Analysis

Physics

[4531/1] [4531/2] [4531/3]

TOPICS	PAPER 1					PAPER 2														
						SECTION A					SECTION B					SECTION C				
	05	06	07	08	09	05	06	07	08	09	05	06	07	08	09	05	06	07	08	09
Introduction to Physics	3	3	2	3	3	1	1	1					1							
Forces and Motion	7	8	9	8	7	3	3	1	1	1										
Forces and Pressure	8	6	5	7	8			1	1	1			1	1	1					
Heat	5	4	3	4	5	1		1	1	1						1	1		1	
Light	5	5	5	5	5	1	1	1	1	1	1	1						1		1
Waves	7	6	5	7	5	1		1	1	2										1
Electricity	5	5	3	4	5		2	1	1	1										
Electromagnetism	3	3	4	5	5				1							1	1	1		
Electronics	4	3	4	4	3	1	1	1		1				1			1			
Radioactivity	3	3	3	3	3			1	1		1	1			1				1	
TOTAL	40	40	40	40	40	8	8	9	8	8	2	2	2	2	2	2	3	2	2	2

TOPICS	PAPER 3									
	SECTION A					SECTION B				
	05	06	07	08	09	05	06	07	08	09
Introduction to Physics										
Forces and Motion	1	1	1	1	1					
Forces and Pressure						1				1
Heat	1	1						1	1	
Light									1	
Waves					1					
Electricity			1	1		1	1			
Electromagnetism								1		1
Electronics										
Radioactivity										
TOTAL	2	2	2	2	2	2	1	2	2	2

Physics Paper 1(4531/1)

1 Which of the following physical quantities has correct S.I unit?

	Physical Quantity	*S.I Unit*
A	Electric charge	Ampere
B	Weight	Newton
C	Mass	Gram
D	Power	Joule

2 Diagram 1 shows the graph which represents the relationship between a and F.

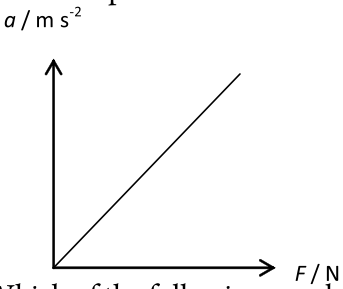


Diagram 1

Which of the following conclusions is correct?

A *a* increases as *F* decreases
B *a* is inversely proportional to *F*
C *a* is directly proportional to *F*

3 The density of water is 1.0 g cm^{-3}. What is the density in kg m^{-3}?

A 10^{-3}
B 10^{-2}
C 10^{2}
D 10^{3}
E 10^{4}

4 Diagram 2 shows the ticker tape chart of a moving object.

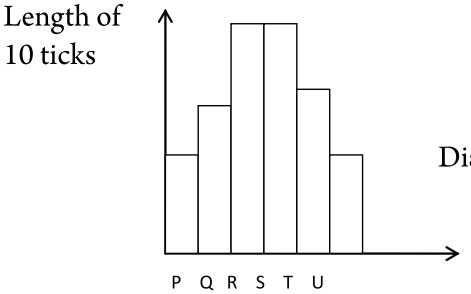


Diagram 2

The object accelerates from

A P to S
B P to R
C R to S
D S to U

5 In equilibrium of forces, the object is in a state of

A rest or uniform acceleration.
B rest or uniform velocity.
C uniform velocity or increasing acceleration.
D increasing velocity or uniform acceleration.

6 The momentum of a bullet from a pistol is big because

A the mass of bullet is small.
B the velocity of bullet is big.
C the volume of bullet is small.

7 Diagram 3 shows the velocity – time graph that represents the motion of an object.

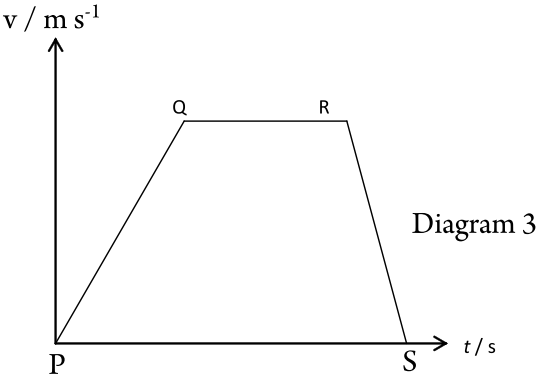


Diagram 3

Which of the following descriptions is correct

	PQ	*QR*	*RS*
A	uniform velocity	zero velocity	decreasing velocity
B	increasing velocity	zero velocity	decreasing velocity
C	uniform acceleration	zero acceleration	uniform deceleration
D	increasing acceleration	uniform acceleration	decreasing deceleration

8 Diagram 4 shows two perpendicular forces 6 N and 8 N acted on point. What is resultant force acted on the point O?

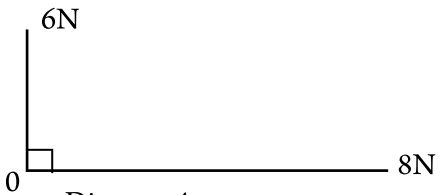


Diagram 4

A 2 N
B 10 N
C 14 N
D 48 N
E 100 N

9 Diagram 5 shows an object of mass 2 kg is pulled upwards with a force of 30 N

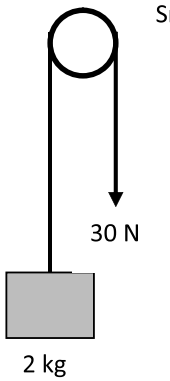


Diagram 5

What is the acceleration of the object?

A 2 m s^{-2}
B 5 m s^{-2}
C 6 m s^{-2}
D 10 m s^{-2}
E 15 m s^{-2}

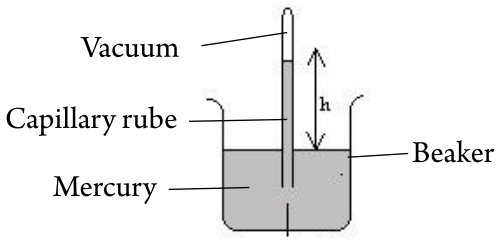
10 An astronaut jumps higher on the moon compare to the earth with the same force. This is because

A there is no air on the moon.
B the weight of the astronaut on the moon is smaller.
C the weight of the astronaut on the moon is same.
D the weight of the astronaut on the moon is larger.

11 A closed container experienced gas pressure due to

A strong force between the gas molecules
B gas molecules are further away from each other
C collision between the gas molecules is elastic
D collision between the gas molecules and the wall of the container

12 Figure shows a simple mercury barometer.



The height of the mercury column, h, will increase if

A a bigger diameter capillary tube is used.
B more mercury is poured in the beaker.
C the barometer is placed at a lower altitude.
D the vacuum in the tube is filled with air.

13 Alcohol is sometimes used as a thermometric liquid because of its

A low density.
B low freezing point.
C ability to wet the glass tube.
D high specific heat capacity.

14 Which of the following is true when ice melt to liquid?

	Volume	*Density*
A	increase	increase
B	decrease	decrease
C	decrease	increase
D	increase	decrease

15 The density of the substance is generally decreases when the temperature increases because

A the mass of the substance increases
B the volume of the substance increases
C the kinetic energy of the molecule of the substance decreases
D the bonding force between the molecules of the substance decreases

16 A passenger in a bus is thrown forward when the bus driver apply an emergency brake. This observation can be explained by

A Pascal's principle
B Bernoulli's principle
C Equilibrium of forces
D Inertia

17 The highest depth in Pacific ocean is 11 000 m. What is the pressure of water if density of the water is 1100 kg m^{-3}?

A 1.00×10^{-1} Pa
B 1.00×10^{1} Pa
C 1.21×10^{6} Pa
D 1.21×10^{7} Pa
E 1.21×10^{8} Pa

18 The pressure of gas in a container filled with inflammable liquid is

A zero
B same as the atmospheric pressure
C higher than the atmospheric pressure
D lower than the atmospheric pressure

19 If total mass of a tanker and the load is 4000 kg, what is the volume of the tanker immerse in water?
[Density of water = 1000 kg m^{-3}]

A 2.0 m^3
B 2.5 m^3
C 4.0 m^3
D 6.0 m^3
E 8.0 m^3

20 Diagram 6 shows the volume of air bubble is increased 3 times at the surface of water when released from the depth of h metre.

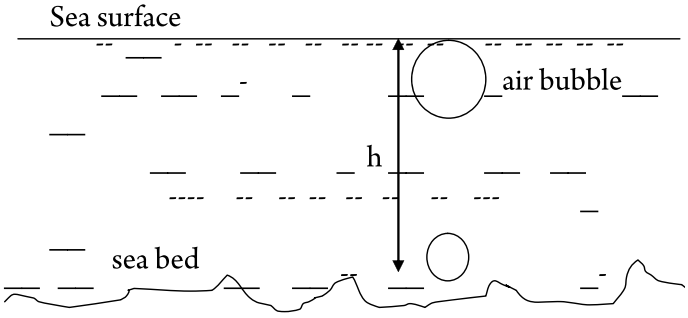


Diagram 6

What is the value of h?
[Atmospheric pressure = 10 m of water].

A 5.5 m
B 8.6 m
C 14.8 m
D 20.0 m
E 23.0 m

21 An e.m.f is produced in a thermocouple because of the difference in

A the containers are made from different materials
B the temperatures at both junctions are different
C the cross-sectional area of both wires
D the liquids are from different type

22 In an experiment to determine the specific heat capacity of an aluminium block, a few drops of oil are poured in a hole before the thermometer is inserted in. The purpose of the oil is to

A reduce the friction between the thermometer and the hole
B reduce the loss of heat to the surrounding
C transfer the heat by convection
D increase the heat conductivity

23 6720 J energy is lost when a solid of mass 0.3 kg is cooled from 60 ^{0}C to 20 ^{0}C. What is the specific heat capacity of the solid in J kg^{-1} $^0C^{-1}$.

A 112
B 168
C 560
D 840
E 1120

24 Which of the following are the common characteristics of the molecule during melting and boiling is correct?

A Temperature increase and average kinetic energy of molecule increased.
B Temperature increase and average kinetic energy of molecule unchanged
C Temperature constant and average kinetic energy of molecule unchanged.
D Temperature constant and average kinetic energy of molecule decreased.

25 Specific heat capacity of aluminium block is 900 J kg^{-1} $^0C^{-1}$. Which of the following statement is correct?

A 900 J energy is required to increase the temperature of 2 kg aluminium by 1 ^{0}C.
B 1800 J energy is required to increase the temperature of 2 kg aluminium by 1 ^{0}C.
C 450 J energy is required to increase the temperature of 2 kg aluminium by 1 ^{0}C.

26 Diagram 7 shows $\frac{1}{u}$ against $\frac{1}{v}$ graph of a converging lens.

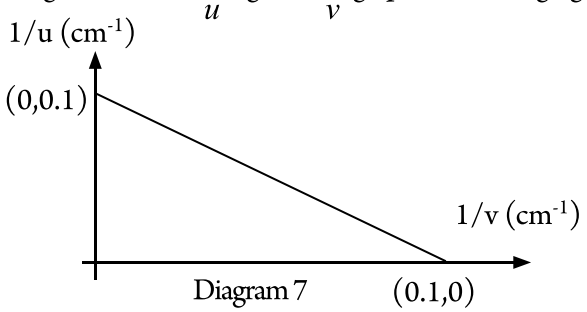


Diagram 7

What is the focal length of the lens?

