Section A

1   Which of the following shows the prefixes in descending order correctly?
    Antara yang berikut, yang manakah menunjukkan imbuhan unit dalam susunan menurun yang betul?
    A   micro, centi, deca, nano
        mikro, senti, deka, nano
    B   deca, centi, nano, micro
        deka, senti, nano, mikro
    C   deca, centi, micro, nano
        deka, senti, mikro, nano
    D   deca, nano, micro, centi
        deka, nano, mikro, senti

2   Which of the following physical quantities is **not** a derived quantity?
    *Antara kuantiti fizik berikut, yang manakah **bukan** kuantiti terbitan?*
    A   Frequency
        Frekuensi
    B   Mass
        Jisim
    C   Velocity
        Halaju
    D   Pressure
        Tekanan

3   A wireless device operates at a frequency of 232.2 MHz.
    How much is this frequency, in Hz?
    Sebuah peranti wayarles beroperasi pada frekuensi 232.2 MHz.
    Berapakah frekuensi ini, dalam Hz?
    A 2.322×10^7
    B 2.322×10^8
    C 2.322×10^9
    D 2.322×10^{10}

4   Which of the following is a basic unit?
    Antara yang berikut, yang manakah unit asas?
    A   Joule   B   Coulomb
        Joule   *Coulomb*
    C   Gram   D   Meter
        Gram   *Meter*

5   Which of the following physical quantities is a base quantity?
    Antara kuantiti fizik berikut, yang manakah kuantiti asas?
    A   Speed   B   Power
        Laju   *Kuasa*
    C   Length   D   Volume
        Panjang   *Isi padu*

6   Which of the following physical quantities is a derived quantity?
    Antara kuantiti fizik berikut, yang manakah kuantiti terbitan?
    A   Electric current   B   Momentum
        Arus elektrik   *Momentum*
    C   Temperature   D   Mass
        Suhu   *Jisim*

7 Table 1 show the results of an experiment to investigate the relationship between load and extension when a spring is stretched.

Jadual 1 menunjukkan keputusan satu eksperimen untuk menyiasat hubungan antara beban dan regangan apabila satu spring direngang.

Load *Beban*	F/N	80	100	120	140	160
Extension *Regangan*	x/cm	6.5	7.0	7.5	8.0	8.5

Table 1
Jadual 1

The original length of the spring is 13.0 cm.
What is the responding variable?
Panjang asal spring ialah 13.0 cm.
Apakah pembolehubah yang bergerak balas?

A Extension
Regangan

B Material used to make the spring
Bahan yang diguankan untuk membuat spring

C Original length of the spring
Panjang asal spring

D Load
Beban

8 Diagram 1 shows an investigation about the stretching of a spring. Objects of same masses are supported by different springs.
Rajah 1 menunjukkan satu penyiasatan tentang regangan suatu spring. Objek yang bersamaan jisim disokong oleh spring yang berbeza.
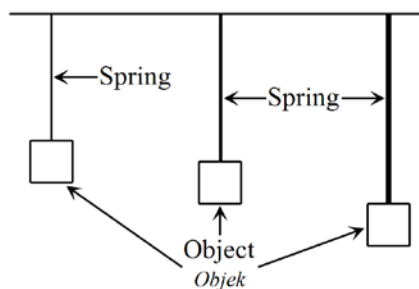

Diagram 1
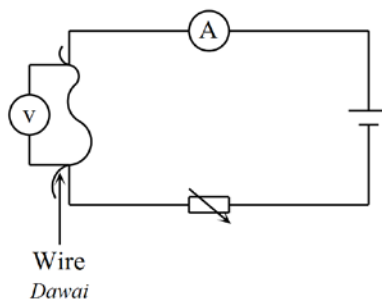*Rajah 1*

Which of the following variables are correct?
Antara pembolehubah berikut, yang manakah betul?

	Manipulated variable *Pembolehubah dimanipulasikan*	**Responding variable** *Pembolehubah bergerak balas*	**Constant variable** *Pembolehubah dimalarkan*
A	Diameter of the spring *Diameter spring*	Length of the spring *panjang spring*	Mass of the object *Jisim objek*
B	Length of the spring *panjang spring*	Diameter of the spring *Diameter spring*	Mass of the object *Jisim objek*
C	Mass of the object *Jisim objek*	Length of the spring *panjang spring*	Diameter of the spring *Diameter spring*

| D | Diameter of the spring / *Diameter spring* | Mass of the object / *Jisim objek* | Length of the spring / *panjang spring* |

9 Diagram 2 shows an electric circuit used to investigate the relationship between the resistance and the length of a wire.

Rajah 2 menunjukkan sebuah litar elektrik yang digunakan untuk mengkaji hubungan antara rintangan dengan panjang satu dawai.

Wire
Dawai

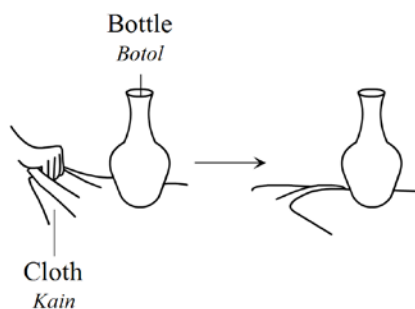**Diagram 2**
Rajah 2

Which of the following is correct?
Antara yang berikut, yang manakah betul?

	Variables *Pembolehubah*		
	Manipulated *Dimanipulasikan*	**Responding** *Bergerak balas*	**Constant** *Dimalarkan*
A	Diameter of the wire *Diameter dawai*	Resistance *Rintangan*	Length of the wire *Panjang dawai*
B	Diameter of the wire *Diameter dawai*	Length of the wire *Panjang dawai*	Resistance *Rintangan*
C	Length of the wire *Panjang dawai*	Resistance *Rintangan*	Diameter of the wire *Diameter dawai*
D	Resistance *Rintangan*	Length of the wire *Panjang dawai*	Diameter of the wire *Diameter dawai*

10 Diagram 3 shows the position of a bottle before and after a cloth is snatched away.
Rajah 3 menunjukkan kedudukan sebuah botol sebelum dan selepas sehelai kain disentap.

Bottle
Botol

Cloth
Kain

Diagram 3
Rajah 3

The bottle remains stationary due to
Botol itu kekal pegun disebabkan oleh

A speed
   kelajuan

B inertia
   inersia

C gravity
   graviti

D momentum
   momentum

11

> An object continues in stationary state, or move with uniform velocity, unless there is an external force that changes its state of motion.
> *Suatu objek terus berada dalam keadaan pegun, atau bergerak dengan halaju malar, kecuali terdapat satu daya luar yang mengubah keadaan gerakannya.*

Which law is explained by the above statement?
Apakah hukum yang diterangkan oleh pernyataan di atas?

A Newton's second law of motion
   Hukum gerakan Newton kedua

B Newton's fourth law of motion
   Hukum gerakan Newton keempat

C Newton's first law of motion
   Hukum gerakan Newton pertama

D Newton's third law of motion
   Hukum gerakan Newton ketiga

12 Diagram 4 shows the flow of air from *S* to *T*.
   Rajah 4 menunjukkan pengaliran udara dari S ke T.

Fast air
Udara laju

Slow air
Udara perlahan
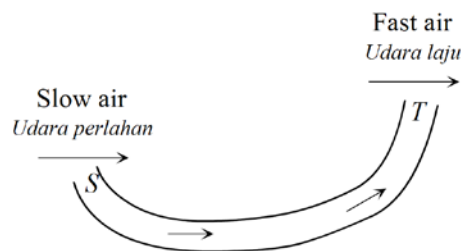
Diagram 4
Rajah 4

What principle explains the flow of air?
Apakah prinsip yang boleh menerangkan pengaliran udara itu?

A Newton's First Law
   Hukum Pertama Newton

B Pascal's principle
   Prinsip Pascal

C Bernoulli's principle
   Prinsip Bernoulli

D Principle of conservation of momentum
   Prinsip keabadian momentum

Diagram 5 shows the condition of a bottle which initially contains hot air, before and after being put into a basin of ice.

13 *Rajah 5 menunjukkan keadaan botol yang pada awalnya mengandungi udara panas, sebelum dan selepas dimasukkan ke dalam sebuah besen yang berisi ais.*
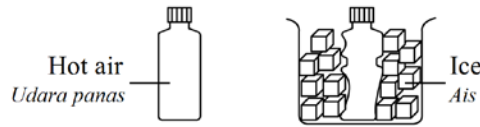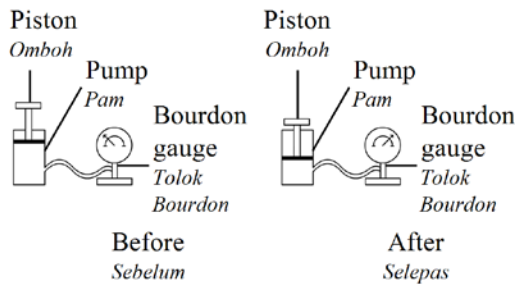

Diagram 5
Rajah 5

Which of the following laws explained the situation?
Antara hukum-hukum berikut, yang manakah menjelaskan situasi tersebut?

A	Euler's law	**B**	Newton's law
	Hukum Euler		*Hukum Newton*
C	Pressure law	**D**	Charles's law
	Hukum tekanan		*Hukum Charles*

14 Diagram 6 shows a pump connected to a Bourdon gauge. The reading on the Bourdon gauge before and after the piston is pushed in are shown below.
Rajah 6 menunjukkan sebuah pam disambung ke tolok Bourdon. Bacaan pada tolok Bourdon itu sebelum dan selepas omboh ditolak masuk ditunjukkan di bawah.
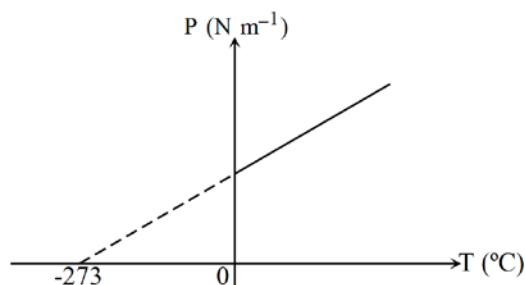

Diagram 6
Rajah 6

Which of the following explains the situation?
Antara yang berikut, yang manakah menerangkan situasi tersebut?

A	Pressure law	**B**	Hooke's law
	Hukum tekanan		*Hukum Hooke*
C	Boyle's law	**D**	Euler's law
	Hukum Boyle		*Hukum Euler*

15 Diagram 7 is a graph which shows the relationship between pressure, P, and temperature, T, of a fixed mass of gas at constant volume.
Rajah 7 ialah graf yang menunjukkan hubungan antara tekanan, P, and suhu, T, suatu gas berjisim tetap pada isi padu malar.

Diagram 7
Rajah 7

Which of the following statement is correct?
Antara pernyataan yang berikut, yang manakah betul?

A The kinetic energy of the gas molecules is maximum at −273°C
  Tenaga kinetik molekul-molekul gas adalah maksimum pada −273°C

B The gas pressure is inversely proportional to the temperature
  Tekanan gas adalah berkadar songsang dengan suhu

C The gas pressure is zero at 0°C
  Tekanan gas adalah sifar pada 0°C

D The gas molecules are not moving at −273°C
  Molekul-molekul gas tidak bergerak pada −273°C

16 Which of the following statements is correct when a fixed mass of gas in a bottle of fixed volume is heated?
Pernyataan manakah yang betul apabila suatu gas berjisim tetap dalam suatu botol berisipadu tetap dipanaskan?

A The molecules of the gas move with higher velocity
  Molekul gas bergerak dengan halaju yang lebih tinggi

B The pressure of the gas is constant
  Tekanan gas adalah malar

C The molecules of the gas move with lower velocity
  Molekul gas bergerak dengan halaju yang lebih rendah

D The molecules of the gas move further apart
 *Molekul gas bergerak lebih jauh antara satu sama lain*

17 Which of the following is the constant variables for the experiment to confirm the Boyle's Law?
Antara yang berikut, yang manakah adalah pemalar-pemalar bagi eksperimen untuk mengesahkan Hukum Boyle?

A The pressure and the mass of the gas
  Tekanan dan jisim gas

B The mass and the temperature of the gas
  Jisim dan suhu gas

C The volume and the mass of the gas
  Tekanan dan jisim gas

D The volume and the temperature of the gas
  Tekanan dan suhu gas

18 Diagram 8 shows a dented bottle before and after being placed in hot water.
*Rajah 8 menunjukkan suatu botol yang kemek sebelum dan selepas diletakkan dalam air panas.*

Diagram 8
Rajah 8
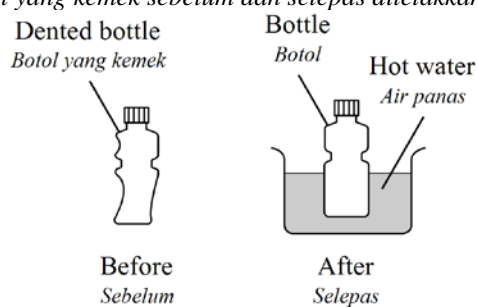
Which of the following is correct?
Antara yang berikut, yang manakah betul?

	Mass of the air *Jisim udara*	**Kinetic energy of the air molecules** *Tenaga kinetik molekul-molekul udara*
A	Increases *Bertambah*	Decreases *Berkurang*
B	Decreases *Berkurang*	Decreases *Berkurang*
C	Unchanged *Tidak Berubah*	Decreases *Berkurang*
D	Unchanged *Tidak Berubah*	Increases *Bertambah*

19 Diagram 9 shows an object is placed in front of a concave mirror. The distance of the object is same as the focal length, *f*, of the mirror.
*Rajah 9 menunjukkan satu objek diletakkan di hadapan satu cermin cekung. Jarak objek itu adalah sama dengan panjang fokus, f, cermin itu.*

Concave mirror
Cermin cekung

Object
Objek

f
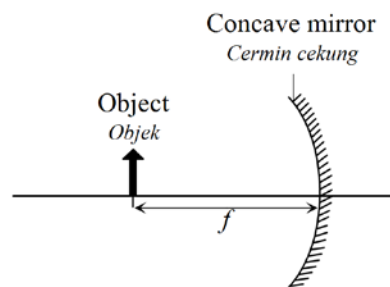
Diagram 9
Rajah 9

The characteristics of the image formed is
Sifat imej yang terbentuk ialah

A virtual, inverted, same size as the object
maya, songsang, sama saiz dengan objek

B virtual, upright, smaller than object
maya, tegak, lebih kecil daripada objek

C virtual, upright, bigger than object
maya, tegak, lebih besar daripada objek

D real, inverted, bigger than object
nyata, songsang, lebih besar daripada objek

20 Diagram 10 shows an object is placed at distance of 2*f* in front of a concave mirror. *f* is focal length.
Rajah 10 menunjukkan satu objek diletakkan pada jarak 2f di hadapan sebuah cermin cekung. f ialah panjang fokus.

Concave mirror
*Cermin cekung*

Object
Objek

f

2f
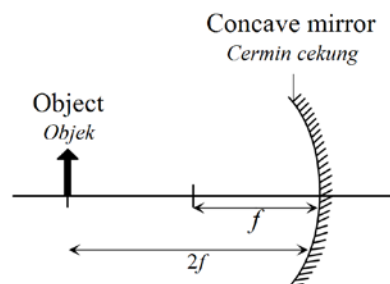
Diagram 10
Rajah 10

The characteristics of the image formed is
Sifat imej yang terbentuk ialah

A real, inverted, same size as the object
    nyata, songsang, sama saiz dengan objek

B virtual, upright, bigger than object
    maya, tegak, lebih besar daripada objek

C real, inverted, smaller than object
    nyata, songsang, lebih kecil daripada objek

D real, upright, smaller than object
    nyata, tegak, lebih kecil daripada objek

21 Which of the following physical quantity of a wave will change when the wave is reflected?
    Antara kuantiti fizik bagi suatu gelombang berikut, yang manakah akan berubah apabila gelombang itu dipantulkan?

A Direction of propagation
    Arah perambatan

B Wavelength
    Panjang gelombang

C Amplitude
    Amplitud

D Frequency
    Frekuensi

22 When a wave is reflected, the wave changes its
    Apabila suatu gelombang dipantulkan, gelombang itu mengubah

A speed
    lajunya

B frequency
    frekuensinya

C wavelength
    panjang gelombangnya

D direction of propagation
    arah perambatannya

23 Ultrasound can be used to
    Ultra boleh digunakan untuk

A destroy cancer cells
    membunuh sel-sel kanser

B determine ocean depth
    menentukan kedalaman lautan

C detect counterfeit notes
    mengesan wang kertas palsu

D check baggage at the airport
    memeriksa bagasi di lapangan terbang

24 Diagram 11 shows a parallel circuit.
    R_1, R_2, and R_3 are not equal to each other.
    Rajah 11 menunjukkan sebuah litar selari.
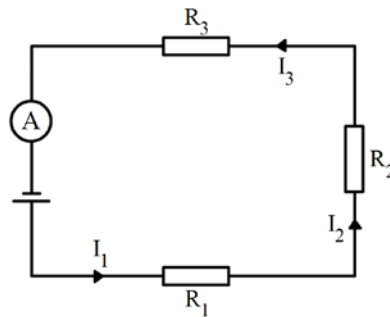   *R_1, R_2 dan R_3 tidak sama antara satu sama lain.*
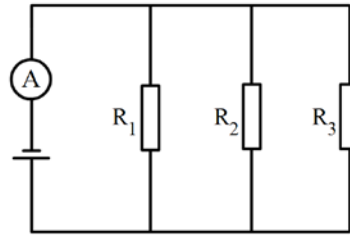
Diagram 11
Rajah 11

The physical quantity that must be same for all three resistors is
Kuantiti fizik yang mesti sama untuk ketiga-tiga perintang ialah

A power
    kuasa

B energy
    tenaga

C voltage
    voltan

D resistance
    rintangan

25 Diagram 12 shows an electric circuit.
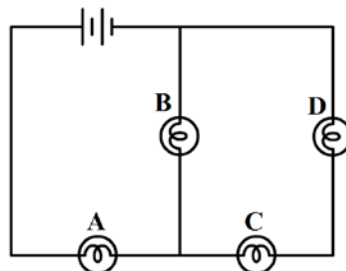   *Rajah 12 menunjukkan sebuah litar elektrik.*

Diagram 12
Rajah 12

Which of the following is correct?
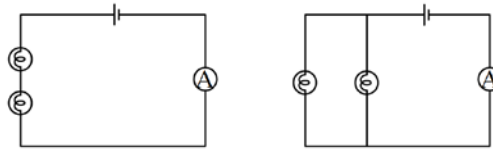*Antara yang berikut, yang manakah betul?*

A $I_1 > I_2 = I_3$

B $I_1 < I_2 < I_3$

C $I_1 = I_2 > I_3$

D $I_1 = I_2 = I_3$

26 Diagram 13 shows an electric circuit with four bulbs, **A**, **B**, **C**, and **D**.
    Which bulb when burned will prevent all other bulbs from lighting up?
    Rajah 13 menunjukkan sebuah litar elektrik dengan empat mentol, A, B, C, and D.
    Antara mentol yang manakah, apabila rosak, akan menyebabkan semua mentol lain tidak menyala?

Diagram 13
Rajah 13

27 Diagram 14 shows a series circuit and a parallel circuit.
*Rajah 14 menunjukkan sebuah litar sesiri dan sebuah litar selari.*

Diagram 14
Rajah 14

Which of the following statement is correct?
Antara pernyataan yang berikut, yang manakah betul?

A The bulbs in the series circuit are brighter than the bulbs in parallel circuit
Mentol dalam litar sesiri adalah lebih cerah daripada litar selari

B The bulbs in the series circuit are darker than the bulbs in parallel circuit
Mentol dalam litar sesiri adalah lebih gelap daripada litar selari

C The total voltage in the series circuit is greater than the total voltage in parallel circuit
Jumlah voltan dalam litar sesiri adalah lebih besar daripada litar selari

D The total current flow in the series circuit is larger than the total current flow in parallel circuit
Jumlah arus yang mengalir dalam litar sesiri adalah lebih besar daripada litar selari

28 An electric appliance labelled 95 W. What does the label means?
Sebuah perkakas elektrik dilabel 95 W. Apakah maksud label tersebut?

