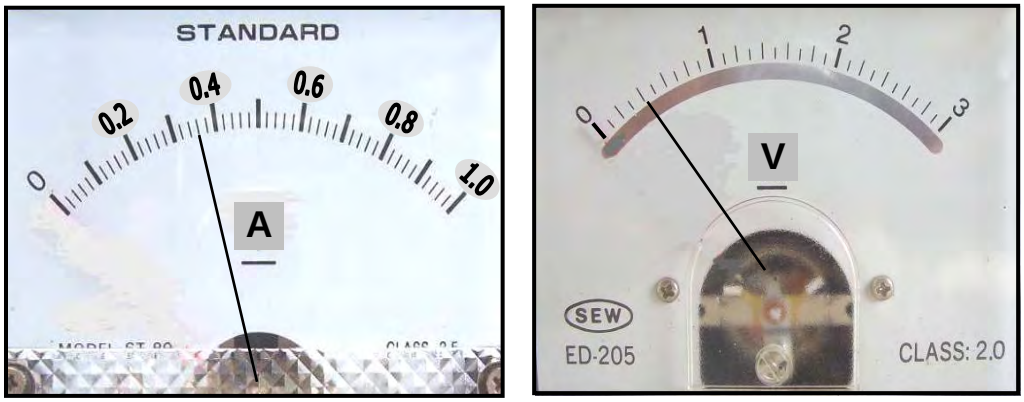
15. CHAPTER 7

A student carries out an experiment to investigate the relationship between the resistance, *R*, of a wire and the length, *L*, of the wire.
Diagram 1.1 shows the circuit used in the experiment.



The position of the sliding contact is adjusted until the length of the wire in the circuit, *L* = 20.0 cm. The rheostat is adjusted to obtain a suitable current. The current, *I* and the potential difference, *V*, across the wire are measured by an ammeter and voltmeter respectively. Diagram 1.2 shows the readings of the ammeter and voltmeter.

The procedure is repeated for lengths of the wire, *L* = 30.0 cm, 40.0 cm, 50.0 cm and 60.0 cm. The corresponding readings of the ammeter and voltmeter are shown in Diagrams 1.3, 1.4, 1.5 and 1.6.



L = 20.0 cm
DIAGRAM 1.2

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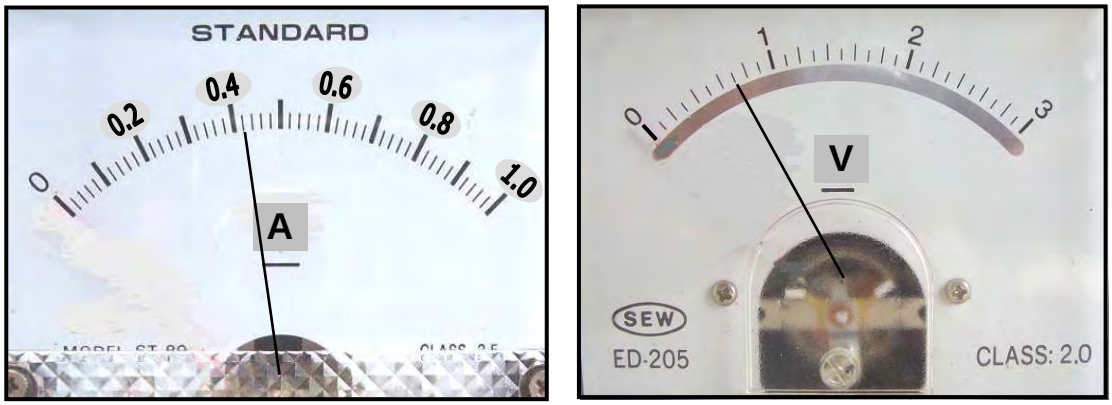
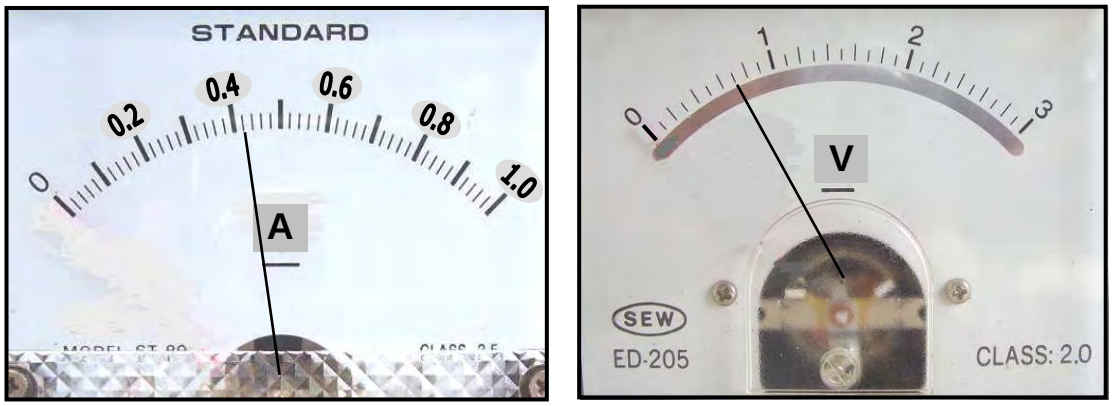
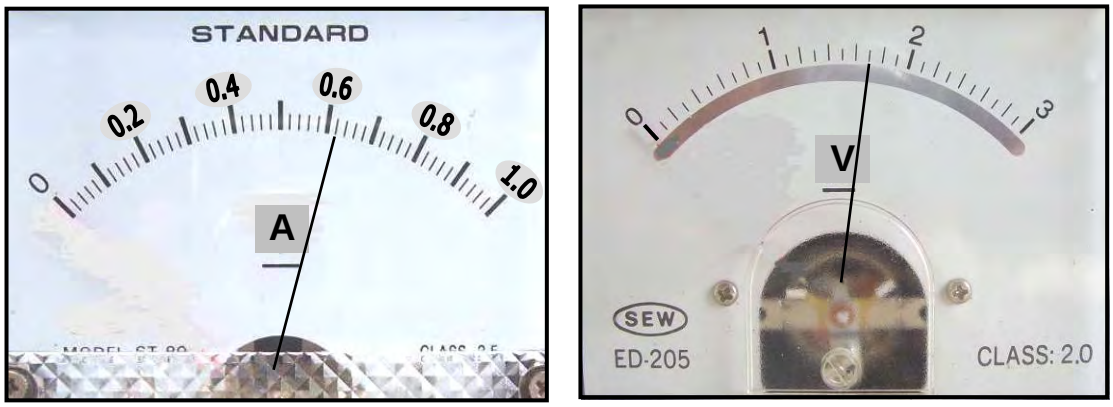


L = 30.0 cm
DIAGRAM 1.3



L = 40.0 cm
DIAGRAM 1.4



L = 50.0 cm
DIAGRAM 1.5

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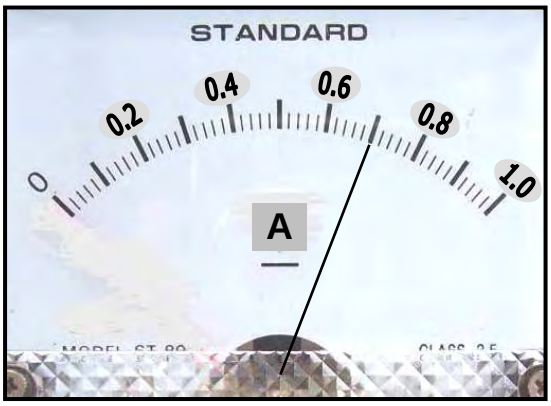

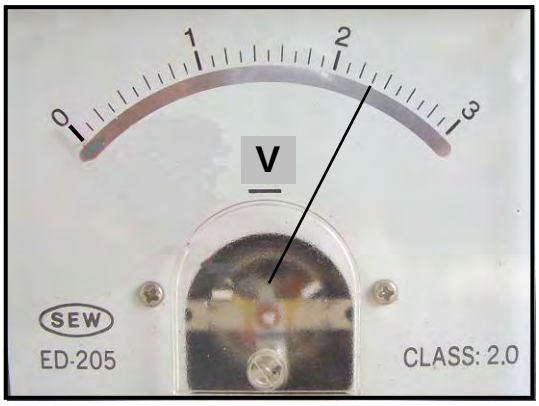

L = 60.0 cm
DIAGRAM 1.6

(a) For the experiment described on page 3, identify:

(i) the manipulated variable,

…….

[1 *mark*]

(ii) the responding variable,

…….

[1 *mark*]

(iii) a fixed variable.

…….

[1 *mark*]

(b) What is the use of the strip of mirror next to the scale of the voltmeter?

…….

[1 *mark*]

(c) Based on Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6 on pages 4 and 5, determine the current, I and potential difference, V for the corresponding lengths of wire, L.
For each value of L, calculate the resistance, R of the wire.
The resistance, R, is calculated using the formula, $R = \frac{V}{I}$
Tabulate your results for L, I, V and R in the space below.

[5 *marks*]

(d) On the graph paper on Page 7, plot a graph of R against L.

[5 *marks*]

(e) Based on your graph, state the relationship between R and L.

…….

[1 *mark*]

(f) State one precaution that should be taken to obtain accurate readings of V.

…….

[1 *mark*]

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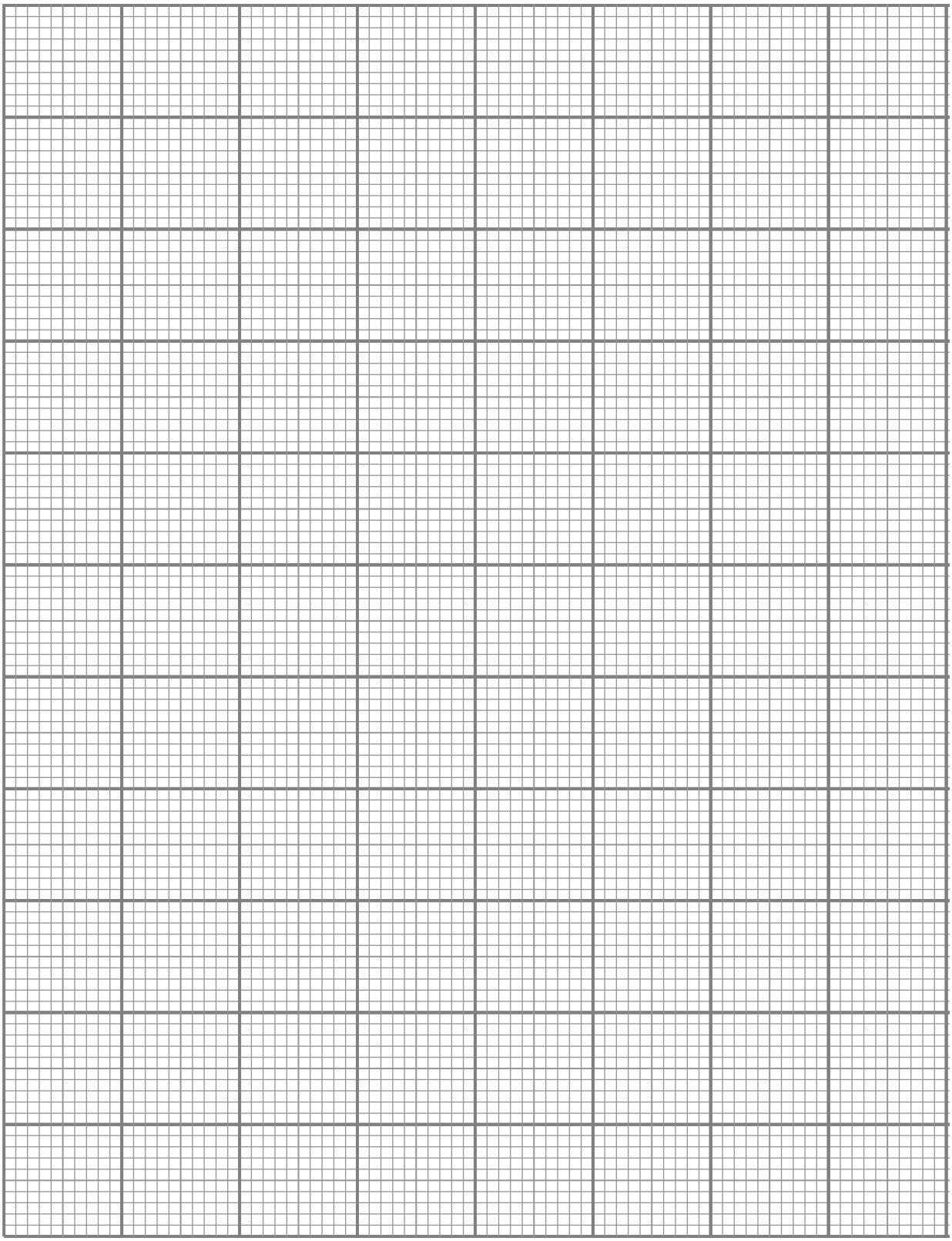
Graph of R against L.



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16 CHAPTER 8

A student carries out an experiment to investigate the relationship between the base current, I_b, and the collector current , I_c

Diagram 1.1 shows the connected circuit that is used to carry out the experiment. There is no zero error in the measuring instruments used.

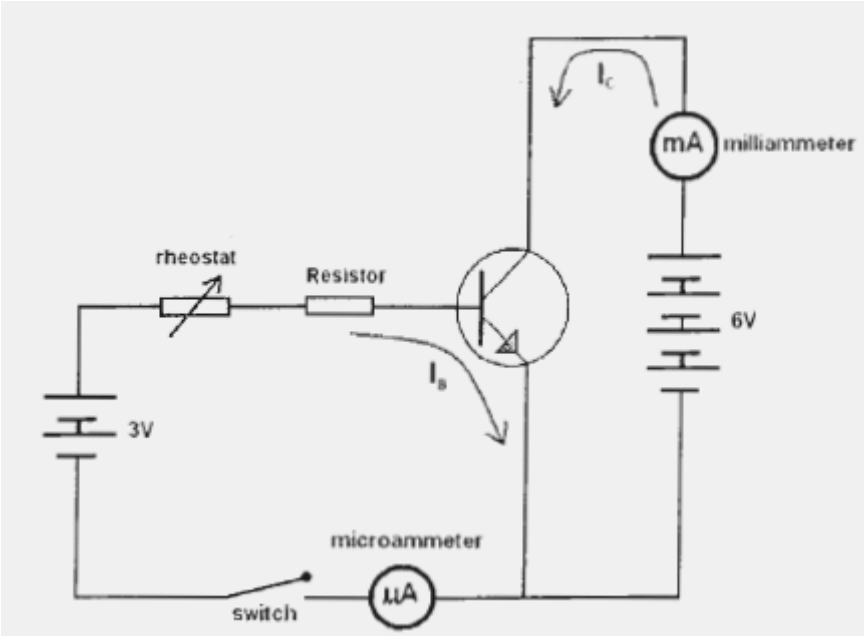
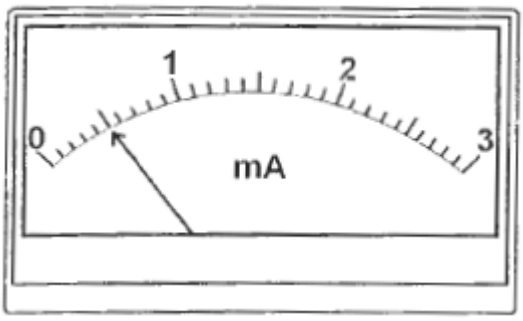
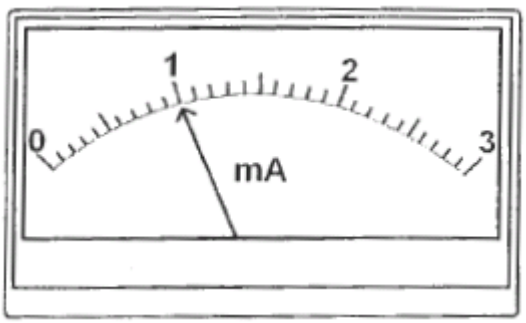


Diagram 1.1

The switch is on and the rheostat is adjusted until micrometer reads 10.0 μA. Then the reading on the miliammeter is recorded. The procedures is repeated with different I_b , 20.0 μ A, 30.0 μA, 40.0 μ A, and 50.0 μA. The actual corresponding readings of miliammeter are shown in Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6



Miliammeter reading at 10.0 μA
Diagram 1.2



Miliammeter reading at 20.0 μA
Diagram 1.3

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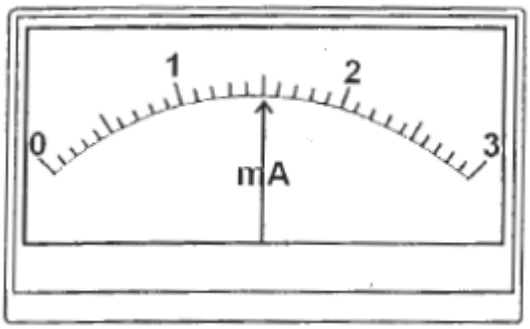
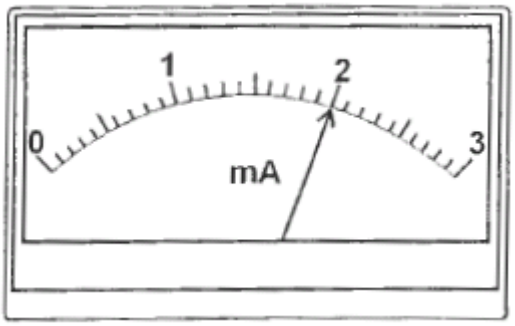
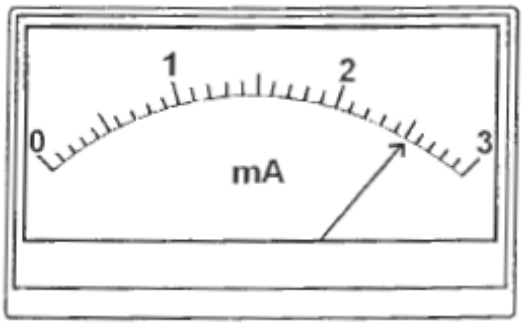


Miliammeter reading at 30.0 μA
Diagram 1. 4



Miliammeter reading at 40.0 μA
Diagram 1.5



Miliammeter reading at 30.0 μA
Diagram 1.6

(a) Based on the aim and the procedure of the experiment state the

(i) The manipulated variable

.....

[1 *mark*]

(ii) The responding variable

.....

[1 *mark*]

(iii) The constant variable

.....

[1 *mark*]

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(b) Name the type of transistor in Diagram 1.1

.....

[1 *mark*]

(c) Based on Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6, determine the readings of base current, I_b, and their corresponding collector current, I_c.

Tabulate your results for I_b and I_c in the space below.

[5 *marks*]

(d) On the graph on page 10, plot a graph I_c against I_b.

[5 *marks*]

(e) Based on your graph, state the relationship between I_c and I_b.

.....

[1 *mark*]

(b) State one precaution that should be taken to obtain the accurate readings of I_c.

[1 *mark*]

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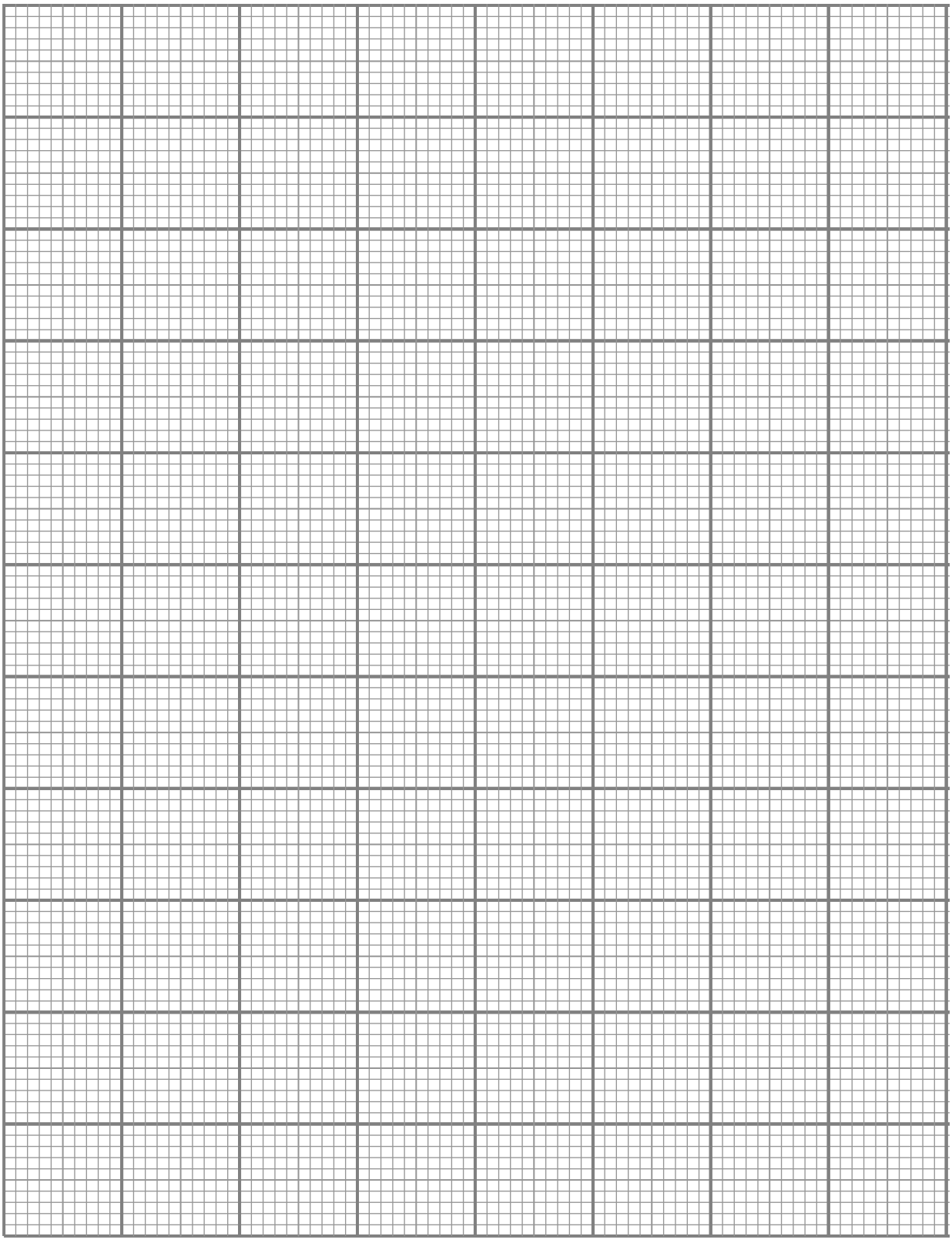
Graph I_c against I_b.



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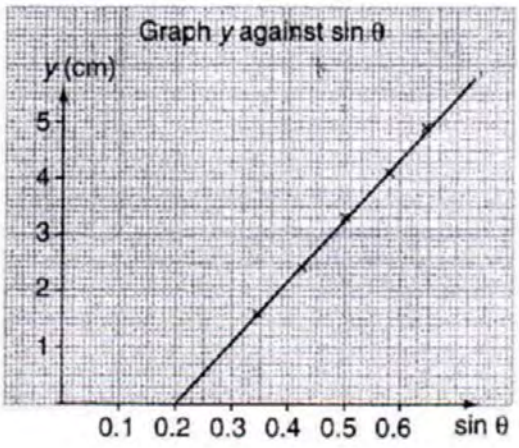
1. CHAPTER 2

<table>
<tr><td>(a)(i)</td><td>The angle of inclination , θ</td><td>1</td></tr>
<tr><td>(ii)</td><td>The increase in length for successive strips , y</td><td>1</td></tr>
<tr><td>(iii)</td><td>The mass of the trolley</td><td>1</td></tr>
<tr><td>(b)</td><td>Increase in velocity or acceleration</td><td></td></tr>
<tr><td>(c)</td><td>
<table>
<tr><th>Angle of inclination</th><th>Sin θ</th><th>Increase in length, y (cm)</th></tr>
<tr><td>20</td><td>0.342</td><td>1.6</td></tr>
<tr><td>25</td><td>0.423</td><td>2.4</td></tr>
<tr><td>30</td><td>0.500</td><td>3.3</td></tr>
<tr><td>35</td><td>0.576</td><td>4.1</td></tr>
<tr><td>40</td><td>0.643</td><td>4.9</td></tr>
</table>
</td><td>7</td></tr>
<tr><td>(d)</td><td> 
</td><td>5</td></tr>
<tr><td>(e)</td><td>The length for successive strips ,y increases linearly with sin θ</td><td>1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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2. CHAPTER 2

<table>
<tr><td>(a)(i)</td><td>Mass // m</td><td>1</td></tr>
<tr><td>(ii)</td><td>Oscillation period // T // time for 10 oscillations // t</td><td>1</td></tr>
<tr><td>(iii)</td><td>The distance from plasticine ball to the clamp</td><td>1</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>m/g</th><th>t_1/s</th><th>t_2/s</th><th>t_3 / s</th><th>T / s</th><th>T^2 / s^2</th></tr>
<tr><td>10.0</td><td>4.0</td><td>4.2</td><td>4.1</td><td>0.41</td><td>0.17</td></tr>
<tr><td>20.0</td><td>5.4</td><td>5.2</td><td>5.3</td><td>0.53</td><td>0.28</td></tr>
<tr><td>30.0</td><td>6.8</td><td>7.0</td><td>6.9</td><td>0.69</td><td>0.48</td></tr>
<tr><td>40.0</td><td>8.0</td><td>8.2</td><td>8.1</td><td>0.81</td><td>0.66</td></tr>
<tr><td>50.0</td><td>8.8</td><td>9.0</td><td>8.9</td><td>0.89</td><td>0.79</td></tr>
</table>
-</td><td>7</td></tr>
<tr><td></td><td>- m, t_1, t_2, t_3, T and T^2 are shown.
- Units for quantities are correct
- Values for m are correct
- Values for t_1 are correct
- Values for t_2 are correct
- Values for t_3 are correct
- Values for T are correct
- Values for T^2 are correct
- Decimal points for T consistent
- Decimal points for T^2 consistent</td><td></td></tr>
<tr><td>(c)</td><td>- Axis label √
- units √
- scale √
- plotting √√
- straight and smooth line √
- graph size > 5 x 4 cm √
<table>
<tr><th>Score</th><th>Marks</th></tr>
<tr><td>6 – 7</td><td>5</td></tr>
<tr><td>4 – 5</td><td>4</td></tr>
<tr><td>3</td><td>3</td></tr>
<tr><td>2</td><td>2</td></tr>
<tr><td>1</td><td>1</td></tr>
</table></td><td>5</td></tr>
<tr><td>(d)</td><td>T^2 is directly proportional with $1/m$ // $T^2 \propto 1/m$</td><td>1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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3. CHAPTER 3

<table>
<tr><td>(a)(i)</td><td>The depth (length) of rod in liquid</td><td>1</td></tr>
<tr><td>(ii)</td><td>Weight / loss in weight / reading of spring balance</td><td>1</td></tr>
<tr><td>(iii)</td><td>Density of liquid</td><td>1</td></tr>
<tr><td>(b)</td><td><table><tr><th>h/cm</th><th>W/N</th></tr><tr><td>5.0</td><td>2.5</td></tr><tr><td>6.0</td><td>2.3</td></tr><tr><td>7.0</td><td>1.8</td></tr><tr><td>8.0</td><td>1.5</td></tr><tr><td>9.0</td><td>1.2</td></tr><tr><td>10.0</td><td>0.8</td></tr></table></td><td></td></tr>
<tr><td></td><td>- A shows a table which have, h and W
- B state the correct unit of h/ cm and W / N
- C all values of h are correct to 1 d.p.
- DD all values of W are correct (give D if only 1 is correct)
- E values of W are consistent to 1 d.p.</td><td>6</td></tr>
<tr><td>(c)</td><td>- A Y and X Axis label √
- B units for Y and X axis √
- C uniform scale √
- DD 6 point correctly plotted √√
- E straight and smooth line √
- F graph size > 5 x 4 cm √

