Name: .....MOZ@C Class: .....

CONFIDENTIAL
4531/2
Physics
Paper 2
September
2008

2½ hours

4531/2

MAKTAB RENDAH SAINS MARA

SIJIL PELAJARAN MALAYSIA
TRIAL EXAMINATION 2008

PHYSICS

Paper 2

Two hours and thirty minutes

DO NOT OPEN THIS QUESTION BOOKLET UNTIL BEING TOLD TO DO SO

1. Write down your name and class in the space provided
   Tuliskan nama dan kelas anda pada ruang yang disediakan.

2. The questions are written in English and Bahasa Melayu
   Kertas soalan ini adalah dalam bahasa Inggeris dan bahasa Melayu .

3. Candidates are required to read the information at the back of the booklet.
   Calon dikehendaki membaca maklumat di halaman belakang buku soalan ini

Examiner's Code			
Section	Question	Marks	Score
A	1	4	
	2	5	
	3	6	
	4	7	
	5	8	
	6	8	
	7	10	
	8	12	
B	9	20	
	10	20	
C	11	20	
	12	20	
Total			

4 5 3 1 2

This paper consists of 34 printed pages and 2 unprinted pages

[Turn over

The following information may be useful. The symbols have their usual meaning.
(Maklumat berikut mungkin berfaedah. Simbol-simbol mempunyai makna yang biasa.)

1. $v = \frac{s}{t}$
2. $a = \frac{v-u}{t}$
3. $v^2 = u^2 + 2as$
4. $s = ut + \frac{1}{2}at^2$
5. Momentum = mv
6. $F = ma$
7. Kinetic energy *(Tenaga kinetik)* = ½ mv^2
8. Potential energy *(Tenaga keupayaan)* = mgh
9. Density *(Ketumpatan)* , $\rho = \frac{m}{V}$
10. Pressure *(Tekanan)*, $P = \frac{F}{A}$
11. Pressure *(Tekanan)*, $P = h\rho g$
12. Heat *(Haba)*, $Q = mc\theta$
13. Heat *(Haba)*, $Q = ml$
14. $\frac{PV}{T}$ = constant *(pemalar)*
15. $v = f\lambda$
16. Wavelength (*panjang gelombang*), $\lambda = \frac{ax}{D}$
17. Power *(Kuasa)*, $P = \frac{E}{t}$
18. $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$
19. Linear magnification *(Pembesaran linear)*, $M = \frac{v}{u}$
20. Refractive index *(indeks biasan)*, $n = \frac{\sin i}{\sin r}$
21. Refractive index (*indeks biasan*), n = real depth (*dalam nyata*) / apparent depth (*dalam ketara*)
22. $Q = It$
23. $V = IR$

24. Power *(Kuasa)*, $P = IV$

25. $\frac{N_s}{N_p} = \frac{V_s}{V_p}$

26. $E = mc^2$

27. Efficiency (*Kecekapan*) $= \frac{I_s V_s}{I_p V_p} \times 100\%$

28. $g = 10 \text{ m s}^{-2}$

29. Atmospheric pressure at sea level (*Tekanan atmosfera pada aras laut)* = 1×10^5 Pa

Section A
Bahagian A

[60 marks]
[60 *markah*]

Answer **all** *questions in this section*

Jawab **semua** *soalan dalam bahagian ini*

1 Diagram 1 shows an electric circuit which is used to investigate the relationship between electric current and potential difference across a conductor XY
Rajah 1 menunjukkan susunan litar elektrik untuk menyiasat hubungan di antara beza keupayaan dan arus elektrik bagi suatu konduktor.

For Examiner's use

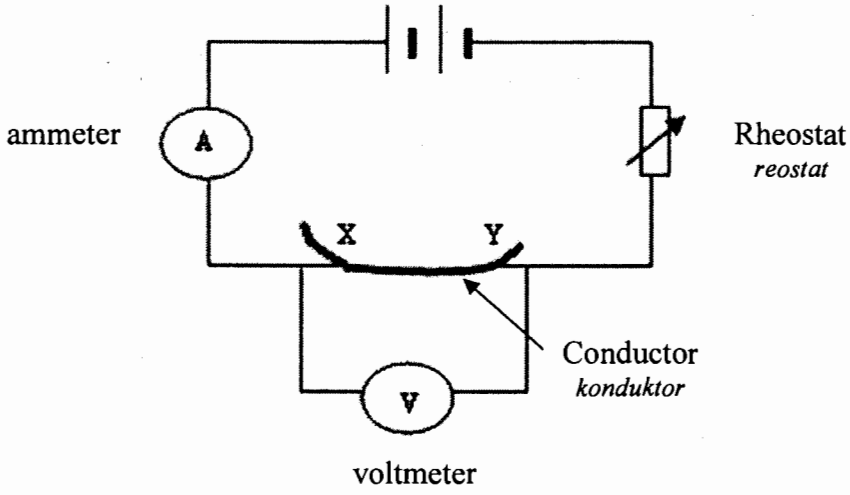


Diagram 1
Rajah 1

(*a*) What is the function of the voltmeter?
Apakah fungsi voltmeter?