A The rate of change of energy is 95 J/s
Kadar perubahan tenaga ialah 95 J/s

B The rate of change of power is 95 W
Kadar perubahan kuasa ialah 95 W

C The rate of change of current is 95 A
Kadar perubahan arus ialah 95 A

D The rate of change of voltage is 95 V
Kadar perubahan voltan ialah 95 V

29 A magnetic field is
Medan magnet ialah

A an area where the magnetic forces act on
kawasan di mana daya magnetik bertindak

B an area where the electric forces act on
kawasan di mana daya elektrik bertindak

C an area where the kinetic forces act on
kawasan di mana daya kinetik bertindak

D an area where the electromotive forces act on
kawasan di mana daya gerak elektromotif bertindak

30 Diagram 15 shows four similar compasses placed around a conductor.
Rajah 15 menunjukkan empat kompas yang serupa diletakkan di sekeliling suatu konduktor.
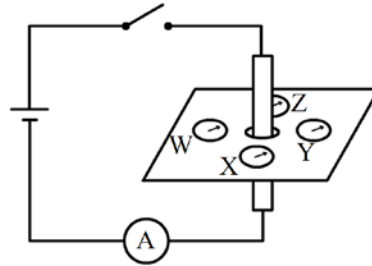
Diagram 15
Rajah 15

Which of the following directions of the magnetic field showed by the four compasses is correct when the switch is closed?
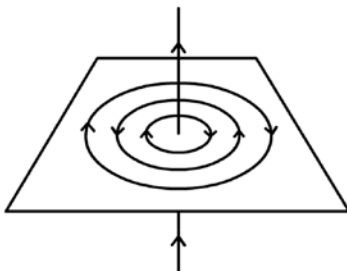*Antara arah medan magnet yang ditunjukkan oleh kempat-empat kompas tersebut yang berikut, yang manakah betul apabila suis ditutupkan?*

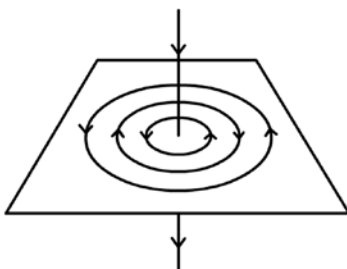|	W	X	Y	Z
A	↑	←	↓	→
B	→	↓	←	↑
C	←	↓	↑	→
D	↓	↑	→	←

31 Which of the following diagrams shows the correct pattern of magnetic field?
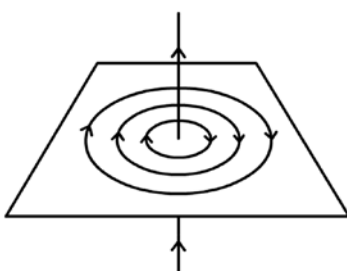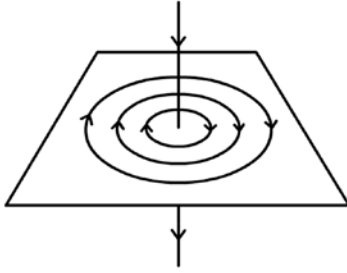*Antara rajah-rajah berikut, yang manakah menunjukkan corak medan magnet yang betul?*
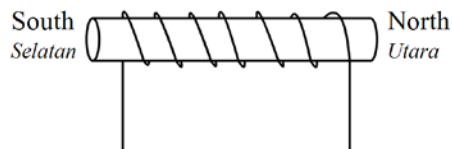
A

B

C

D

32 Diagram 16 shows a solenoid.
Rajah 16 menunjukkan satu solenoid.

Diagram 16
Rajah 16

The rule that used to determine the direction of the current in the coil is
Petua yang digunakan untuk menentukan arah arus dalam gegelung ialah

A the Right Hand
Screw Rule
*Petua Skru Tangan
Kanan*

B the Right Hand
Grip Rule
*Petua Genggaman
Tangan Kanan*

C the Fleming's
Left Hand Rule
*Petua Tangan Kiri
Fleming*

D the Fleming's
Right Hand Rule
*Petua Tangan
Kanan Fleming*

33 Diagram 17 shows an experiment to observe the magnetic field created by a current in a coil.
Rajah 17 menunjukkan satu eksperimen untuk memerhatikan medan magnet dihasilkan oleh arus dalam gegelung.
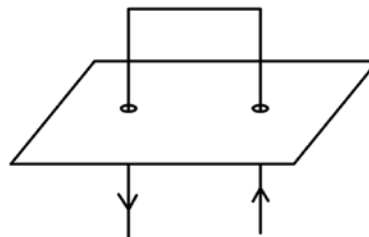
Diagram 17
Rajah 17

The correct magnetic field is
Medan magnet yang betul ialah

A
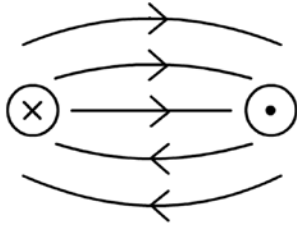
B
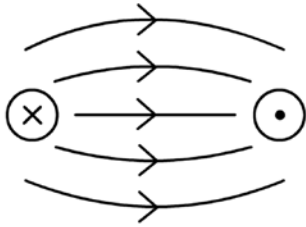
C
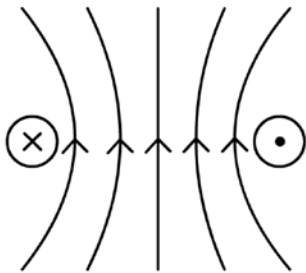
D
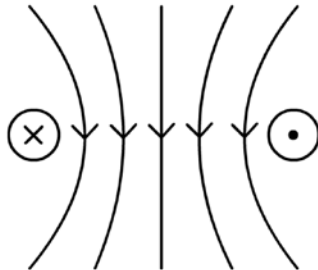
34 Diagram 18 shows an experiment to investigate the effect of an electromagnet.
Rajah 18 menunjukkan satu eksperimen untuk mengkaji kesan elektromagnet.
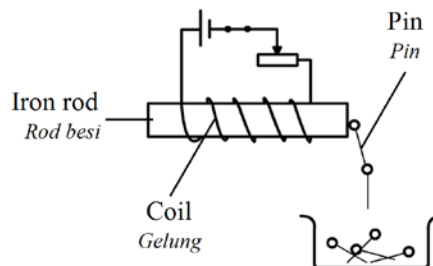
Diagram 18
Rajah 18

How to increase the number of pins attracted to the iron rod?
Bagaimanakah cara untuk menambahkan bilangan pin yang tertarik pada rod besi tersebut?

A Use a thinner wire
Guna dawai yang lebih halus

B Reduce the number of coils
Kurangkan bilangan lilitan gegelung

C Use a non-insulated wire
Guna dawai yang tidak bertebat

D Use a larger current
Guna arus yang lebih besar

35 Diagram 19 shows a solenoid.
Rajah 19 menunjukkan satu solenoid.
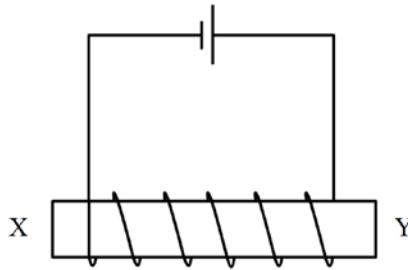
Diagram 19
Rajah 19

Which of the following is correct about the magnetic poles for X and Y?
Antara yang berikut, yang manakah betul mengenai pola-pola magnet X dan Y?

|	X	Y
A	North *Utara*	North *Utara*
B	North *Utara*	South *Selatan*
C	South *Selatan*	South *Selatan*
D	South *Selatan*	North *Utara*

36 Diagram 20 shows two iron cores wound with copper wire in a circuit.
Rajah 20 menunjukkan dua teras besi dililitkan dengan dawai kuprum dalam satu litar.
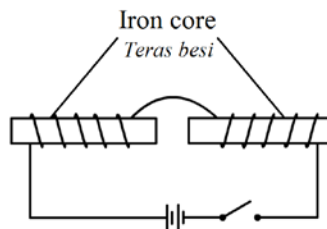
Diagram 20
Rajah 20

When the switch is closed,
Apabila suis ditutupkan,

A the iron cores are heated up
teras-teras besi dipanaskan

B the iron cores attract to each other
teras-teras besi menarik antara satu sama lain

C the iron cores repel against each other
teras-teras besi menentang antara satu sama lain

D the magnetic field strength for both iron cores is the same
kekuatan medan magnet teras-teras besi adalah sama

37 Diagram 21 shows a system of transmission of electricity.
Rajah 21 menunjukkan satu sistem penghantaran elektrik.
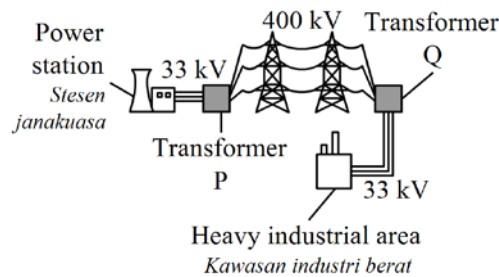
Diagram 21
Rajah 21

Which of the following is correct?
Antara yang berikut, yang manakah betul?

	P	**Q**
A	Step down *Injak turun*	Step down *Injak turun*
B	Step up *Injak naik*	Step up *Injak naik*
C	Step up *Injak naik*	Step down *Injak turun*
D	Step down *Injak turun*	Step up *Injak naik*

38 Diagram 22 shows a system of transmission of electricity.
Rajah 22 menunjukkan satu sistem penghantaran elektrik.

Diagram 22
Rajah 22

Which of the following is correct?

Antara yang berikut, yang manakah betul?

	Transformer X		Transformer Y	
	Primary coil (turns) *Gegelung primer (lilitan)*	**Secondary coil (turns)** *Gegelung sekunder (lilitan)*	**Primary coil (turns)** *Gegelung primer (lilitan)*	**Secondary coil (turns)** *Gegelung sekunder (lilitan)*
A	120	2400	2400	120
B	2400	120	2400	120
C	2400	120	120	2400
D	120	2400	120	2400

39 What is the function of a transformer in an electrical energy transmission system?

Apakah fungsi transformer dalam sistem penghantaran tenaga elektrik?

   A To change the potential difference
   Untuk mengubah beza keupayaan

   B To increase the power
   Untuk meningkatkan kuasa

   C To decrease the resistance
   Untuk mengurangkan rintangan

   D To reduce the power
   Untuk merendahkan kuasa

40 Diagram 23 shows the national system grid network.

Rajah 23 menunjukkan rangkaian sistem grid nasional.
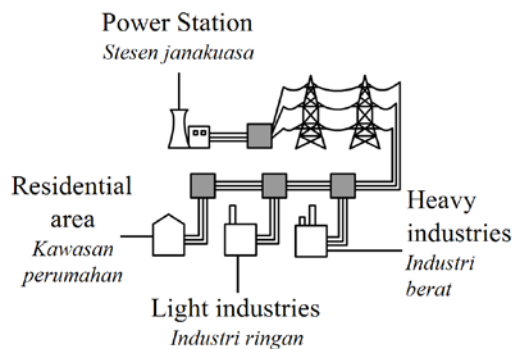
Diagram 23
Rajah 23

Which of the following is **not** an advantage of this type of network?

*Antara yang berikut, yang manakah **bukan** kelebihan rangkaian jenis ini?*

   A Power stations can be located far away from the residential area
   Stesen janakuasa boleh ditempatkan juah dari kawasan perumahan

   B Cope better with peak consumption periods
   Untuk menangani masa pengunaan puncak dengan lebih baik

   C Maintenance can be carried out at any station at any time
   Penyelenggaraan boleh dilakukan di mana-mana stesen pada bila-bila masa

   D Small amount of cables used
   Jumlah kabel yang digunakan kecil

41 Diagram 24 shows a model of transmission of electrical energy which consisting two transformers and three similar bulbs X, Y, and Z.

Rajah 24 menunjukkan satu model penghantaran tenaga elektrik yang mengandungi dua transformer dan tiga mentol serupa, X, Y, dan Z.

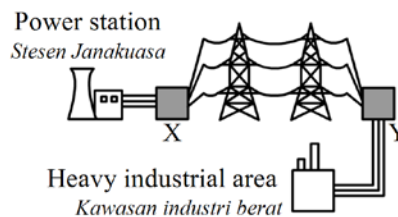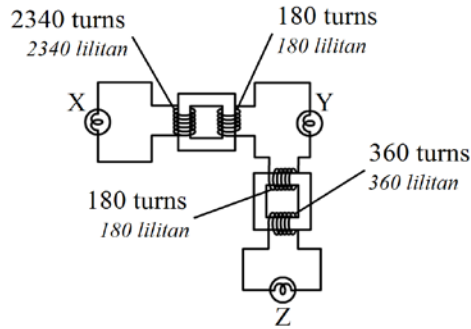**Diagram 24**
Rajah 24

Which of the following is correct about the brightness of the bulbs?
Antara yang berikut, yang manakah betul tentang kecerahan mentol-mentol tersebut?

	X	Y	Z
A	Bright *Cerah*	Brighter *Lebih cerah*	Brightest *Paling cerah*
B	Brightest *Paling cerah*	Brighter *Lebih cerah*	Bright *Cerah*
C	Bright *Cerah*	Brightest *Paling cerah*	Brighter *Lebih cerah*
D	Brighter *Lebih cerah*	Brightest *Paling cerah*	Bright *Cerah*

42 Diagram 25 shows a cathode being heated by a filament.
Rajah 25 menunjukkan satu katod yang dipanaskan oleh satu filamen.
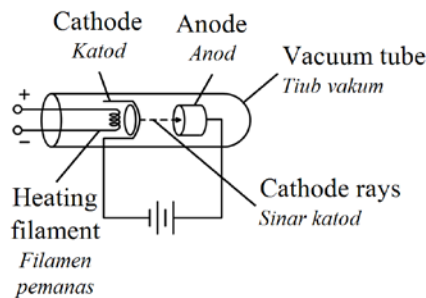
Diagram 25
Rajah 25

The particle emitted from the cathode is
Zarah yang dipancarkan dari katod ialah

A Neutron
   Neutron
B Proton
   Proton
C Alpha
   Alfa
D Electron
   Elektron

43 Diagram 26 shows a cathode ray oscilloscope and a waveform.
Rajah 26 menunjukkan sebuah osiloskop sinar katod dan satu corak gelombang.
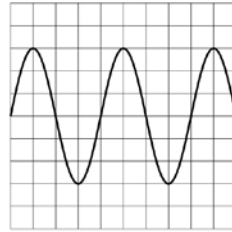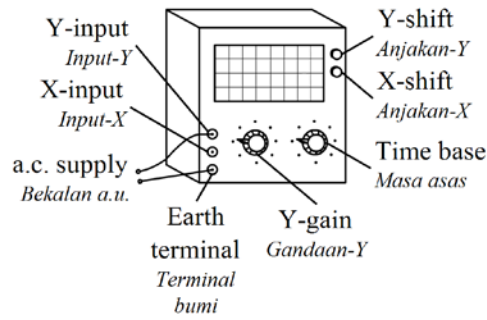
Diagram 26
Rajah 26

The waveform in Diagram 26 is produced when
Corak gelombang dalam Rajah 26 dihasilkan apabila

A the time base is switched off
  masa asas dimatikan

B the time base is switched on
  masa asas dihidupkan

C the Y-shift is adjusted
  anjakan-Y dilaraskan

D the X-shift is adjusted
  anjakan-X dilaraskan

44 Diagram 27 shows the process of the electrons escaping from the surface of a heated metal.
   Rajah 27 menunjukkan proses elektron terbebas daripada permukaan logam yang dipanaskan.
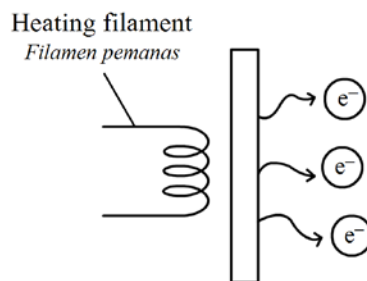
Diagram 27
Rajah 27

This process is called
Proses ini dipanggil

A refraction
pembiasan

B evaporation
penyejatan

C thermionic emission
pancaran termion

D rectification
rektifikasi

45 Diagram 28 shows a cathode ray oscilloscope.
Which component, **A**, **B**, **C**, and **D**, accelerates the electron?
Rajah 28 menunjukkan satu osiloskop sinar katod.
Antara komponen A, B, C, dan D, memecutkan elektron?

Electron beam
Alur elektron

A B C D
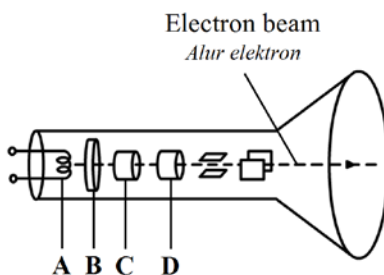
Diagram 28
Rajah 28

46 Which of the following statement is **not** correct about a cathode ray in an electron gun?
*Antara pernyataan yang berikut, yang manakah **tidak** betul tentang sinar katod dalam senapang elektron?*

A The cathode ray is negatively charged
Sinar katod bercas negatif

B The kinetic energy of the cathode ray converted into light when it is on the fluorescent screen
Tenaga kinetik sinar katod diubahkan kepada cahaya apabila ia mengenai skrin berpendaflour

C The cathode ray is positively charged
Sinar katod bercas positif

D The electric fields deflect the cathode ray
Medan elektrik memesongkan sinar katod

47 Diagram 29 shows a cathode ray oscilloscope, CRO, is connected to an audio signal generator.
Rajah 29 menunjukkan satu osiloskop sinar katod, OSK, disambungkan ke suatu penjana isyarat audio.

Audio signal generator
Penjana isyarat audio

CRO
OSK
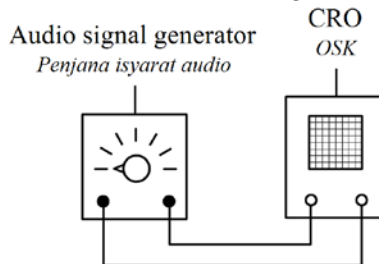
Diagram 29
Rajah 29

The wave trace that shows the loudest and the highest pitched audio signal is
Surihan gelombang yang menunjukkan isyarat audio yang paling kuat dan paling langsing ialah

A   **B**

C   **D**
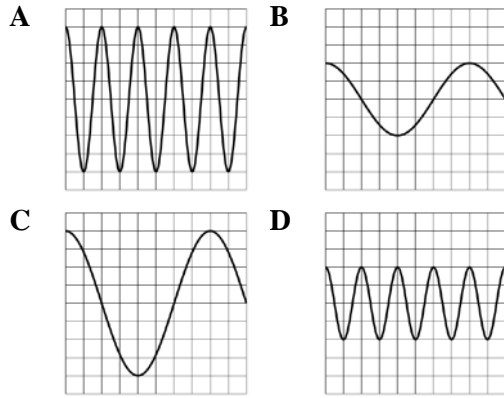
48   The diagram that shows the correct movement of an electron beam in an electric field is
Gambar rajah yang menunjukkan pergerakan yang betul bagi alur elektron dalam medan eletrik ialah

A
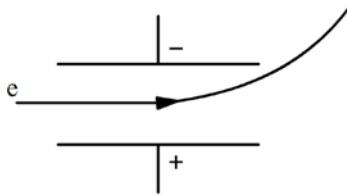
B
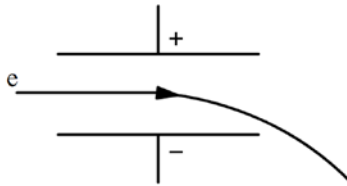
C
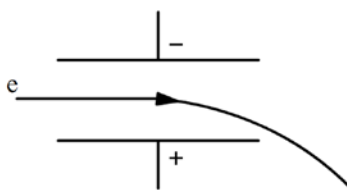
D
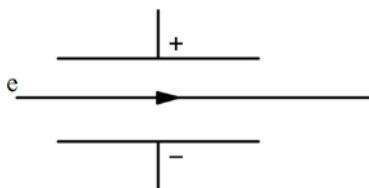
49   Diagram 30 shows a Maltese Cross Tube. A shadow formed on the screen is deflected by the magnets.
Rajah 30 menunjukkan satu Tiub Palang Maltese. Satu bayang terbentuk di atas skrin dipesongkan oleh magnet.
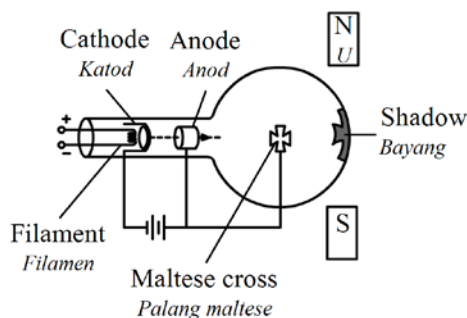
Diagram 30
Rajah 30

Which of the following rules is used to determine the direction of the deflection?
Antara petua yang berikut, yang manakah digunakan untuk menentukan arah pesongan?

A The Fleming's left hand rule
   Petua tangan kiri Fleming

B The Fleming's right hand rule
   Petua tangan kanan Fleming

C The right hand grip rule
   Petua genggaman tangan kanan

D The left hand grip rule
   Petua genggaman tangan kiri

50 Which of the following radioactive detector can **not** be used to detect gamma ray?
   *Antara alat pengesan radioaktif berikut, yang manakah **tidak** boleh digunakan untuk mengesan sinar gama?*

A Spark counter
   Pembilang bunga api

B Cloud chamber
   Kebuk awan

C Photographic film
   Filem fotografi

D Geiger-Muller tube
   Tiub Geiger-Muller

Answer:

1 C	**2** B	**3** B	**4** D	**5** C
6 B	**7** A	**8** A	**9** C	**10** B
11 C	**12** C	**13** D	**14** C	**15** D
16 A	**17** B	**18** D	**19** C	**20** A
21 A	**22** D	**23** B	**24** C	**25** D
26 A	**27** B	**28** A	**29** A	**30** A
31 D	**32** B	**33** D	**34** D	**35** B
36 C	**37** C	**38** A	**39** A	**40** D
41 D	**42** D	**43** B	**44** C	**45** D
46 C	**47** A	**48** C	**49** A	**50** A

Section A
Bahagian A

[60 marks]
[*60 markah*]

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

1   Diagram 1shows an optical fibre which used to build an endoscope.
   Rajah 1 menunjukkan gentian optik yang digunakan untuk membina sebuah endoskop.
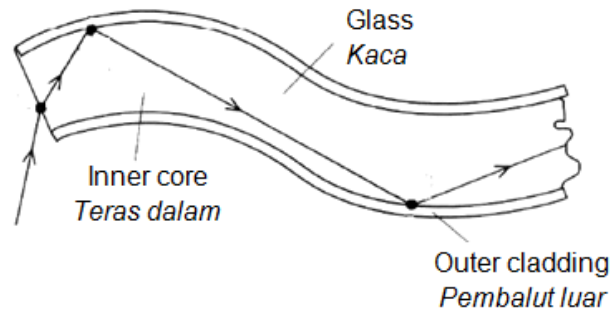
Diagram 1
Rajah 1

(a) Underline the correct answer in the bracket to complete the sentence below.
    Inner core is optically (denser, less dense) than outer cladding.

    Garis jawapan yang betul dalam kurungan untuk melengkapkan ayat di bawah.
    Teras dalam secara optiknya adalah(lebih tumpat, kurang tumpat) daripada
    pembalut luar.
                                                                        [1 mark]
                                                                        [*1 markah*]

(b) Based on Diagram 1,
    Berdasarkan Rajah 1,

    (i)   state the phenomenon of light that occurs in optical fibre.
         nyatakan fenomena cahaya yang berlaku dalam gentian optik.

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

    (ii) give **one** condition for the phenomenon in 1(b)(i) to occur.
         *beri **satu** syarat untuk fenomena dalam 1(b)(i) berlaku.*

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

1

(c) State **one** advantage of high flexibility of the optical fibre as an endoscope?
Nyatakan satu kelebihan kelenturan tinggi pada gentian optik sebagai endoskop?

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

2   Diagram 2 shows the path of cathode ray in a deflection tube.
Rajah 2 menunjukkan lintasan sinar katod dalam suatu tiub pemesongan.
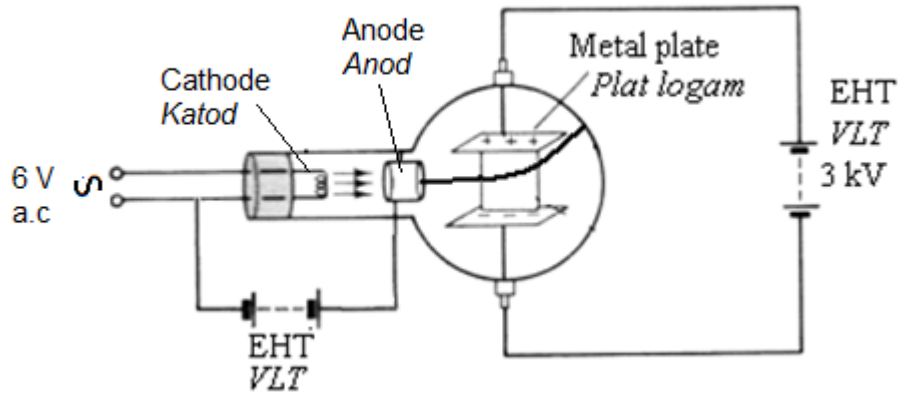
Diagram 2
Rajah2

(a) What is the meaning of cathode ray?
Apakah maksud sinar katod?