Scoring:<table><tr><th>Score</th><th>Marks</th></tr><tr><td>6 – 7</td><td>5</td></tr><tr><td>4 – 5</td><td>4</td></tr><tr><td>3</td><td>3</td></tr><tr><td>2</td><td>2</td></tr><tr><td>1</td><td>1</td></tr></table></td><td>5</td></tr>
<tr><td>(d)</td><td>The deeper the rod is immersed , the lower the reading on the spring balance</td><td>1</td></tr>
<tr><td></td><td>Avoid parallax errors with the eyes perpendicular to the scales of reading</td><td>1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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4 CHAPTER 4

<table>
<tr><td>(a)(i)</td><td>Time</td><td>1</td></tr>
<tr><td>(ii)</td><td>Temperature // Increase in temperature</td><td>1</td></tr>
<tr><td>(iii)</td><td>Mass of the water, power of the heater</td><td>1</td></tr>
<tr><td>(b)</td><td>The eye should be at the same horizontal level as the meniscus of the mercury column</td><td>1</td></tr>
<tr><td>(c)(i)</td><td>θ_0 = 25 °C</td><td>1</td></tr>
<tr><td>(d)(ii)</td><td><table><tr><th>t / s</th><th>θ / °C</th><th>$\Delta\theta$ / °C</th></tr><tr><td>20</td><td>32</td><td>7</td></tr><tr><td>40</td><td>39</td><td>14</td></tr><tr><td>60</td><td>46</td><td>21</td></tr><tr><td>80</td><td>53</td><td>28</td></tr><tr><td>100</td><td>60</td><td>35</td></tr></table></td><td>4</td></tr>
<tr><td>(e)</td><td>Graph of $\Delta\theta$ against t
Give a tick (✓) based on the following:
A • $\Delta\theta$ at the y-axis, t at the x-axis ✓
B • Correct units at both axes ✓
C • Uniform scale at both axes ✓
D • 5 points plotted correctly ✓✓
[Note : 4 points plotted correctly : ✓]
E • Straight line through the origin ✓
F • Minimum size of graph 5 x 4 big squares ✓
(Big square : 2 cm x 2 cm)
(From the origin to the last point)

Marks awarded :<table><tr><th>Number of ✓</th><th>Marks</th></tr><tr><td>7 ✓</td><td>5</td></tr><tr><td>5-6 ✓</td><td>4</td></tr><tr><td>3-4 ✓</td><td>3</td></tr><tr><td>2 ✓</td><td>2</td></tr><tr><td>1 ✓</td><td>1</td></tr></table>Total marks : 5</td><td>5</td></tr>
<tr><td>(e)</td><td>$\Delta\theta$ is directly proportional to t</td><td>1</td></tr>
<tr><td>(f)</td><td>The water is stirred continuously so that the temperature is uniform</td><td>1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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5. CHAPTER 4

<table>
<tr><td>1 (a)(i)
(ii)
(iii)</td><td>Temperature
Current
Length of conductor</td><td>1
1
1(3)</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>$\theta/^0C$</th><th>I / A</th><th>$1/I\ /A^{-1}$</th></tr>
<tr><td>10</td><td>0.29</td><td>3.4</td></tr>
<tr><td>20</td><td>0.18</td><td>5.6</td></tr>
<tr><td>30</td><td>0.13</td><td>7.7</td></tr>
<tr><td>40</td><td>0.09</td><td>11.1</td></tr>
<tr><td>50</td><td>0.08</td><td>12.5</td></tr>
</table>
A Title of table – quantity/symbol of quantity
B All the unit are correct
C Measuring of I (in range) - all correct
- 2 or 3 correct
- Only 1 correct
D Measuring of 1/I (in range) - all correct
- 4 correct
E All value of 1/I are consistents</td><td>1
1
2
1
0
2
1
1 (7)</td></tr>
<tr><td>(c)</td><td>Consistency (uniform decimel places based on quantity)
Axis – quantity/symbol y-axis and x-axis ✓A
Unit for y-axis and x-axis ✓B
Uniform scale ✓C
Plotting – all correct ✓✓D 2 – 3 correct ✓D
Graph line (cross y-axis) ✓E
Scoring ✓
7 = 5
5-6 = 4
3-4 = 3
2 = 2
1 = 1</td><td>5</td></tr>
<tr><td>(d)</td><td>I is linear proportional to θ (or directly - depends to the graph)</td><td>1 (1)</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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6. CHAPTER 4

(a)
i)mass // m — 1
ii)rise in temperature //Θ — 1
iii)density//(rate of) energy supplied — 1(3)

(b)

V/cm^3	m/g	1/m / g^{-1}	T/°C	Θ/ °C
50	50	0.020	80	55
60	60	0.017	75	50
70	70	0.014	66	41
80	80	0.013	60	35
90	90	0.011	51	26

√ M1 column and label for v,m,1/m,T&Θ shown — 1
√ M2 units correct — 1
√ M3 all values for v correct — 1
√ M4 all values for m correct — 1
√ M5 all values for 1/m correct — 1
√ M6 all values for 1/m 3 d.p. — 1
√ M7 all values for Θ correct. — 1 (7)

Num. of √	Marks
7	7
6	6
5	5
4	4
3	3
2	2
1	1

(c)
√ A y axis labelled Θ and x axis labelled 1/m
√ B unit for y axis and x axis are correct
√ C even and constant scale for graph
√√ D D 5 points are plotted correctly
√ D 4 or 3 points are plotted correctly — (5)
√ E the best straight line is drawn
√ F size of graph is more than half of graph paper

Num. of √	Marks
7	5
6	4
5	4
4	3
3	3
2	2
1	1

- Θ is linearly propotional to 1/m — 1
* (base on graph plotted by student)

TOTAL MARK — **16**

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7. CHAPTER 5

(a)(i)	Angle of incidence	1
(ii)	Angle of refraction	1
(iii)	Refractive index of the glass block	1
(b)		

Angle of incidence /^{0}	Angle of refraction /^{0}	Sin i	Sin r
15			
20			
25			
30			
35			

(c)

A Table consists of i, r, sin i and sin r (4 columns)
B State the unit for each i and r
C Values of r are correctly
D Values of sin i are correctly
E Values of sin r correctly
F All values of sin i are written to 4 decimal places
G All values of sin r are written to 4 decimal places

Scoring :

Mark	No. of √
6	7
5	6
4	4-5
3	3
2	2
1	1

6

Graph of $\Delta\theta$ against t
Give a tick (✓) based on the following:

A • $\Delta\theta$ at the y-axis, t at the x-axis ✓
B • Correct units at both axes ✓
C • Uniform scale at both axes ✓
D • 5 points plotted correctly ✓✓
[Note : 4 points plotted correctly : ✓]
E • Straight line through the origin ✓
F • Minimum size of graph 5 x 4 big squares ✓
(Big square : 2 cm x 2 cm)
(From the origin to the last point)

Scoring :

Number of ✓	Marks
7 ✓	5
5-6 ✓	4
3-4 ✓	3
2 ✓	2
1 ✓	1

5

(d)	Sin r is directly proportional to sin i * *(depends to the graph)*	1
(f)	Repeat the experiment and calculate the average	1
	TOTAL MARK	16

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8. CHAPTER 5

<table>
<tr><td>(a)(i)</td><td>Angle of incidence</td><td>1</td></tr>
<tr><td>(ii)</td><td>Angle of refraction</td><td>1</td></tr>
<tr><td>(iii)</td><td>Refractive index of the glass block</td><td>1</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>Angle of incidence /^{0}</th><th>Angle of refraction /^{0}</th><th>Sin i</th><th>Sin r</th></tr>
<tr><td>20</td><td>13</td><td>0.3420</td><td>0.2250</td></tr>
<tr><td>30</td><td>19</td><td>0.500</td><td>0.3256</td></tr>
<tr><td>40</td><td>25</td><td>0.6428</td><td>0.4226</td></tr>
<tr><td>50</td><td>31</td><td>0.7660</td><td>0.5150</td></tr>
<tr><td>60</td><td>35</td><td>0.8660</td><td>0.5736</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>A Table consists of i, r, sin i and sin r (4 columns)
B State the unit for each i and r
C Values of r are correctly
D Values of sin i are correctly
E Values of sin r correctly
F All values of sin i are written to 4 decimal places
G All values of sin r are written to 4 decimal places

Scoring :
<table>
<tr><th>Mark</th><th>No. of √</th></tr>
<tr><td>6</td><td>7</td></tr>
<tr><td>5</td><td>6</td></tr>
<tr><td>4</td><td>4-5</td></tr>
<tr><td>3</td><td>3</td></tr>
<tr><td>2</td><td>2</td></tr>
<tr><td>1</td><td>1</td></tr>
</table>
</td><td>6</td></tr>
<tr><td>(c)</td><td>Graph of $\Delta\theta$ against t
Give a tick (✓) based on the following:

A • $\Delta\theta$ at the y-axis, t at the x-axis ✓
B • Correct units at both axes ✓
C • Uniform scale at both axes ✓
D • 5 points plotted correctly ✓✓
[Note : 4 points plotted correctly : ✓]
E • Straight line through the origin ✓
F • Minimum size of graph 5 x 4 big squares ✓
(Big square : 2 cm x 2 cm)
(From the origin to the last point)

Scoring :
<table>
<tr><th>Number of ✓</th><th>Marks</th></tr>
<tr><td>7 ✓</td><td>5</td></tr>
<tr><td>5-6 ✓</td><td>4</td></tr>
<tr><td>3-4 ✓</td><td>3</td></tr>
<tr><td>2 ✓</td><td>2</td></tr>
<tr><td>1 ✓</td><td>1</td></tr>
</table>
</td><td>5</td></tr>
<tr><td>(d)</td><td>Sin r is directly proportional to sin i * (depends to the graph)</td><td>1</td></tr>
<tr><td>(f)</td><td>Repeat the experiment and calculate the average</td><td>1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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9. CHAPTER 5

<table>
<tr><td>(a)(i)</td><td>Real depth, H</td><td>1</td></tr>
<tr><td>(ii)</td><td>Apparent depth, h</td><td>1</td></tr>
<tr><td>(iii)</td><td>Density of water</td><td>1</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>Real depth,H /cm</th><th>Apparent depth, h/ cm</th></tr>
<tr><td>4.0</td><td></td></tr>
<tr><td>6.0</td><td></td></tr>
<tr><td>8.0</td><td></td></tr>
<tr><td>10.0</td><td></td></tr>
<tr><td>12.0</td><td></td></tr>
</table>
A Table consists of H and h
B State the unit for each H/ cm and h/ cm
C Values of H are correctly
DD All Values of h are correctly
E All values of h are consistent
</td><td>6</td></tr>
<tr><td>(c)</td><td>
Graph of h against H
Give a tick (✓) based on the following:
A • h at the y-axis, H at the x-axis ✓
B • Correct units at both axes ✓
C • Uniform scale at both axes ✓
D • 5 points plotted correctly ✓✓
[Note : 4 points plotted correctly : ✓]
E • Straight line through the origin ✓
F • Minimum size of graph 5 x 4 big squares ✓
(Big square : 2 cm x 2 cm)
(From the origin to the last point)
Scoring :
<table>
<tr><th>Number of ✓</th><th>Marks</th></tr>
<tr><td>7 ✓</td><td>5</td></tr>
<tr><td>5-6 ✓</td><td>4</td></tr>
<tr><td>3-4 ✓</td><td>3</td></tr>
<tr><td>2 ✓</td><td>2</td></tr>
<tr><td>1 ✓</td><td>1</td></tr>
</table>
</td><td>5</td></tr>
<tr><td>(d)</td><td>H is directly proportional to h * (depends to the graph)</td><td>1</td></tr>
<tr><td>(f)</td><td>Avoid parallax error by placing the eye perpendicular to the scale of ruler</td><td>1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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10. CHAPTER 5

<table>
<tr><td>(a) (i)</td><td>Object distance, u</td><td>1</td></tr>
<tr><td>(ii)</td><td>Imej distance, v</td><td>1</td></tr>
<tr><td>(iii)</td><td>Focal length</td><td>1</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>u /cm</th><th>v /cm</th><th>1/u
(cm $^{-1}$)</th><th>1/v
(cm $^{-1}$)</th></tr>
<tr><td>34.0</td><td>14.2</td><td>0.029</td><td>0.070</td></tr>
<tr><td>30.0</td><td>15.0</td><td>0.033</td><td>0.067</td></tr>
<tr><td>26.0</td><td>16.3</td><td>0.038</td><td>0.063</td></tr>
<tr><td>20.0</td><td>20.0</td><td>0.050</td><td>0.050</td></tr>
<tr><td>16.0</td><td>26.7</td><td>0.063</td><td>0.037</td></tr>
</table>
Tabulate data
1. Shows a table which have u , v, 1/u and 1/v
2. State the correct unit for 3. u , v, 1/u and 1/v
3. All values of v are correct
4. Values of 1/u are consistent to 3 decimal places.
5. Values of 1/v are consistent to 3 decimal places.</td><td>1
1
2
1
1</td></tr>
<tr><td>(c)</td><td>Draw the graph of 1/v against 1/u

1. The responding variable, 1/v at y axis,
the manipulated variable, 1/u at x axis
States the unit of the variable correctly
2. Both axis with the even and uniform scale
3. 5 points correctly plotted
4. A smooth best fit straight line
5. Minimum size of the graph is 10 cm x 8 cm
<table>
<tr><th>No of ticks $\surd$</th><th>Marks</th></tr>
<tr><td>7</td><td>5</td></tr>
<tr><td>5,6</td><td>4</td></tr>
<tr><td>3,4</td><td>3</td></tr>
<tr><td>2</td><td>2</td></tr>
<tr><td>1</td><td>1</td></tr>
</table></td><td>

1
1
1
1
1</td></tr>
<tr><td>(d)</td><td>1/v is decreases linearly to 1/u</td><td>1</td></tr>
<tr><td>(e)</td><td>• Put on the curtain to avoid excess light from outside.
• The position of the eyes must be perpendicular to the reading taken to avoid parallax error.</td><td>1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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11. CHAPTER 5

<table>
<tr><td>(a)(i)</td><td>Refractive index, n</td><td>1</td></tr>
<tr><td>(ii)</td><td>Refracted angle, r</td><td>1</td></tr>
<tr><td>(iii)</td><td>Angle of incidence</td><td>1</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>Refractive index, n</th><th>Refracted angle, r^0</th></tr>
<tr><td>1.3</td><td></td></tr>
<tr><td>1.4</td><td></td></tr>
<tr><td>1.49</td><td></td></tr>
<tr><td>1.5</td><td></td></tr>
<tr><td>1.6</td><td></td></tr>
</table>
A Table consists of n and r
B State the unit for r^0
C Values of n are correctly
DD All Values of r are correctly
E All values of r are consistent
</td><td>6</td></tr>
<tr><td>(c)</td><td>
Graph of h against H
Give a tick (✓) based on the following:
A • h at the y-axis, H at the x-axis ✓
B • Correct units at both axes ✓
C • Uniform scale at both axes ✓
D • 5 points plotted correctly ✓✓
[Note : 4 points plotted correctly : ✓]
E • Straight line through the origin ✓
F • Minimum size of graph 5 x 4 big squares ✓
(Big square : 2 cm x 2 cm)
(From the origin to the last point)
Scoring :
<table>
<tr><th>Number of ✓</th><th>Marks</th></tr>
<tr><td>7 ✓</td><td>5</td></tr>
<tr><td>5-6 ✓</td><td>4</td></tr>
<tr><td>3-4 ✓</td><td>3</td></tr>
<tr><td>2 ✓</td><td>2</td></tr>
<tr><td>1 ✓</td><td>1</td></tr>
</table>
</td><td>5</td></tr>
<tr><td>(d)</td><td>H is directly proportional to h * (depends to the graph)</td><td>1</td></tr>
<tr><td>(f)</td><td>Avoid parallax error by placing the eye perpendicular to the scale of ruler</td><td>1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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12. CHAPTER 7

(a)(i) 1 Length / *L*

(ii) 1 Resistance / *R* // Potential difference / *V* // Current / *I*

(iii) 1 Diameter of the wire // Cross-sectional area of the wire // Type of wire

(b) 1 Avoid parallax error

(c) 5 Give a tick (✓) based on the following:

A • *Columns L, I, V and R* ✓

B • *Correct units for I, V and R* ✓

C • *All values of I correct* ✓

D • *All values of I consistent to 2 d.p.* ✓

E • *All values of V correct* ✓

F • *All values of V consistent to 1 or 2 d.p.* ✓

G • *All values of R correct* ✓

H • *All values of R consistent to 2, 3 or 4 d.p.* ✓

L / cm	*I* / A	*V* / V	*R* / Ω
20.0	0.36	0.4	1.11
30.0	0.42	0.7	1.67
40.0	0.50	1.1	2.20
50.0	0.62	1.7	2.74
60.0	0.70	2.3	3.29

(d) Give a tick (✓) based on the following:

A • *R* at the *y*-axis, *L* at the *x*-axis ✓

B • Correct units at both axes ✓

C • Uniform scale at both axes ✓

D • 5 points plotted correctly ✓✓

E • Best straight line ✓

F • Minimum size of graph 10 cm x cm ✓

1 Resistance is directly proportional to length / *R* directly proportional to *L* / $R \propto L$

Or Resistance increases linearly with length

1 Ensure all the connections in the circuit are tight // No short circuit //Check the voltmeter for zero error and make zero adjustment // Position of the eye such that the image of the pointer in the mirror is blocked by the pointer to avoid parallax error

16 TOTAL MARK

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14. CHAPTER 7

<table>
<tr><td>(a)(i)</td><td>Current</td><td>1</td></tr>
<tr><td>(ii)</td><td>Voltage</td><td>1</td></tr>
<tr><td>(iii)</td><td>Electromotive force</td><td>1</td></tr>
<tr><td>(b)</td><td></td><td>1</td></tr>
<tr><td>(c)</td><td>
<table>
<tr><th>Current, I(A)</th><th>Voltage, V (V)</th></tr>
<tr><td>0.1</td><td>2.7</td></tr>
<tr><td>0.2</td><td>2.5</td></tr>
<tr><td>0.3</td><td>2.3</td></tr>
<tr><td>0.4</td><td>2.1</td></tr>
<tr><td>0.5</td><td>1.9</td></tr>
</table>
A Columns I and V
B All unit are correct
C Value for I up to 1 d.p
D Value for V up to 1 d.p
E All value for I are correct
F All value for V are correct
G All values for V are consistence
</td><td>7</td></tr>
<tr><td>(d)</td><td>
Graph of V against I
Give a tick (✓) based on the following:
A • V at the y-axis, I at the x-axis ✓
B • Correct units at both axes ✓
C • Uniform scale at both axes ✓
D • 5 points plotted correctly ✓✓
[Note : 4 points plotted correctly : ✓]
E • Straight line through the origin ✓
F • Minimum size of graph 5 x 4 big squares ✓
(Big square : 2 cm x 2 cm)
(From the origin to the last point)
Scoring :
<table>
<tr><th>Number of ✓</th><th>Marks</th></tr>
<tr><td>7 ✓</td><td>5</td></tr>
<tr><td>5-6 ✓</td><td>4</td></tr>
<tr><td>3-4 ✓</td><td>3</td></tr>
<tr><td>2 ✓</td><td>2</td></tr>
<tr><td>1 ✓</td><td>1</td></tr>
</table>
</td><td>5</td></tr>
<tr><td>(d)</td><td>V is directly proportional to I * (depends to the graph)</td><td>1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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15. CHAPTER 7

(a)(i) **1** Length / *L*

(ii) **1** Resistance / *R* // Potential difference / *V* // Current / *I*

(iii) **1** Diameter of the wire // Cross-sectional area of the wire // Type of wire

(b) **1** Avoid parallax error

5 **Tabulate *L, I, V* and *R* correctly**

Give a tick (✓) based on the following:

A • *Columns L, I, V and R* ✓

B • *Correct units for I, V and R* ✓

C • *All values of I correct* ✓

D • *All values of I consistent to 2 d.p.* ✓

E • *All values of V correct* ✓

F • *All values of V consistent to 1 or 2 d.p.* ✓

G • *All values of R correct* ✓

H • *All values of R consistent to 2, 3 or 4 d.p.* ✓

awarded

L / cm	*I* / A	*V* / V	*R* / Ω
20.0	0.36	0.4	1.11
30.0	0.42	0.7	1.67
40.0	0.50	1.1	2.20
50.0	0.62	1.7	2.74
60.0	0.70	2.3	3.29

Number of ✓	Marks
8 ✓	5
6 - 7 ✓	4
4 - 5 ✓	3
2 - 3 ✓	2
1 ✓	1

5 Give a tick (✓) based on the following:

A • *R* at the *y*-axis, *L* at the *x*-axis ✓

B • Correct units at both axes ✓

C • Uniform scale at both axes ✓

D • 5 points plotted correctly ✓✓

[**Note : 3 or 4 points plotted correctly** : ✓]

E • Best straight line ✓

F • Minimum size of graph 5 x 4 big squares ✓
(Big square **:** 2 cm x 2 cm from the origin to the last point)

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(c) **5**

Marks awarded :

Number of ✓	Marks
7 ✓	5
5-6 ✓	4
3-4 ✓	3
2 ✓	2
1 ✓	1

Total marks : 5

(d) **1** Resistance is directly proportional to length / R directly proportional to L / $R \propto L$

or

Resistance increases linearly with length

** (base to the graph)*

(e) **1** Check the voltmeter for zero error and make zero adjustment // Position of the eye such that the image of the pointer in the mirror is blocked by the pointer to avoid parallax error

16 **TOTAL MARK**

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16 . CHAPTER 9

<table>
<tr><td>(a)(i)</td><td>Base current / I_b</td><td>1</td></tr>
<tr><td>(ii)</td><td>Collector current / I_c</td><td>1</td></tr>
<tr><td>(iii)</td><td>Length of the connection wire</td><td>1</td></tr>
<tr><td>(b)</td><td>Transistor n p n</td><td>1</td></tr>
<tr><td>(c)</td><td>
<table>
<tr><th>I_b / μA</th><th>I_c / mA</th></tr>
<tr><td>10.0</td><td>0.5</td></tr>
<tr><td>20.0</td><td>1.0</td></tr>
<tr><td>30.0</td><td>1.5</td></tr>
<tr><td>40.0</td><td>2.0</td></tr>
<tr><td>50.0</td><td>2.5</td></tr>
</table>
A Columns I_b and I_c
B All unit are correctly
CC All the values of Ic are correct
D All the values of Ic are consistently to 1 d.p.
</td><td>5</td></tr>
<tr><td>(d)</td><td>Graph of I_b against I_c
Give a tick (✓) based on the following:
A • I_c at the y-axis, I_b at the x-axis ✓
B • Correct units at both axes ✓
C • Uniform scale at both axes ✓
D • 5 points plotted correctly ✓✓
[Note : 4 points plotted correctly : ✓]
E • Straight line through the origin ✓
F • Minimum size of graph 5 x 4 big squares ✓
(Big square : 2 cm x 2 cm)
(From the origin to the last point)
Scoring :
<table>
<tr><th>Number of ✓</th><th>Marks</th></tr>
<tr><td>7 ✓</td><td>5</td></tr>
<tr><td>5-6 ✓</td><td>4</td></tr>
<tr><td>3-4 ✓</td><td>3</td></tr>
<tr><td>2 ✓</td><td>2</td></tr>
<tr><td>1 ✓</td><td>1</td></tr>
</table>
</td><td>5</td></tr>
<tr><td>(d)</td><td>I_c is directly proportional to I_b * (depends to the graph)</td><td>1</td></tr>
<tr><td>(f)</td><td>Ensure all the connections in the circuit are tight // No short circuit</td><td>1</td></tr>
<tr><td></td><td>TOTAL MARK</td><td>16</td></tr>
</table>

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CHECK LIST

No	QUESTION	CHAPTER	TOPIC	PAGE	DATE	MARK (12)
1	Mid Year SBP 2006	2	Velocity	3		
2	Mid Year Pahang 2007	2	Momentum	4		
3	Trial Terengganu 2007	2	Velocity	4		
4	Mid Year Pahang Form 4 2007	3	Spring	5		
5	Trial Pahang 2007	3	Pressure	5		
6	Final Year Pahang Form 4 2007	3	Presssure	6		
7	Trial SBP 2007	3	Density	6		
8	Trial Johor 2007 Q3	3	Gas Law	7		
9	Mid Year SBP 2007	4	Heat	7		
10	Trial MRSM 2007	4	Heat	8		
11	Final Year KRK Form 4 2006	4	Heat	8		
12	Trial MRSM 2004	4	Heat	9		
13	Trial Kedah 2007	5	Lens	10		
14	JP TEKNIK 2007	5	Lens	10		
15	Mid Year Pahang 2007	6	Water waves	11		
16	April Test SMKTL 2007	6	Sound waves	11		
17	Trial Negeri Sembilan 2007	6	Sound waves	12		
18	JUJ Pahang 2007	7	Ohm's Law	12		
19	Pre SPM SMKTL 2007	7	Ohm' Law	13		
20	Trial Johor 2007	4 + 7	Heat + electric	14		
21	Trial Pahang 2007	8	Electromagnet	14		
22	Trial Kedah 2007	8	Electromagnet	15		
23	Trial SBP 2007	8	Electromagnet	15		
24	JP Teknik 2007	9	Electronic	16		

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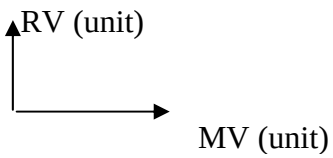
ANSWER FORMAT FOR PAPER 3B [12 MARKS]

<table>
<tr><td>(a) Inference</td><td>Manipulated variable influenced the responding variable
0r
Responding variable depends on manipulated variable
or
Responding variable is influenced by the manipulated variable</td></tr>
<tr><td>(b) Hypothesis</td><td>The higher/larger/bigger the manipulated variable, the higher/smaller the responding variable</td></tr>
<tr><td>(c) Aim</td><td>To determine the relationship between manipulated variable and responding variable</td></tr>
<tr><td>(d) Variables</td><td>(i) manipulated variable :
(ii) responding variable :
(iii) fixed variable : only one fixed variable
*[give all the variable that can be measured].</td></tr>
<tr><td>Apparatus & Arrangement)</td><td></td></tr>
<tr><td>Procedure</td><td>1. Start the experiment with MV = (value + unit)
2. Measure/record the RV (give the equation if available)
3. Repeat the experiment 4 times for MV = (give 5 value)</td></tr>
<tr><td></td><td>Tabulation
<table>
<tr><td>MV (unit)</td><td>RV (unit)</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Fill in the values of manipulated variable</td><td>blank</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table>
Graph (just plot y-axis & x-axis)
 
</td></tr>
</table>

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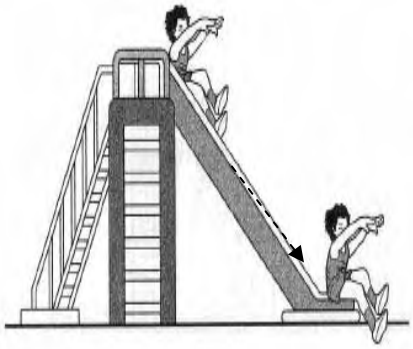
1. MID YEAR SBP 2006 (CHAPTER 2)

Figures show two slides P and Q of different height in a playground.



Slide P

Slide Q

The two boys of the same mass are sliding down from the top of slides P and Q . The boy at slide P found that he reaches the ground at a higher speed than a boy at slide Q .

Based on the information and observation above :

(a) Satate **one** suitable inference.

[1 mark]

(b) State **one** suitable hypotesis.

[1 mark]

(c) With the use of apparatus as such as runway, trolleys and other apparatus, describe an experiment framework to investigate the hypothesis stated in (b)

In your description, state slearly the following :

(i) Aim of the experiment.
(ii) Variables in the experiment.
(iii) List of apparatus and materials.
(iv) Arrangement of the apparatus.
(v) The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable.
(vi) The way you would tabulate the data.
(vii) The way you would analyse the data.

[10 marks]

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2. MID YEAR PAHANG 2007 (CHAPTER 2)

Diagram 2 shows stationary carom seed which moves off quickly after being hit by a striker. Before the collision, momentum of the carrom seed is zero. After the collision, both the striker and the carrom seed move on with the same momentum.