A 10 cm
B 20 cm
C 40 cm
D 50 cm
E 60 cm

27 Diagram 8 shows an object O in front of a convex mirror.

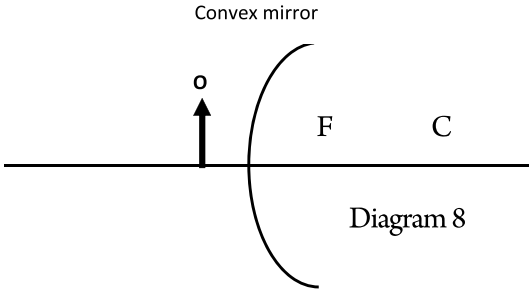


Diagram 8

Which of the following characteristics of image is correct?

A virtual, upright and diminished
B virtual, upright and magnified
C real, inverted and diminished
D real, upright and magnified

28 Diagram 9 shows light ray propagate through liquid X in a thin beaker.

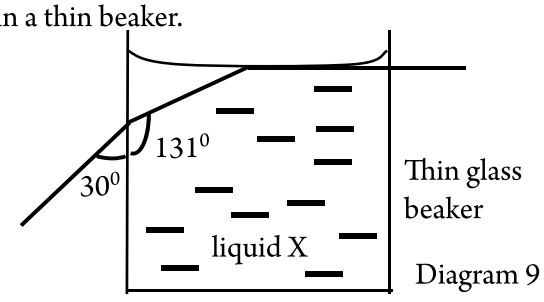


Diagram 9

What is the critical angle of liquid X?

A 30 ⁰
B 41 ⁰
C 49 ⁰
D 90 ⁰
E 131 ⁰

29 Diagram 10 shows the path of the light ray propagated in mediums J and K.

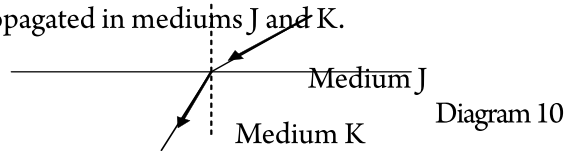


Diagram 10

Which of the following statements is correct?

A Optical density of medium J > optical density of medium K
B Speed of light in medium J> speed of light in medium K
C Refractive index of medium J > refractive index of medium K

30 Which of the following combinations of the lenses is the best to construct an astronomical telescope?

	Objective lens	Eyepiece lens
A	Concave lens of focal length 3 cm	Concave lens of focal length 5 cm
B	Convex lens of focal length 3 cm	Convex lens of focal length 5 cm
C	Convex lens of focal length 5 cm	Convex lens of focal length 120 cm
D	Convex lens of focal length 120 cm	Convex lens of focal length 5 cm

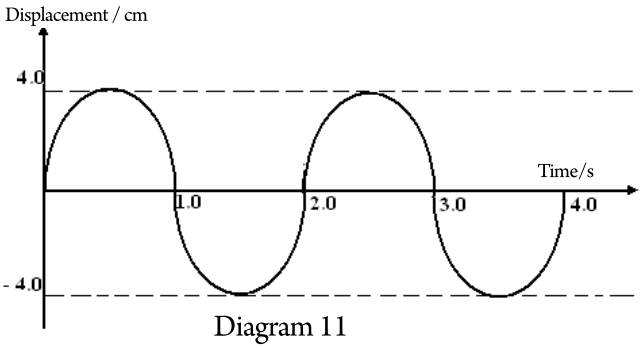
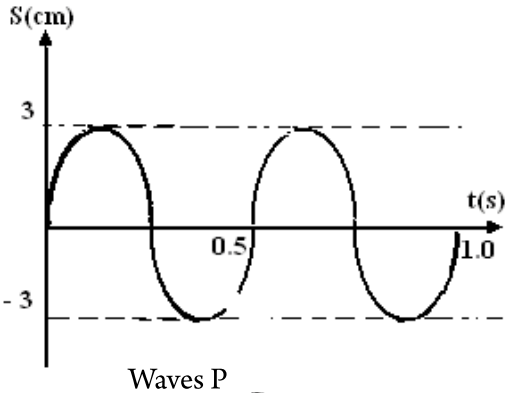


Diagram 11

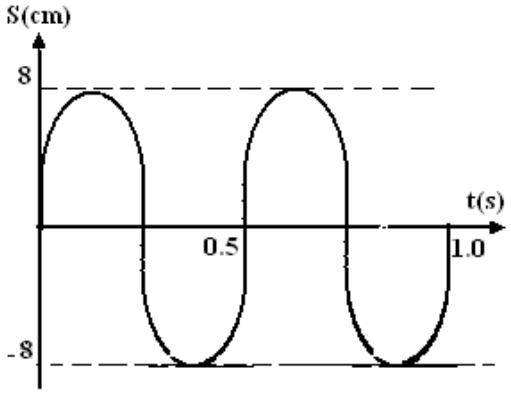
31 Diagram 11 shows displacement – time graph of a wave. Which of the following information is correct?

	Amplitude (cm)	Frequency (Hz)
A	4.0	0.5
B	4.0	2.0
C	4.0	4.0
D	8.0	0.5
E	8.0	2.0

32 Diagram 12 shows displacement – time graph of



Waves P



Waves Q

Diagram 12

Which of the following statement is correct?

A Waves P has lower pitch
B Waves P has higher loudness
C Waves Q has higher pitch
D Waves Q has higher loudness

33 Which of the following explain why sound becomes weaker when the source of sound is further away?

A Velocity decreases
B Energy decreases
C Period decreases
D Frequency decreases

34 The waves in electromagnetic spectrum have same

A speed
B period
C frequency
D wavelength

35 Which of the following will increase the speed of an electric motor?

A Increase the size of anchor
B Increase the current
C Reduce the number of turns of coil
D Reduce the strength of magnet

36 Diagram 13 shows the circuit with four identical bulbs J, K, L and M.

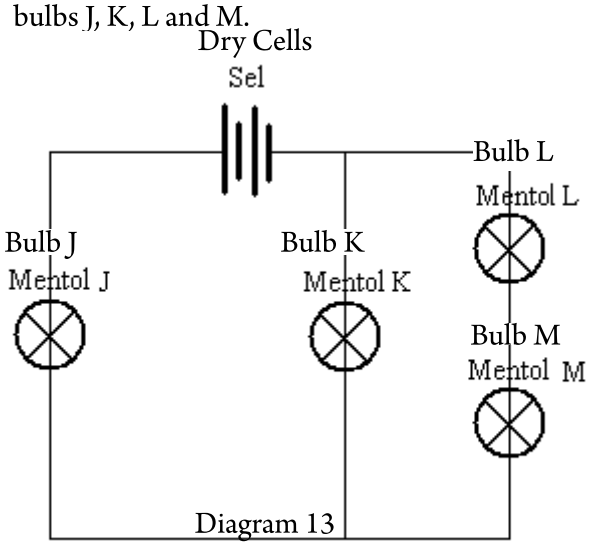
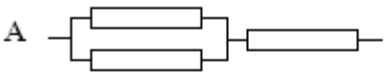


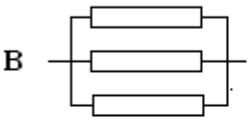
Diagram 13

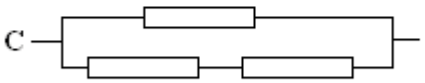
Which bulb light up brightest?

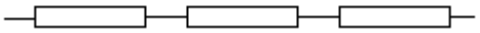
A Bulb J
B Bulb K
C Bulb L
D Bulb M

37 Which of the following circuits has highest effective resistance if the resistors are identical?

A 

B 

C 

D 

38 Diagram 14 shows an electric circuit with resistor Q and 5 Ω resistance. Current in the circuit is 2A.

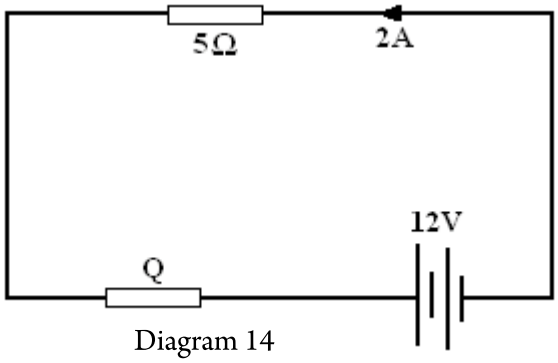


Diagram 14

What is the potential difference across Q?

A 2.0 V
B 2.5 V
C 9.5 V
D 10.0 V
E 12.0 V

39 Diagram 15 shows two parallel wires, each from two circuits passed through a horizontal cardboard.

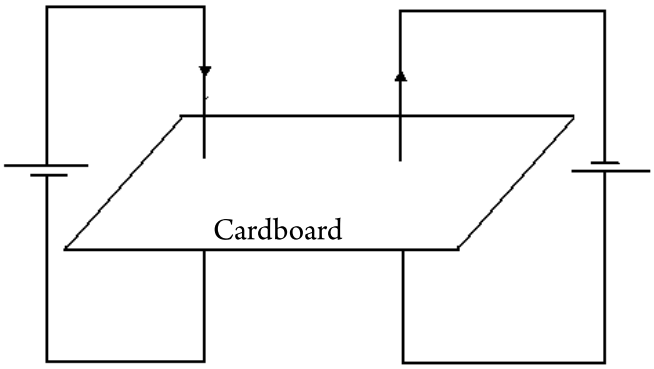
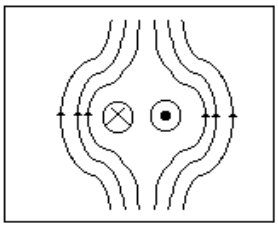
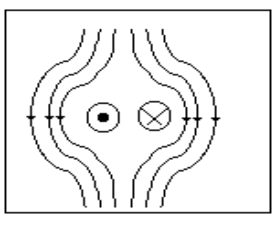
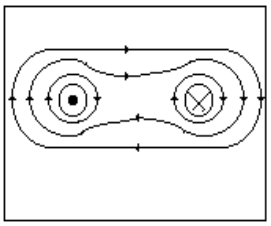


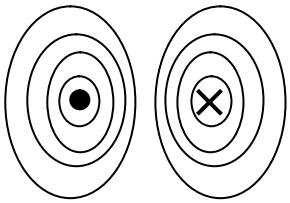
Diagram 15

Which of the following pattern of the magnetic field is correct?

A


B


C


D


40 A vacuum cleaner has a power labeled as 800 W is connected to power supply of 240 V. What is the current flow and the suitable fuse used?

	Current (A)	Fuse (A)
A	0.30	1
B	0.30	2
C	3.33	1
D	0.30	5
E	3.33	5

41 Focusing anode in electron gun of cathode ray oscilloscope is used to

A control the number of electron flow.
B heat-up electrons.
C attract and narrow down the electron beam.
D attract and accelerate the electron beam.

42 Diagram 16 shows battery, diode, capacitor and resistor in an electric circuit.

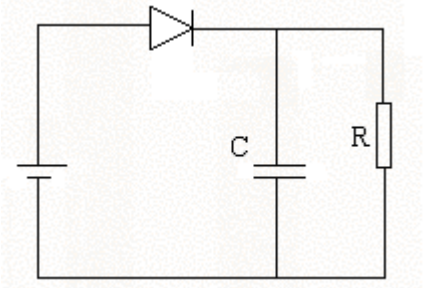


Diagram 16

What will happen if the battery terminal is reversed?