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

(b) (i)   State the type of charge of cathode ray.
Nyatakan jenis cas pada sinar katod.

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

(ii) Give one reason for the answer in 2(b)
Beri satu sebab bagi jawapan di 2(b).

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

2

(c) When the potential difference of the Extra High Tension (EHT) is increased,
Apabila beza keupayaan Voltan Lampau Tinggi (VLT) bertambah,

  (i) what happen to the angle of deflection of cathode ray?
  apa berlaku kepada sudut pesongan sinar katod itu?

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

  (ii) give one reason for the answer in 2(c)(i).
  beri satu sebab bagi jawapan di 2(c)(i).

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

3 Diagram 3 shows an electric iron labeled 240V 1000W.
   Rajah 3 menunjukkan sebuah sterika elektrik berlabel 240V 1000W.

Heating element
Unsur pemanas
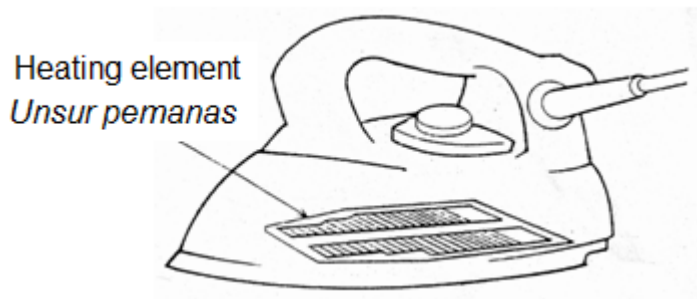
Diagram 3
Rajah 3

(a) What is the meaning of labeled 240V 1000W?
    Apakah maksud label 240V 1000W?

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

3

(b) If the electrical iron is connected to 240V of power supply, calculate;
Jika sterika elektrik itu disambungkan kepada bekalan kuasa 240V, hitung;

(i) the electric current flows through the heating element.
arus elektrik yang mengalir melalui unsur pemanas.

[2 marks]
[*2 markah*]

(ii) the resistance of the heating element.
rintangan unsure pemanas itu.

[2 marks]
[*2 markah*]

(c) Give **one** characteristic should be possessed by the heating element to produce higher heat energy.
*Beri **satu** ciri yang perlu ada pada unsur pemanas itu menghasilkan tenaga haba yang lebih tinggi.*

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

4   Diagram 4 shows the arrangement of apparatus of a gas law. The volume of trapped air in the flask is constant.
    Rajah 4 menunjukkan susunan radas bagi suatu hukum gas. Isipadu udara yang terperangkap dalam kelalang adalah tetap.

Diagram 4
Rajah 4

(a) State the physical quantity measured by Bourdon gauge?
    Nyatakan kuantiti fizik yang diukur oleh Tolok Bourdon?

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

(b) Give **one** reason why the rubber tube used is as short as possible.
    *Beri **satu** sebab mengapa tiub getah yang digunakan adalah sependek mungkin.*

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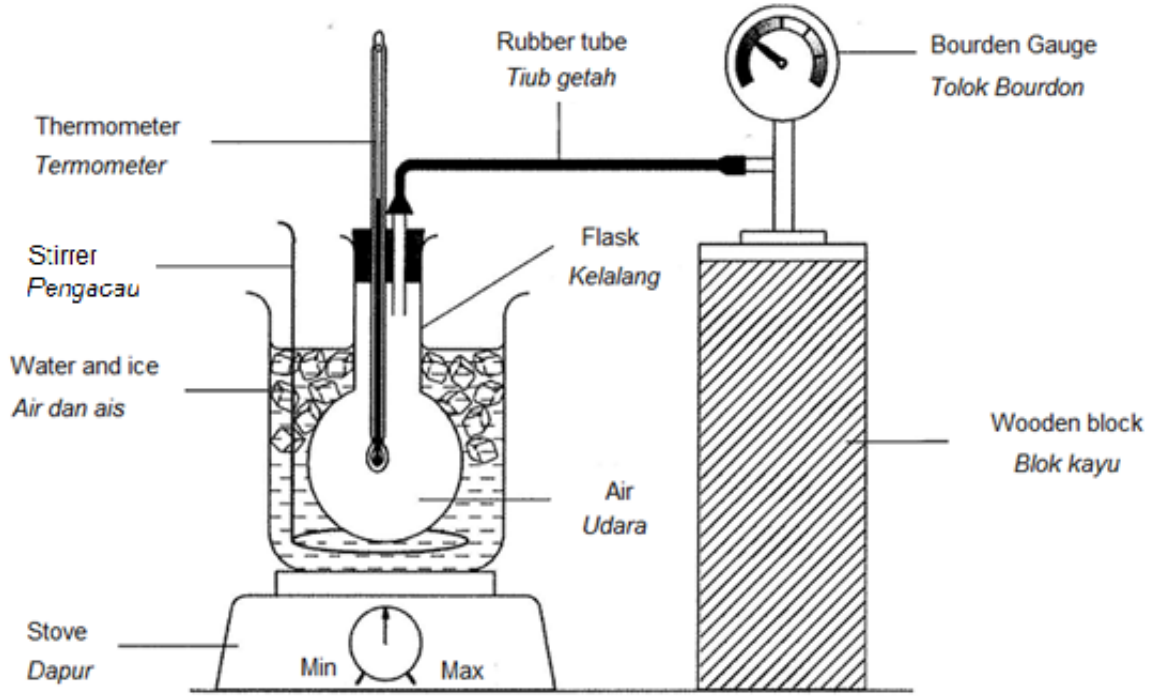   [1 mark]
                                                                                    [*1 markah*]

(c) Name the gas law involved.
    Namakan hukum gas yang terlibat.

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

5

(d) What happen to the reading of Bourdon gauge when the temperature of trapped air is increased?
Apakah berlaku kepada bacaan Tolok Bourdon bila suhu udara yang terperangkap itu bertambah?

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

(e) The reading of Bourdon gauge is 20 kPa when the temperature of trapped air is 30°C.
Bacaan Tolok Bourdon itu adalah 20 kPa suhu bila suhu udara terperangkap adalah 30°C.

(i) State the temperature of 30°C in Kelvin.
Nyatakan suhu 30°C dalam Kelvin.

[1 mark]
[*1 markah*]

(ii) Calculate the temperature of trapped air when the reading of Bourdon gauge is 25 kPa.
Hitung suhu udara terperangkap itu bila bacaan Tolok Bourdon adalah 25 kPa.

.

[2 marks]
[*2 markah*]

5   Diagram 5.1 and Diagram 5.2 show the formation of virtual image by two convex mirrors which have different curvatures. The position of objects from the pole for both mirrors is equal.
Rajah 5.1 dan Rajah5.2 menunjukkan pembentukan imej maya oleh dua cermin cembung yang mempunyai kelengkungan yang berbeza. Kedudukan objek dari kutub bagi kedua-dua cermin adalah sama.
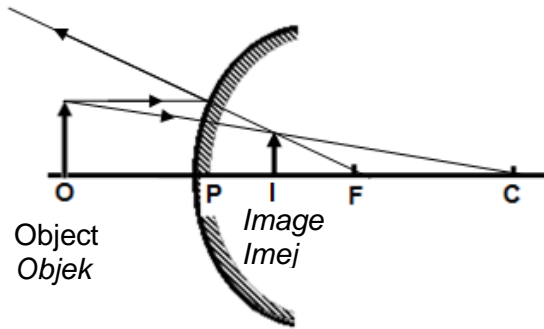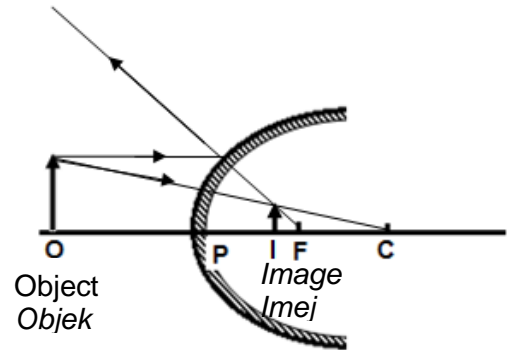

Diagram 5.1
Rajah 5.1

Diagram 5.2
Rajah 5.2

(a) What is the meaning of virtual image?
Apakah maksud imej maya?

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

(b) Observe Diagram 5.1 and Diagram 5.2.
Perhatikan Rajah 5.1 dan Rajah 5.2.

(i)   Compare the curvature of the mirrors.
Bandingkan kelengkungan cermin-cermin itu.

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

(ii) Compare the focal length of the mirrors.
Bandingkan panjang fokus cermin-cermin itu.

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

7

(iii) Compare the size of the images formed.
Bandingkan saiz imej yang terbentuk.

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

(c) Based on the answers in 5 (b);
Berdasarkan jawapan di 5(b);

    (i) state the relationship between the focal length and the curvature of the mirror.
nyatakan hubungan antara panjang fokus dan kelengkungan cermin.

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

    (ii) state the relationship between the focal length and the size of the image.
nyatakan hubungan antara panjang fokus dan saiz imej.

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

(d) What happen to the size of image formed in Diagram 5.1 when the object distance is increased?
Apakah akan berlaku kepada saiz imej yang terbentuk dalam Rajah 5.1 bila jarak objek bertambah?

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

(e) Give one application of the convex mirror for security purpose.
Beri satu kegunaan cermin cembung bagi tujuan keselamatan.

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

8

6   Diagram 6.1 and Diagram 6.2 show two transformers. The efficiency of both transformers is the same.
Rajah 6.1 dan Rajah 6.2 menunjukkan dua transformer yang serupa. Kecekapan kedua-dua transformer adalah serupa.
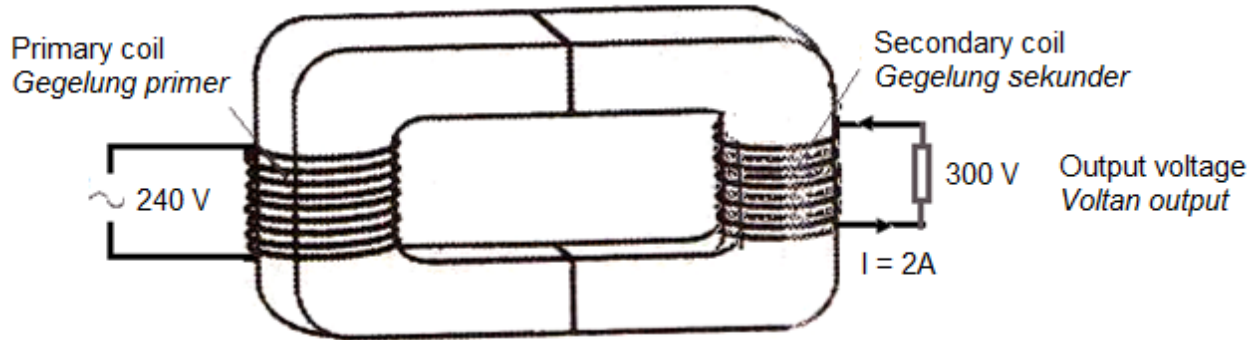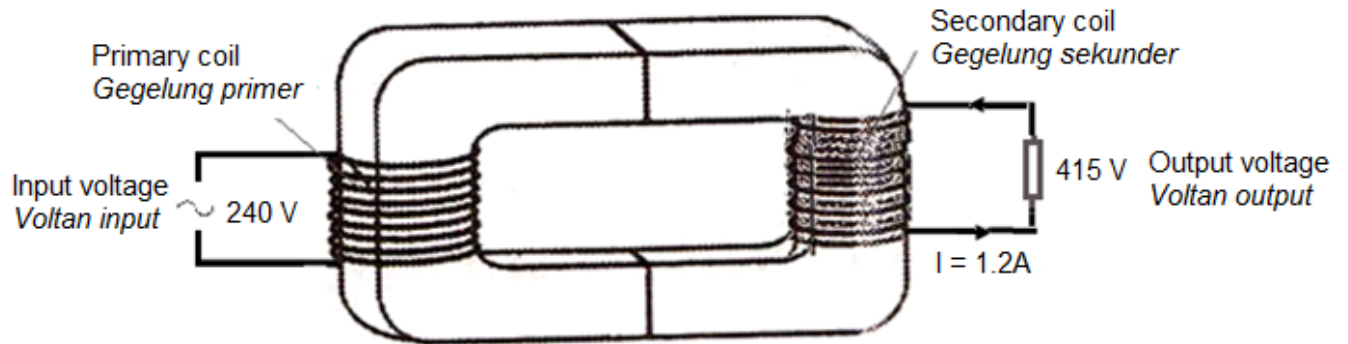

Diagram 6.1
Rajah 6.1

Diagram 6.2
Rajah 6.2

(a) What is the function of transformer?
Apakah fungsi transformer?

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

(b) Observe Diagram 6.1 and Diagram 6.2;
Perhatikan Rajah 6.1 dan Rajah 6.2,

(i)   Compare the number of turn of primary coils.
Bandingkan bilangan lilitan gegelung-gegelung primer.

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

9

(ii) Compare the number of turn of secondary coils.
Bandingkan bilangan lilitan gegelung-gegelung sekunder.

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

(iii) Compare the output voltage.
Bandingkan voltan-voltan output.

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

(iv) Compare the output current.
Bandingkan arus-arus output.

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

(c) Based on the answers in 6(b),
Berdasarkan jawapan di 6(b),

(i) state the relationship between the number of turn of secondary coil and the output voltage.
nyatakan hubungan antara bilangan lilitan gegelung sekunder dan voltan output.

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

(ii) state the relationship between the number of turn of secondary coil and the output current.
nyatakan hubungan antara bilangan lilitan gegelung sekunder dan arus output.

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

(d) Give **one** factor which causes the transformer is not 100% efficient.
*Beri **satu** faktor yang menyebabkan transformer tidak 100% cekap.*

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

7 Diagram 7.1 shows 0.4 kg mass of metal ball is hung using a string. The metal ball is in equilibrium of forces X and Y
Rajah 7.1 menunjukkan bola logam berjisim 0.4 kg digantung dengan suatu tali. Bola logam itu berada dalam keseimbangan daya-daya X dan Y.
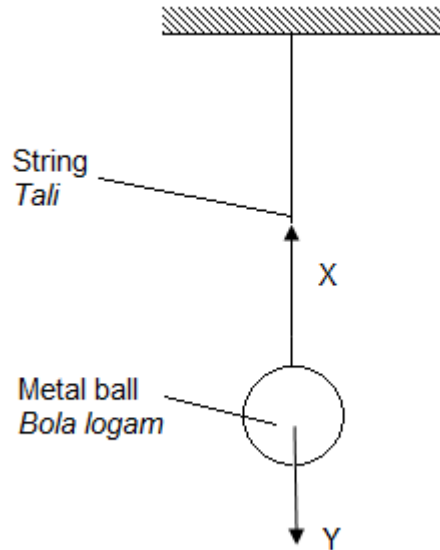

String
Tali

X

Metal ball
Bola logam

Y

Diagram 7.1
Rajah 7.1

(a) What is the meaning of equilibrium of force?
Apakah maksud keseimbangan daya?

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

(b) On Diagram 7.1, name the forces X and Y that acting on the string and the metal ball.
Pada Rajah 7.1, namakan daya-daya X dan Y yang bertindak ke atas tali dan bola logam itu.
[2 marks]
[*2 markah*]

(c) The metal ball then is pulled by a pulling force, F, at angle, Θ of 30° from vertical line as shown in Diagram 7.2 until the ball is in equilibrium of three forces.
Bola logam itu kemudian ditarik oleh suatu daya tarikan, F, pada sudut Θ 30° dari garis tegak seperti ditunjukkan dalam Rajah 7.2 sehingga bola itu berada dalam keseimbangan tiga daya.
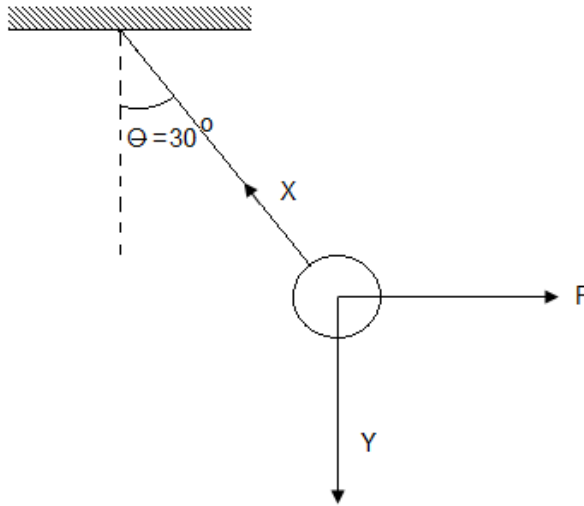
Diagram 7.2
Rajah 7.2

Using Diagram 7.2,
Menggunakan Rajah 7.2 ,

(i) draw a labeled triangle of forces.
     lukis satu segitiga daya yang berlabel .

[1 mark]
[*1 markah*]

(ii) calculate the magnitude of the pulling force, F.
     hitung magnitud daya tarikan, F.

[2 marks]
[*2 markah*]

12

(d) Suggest the modifications should be done on the system in Diagram 7.2 to avoid the string from being broken.
Cadangkan pengubahsuaian yang perlu dilakukan ke atas sistem pada Rajah 7.2 untuk mengelakkan daripada putus.

(i) The type material of string.
Jenis bahan tali.

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

Reason
Sebab

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

(ii) The angle of pulling force, F from vertical line, Θ .
Sudut daya tarikan, F daripada garis tegak, Θ.

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

Reason
Sebab

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

8   A radioactive substance emits two radioactive emissions P and Q. The path of both radioactive emissions in electric field are shown in Diagram 8.1.
    Suatu bahan radioaktif memancarkan dua sinaran radioaktif P dan Q. Lintasan kedua-dua sinaran radioaktif itu dalam medan elektrik adalah ditunjukkan dalam Rajah 8.1.
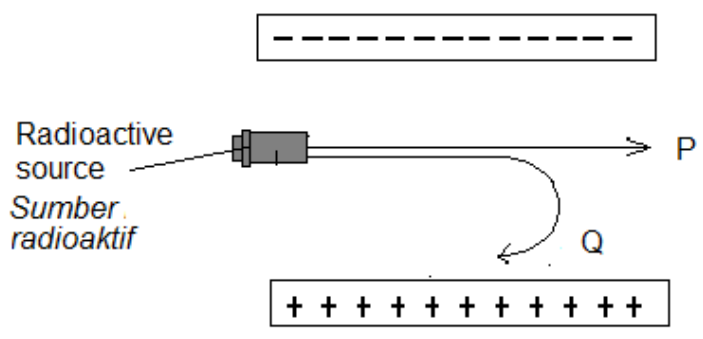
Diagram 8.1
Rajah 8.1

(a) What is the meaning of radioactive substance?
    Apakah maksud bahan radioaktif?

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

(b) Name radioactive emission of P and Q.
    Namakan sinaran radioaktif P dan Q.

    P   ....

    Q   ....

    [2 marks]
    [*2 markah*]

(c) Explain why radioactive emission P follow the path as shown in Diagram 8.1?
    Terangkan mengapa sinaran radioaktif P mengikut lintasan seperti ditunjukkan dalam Rajah 8.1?

    ....

    ....

    [2 marks]
    [*2 markah*]

14

(d) Diagram 8.2 shows a radioactive source and a detector are used to detect the level of orange juice in the boxes in a factory. The radioactive substance used emits radioactive radiation.

Rajah 8.2 menunjukkan satu sumber radioaktif dan sebuah pengesan digunakan untuk mengesan jus oren di dalam kotak-kotak bungkusan di sebuah kilang. Bahan radioaktif yang digunakan memancarkan sinaran radioaktif.
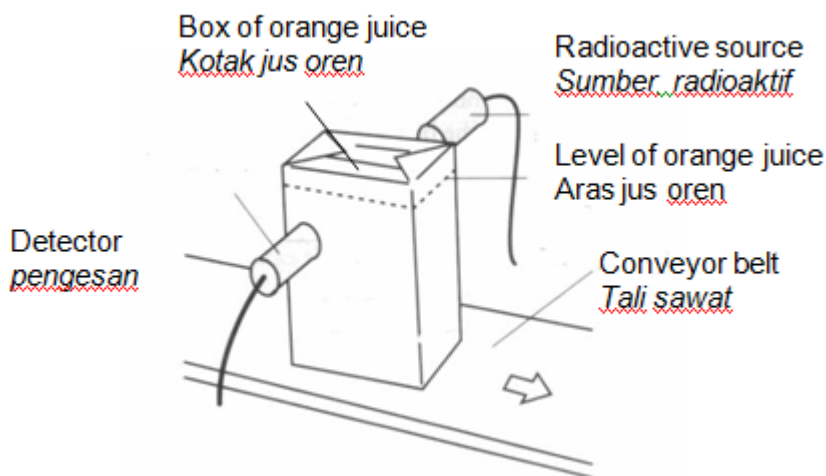
Diagram 8.2
Rajah 8.2

Table 8 shows the properties of four radioactive sources.
Jadual 8 menunjukkan sifat-sifat empat sumber radioaktif.

Source *Sumber*	Type of radiation *Jenis Sinaran*	Half-life *Separuh hayat*	State of matter *Keadaan jirim*
W	Alpha *Alfa*	50 years *50 tahun*	Solid *Pepejal*
X	Gamma *gama*	40 days *40 hari*	Liquid *Cecair*
Y	Beta *beta*	300 years *300 tahun*	Solid *Pepejal*
Z	Gamma *gama*	50 minutes *50 minit*	Gas *Gas*

Table 8
Jadual 8

Based on Table 8, state the suitable properties of the radioactive sources to detect the level of orange juice in the packed boxes. Give reason for the suitability of the properties.

Berdasarkan Jadual 8, nyatakan sifat-sifat sumber radioaktif yang sesuai untuk mengesan paras jus oren dalam kotak bungkusan. Beri sebab mengapa sifat-sifat itu sesuai.

(i) Type of radiation
     Jenis Sinaran

     ....
     Reason
     Sebab

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

(ii) Half-life
      Separuh hayat

     ....
      Reason
     Sebab

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

(iii) Type of matter
       Keadaan jirim

     ....
      Reason
     Sebab

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

(e) Based on the answers in 8(d), determine the most suitable radioactive source in Table 8 to detect the level of orange juice in the packed boxes.
     Berdasarkan jawapan di 8(d), tentukan sumber radioaktif dalam Jadual 8 yang paling sesuai yang boleh digunakan untuk mengesan paras jus oren di dalam kotak bungkusan.