.....

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

1(a)
1

(*b*) Underline the correct answer in the bracket to complete the sentence below.
Garis jawapan yang betul dalam kurungan untuk melengkapkan ayat di bawah

For Examiner's use

When the electric current increases,
Apabila arus electrik bertambah,

(i) the potential difference (increases, decreases, remains unchanged)
beza keupayaan (bertambah, berkurang, tidak berubah)

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

1(b)(i) 1

(ii) the resistance will (increase, decrease, remain unchanged)
rintangan akan (bertambah, berkurang, malar)

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

1(b)(ii) 1

(*c*) State **one** physical quantity which is kept constant in the experiment.
*Nyatakan **satu** kuantiti fizikal yang dimalarkan dalam eksperimen ini.*

.....

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

1(c) 1

Total A1 4

2 Diagram 2 shows a softball moving with high momentum.
Rajah 2 menunjukkan bola lisut yang bergerak dengan momentum yang tinggi.

For Examiner use

Diagram 2
Rajah 2

(*a*) What is meant by momentum?
Apakah yang dimaksudkan dengan momentum?

.....

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

2(a) 1

(*b*) Calculate the momentum of the softball if the mass of the ball is 80g and its velocity is 100 m s^{-1}.
Hitungkan momentum bola lisut jika jisim bola ialah 80g dan halajunya ialah 100 m s^{-1}

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

2(b) 2

(*c*) If the mass of the ball is increased but its momentum remains unchanged, how does its velocity change?
Jika jisim bola ditambah tetapi momemtum tidak berubah , bagaimanakah halaju berubah ?

.....

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

For Examiner's use

2(c) 1

(*d*) Using the concept of force, explain why the player needs to wear a glove to catch a fast-moving softball.
Menggunakan konsep daya, terangkan mengapa pemain perlu memakai sarung tangan untuk menangkap bola lisut yang bergerak laju.

.....

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

2(d) 1

Total A2 5

3 Radioisotope uranium-238 decays to become thorium-234 as shown in the equation below.
Radioisotop uranium-238 mereput untuk menjadi thorium-234 seperti dalam persamaan berikut.

For Examiner's use

$$^{238}_{92}U \longrightarrow {}^{234}_{90}Th + P + \text{energy}$$

(*a*) (i) What is meant by radioisotope?
Apakah yang dimaksudkan dengan radioisotop?

.....

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

3(a)(i) 1

(ii) What is radiation **P**?
Apakah sinar **P***?*

.....

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

3(a)(ii) 1

(*b*) If the mass defect in the above radioactive decay is 3.35×10^{-27} kg, calculate the energy released in joule. (Speed of light, $c = 3.0 \times 10^{8}$ m s^{-1})
Jika cacat jisim dalam pereputan di atas adalah 3.35×10^{-27} *kg, hitung tenaga yang dibebaskan dalam joule. (Laju cahaya ,* $c = 3.0 \times 10^{8}$ *m* s^{-1}*)*

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

3(b)

(*c*) A radioactive source which emits radiation **P** is placed near an electric field as shown in Diagram 3
Satu sumber radioaktif yang memancarkan sinaran **P** *diletakkan berdekatan medan elektrik seperti dalam Rajah 3*

For Examiner's use

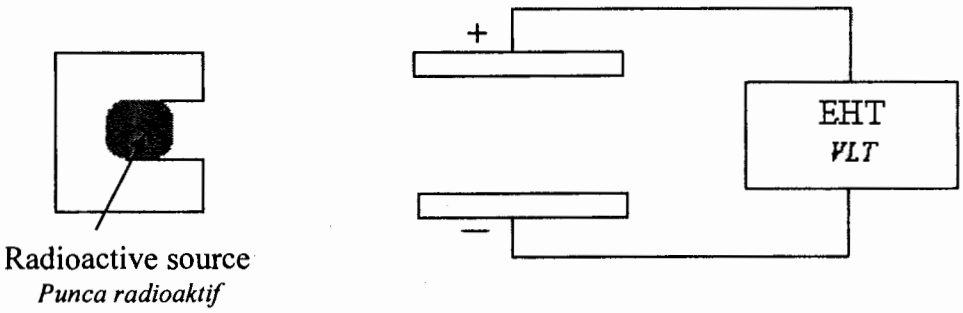


Diagram 3
Rajah 3

(i) On Diagram 3, draw the path of radiation **P** in the electric field.
Dalam Rajah 3, lukiskan laluan sinaran **P** *di dalam medan elektrik.*

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

3(c)(i) 1

(ii) Explain your answer in (*c*)(i)
Terangkan jawapan anda dalam (c)(i)

.....