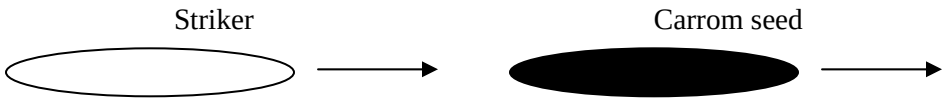

Diagram 2

Based on the above information and observation:

(a) State one suitable inference.
(b) State one suitable hypothesis.

(c) With the use apparatus such as a runway, ticker timer, tick tape, trolleys and other apparatus, describe an experiment framework to investigate your hypothesis stated in 2(b).

3. TRIAL TERENGGANU 2007 (CHAPTER 2)

A boy pushes the boxes along a level walkway as shown in Diagram 3.1. The boy experiences that the boxes move slowly. When the boy removes one of the boxes as shown in Diagram 3.2, he experiences that the boxes move faster than before although the same force was applied.

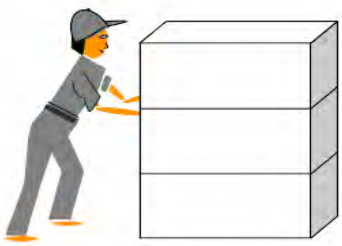

Diagram 3.1

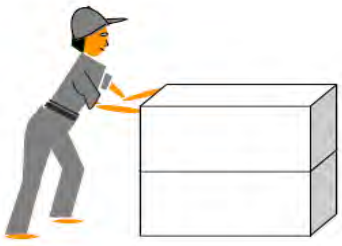

Diagram 3.2

Based on the above information and observation:
(a) State one suitable inference.
(b) State one suitable hypothesis.

(c) With the use of apparatus such as trolley, ticker tape, ticker timer, elastic cord and other apparatus, describe an experiment framework to investigate the hypothesis stated in 3 (b)

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4. MID YEAR PAHANG FORM 4 2007 (CHAPTER 2)

Figure 4 below shows two babies of different weights lying on a cradle attached to a spring of the same type.

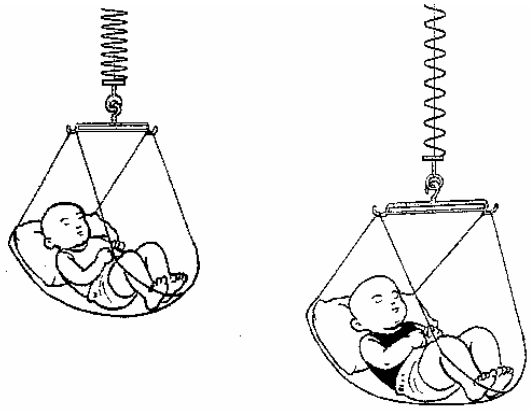

Figure 4

Based on the observations;

a) State one suitable inference
b) State one suitable hypothesis

b) With the use of apparatus such as spring, constantan wire and other apparatus, describe an experimental framework to test your hypothesis.

5. TRIAL PAHANG 2007 (CHAPTER 3)

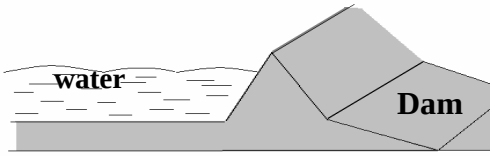

Figure 5

Figure 5 shows the cross-section of a dam. The wall has to be thicker at the bottom of the dam.
Based on the above information and observation:
(a) State one suitable inference.
(b) State one suitable hypothesis.

(c) With the use apparatus such as a measuring cylinder, manometer, rubber tube and other apparatus, describe an experiment framework to investigate your hypothesis stated in 3(b).

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6. FINAL YEAR PAHANG F4 2007 (CHAPTER 3)

In Figure 6, it is easier to walk on the field with sport shoes compared to high-heel shoes. The pointed heels of ladies shoes may sink into the soft ground of the field

Figure 6

Based on the observation above,
(a) State one suitable inference.
(b) State one suitable hypothesis.

(c) With the use of apparatus such as sponge, cardboard, slotted masses, wooden block and others apparatus describe an experiment framework to test your hypothesis stated in 6 (b).

7. TRIAL SBP 2007 (CHAPTER 3)

Diagram 7.1 and Diagram 7.2 show a boat with different load.
It is observed that the boat in Diagram 7.2 sinks more than in Diagram 7.1.

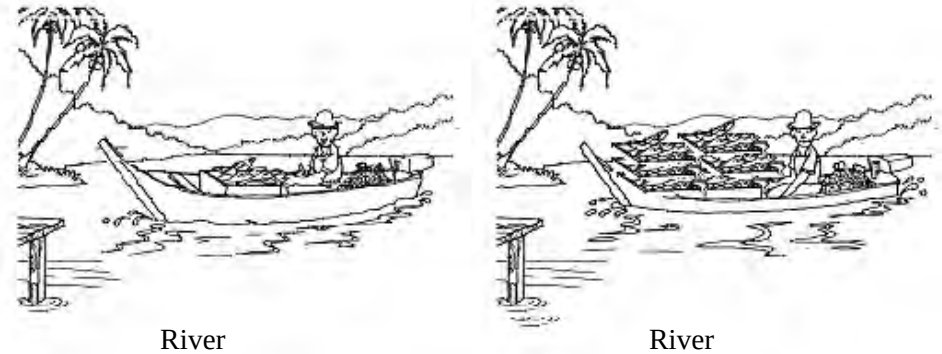

Diagram 7.1 Diagram 7.2

Based on the information and observation above:
(a) State **one** suitable inference
(b) State **one** suitable hypothesis
(c) With the use of apparatus such as slotted masses, beaker and other suitable apparatus, describe an experiment framework to investigate the hypothesis stated in 7 (b).

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8. TRIAL JOHOR 2007 (CHAPTER 3)

Diagram 8.1 shows a student holds a balloon which is tied to a string. When she releases the balloon, the balloon moves upward. She noticed that the balloon becomes bigger as it moves higher as shown in Diagram 8.2.

Diagram 8.1

Diagram 8.2

Based on observation on the air pressure in the balloon;

(a) Make one suitable inference

(b) State one appropriate hypothesis

(c) With the use of apparatus such as a syringe, a retort stand and others suitable apparatus, describe an experiment framework to investigate the hypothesis stated in 8 (b).

9. MID YEAR SBP 2007 (CHAPTER 4)

Diagram 9.1 and 9.2 show two pots of different size filled with boiling water. It is observed that the temperature of the water in Diagram 9.1 drops at a faster rate than in Diagram 9.2.

Diagram 9.1

Diagram 9.2

Based on the information and observation above:

(a) State **one** suitable inference

(b) State **one** suitable hypothesis

(c) With the use of apparatus such as a beaker, stopwatch and other apparatus, describe an experiment framework to investigate the hypothesis stated in 9(b).

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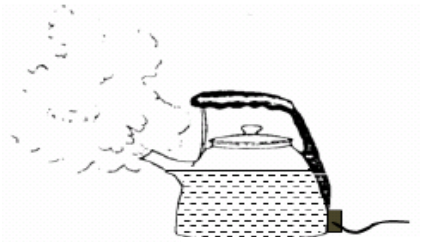
10 TRIAL MRSM 2007 (CHAPTER 4)

Figure 10 (a) and 10(b) show two similar electric kettles used to boil water. The power ratings for the kettles are 240 V, 100 W. It is found that the water in the kettle in Figure 3(b) boils faster than the water in the kettle in Figure 10(a).



240V, 1 000W
Figure 10(a)

240V, 1 000W
Figure 10(b)

Based on observation on the air pressure in the balloon;

(a) Make **one** suitable inference.

(b) State **one** appropriate hypothesis

(c) With the use of apparatus such as immersion heater, measuring cylinder and other apparatus, describe an experiment framework to investigate the hypothesis stated in 10 (b)

11. FINAL KRK F4 2006 (CHAPTER 4)

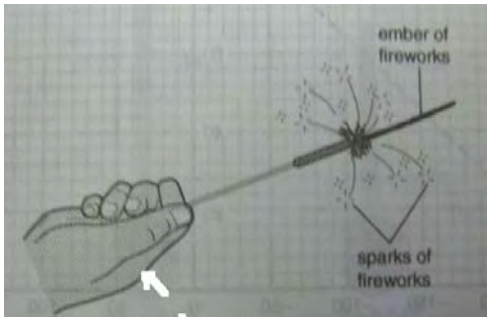


FIGURE 11

Figure 11 shows a student holding a burning fireworks. Some of the sparks landed on his hand but his hand was not burned . However, his hand was burned when he touched the ember of fireworks which had the same temperature as the sparks

Based on the observations ,

(a) State one suitable inference

(b) State one appropriate hypothesis

(c) With the use of appropriate apparatus such as beakar, slotted weight , Bunsen burner , describe an experimental framework to test your hypothesis.

12. TRIAL MRSM 2004

Figures 12(a) and 12(b) show the same items of clothing left to dry on the clothes line on two different days.

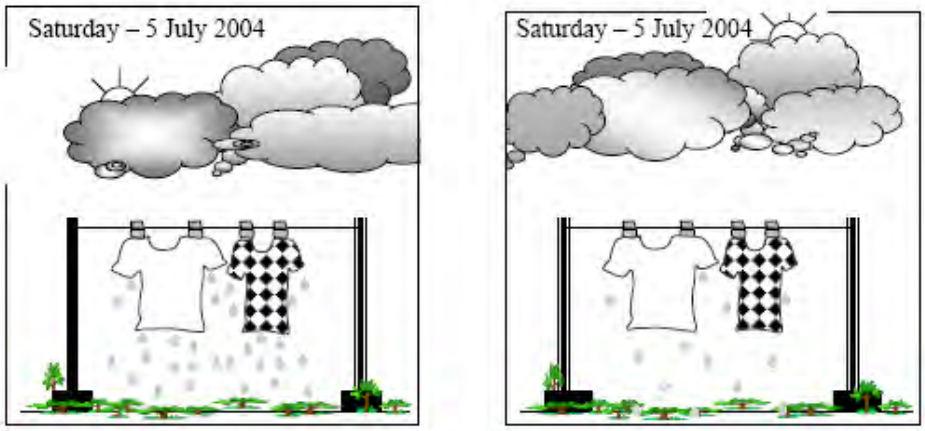


Figure 12(a)

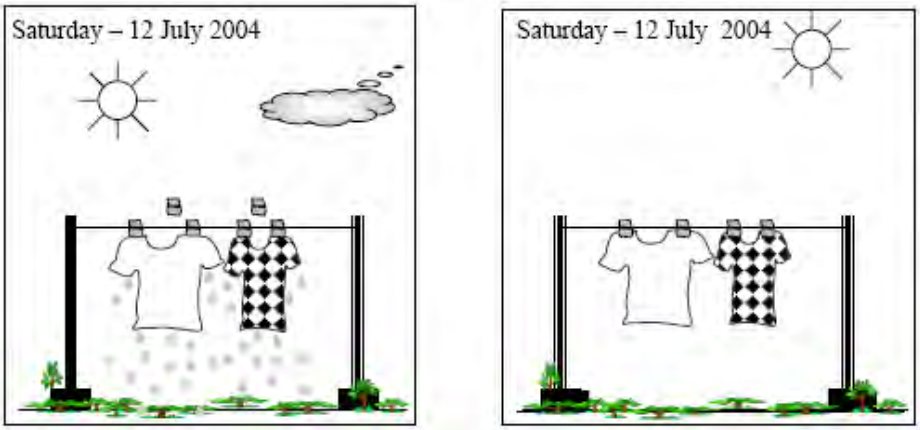


Figure 12(b)

Observe the clothes and the surroundings in which the clothes are hung.
Based on the observations:

(a) State one suitable inference that can be made
(b) State one appropriate hypothesis for an investigation
(c) Using apparatus and material such as light bulb, water and others, design an experiment to test your hypothesis.

12. TRIAL KEDAH 2007 (CHAPTER 5)

Diagram 12.1 shows a laboratory poster being observed through a convex lens.
Diagram 12.2 shows the laboratory poster observed through the same convex lens when the poster is brought closer to the lens.

Diagram 12.1

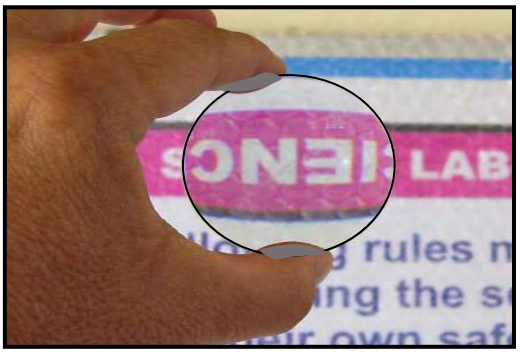


Diagram 12.2

Based on the above information and observation:

(a) State one suitable inference.
(b) State one suitable hypothesis.

(c) With the use of apparatus such as a convex lens, a light bulb and other apparatus, describe an experimental framework to investigate the hypothesis stated in 12(b).

13. JPTEK 2007 (CHAPTER 5)

A student used a slide projector to project a picture onto the screen. Figure 13(a) and 13(b) show the relative positions of the slide, projector lens and the screen. It is observed that when the screen is moved further away (Figure 4b), the lens of the projector has to be moved nearer to the slide to obtain a sharp image.

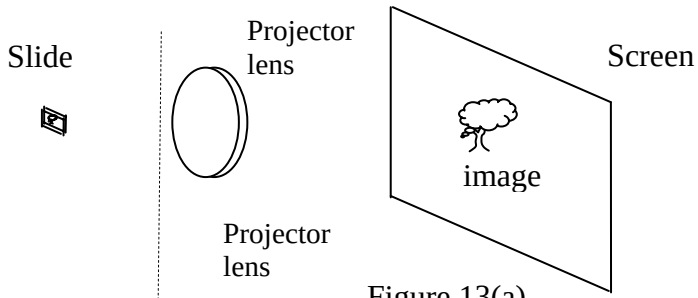


Figure 13(a)

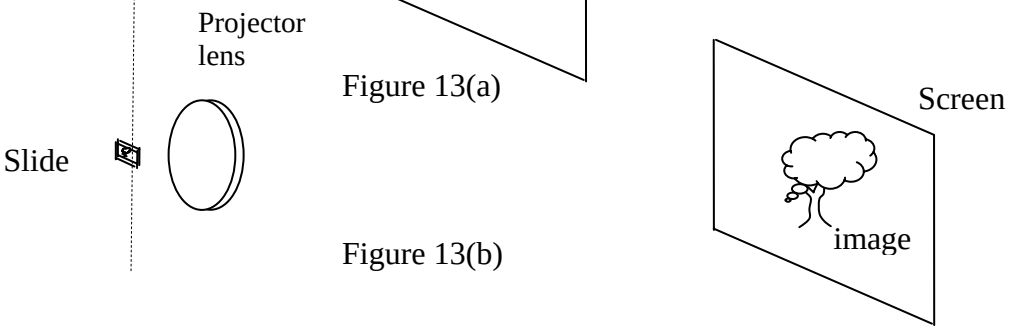


Figure 13(b)

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Based on the information and obsevation above :
(a) State **one** suitable inference.
(b) State **one** suitable hypotesis.

(c) With the use of apparatus such as convex lens, filament bulb and other apparatus, describe an experiment framework to investigate the hypothesis stated in 13(b)

14. <u>MID YEAR PAHANG 2007 (CHAPTER 6)</u>

Diagram 14.1 shows peaks of tidal waves or water waves becoming closer as they travel closer towards the coast.

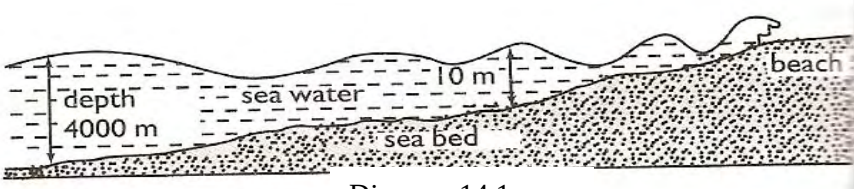
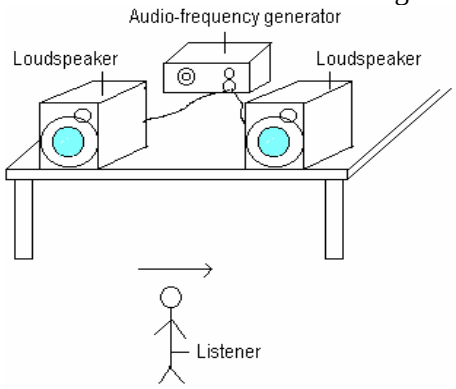


Diagram 14.1

Based on the above information and observation:
(a) State one suitable inference.
(b) State one suitable hypothesis .
(c) With the use apparatus such as a runway, ticker timer, ticker tape, trolleys and other apparatus, describe an experiment framework to investigate your hypothesis stated in 14(b).

15. <u>PRE SPM SMKTL 2006 (CHAPTER 6)</u>

A listener walks slowly along the two loudspeakers in front of the loudspeakers. She hears loud sound and low alternately. If the distance between the listener from speakers increases, the distance between two successive loud regions also increases.



Based on the information and obsevation above :
(a) State **one** suitable inference.
(b) State **one** suitable hypotesis.

(c) With the use of apparatus such as audio, speakers and other apparatus, describe an experiment framework to investigate the hypothesis stated in 4(b)

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16. TRIAL NEGERI SEMBILAN 2007 (CHAPTER 6)

Two spherical dippers which have a distance, a, are operate from the same motor produced a pattern of waves as shown in Figure 16(a). When the distance, a, between the two vibrating dippers is decreased, the waves pattern is changes as shown in Figure 16(b)

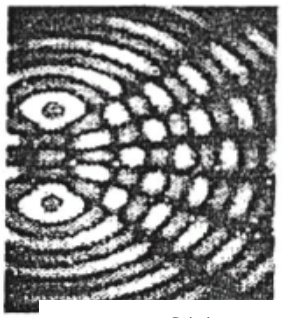


Figure 16(a)

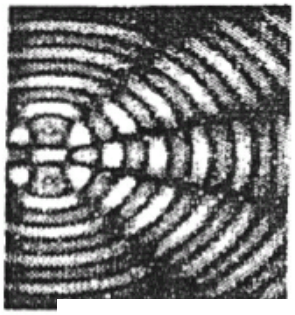


Figure 16(b)

Based on the above information and observation:

(a) State one suitable inference.
(b) State one suitable hypothesis.
(c) With the use of apparatus such as two loudspeakers connected to an audio generator, measuring tape and others apparatus, describe an experiment framework to investigate the hypothesis stated in 16(b)

17. PRE SPM SMKTL 2007 (CHAPTER 7)

Figure 17(a) and 17(b) show two similar bulbs , each is connected to a dry cell. The bulb in Figure 17(b) lights up brighter than the bulb in Figure 17(a)

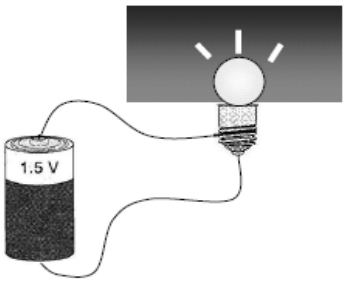


Figure 17(a)

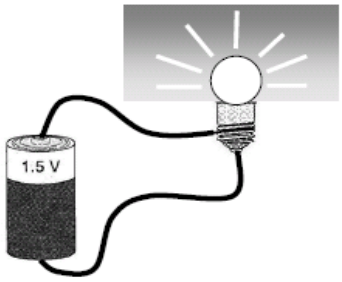


Figure 17(b)

Based on the above information and observation:
(a) State one suitable inference.
(b) State one suitable hypothesis.

(c) With the use of apparatus such as wire of different diameters and other apparatus, describe an experiment framework to investigate the hypothesis stated in 17(b)

18. JUJ PAHANG 2007 (CHAPTER 7)

Diagram 18.1 and 18.2 show two kiosks where were used bulb with filament 60 W connected to 24 V car battery by connection wire. At night the light on and the bulb produced different brightness.

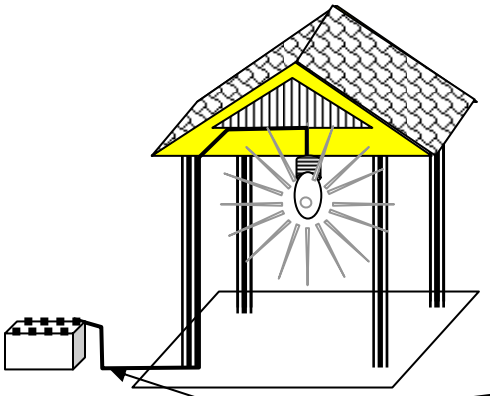


Diagram 18.1

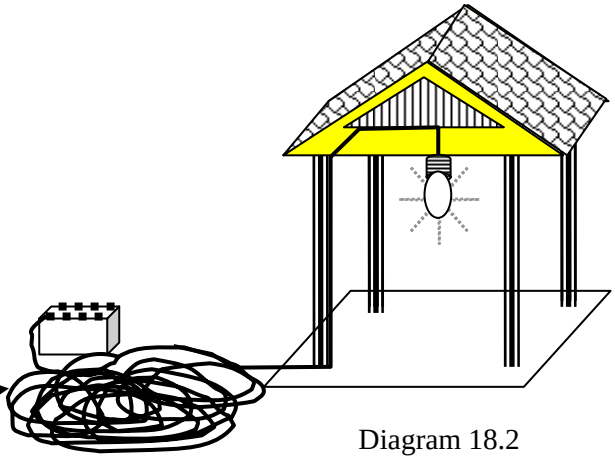


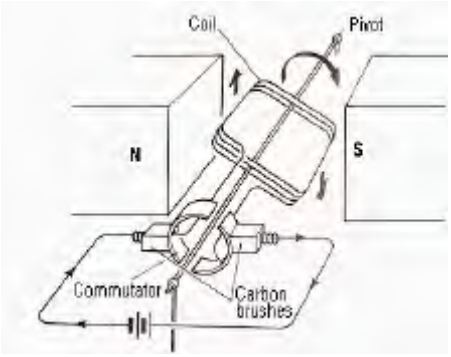
Diagram 18.2

(a) State **one** suitable inference.
(b) State **one** suitable hypotesis.

(c) With the use of apparatus such as a 1.5 V battery, nicrom resistance wire, connection wire and other apparatus, describe an experiment framework to investigate the hypothesis stated in 18(b)

19. TRIAL TERENGGANU 2007 (CHAPTER 8)

Diagram 19.1 shows a model of direct current motor. A student investigate that affected the speed of the motor rotation. He found that the rotation of the coil speed up when he use more batteries.



Based on the information and observation above:

(a) State one suitable inference.
(b) State one suitable hypothesis.

(c) With the use of apparatus such as a 1.5 V battery, ammeter, U-magnet connecting wire and other apparatus, describe an experiment framework to investigate the hypothesis stated in 19(b).

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20. TRIAL JOHOR 2007 (CHAPTER 7)

Diagram 20 shows a structure of a d.c electric motor which has a magnet and a coil of insulated iron wire. The motor is connected to a pulley system to lift up a load. When the switch is turned on, the motor will rotate and the load is lifted. An experiment was repeated several times, the time for the motor to lift the load increases as it gets hotter.

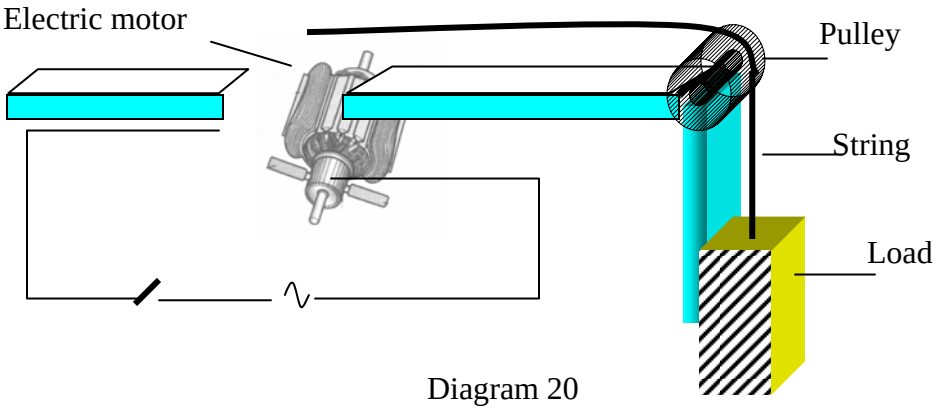

Diagram 20

Based on the information above:

(a) Make one suitable inference.
(b) State one appropriate hypothesis
(c) With the use of apparatus such as thermometer, iron wire, rheostat and other apparatus, describe an experiment framework to investigate the hypothesis stated in 20(b).

21. TRIAL PAHANG 2007 (CHAPTER 8)

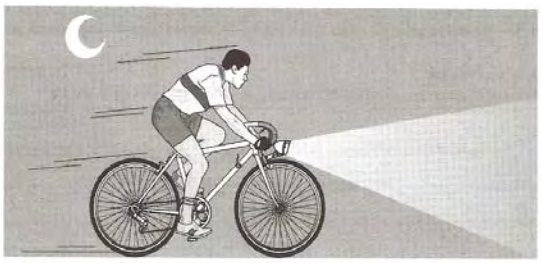

Figure 21 shows a boy cycling at night. The bicycle's lamp becomes brighter when he cycles faster.

Based on this observation,

(a) Make a suitable inference
(b) State an appropriate hypothesis

(c) With the use of apparatus such as bar magnet, miliammeter and connecting wires, design an experimental framework to investigate your hypothesis stated in 21(b).

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22. TRIAL KEDAH 2007 (CHAPTER 8)

Diagram 22.1 shows an electromagnet at the end of the arm of a crane lifting up some scrap iron.
Diagram 22.2 shows some pieces of scrap iron dropping off when the current in the electromagnet is reduced.

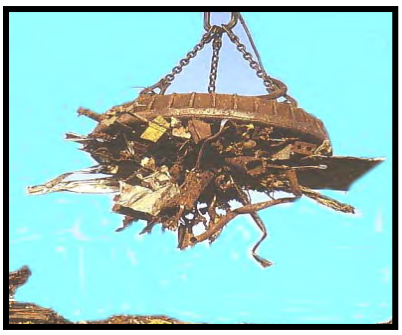

Diagram 22.1

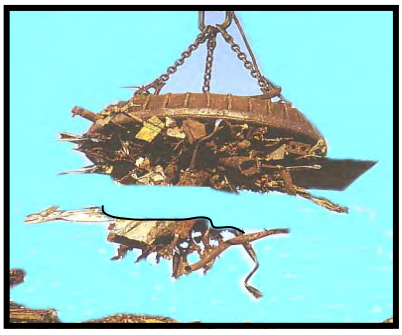

Diagram 22.2

Based on the above information and observation:

(a) State one suitable inference.

(b) State one suitable hypothesis.

(c) With the use of apparatus such as a solenoid, direct current power supply, paper clips and other apparatus, describe an experimental framework to investigate the hypothesis stated in 22(b).

23. TRIAL SBP 2007 (CHAPTER 8)

Diagram 23.1 and Diagram 23.2 show two cranes transferring different loads of scrapped irons. The solenoid used in the crane in Diagram 4.1 has fewer coils than the crane in Diagram 23.2. Both using the same magnitude of current supply to operate.