A Capacitor will discharged
B Current flow through diode
C No current flow through resistor
D Energy in capacitor increased

43 Which of the following electronic component is used to detect heat in electronic circuit ?

A diode
B thermistor
C transistor
D capacitor

44 Diagram 17 shows the combination of three logic gates.

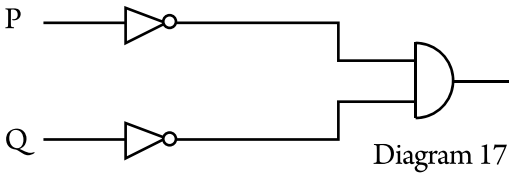
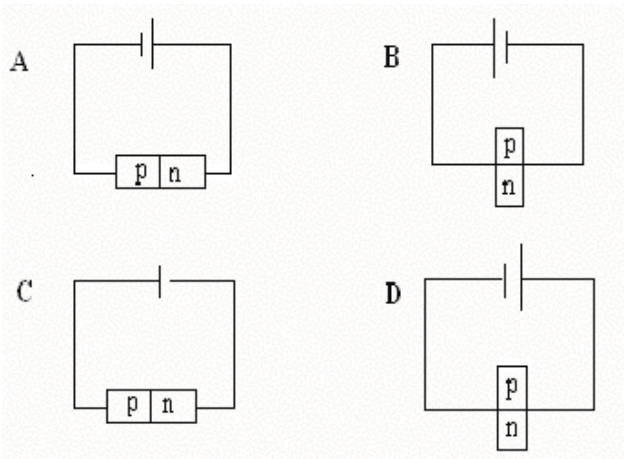


Diagram 17

The combination of logic gates is equivalent to a single logic gate of

A NOR
B NAND
C NOT
D OR

45 Which of the circuit shows a diode is connected in forward bias?



46 Isotope is the elements which have same

A atomic mass
B proton number
C nucleon number
D number neutron

47 Diagram 18 shows the decay graph of a radioactive substance, R.

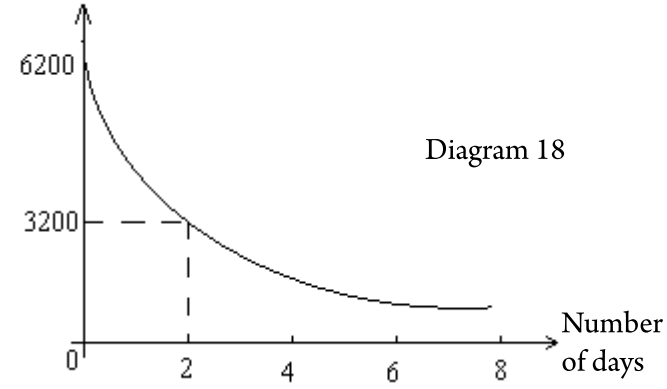


Diagram 18

After 6 days, the number of atom R left is

A 200
B 400
C 800
D 1600
E 3200

48 Which of the following radioactive rays can be detected by a spark counter?

A alpha
B beta
C gamma

49 Which of the following is not the use of radioisotope?

A sterilize the food.
B control the thickness of metal.
C detect the leakage of water pipe.
D measure the volume of milk in a can.

50 In a nuclear fusion, 2.7×10^{-10} J of energy is released. What is the defect mass?
[Speed of light, $c = 3 \times 10^{8}$ m s^{-1}]

A 6 x 10-2 kg
B 3 x 10-19 kg
C 9 x 10-19kg
D 3 x 10-27 kg
E 9 x 10-27 kg

Physics Paper 2(4531/2)

Section A
[60 marks]
Answer all questions in this section.

1 Figure 1 shows a velocity – time graph that represents the motion of an object.

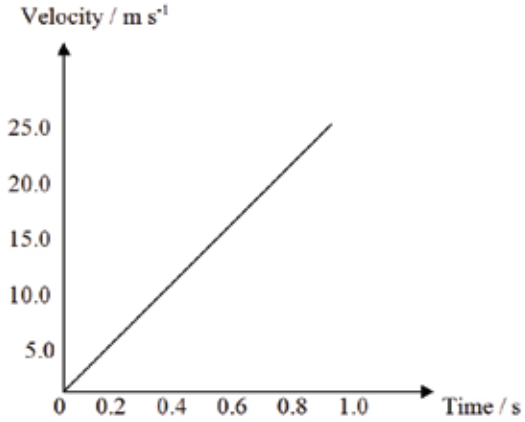


Figure 1

(a) Based on Figure 1,
(i) state the manipulated variable

_____ [1 mark]

(ii) what is the relationship between velocity and time.

_____ [1 mark]

(b) Based on the scale value on the time axis,
(i) name measuring instrument used

_____ [1 mark]

(ii) what is the accuracy of the measuring instrument?

_____ [1 mark]

2 Figure 2 shows a measuring cylinder filled with water before and after a spherical metal P of mass 0.1 kg is dropped in.
[Reading of water level without P inside = 2.0×10^{-5} m^3, Reading of water level with P inside = 3.3×10^{-5} m^3]

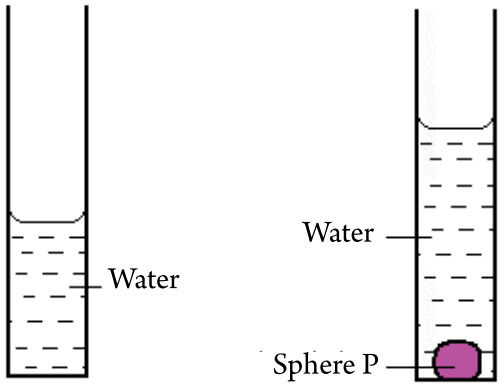


Figure 2

(a) Why the sphere P sinks in water?

_____ [1 mark]

(b) What is the volume of sphere P?

_____ [1 mark]

(c) Calculate the density of P.

[2 marks]

(d) State one application of density in daily life

_____ [1 marks]

3 Figure 3.1 shows water is flowing from a beaker to a cylinder using the effect of pressure. The volume of the beaker and the cylinder are the same.

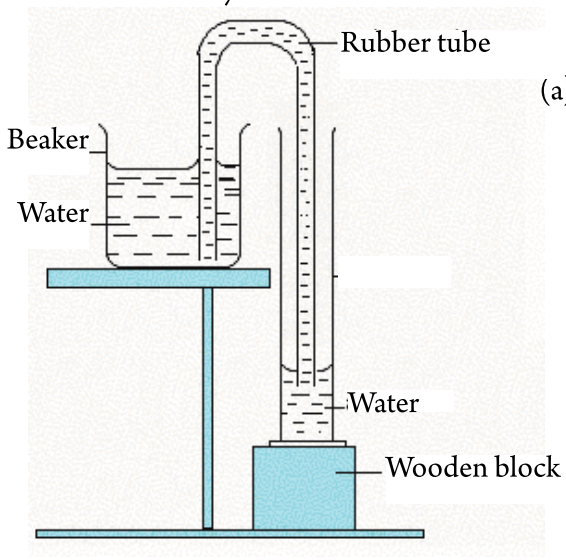


Figure 3.1

(a) (i) What is meant by pressure.

_____ 1 mark]

_____

(ii) Explain why the water flow from the beaker to the cylinder.

_____

_____

_____

_____ [2 marks]

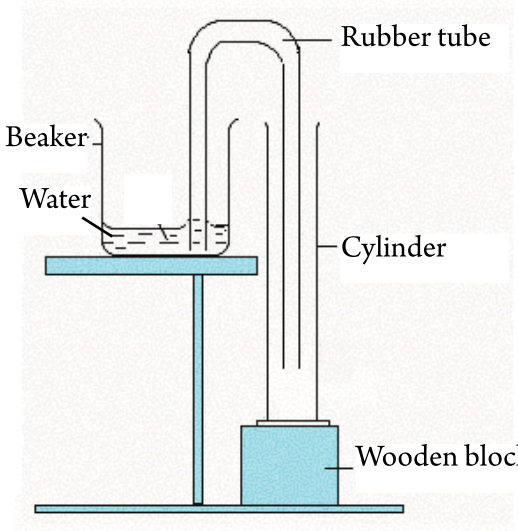


Figure 3.2

(b) Figure 3.2 shows the level in beaker P when the water stops flowing.

(i) In Figure 3.2, draw the level of water in the cylinder. [1 mark]

(ii) Why the water stop from flowing?

_____

_____ [1 mark]

(c) **Suggest** one way to completely transfer water in the beaker to the cylinder.

_____

_____ [1 mark]

4 Figure 4 shows two sound waves produced from two loud speakers which are connected to an audio generator. A boy hears loud and soft sound alternately as he walks from A to B.

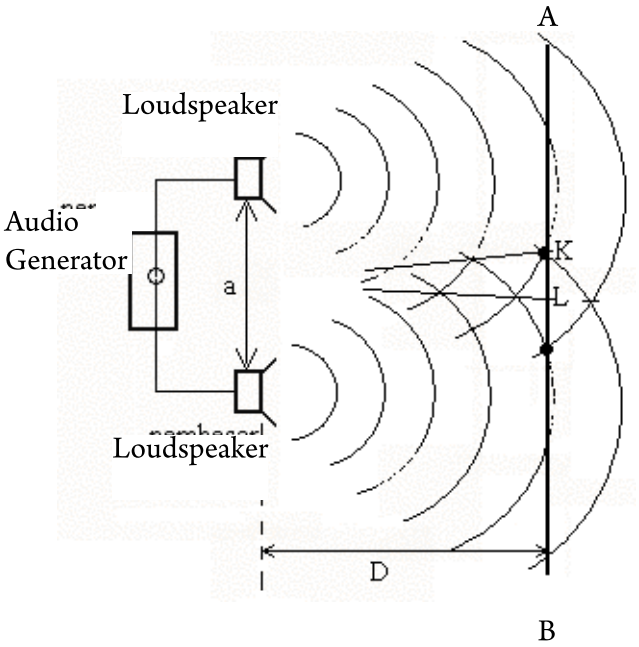


Figure 4

(a) (i) Name the phenomenon of waves along AB

_____

_____

[1 mark]

(ii) Explain how this phenomenon takes place.

_____

_____

_____

_____

[2 marks]

(b) Calculate the distance KL if a = 2.0 m, D = 5.0 m and wavelength of sound = 0.18 m.

[2 marks]

(c) Explain the changes to the distance between two consecutive loud sound if the frequency of the audio generator is increased.

_____

_____

[2 marks]

5 Figure 5.1 shows the rope does not move eventhough the two teams pulled with the forces of F_1 and F_2. Figure 5.2 shows a student is driving a car at velocity 20 m s^{-1}. The horizontal forces acted on the car are F_3 and F_4.