     ....
                                                                          [1 *mark*]
                                                                          [1 *mark*]

[20 marks]
[20 *markah*]

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

9   Diagram 9.1 and Diagram 9.2 shows an air bubble released by an air pump in an
     aquarium. The water pressure acting on air bubbles both situations is different.
     *Rajah 9.1 dan Rajah 9.2 menunjukkan suatu gelembung udara yang dibebaskan
     daripada sebuah pam udara dalam sebuah akuarium. Tekanan air yang bertindak ke
     atas gelembung udara dalam kedua-duasituasi adalah berbeza.*
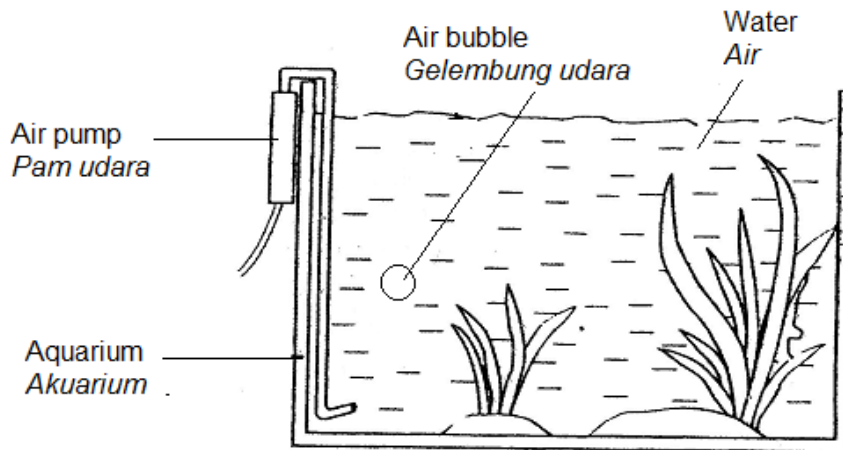
Diagram 9.1
Rajah 9.1
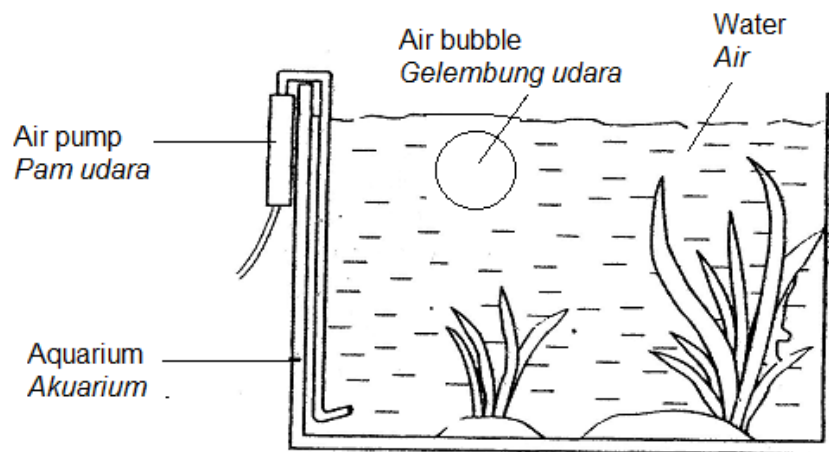
Diagram 9.2
Rajah 9.2

17

(a) What is the meaning of pressure?
Apakah maksud tekanan.

[1 mark]
[*1 markah*]

(b) Using Diagram 9.1 and Diagram 9.2, compare the depth of air bubbles, the water pressure acting on the air bubbles and the volume of the air bubbles.
Menggunakan Rajah 9.1 dan Rajah 9.2, bandingkan kedalaman gelembung udara, tekanan air yang bertindak ke atas gelembung udara itu dan isipadu gelembung - gelembung udara.

[3 marks]
[*3 markah*]

(c) State the relationship between;
Nyatakan hubungan antara

(i) the depth of air bubble and the water pressure
kedalaman gelembung udara dan tekanan air.

(ii) the water pressure and the volume of air bubble.
tekanan air dan isipadu gelembung udara.

[2 marks]
[*2 markah*]

(d) Diagram 9.3 shows a vacuum cleaner.
Rajah 9.3 menunjukkan sebuah pembersih hampagas.
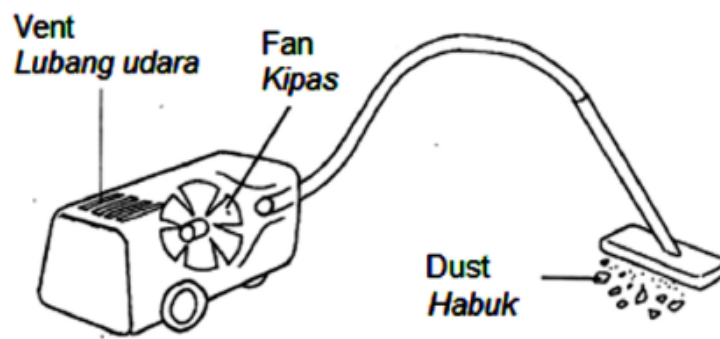
Diagram 9.3
Rajah 9.3

Explain how the vacuum cleaner is able to remove dust from the floor?
Terangkan bagaimana pembersih hampagas boleh membersihkan habuk dari lantai?

[4 marks]
[*4 markah*]

18

(e) Diagram 9.4 a hydraulic jack in a car service centre.
   Rajah 9.4 menunjukkan sebuah jek hidraulik di suatu pusat servis kereta
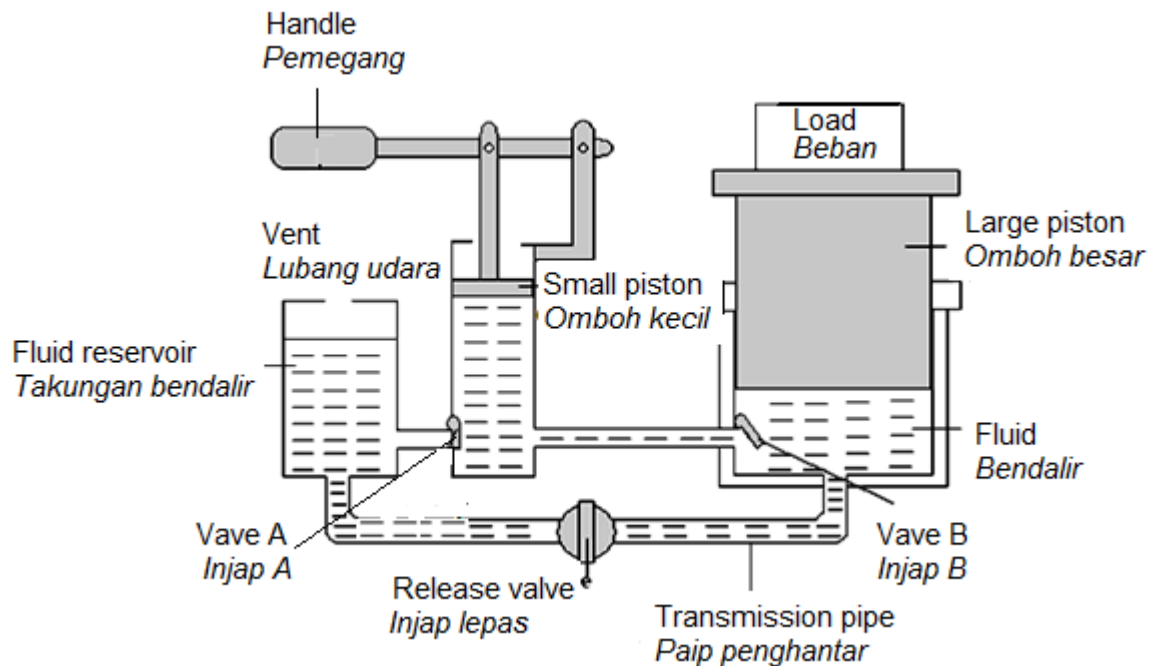
Diagram 9.4
Rajah 9.4

You are required to give some suggestions to design a hydraulic jack which can lift the heavier load and more efficient.
Anda dikehendaki untuk memberi beberapa cadangan untuk mereka bentuk sebuah jek hidraulik yang mengangkat beban yang lebih berat dan lebih cekap.

Using the knowledge on Pascal Principle and the properties of materials, explain your suggestions on the following aspects:
Menggunakan pengetahuan mengenai Prinsip Pascal dan ciri-ciri bahan, terangkan cadangan anda berdasarkan aspek-aspek berikut:

(i)   Type material of the fluid
      Jenis bahan bendalir.

(ii) Size of fluid reservoir
      Saiz takung

(iii) Density of the pistons
      Ketumpatan omboh-omboh.

(iv) the ratio of cross-sectional area of large piston to cross-sectional area of small piston.
      nisbah keratan rentas omboh besar kepada keratan rentas omboh kecil.

(v) Type material of transmission pipe
Jenis bahan paip penghantaran

[10 marks]
[*10 markah*]

10 Diagram 10.1 and Diagram 10.2 shows the experiment of sound waves. Both loud speakers in each situation act as two coherent sources of sound waves.
Rajah 10.1 dan Rajah 10.2 menunjukkan eksperimen gelombang bunyi. Kedua-dua pembesar suara dalam setiap situasi bertindak sebagai sumber koheren bagi gelombang bunyi.

Loud speaker
Pembesar suara

Audio signal generator
Penjana isyarat audio
Frequency = 400 Hz
Frekuensi

Key
Kekunci

● Loud sound
  Bunyi kuat
○ Soft sound
  Bunyi perlahan
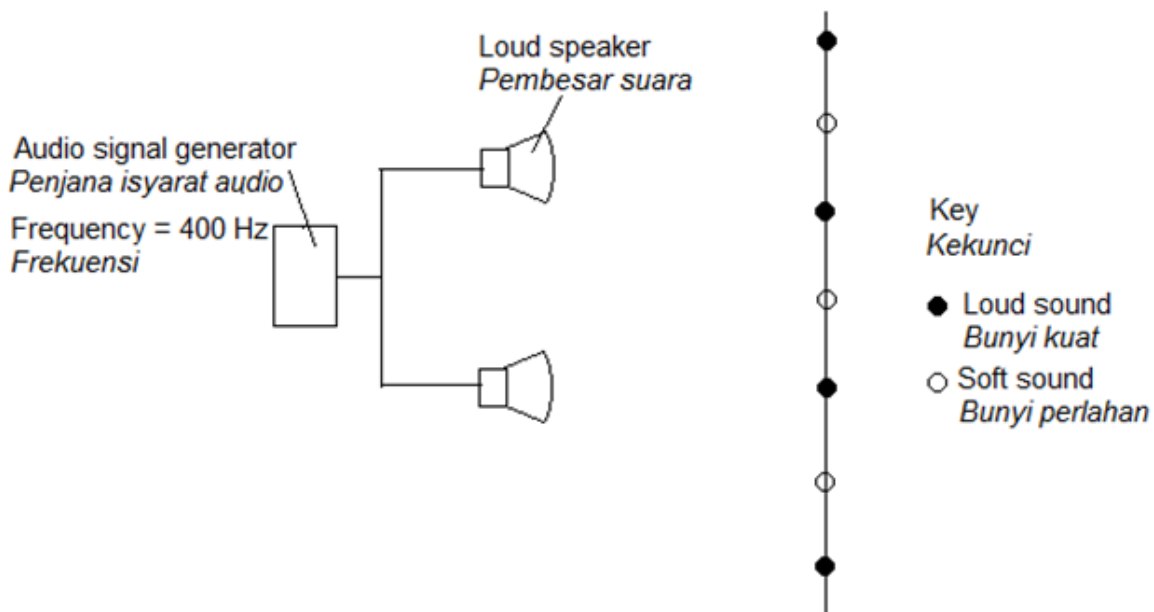
Diagram 10.1
Rajah 10.1
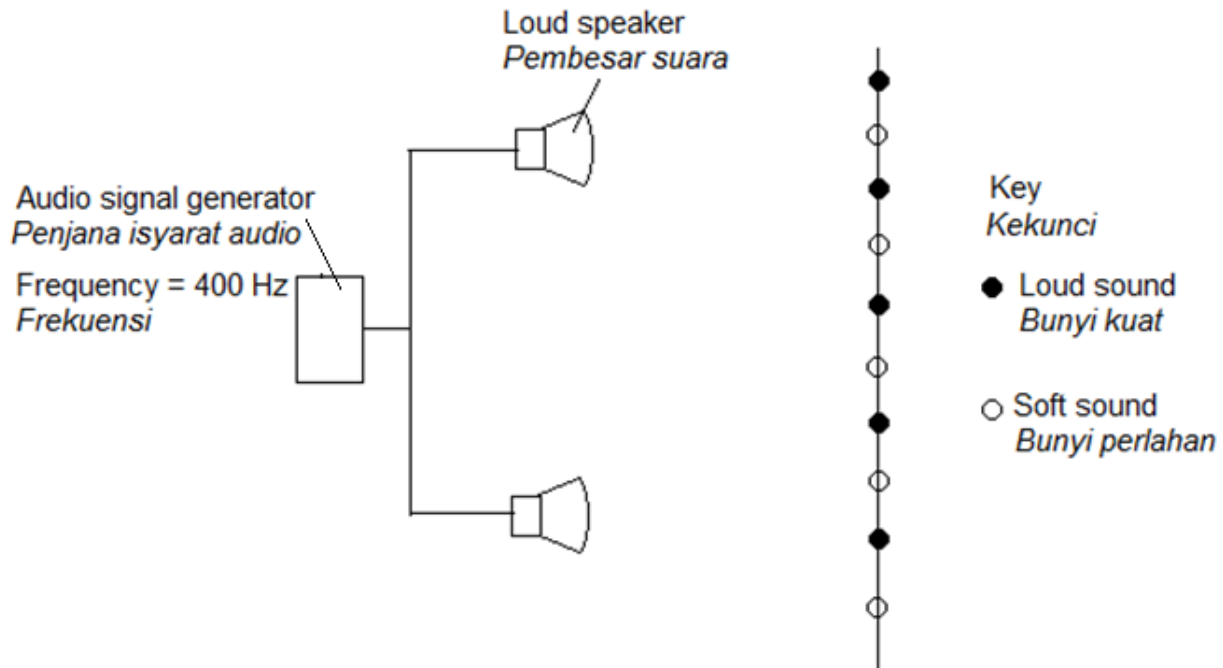
Diagram 10.2
Rajah 10.2

(a) What is the meaning of coherent sources?
Apakah maksud sumber koheren?

[1 mark]
[*1 markah*]

(b) (i) Based on Diagram 10.1 and Diagram 10.2, compare the distance between two loud speakers, the distances between two consecutive loud sounds and the frequency of the sound waves.
Berdasarkan Rajah 10.1 dan Rajah 10.2,bandingkan jarak antara dua pembesar suara, jarak antara jarak antara dua bunyi kuat berturutan dan frekuensi gelombang bunyi itu.

[3 marks]
[*3 markah*]

(ii) Based on the answer in 10(b)(i), state the relationship between the distance between two loud speakers and the distance between two consecutive loud sounds.
Berdasarkan jawapan dalam 10(b)(i), nyatakan hubungan antara jarak antara dua pembesar suara dan jarak antara dua bunyi kuat berturutan.

[1 marks]
[*1 markah*]

(iii) Name the physics concept involved
Namakan konsep fizik yang terlibat.

[1 mark]
[*1 markah*]

21

(c) Diagram 10.3 shows an audio frequency generator connected to a speaker and placed the corner of a wall. Three students, P, Q and R are standing around the next corner.

The generator and speaker can produce sound with the same speed but different pitch.

Rajah 10.3 menunjukkan sebuah penjana isyarat audio disambungkan kepada sebuah pembesar suara diletakkan berdekatan penjuru dinding. Tiga orang murid, P, Q dan R berdiri di penjuru yang bersebelahan.

Penjana dan pembesar dapat menghasilkan bunyi pada kelajuan yang sama tetapi dengan kelansingan yang berbeza.
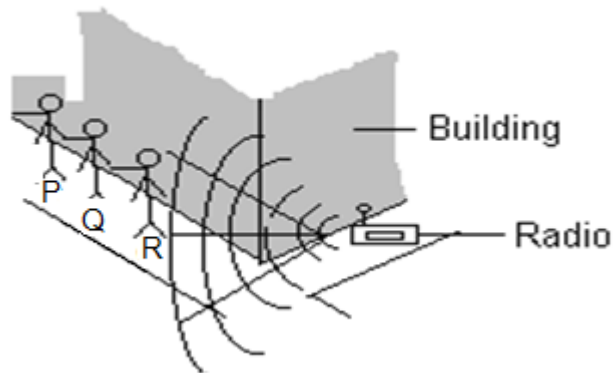
Diagram 10.3
Rajah 10.3

When a high pitch sound is generator generated, only student R can hear the sound clearly.

When a low pitch sound is generated, all the three students can hear the sound clearly.

Explain how this situation occurs.

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

Terangkan bagaimana keadaan ini berlaku.

[4 marks]
[*4 markah*]

(d) Diagram 10.4 shows sonar (sound navigation and ranging) system used to detect a shoal of fish in deep sea.
Rajah 10.4 menunjukkan sistem sonar digunakan untuk mengesan sekumpulan ikan di laut dalam.
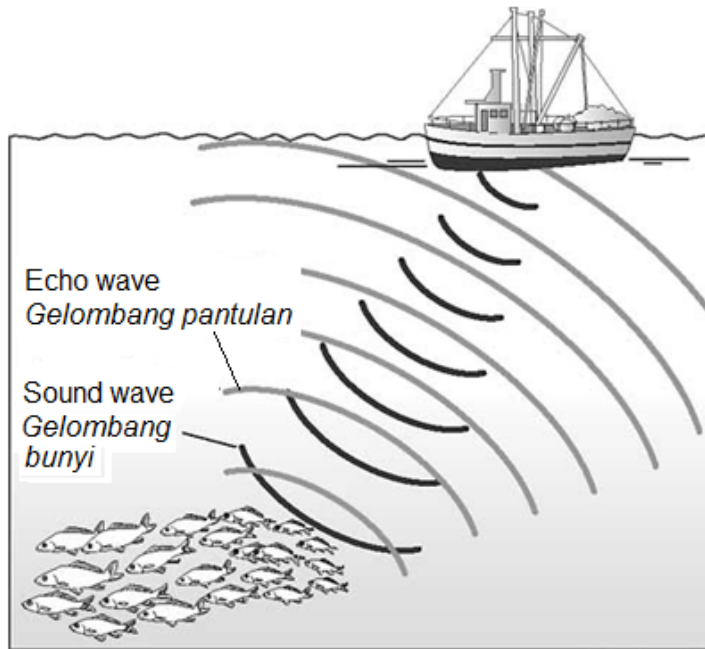
Suggest the modifications should be done on the systems so that enable it to function effectively. Explain your modifications on the following aspects:
Cadangkan pengubahsuaian yang perlu dilakukan ke atas sistem itu untuk membolehkannya berfungsi dengan lebih berkesan. Terangkan cadangan anda berdasarkan aspek-aspek berikut:

(i) Type of wave transmitted
Jenis gelombang yang dipancarkan

(ii) Frequency of wave
Frekuensi gelombang

(iii) Wavelength of wave
Panjang gelombang bagi gelombang

(iv) The phenomenon of wave involved
Kedudukan pemancar gelombang bunyi

(v) The equipments required
Peralatan yang diperlukan

[10 marks]
[*10 markah*]

11   The density of water is 1000 kgm^{-3}.
     Ketumpatan air adalah 1000 kgm^{-3}.

     (a) What is the meaning of density?
          Apakah maksud ketumpatan?

                                                                         [1 mark]
                                                                       [*1 markah*]

     (b) The reading of spring balance in Diagram 11.1 shows the weight of a metal block in
          air.
          The reading of spring the balance in Diagram 11.2 shows the weight of the metal
          block when it is fully immersed in water.
          Bacaan neraca spring dalam Rajah 11.1 menunjukkan berat blok logam di udara.
          Bacaan neraca spring dalam Rajah 11.2 menunjukkan berat blok logam itu bila
          terendam sepenuhnya dalam air.
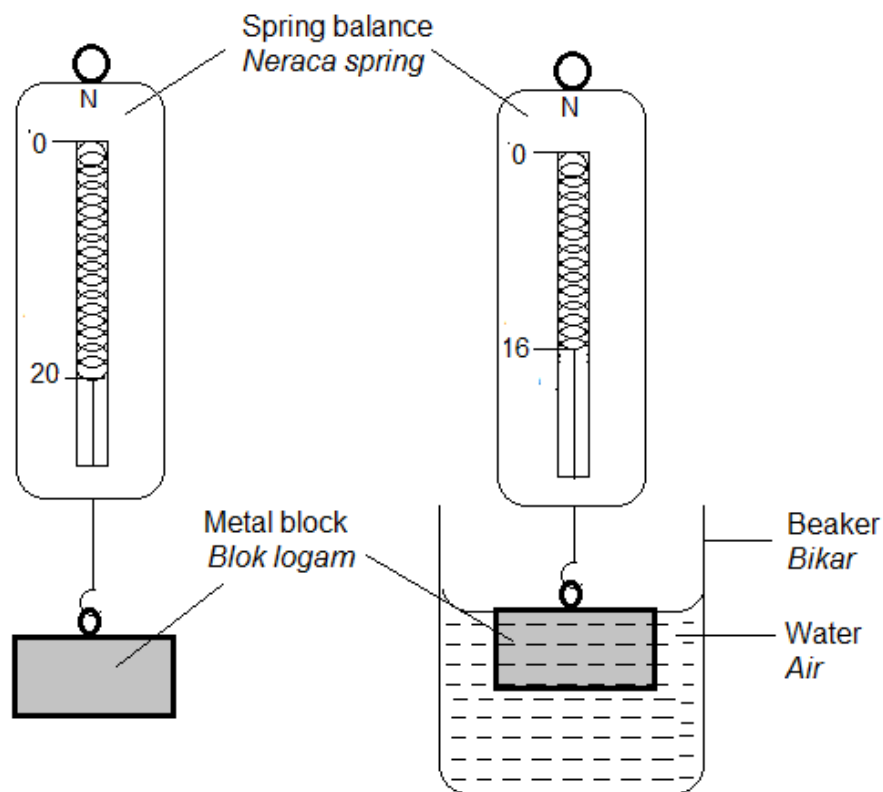
                  Diagram 11.1   Diagram 11.2
                   Rajah 11.1   *Rajah 11.2*

     (i)   What is the buoyant force acting on the metal block?
           Berapakah daya apungan yang bertindak ke atas blok logam itu.

     (ii) Calculate the mass of displaced water.
           Hitung jisim air yang tersesar.

(iii) Calculate the volume of displaced water.
.   *Hitung isipadu air yang tersesar.*

[5 marks]
[*5 markah*]

(c) Using the concept of buoyant force, explain why a balloon which is filled with helium gas able to rise upwards when it released in air but not the balloon which is filled with air.
Menggunakan konsep daya apungan, terangkan bagaimana belon yang diisi dengan gas helium boleh naik ke atas apabila dilepaskan di udara tetapi belon yang diisi dengan udara tidak boleh naik ke atas.