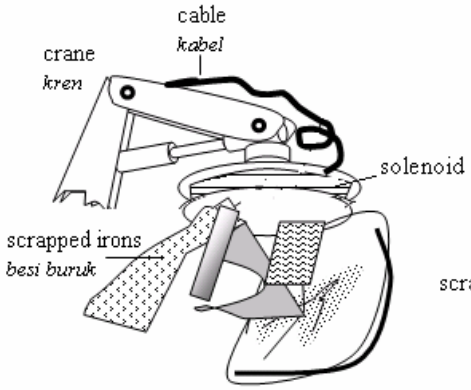

Diagram 23.1

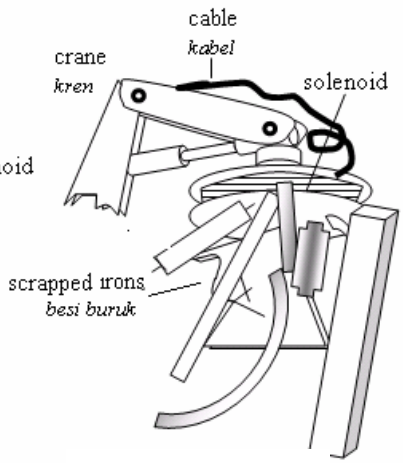

Diagram 23.2

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Based on the information and the observation above:
(a) State **one** suitable inference
(b) State one suitable hypothesis.

(c) With the use of apparatus such as insulated wires, power supply and other suitable apparatus, describe an experiment framework to investigate the hypothesis stated in 23(b).

24. JPTEK 2007 (CHAPTER 9)

Figure 24 shows a microphone connected to a power amplifier. When the microphone has detected a sound, an amplified sound is given out through the loudspeaker. The sound becomes louder if the volume of the amplifier is turned on to increase the power.

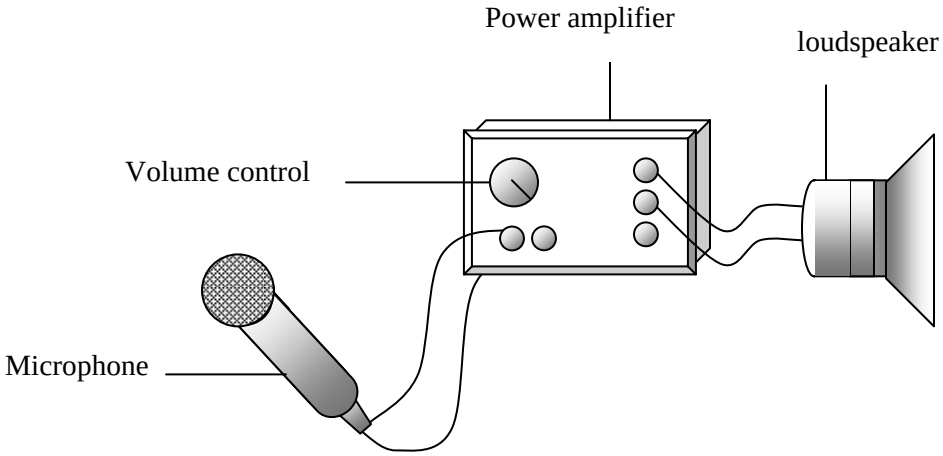

Figure 24

Based on the information and the observation above:
(a) State **one** suitable inference
(b) State one suitable hypothesis.

(c) With the use of apparatus such as npn transistor, 2 batteries, microammeter, miliammeter, rheostat, connecting wires and other suitable apparatus, describe an experiment framework to investigate the hypothesis stated in 24(b).

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1. (CHAPTER 2)

Inference: The velocity of the boys is depends to the height of the slide.

Hypothesis: The higher the slide, the higher the velocity of the slide.

Aim : To investigate the relationship between the velocity of an object and the height of runway

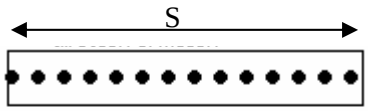
Variable : Manipulated : Height, h
Responding : Velocity, v
Fixed : mass of trolley

Apparatus: Ticker timer, ticker tape, metre rule, runway, wooden bloc

Arrangement of apparatus:

Procedure:

1. Start the experiment with height of the trolley = 20 cm from tabletop.
2. The power supply is turned on and the trolley is released to run down the runway
3. The velocity of the trolley at the bottom of the runway is determined using formula

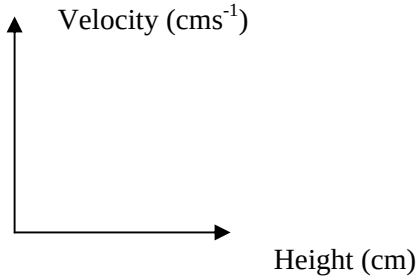


$$v = \frac{\text{Distance traveled of ten ticks}}{\text{Time for 10 ticks}} = \frac{S \text{ cm}}{0.2 \text{ s}}$$

4. The experiment is repeated 4 times for height = 30 , 40, 50 and 60 cm.

Tabulation:

Height (cm)	Velocity (cms^{-1})
20	
30	
40	
50	
60	



Notes for candidates:

- ***Procedure for experiment ticker tape, must have complete explaination:***
  [Switch on the power supply ; Draw 10 ticks of ticker tape & give the suitable equation]

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2. MOMENTUM (CHAPTER 2)

Inference : The momentum of an object changes after a collision
Hypothesis : The total momentum before and after collision is unchanged / constant / conserved

Aim : To investigates the principle of conservation of momentum during an inelastic collision.

Manipulated : Mass of trolleys.
Responding : Velocity
Constant : Frequency of ticker-timer

Apparatus : 4 trolleys, runway, wooden blocks, ticker-timer, power supply, ticker tape, cellophane tape and plasticine.
Arrangement of apparatus

Procedure:
1. A friction-compensated run-way is set up by placing wooden blocks below one end so that a trolley can move down the runway with uniform velocity.

2. Trolley A and trolley B are placed on the runway. The ticker-timer is switched on and trolley A is pushed to collide with trolley A should stick to trolley B and move on together after the collision.

3. The velocity before collision, u and the velocity after collision, v are calculated from the ticker tape obtained.

4. The above procedure is repeated by using
   a) 1 trolley to collide with 2 stationary trolleys.
   b) 2 trolleys to collide with 1 stationary trolley.
   c) 3 trolleys to collide with 1 stationary trolley.
   d) 4 trolleys to collide with 1 stationary trolley

Tabulation:

Mass of trolley		Velocity, u/m s^{-1}	Total initial momentum (m_1 u)/kg m s^{-1}	Mass of trolleys (m_1+m_2)	Velocity v/m s^{-1}	Total final momentum (m_1+m_2)/kg m s^{-1}
M_1//kg	M_2/kg					
1	1					
1	2					
2	1					
3	1					
4	1					

Analyse the data:

The total final momentum after collision is compared with the total initial momentum before collision.
It is found that the total momentum before and after collision is conserved (unchanged).

Notes for candidates:
- ***The question ask about principle. So the experiment framework is different***
- ***Analyse data cannot show the graph. Just give the conclusion / definition of principle.***

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3. VELOCITY (CHAPTER 2)

Inference : The velocity of the boxes is depends to the mass

Hypothesis: The higher the mass, the lower the velocity .

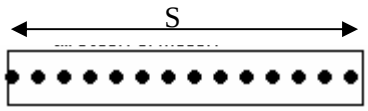
Aim : To investigate the relationship between the velocity and the mass of trolley

Variable : Manipulated : Mass, m / number of the trolley
Responding : Velocity, v
Fixed : Height of the inclined runway

Apparatus: Ticker timer, ticker tape, meter rule, runway, wooden block, trolley.
Arrangement of apparatus:

Procedure:

4. Start the experiment with number of trolley = 1
5. The power supply is turned on and the trolley is released to run down the runway
6. The velocity of the trolley at the bottom of the runway is determined using formula

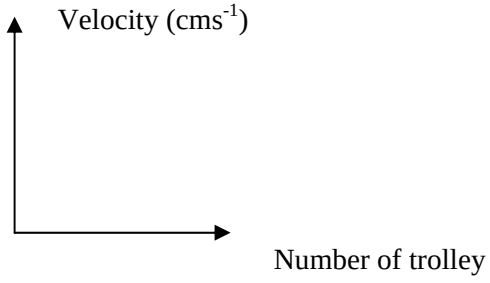


$$v = \frac{\text{Distance traveled of ten ticks}}{\text{Time for 10 ticks}} = \frac{S \text{ cm}}{0.2 \text{ s}}$$

4. The experiment is repeated 4 times for number of trolley = 2, 3, 4 and 5

Tabulation:

Number of trolley	Velocity (cms^{-1})
1	
2	
3	
4	
5	



Notes for candidates:

- ***Procedure for experiment ticker tape, must have complete explaination:***
  [Switch on the power supply ; Draw 10 ticks of ticker tape & give the suitable equation]

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4. SPRING (CHAPTER 2)

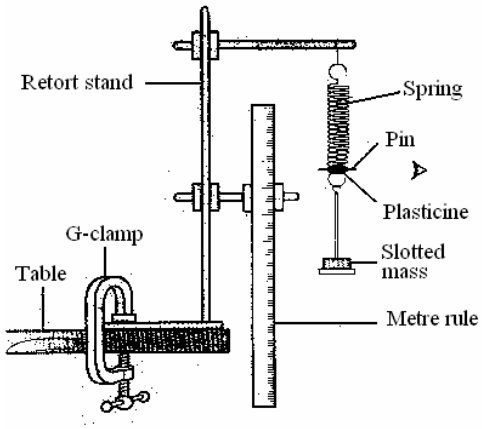
Inference : The extension of the spring is influenced by the mass.
Hypothesis : The extension of the spring is directly proportional to the applied force.

Aim : To investigate the relationship between force and extension of a spring.

Manipulated variable: Force
Responding variable : Extension of spring
Fixed variable : Diameter of spring

Apparatus : Steel spring, meter rule, mass, holder of slotted masses, pin, retort stand and G-clamp.

Arrangement of apparatus:

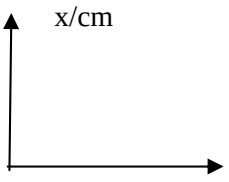


Procedure:
1. The initial position of the pin is marked when no mass is attached to the spring = l_0
2. A slotted mass, m = 20 g is attached to the end of the spring.
3. The extension of the spring is measured x = $l_1 - l_0$
4. Experiment is repeated 4 times by using mass slotted masses of mass, m = 30 g, 40 g, 50 g and 60 g.

Tabulation:

Mass, *m* / g	**Weight of slotted mass, F/N**	**Extension of spring, x / cm**
20		
30		
40		
50		
60		

Graph:



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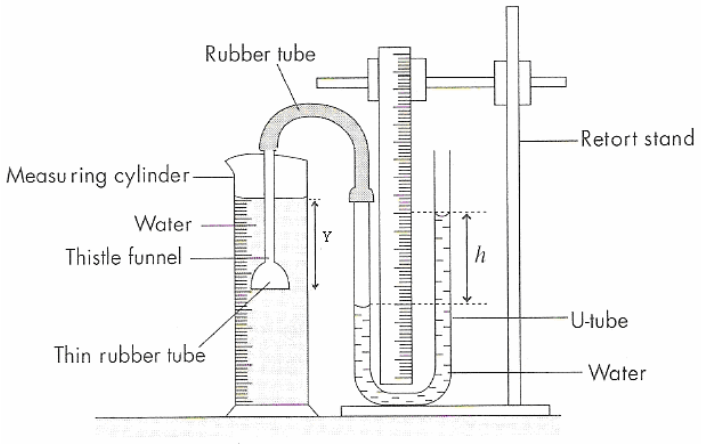
5. PRESSURE (CHAPTER 3)

Inference : The wall of the dam is thicker at the bottom of the dam.
Hypothesis : The higher the depth, the higher the pressure increases

Aim : To investigate the relationship between the pressure in a liquid and the depth.
Variables : Manipulated : Depth of liquid, y
Responding : Pressure in liquid, h
Fixed : Density, p
Apparatus : Measuring cylinder, thistle funnel, rubber tube, manometer, and retort stand.

Arrangement of apparatus:

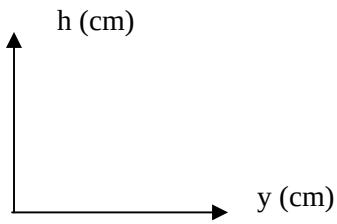


Procedure:
1. The thistle funnel is lowered with the water to a depth y = 10 cm
2. The manometer reading, h is measured.
3. he experiment is repeated with values of depth y = 20cm, 30cm, 40 cm and 50 cm.

Tabulation:

y (cm)	h (cm)
10	
20	
30	
40	
50	

Graph



**** Student also can use other apparatus such as container with 5 holes.***

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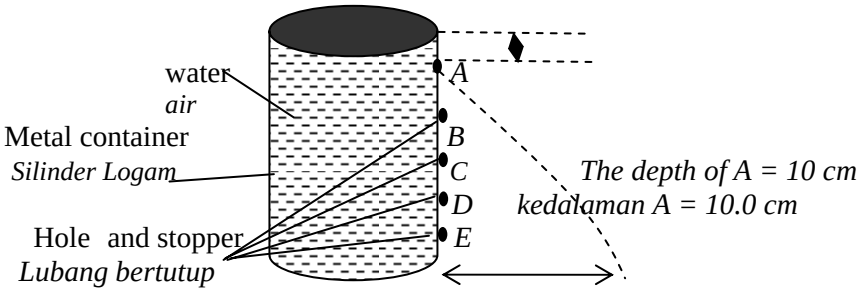
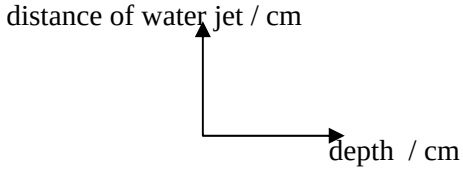
ANSWER SCHEME FOR ANOTHER APPARATUS: (CONTAINER WITH 5 HOLES)

5. TRIAL PAHANG 2007 (CHAPTER 3)

State a suitable inference Water pressure is influenced by its depth	1
The higher the depth the higher the horizontal distance of jet water	1
To investigate the relationship between the depth of water and the horizontal distance of jet water	1
Manipulated variable : depth of water Responding variable : distance of jet water	1
Density / volume / type of liquid	1
Water, meter rule, container with 5 side holes and stopper	1
 The distance of water jet	1
Open the stopper of hole A at 30.0 cm depth	1
Measure the distance of jet water	1
Repeat the experiment at the depth B = 25.0 cm, C = 20.0 cm, D 15.0 cm and E =10.0 cm	1
Depth / cm: 30.0, 25.0, 20.0, 15.0, 10.0 — Distance of jet water / cm	1
	1
Total	**12**

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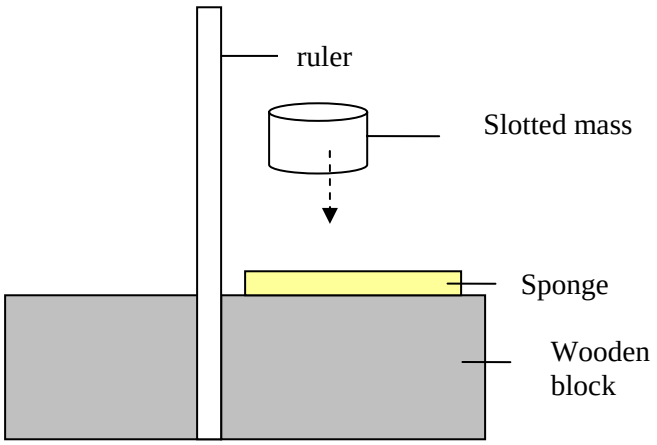
6. PRESSURE(CHAPTER 3)

Inference : Pressure depends on the area of surface contact
Hypothesis : The bigger of the surface area the higher the pressure produce

Aim : To investigate the relationship between surface area and the pressure

Variables : Manipulated : Area
Responding : Pressure/ distance sponge compress
Fixed : mass

Apparatus : Ruler, Cardboard , slotted mass, wooden block and sponge

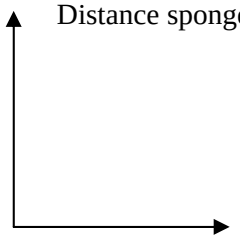


Procedure:

1. A 500g slot mass with diameter 4 cm is put on the sponge
2. Measure the distance sponge, compress and record
3. The experiment is repeated use the slot mass with diameter 6 cm,8 cm,10 cm,12 cm

Tabulation

Diameter (D) / cm	Distance sponge compress (H) / cm
4	
6	
8	
10	
12	



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6. HEAT (CHAPTER 4)

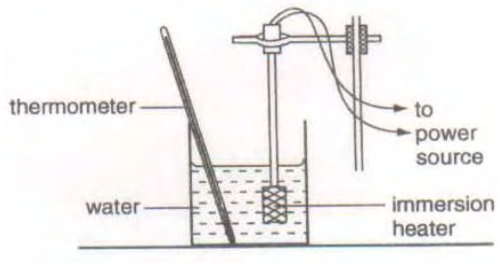
Inference : The time to boil the water is influence by the mass of water
Hypothesis : The longer the time to boil of water , the greater the mass of water

Aim : To investigate the relationship between the mass of water and the time taken to boil the water

Variables : Manipulated : the mass of water
Responding : the time to boil the water
Constant : amount of energy supplied

Apparatus : Immersion heater, beaker, stop watch, triple beam balance

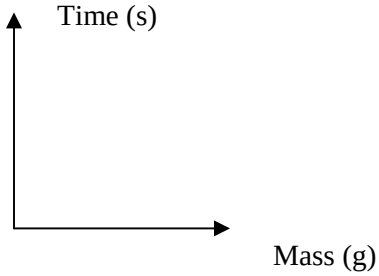
Arrangement of apparatus:



Procedure:
1. Boil the water in a beaker , mass , m = 100 g
2. Record the time taken to boil the water , t
3. The experiment is repeated 4 times with mass of water = 200 g, 300g, 400 g and 50g

Tabulation:

Mass (g)	Time (s)
100	
200	
300	
400	
500	



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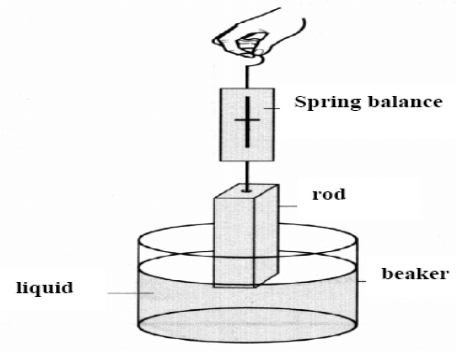
7. ARCHIMEDES PRINCIPLE (CHAPTER 3)

Inference : The depth of the boat in water is depends to the weight/ mass of load.
Hypothesis: The higher the mass, the higher the volume of water displaced.

Aim : To investigate the relationship between mass of rod and the volume of water displaced

Manipulated variable: Mass
Responding variable : Volume of water / liquid displaced, V
Fixed variable : Density of liquid

Apparatus: rod , water/ liquid, beaker, spring balance, beaker, measuring cylinder
Arrangement of apparatus **:**

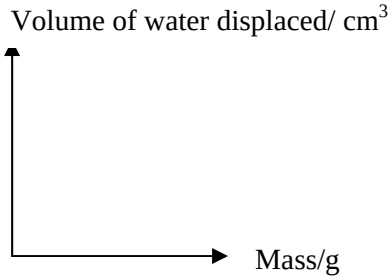


Procedure:
1. A rod of 20 g is immersed in the liquid.
2. The volume of liquid water displaced is measure and recorded
3. The experiment is repeated by placing 25,30,35 and 40 g of rod.

Tabulation:

Mass /g	Volume of water displaced, V/cm^3
20	
25	
30	
35	
40	

Graph:



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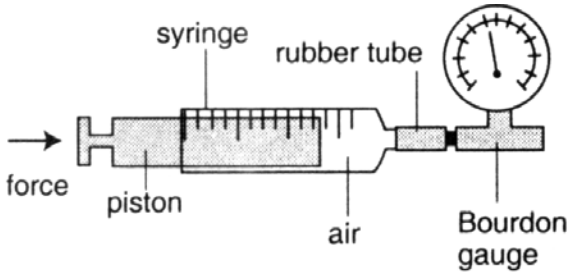
8. GAS LAW (CHAPTER 3)

Inference : The volume of the gas depends on the pressure which acts on it.
Hypothesis : The smaller the pressure, the larger is the volume of a fixed mass of gas.

Aim : To investigate the relationship between the pressure and volume for a fixed mass of gas at a constant temperature.

Variables : Manipulated : Gas volume, V
Responding : Gas pressure, P
Fixed : : Gas temperature,T or mass of gas, m

Apparatus : Glass syringe, a short rubber tube and Bourdon gauge
Arrangement of apparatus:



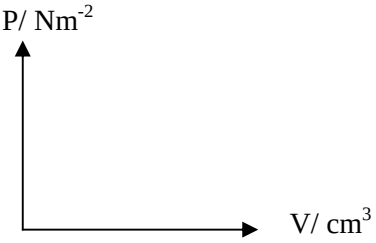
Procedure:

1. The piston of the syringe is adjusted until the volume of air in the syringe is 100 cm^3 at atmospheric pressure.
2. The syringe is connected to a Bourdon gauge and the pressure of the air in the syringe is observed and recorded.
3. The experiment is repeated 4 times for volumes = 90 cm^3 ,80cm^3, 70 cm^3 and 60 cm^3.

Tabulation:

Volume V / cm^3	Pressure P / Nm^{-2}
100	
90	
80	
70	
60	

Graph:



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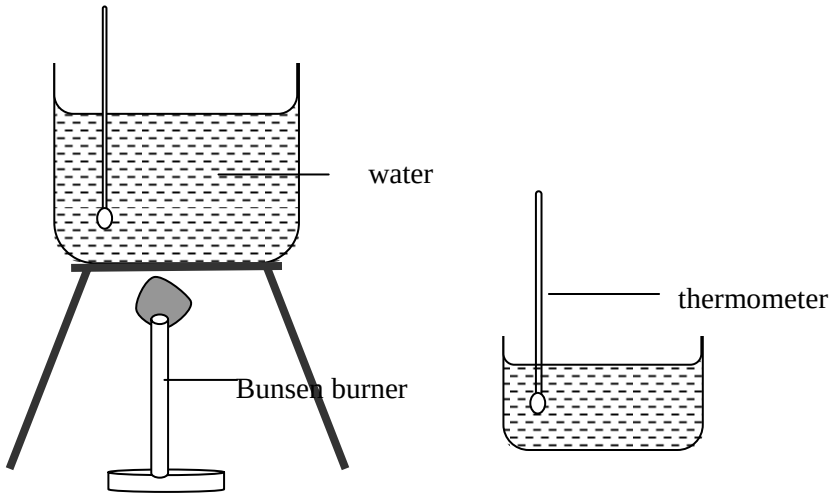
9. HEAT (CHAPTER 4)

Inference : The rate of temperature drop is depends to the diameter of beaker
Hypothesis: The higher the diameter of beaker, the higher the rate of temperature drop

Aim: To investigate the relationship between the diameter of beaker and the rate of temperature drop

Variables : Manipulated : diameter of beaker
Responding : temperature
Fixed : : Time taken / volume of water

Apparatus: beaker, stopwatch, water, thermometer, Bunsen burner, measuring cylinder, stir,
Arrangement of apparatus:



Procedure:
1. 1000 cm^3 of water is boiled to 100^0C.
2. 200 cm3 is poured into 5 beaker of different diameter 10 cm, 15 cm, 20cm, 25 cm and 30 cm.
3. After 15 minutes the temperature is recorded
The rate of temperature drop = 100 - θ_0

Tabulation:

Diameter/cm	Final temperature	Rate of temperature drop
10		
15		
20		
25		
30		

Graph

Temperature drop^{0}C

Diameter /cm

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10 HEAT (CHAPTER 4)

Inference : The time taken to boil the water is depends to the volume of water
Hypothesis The higher the volume of water, the longer the time taken to boil the water

Aim : To study the relationship between the volume of water and the time taken to boil the water

Manipulated variable: volume of water
Responding variable : time taken to boil the water
Constant variable : The amount of energy supplied

Apparatus : Immersion heater , beaker, stop watch, measuring cylinder.

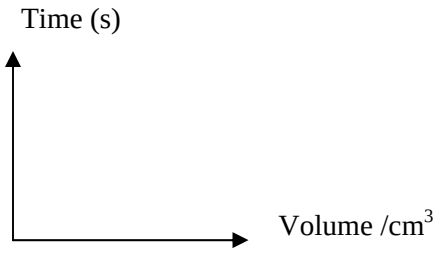
Arrangement of apparatus:

Procedure:
1. Boil 100 cm^3 of water in a beaker
2. Record the time taken until the temperature reading is 100^0C
3. Repeat the experiment 4 times for v = 150, 200, 250 and 300 cm^3

Tabulation:

Volume V / cm^3	Time taken (s)
100	
150	
200	
250	
300	

Graph:



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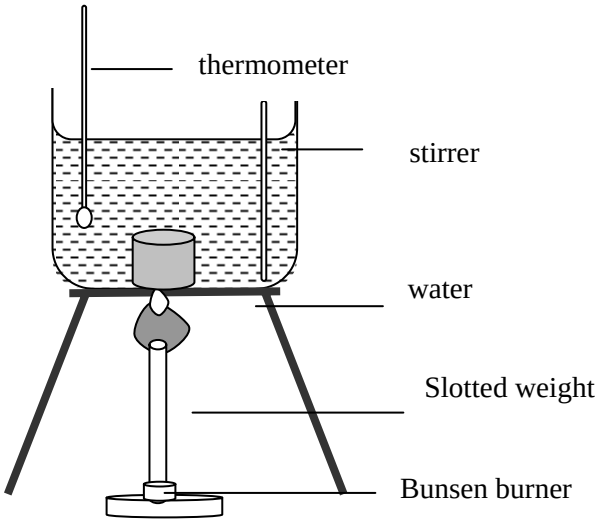
11. HEAT (CHAPTER 4)

Inference : The ember of fireworks which has a large mass gives out more heat.
Hypothesis : A bigger mass of slotted weight at fixed temperature will further increase the temperature of a given mass of water .

Aim : To investigate the relationship between the mass of slotted weight at fixed temperature and the increase in temperature of water

Variables : Manipulated variable : mass of slotted weight , m
Responding variable : increase in temperature of water, Θ
Constant variable : mass of water used

Apparatus :Beakar, slotted weight (100 x 5) , Bunsen burner , thermometer , stirrer , tripod stand , water
Arrangement of apparatus:



Procedure
1. The slotted weights of mass 100g each is heated until 100º C in boiling water.
2. The innitial temperature of water of volume 200 cm^3 is measured as T_1.
3. A slotted weight of mass 100 g is quickly transferred into the boiling water.
4. The water is constantly stirred and the highest temperature reached T_2 is recorded . The rise in temperature $\theta = T_2 - T_1$ is determined
5. The experiment is repeated for slotted weights of mass m = 200 g, 300 g, 400 g and 500 g.