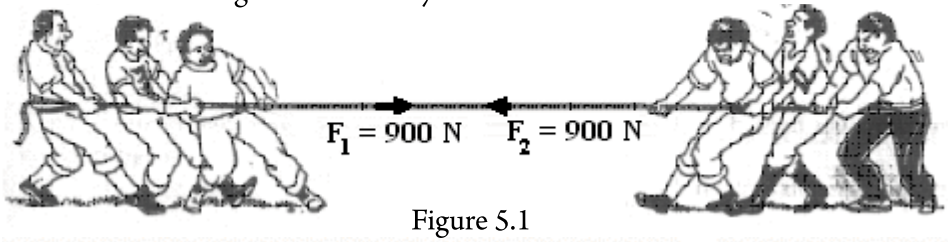


Figure 5.1

Figure 5.2

(a) Name the force

(i) F_1

_____

[1 mark]

(ii) F_4

_____

[1 mark]

(*b*) Compare the magnitude of resultant force;

(i) between F_1 and F_2

_____ [1 mark]

(ii) between F_3 and F_4

_____ [1 mark]

(*c*) Based on your answers in b(i), b(ii) and the discriptions of the Figures 5.1 and Figure 5.2, relate the physics concept involved.

_____

_____

_____ [2 marks]

(*d*) (i) What happen to the motion of the car if F_3 is increased to 8 000 N?

_____ [1 marks]

(ii) Give one reason for your answer.

_____ [1 marks]

6 Figure 6.1 shows the condition of a balloon which is attached to the opening of a test tube before and after the test tube is heated by a bunsen burner.
Figure 6.2 shows the condition of air column trapped by the sulfuric acid in a capillary tubebefore and after the water in the beaker is heated by the burner.

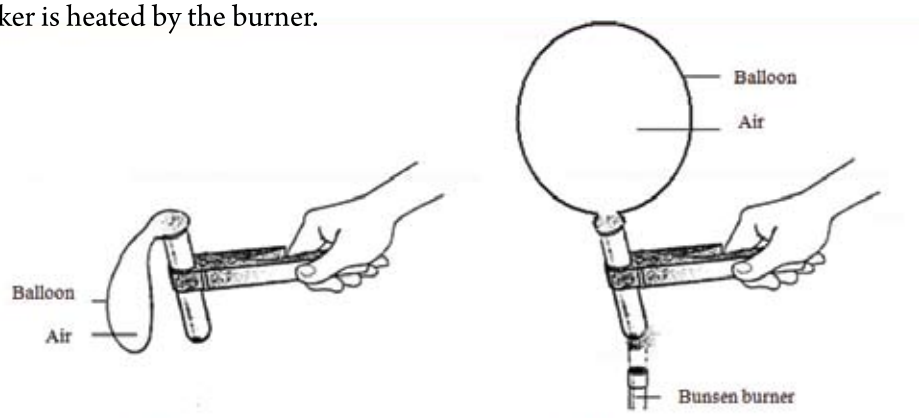


Figure 6.1

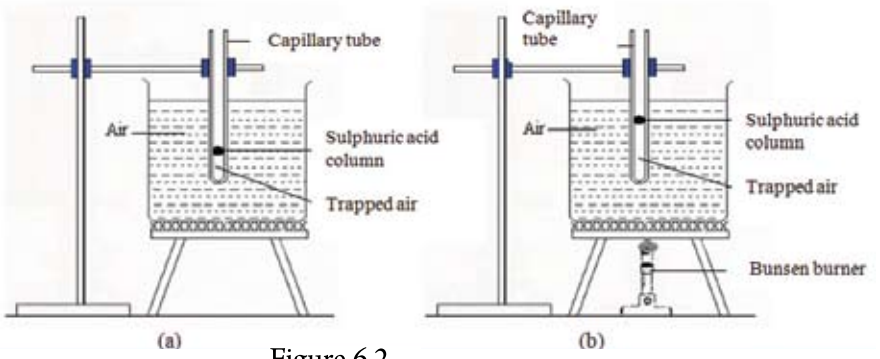


Figure 6.2

(*a*) (i) Observe the figures above and state one similarity of the air in the balloon and the air in the capillary tube

_____

_____ [1 mark]

(ii) Compare the mass of air in the balloon di Figure 6.1 (a) and 6.1 (b)

_____ [1 mark]

(*b*) (i) Based on your answers in (a)(i) and (a)(ii), make a relationship between the physical quantities involved.

_____ [1 mark]

(ii) Name the physics law that involved in (b)(i).

_____ [1 mark]

(iii) Based on the kinetic theory of mass, explain the law that you mentioned in (b)(ii).

_____

_____

_____ [2 marks]

(*c*) Blow in air into another balloon and tie the balloon with a string.

(i) After a few days, what will happen to the size of the balloon?

_____ [1 mark]

(ii) Give one reason for your answer.

_____ [1 mark]

7 Figure 7.1 shows a torch light with two dry cells of 1.5 V. The bulb lights up when current flow if the switch is closed.

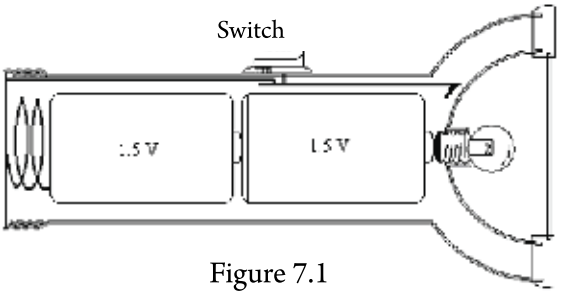


Figure 7.1

(*a*) What is meant by current?

_____ [1 mark]

(*b*) (i) Mark with letter M in Figure 7.1 one component which is made from metal.

[1 mark]

(ii) Draw the circuit diagram of the torch light in Figure 7.1 using the correct symbols.

[2 marks]

(*c*) The system of torch light in Figure 7.1 is not suitable for a front lamp of a car. A few changes have to be done for a front lamp of the car.
Figure 7.2 shows the devices that are suitable to be used.

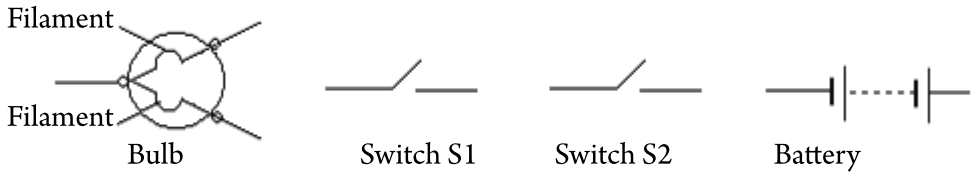


Figure 7.2

(i) State two reason why the bulb in Figure 7.2 is more suitable than the bulb in Figure 7.1?

_____
_____
_____ [2 marks]

(ii) Using the devices in Figure 7.2, draw the circuit diagram to show the new system of lighting system of athe car.

[4 marks]

8 Figure 8.1 and Figure 8.2 show a transformer and a cathode ray oscilloscope (CRO) used to study the characteristics of an alternating current by adjusting the buttons of the CRO.

(*a*) Complete the connection of the connecting wires P and Q from the transformer to the correct buttons on the CRO. [1 mark]

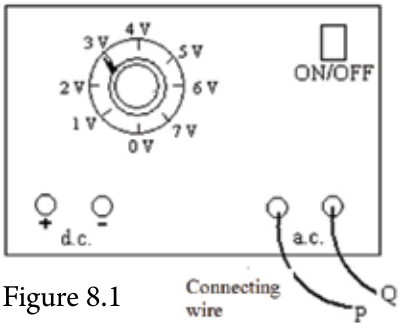


Figure 8.1

(*b*) If the connection in (a) is correct, the screen of the CRO will display the traces as in Figure 8.2. Which button is adjusted so that

(i) the traces at the centre of the screen?

_____
_____ [1 mark]

(ii) the frequency of the supplied a.c can be determined.
Explain your answer.

_____
_____
_____
_____
_____ [3 marks]

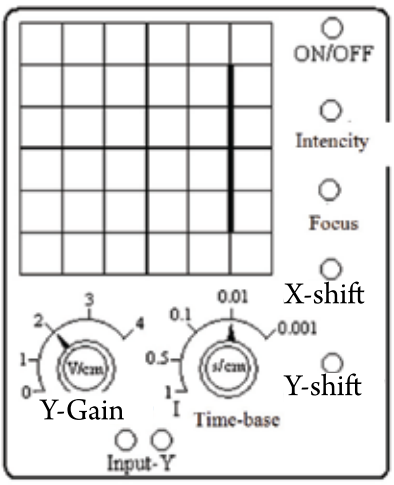


Figure 8.2

(*c*) When the correct buttons are adjusted in b(ii), the traces displayed on the screen of CRO is as shown in Figure 8.3. [One division on the screen is 1 cm x 1 cm]

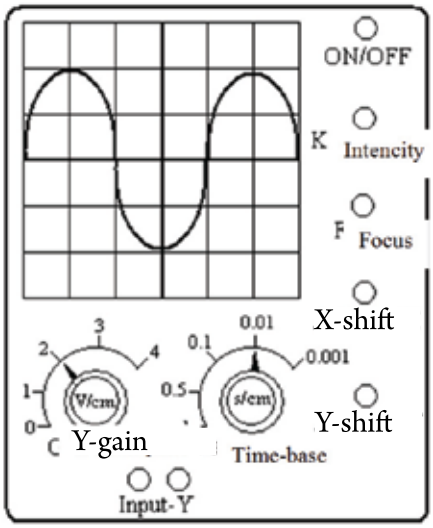


Figure 8.3

(i) Determine the frequency of the supplied a.c.

[3 marks]

(ii) Calculate the peak voltage of the a.c. source.

[2 marks]

(*d*) Explain how to increase the amplitude of the wavesform of the trace in Figure 8.3.

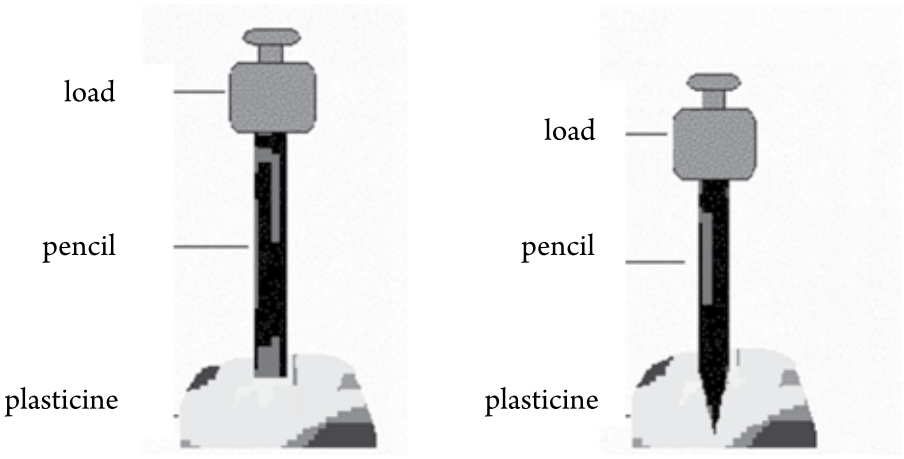
_____

_____

_____ [2 marks]

Section B
[20 marks]
Answer any **one** question from this section

9 Diagram 9.1 shows the position of lower end of the pencil in the plasticine before and after the pencil is sharpened while the other end is placed with the load with same weight. Diagram 9.2 shows the writings before and after the pencil is sharpened.