[4 marks]
[*4 markah*]

(d) Diagram 11.3 shows four hot air balloons P, Q, R and S with different specifications.
You are required to determine the most suitable hot air balloon to rise at high altitude and safe.
Study the specifications of all the four hot air balloons based on the following aspects:
Rajah 11.3 menunjukkan empat belon udara panas P, Q, R dan S dengan spesifikasi yang berbeza.
Anda dikehendaki menentukan belon udara panas yang paling sesuai supaya dapat naik lebih tinggi dan selamat.
Kaji spesifikasi keempat-empat belon udara panas itu berdasarkan aspek-aspek berikut:

(i) Type material of the balloon
Jenis bahan belon

(ii) Number of burner
Bilangan pembakar

(iii) Size of balloon
Saiz belon

(iv) Type material of the basket
Sifat bahan bakul

(v) The number of gas tank
Bilangan tangki gas

Explain the suitability of the aspects and determine the most suitable hot air balloon.
Give reasons for your choice.

25

Terangkan kesesuain aspek-aspek itu dan tentukan belon udara panas yang paling sesuai.
Beri sebab bagi pilihan anda.

<div align="right">

[10 marks]
[*10 markah*]

</div>

P

Nylon balloon and big size

Belon nilon dan bersaiz besar

Two burners
Dua pembakar

One gas tank
Satu tangki gas

Steel basket
Bakul keluli

Q

Canvas balloon and small size

Belon kanvas dan bersaiz kecil

One burner
Satu pembakar

One gas tank
Satu tangki gas

Rattan basket
Bakul rotan

R

Canvas balloon and small size

Belon kanvas dan bersaiz kecil

Two burners
Dua pembakar

Two gas tanks
Dua tangki gas

Rattan basket
Bakul rotan

S

Nylon balloon and big size

Belon nilon dan bersaiz besar

Two burners
Dua pembakar

Two gas tanks
Dua tangki gas

Rattan basket
Bakul rotan

Diagram 11.3
Rajah 11.3

26

12 The resistance of bulb R and bulb S is 10 Ω.
    Rintangan mentol R dan S adalah 10 Ω.

    (a) What is the meaning of resistance?
         Apakah maksud rintangan?

                                                                        [1 mark]
                                                                        [*1 markah*]

    (b) Bulb R and bulb S with resistance are connected in circuit as shown in Diagram
         12.1. The voltmeter reading is 12 V.
         *Mentol R dan S itu disambungkan dalam satu litar elektrik seperti ditunjukkan
         dalam Rajah 12.1.Bacaan voltmeter adalah 12 V.*
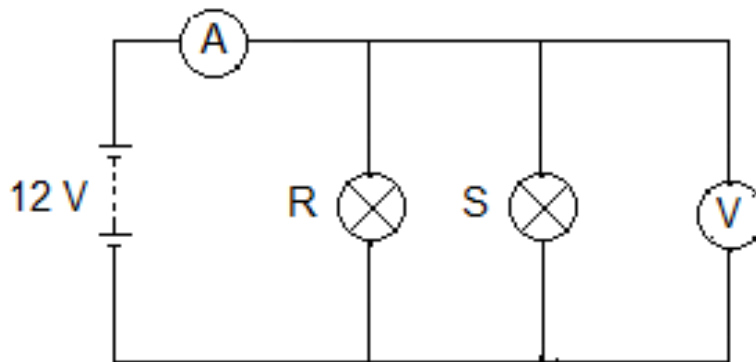
Diagram 12.1
Rajah 12.1

    (i)   State the type of connection between bulb R and bulb S.
          Nyatakan jenis sambungan antara bentol R dan mentol S.

                                                                        [1 mark]
                                                                        [*1 markah*]

    (ii) Calculate the effective resistance of the circuit.
          Hitung rintangan berkesan litar itu

                                                                        [1 mark]
                                                                        [*1 markah*]

    (iii) Determine the reading of ammeter.
          Tentukan bacaan ammeter.

                                                                        [2 marks]
                                                                        [*2 markah*]

    (c) (i)   Another identical bulb, T, is connected to the circuit as shown in Diagram 12.2.
               *Suatu mentol yang serupa, T, disambungkan kepada litar itu seperti yang
               ditunjukkan dalam Rajah 12.2.*

27
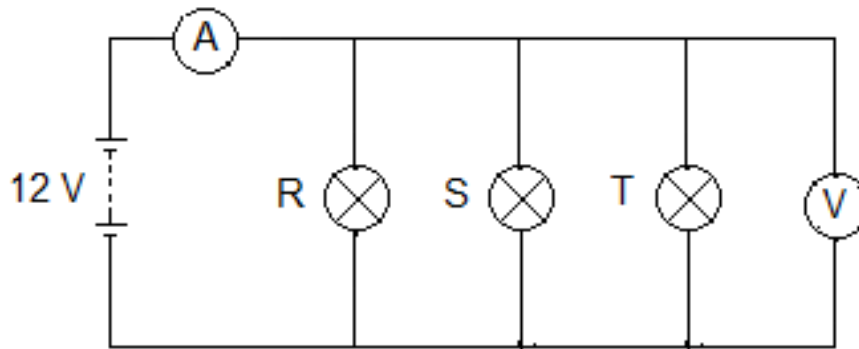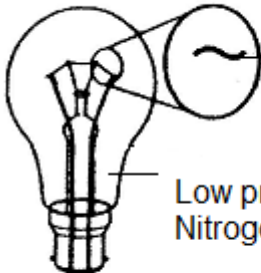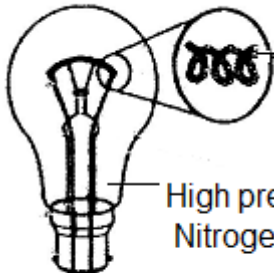
Diagram 12.2
Rajah 12.2

State what happen to the reading of the ammeter.
Nyatakan apakah berlaku kepada bacaan ammeter itu.

(ii) Give **one** reason for the answer in 12(c)(i).
*Beri **satu** sebab bagi jawapan di 12(c)(i)*

[2 marks]
[*2 markah*]

(d) You are required to investigate the specifications of four filament lamps as shown in Diagram 12.3.
Anda dikehendaki menyiasat reka bentuk dan ciri-ciri bagi empat lampu berfilamen seperti yang ditunjukkan dalam Rajah 12.3.

Lamp W
Lampu W

Copper wire, thick and not coiled
Wayar kuprum, tebal dan tidak bergelung

Low pressure of Nitrogen gas
Gas Nitrogen bertekanan rendah

Lamp X
Lampu X

Tungsten wire, Thick and coiled
Wayar Tungsten tebal dan bergelung

High pressure of Nitrogen gas
Gas Nitrogen bertekanan tinggi

Lamp Y
Lampu Y

Tungsten wire, thin and coiled
Wayar Tungsten nipis dan bergelung

Low pressure of Nitrogen gas
Gas Nitrogen bertekanan rendah

Lamp Z
Lampu Z

Copper wire, thin and not coiled
Wayar kuprum, nipis dan tidak bergelung

High pressure of Nitrogen gas
Gas Nitrogen bertekanan tinggi
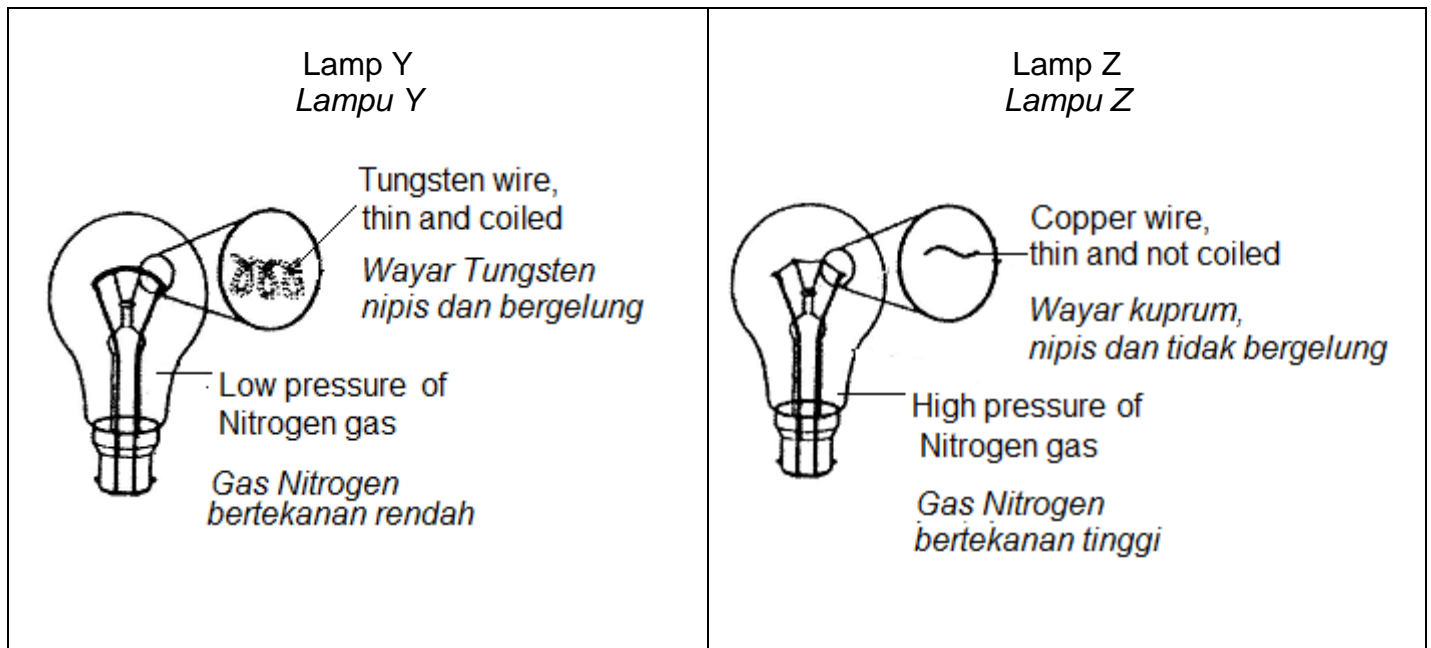
Diagram 12.3
Rajah 12.3

Study the specifications of four lamps based on the following aspects:
Kaji spesifikasi keempat-empat lampu itu berdasarkan aspek-aspek berikut:

(i) Type material of filament
     Jenis bahan filamen

(ii) Shape of the filament
      Bentuk filament

(iii) Thickness of filament wire
       Ketebalan wayar filamen

(vi) The pressure of Nitrogen gas
      Tekanan gas Nitrogen

Explain the suitability of each aspect to determine the most suitable lamp which can function with high efficiency.
Terangkan kesesuaian bagi setiap aspek untuk menentukan lampu yang paling sesuai supaya berfungsi dengan kecekapan yang tinggi

Give reasons for your choice.
Berikan sebab untuk pilihan anda.

[10 marks]
[*10 markah*]

(e) Diagram 12.4 shows an electric circuit.
Rajah 12.4 menunjukkan suatu litar elektrik.
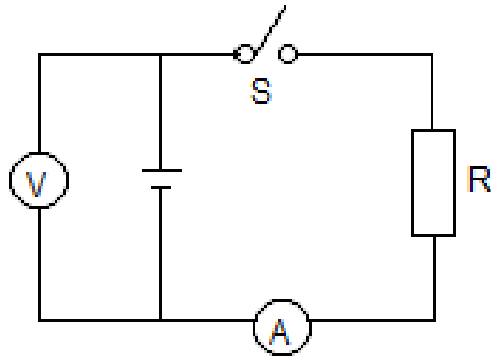
Diagram 12.4
Rajah 12.4

When switch S is open, the reading of voltmeter, V, is 3.0 V. When switch S is closed, the reading of voltmeter is 2.5 V and the current flows is 1.0 A.
Apabila suis S dibuka bacaan voltmeter, V, adalah 3.0 V. Apabila suis S ditutup, bacaan voltmeter adalah 2.5 V dan arus yang mengalir adalah 1.0 A.

Calculate;
Hitung;

(i)   the internal resistance of the battery
      rintangan dalam bateri

(ii) The resistance of resistor R
      Rintangan perintang R
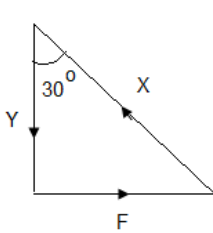
[3 marks]
[*3 markah*]

END OF QUESTION PAPER
KERTAS SOLAN TAMAT

MARKING SCHEME -

NO	SCHEME	SUB MARK	TOTAL MARK
1. (a)	Denser	1	1
(b)(i)	Total internal reflection of light	1	1
(ii)	Light traavel from higher density medium to less dense medium // angle of incidence of light > critical angle	1	1
(c)	Can travel in curved path.	1	1
	TOTAL MARK		**4M**
2(a)	High speed of electron beam in vacuum tube	1	1
(b)(i)	Negative charge	1	1
(ii)	Attracted to positive plate	1	1
(c)(i)	Increases	1	1
(ii)	The strength of electric field increased	1	1
	TOTAL MARK		**5M**
3(a)	When the voltage supplied is 240V so the power released by the iron is 1000W	1	1
(b)(i)	$I = \dfrac{1000}{240}$ = 4.166 A	1 1	2
(ii)	$R = \dfrac{240}{4.166}$ = 57.6 Ω	1 1	2
(c)	High resistivity of material // thinner wire // higher resistance	1	1
	TOTAL MARK		**6M**

NO	SCHEME	SUB MARK	TOTAL MARK
4(a)	Pressure	1	1
(b)	Reduce the volume of trapped air in the tube // to fix the volume of air in the flask.	1	1
(c)	Pressure Law	1	1
(d)	Increased	1	1
(e)(i)	(30 + 273) K // 303 K	1	1
(ii)	$\dfrac{20}{303} = \dfrac{25}{T_2}$ $T_2 = 378.75$ K // $105.75\ ^{o}$C	1 1	2
		TOTAL MARK	**7M**
5(a)	The image that cannot be formed on the screen	1	1
(b)(i)	The curvature of the mirror in Diagram 5.2 > Diagram 5.1// vice-versa	1	1
(ii)	The focal length of the mirror in Diagram 5.2 < Diagram 5.1// vice-versa	1	1
(iii)	The image in Diagram 5.1 > Diagram 5.2 // vice-versa	1	1
(c)(i)	The higher the curvature, the shorter the focal length // vice-versa	1	1
(ii)	The shorter the focal length, the smaller the image // vice-versa	1	1
(d)	Decreases	1	1
(e)	Convex mirror is placed at sharp road corners to enable the motorists to see the oncoming traffic. // it is placed in bookstores / mini market / any suitable shop to monitor the customers.	1	1
		TOTAL MARK	**8M**

NO	SCHEME	SUB MARK	TOTAL MARK
6(a)	To increase or decrease the alternating voltage (Vac)	1	1
(b)(i)	Number of turn of primary coil in Diagram 6.1 = number of turn of primary coil in Diagram 6.2	1	1
(ii)	Number of turn of secondary in Diagram 6.1 < Diagram 6.2 // vice -versa	1	1
(iii)	Output voltage in Diagram 6.1 < Diagram 6.2 // vice-versa	1	1
(iv)	Output current in Diagram 6.1 > Diagram 6.2 // vice-versa	1	1
(c)(i)	The higher the number of turn of secondary coil, the higher the output voltage.	1	1
(ii)	The higher the number of turn of secondary coil, the lower the output current.	1	1
(iii)	The formation of eddy current // the loss of energy due magnitised and demagnetized the iron core // magnetic flux leakage // the resistance of the primary and secondary coils	1	1
	TOTAL MARK		**8M**
7(a)	No resultant /net force // total force /resultant force equal to zero	1	1
(b)	X - Tension Y - Weight	1 1	2
(c)		1	1

(d)	F = W tan 30°
	
	     = (0.4)(10) tan 30°
	
	     = 2.309 N
		1
		
		1
			2

(e)(i)	• Nylon • Strong material	1 1	2
(ii)	• Use smaller angle • Reduce the magnitude of tension / force X of the string [X = Y / cos 30°]	1 1	2
		TOTAL MARK	**10M**
8(a)	A substance which has unstable nucleus that always decay to be more stable by emitting radioactive emissions.	1	1
(b)	P - gamma ray Q - beta particle	1 1	2
(c)	P has no charge / neutral Q is negatively charged	1 1	2
(d)(i)	• Beta particle • Can penetrate the box	1 1	2
(ii)	• Long half life • long lasting // no need to replace frequently	1 1	2
(iii)	• Solid state • easy to handle	1 1	2
(e)	Y	1	1
		TOTAL MARK	**12M**

4

NO	SCHEME	SUB MARK	TOTAL MARK
9(a)	Force per unit area	1	1
(b)	1. Depth of air bubble in Diagram 9.1 > Diagram 9.2 2. Water pressure acting on air bubble in Diagram 9.1 > Diagram 9.2. 3. Volume of air bubble in Diagram 9.1 < Diagram 9.2	1 1 1	3
(c)	1. The higher the depth, the higher the water pressure. 2. The higher the water pressure acting on the air bubble, the lower the volume of air bubble.	1 1	2
(d)	1. As the fan rotates, air is force out through vent 2. Creates low air pressure inside the vacuum 3. Atmospheric pressure is higher than air pressure inside vacuum cleaner 4. Thus a force is produced to push the dust in due to the difference in pressure	1 1 1 1	4
(e)	<table><tr><td>Aspects</td><td>Explanation</td></tr><tr><td>Oil</td><td>Not easy to evaporate // high viscosity // not easily form air bubble</td></tr><tr><td>Big size of fluid reservoir</td><td>Able to occupy more volume of fluid // avoid fluid to spill over</td></tr><tr><td>Low density of pistons</td><td>Lighter // small mass</td></tr><tr><td>Big ratio of cross sectional-area large piston to cross cross-sectional area of small piston</td><td>Produce larger output force</td></tr><tr><td>Steel pipe</td><td>Not easily breaks.// Not easily rust // long lasting</td></tr></table>	2 2 2 2 2	10
	TOTAL MARK		**20M**
10(a)	Sources of waves which produce waves that vibrates with same frequency and same phase / constant difference phase.	1	1
(b)(i)	1. Distance between two loud speakers in Diagram 10.1 < Diagram 10.2 // vice-versa. 2. Distance between two consecutive loud sounds in	1	

5

		Diagram 10.2 < Diagram 10.1 // vice-versa. 3. Frequency of sound wave in Diagram 10.1 = Diagram 10.2	1 1	3
	(ii)	The higher the distance between two loud speakers, the lower the distance between two consecutive loud sounds.	1	1
	(iii)	Interference of sound waves	1	1
	(c)	1. High pitch sound has high frequency so that the wave length is shorter. 2. Less diffraction of sound wave occur // sound wave spread less 3. Low pitch sound has low frequency so that the wave length is longer 4. More diffraction of sound wave occur // sound wave spread more	1 1 1 1	4
	(d)	<table><tr><td>Aspects</td><td>Explanation</td></tr><tr><td>Ultrasonic waves // very high frequency of sound wave</td><td>high frequency // high energy wave</td></tr><tr><td>High frequency</td><td>High energy // able to penetrate the deep sea // able to travel further</td></tr><tr><td>Short wavelength</td><td>Less diffracted // Travel in narrow beam // less energy loss</td></tr><tr><td>Phenomenon Reflection of wave</td><td>To produce echo // reflected of ultrasonic waves</td></tr><tr><td>Transmitter / receiver // Transducer</td><td>To transmit wave / to receive wave</td></tr></table>	2 2 2 2 2	10
11(a)		Mass per unit volume	1	1
(b)(I)		F_b = 20 - 16 = 4 N	1	1
(ii)		Weight of displaced water = buoyant force $m \times 10 = 4$ $m = 0.4$ kg	1 1	2
(iii)		Density of water $= \dfrac{\text{mass}}{\text{volume}}$		

	1000 $= \dfrac{0.4}{V}$		1	
	V $= 4 \times 10^{-4} \, m^3$		1	2
(c)	1. The mass balloon filled with gas helium > mass balloon filled with air 2. The weight of displaced air / Buoyant force acting on balloon with air > weight of displaced air / buoyant force acting on balloon that filled with helium gas. 3. Weight of balloon filled with helium gas < buoyant force that acting on it. // Weight of balloon filled with air = buoyant force that acting on it. 4. There is upwards resultant force acting on the balloon that filled with helium gas // No resultant force acting on balloon with air.		1 1 1 1	4

(d)	Aspects	Explanation		
	Nylon material	Strong // not easily tear // lighter	2	
	Two /more burners	Increase the temperature of air // decrease the density of air	2	
	Big size of balloon	Can displaced more volume / weight of air // increase the buoyant force	2	
	Rattan basket	lighter // small mass/weight	2	
	Two /more number of gas tank	Can carry bigger mass of gas // supply enough fuel to be burnt	2	10
		TOTAL MARK		**20M**

NO	SCHEME	SUB MARK	TOTAL MARK
12(a)	The ratio of voltage to current	1	1
(b)(i)	Parallel	1	1
(ii)	$\dfrac{1}{R} = \dfrac{1}{10} + \dfrac{1}{10}$ $R = 5\,\Omega$	1	1
(iii)	$I = \dfrac{12}{5}$ $= 2.4\ A$	1 1	2
(c)(i)	Increase	1	1
(ii)	Effective / total resistance decreases	1	1
(d)	<table><tr><td>Aspects</td><td>Explanation</td></tr><tr><td>Tungsten</td><td>High resistance // produce more light // high resistivity //easy to be hot // high melting point</td></tr><tr><td>Coiled shape</td><td>Can fixed longer wire // produce more light /heat increase the resistance</td></tr><tr><td>Thin wire</td><td>Increase the resistance // produce more light/heat // easy to be hot</td></tr><tr><td>Low pressure of Nitrogen gas</td><td>Avoid the bulb to breaks // avoid the filament to evaporates at high temperature.</td></tr><tr><td>Y is the most suitable lamp</td><td>Tungsten filament, coiled small diameter low pressure of nitrogen gas</td></tr></table>	2 2 2 2 2	10
(e)(i)	$r = \dfrac{3 - 2.5}{1}$ $r = 0.5\,\Omega$	1	1

(ii)	R = $\frac{2.5}{1}$	1	
	= 2.5 Ω	1	2
	TOTAL MARK		**20 M**

SOALAN BERFORMAT KERTAS 3 FIZIK

1. A student carries out an experiment to investigate the relationship between the   length , l of
    a piece of wire X placed at the cut A of cardboard strip and the angle , θ.
    The apparatus set-up for this experiment is shown in Diagram 1.1 and 1.2.
    Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara panjang, l
    seutas wayar X yang diletakkan pada sekeping potongan kadbod di A dengan sudut, θ.
    Susunan alat radas bagi eksperimen ini ditunjukkan pada rajah 1.1 dan 1.2.
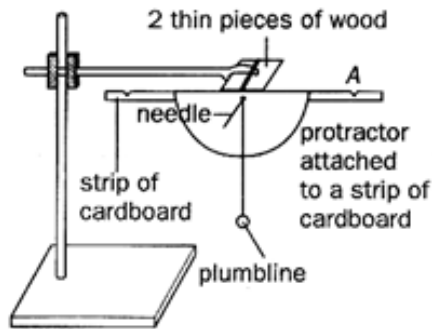
Diagram 1.1
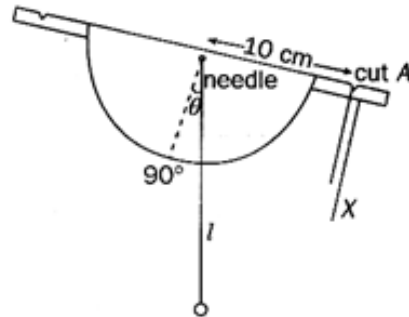
Diagram 1.2

   The student starts the experiment with the length, l of a piece of wire X that is 50.0 cm. The
corresponding reading of protractor is shown in Diagram 1.3 on page 3. The experiment is
repeated with length, l of wire 40.0 cm, 30.0 cm, 20.0 cm and 10.0 cm. The corresponding
readings of protractor are shown in Diagram 1.4, 1.5, 1.6 and 1.7 on pages 3, 4 and 5.