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

3(c)(ii) 1

Total A3 6

4 Diagram 4.1 shows a mirror which is placed at the corner of a road to aid drivers.
Rajah 4.1 menunjukkan sebuah cermin yang diletakkan di selekoh jalan untuk membantu pemandu kereta.

For Examiner's use

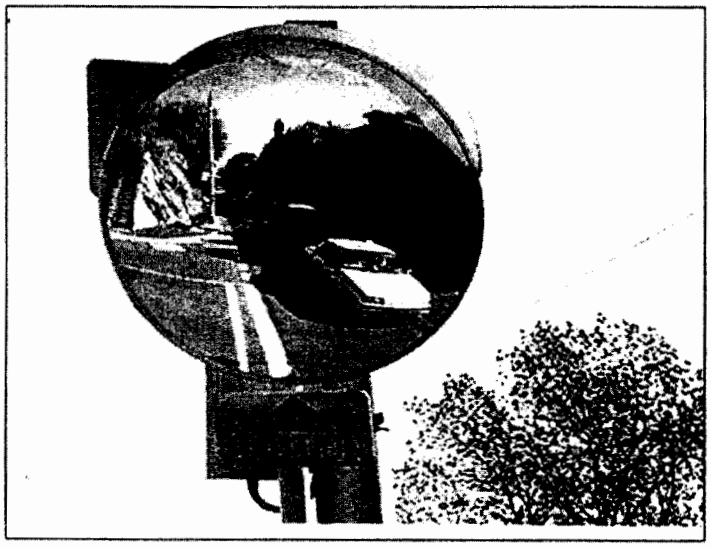


Diagram 4.1
Rajah 4.1

(*a*) State the type of mirror used.
Nyatakan jenis cermin yang digunakan.

.....

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

4(a) 1

(*b*) State why this mirror is used.
Nyatakan mengapa cermin jenis ini digunakan..

.....

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

4(b) 1

(c) In Diagram 4.2, F is the focal point and C is the centre of curvature of a mirror.
Pada Rajah 4.2, F ialah titik fokus dan C ialah pusat kelengkungan suatu cermin.

For Examiner's use

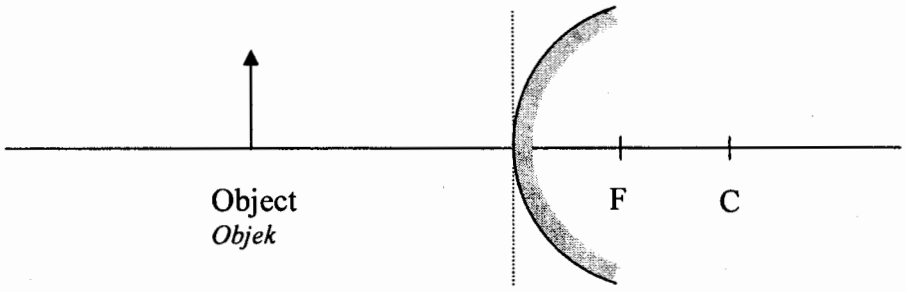


Diagram 4.2
Rajah 4.2

(i) Draw two light rays in Diagram 4.2 to locate the position of the image.
Lukiskan dua sinar cahaya dalam Rajah 4.2 untuk menentukankedudukan imej.

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

4(c)(i) 2

(ii) State **two** characteristics of the image formed
*Nyatakan **dua** ciri imej yang terbentuk.*

.....

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

4(c)(ii) 1

(iii) Calculate the magnification of the image. (Object shown is of the actual size)
Hitungkan pembesaran imej. (Objek yang ditunjukkan adalah saiz sebenar)

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

4(c)(iii) 2

Total A4 7

5 Diagrams 5.1 and 5.2 show instrument K being used to measure pressure for a fixed mass of gas in an air-tight container.
Rajah 5.1 dan 5.2 menunjukkan alat pengukur K *digunakan untuk mengukur tekanan suatu jisim gas di dalam sebuah bekas kedap udara.*