(a) DIAGRAM 9.1 (b)

(a) DIAGRAM 9.2 (b)

(a) (i) What is meant by weight? [1 mark]

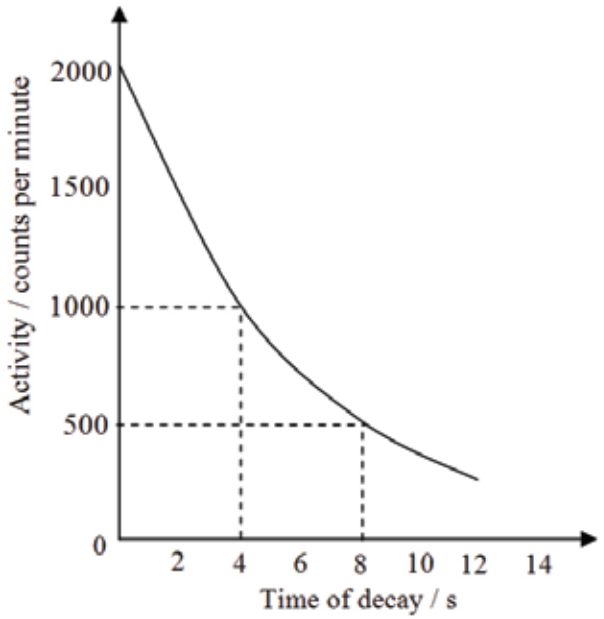
(ii) Observe Figure 9.1 and Figure 9.2. Compare the shape of the end of the pencil, the positions in the plasticine and the writings before and after the pencil is sharpened.

Relate the position of the pencil and the writings with the end of the pencils to the concept of physics involved. [5 marks]

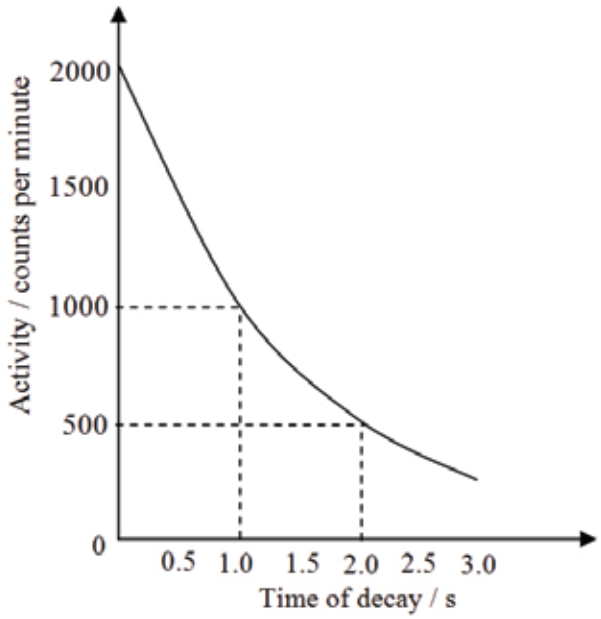
(b) Explain why a soccer player usually wears shoes with spikes. [4 marks]

(c) A new housing estate needs a water tank to supply water to the resident. Using suitable concept of physics, suggest and explain the design of the tank or the methods so that the water is supplied efficiently, sufficient and save for consumption. You may also suggest the material and the position of the tank. [10 marks]

10 Figure 10.1 and Figure 10.2 show the decay graphs of two radioisotopes P and Q.



Decay graph of Radioisotope P
Figure 10.1



Decay graph of Radioisotope Q
Figure 10.2

(a) (i) What is meant by radioisotope? [1 mark]

(ii) Based on the graphs in Figure 10.1 and Fgure 10.2, state the common observations and the characteristics of both graphs. Hence relate those characteristics to deduce the concept of physics involved. [5 marks]

(b) Below is the nuclear reaction of a radioactive material

$$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{141}_{56}Ba + {}^{92}_{36}Kr + 3\,{}^{1}_{0}n + Energy$$

(236.05 a.m.u.) (235.85 a.m.u. + Energy)

From the above nuclear reaction, calculate

(i) the defect mass in kg [1 a.m.u = 1.66×10^{-27} kg]

(ii) the energy released during the reaction [4 marks]

(c) Using the suitable concept of physics, suggest and explain the modifications to the school's laboratory and the the apparatus inside the laboratory so that the research work using radioactive substance is save. The modifications must be based on

i) the design of the laboratory

ii) how to handle the radioactive materials. [10 marks]

Section C
[20 marks]

Answer any **one** question from this section

11 Figure 11.1 shows three identical wooden block float on the surface of liquid X, liquid Y and liquid Z with different densities. The base of the block has the cross-sectional area of 0.02 m 2 .

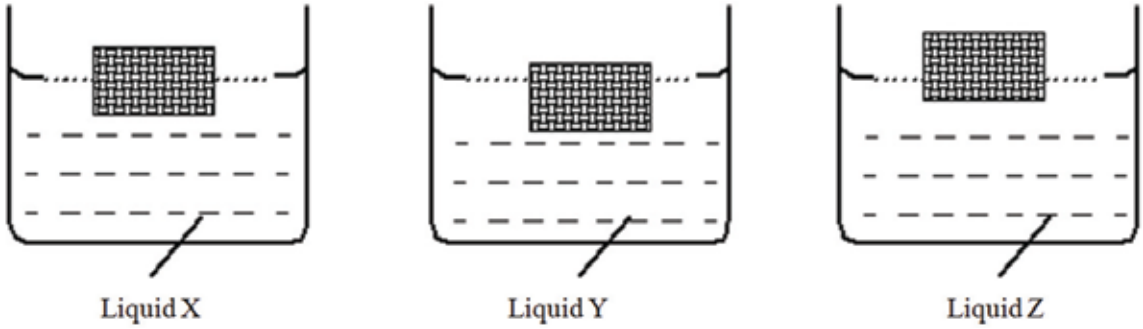


Figure 11.1

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

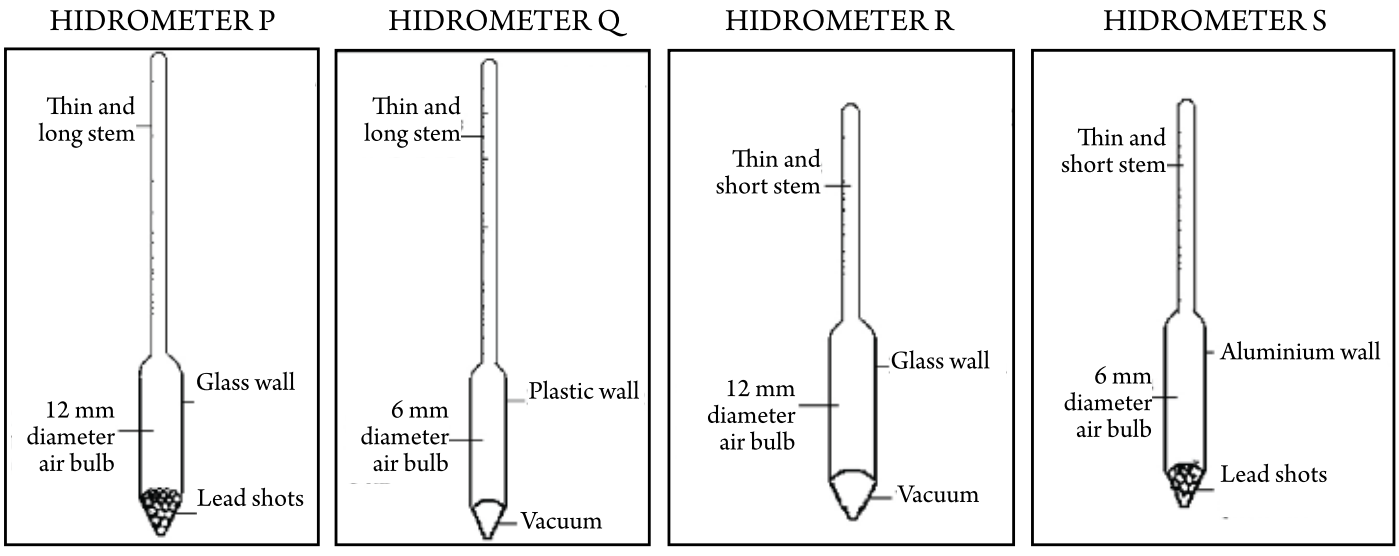
(b) Why the blocks float in liquid? [1 mark]

(c) Compare the densities of liquid X, liquid Y and liquid Z. Explain your answer. [3 marks]

(d) If the block immersed 0.05 m in liquid X and the density of X is 800 kg m-3. Calculate

(i) the volume of liquid displaced [2 marks]
(ii) the bouyant force acted on the wooden block [3 marks]

(e) Figure 11.2 shows characteristics of the hydrometers P, Q, R and S.



Glass wall

Figure 11.2

Based on the Figure 11.2.

(i) Explain the suitable characteristics of the hydrometer to measure the density of acid.
(ii) Choose the most suitable hydrometer to measure the density of acid. [10 marks]

12 Figure 12.1 shows a simple transformer. The primary coil is connected to alternating current power supply with potential difference of 12 V.

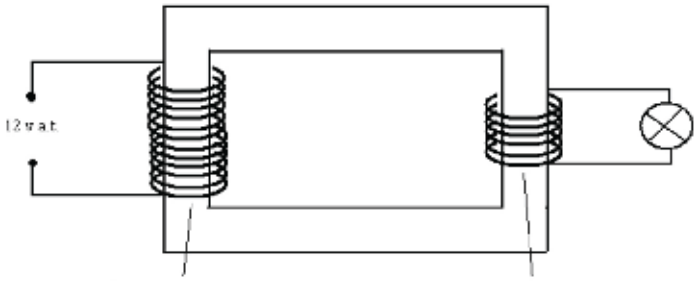


Figure 12.1

(a) What is meant by potential difference? [1 mark]

(b) Explain how the current is induced in the secondary coils. [3 marks]

(c) Explain one way to increase the efficiency of the above transformer. [2 marks]

(d) Figure 12.2 shows a part of National Grid system used to transmit the electrical energy.

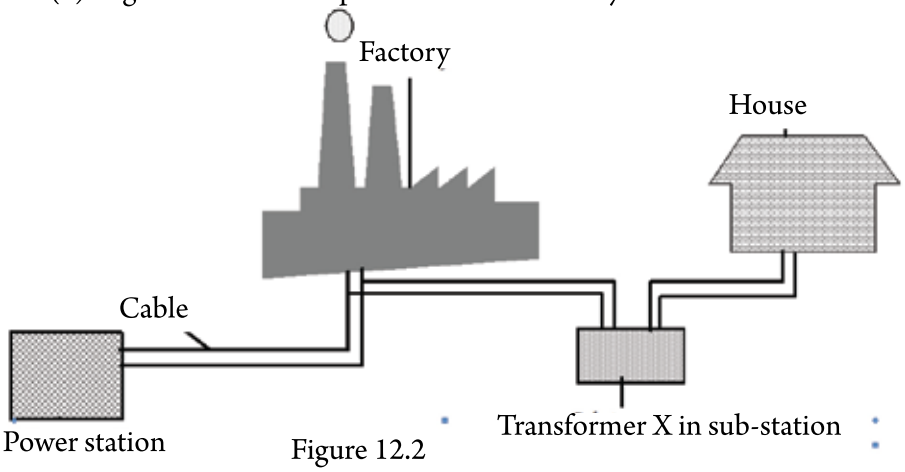


Figure 12.2

Types of transformer	
Step-up	Step-down

Table 12.1

Based on the Table 12.1, state the type of transformer X and give a reason of your choice. [2 marks]

(e) Table 12.2 shows the characteristics for four types of cable with the same length.