Tabulation

Mass of slotted weight , m / g	Final temperature of water, T_2 / º C	Innitial temperature of water T_1 / º C	Increase in temperature $\theta = T_2 - T_1$ / º C
100			
200			
300			
400			
500			

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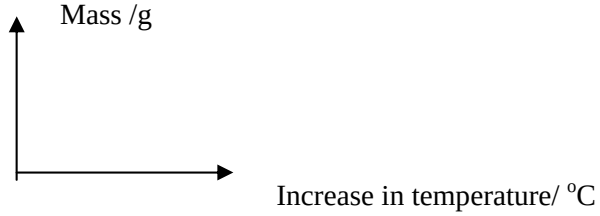
Graph



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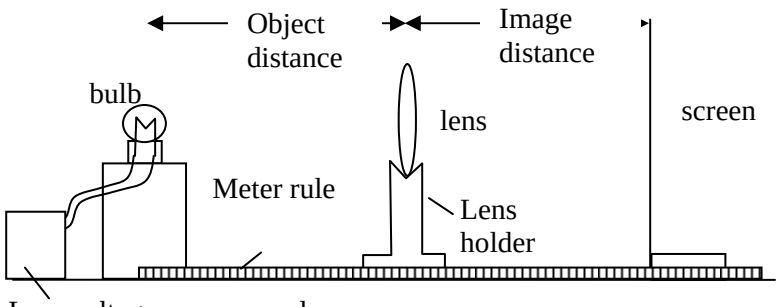
12 LENS (CHAPTER 5)

Inference : The size of the image depends on the object distance
Hypothesis :The greater the object distance, the smaller the size of the image

Aim :To investigate the relationship between the object distance and the size of the image

Manipulated variable : object distance, *u*
Responding variable : size of the image, *H*
Fixed variable : Focal length of the lens / type of lens

Apparatus :Convex lens with holder, light bulb with power supply, screen, metre rule
Arrangement of apparatus:



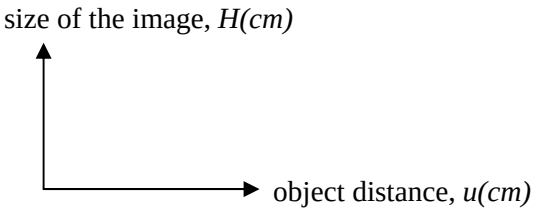
Procedure:

1. Start the experiment with , *u* = 15 cm
2. The screen is adjusted until a sharp image is formed on it.
   The size of the image, *H* is measured.
3. The procedure is repeated with values of *u* = 20 cm, 25 cm, 30 cm, and 35 cm

Tabulation

u / cm	*H* / cm
15	
20	
25	
30	
35	

Graph



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13. LENS (CHAPTER 5)

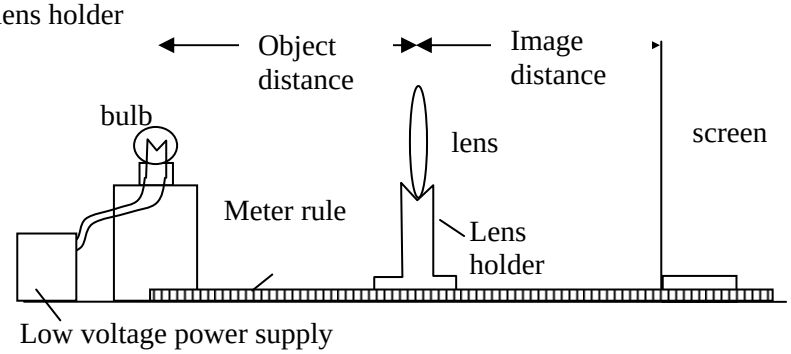
Inference : The image distance is depends on the object distance
Hypothesis : The greater the object distance, the smaller the image distance

Aim : To investigate the relationship between object distance and image distance for a convex lens

Manipulatd variable : object distance
Responding variable : image distance

Constant variable : Focal length of lens

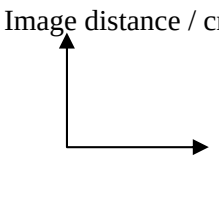
Apparatus : light bulb, convex lens of focal length 10 c , white screen, metre rule, low voltage power supply and lens holder



Procedure:
1. Adjust the bulb so that the object distance (filament), *u* is 35 cm from the lens.
2. Light up the electric bulb, adjust the screen position until a sharp image of the filament is formed on the screen. Record the image distance, *v*.
3. Repeat the experiment 4 times for objects distances of, *u* = 30cm, 25 cm, 20 cm, and 15 cm.

Tabulation:

object distance, u / cm	Image distance, v / cm
35	
30	
25	
20	
15	



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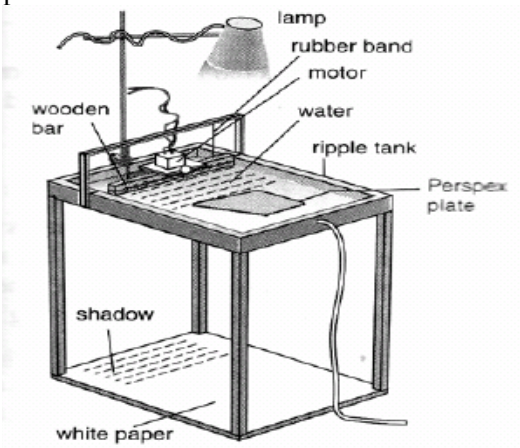
14. WATER WAVE (CHAPTER 6)

Inference : The speed of the water waves is influenced by the depth of the water
Hypothesis : The lower the depth of water , the lower the speed of the water

Aim : To study the relationship between the waves speed and the depth of the water.
Variable : Manipulated : Depth , h, of the water
Responding : Speed of the waves
Constant : frequency of the waves

Apparatus : Ripple tank, wooden block with vibrator, power supply, rheostat , Perspex plate, hand stroboscope, white paper, rubber bands, ruler.

Arrangement of apparatus:

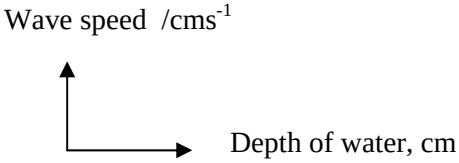


Procedure:
1 Fill the tray of the ripple tank with water to the depth , d= 0.5 cm.
2 Place a piece of Perspex plate at the centre of the ripple tank
3 Switch on the vibrating motor circuit. Adjust the rheostatto get the frequency = 1Hz
4 Measure the wavelength and calculate the speed , $v = f \lambda$
5 Repeat the experiment 4 times for depth = 0.6 cm, 0.7 cm , 0.8 cm and 0.9 cm

Tabulation :

Depth of the water, d/cm	Wave speed, v/cms^{-1}
0.5	
0.6	
0.7	
0.8	
0.9	
2.6	

Graph



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15. SOUND WAVE **(CHAPTER 6)**

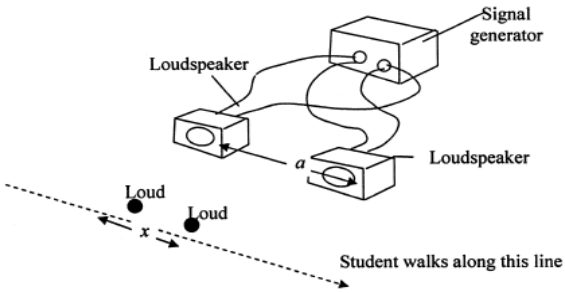
Inference : The distance between two successive loud regions is depends to the distance between the listener from speakers

Hypothesis : The longer the distance between the listener from speakers, the longer the distance between two successive loud regions

Aim : To study the relationship between the distance between two successive loud regions and the distance between the listener from speakers

Manipulated variable : the distance between the listener from speakers, *D*
Responding variable : the distance between two successive loud regions, *x*
Constant variable : frequency audio / distance between 2 speakers

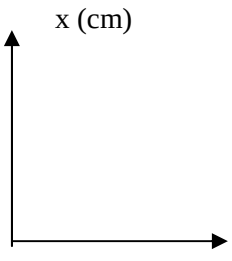
Apparatus : audio, speakers, power supply, measuring tape,
Arrangement of apparatus:



Procedure:
1. Start the experiment with D = 50 cm
2. Measure the distance of two consecutive interference using measuring tape.
3. The experiment is repeated 4 times for D = 60 cm, 70 cm, 80 cm and 90 cm

Tabulation:

D (cm)	x (cm)
50	
60	
70	
80	
90	



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16. SOUND WAVE (CHAPTER 6)

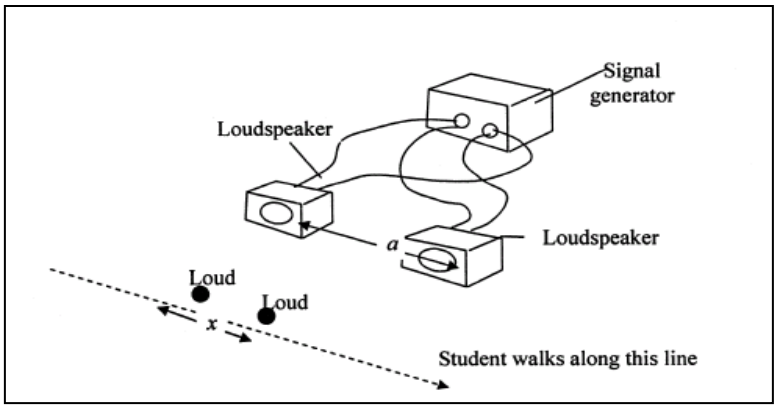
Inference : The distance x between two consecutive interference changes when the distance , a between two sources changes

Hypothesis: The greater the distance of two sources, the greater the distance of two consecutive interference.

Aim : To investigate the relationship between the distance of two sources and the distance two consecutive interference

Variable : Manipulated : distance of two sources, a
Responding : distance of two consecutive interference, x
Fixed : wavelength

Apparatus: Two loud speaker, a audio signal generator, connecting wire, measuring tape,
Arrangement of apparatus:



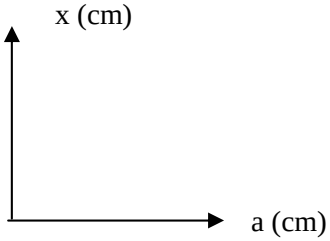
Procedure:

2. Start the experiment with a = 50 cm
2. Measure the distance of two consecutive interference using measuring tape.
3. The experiment is repeated 4 times for height = 60 cm, 70 cm, 80 cm and 90 cm

Tabulation:

a (cm)	x (cm)
50	
60	
70	
80	
90	

Graph



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17. OHM'S LAW (CHAPTER 7)

Inference : The brightness of light influenced by the length of wire
Hypothesis: The higher the length of wire, the lower the current

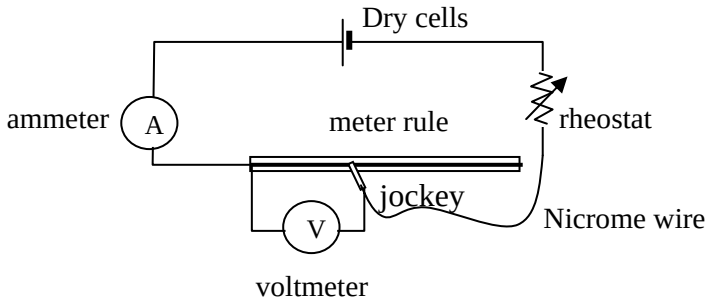
Aim : To investigate the relationship between the length of wire and current

Manipulated variable : length of wire
Responding variable : current

Constant variable : The thickness of wire / type of wire

Apparatus and materials : Ammeter, Voltmeter, meter rule, rheostat and jockey, dry cell

Arrangement of the apparatus:

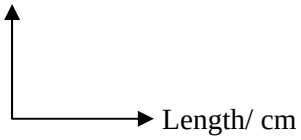


Procedure:
1. Start the experiment with length of wire = 20 cm
2. Adjust the rheostat at a constant value and record the reading of ammeter
3. Repeat the experiment 4 times with length of wire = 40 cm, 60 cm, 80 cm, and 100 cm.

Tabulation:

Length /cm	Current/A
20	
40	
60	
80	
100	

Graph



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18 OHM'S LAW (CHAPTER 7)

Inference : The resistance of wire is depends to the diameter of wire
Hypothesis: The higher the diameter of wire, the lower the resistance

Aim : To investigate the relationship between the diameter of wire and resistance

Manipulated variable : diameter of wire
Responding variable : resistance

Constant variable: The length of wire / type of wire

Apparatus and materials : Ammeter, Voltmeter, meter rule, rheostat , dry cell,
15 cm constantat wire

Arrangement of the apparatus:

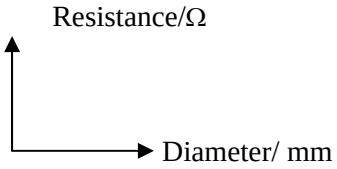
Procedure:

1. Start the experiment with diameter of wire = 0.5 mm
2. Adjust the rheostat at a constant value and record the reading of ammeter and voltmeter.
3. Measure the resistance, R = V/I Ω
4. Repeat the experiment 4 times with diameter of wire = 0.6, 0.7, 0.8 and 0.9 mm

Tabulation:

Diameter /mm	Current/A	Voltmeter/V	R /Ω
0.5			
0.6			
0.7			
0.8			
0.9			

Graph



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19. ELECTROMAGNETIC (CHAPTER 8)

Inference : The speed rotation of the coil depends to the number of batteries.
Hypothesis : The higher the number of batteries, the higher the speed rotation of the coil.

Aim : To study the relationship between the number of batteries and the current

Manipulated variable : number of batteries
Responding variable : current
Fixed variable : the strength of magnet

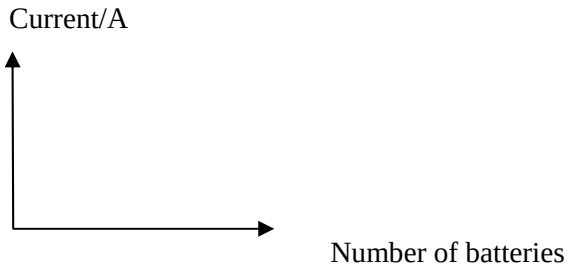
Apparatus: 1.5 V battery, ammeter, U-magnet connecting wire,
Arrangement of apparatus:

Procedure:
1. Start the experiment with 1 battery.
2. Record the reading of ammeter
3. Repeat the experiment 4 times for batteries = 2,3,4 and 5

Tabulation:

Number of batteries	Current/A
1	
2	
3	
4	
5	

Graph



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20. HEAT (CHAPTER 4)

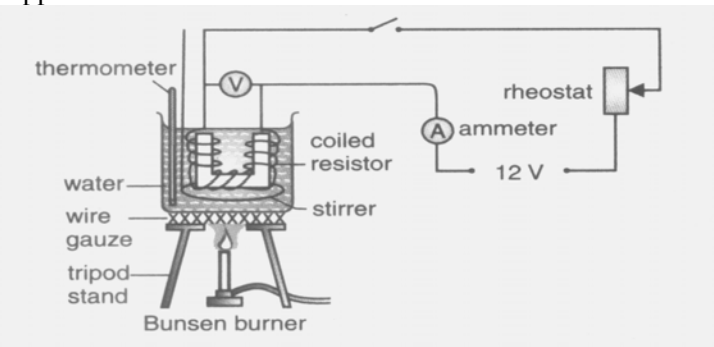
Inference : The resistance of a metal conductor is depends on the temperature.
Hypothesis :The higher the temperature, the higher the resistance of a metal conductor

Aim : To investigate the effect of temperature on the resistance of a metal conductor.

Variables : Manipulated : Temperature, T
Responding : Resistance, R
Fixed : Type of material, length and cross-sectional area of the wire.

Apparatus : Iron wire, ammeter, voltmeter, rheostat, U- shaped glass rod, beaker, thermometer, stirrer, electrical power supply, connecting wires, crocodile clips, Bunsen burner, water, wire gauze and tripod stand.

Arrangement of apparatus:

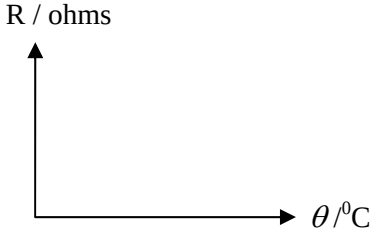


Procedure:

1. The length of fine iron wire is wound around a U-shaped glass rod to form a coiled resistor and the apparatus is set up as shown in the diagram above.
2. The water is heated to a temperature of 30°C, the current is maintained at a value of 0.5 A using the rheostat and the reading of the voltmeter is recorded.
3. The experiment is repeated with the temperature raised to 40°C, 50°C, 60°C, 70°C and 80°C.
4. The corresponding value of the resistance $R = \frac{V}{I}$ is calculated for each of the above temperatures.

Tabulation

Temperature T /°C	Potential difference V/ V	Resistance R / ohms
30		
40		
50		
60		
70		
80		



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21. ELECTROMAGNETIC CHAPTER 8

Inference : The brightness of the light depends on the speed of rotation of the wheel.

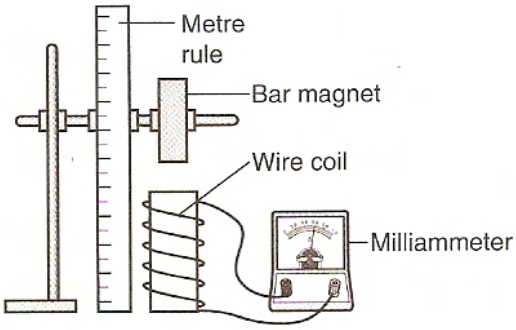
Hypothesis : The greater the velocity of the magnet in the coil wire, the greater magnitude of the induced current

Aim : To identify the relationship between the velocity of the magnet and the magnitude of the induced current.

Manipulated variable : The velocity of the magnet
Responding : The magnitude of the induced current

Constant variable : The number of turns of the coil

Material : magnet, a coil of cooper wire, milammeter, meter ruler, connecting wires

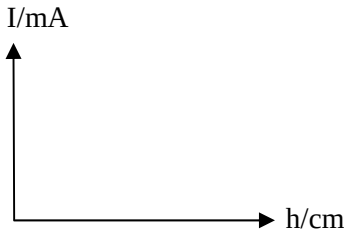


1. Start the experiment with the height of a bar magnet at h = 20 cm.
2. The bar magnet is dropped into the coil wire.
   Reading of miliammeter for current is recorded
3. The experiment is repeated 4 times for h = 30 cm, 40 cm, 50 cm and 60 cm

Tabulation

h / cm	I / mA
20	
30	
40	
50	
60	

Graph



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22. ELECTROMAGNETIC (CHAPTER 8)

Inference The Strength of the electromagnetic field is depends on the current

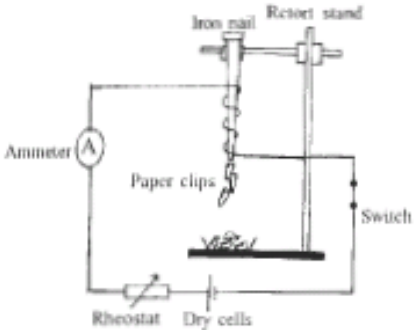
Hypothesis : The greater the current, the stronger the electromagnetic field

Aim : To investigate the relationship between the current and the strength of the electromagnetic field

Variable : Manipulated : current, *I*
Responding : number of paper clips, *N*
Constant :The number of turns of the coil

Apparatus : D.c. power supply, ammeter, rheostat, petri dish, retort stand with clamp, paper clips, soft iron rod, insulated copper wire, and connecting wires.

Arrangement of apparatus:



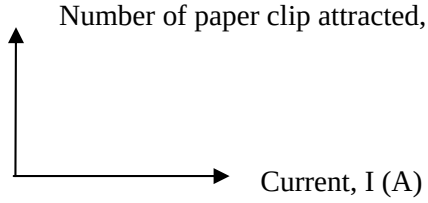
Procedure:

1. The current was switched on. The rheostat was adjusted to obtain a current of 0.5 A
2. The number of paper clips, *N* attracted to the soft iron rod was counted
3. The experiment is repeated 4 times for the current, *I* = 1.0 A, 1.5 A, 2.0 A and 2.5 A

Tabulation

Current, *I* / A	Number of paper clips attracted, *N*
0.5	
1.0	
1.5	
2.0	
2.5	

Graph:



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23. ELECTROMAGNETIC (CHAPTER 8)

Inference : The strength of the electromagnetic field of an electromagnet is depends to the number of turn

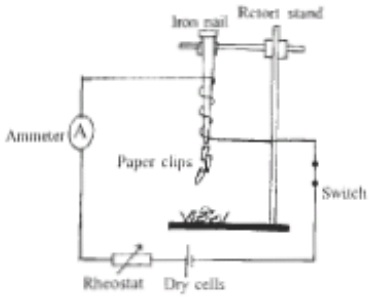
Hypothesis : The larger the number of turn, the higher the strength of the electromagnetic field

Aim : To investigate the relationship between the number of turn and the strength of the magnetic field of an electromagnet.

Variable : Manipulated : number of turn
Responding : number of paper clips attached, *N*
Constant : current, I

Apparatus : D.c. power supply, ammeter, rheostat, petri dish, retort stand with clamp, paper clips, soft iron rod, insulated copper wire, and connecting wires.

Arrangement of apparatus:



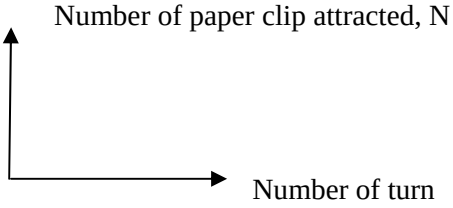
Procedure:

1 Start the experiment with the number of turn = 10
2 Switch on the power supply.
3 The number of paper clips, *N* attracted to the soft iron rod was counted
4 The experiment is repeated 4 times for the number of turn = 20, 30, 40 and 50

Tabulation

Number of turns	Number of paper clips attached, *N*
10	
20	
30	
40	
50	

Graph:



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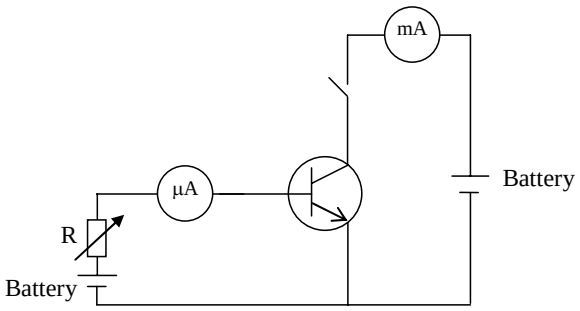
24. ELECTRONIC (CHAPTER 9)

Inference: The strength of the output signal of the amplifier depends on the input current of the amplifier.
Hypothesis: The larger the input current in an amplifier circuit, the larger the output current

Aim : To determine the relationship between base current and collector current of a transistor amplifier circuit

Manipulated variable : Base current, I_B
Responding variable : Collector current, I_C
Constant variable : Supply voltage

Apparatus : npn transistor, 2 batteries, microammeter, miliammeter, rheostat, connecting wires.



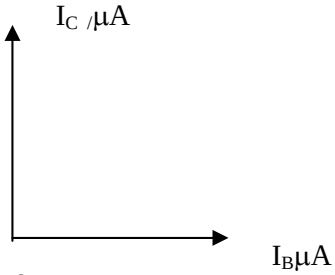
Procedure:

1. The rheostat is adjusted until the readings of microammeter for base current, I_B = 25 μA.
2. The readings of the miliammeter for collector current, I_C is recorded.
3. The steps are repeated 4 times for the values of microammeter, I_B = 50, 75,100,125μA.

Tabulation:

base current, I_B(μA)	collector current, I_C (μA)
25	
50	
75	
100	
125	

Graph:



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SOALAN SPM 2007
(KERTAS 2)

Section B
Bahagian B

[20 *marks*]
[20 *markah*]

Answer any **one** *question from this section.*

Jawab mana-mana **satu** *soalan daripada bahagian ini.*

9 (*a*) Diagram 9.1 shows a cross-section of a wing of a moving aeroplane. The wing of the aeroplane experiences a lift force.

Rajah 9.1 *menunjukkan suatu keratan rentas bagi sayap sebuah kapal terbang yang sedang bergerak. Sayap kapal terbang itu mengalami daya angkat.*

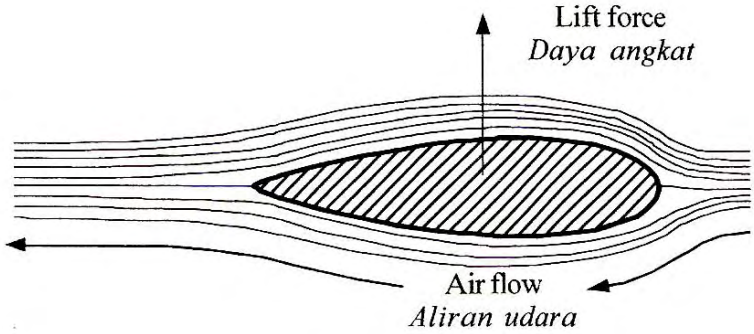

Diagram 9.1
Rajah 9.1

(i) Name the shape of the cross-section in Diagram 9.1 [1 *mark*]
Namakan bentuk keratan rentas dalam Rajah 9.1. [1 *markah*]

(ii) Explain why the lift force acts on the wing of the aeroplane. [3 *marks*]
Terangkan mengapa daya angkat bertindak pada sayap kapal terbang itu. [3 *markah*]

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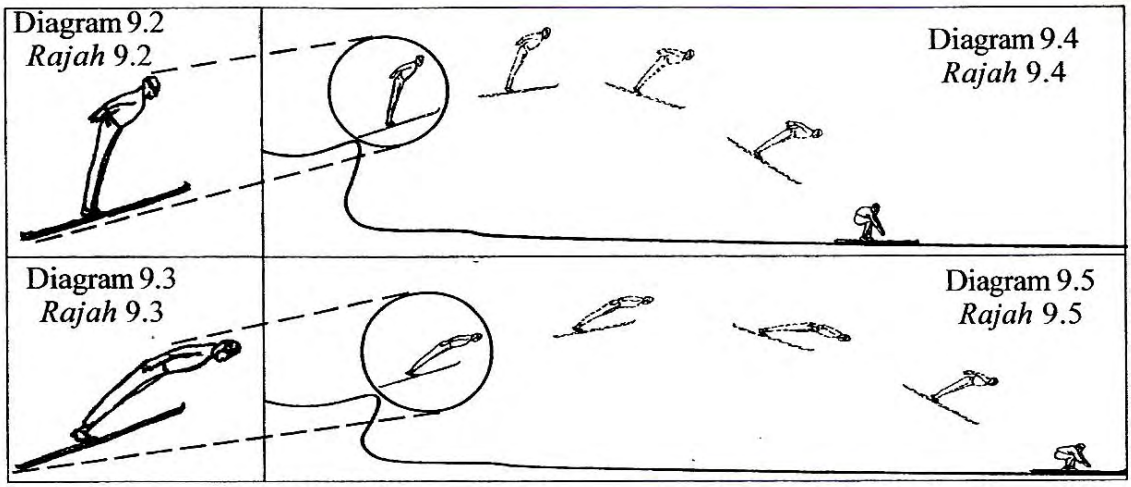
(*b*) Two ski jumpers ski down from a very high platform with the same take off velocity.
Diagram 9.2 and Diagram 9.3 show the posture of the two ski jumpers during take off from the platform.
Diagram 9.4 and Diagram 9.5 show the posture of the two ski jumpers in the air. They land on the ground at the same instant.

Dua orang peluncur ski berlepas dengan halaju yang sama ketika menuruni satu platform yang tinggi.
Rajah 9.2 dan Rajah 9.3 menunjukkan keadaan badan bagi dua orang peluncur ski itu semasa berlepas dari platform.
Rajah 9.4 dan Rajah 9.5 menunjukkan keadaan badan dua peluncur ski itu semasa di udara. Kedua-dua peluncur itu mendarat di permukaan tanah pada ketika yang sama.



(i) Based on Diagram 9.2 and Diagram 9.3, compare the posture of the two ski jumpers. [1 *mark*]

Berdasarkan Rajah 9.2 dan Rajah 9.3, bandingkan keadaan badan kedua-dua peluncur ski itu. [1 *markah*]

(ii) Based on Diagram 9.4 and Diagram 9.5, compare the landing distance of the two ski jumpers. [1 *mark*]

Berdasarkan Rajah 9.4 dan Rajah 9.5, bandingkan jarak mendarat bagi kedua-dua peluncur ski itu. [1 *markah*]

(iii) Based on Diagram 9.4 and Diagram 9.5, relate the lift force to the landing distance. [2 *marks*]

Merujuk kepada Rajah 9.4 dan Rajah 9.5, hubungkaitkan antara daya angkat dan jarak mendarat. [2 *markah*]

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(iv) Name **one** sport which uses the same principle of lift force as the ski jumper. Explain the similarities. [2 *marks*]

Namakan **satu** *sukan yang menggunakan prinsip daya angkat yang sama dengan peluncur ski itu.*
Jelaskan persamaan itu. [2 *markah*]

(*c*) Diagram 9.6 shows a sailboat.

Rajah 9.6 *menunjukkan sebuah perahu layar.*

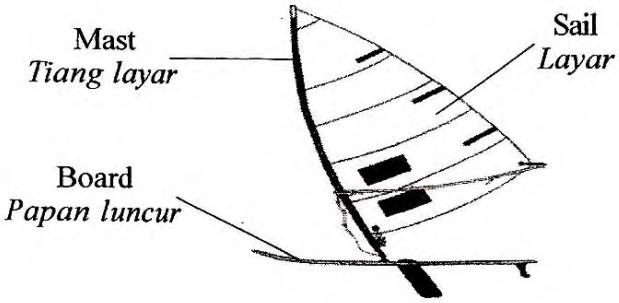

Diagram 9.6
Rajah 9.6

You are required to give some suggestions to design a sailboat which can travel faster.
Using the knowledge on motion, forces and the properties of materials, explain the suggestions based on the following aspects:

Anda dikehendaki memberi beberapa cadangan untuk mereka bentuk sebuah perahu layar yang boleh bergerak dengan lebih laju.