Murid itu memulakan eksperimen dengan panjang, l seurat wayar X 50.0 cm. Bacaan
jangkasudut yang sepadan yang sepadan ditunjukkan pada rajah 1.3 dihalaman 3.
Eksperimen diulangi dengan mengunakan panjang, l = 40.0 cm, 30.0 cm, 20.0 cm dan 10.0
cm. Bacaan jangkasudut yang sepadan dihalaman 3, 4 dan 5.

ℓ = 50.0 cm

θ = _____

Diagram 1.3

ℓ = 40.0 cm

θ = _____

Diagram 1.4

2

ℓ = 30.0 cm

θ = _____

Diagram 1.5

ℓ = 20.0 cm

θ = _____

Diagram 1.6

ℓ = 10.0 cm

θ = _____
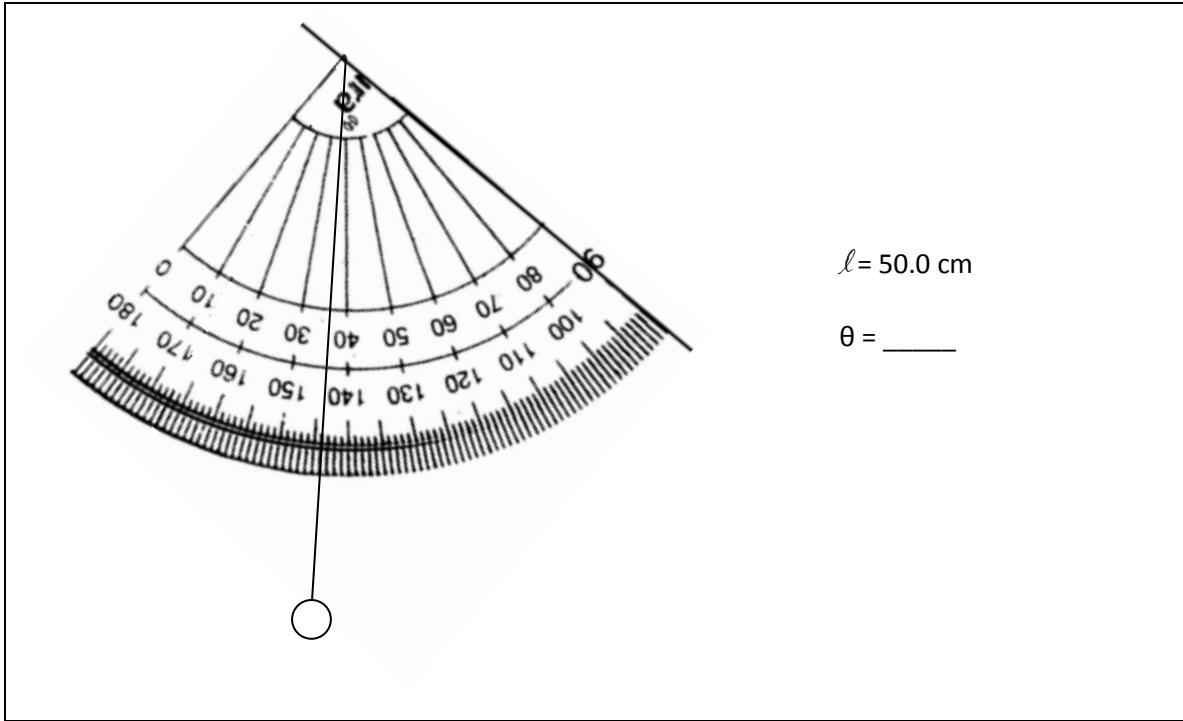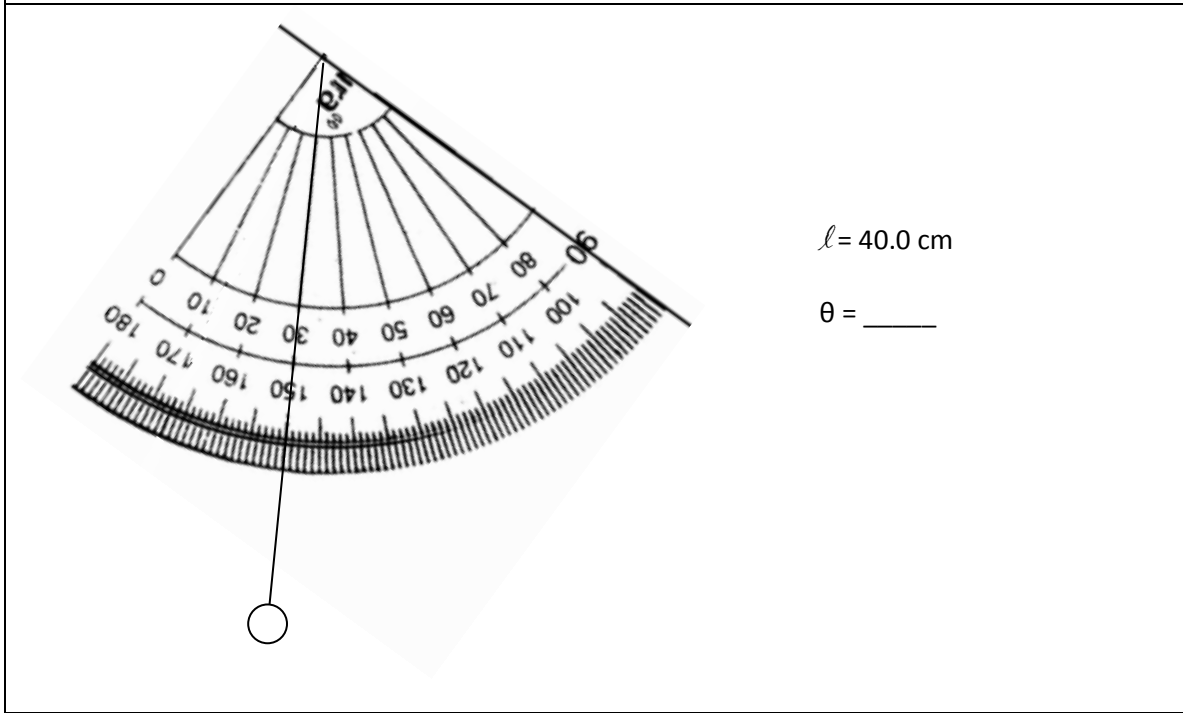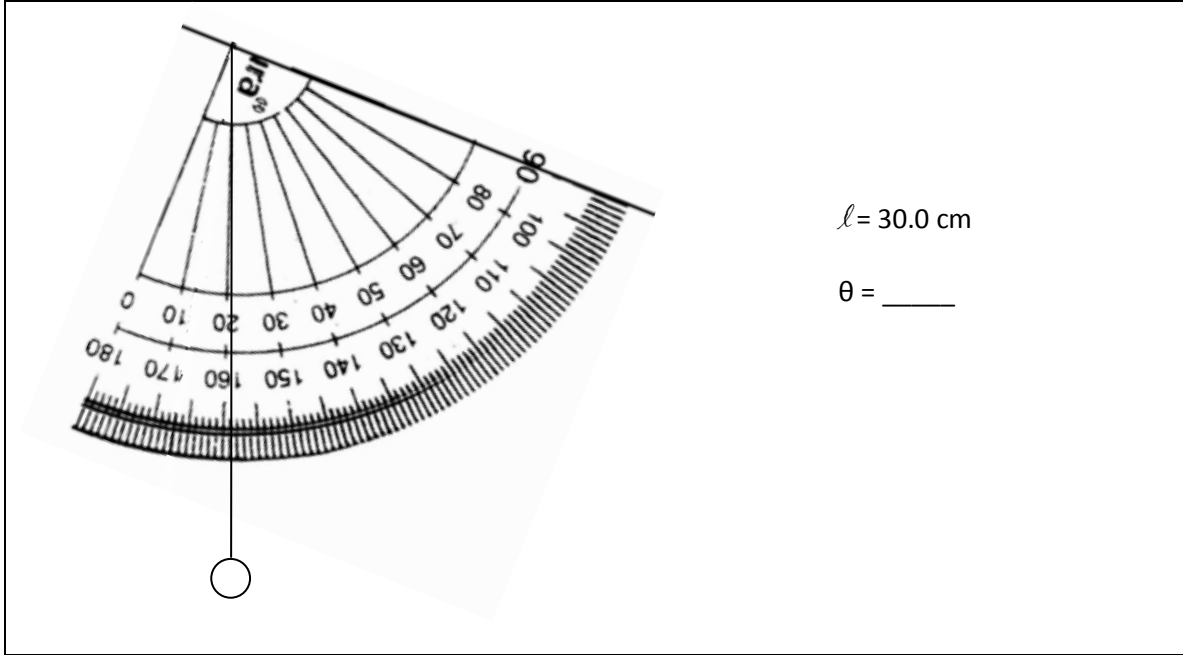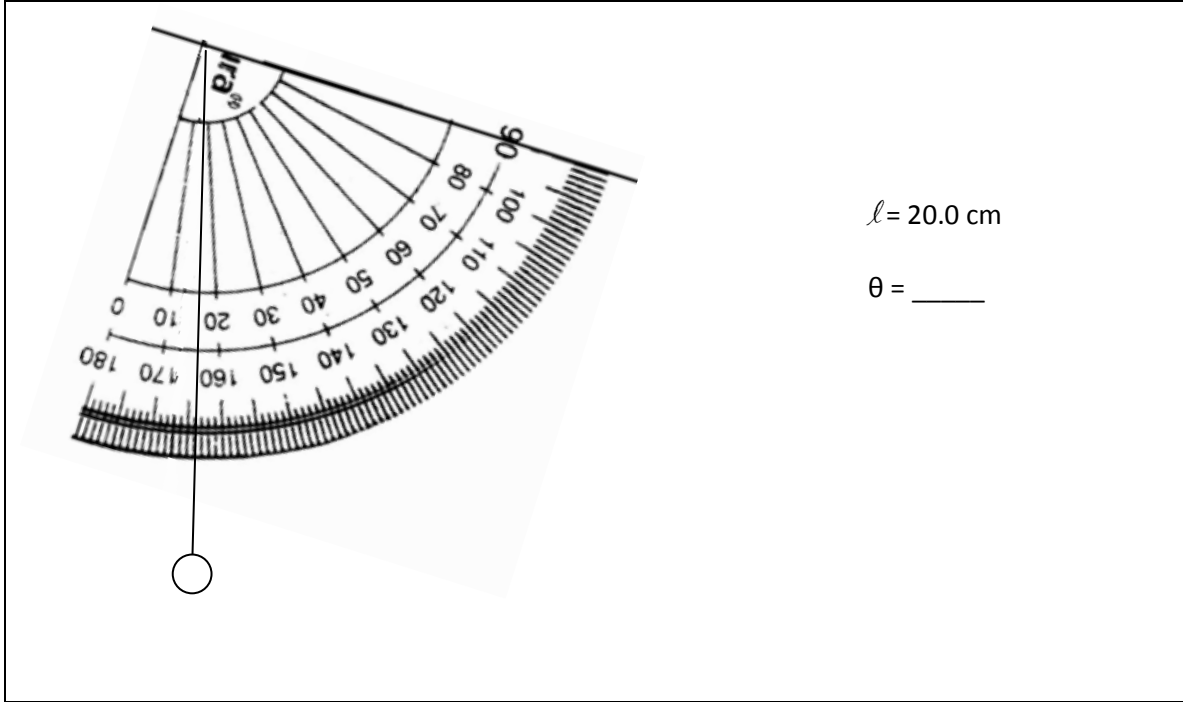
Diagram 1.7
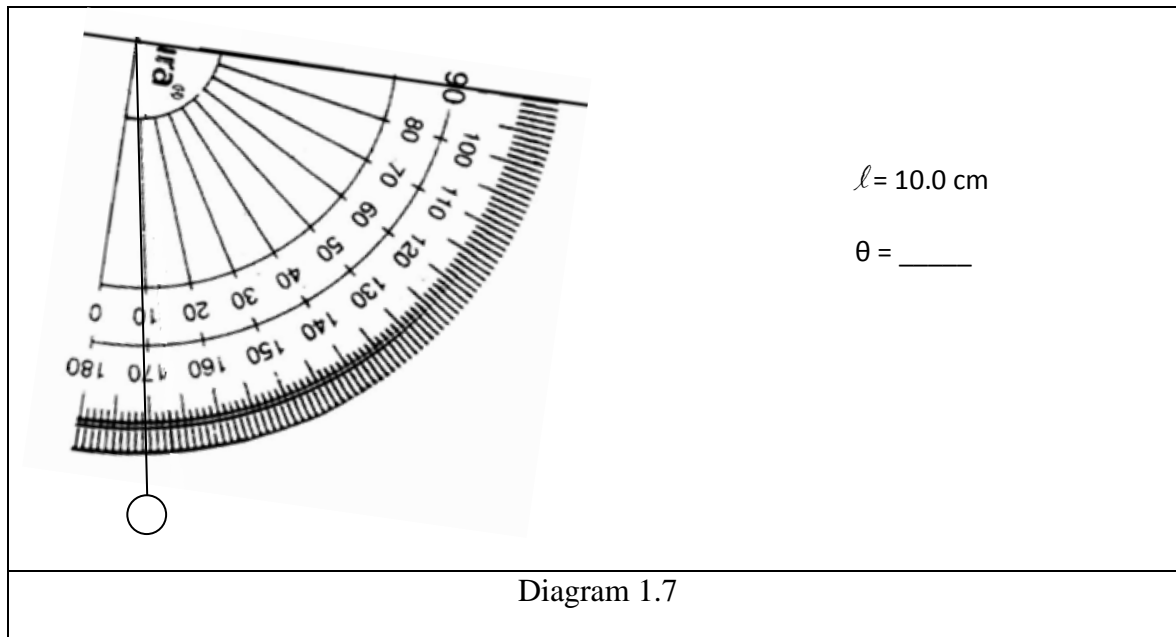
For the experiment describe on page 2, identify

Bagi eksperimen yang diterangkan di halaman 2, kenalpasti

(i) the manipulated variable
     Pembolehubah dimanipulasi

     ………………………………………………………………………….

     [*1 mark*]

(ii) the responding variable
     Pembolehubah bergerak balas

     …………………………………………………………………………

     [*1 mark*]

(iii) the constant variable
      Pembolehubah yang dimalarkan

4

....

(b) For this part of question, write your answers in the spaces provided in the corresponding diagrams.
Untuk bahagian soalan ini, tulis jawapan anda diruang yang disediakan dalam rajah-rajah yang sepadan.

Based on Diagram 1.3, 1.4, 1.5, 1.6 and 1.7 on pages 3, 4 and 5.

Berdasarkan rajah 1.3, 1.4, 1.5, 1.6 dan 1.7 di halaman 3, 4 dan 5.

(i) Record the reading of protractor in the space provided on pages 3, 4 and 5.
Catat bacaan bagi jangka sudut diruangan yang telah disediakan pada mukasurat 3, 4 dan 5.

[*2 marks*]

(ii) Tabulate your results for all values of l and θ in the space given below.
Jadualkan keputusan anda bagi semua nilai l dan θ dalam ruang di bawah

[*4 marks*]

(c) On the graph paper on page 8, plot a graph of θ against l.
Pada kertas graf di halaman 8, lukis graf θ melawan l.

[*5 marks*]

5

(d) Based on your graph in 1 (c), state the relationship between θ and *l*.
Berdasarkan graf di 1 (c), nyatakan hubungan diantara θ dan l.

………………………………………………………………………………………

[*1 mark*]

(e) State **one** precaution that should be taken to improve the result of this experiment.
Nyatakan satu langkah berjaga-jaga yang perlu diambil untuk memperbaiki keputusan eksperimen ini.

………………………………………………………………………………………………
…………………………………………………………………………………… [*1 mark*]

2. A student carries out an experiment to investigate the relationship between the diameter of nichrome wire, *d*, and the resistance, *R*. Diagram 1.1 shows the arrangement of the apparatus for the experiment.

Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara diameter dawai nikrom , d, dengan rintangan, R. Rajah 1.1 menunjukkan susunan radas untuk eksperimen tersebut.
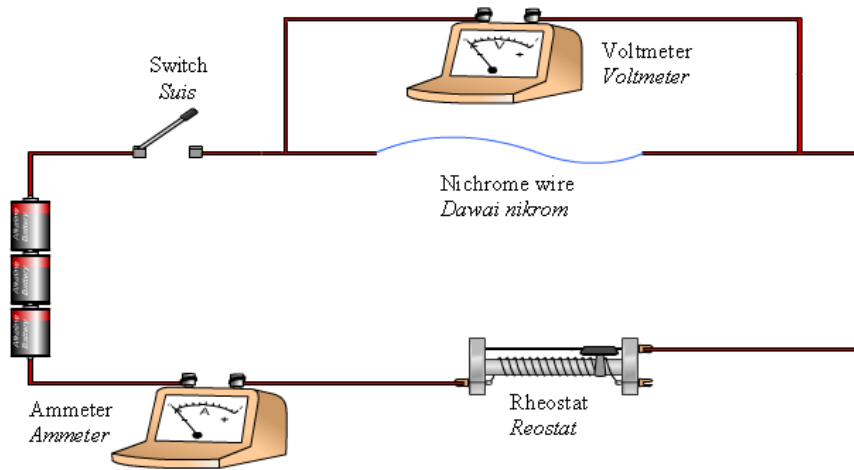
Diagram 1.1/ *Rajah 1.1*

A nichrome wire of diameter, *d*, 0.30 mm and length of 10 cm is connected. The switch is on and the rheostat is adjusted until the ammeter reads 0.3 A. Then the reading on the voltmeter is recorded.

6

The procedure is repeated with different *d*: 0.35 mm, 0.40 mm, 0.45 mm and 0.50 mm. The actual corresponding readings of voltmeter are shown in Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6.

Suatu dawai nikrom yang berdiameter, d, 0.30 mm dengan panjang 10 cm disambung. Suis dihidup dan reostat dilaras sehingga bacaan arus pada ammeter menunjukkan 0.3 A. Kemudian bacaan pada voltmeter dicatat. Prosedur tersebut diulangi dengan d: 0.35 mm, 0.40 mm, 0.45 mm dan 0.50 mm.
Bacaan sebenar pada voltmeter yang sepadan masing-masing ditunjukkan pada Rajah 1.2, 1.3, 1.4, 1.5 dan 1.6.