Cable	Characteristics of cable		
	Diameter/cm	Density/ kg m-3	Rate of expansion
P	3	7.2 x 103	Low
Q	3	6.1 x 103	Moderate
R	5	2.9 x 103	Low
S	6	8.0 x 103	Moderate

Table 12.2

Based on Table 12.2,

(i) explain the suitable characteristics of the cable used in transmission of electrical energy to a long distance consumer

(ii) determine the most suitable cable and give reasons for your answer. [8 marks]

(f) 110 kW of electrical power is supplied to the cable with the potential difference of 10 kV. The resistance of the cable is 10 Ω. Calculate

(i) the current flow in the cable [2 marks]

(ii) the power lost in the cable. [2 marks]

Physics Paper 3(4531/3)

Section A
[28 marks]

Answer **all** questions

1 A student carries out an experiment to investigate the relationship between pressure and temperature of constant volume of gas.

Figure 1.1 shows a flask immersed in a mixture of water and ice with an open end connected to U-tube by a rubber tube. The temperature is measured by a thermometer and the pressure is measured using a metre rule, represented by the difference of height, h, of the mercury column in U-tube.

The mixture is stirred continously so that the temperature around the flask is 0^0C. The corresponding difference of height of mercury column is h1 as shown in Figure 1.2.

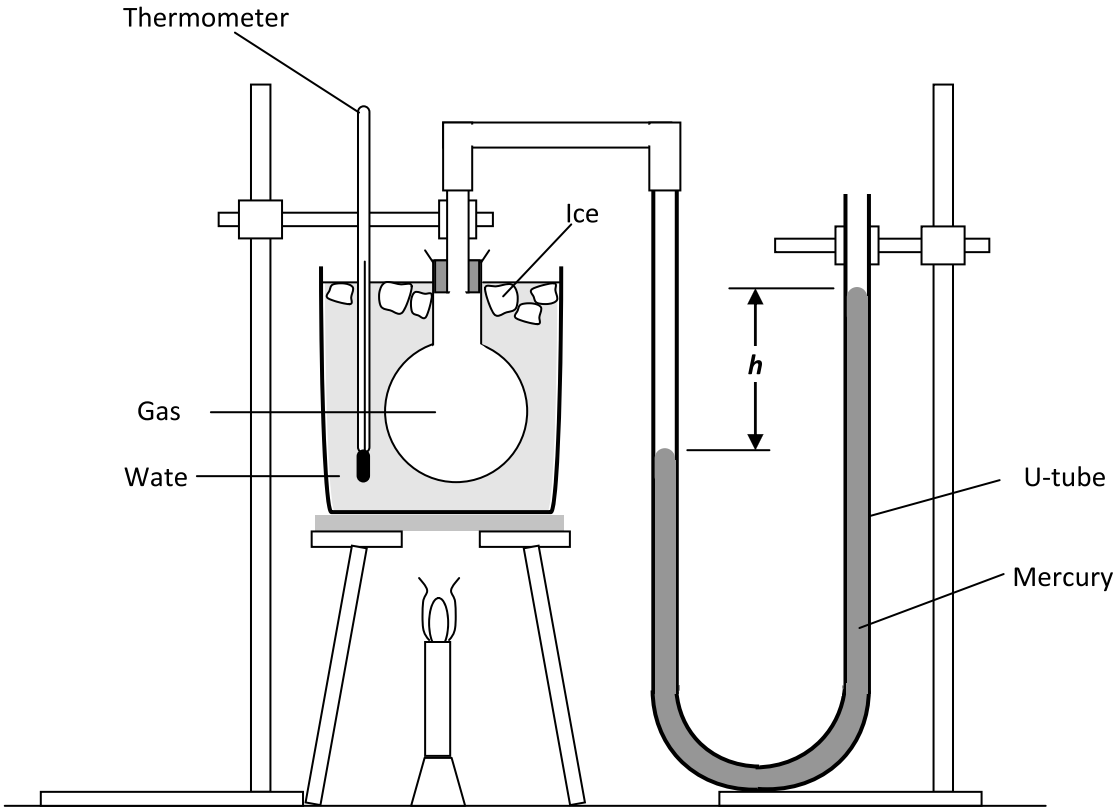


Figure 1.1

The experiment is repeated by increasing the temperature of water to 20°C, 40°C, 60 °C, 80°C, and 100°C and the difference of height of mercury columns are h_2, h_3, h_4, h_5, and h_6 respectively as shown in Figures 1.2, 1.3, 1.4, 1.5, 1.6, and 1.7 which are drawn with the actual scale.

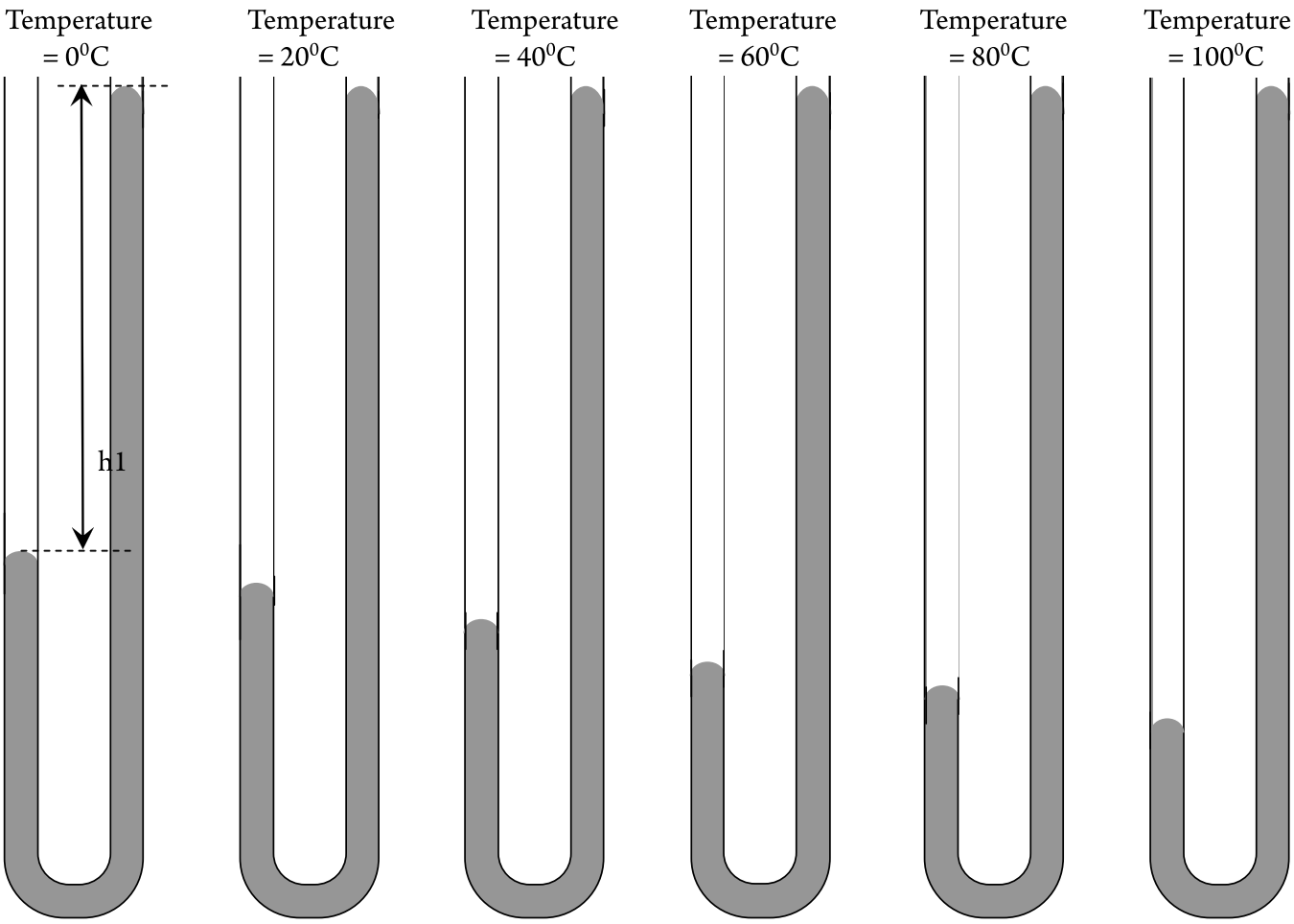


Figure 1.2 Figure 1.3 Figure 1.4 Figure 1.5 Figure 1.6 Figure 1.7

(a) From the information given, identify

(i) the manipulated variable [1 mark]
(ii) the responding variable [1 mark]
(iii) the fixed variable [1 mark]

(b) In Figures 1.2, 1.3, 1.4, 1.5, 1.6, and 1.7, mark the difference of height of the mercury columns h_2 to h_6 when corresponding temperatures of water = 20^0C, 40^0C, 60^0C, 80^0C, and 100^0C. [3 marks]

(c) Based on the marks you have drawn, measure the difference of height of mercury columns and tabulate the data for temperature, θ / oC, temperature, T / K and the difference in height of mercury column, *h*.

Temperature, *T* can be calculated using

$$T = \theta + 273$$ [4 marks]

(d) Based on you table, draw the graph of *h*/cm against T/K on the graph paper provided. [5 marks]

(e) From your graph, state the relationship between *h* and T. [1 mark]

2 A student carries out an experiment to investigate the relationship between the distance of two coherent sources, *a* and the distance of two consecutive antinodal lines, *x* using a ripple tank. The distance between two coherent sources and the line of observation, *D* is fixed at 25 cm.
The results of the experiment are tabulated and the graph *a* against $\frac{1}{x}$ as shown in Figure 2.1.