Menggunakan pengetahuan tentang gerakan, daya dan sifat-sifat bahan, terangkan cadangan itu yang merangkumi aspek-aspek berikut:

(i) the surface of the board
permukaan papan luncur

(ii) the shape of the board
bentuk papan luncur

(iii) material used for the board
bahan yang digunakan untuk papan luncur

(iv) material used for the sail
bahan yang digunakan untuk layar

(v) the size of the sail
saiz layar

[10 *marks*]
[10 *markah*]

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10 Diagram 10.1 and Diagram 10.2 show two electrical circuits containing semiconductor diodes.

Rajah 10.1 *dan Rajah* 10.2 *menunjukkan dua litar elektrik yang mengandungi diod semikonduktor.*

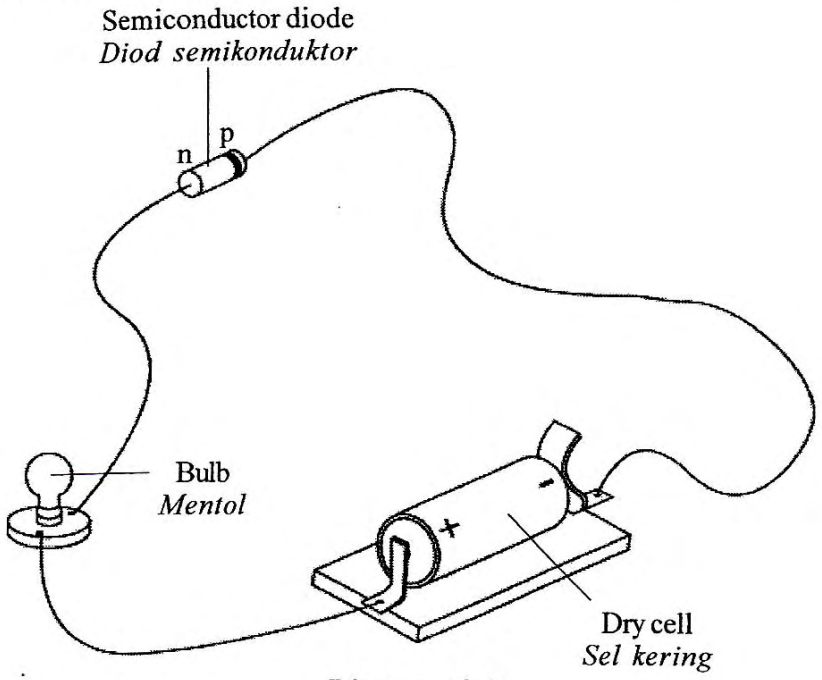

Diagram 10.1
Rajah 10.1

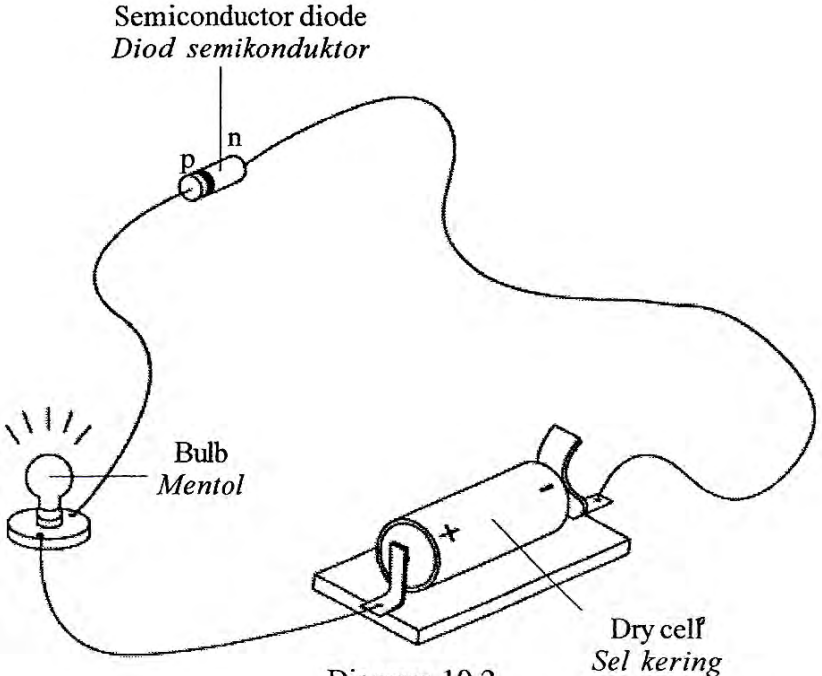

Diagram 10.2
Rajah 10.2

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(*a*) What is meant by a semiconductor? [1 *mark*]

Apakah yang dimaksudkan dengan semikonduktor? [1 *markah*]

(*b*) Using Diagram 10.1 and Diagram 10.2, relate the lighting of the bulbs, the current and the way the diode is connected to the terminals of the battery to deduce a relevant physics concept. [5 *marks*]

Menggunakan Rajah 10.1 *dan Rajah* 10.2, *hubungkaitkan nyalaan mentol, arus dan cara sambungan diod ke terminal bateri untuk menyimpulkan satu konsep fizik yang relevan.* [5 *markah*]

(*c*) Diagram 10.3 shows a full wave rectifier circuit.

Rajah 10.3 *menunjukkan litar rektifikasi gelombang penuh.*

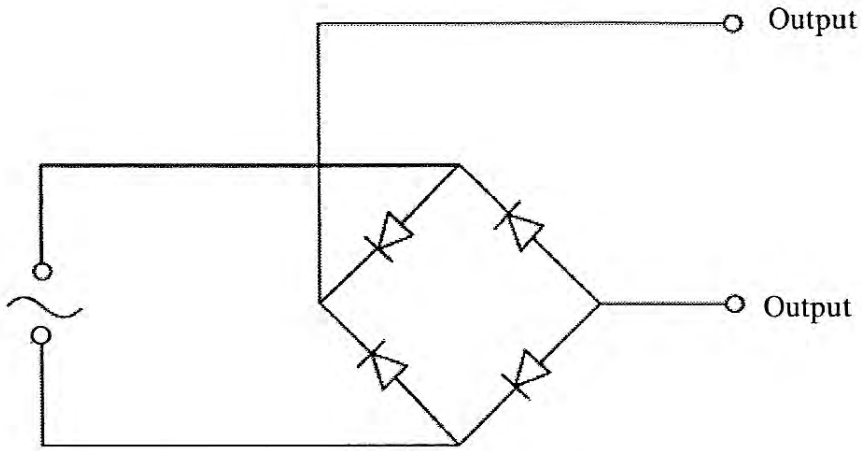

Diagram 10.3
Rajah 10.3

(i) Draw the wave form of a full wave rectification. [1 *mark*]

Lukis bentuk gelombang bagi rektifikasi gelombang penuh. [1 *markah*]

(ii) A capacitor is placed across the output to smooth the current.
Draw the wave form produced.
Explain how a capacitor is used to smooth the current. [3 *marks*]

Sebuah kapasitor diletakkan merentasi output untuk meratakan arus dalam litar itu.
Lukis bentuk gelombang yang dihasilkan.
Jelaskan bagaimana kapasitor digunakan untuk meratakan arus.
[3 *markah*]

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(*d*) Diagram 10.4 shows a circuit with a transistor that acts as an automatic switch.

Rajah 10.4 *menunjukkan litar yang mengandungi transistor yang bertindak sebagai suis automatik.*

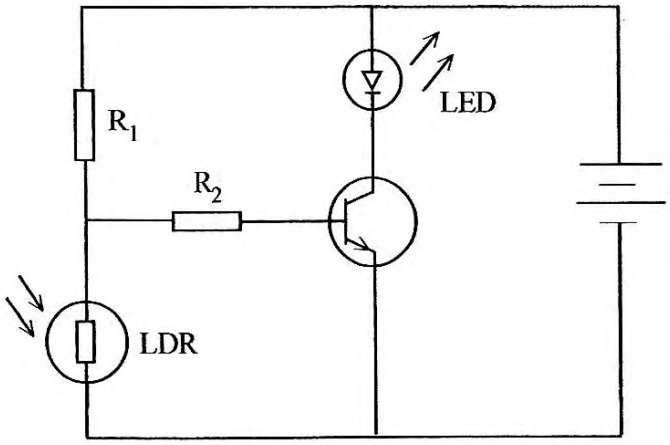

Diagram 10.4
Rajah 10.4

The transistor in the circuit causes the light emitting diode (LED) to light up when it is dark.
A technician wants a fan labelled 240 V, 100 W in a room to be automatically switched on when the room is hot.

Transistor dalam litar menyebabkan diod pemancar cahaya (LED) *menyala apabila keadaan gelap.*
Seorang juruteknik ingin sebuah kipas berlabel 240 V, 100 W *disebuah bilik dihidupkan secara automatik apabila bilik itu panas.*

Suggest modifications that can be made to the circuit in Diagram 10.4 so that the fan can be automatically switched on when the room is hot.
Draw the modified circuit.

Cadangkan pengubahsuaian yang boleh dilakukan pada litar dalam Rajah 10.4 *untuk membolehkan kipas itu dihidupkan secara automatik apabila bilik itu panas.*
Lukis litar yang diubahsuai itu.

State and explain the modifications based on the following aspects:

Nyatakan dan beri penerangan tentang pengubahsuaian itu berdasarkan aspek-aspek berikut:

– the electrical components that are needed to replace the LED and the light dependent resistor (LDR) in the circuit.

komponen-komponen elektrik yang perlu untuk menggantikan LED *dan perintang peka cahaya* (LDR) *dalam litar itu.*

– the positions of the electrical components in the circuit.

kedudukan komponen-komponen elektrik dalam litar itu.

[10 *marks*]
[10 *markah*]

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Section C
Bahagian C

[20 *marks*]
[20 *markah*]

Answer any **one** *question from this section.*

Jawab mana-mana **satu** *soalan daripada bahagian ini.*

11 Diagram 11.1 shows the speed limit and the load limit of heavy vehicles such as buses and lorries.

Rajah 11.1 *menunjukkan had laju dan had muatan bagi kenderaan berat seperti bas dan lori.*

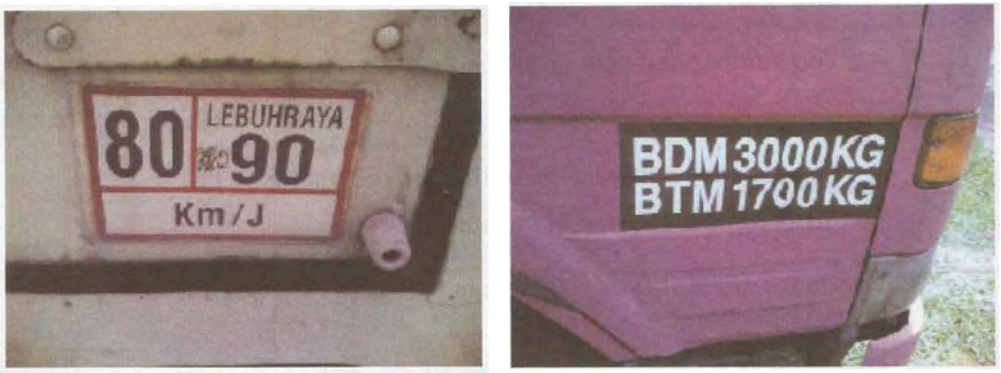

Diagram 11.1
Rajah 11.1

(*a*) What is meant by speed? [1 *mark*]

Apakah yang dimaksudkan dengan laju? [1 *markah*]

(*b*) Using the concepts of momentum and inertia, explain why the speed limit and the load limit must be imposed on heavy vehicles. [4 *marks*]

Dengan menggunakan konsep momentum dan inersia, terangkan mengapa had laju dan had muatan mesti dikenakan ke atas kenderaan berat. [4 *markah*]

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(*c*) Diagram 11.2 shows four tankers, P, Q, R and S, with different specifications. You are required to determine the most suitable tanker to deliver oil safely. Study the specifications of all the four tankers from the following aspects:

Rajah 11.2 *menunjukkan empat lori tangki*, P, Q, R *dan* S, *dengan spesifikasi yang berbeza.*
Anda dikehendaki menentukan lori tangki yang paling sesuai digunakan untuk menghantar minyak dengan selamat.
Kaji spesifikasi keempat-empat lori itu dari aspek berikut:

- The type of brakes
  Jenis brek
- The number of tyres
  Bilangan tayar
- The number and size of the tanks
  Bilangan dan saiz tangki
- The distance between the trailer and the tractor
  Jarak antara treler dan kepala lori

Explain the suitability of the aspects.
Justify your choice.

Terangkan kesesuaian aspek-aspek itu.
Beri sebab bagi pilihan anda.

[10 *marks*]
[10 *markah*]

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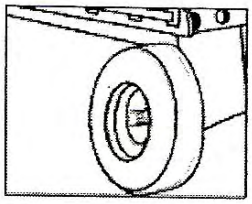
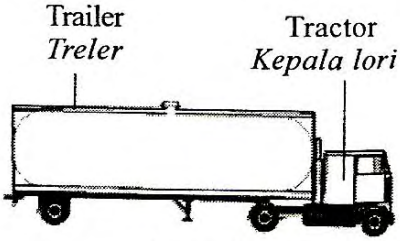
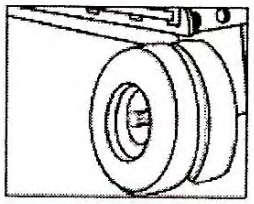
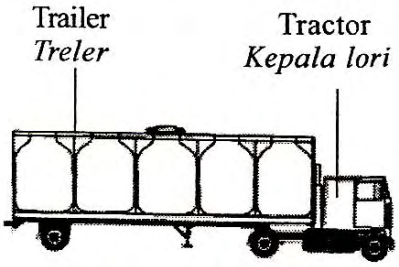
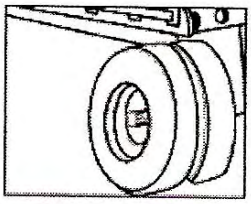
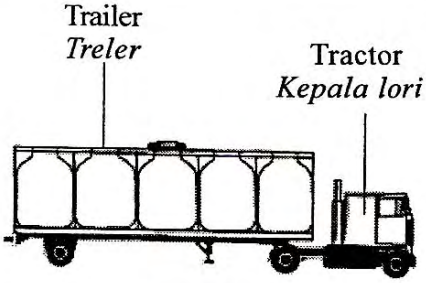
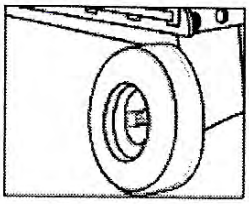
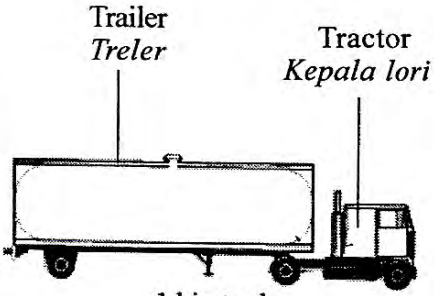
Tanker P *Lori tangki* P Type of brake: Air *Jenis brek* : *Udara*	 1 tyre 1 *tayar*  Trailer *Treler* Tractor *Kepala lori* 1 big tank 1 *tangki besar*
Tanker Q *Lori tangki* Q Type of brake: Air *Jenis brek* : *Udara*	 2 tyres 2 *tayar*  Trailer *Treler* Tractor *Kepala lori* 5 small tanks 5 *tangki kecil*
Tanker R *Lori tangki* R Type of brake: ABS *Jenis brek* : ABS (Antilock Brake System)	 2 tyres 2 *tayar*  Trailer *Treler* Tractor *Kepala lori* 5 small tanks 5 *tangki kecil*
Tanker S *Lori tangki* S Type of brake: ABS *Jenis brek* : ABS (Antilock Brake System)	 1 tyre 1 *tayar*  Trailer *Treler* Tractor *Kepala lori* 1 big tank 1 *tangki besar*

Diagram 11.2
Rajah 11.2

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(*d*) A tanker of mass 1 800 kg accelerates from rest to a velocity of 45 km h^{-1} in 10 s.

Sebuah lori tangki berjisim 1 800 kg *memecut dari pegun sehingga mencapai halaju* 45 km j^{-1} *dalam masa* 10 s.

(i) Calculate the acceleration of the tanker.

Hitung pecutan lori tangki itu.

(ii) Calculate the force acting on the tanker.

Hitung daya yang bertindak ke atas lori tangki itu.

[5 *marks*]
[5 *markah*]

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12 Diagram 12.1 shows an audio frequency generator connected to a speaker and placed near the corner of a wall. Three students, A, B, and C, are standing around the next corner.
The generator and speaker can produce sound with the same speed but different pitch.

Rajah 12.1 *menunjukkan penjana frekuensi audio disambung kepada pembesar suara dan diletakkan berdekatan satu penjuru dinding. Tiga orang murid,* A, B, *dan* C, *berdiri di penjuru yang bersebelahan.*
Penjana dan pembesar suara dapat menghasilkan bunyi pada kelajuan yang sama tetapi dengan kelangsingan yang berbeza.

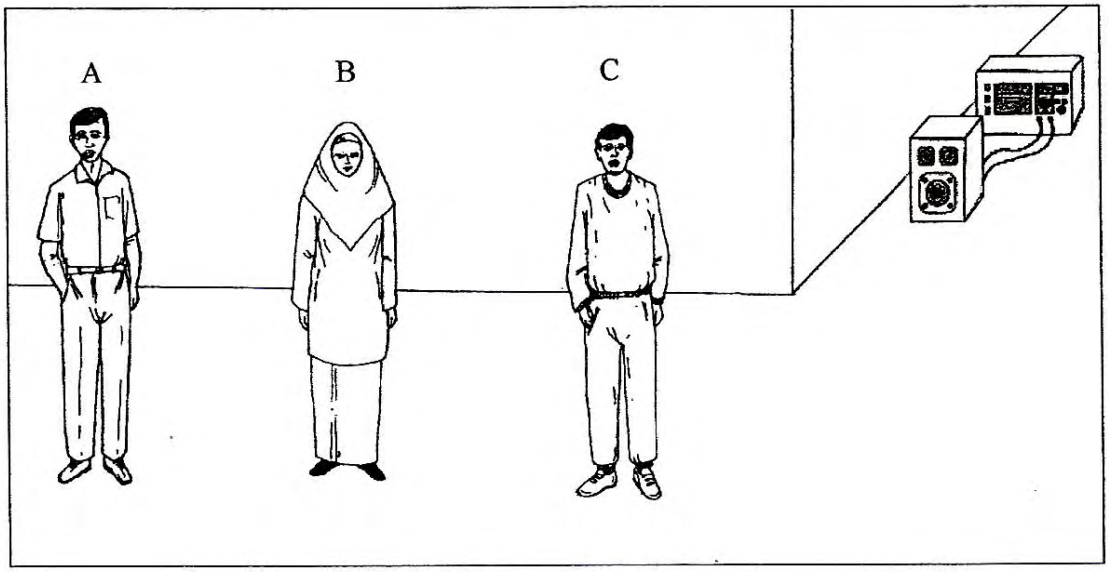

Diagram 12.1
Rajah 12.1

(*a*) State the physical quantity that affects the pitch of the sound. [1 *mark*]
Nyatakan kuantiti fizik yang mempengaruhi kelangsingan bunyi. [1 *markah*]

(*b*) When a high pitch sound is generated, only student C can hear the sound clearly. When a low pitch sound is generated, all the three students can hear the sound clearly.
Explain this situation. [4 *marks*]
Apabila bunyi dengan kelangsingan tinggi dijanakan, hanya murid C *dapat mendengar bunyi itu dengan jelas. Apabila bunyi dengan kelangsingan rendah dijanakan, ketiga-tiga murid itu boleh mendengar dengan jelas.*
Terangkan keadaan ini. [4 *markah*]

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(*c*) Diagram 12.2 shows a radar system at an airport. Signals are transmitted from the radar system to determine the position of an aeroplane.

Rajah 12.2 *menunjukkan sebuah sistem radar di sebuah lapangan terbang. Isyarat dihantar dari sistem radar untuk menentukan kedudukan kapal terbang.*

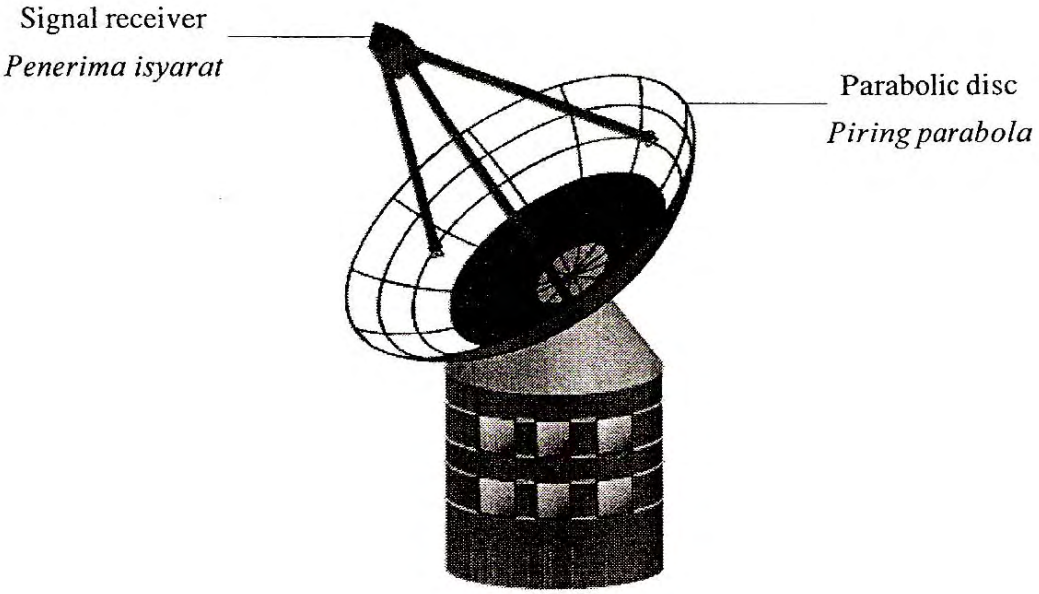

Diagram 12.2
Rajah 12.2

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Table 12.3 shows the specifications of four radar systems, K, L, M and N, that can be used to determine the position of an aeroplane.

Jadual 12.3 *menunjukkan spesifikasi empat sistem radar*, K, L, M *dan* N, *yang boleh digunakan untuk menentukan kedudukan kapal terbang.*

Radar system ***Sistem radar***	**K**	**L**	**M**	**N**
Diameter of the parabolic disc /m ***Diameter piring parabola /m***	10	5	7	12
Distance of the signal receiver from the centre of the parabolic disc ***Jarak penerima isyarat dari pusat piring parabola***	Same as the focal length *Sama dengan panjang fokus*	Less than the focal length *Kurang daripada panjang fokus*	Same as the focal length *Sama dengan panjang fokus*	Less than the focal length *Kurang daripada panjang fokus*
Types of wave transmitted ***Jenis gelombang yang dipancar***	Microwave *Gelombang mikro*	Microwave *Gelombang mikro*	Radiowave *Gelombang radio*	Radiowave *Gelombang radio*
Height of the parabolic disc from the ground ***Ketinggian piring parabola dari bumi***	High *Tinggi*	Low *Rendah*	Low *Rendah*	High *Tinggi*

Table 12.3
Jadual 12.3

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You are required to determine the most suitable radar system. Study the specifications of all the four radar systems based on the following aspects:

Anda diminta untuk mengenal pasti sistem radar yang paling sesuai. Kaji spesifikasi keempat-empat sistem radar itu berdasarkan aspek yang berikut:

- The diameter of the parabolic disc
  Diameter piring parabola
- The distance of the signal receiver from the centre of the parabolic disc
  Jarak penerima isyarat dari pusat piring parabola
- The types of wave transmitted
  Jenis gelombang yang dipancar
- The height of the parabolic disc from the ground
  Ketinggian piring parabola dari bumi

Explain the suitability of the aspects.

Terangkan kesesuaian aspek-aspek tersebut.

[10 *marks*]
[10 *markah*]

(*d*) The depth of a sea is 90 m. A ship transmits an ultrasonic wave of frequency 50 kHz to the seabed and receives an echo 0·12 s later.

Kedalaman suatu laut ialah 90 m. *Sebuah kapal memancar gelombang ultrasonik berfrekuensi* 50 kHz *ke dasar laut dan menerima gema* 0·12 s *kemudian.*

Calculate

Hitung

(i) the speed of the ultrasonic wave in the water,
laju gelombang ultrasonik dalam air,

(ii) the wavelength of the ultrasonic wave in the water.
panjang gelombang bagi gelombang ultrasonik dalam air.

[5 *marks*]
[5 *markah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

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SOALAN SPM 2007
(KERTAS 3)

Section A
Bahagian A

[28 *marks*]
[28 *markah*]

Answer **all** questions in this section.
Jawab **semua** *soalan dalam bahagian ini.*

1 A student carries out an experiment to investigate the relationship between the length of a wire, l, and its resistance, R.

The arrangement of the apparatus is shown in Diagram 1.1. An ammeter, dry cells, a rheostat, a switch and a piece of constantan wire are connected in series.

A voltmeter is used to measure the potential difference, V, across the constantan wire between P and Q.

Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara panjang suatu dawai, l, dengan rintangan, R.

Susunan radas ditunjukkan pada Rajah 1.1. *Sebuah ammeter, sel kering, reostat, suis dan dawai konstantan disambung secara sesiri.*

Sebuah voltmeter digunakan untuk mengukur beza keupayaan, V, merentasi dawai konstantan antara P dan Q.

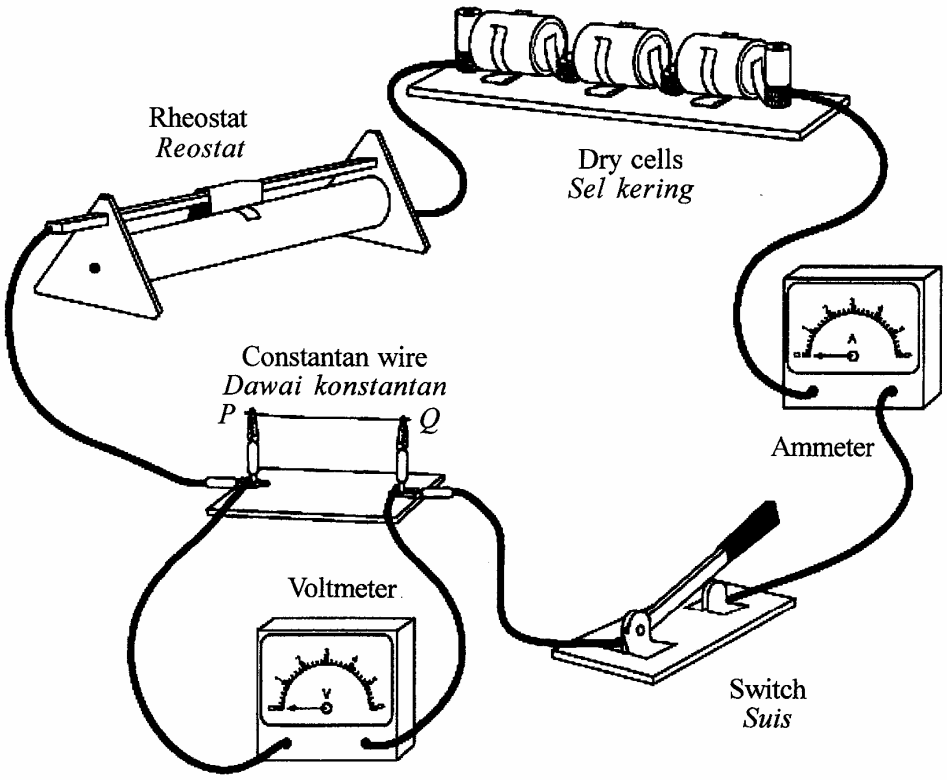

Diagram 1.1
Rajah 1.1

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A constantan wire of length, $l = 20 \cdot 0$ cm is connected between P and Q. When the switch is on, the rheostat is adjusted until the ammeter reading is $0 \cdot 50$ A. The voltmeter reading, V, is as shown in Diagram 1.2 on page 4.