Diagram 1.2

Rajah 1.2
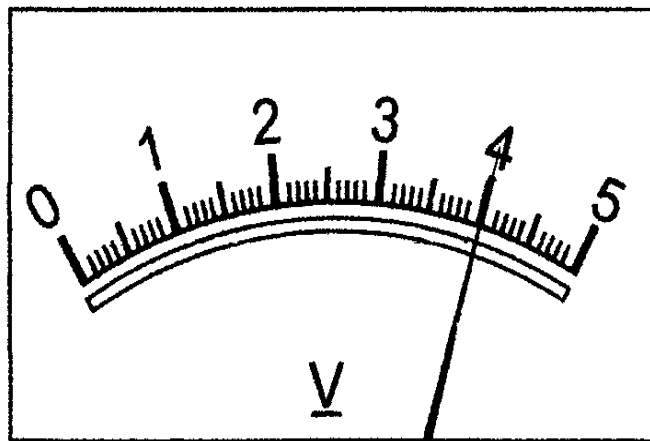
Voltmeter reading is………. when *d* is 0.30 mm

Bacaan voltmeter............apabila d bernilai 0.30 mm

7
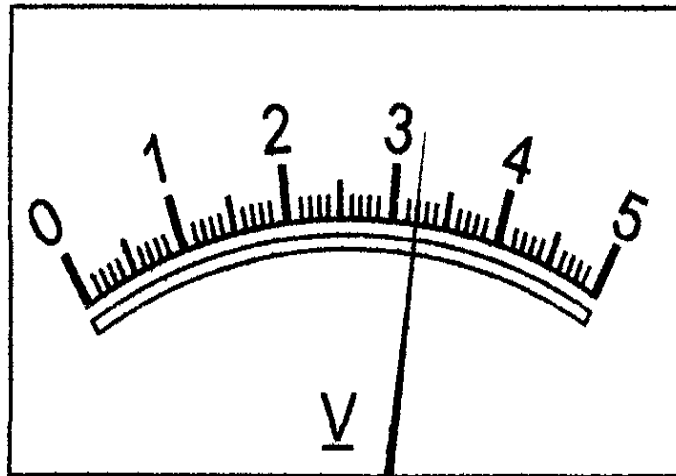
Diagram 1.3

Rajah 1.3

Voltmeter reading is………. when *d* is 0.35 mm

Bacaan voltmeter............ apabila d bernilai 0.35 mm

Diagram 1.4

Rajah 1.4
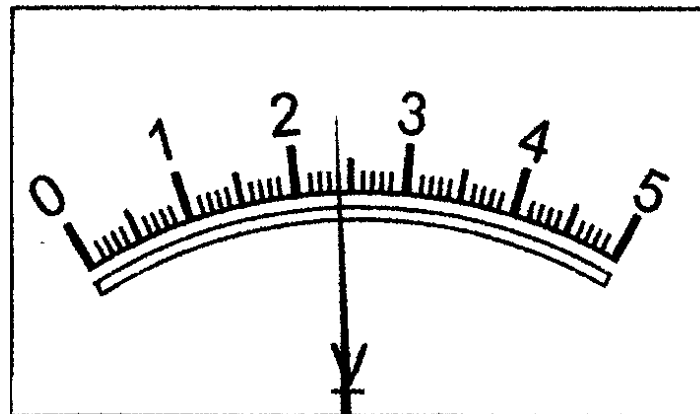
Voltmeter reading is………. when *d* is 0.40 mm

Bacaan voltmeter............ apabila d bernilai 0.40 mm

8
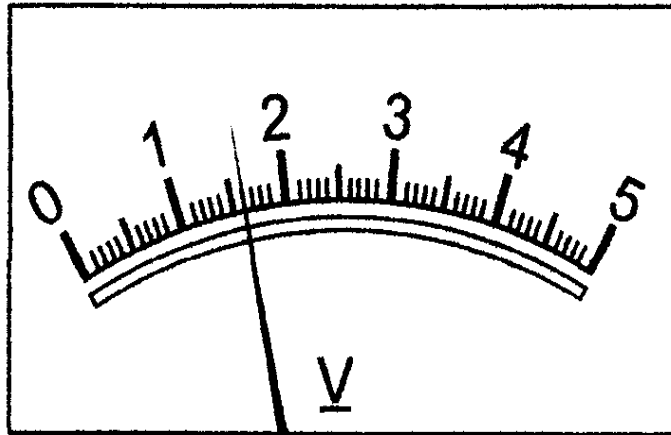
Diagram 1.5

Rajah 1.5

Voltmeter reading is………. when *d* is 0.45 mm

Bacaan voltmeter............ apabila d bernilai 0.45 mm

Diagram 1.6

Rajah 1.6
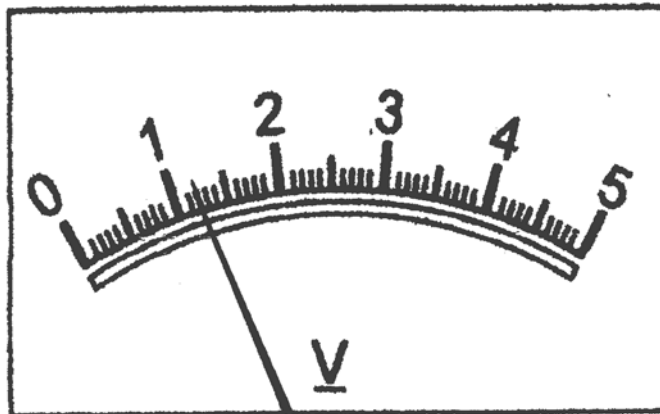
Voltmeter reading is……… when *d* is 0.50 mm

Bacaan voltmeter............ apabila d bernilai 0.50 mm

(a) For the experiment described on page above, identify:
    Bagi eksperimen yang diterangkan di atas, kenal pasti:

   (i) The manipulated variable
    Pembolehubah dimanipulasikan

    …………………………………………………………………………………………

[1 *mark*]

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(ii) The responding variable
Pembolehubah bergerak balas

……………………………………………………………………………………………

[1 *mark*]

(iii)The constant variable
Pembolehubah dimalarkan

……………………………………………………………………………………………

[1 *mark*]

(b) Based on Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6 :
Berdasarkan Rajah 1.2, 1.3, 1.4, 1.5 dan 1.6 :

(i) Record the reading of each potential difference, V, in the spaces provided .
Catatkan bacaan voltmeter, V , dalam ruang yang disediakan .

[2 *marks*]

(ii) Calculate the values of *R* for each of diameter of nichrome wire.
Hitungkan nilai R bagi setiap diameter wayar nikrom.

[2 *marks*]

(iii)Tabulate your results for $\dfrac{1}{d^2}$, *I*, *V* and *R* for all values of *d*, in the space below.

Jadualkan keputusan anda bagi $\dfrac{1}{d^2}$, I, V dan R untuk semua nilai d, pada ruang di bawah

[3 *marks*]

(c) On the graph paper , plot a graph of R against $\dfrac{1}{d^2}$.

Pada kertas graf, lukis graf R melawan $\dfrac{1}{d^2}$.

[5 *marks*]

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(d) Based on your graph in **1**(c), state the relationship between R and $\frac{1}{d^2}$.

*Berdasarkan graf anda di **1**(c), nyatakan hubungan antara R and $\frac{1}{d^2}$.*

....

[1 *mark*]

3.A student carries out an experiment to investigate the relationship between the incident angle, *i* and the refracted angle, *r* of a light ray traveling from air into a glass block. The student uses the data collected to determine the refractive index, *n* of the glass block. The results of this experiment are shown in the graph of sin *i* against sin *r* in Diagram 2.

Seorang pelajar menjalankan sebuah eksperimen untuk mengkaji hubungan di antara sudut tuju, i dan sudut biasan, r bagi sinar cahaya yang sedang bergerak dari udara ke dalam sebuah blok kaca. Pelajar itu menggunakan data yang dikutip itu untuk menentukan indeks biasan, n bongkah kaca itu. Keputusan eksperimen ini ditunjukkan oleh graf sin i melawan sin r dalam rajah .

Graf of sin i against sin r
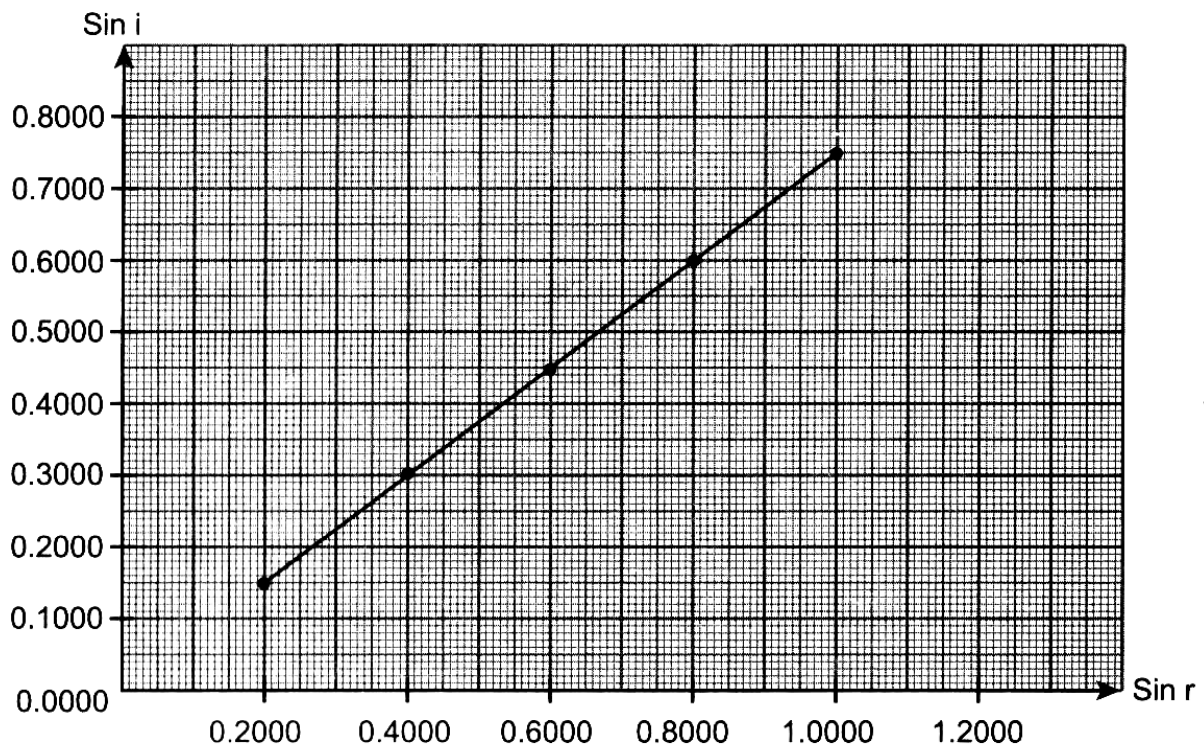
Diagram 2/ *Rajah 2*

(a) Based on the graph in Diagram 2:
   Berdasarkan graf pada Rajah 2:

   (i) What happens to sin i as sin r increases?
      Apakah yang berlaku pada sin i sekiranya sin r bertambah?

      ....

      [1 *mark*]

   (ii) Determine the value of sin r when sin i = 0.
      Tentukan nilai sin r apabila sin i = 0.

      sin r = ...

      [2 *marks*]

   (iii)Determine the value of i when sin r = 0.6.
      Tentukan nilai i apabila sin r = 0.6

      i = ...

      [3 *marks*]

(b) The relationship between sin *i* and sin *r* is given by the formula:
   Hubungan antara sin i dan sin r diberikan oleh formula:

   $$n = \frac{\sin i}{\sin r}$$

   where n is the refractive index of the glass
   dimana n ialah indeks biasan kaca itu

   (i) Calculate the gradient of the graph.
      Hitungkan kecerunan graf itu.

      [3 *marks*]

   (ii) Determine the value of n based on the gradient in 2(b)(i).
      Tentukan nilai n berdasarkan kecerunan dalam 2(b)(i).

      n = ...   [2 *marks*]

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(c) State **one** law that describes the relationship between sin *i*, sin *r* and n.

*Nyatakan **satu** hukum yang menerangkan hubungan antara sin i, sin r and n.*

....

[1 *mark*]

4. A student carries out an experiment to investigate the relationship between resistance, *R,* and length of a constantan wire, *l*.The results of this experiment is shown in the graph of *R* against *l* in Diagram 2.1.

Seorang pelajar menjalankan eksperimen untuk mengkaji hubungan antara rintangan, R, dengan panjang, l, bagi suatu dawai konstantan. Keputusan eksperimen ini ditunjukkan oleh graf R melawan l pada Rajah 2.1.

Diagram 2.1/*Rajah 2.1*

13
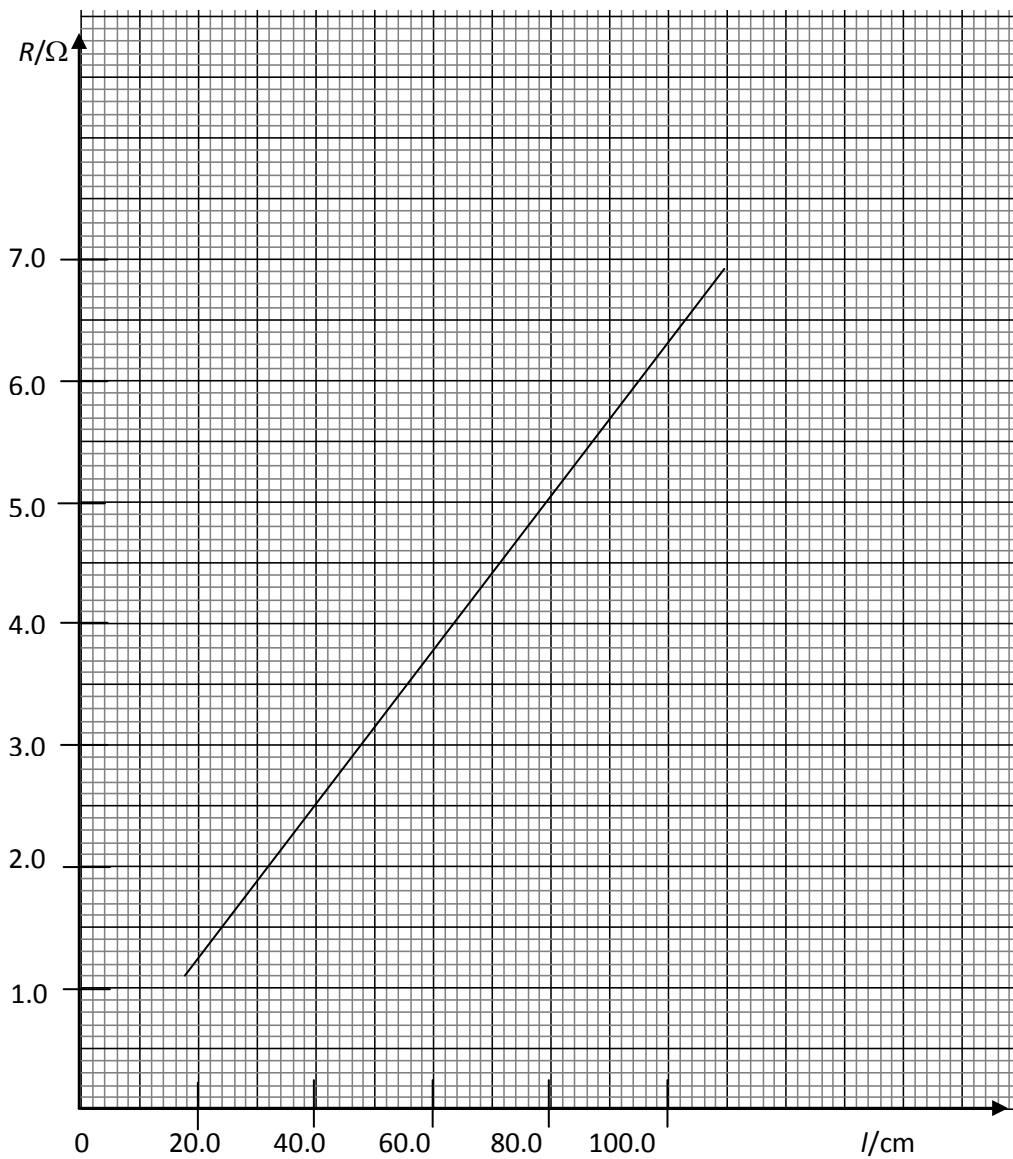
a)   Based on the graph in Diagram 2.1, state the relationship between *R* and *l*.

....

<div align="right">[1 mark]</div>

(b) The resistivity, ρ, is given by the formula $\rho = mA$, where m is the gradient of the graph and
     A is the cross-sectional area of the wire.
     Kerintangan, ρ, bagi dawai itu dinyatakan oleh persamaan, $\rho = mA$, di mana m adalah
     kecerunan graf dan A ialah luas keratan rentas dawai.

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

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

      m = ...   [*3 marks*]

      (ii)   Determine the value of ρ, if A = 1.5 x 10^{-5}cm^2.
              Tentukan nilai ρ, jika A = 1.5 x 10^{-5}cm^2.

<div align="right">[2 marks]</div>

(c)   (i)   Based on the graph in Diagram 2.1, determine the value of *R* when *l* = 16.0 cm.
              Show on the graph, how you determine the value of R.

              Berdasarkan graf pada Rajah 2.1, tentukan nilai R apabila l = 16.0 cm.
              Tunjukkan pada graf itu bagaimana anda menentukan nilai V.

<div align="right">[2 marks]</div>

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(ii)   Another identical constantan wire with the same resistance as 2 (c) (i) is connected in parallel to the wire. The effective resistance, R', of two constantan wire in parallel is given by the formula $\frac{1}{R'} = \frac{1}{R} + \frac{1}{R}$. Calculate R'.

Satu dawai konstantan yang serupa yang mempunyai rintangan yang sama dengan 2 (c) (i) disambung secara selari pada dawai.
Rintangan berkesan, R', bagi dua dawai konstantan ini diberi oleh
formula $\frac{1}{R'} = \frac{1}{R} + \frac{1}{R}$. Hitung R'.

[*3 marks*]

(d) State **one** precaution that can be taken to improve the accuracy of the readings in the experiment.
*Nyatakan **satu** langkah berjaga-jaga yang boleh diambil untuk memperbaiki   ketepatan bacaan dalam eksperimen ini.*

....

....

[1 *marks*]

DESIGN EXPERIMENT

Based on the diagrams in Questions 1- 5,
Berdasarkan pemerhatian 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 dan boleh disiasat.

(c   describe how you would design an experiment to test your hypothesis

In your explanation, state clearly the following :

i)   aim of the experiment / *Tujuan eksperimen,*

ii)   variables in the experiment/ *pemboleh ubah eksperimen*

iii) list   of apparatus and materials/ *Senarai radas dan bahan*
iv) arrangement of the apparatus/ *Susunan radas,*

v)   the procedures of the experiment, which includes the method of controlling the
manipulated variable and the method of measuring the responding variable
*Prosedur eksperimen termasuk kaedah mengawal pembolehubah dimanipulasi dan kaedah
mengukur pembolehubah bergerak balas.*

vi) the way you would tabulate the data
Cara bagaimana anda menjadualkan data

vii) the way you would analyse the data
Cara bagaimana anda menganalisis data

QUESTION 1

Headlamp
Lampu kereta
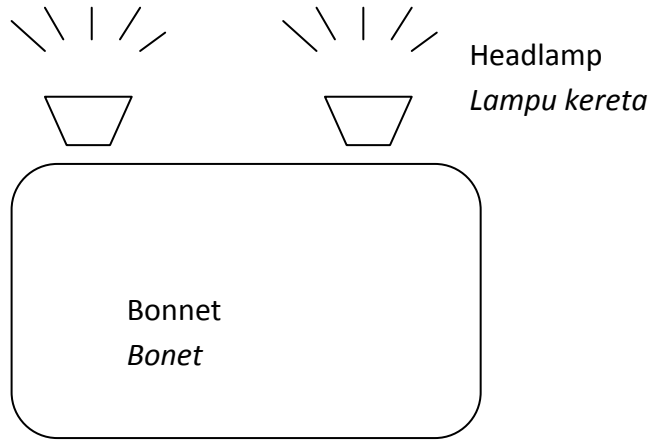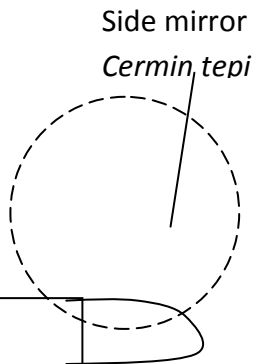
Plane mirror
Cermin satah

Bonnet
Bonet

Diagram 3.1/ *Rajah 3.1*

Side mirror
Cermin tepi

Diagram 3.2
Rajah 3.2

Steering
Stereng

Driver
Pemandu

Driver's head
Kepala pemandu
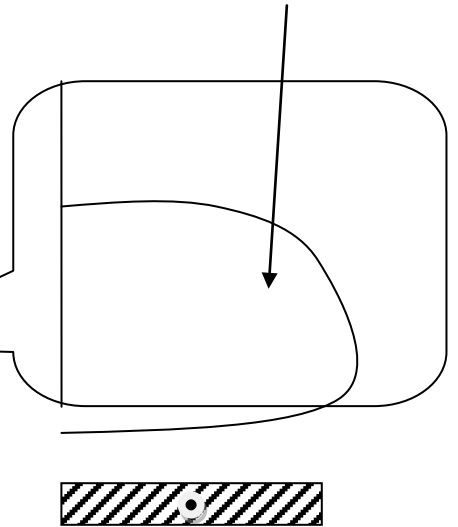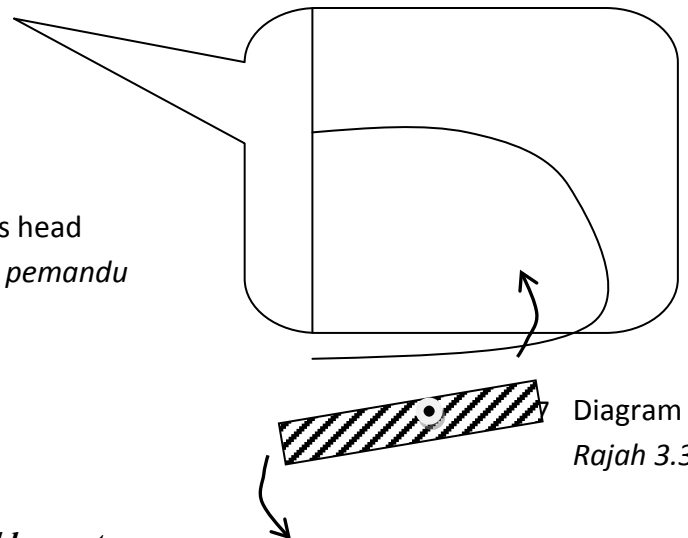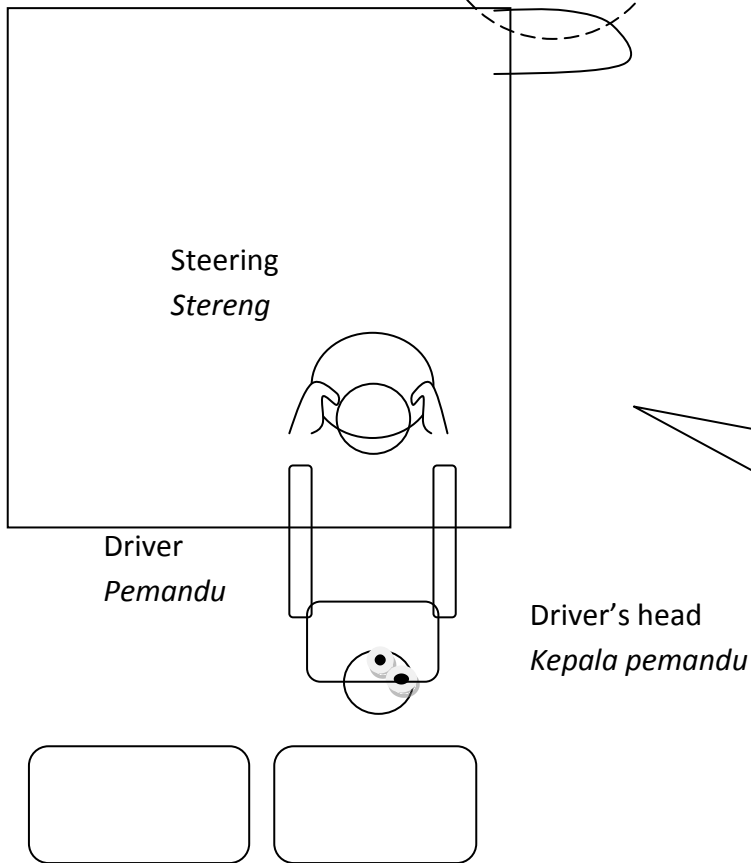
Diagram 3.3
Rajah 3.3

Diagram 3.1 shows the plane sketch of car compartment wherein a driver is holding the steering and he is testing his side vision field using the side mirror.

Rajah 3.1 menunjukkan lakaran pelan bagi ruang kereta di mana seorang pemandu yang memegang stereng dan menguji medan penglihatannya menggunakan cermin tepi

Diagram 3.2 shows the initial position of the side mirror.
Rajah 3.2 menunjukkan posisi asal cermin tepi.

Diagram 3.3 shows the side mirror is rotated anti-clockwise to give the driver more view on the side of the vehicle.
Rajah 3.3 menunjukkan cermin tepi itu diputar mengikut lawan jam untuk memberi pemandu itu darjah penglihatan yang lebih luas di sisi kenderaan.