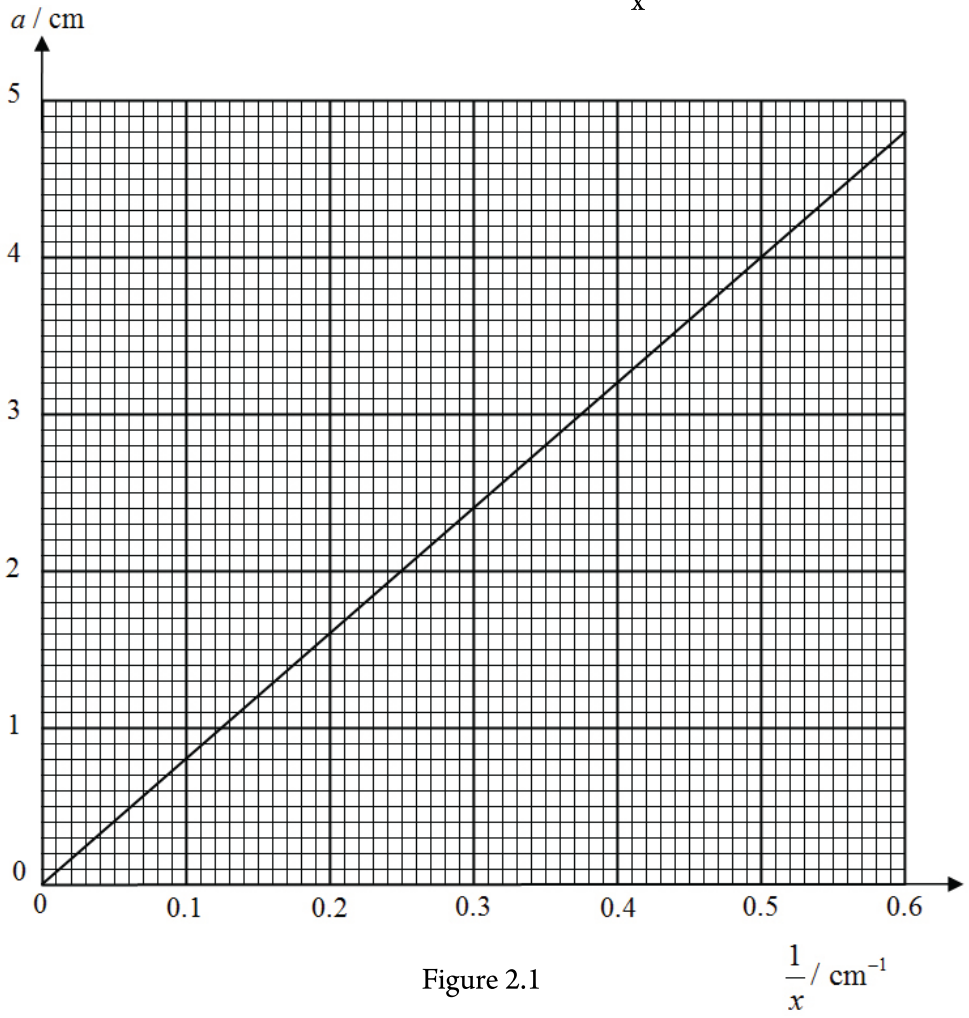


Figure 2.1

(a) Based on the graph in Figure 2.1

(i) What happen *x* when *a* increases? [1 mark]

(ii) Determine the distance between two consecutive anti nodal lines, x when
a = 4.0 cm.
Show how you determine the value of *x* on the graph. [3 marks]

(iii) Calculate the gradient of the graph. [4 marks]

(b) Using the value of the gradient in (a)(iii) and the equation $\lambda = \frac{ax}{D}$, determine the wavelength, λ of water waves. [3 marks]

(c) State one precaution in this experiment. [1 mark]

Section B
[12 marks]

Answer any one question from this section.

3 Figure 3 shows a rocket is launched for a space mission. When the fuel in a tank is used up, the empty tank is

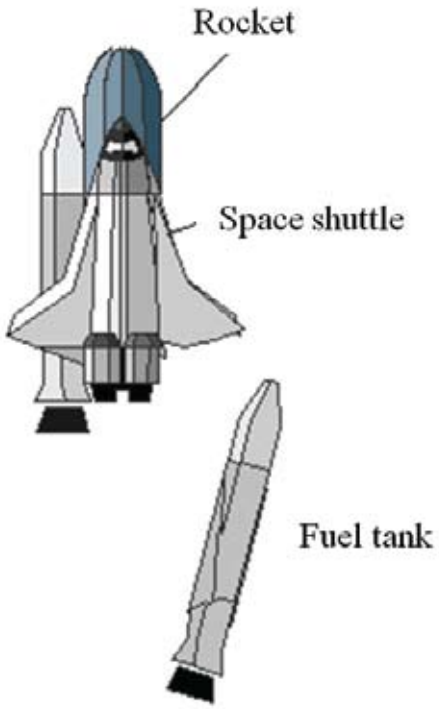


Figure 3

detached from the rocket to increase the acceleration.
Based on the information and observation above:

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

(b) State **one** suitable hypothesis. [1 mark]

(c) With the use of apparatus such as trolley, ticker timer and other apparatus, describe an experiment framework to investigate the hypothesis stated in 3(b).
In your description, state clearly 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]

4. Figure 4.1 shows a bar magnet is pushed gently into the solenoid.
Figure 4.2 shows the bar magnet is pushed at a bigger speed into the solenoid.

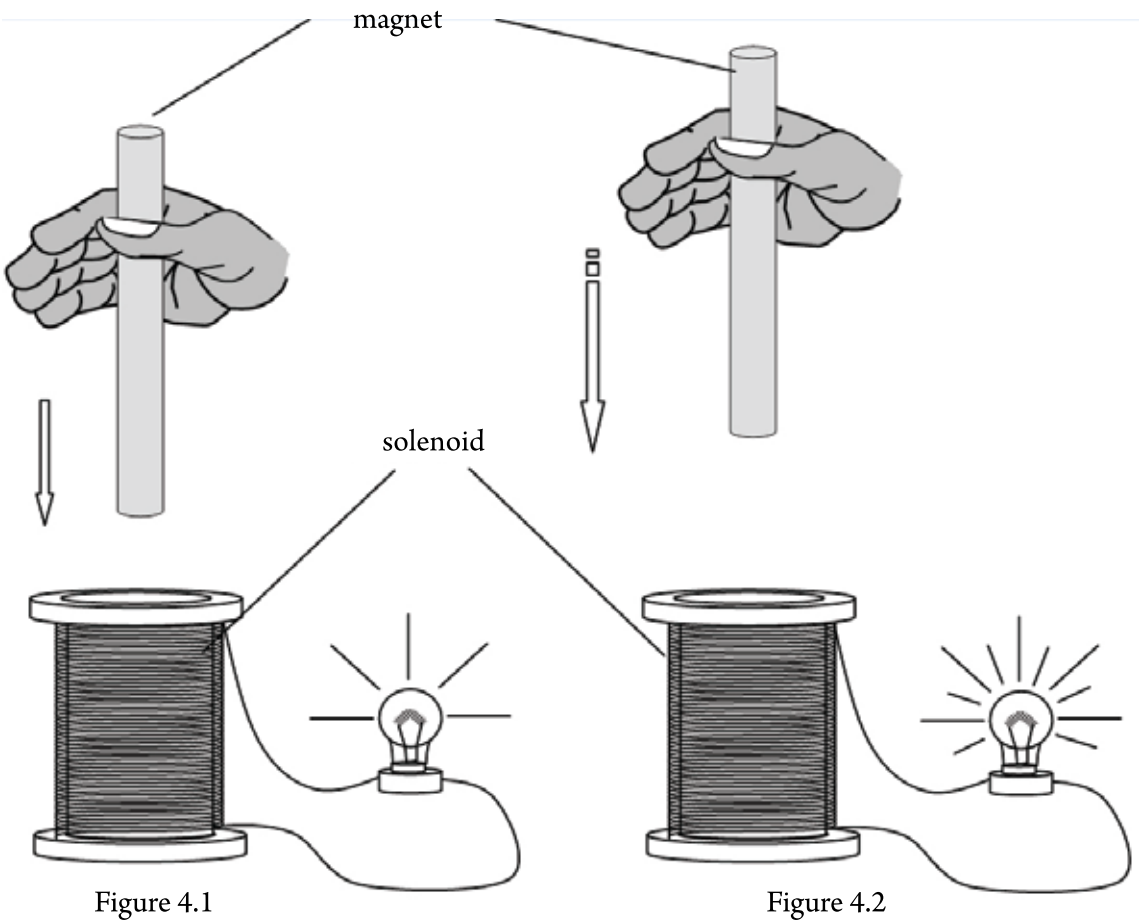


Figure 4.1 Figure 4.2

Based on the information and observation above:

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

(b) State **one** suitable hypothesis. [1 mark]

(c) With the use of apparatus such as magnet, metre rule, coil wire and other apparatus, describe an experiment framework to investigate the hypothesis stated in 3(b).

In your description, state clearly 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]

Jawapan

Physics

[4531/1] [4531/2] [4531/3]

Physics Paper 1(4531/1)

No	Answer
1	B
2	B
3	D
4	B
5	A
6	B
7	C
8	B
9	B
10	B

No	Answer
11	D
12	C
13	B
14	D
15	B
16	D
17	E
18	C
19	C
20	D

No	Answer
21	B
22	D
23	C
24	C
25	B
26	A
27	A
28	C
29	B
30	D

No	Answer
31	A
32	D
33	B
34	A
35	A
36	A
37	D
38	A
39	D
40	E

No	Answer
41	C
42	D
43	B
44	C
45	A
46	B
47	C
48	A
49	D
50	D

Physics Paper 2(4531/2)

1 (a) (i) time
(ii) directly proportional

(b) (i) stop watch
(ii) 0.2 s

2 (a) P is denser than water

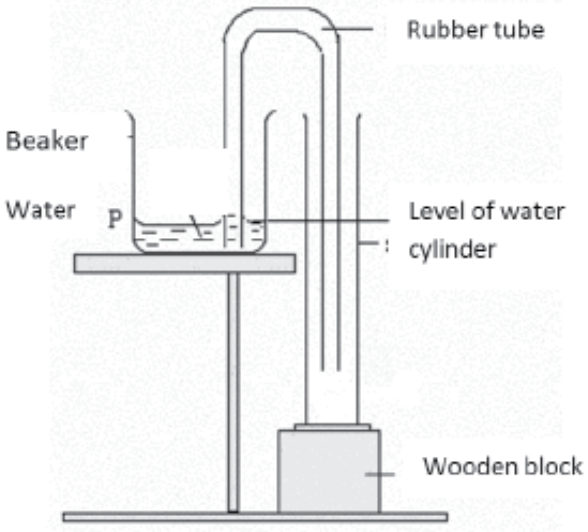
(b) 1.3 x 10-5 m^3

(c) $\frac{0.1}{1.3 \times 10 - 5}$ = 7.5 x 10^3 kg m^{-3}

(d) boat

3 (a) (i) pressure per unit volume
(ii) the end of tube in the cylinder is at lower position than the end of tube in the beaker.

(b) (i) The pressure at this end is higher than the atmospheric pressure.



(ii) no difference in pressure

(c) remove the wooden block and put the cylinder on the floor

4 (a) (i) interference
(ii) sound from two loudspeaker overlap
Loud sound produced when constructive interference and soft sound when destructive interference occur.

(b) $\frac{0.18x5}{2}$ = 0.45 m

(c) decreases because the wavelength decreases.

5 (a) (i) tension
(ii) drag force

(b) (i) same
(ii) same

(c) when the objects at rest or move with constant velocity, the resultant is zero and the force are in equilibrium.

(d) (i) the car accelerate
(ii) the resultant force > 0N

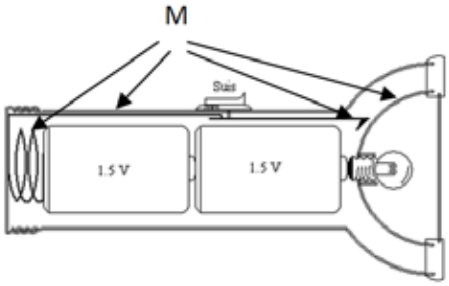
6 (a) (i) gas expand at higher temperature
(ii) same

(b) (i) volume increases as temperature increases
(ii) Charle's law
(iii) the kinetic energy of the gas molecule increases as the temperature increases.
Pressure of gas molecules is bigger than the atmospheric pressure.