The procedure is repeated with constantan wires of length, $l = 40 \cdot 0$ cm, $60 \cdot 0$ cm, $80 \cdot 0$ cm and $100 \cdot 0$ cm.

The corresponding voltmeter readings across P and Q are shown in Diagrams 1.3, 1.4, 1.5 and 1.6 on page 4.

Dawai konstantan yang mempunyai panjang, $l = 20 \cdot 0$ cm *disambung antara P dan Q. Apabila suis dihidupkan, reostat dilaraskan sehingga bacaan ammeter adalah* $0 \cdot 50$ A. *Bacaan voltmeter, V, adalah seperti yang ditunjukkan pada Rajah* 1.2 *di halaman* 4.

Prosedur diulangi dengan dawai konstantan yang mempunyai panjang, $l = 40 \cdot 0$ cm, $60 \cdot 0$ cm, $80 \cdot 0$ cm *dan* $100 \cdot 0$ cm.

Bacaan voltmeter yang sepadan, yang merentasi P dan Q, ditunjukkan pada Rajah 1.3, 1.4, 1.5 *dan* 1.6 *di halaman* 4.

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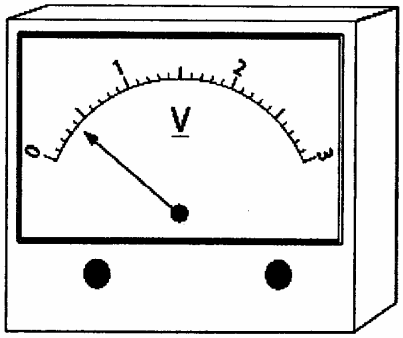
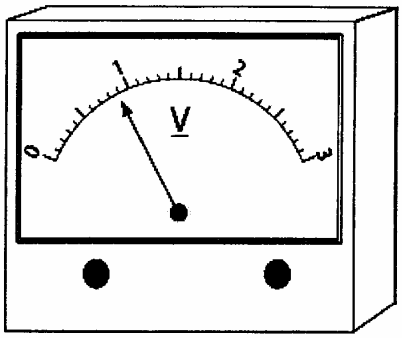


V = ...

Length of wire, l = 20·0 cm
Panjang dawai, l = 20·0 cm

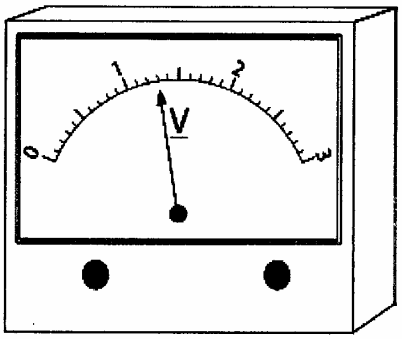
Diagram 1.2
Rajah 1.2



V = ...

Length of wire, l = 40·0 cm
Panjang dawai, l = 40·0 cm

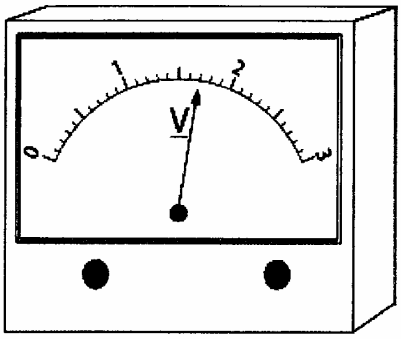
Diagram 1.3
Rajah 1.3



V = ...

Length of wire, l = 60·0 cm
Panjang dawai, l = 60·0 cm

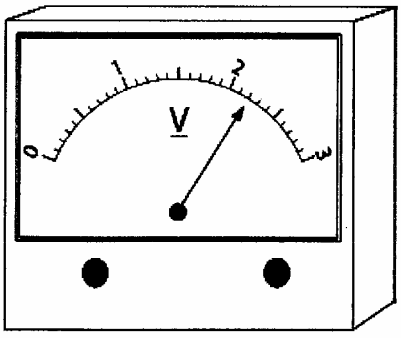
Diagram 1.4
Rajah 1.4



V = ...

Length of wire, l = 80·0 cm
Panjang dawai, l = 80·0 cm

Diagram 1.5
Rajah 1.5



V = ...

Length of wire, l = 100·0 cm
Panjang dawai, l = 100·0 cm

Diagram 1.6
Rajah 1.6

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(*a*) For the experiment described on pages 2 and 3, identify:
Bagi eksperimen yang diterangkan di halaman 2 *dan* 3, *kenal pasti*:

(i) The manipulated variable
Pembolehubah dimanipulasikan

.....

[1 *mark*]
[1 *markah*]

(ii) The responding variable
Pembolehubah bergerak balas

.....

[1 *mark*]
[1 *markah*]

(iii) The constant variable
Pembolehubah dimalarkan

.....

[1 *mark*]
[1 *markah*]

(*b*) Based on Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6 on page 4:
Berdasarkan Rajah 1.2, 1.3, 1.4, 1.5 *dan* 1.6 *di halaman* 4:

(i) Record the voltmeter readings, V, in the spaces provided on page 4.
Catatkan bacaan voltmeter, V, *dalam ruang yang disediakan di halaman* 4.

[2 *marks*]
[2 *markah*]

(ii) Calculate the values of R for each length of wire using the formula $R = \frac{V}{0{\cdot}5}$.

Hitung nilai-nilai R *bagi setiap panjang dawai menggunakan formula* $R = \frac{V}{0{\cdot}5}$.

[2 *marks*]
[2 *markah*]

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(iii) Tabulate your results for V and R for all values of l, in the space below.

Jadualkan keputusan anda bagi V dan R untuk semua nilai l, pada ruang di bawah.

[3 *marks*]
[3 *markah*]

(*c*) On the graph paper on page 7, plot a graph of R against l.

Pada kertas graf di halaman 7, *lukis graf R melawan l.*

[5 *marks*]
[5 *markah*]

(*d*) Based on your graph in **1**(*c*), state the relationship between R and l.

Berdasarkan graf anda di **1**(*c*), *nyatakan hubungan antara R dengan l.*

.....

[1 *mark*]
[1 *markah*]

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2 A student carries out an experiment to investigate the relationship between the mass, *m*, of a load placed on a spring and the length, *l*, of the spring. The student also determines the spring constant, k.

Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara jisim, m, bagi suatu beban yang diletakkan pada spring dengan panjang, l, bagi spring itu. Murid itu juga menentukan pemalar spring, k.

The results of this experiment is shown in the graph of *l* against *m* in Diagram 2.1 on page 9.

Keputusan eksperimen ini ditunjukkan oleh graf l melawan m pada Rajah 2.1 *di halaman* 9.

(*a*) Based on the graph in Diagram 2.1,

Berdasarkan graf pada Rajah 2.1,

(i) what happens to *l* as *m* increases?

apakah yang berlaku pada l apabila m bertambah?

.....

[1 *mark*]
[1 *markah*]

(ii) determine the value of *l* when *m* = 0 g.
Show on the graph, how you determine the value of *l*.

tentukan nilai l apabila m = 0 g.
Tunjukkan pada graf itu bagaimana anda menentukan nilai l.

l = ...

[2 *marks*]
[2 *markah*]

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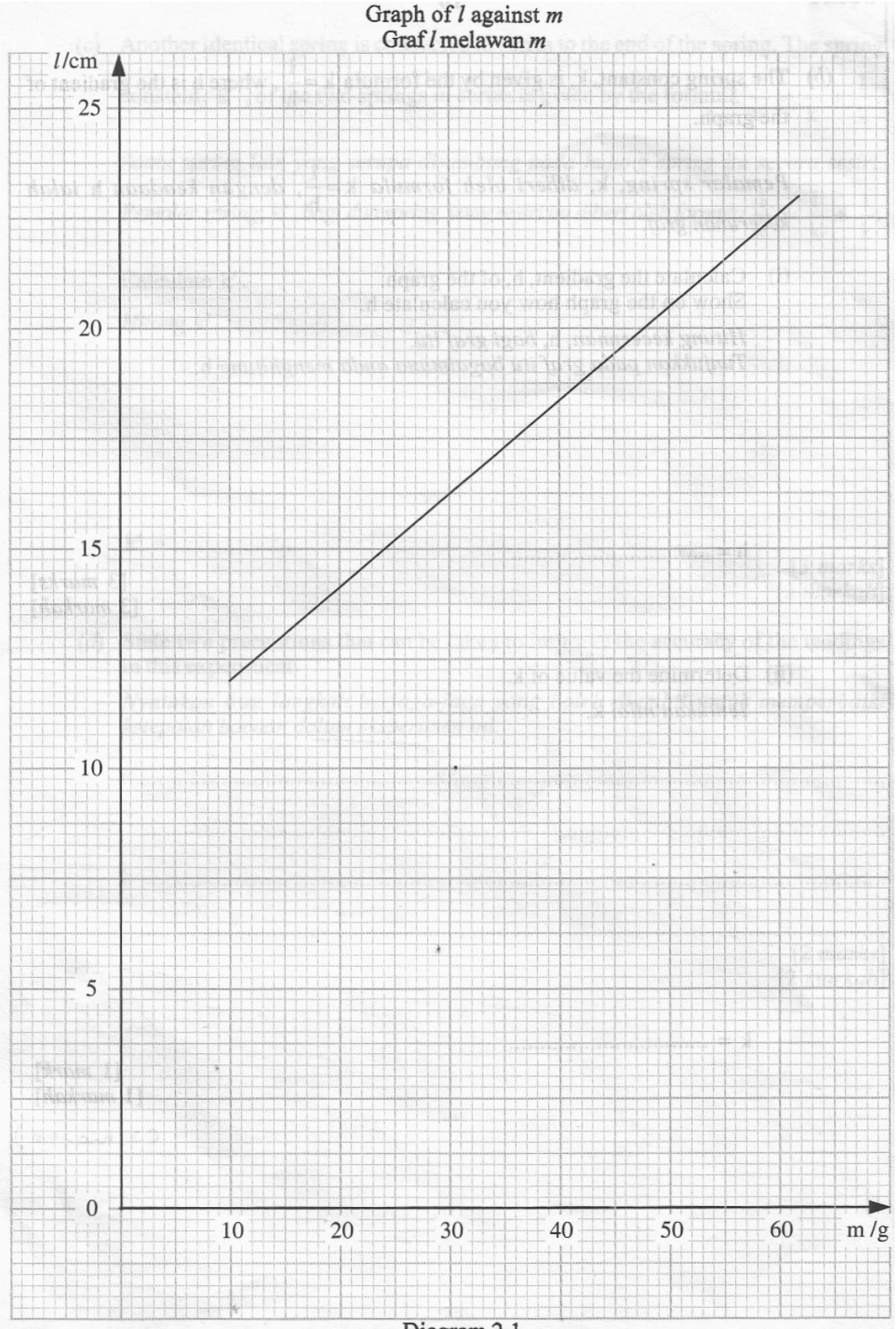

Diagram 2.1
Rajah 2.1

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(*b*) The spring constant, k, is given by the formula $k = \frac{1}{h}$, where h is the gradient of the graph.

Pemalar spring, k, *diberi oleh formula* $k = \frac{1}{h}$, *dengan keadaan* h *ialah kecerunan graf.*

(i) Calculate the gradient, h, of the graph.
Show on the graph how you calculate h.

Hitung kecerunan, h, *bagi graf itu.*
Tunjukkan pada graf itu bagaimana anda menghitung h.

h = ...

[3 *marks*]
[3 *markah*]

(ii) Determine the value of k.

Tentukan nilai k.

k = ...

[1 *mark*]
[1 *markah*]

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(*c*) Another identical spring is connected in series to the end of the spring. The spring constant, k', of the two springs in series is given by the formula $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Suatu spring lain yang serupa disambung pada hujung spring itu secara sesiri. Pemalar spring, k', *bagi dua spring yang sesiri ini diberi oleh formula* $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Calculate k'.

Hitung k'.

k' = ...

[3 *marks*]
[3 *markah*]

(*d*) State **two** precautions that can be taken to improve the accuracy of the readings in this experiment.

Nyatakan **dua** *langkah berjaga-jaga yang boleh diambil untuk memperbaiki ketepatan bacaan dalam eksperimen ini.*

1 .....

.....

2 .....

.....

[2 *marks*]
[2 *markah*]

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Section B
Bahagian B

[12 *marks*]
[12 *markah*]

Answer any **one** question from this section.
Jawab mana-mana **satu** *soalan daripada bahagian ini.*

3 Diagram 3 shows two opaque cups, A and B, containing different amount of water. A similar coin is placed at the bottom of each cup.

When the coin is observed from the same position, the image of the coin in cup A cannot be seen, but the image of the coin in cup B can be seen.

Rajah 3 *menunjukkan dua cawan legap,* A *dan* B, *yang berisi air yang berlainan kuantiti. Sekeping syiling yang serupa diletakkan di dasar setiap cawan itu.*

Apabila syiling itu diperhati daripada kedudukan yang sama, imej syiling dalam cawan A *tidak boleh dilihat tetapi imej syiling dalam cawan* B *boleh dilihat.*

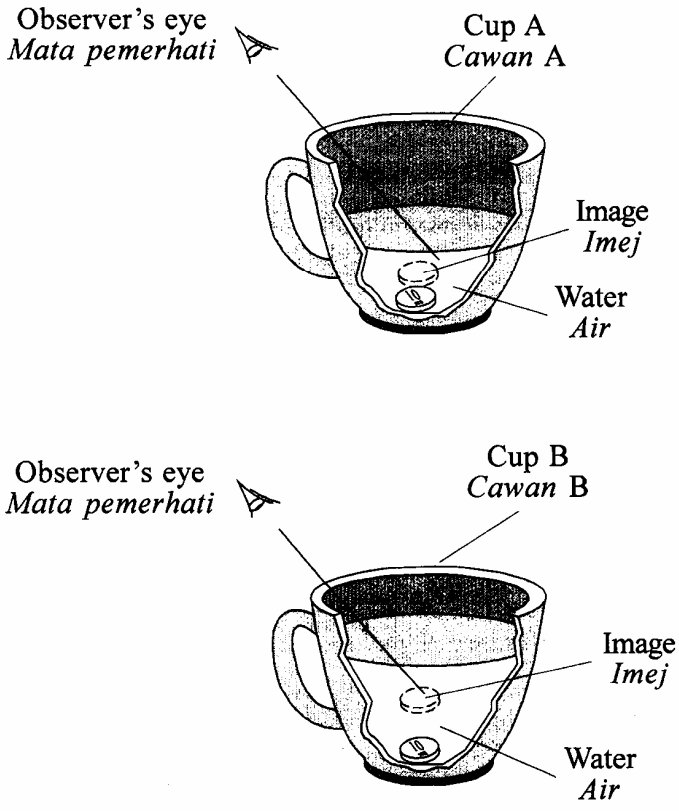

Diagram 3
Rajah 3

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Based on your observations on the depth of the water and the position of the images of the coins:

Berdasarkan pemerhatian anda tentang kedalaman air dan kedudukan imej syiling-syiling tersebut:

(*a*) State **one** suitable inference. [1 *mark*]

Nyatakan **satu** *inferens yang sesuai.* [1 *markah*]

(*b*) State **one** hypothesis that could be investigated. [1 *mark*]

Nyatakan **satu** *hipotesis yang boleh disiasat.* [1 *markah*]

(*c*) With the use of apparatus such as a tall beaker, pins and other apparatus, describe an experiment to investigate the hypothesis stated in **3**(*b*).

Dengan menggunakan radas seperti sebuah bikar yang tinggi, pin-pin dan radas lain, terangkan satu eksperimen untuk menyiasat hipotesis yang dinyatakan di **3**(*b*).

In your description, state clearly the following:

Dalam penerangan anda, jelaskan perkara berikut:

(i) The aim of the experiment.

Tujuan eksperimen.

(ii) The variables in the experiment.

Pembolehubah dalam eksperimen.

(iii) The list of apparatus and materials.

Senarai radas dan bahan.

(iv) The arrangement of the apparatus.

Susunan radas.

(v) The procedure used in the experiment.

Describe how to control and measure the manipulated variables and how to measure the responding variables.

Prosedur yang digunakan dalam eksperimen.

Terangkan bagaimana mengawal dan mengukur pembolehubah dimanipulasikan dan bagaimana mengukur pembolehubah bergerak balas.

(vi) The way to tabulate the data.

Cara untuk menjadualkan data.

(vii) The way to analyse the data.

Cara untuk menganalisis data.

[10 *marks*]
[10 *markah*]

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4 Diagram 4.1 shows Jason taking a shower on a very cold morning. After the water heater is switched on for a while, he still feels cold.

Diagram 4.2 shows that Jason no longer feels cold after the temperature control knob on the heater is turned.

Rajah 4.1 *menunjukkan Jason sedang mandi pada suatu pagi yang sangat sejuk. Selepas pemanas air dihidupkan beberapa ketika, dia masih terasa sejuk.*

Rajah 4.2 *menunjukkan Jason tidak lagi terasa sejuk selepas tombol kawalan suhu pada pemanas diputarkan.*

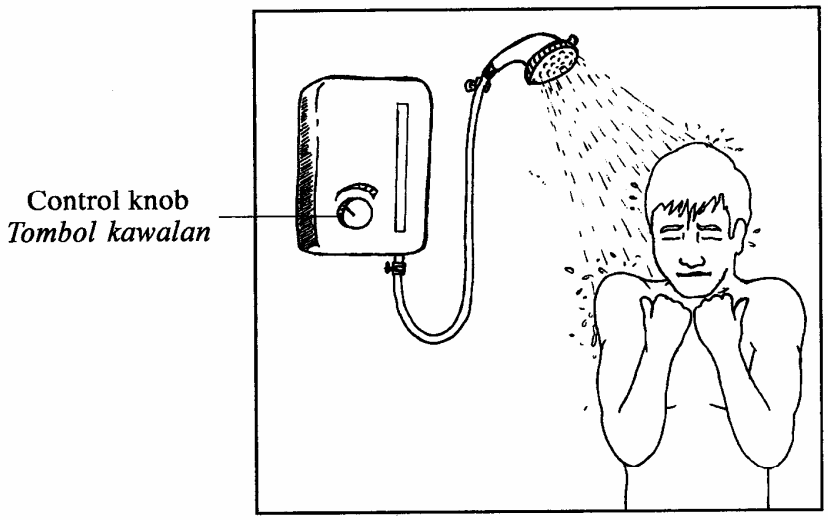

Diagram 4.1
Rajah 4.1

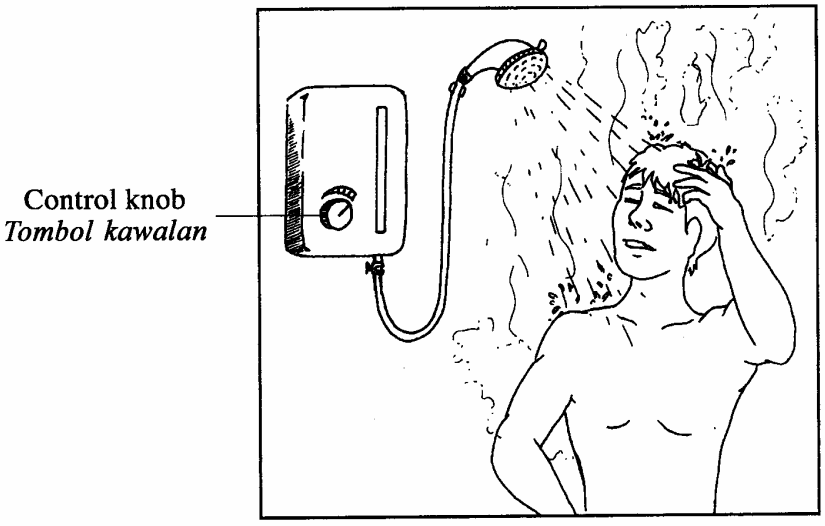

Diagram 4.2
Rajah 4.2

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Based on the observation on Diagram 4.1 and Diagram 4.2 and using your knowledge of the effect of current on heating:

Berdasarkan pemerhatian anda pada Rajah 4.1 *dan Rajah* 4.2 *dan menggunakan pengetahuan anda tentang kesan arus terhadap pemanasan*:

(*a*) State **one** suitable inference. [1 *mark*]

Nyatakan **satu** *inferens yang sesuai.* [1 *markah*]

(*b*) State **one** hypothesis that could be investigated. [1 *mark*]

Nyatakan **satu** *hipotesis yang boleh disiasat.* [1 *markah*]

(*c*) With the use of apparatus such as a beaker, an ammeter, an immersion heater and other apparatus, describe an experiment to investigate the hypothesis stated in **4**(*b*).

Dengan menggunakan radas seperti bikar, ammeter, pemanas rendam dan radas lain, terangkan satu eksperimen untuk menyiasat hipotesis yang dinyatakan di **4**(*b*).

In your description, state clearly the following:

Dalam penerangan anda, jelaskan perkara berikut:

(i) The aim of the experiment.

Tujuan eksperimen.

(ii) The variables in the experiment.

Pembolehubah dalam eksperimen.

(iii) The list of apparatus and materials.

Senarai radas dan bahan.

(iv) The arrangement of the apparatus.

Susunan radas.

(v) The procedure used in the experiment.

Describe how to control and measure the manipulated variables and how to measure the responding variables.

Prosedur yang digunakan dalam eksperimen.

Terangkan bagaimana mengawal dan mengukur pembolehubah dimanipulasikan dan bagaimana mengukur pembolehubah bergerak balas.

(vi) The way to tabulate the data.

Cara untuk menjadualkan data.

(vii) The way to analyse the data.

Cara untuk menganalisis data.

[10 *marks*]
[10 *markah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

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Question 1 (candidate 1)

(*a*) For the experiment described on pages 2 and 3, identify:
Bagi eksperimen yang diterangkan di halaman 2 *dan* 3, *kenal pasti*:

(i) The manipulated variable
Pembolehubah dimanipulasikan

l ✓
.....

[1 *mark*]
[1 *markah*]

(ii) The responding variable
Pembolehubah bergerak balas

V ✓
.....

[1 *mark*]
[1 *markah*]

(iii) The constant variable
Pembolehubah dimalarkan

Diameter of wire ✓
.....

[1 *mark*]
[1 *markah*]

(*b*) Based on Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6 on page 4:
Berdasarkan Rajah 1.2, 1.3, 1.4, 1.5 *dan* 1.6 *di halaman* 4:

(i) Record the voltmeter readings, V, in the spaces provided on page 4.
Catatkan bacaan voltmeter, V, *dalam ruang yang disediakan di halaman* 4.

[2 *marks*]
[2 *markah*]

(ii) Calculate the values of R for each length of wire using the formula $R = \frac{V}{0{\cdot}5}$.

Hitung nilai-nilai R *bagi setiap panjang dawai menggunakan formula* $R = \frac{V}{0{\cdot}5}$.

[2 *marks*]
[2 *markah*]

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(iii) Tabulate your results for V and R for all values of l, in the space below.

Jadualkan keputusan anda bagi V dan R untuk semua nilai l, pada ruang di bawah.

l / cm	V / V	R / Ω
20	0.4	0.8
40	0.9	1.8
60	1.3	2.6
80	1.7	3.4
100	2.2	4.4

✓1 ✓2 ✓3 ✓4 ✓5 ✓6 ✓7

[3 *marks*]
[3 *markah*]

(*c*) On the graph paper on page 7, plot a graph of R against l.

Pada kertas graf di halaman 7, lukis graf R melawan l.

[5 *marks*]
[5 *markah*]

(*d*) Based on your graph in 1(*c*), state the relationship between R and l.

Berdasarkan graf anda di 1(*c*), *nyatakan hubungan antara R dengan l.*

Directly proportional ✗

[1 *mark*]
[1 *markah*]

14

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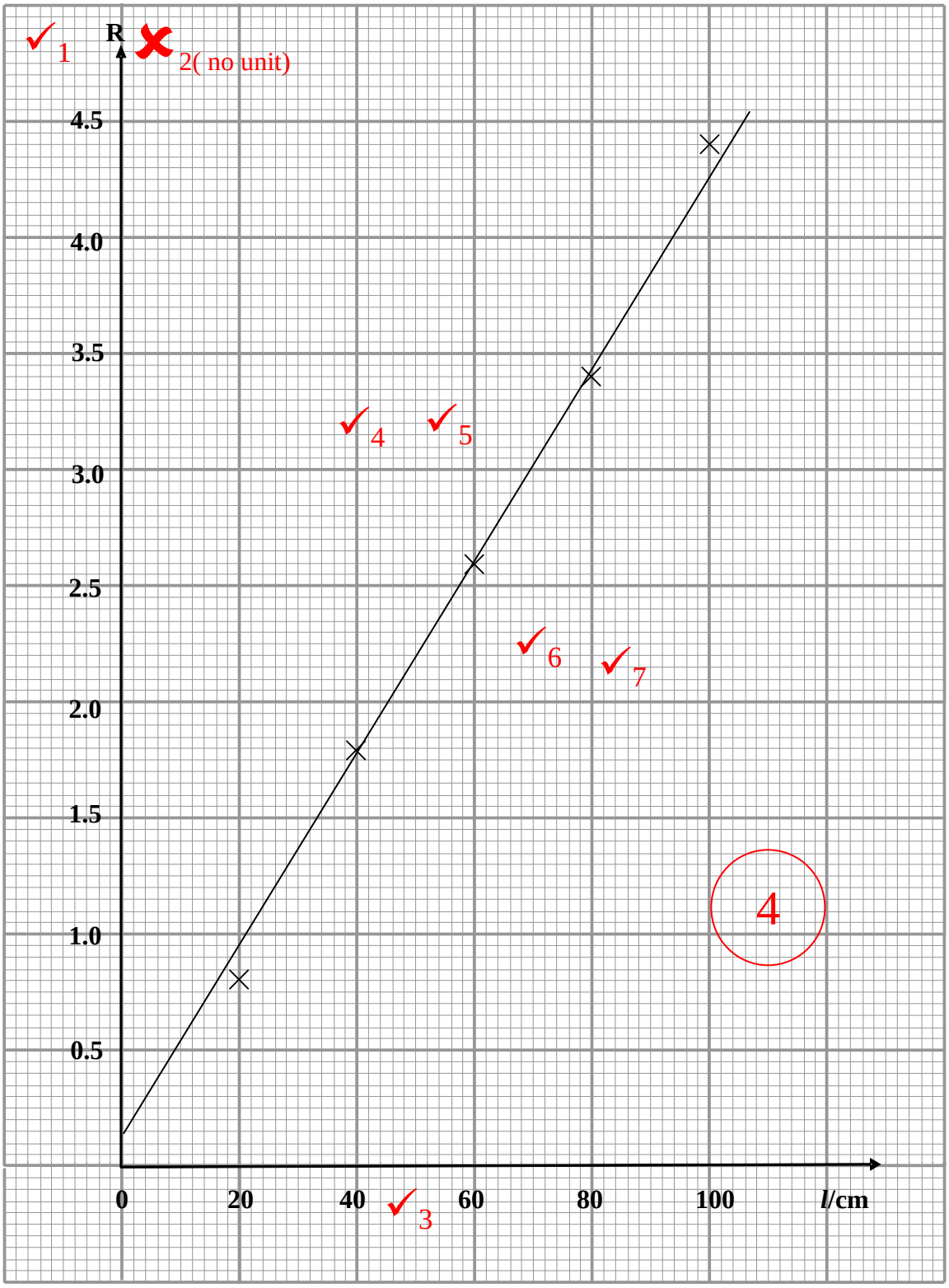
R
1
2(no unit)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
4
5
6
7
0
20
40
3
60
80
100
l/cm
4

Que

(*a*) For the experiment described on pages 2 and 3, identify:
Bagi eksperimen yang diterangkan di halaman 2 *dan* 3, *kenal pasti*:

(i) The manipulated variable
Pembolehubah dimanipulasikan
length ✓
.....
[1 *mark*]
[1 *markah*]

(ii) The responding variable
Pembolehubah bergerak balas
voltmeter ✗
.....
[1 *mark*]
[1 *markah*]

(iii) The constant variable
Pembolehubah dimalarkan
ammeter ✗
.....
[1 *mark*]
[1 *markah*]

(*b*) Based on Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6 on page 4:
Berdasarkan Rajah 1.2, 1.3, 1.4, 1.5 *dan* 1.6 *di halaman* 4:

(i) Record the voltmeter readings, V, in the spaces provided on page 4.
Catatkan bacaan voltmeter, V, *dalam ruang yang disediakan di halaman* 4.
[2 *marks*]
[2 *markah*]

(ii) Calculate the values of R for each length of wire using the formula $R = \frac{V}{0{\cdot}5}$.