QUESTION 2
Diagram 4.1 shows a situation where the light wave from monochromatic light source undergoes interference through the double slits and forms dark and bright fringes on the white screen.
Rajah 4.1 menunjukkan suatu situasi di mana gelombang cahaya dari cahaya monokromatik mengalami interferens melalui dua celah kecil dan membentuk pinggir gelap dan cerah di atas skrin putih.
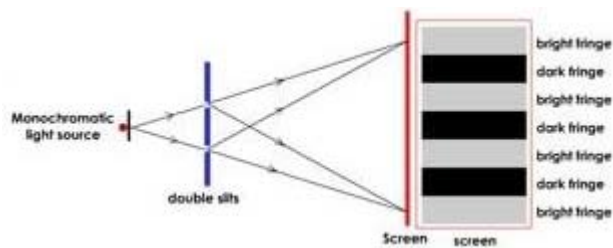
Diagram 4.1/ *Rajah 4.1*

Diagram 4.2 shows the pattern of the fringes on the screen when both slits are separated closer.
Diagram 4.3 shows the pattern of the fringes on the screen when both slits are separated further apart.
Rajah 4.2 menunjukkan corak pinggir yang terbentuk apabila kedua-dua celah terpisah pada jarak yang dekat.
Rajah 4.3 menunjukkan corak pinggir yang terbentuk apabila kedua-dua celah terpisah pada jarak yang lebih jauh.

18
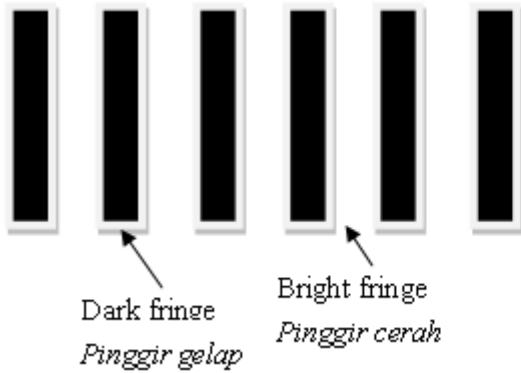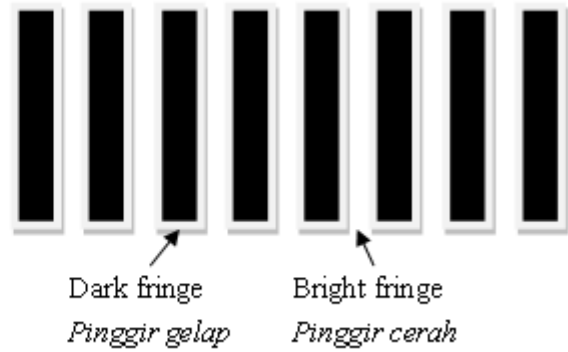
Diagram 4.2/ *Rajah 4.2*   Diagram 4.3/ *Rajah 4.3*

QUESTION 3

Diagram 6 shows two catapults A and B made from same catapult rubber. Different forces are applied on the catapults.

Rajah 6 menunjukkan 2 lastik A dan B diperbuat dari   getah lastik yang sama. Daya daya yang dikenakan adalah berbeza.
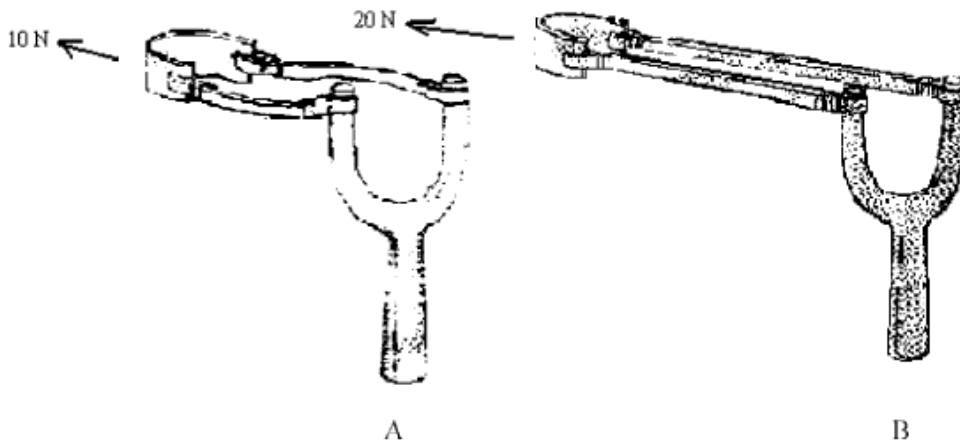
Diagram 3
Rajah 3

QUESTION 4

Diagram 4 shows a horse pulling a carriage. Diagram 5 shows another horse of the same strength is added. The two horses now pulling the same carriage. It is observed that in the case of Diagram 5, the carriage increases its velocity at a faster rate.

19

Rajah 4 menunjukkan seekor kuda menarik beban. Rajah 5 menunjukkan seekor kuda lain yg berkekuatan sama ditambah. Kedua –dua kuda itu menarik beban yang sama. Diperhatikan kuda rajah 5 mempunyai kelajuan yang bertambah.
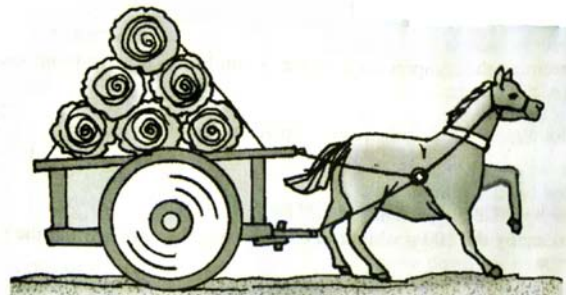
One horse pulling carriage

Diagram 4
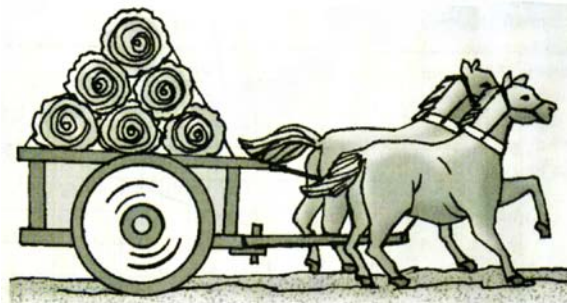
Two horses pulling carriage

Diagram 5

QUESTION 5

Diagram 2 shows a magnetic lock on the door at an office. A technician decides to repair it. When a magnet supplied to the electromagnet in the lock , the door cannot be pulled open. When the number of magnet is increased; the door can be pulled open.

Rajah 2 menunjukkan satu kunci kunci magnetic pintu sebuah pejabat. Seorang juruteknik ingin memperbaikinya. Bila sebuah magnet digunakan pada electromagnet pada pintu itu, pintu itu tidak terbuka . Bila bilangan magnet ditambahkan, pintu itu boleh dibuka,

Electromagnet at the door frame

Steel plate on the door

Diagram 2

20
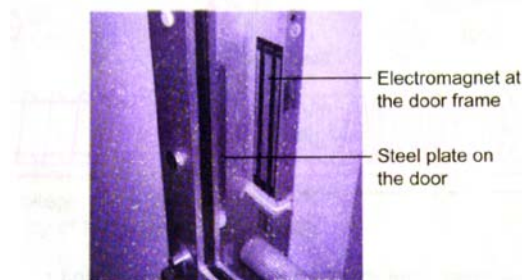
MARKING SCHEME FOR PAPER 3
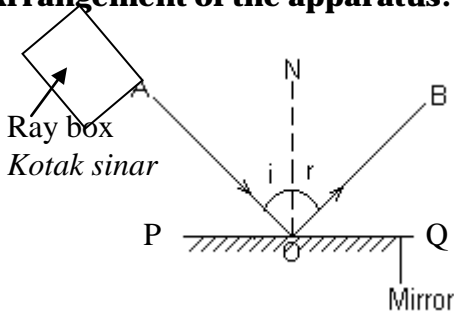
No. 1	Answer	Mark
(a) (i)	Manipulated variable = The length, ℓ of the wire X	1
(a)(ii)	Responding variable = The angle, θ	1
(a)(iii)	Constant variable = The distance from A to the needle // the diameter of the wire //the material of wire X	1
(b)(i)

(ii) | Values of θ are correct
 (All values are correct : 2M)
 (One value incorrect : 1M)

Tabulate ℓ and θ correctly in the table.

A Shows a table which have ℓ, and θ

B State the correct unit of ℓ /*cm* and θ /°

C All values of ℓ are correct

D Values of ℓ and θ are consistent | 1+1

1
1
1
1 |

ℓ /*cm*	θ /°
50.0	36
40.0	30
30.0	21
20.0	16
10.0	9

(c)	**Draw the graph of θ against ℓ.** A - Label y-axis and x-axis correctly B - States the unit at the axis correctly C - Both axes with the even and uniform scale: D - 5 points correctly plotted: E - a smooth best straight line F - minimum size of the graph is 5 x 4 squares of 2 x 2 cm.	5

Number of √	Score
6	5
5	4
3-4	3
2	2
1	1

(d)	**State the correct relationship <u>based on the candidate's graph</u>** ℓ is directly propotional to θ // ℓ is increasing linearly to θ	1
(e)	1- The eye's of observer must be perpendicular to the scale reading in order to avoid the parallax error. 2- Repeat the experiment and find the average.	1
	TOTAL	**16**

SECTION A			
NO	MARKING SCHEME	MARK	
2		SUB	TOTAL
(a) (i)	- diameter of nichrome wire / d	1	1
(ii)	- Resistance of nichrome wire / R	1	1
(iii)	- Length of nichrome wire / Current		
(b) (i)	-Diagram 1.2 : 1.5 V -Diagram 1.3 : 0.9 V -Diagram 1.4 : 0.6 V -Diagram 1.5 : 0.4 V -Diagram 1.6 : 0.3 V <u>Note</u> : Any three readings correct, award 1 mark	1	1
(ii)	<table><tr><td>d / mm</td><td>R /Ω</td></tr><tr><td>0.15</td><td>7.50</td></tr><tr><td>0.20</td><td>4.50</td></tr><tr><td>0.25</td><td>3.00</td></tr><tr><td>0.30</td><td>2.00</td></tr><tr><td>0.35</td><td>1.50</td></tr></table>	2	2
(iii)	<u>Note</u> : Any three readings correct, award 1 mark - Values of $d, 1/d^2, I, V$ and R shown in the table - State the units of $d, 1/d^2, I, V$ and R correctly - The values of $d, 1/d^2, I, V$ and R are consistent (value for $1/d^2$ must be 3 or 4 decimal places) <table><tr><td>d / mm</td><td>1/d² / mm⁻²</td><td>I / A</td><td>V / V</td><td>R /Ω</td></tr><tr><td>0.30</td><td>11.1111</td><td>0.3</td><td>4.0</td><td>13.33</td></tr><tr><td>0.35</td><td>8.1632</td><td>0.3</td><td>3.2</td><td>10.66</td></tr><tr><td>0.40</td><td>6.2500</td><td>0.3</td><td>2.4</td><td>8.00</td></tr><tr><td>0.45</td><td>4.9382</td><td>0.3</td><td>1.6</td><td>5.33</td></tr><tr><td>0.50</td><td>2.6667</td><td>0.3</td><td>1.2</td><td>2.67</td></tr></table>	2 1 1 1	2 1 1 1

(c)	Draw a complete graph of R against $1/d^2$
	Tick √ based on the following aspects :
	- A. Show R on Y-axis and $1/d^2$ on X-axis
	- B. State the units of the variables correctly
	- C. Both axes are marked with uniform scale
	- D. All five points are plotted correctly,
	  <u>Note :</u> Only three points plotted correctly, award √
	- E. Best straight line is drawn
	- F. Show the minimum size of graph at least
	   5 x 4 (10 cm x 8 cm) square
	   (counted from the origin until the furthest
	   point)
		√
		√
		√
		√√
		
		√
		√	
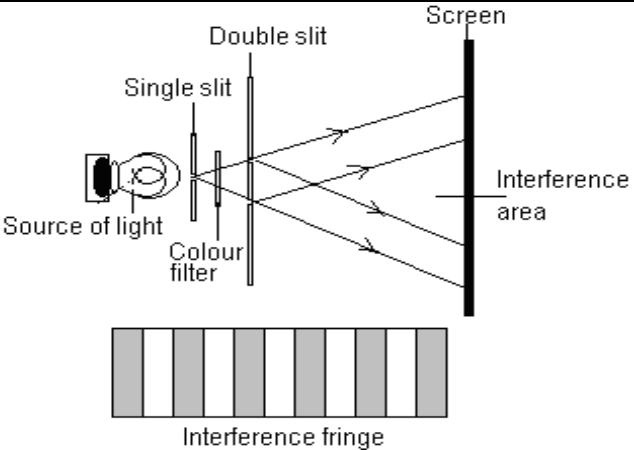
NO	MARKING SCHEME		MARK	
			SUB	TOTAL
(d)	Score			

Number of √	Score
7	5
5-6	4
3-4	3
2	2
1	1

- R is directly proportional to $\dfrac{1}{d^2}$ **5**   **5**

- R berkadar langsung dengan $\dfrac{1}{d^2}$ **1**   **1**
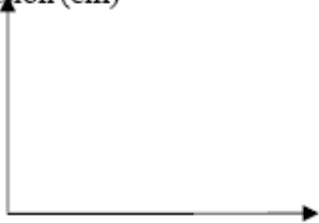
QUESTION 3
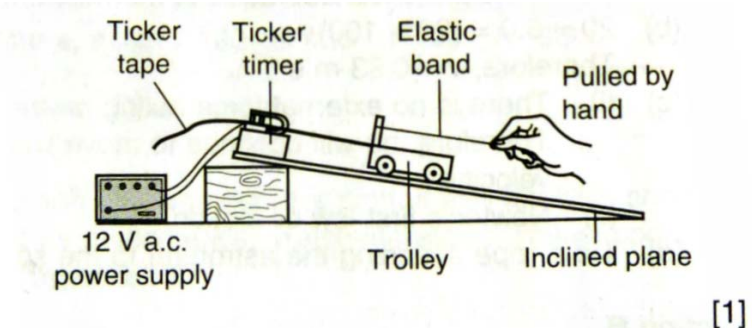
Section	Mark	Section	Note
(a)(i)	1	Increase	
(a)(ii)	1	Extrapolation line on the graph	
	1	Sin r = 0	
(a)(iii)	1	Mark on the graph	
	1	Sin i = 0.45	
	1	i = 26.7°	
(b)(i)	1	Big triangle on the graph	
	1	Gradient = $\dfrac{0.7000}{1.0000}$	
	1	Correct answer with correct unit = 0.7	
(b)(ii)	1		
	1	$n = \dfrac{\sin i}{\sin r} = \dfrac{0.7000}{1.0000} = 0.7$	
(c)	1	Snell Law	
Total	**12**		
QUESTION 4 (a)	**1**	**State the relationship between R and l** R is directly proportional to l	
(b)(i)	3	**Calculate the gradient of the graph and state the value within the acceptable range** Show the triangle with an acceptable size (4 x 4 squares of 2 cm). **Substitute correctly (according to the candidate's graph)** $m = \dfrac{6.3 - 0}{100.0 - 0}$ **State the correct value of the gradient with unit** = 0.063 Ωcm⁻¹	Note

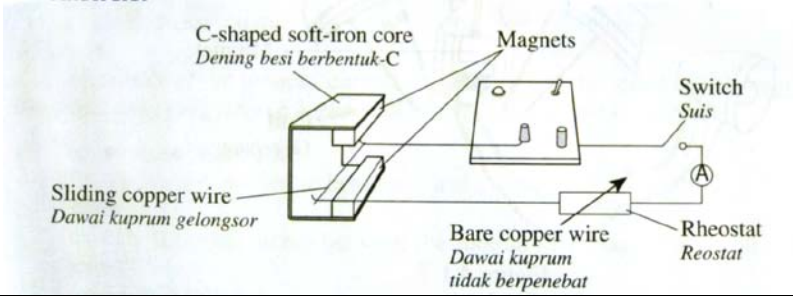|			
(ii)	**2**	$\rho = mA$ $= 0.063 \times 1.5 \times 10^{-5}$ $= 9.375 \times 10^{-7} \ \Omega \ cm$	
(c) (i)	**2**	$R = 1.0 \ \Omega$	
(ii)	**3**	$\dfrac{1}{R'} = \dfrac{1}{1.0} + \dfrac{1}{1.0}$ $\dfrac{1}{R'} = \dfrac{2}{1.0}$ $\therefore R' = 0.5 \ \Omega$	
(d)	**1**	**State ONE correct precaution so as to produce an accurate result of the experiment** The position of the eye perpendicular to the scale when takes the reading to avoid errors due to parallax/systematic error.	
Question 1	**Mark**	**DESIGN EXPERIMENT**	**Note**
(a)	1	**Inference :** The angle of reflection is depends on the angle of incidence	
(b)	1	**Hypothesis**: The angle of reflection increases as the angle of incidence increases	
(c) (i)	1	**Aim of the experiment** : To investigate the relationship between the angle of incidence and the angle of reflection.	
(ii)	1 1	**Variables in the experiment:** Manipulated variable: Angle of incidence Responding variable: Angle of reflection Fixed variable: Refractive index	
	1	**List of apparatus and materials**: Plane mirror, ray box, white paper, protractor, power supply .	
	1	**Arrangement of the apparatus:** Ray box *Kotak sinar* AO : Incident ray ON : Normal	

		OB : Reflected ray i : Angle of incidence r : Angle of reflection	
	1 1 1	The plane mirror is placed on a white paper. The outline of the plane mirror are traced on the white paper and labelled as PQ. The glass block is removed. The normal ON is drawn. By using a protractor , the angle of incidence is measured = i The plane mirror is replaced again on its outline on the paper. A ray of light from the ray box is directed along incidence line AO. The ray emerging from the side PQ is drawn as line OB. The plane mirror is removed again. The point O and B is joined and is drawn as line OB. The experiment is repeated 5 times for the other angles of incidence.	
	1	**Tabulate the data:** <table><tr><td>Incidence angle, i/°</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Reflected angle, r/°</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	
	1	**Analysis the data:** Plot the graph r against i	
QUESTION 2	a	**Inference** :The distance between two consecutive bright fringe is depends on the separation of slit.	1
	b	**Hypothesis** :The greater of the separation of slit , the greater of the distance between two consecutive bright fringe.	1
	c	i) **Aim** : To study the relationship between The distance between two consecutive bright fringe and the separation of slit. ii) **Variables:** **MV:** the separation of slit **RV:**The distance between two consecutive bright fringe **CV:** the distance between the double slit Young and screen	1 } 1 1
		iii) **List of apparatus:** young double slits, single slit , laser pen, screen, metre rule	1
		iv)**Arrangement of the apparatus:**	1

Interference fringe

| | | **The procedure of the experiment which include the method of controlling the manipulated variable and the method of measuring the responding variable**.
A red filter is placed between the light source and the slits. The Young's double slits with separation, a = 0.1cm
The source of light is switched on.
The interference pattern formed on the screen is observed and drawn.
By using a metre rule the distance across 6 consecutive bright fringes is measured.
The distance between two consecutive bright fringes is calculated ,

$x = \dfrac{L}{5}$

The experiment is repeated 4 times for with other Young's double slits with different separation, a = 0.2 cm, a = 0.3 cm, a = 0.4 cm and a = 0.5 cm. | **1**

1

1 |

Tabulate the data:

a/cm	0.1	0.2	0.3	0.4	0.5		1
x/cm							

Analysis the data:
Plot the graph x against a | 1

No	Marking Criteria	Mark
3 (a)	The length of catapult rubber depends on the force	1
(b)	The bigger the force, the longer the extension of the catapult rubber	1
(c)(i)	To investigate the relationship between the force and extension of a spring	1
(ii)	Manipulated variable : Force Responding variable : Extension Constant variable : Length of the spring//diameter of the spring //type of spring	1 1
(iii)	Spring, retort stand, <u>ruler, slotted weight</u>	1
(iv)	State a functionable arrangement of the apparatus	1
(v)	Measure the initial length of the spring, l_1 Put one slotted mass, 20 g/m_1 at the end of the spring.	1
(vi)	Measure the length of the spring, l_2 Calculate extension of the spring, $x = l_2 - l_1$	1
(vii)	Repeat the experiment for the mass 40 g, 60 g, 80 g, 100 g. (Repeat at least 4 times)	1
(viii)	Tabulate the data	1

Force(N)/Mass(g)	Extension(cm)/Length of the spring (cm)

No	Marking Criteria	Mark
(ix)	Plot graph of extension /length of spring against force/mass//graph Extension (cm)	1
		Total 12

Question 4	**a)Inference**: Acceleration depends on the applied force.	1
	b)Hypothesis : The bigger is the applied force, the bigger is the acceleration of an object.	1
	(c) (i) **Aim** : To study the relationship between the force acting on an object and its acceleration.	1

	(ii) **Manipulated variable**: Force
	    Responding variable: Acceleration
	    Fixed variable: Mass
		1
		
		1

	(iii) **List of apparatus** : Ticker timer, 12 V a.c. power supply, inclined plane, trolley, ticker tape, elastic band and cellophane tape	1
	(iv) Arrangement of apparatus [1]	1
	V) Procedure: 1. Arrange the inclined plane so that it is friction compensated. 2. Pull the trolley with **an** elastic band. The band is always maintain parallel with the inclined plane and pulled at a fixed length to maintain a constant force, F. 3. Analyze the ticker tape to determine the acceleration, a of the trolley. The acceleration of trolley is calculated by formula $a = v\text{-}u / t$ 4. Repeat the experiment with 2, 3, 4 and 5 elastic bands for forces, 2F, 3F, 4Fand 5F.	1 1 1

	(vi) Record the result in table form.		1

Force	F	2F	3F	4F	5F
Acceleration, a/cm s^{-2}					

[1]

	(vii) Plot a graph of acceleration against force.	1
Question 5	**Inference: The force depends on the strength of magnet**	1
	b)Hypothesis : The higher the no of magnet is, the higher the force will be.	1
	c. i)Aim : To study the relationship between the no of magnet and the force	1
	ii) MV: no . of magnet RV : Force CV : current	1 1
	iii) list of apparatus and materials. Metre rule, sliding copper wire, d.c. power supply, connecting wires, C-shaped iron yoke, magnet, ammeter and bare copper wire	1
	iv) Arrangement of apparatus	1
	Procedure: 1. Start the experiment with a magnet.. 2. Measure the displacement of the sliding wire using metre rule 3. Repeat the experiment at least 4 times with increasing the number of magnet 2, 3,4 and 5 magnets.	1 1 1
	Tabulate data :	

Number of magnet	displacement of the sliding wire

		1
	Analyze data: Plot graph displacement of the sliding wire against Number of magnet	1

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:

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