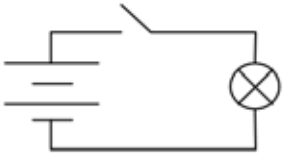
(c) (i) decrease
(ii) gas molecules escape through the tiny hole on the surface of balloon

7 (a) rate flow of charge

(b) (i)

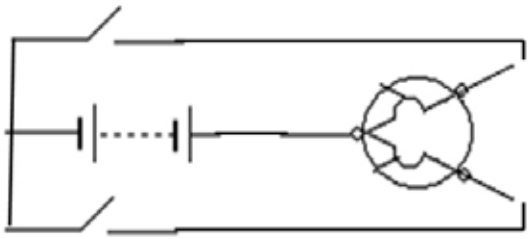


(ii)

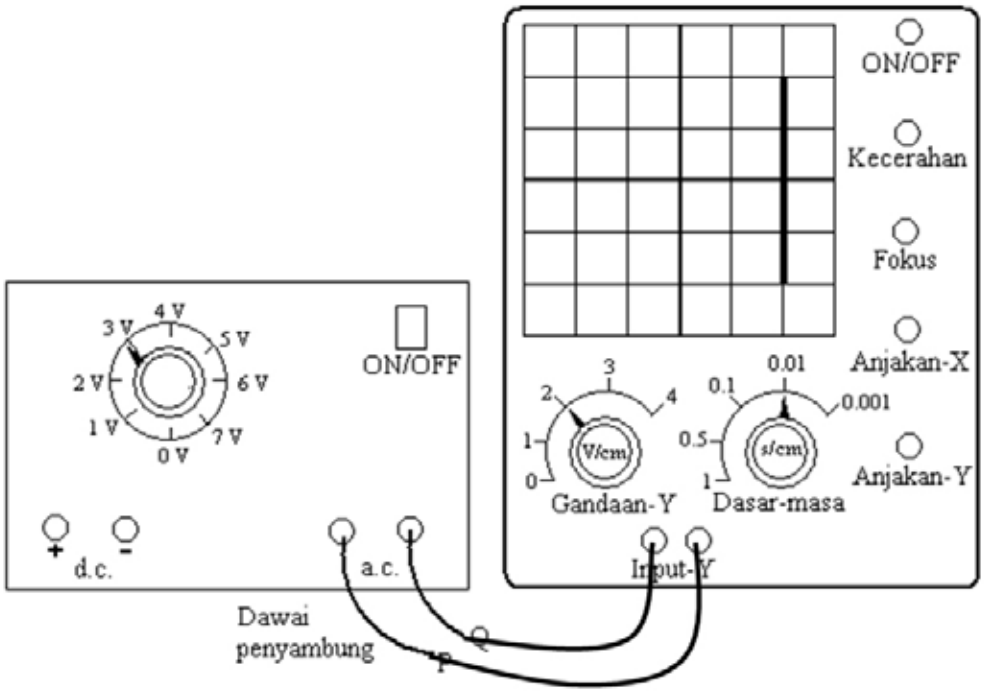


(c) (i) brighter light produced and the brightness can be controlled

(ii)



8 (a)



(b) (i) turn the button 'anjakan X'

(ii) turn on Time-base button. Calculate period using the formula,
T = number of division for one wave x Time-base. Frequency, f = 1/T

(c) (i) $f = \frac{1}{4x0.01} = 25$ Hz

(ii) $V_o = 2 \times 2 = 4$ V

(d) increase the Y-multiplier. The cathode ray deflected vertically more due to increase in potential difference between the y-plates.

9 (a) (i) gravitational force due to gravity

(ii) In Figure 9.1(b) and Figure 9.2(b), the area at the end of the pencil is smaller
In Figure 9.1(b) the end sink deeper in the plasticine
In Figure 9.2(b), the writing is sharper
The smaller the area, the deeper the pencil sinks in the plasticine
As the area decreases, the pressure increases

(b) Spikes have small area at their ends. Pressure exerted on the ground is high.
Spikes sink in the ground. Skidding is prevented.

(c) The tank is placed on a high ground so that water pressure is high
The size of the tank is big so that it can store large volume of water
The tank is made from non corrosive material so that it will not rust
The wall of the tank is thicker at the bottom so prevent from crack due to high pressure
The base of the tank has broad base to reduce the pressure on the wall

10 (a) (i) element of the isotope which has unstable nucleus

(ii) Both graphs show the activity is decreasing.
The time taken to reduce the activity to half of its initial value is the same.
The time taken to reduce to half of its initial activity for radioisotope Q is smaller than radioisotope P
The concept involved is half-life
The half life of radioisotope Q is smaller than the half life of radioisotope P.

(b) $(236.05 - 235.85) \times 1.66 \times 10^{-27} = 3.32 \times 10^{-26}$ kg
$3.32 \times 10^{-26} \times (3 \times 10^{8})^2 = 2.99 \times 10^{-9}$ J

(c) The radioactive substance stored in thick lead so that radioactive rays do not penetrate out
The laboratory has precautionary label so that the student with the effect of exposure of radiation
The student is equiped with fotographic bagde to indicate the degree exposure.
The student carry out the experiment behind the thick concrete wall to prevent the exposure.
The waste product of the radioactive substance are sent to the treatment centre so that the surrounding such as water do not pollute.

11 (a) Density is mass per unit volume.

(b) Density of the block is lower than water.

(c) $\rho_Y < \rho_X < \rho_Z$. The liquid with highest density displaced smallest volume by the block so the block immersed least in the liquid.

(d) (i) $0.02 \times 0.05 = 0.001\ m^{-3}$.

(ii) $800 \times 0.001 \times 10 = 8$ N.

(e) The stem is long and thin so that the hydrometer is more sensitive
The air bulb has big diameter so that buoyant force is big
The wall is made from glass so that it will not react with acid
The hydrometer has lead shots so that the hydrometer float vertical in the liquid
The most suitable hydrometer is P because the stem is thin, long made from glass, big diameter of air bulb with lead shots.

12 (a) Potential difference is the amount of energy required to move 1 Coulombs of change through two points.

(b) When current flow in primary coil, magnetic field is produced. Alternating current causes the secondary coil experienced continuous change of magnetic field. The current is induced through electromagnetic induction.

(c) Use laminated soft iron core to reduce eddy current.

(d) X is step down transformer so that the voltage is reduced suitable with the domestic electrical appliances.

(e) The cable has big diameter so that the resistance is small
The density is low so that the mass is small
The rate of expansion is low so that small expansion during hot day
The most suitable cable is R because the cable has big diameter, low density and small rate of expansion.

(f) (i) $\frac{110}{10} = 11$ A

(ii) $11^2 \times 10 = 12.1$ W

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1 (a) (i) temperature
(ii) pressure
(iii) density of mercury

(c)

θ / o	T / K	h / cm
0	273	7.1
20	293	7.6
40	313	8.0
60	333	8.7
80	353	9.1
100	373	9.5

(d) h is directly proportional to T.

2 (a) (i) $\frac{1}{x}$ increases

(ii) $\frac{1}{x}$ = 0.5, x = 2.0 cm
(iii) gradient = 8 cm^2

(b) ax = 8

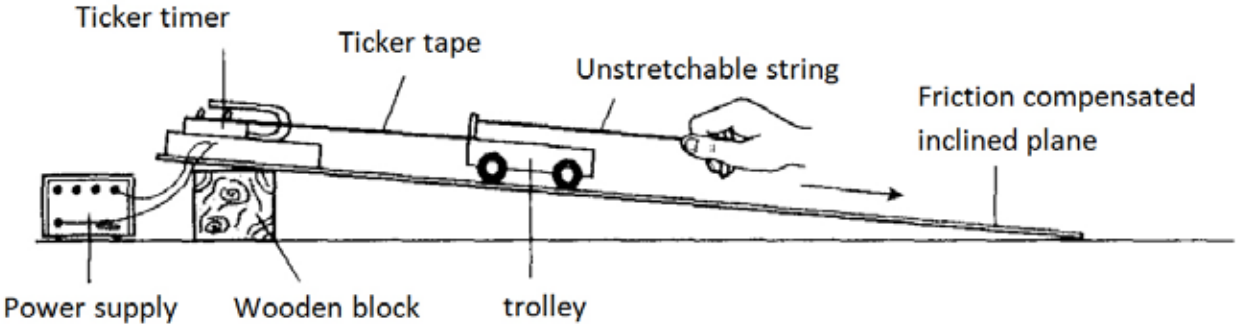
$\lambda = \frac{8}{25} = 0.32$ cm

(c) the depth of water is uniform

3 Inference : The acceleration of the rocket depends on its mass.
Hypothesis : As mass decreases, acceleration increases

Aim : To investigate the relationship between mass and acceleration.

Variable:
a) Manipulated variable - mass
b) Responding variable - acceleration
c) Fixed variable - angle of inclination of the plane



Procedure:
1 Set up the apparatus and the compensated as shown in the diagram.
2 Using beam balance, measure a trolley and load of mass 400 g
3 Turn on the power supply and pull the trolley using unstretchable string at constant length. Using a metre rule, determine the acceleration.
4 Repeat the step above by adding the mass 200 g, 400 g, 600 g and 800 g subsequently.
5 Fill in the data in the table

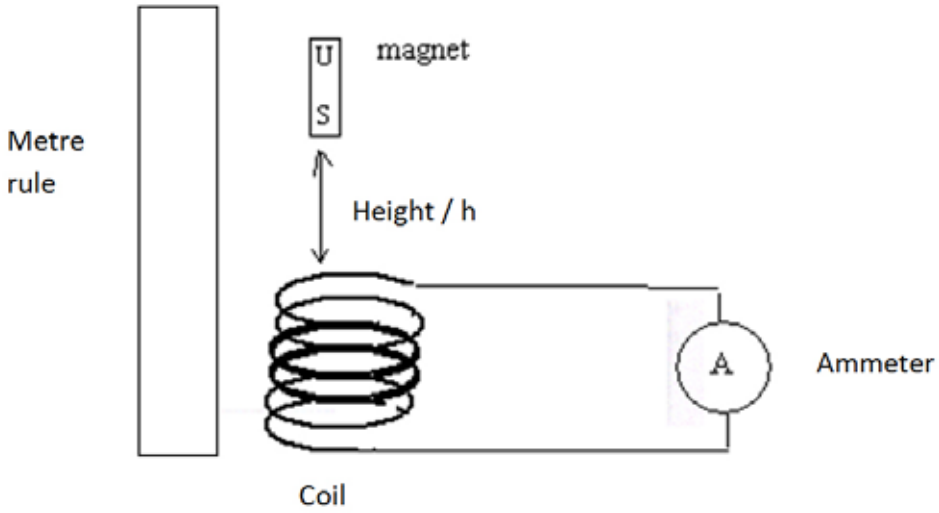
Mass / g	Acceleration / cms^{-2}

6 Plot a graph of acceleration against mass

3 Inference : The brightness of bulb depends on speed of magnet.
Hypothesis : As speed increases, current increases

Aim : To investigate the relationship between speed and current.

Variable:
a) Manipulated variable - height of magnet released represented speed
b) Responding variable - current
c) Fixed variable - number of turns of coil



Procedure:
1 Set up the apparatus as shown in the diagram.
2 Using a metre rule, hold a magnet 50.0 cm above the coil.
3 Release the magnet and read the maximum reading of the ammeter.
4 Repeat the step above by release the magnet at the height 70.0 cm, 90.0 cm, 110.cm and 130.cm
5 Fill in the data in the table

Height /cm	Current / A

6 Plot a graph of Current against height.