Hitung nilai-nilai R *bagi setiap panjang dawai menggunakan formula* $R = \frac{V}{0{\cdot}5}$.

[2 *marks*]
[2 *markah*]

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(iii) Tabulate your results for V and R for all values of l, in the space below.

Jadualkan keputusan anda bagi V dan R untuk semua nilai l, pada ruang di bawah.

// cm	V/V	R
20	0.4	0.8
40	0.9	1.8
60	1.3	2.6
80	1.7	3.4
100	2.2	4.4

✓1 ✗ 2(no unit)
✓3
✓4 ✓5 ✓6 ✓7

[3 *marks*]
[3 *markah*]

(*c*) On the graph paper on page 7, plot a graph of R against l.

Pada kertas graf di halaman 7, lukis graf R melawan l.

[5 *marks*]
[5 *markah*]

(*d*) Based on your graph in 1(*c*), state the relationship between R and l.

Berdasarkan graf anda di 1(*c*), *nyatakan hubungan antara R dengan l.*

Directly proportional ✓

.....

[1 *mark*]
[1 *markah*]

12

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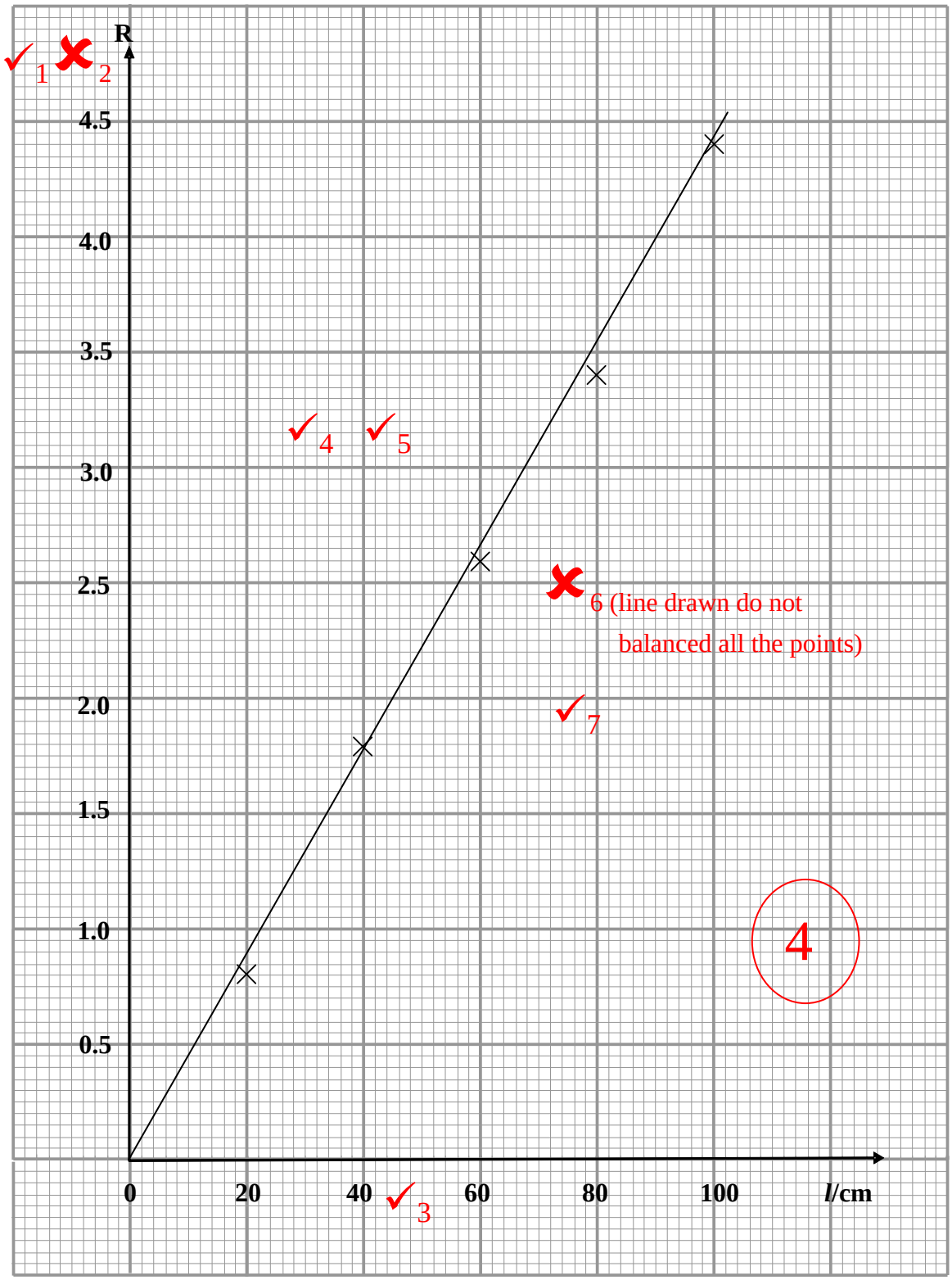
R
1
2
4.5
4.0
3.5
4
5
3.0
2.5
6 (line drawn do not balanced all the points)
2.0
7
1.5
1.0
4
0.5
0
20
40
3
60
80
100
l/cm

Qu

2 A student carries out an experiment to investigate the relationship between the mass, *m*, of a load placed on a spring and the length, *l*, of the spring. The student also determines the spring constant, k.

Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara jisim, m, bagi suatu beban yang diletakkan pada spring dengan panjang, l, bagi spring itu. Murid itu juga menentukan pemalar spring, k.

The results of this experiment is shown in the graph of *l* against *m* in Diagram 2.1 on page 9.

Keputusan eksperimen ini ditunjukkan oleh graf l melawan m pada Rajah 2.1 *di halaman* 9.

(*a*) Based on the graph in Diagram 2.1,

Berdasarkan graf pada Rajah 2.1,

(i) what happens to *l* as *m* increases?

apakah yang berlaku pada l apabila m bertambah?

It will also increase ✓

.....

[1 *mark*]
[1 *markah*]

(ii) determine the value of *l* when *m* = 0 g.
Show on the graph, how you determine the value of *l*.

tentukan nilai l apabila m = 0 g.
Tunjukkan pada graf itu bagaimana anda menentukan nilai l.

2

l = 9.75 ✓ ..... ✓

1 2 (accepted last year)

[2 *marks*]
[2 *markah*]

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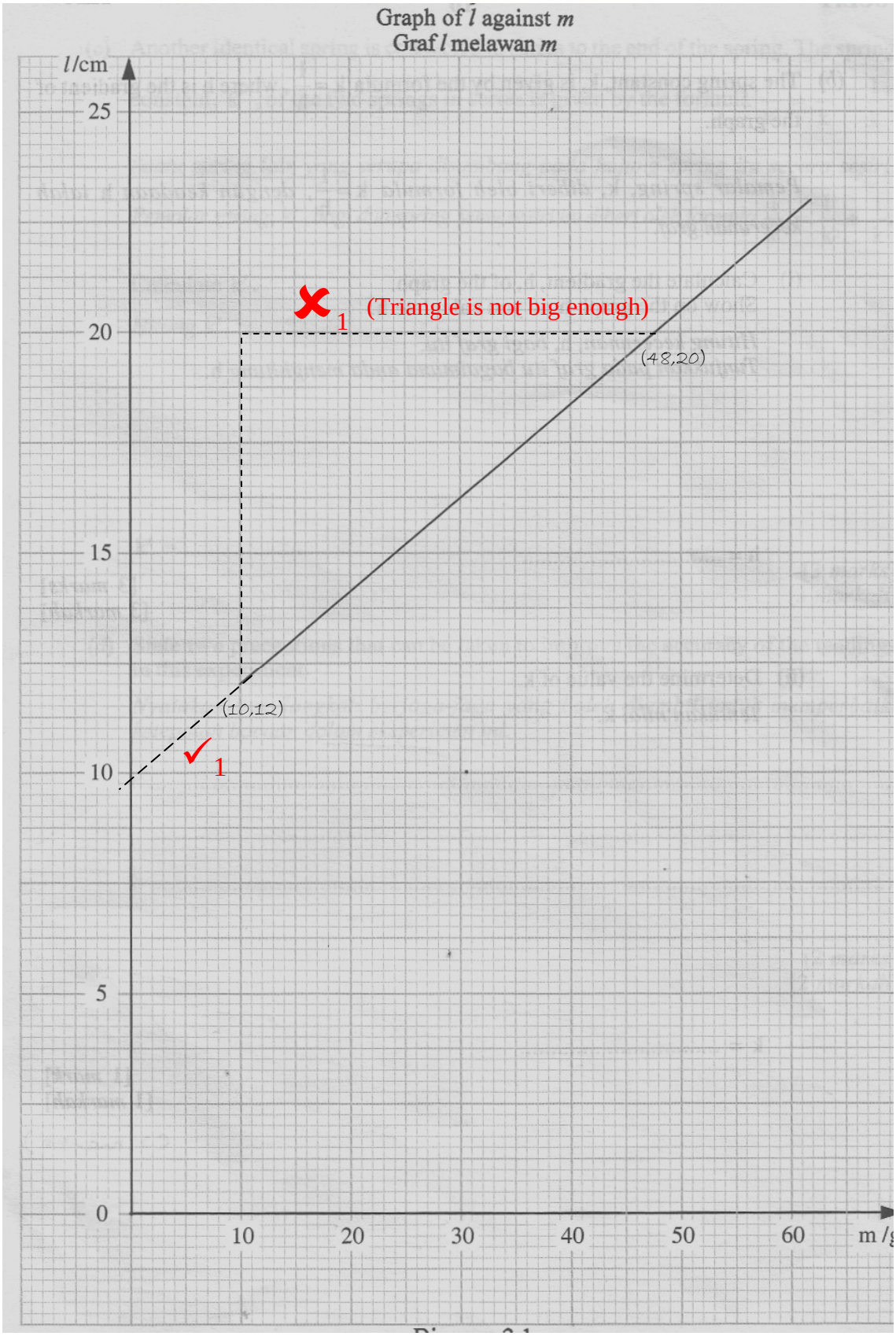
Graph of l against m
Graf l melawan m
l/cm
25
20
15
10
5
0
10
20
30
40
50
60
m /g
(Triangle is not big enough)
1
(48,20)
(10,12)
1

(*b*) The spring constant, k, is given by the formula $k = \frac{1}{h}$, where h is the gradient of the graph.

Pemalar spring, k, *diberi oleh formula* $k = \frac{1}{h}$, *dengan keadaan* h *ialah kecerunan graf.*

(i) Calculate the gradient, h, of the graph.
Show on the graph how you calculate h.
Hitung kecerunan, h, *bagi graf itu.*
Tunjukkan pada graf itu bagaimana anda menghitung h.

1

$\frac{20 - 12}{48 - 10}$ ✓2 ✗1 (because of smaller triangle)

$= 0.2105$ ✗3 unit

h = ...

[3 *marks*]
[3 *markah*]

(ii) Determine the value of k.
Tentukan nilai k.

2

$\frac{1}{0.2105}$ ✓1

$= 4.75$ ✓2

k = ...

[1 *mark*]
[1 *markah*]

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(c) Another identical spring is connected in series to the end of the spring. The spring constant, k′ , of the two springs in series is given by the formula $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Suatu spring lain yang serupa disambung pada hujung spring itu secara sesiri. Pemalar spring, k′ *, bagi dua spring yang sesiri ini diberi oleh formula* $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Calculate k′ .

Hitung k′ .

$\frac{1}{k'} = \frac{1}{4.75} + \frac{1}{4.75}$ ✓1

$= \frac{2}{4.75}$

k′ = $\frac{4.75}{2}$ ✗ 2 (no unit)

[3 *marks*]
[3 *markah*]

(d) State **two** precautions that can be taken to improve the accuracy of the readings in this experiment.

Nyatakan **dua** *langkah berjaga-jaga yang boleh diambil untuk memperbaiki ketepatan bacaan dalam eksperimen ini.*

1 The eye must be parallel with the ruler ✗

2 Repeat the experiment and calculate the mean ✓

[2 *marks*]
[2 *markah*]

8

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2 A student carries out an experiment to investigate the relationship between the mass, *m*, of a load placed on a spring and the length, *l*, of the spring. The student also determines the spring constant, k.

Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara jisim, m, bagi suatu beban yang diletakkan pada spring dengan panjang, l, bagi spring itu. Murid itu juga menentukan pemalar spring, k.

The results of this experiment is shown in the graph of *l* against *m* in Diagram 2.1 on page 9.

Keputusan eksperimen ini ditunjukkan oleh graf l melawan m pada Rajah 2.1 *di halaman* 9.

(*a*) Based on the graph in Diagram 2.1,

Berdasarkan graf pada Rajah 2.1,

(i) what happens to *l* as *m* increases?

apakah yang berlaku pada l apabila m bertambah?

increase ✓

.....

[1 *mark*]
[1 *markah*]

(ii) determine the value of *l* when *m* = 0 g.
Show on the graph, how you determine the value of *l*.

tentukan nilai l apabila m = 0 g.
Tunjukkan pada graf itu bagaimana anda menentukan nilai l.

l = 0 ✗1 ✗2

[2 *marks*]
[2 *markah*]

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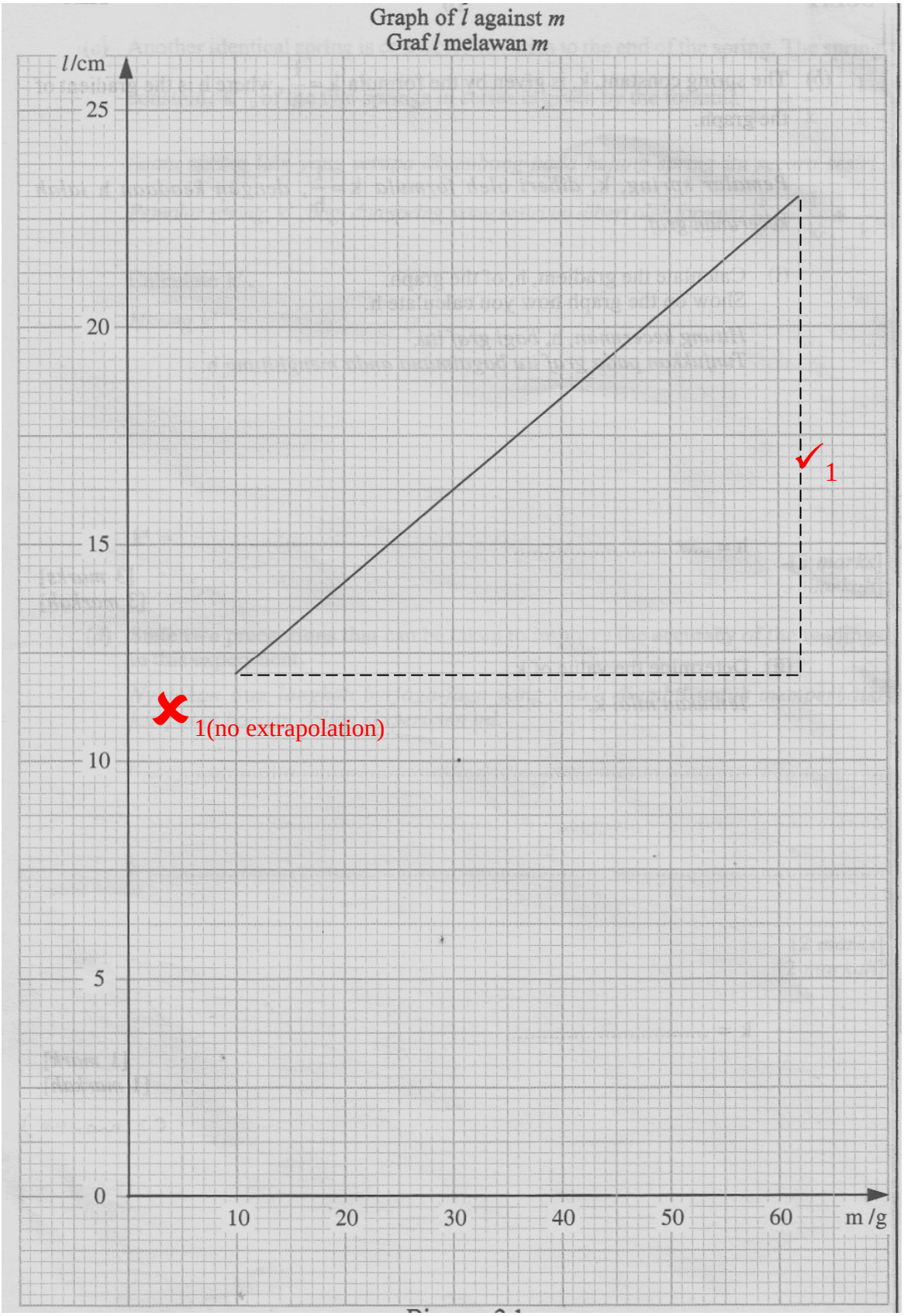
Graph of l against m
Graf l melawan m
l/cm
25
20
15
10
5
0
10
20
30
40
50
60
m /g
1
1(no extrapolation)

(*b*) The spring constant, k, is given by the formula $k = \frac{1}{h}$, where h is the gradient of the graph.

Pemalar spring, k, *diberi oleh formula* $k = \frac{1}{h}$, *dengan keadaan* h *ialah kecerunan graf.*

(i) Calculate the gradient, h, of the graph.
Show on the graph how you calculate h.
Hitung kecerunan, h, *bagi graf itu.*
Tunjukkan pada graf itu bagaimana anda menghitung h.

$m = \frac{11}{52}$ ✗1

$= 0.2115$ ✗2 (no unit)

h = ...

[3 *marks*]
[3 *markah*]

(ii) Determine the value of k.
Tentukan nilai k.

$= \frac{1}{h}$

$= \frac{1}{0.2115}$ ✓1

$= 4.728$ ✓2

k = ...

[1 *mark*]
[1 *markah*]

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(*c*) Another identical spring is connected in series to the end of the spring. The spring constant, k′ , of the two springs in series is given by the formula $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Suatu spring lain yang serupa disambung pada hujung spring itu secara sesiri. Pemalar spring, k′ , *bagi dua spring yang sesiri ini diberi oleh formula* $\frac{1}{k'} = \frac{1}{k} + \frac{1}{k}$.

Calculate k′ .

Hitung k′ .

$\frac{1}{k'} = \frac{1}{4.728} + \frac{1}{4.728}$ ✓1

$= 0.4230$ ✗2 (no unit)

k′ = ...

[3 *marks*]
[3 *markah*]

(*d*) State **two** precautions that can be taken to improve the accuracy of the readings in this experiment.

Nyatakan **dua** *langkah berjaga-jaga yang boleh diambil untuk memperbaiki ketepatan bacaan dalam eksperimen ini.*

1 Avoid parallax error ✗

2 Make sure the spring is not exceeded its elastic limit ✓

[2 *marks*]
[2 *markah*]

5

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Question 3 (Candidate 1)

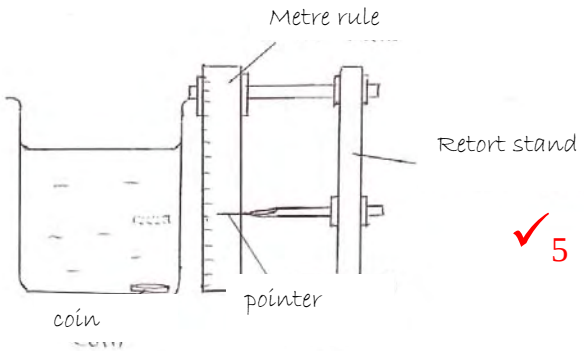
a) Inference : Real depth effects the apparent depth of the image ✓A

b) Hypothesis : The higher the real depth, the higher the apparent depth of the image ✓B

c) Aim : To investigate the relationship between real depth and apparent depth ✓1

Manipulated variable : real depth
Responding variable : apparent depth ✓2
Constant variable : density of water ✓3

Apparatus and materials : coin, beaker, water, retort stand ✓4 (Accepted because metre rule in diagram)



✓5

Procedures :

1) Fill the beaker with water for the depth of 5 cm ✓6
2) Put a coin in the beaker and observe the image formed
3) Move the pin outside the beaker to position of the image and measure the height of image with meter rule ✓7
4) Repeat the experiment with the depth of water 10 cm, 15 cm and 20 cm

✗8 (not enough readings)

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Tabulate data :

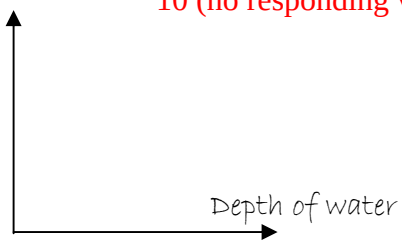
✓ 9

Depth of water / cm	Height of image / cm
5	
10	
15	
20	

Analysis data :

cm

✘ 10 (no responding variable)



10

Question 3 (candidate 2)

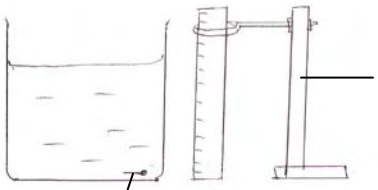
a) Inference : the level of water affects the position of image ✓A

b) Hypothesis : the higher the level of water, the higher the position of image ✓B

c) Aim : to investigate the relationship between the level of water and the position of image ✗1 (position cannot be measured so it being penalised one time only)

Manipulated variable : level of water
Responding variable : position of image ✓2
Constant variable : amount of water ✓3

Apparatus and material : beaker water ruler ✓4



✗5 (No pointer – not functionable)

Procedures

1) Fill the beaker with 10 cm of water ✓6
2) Measure the position of image formed ✗7 (not functionable)
3) Repeat the experiment

Data :

✓9 ✓8

Level of water / cm	Position of image / cm
10	
20	
30	
40	
50	

Analysis data :
Draw a graph of level of water against position of image ✓10

8

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Question 3 (candidate 3)

a) The amount of water effects the real depth ✗A

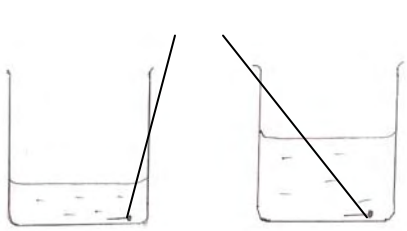
b) When the amount of water increase, the real depth also increase ✗B

c) Aim : to investigate the relationship between amount of water and real depth ✗1

Manipulated variable : volume of water ✓2
Responding variable : height of image
Constant variable : type of medium ✓3

Apparatus and materials : beaker, water, pins, metre rule ✓4

Arrangement of apparatus :



✗5 (Not functionable)

Procedures :

1) Fill a beaker with 10 cm of water ✓6
2) Measure the height of image ✗7 (apparatus not functionable)
3) Fill another beaker with 20 cm of water
4) Repeat the experiment ✗8 (not enough readings)

Tabulation of data :

✗9

V / cm	Real depth
10	
20	

Analysis of data

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Hypothesis s accepted. When the volume of water increase, the apparent depth also increase.

✘ 10 (no graph)

4

Question 4 (candidates 1)

a) Jason no longer feels cold because the current is higher ✓A

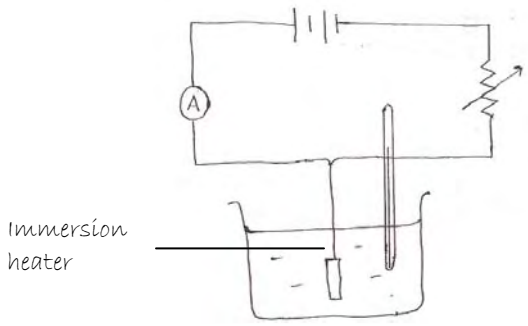
b) The higher the current, the hotter the water ✗B (cannot be measured)

c) i) to investigate the relationship between current and temperature ✓1

ii) Manipulated variable : current flow
Responding variable : temperature of water ✓2
Constant variable : volume of water ✓3

iii) Thermometer, water, beaker, stopwatch, a.c power supply, rheostat ✓4

iv)



✓5

v) 1) Fill the beaker with 50 ml of water.
2) Switch on the power supply and start the experiment with I = 2 A
3) After 5 minutes, record the temperature with thermometer ✓6
4) Repeat the experiment with increasing value of current supply ✓7

vi)

I / A	θ / °C
2	
4	
6	
8	
10	

✓8 ✓9

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vii)

✓ 10

11

Question 4 (candidates 2)

a) *Inference : the current flow effects the temperature of water* ✓A

b) *Hypothesis : when the current flow is higher, the temperature is also higher* ✓B

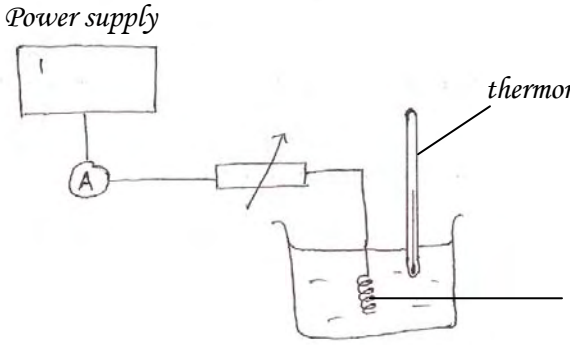
c) *Aim : to study the effects of current on temperature* ✓1

Manipulated variable : current
Responding variable : temperature ✓2
Constant variable : time ✓3

Apparatus and materials : power supply, water, thermometer, beaker ✗4

(No stopwatch)

Arrangement of apparatus :



✗5

(not functionable so cannot get marks 6, 7 and 8)

Procedures :

1) *Set up the experiment as the diagram* ✗6
2) *Start the experiment with 2 A of current*
3) *Record the rate of change of thermometer* ✗7
4) *Repeat the experiment with 3 A, 4 A, 5A and 6A* ✗8

Data :

✓9

I / A	*θ / °C*
2	
3	
4	
5	
6	

Analysis of data :

A graph of I against θ is plotted ✓10

7

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Question 4 (candidates 3)

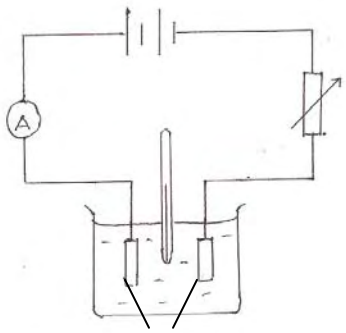
a) Inference : heats depends on the current supply ✓ A

b) Hypothesis : when the heat is higher, the temperature is also higher
✗ B (both are responding variable)

c) Aim : to study the relationship between heat and temperature ✗ 2

Manipulated variable : heat
Responding variable : temperature ✗ 2
Constant variable : time ✓ 3

Apparatus and materials : power supply, beaker, water, stopwatch, thermometer, rheostat, ammeter, wires ✓ 4



✗ 5 (irrelevant so cannot get marks 6, 7 and 8)

Procedures :
1) Set up the apparatus like the diagram above
2) Switch on the power supply ✗ 6
3) After 5 minutes, record the temperature ✗ 7
4) Repeat the experiment with more power produced ✗ 8

Data :

✘9

Heat	Temperature

Analysis data :

Hypothesis is accepted ✘10 (no graph plotted / no statement about plotting the graph)

3