For Examiner's use

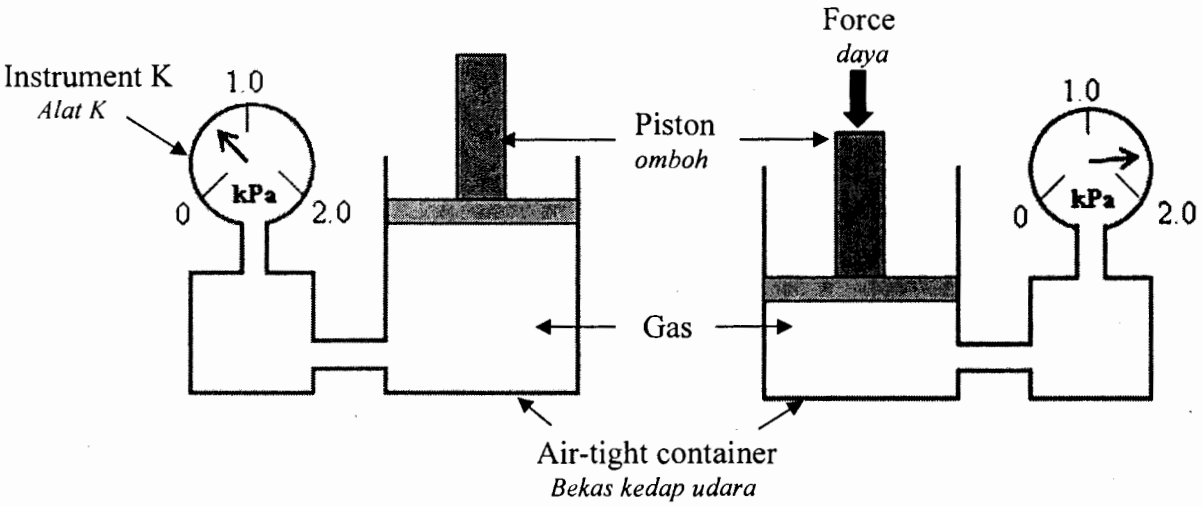


Diagram 5.1
Rajah 5.1

Diagram 5.2
Rajah 5.2

(*a*) Name the instrument K.
Namakan alat K

.....

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

5(a) 1

(*b*) Based on the observations of Diagrams 5.1 and 5.2,
Berdasarkan pemerhatian pada Rajah 5.1 dan 5.2,

(i) compare the volume of the gas.
bandingkan isipadu gas

.....

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

5(b)(i) 1

(ii) compare the pressure of the gas.
bandingkan tekanan gas.

.....

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

5(b)(ii) 1

(iii) state **one** assumption made while performing the experiment.
nyatakan ***satu*** *andaian yang dibuat semasa menjalankan eksperimen.*

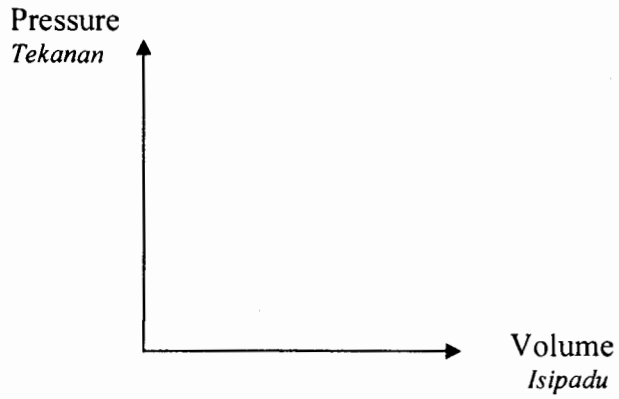
.....MOZ@C.....

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

5(b)(iii) 1

(c) Using your answers in (*b*)(i) and (*b*)(ii), sketch the graph of pressure against volume of the gas.
Menggunakan jawapan anda dalam (*b*)(i) and (*b*)(ii), *lakarkan graf tekanan melawan isipadu untuk gas tersebut.*

For Examiner's use



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

5(c) 1

(d) Name the physics law which is involved in the above observation.
Namakan hukum fizik yang terlibat dalam pemerhatian di atas.

.....

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

5(d) 1

(e) Using the kinetic theory of matter, explain why pressure changes when the gas volume changes.
Dengan menggunakan teori kinetik jirim, terangkan mengapa tekanan berubah bila isipadu gas berubah.

.....

.....

.....

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

5(e) 2

Total A5

8

6 (*a*) Diagram 6.1 shows a waveform on the screen of a cathode ray oscilloscope that is connected across R. Diagram 6.2 shows how an electric component **Q** is connected to the circuit.

Gambarajah 6.1 menunjukkan bentuk gelombang di atas skrin sebuah osiloskop sinar katod yang disambung merentasi R. Rajah 6.2 menunjukkan bagaimana komponen elektrik Q disambungkan ke dalam litar tersebut.

For Examin use

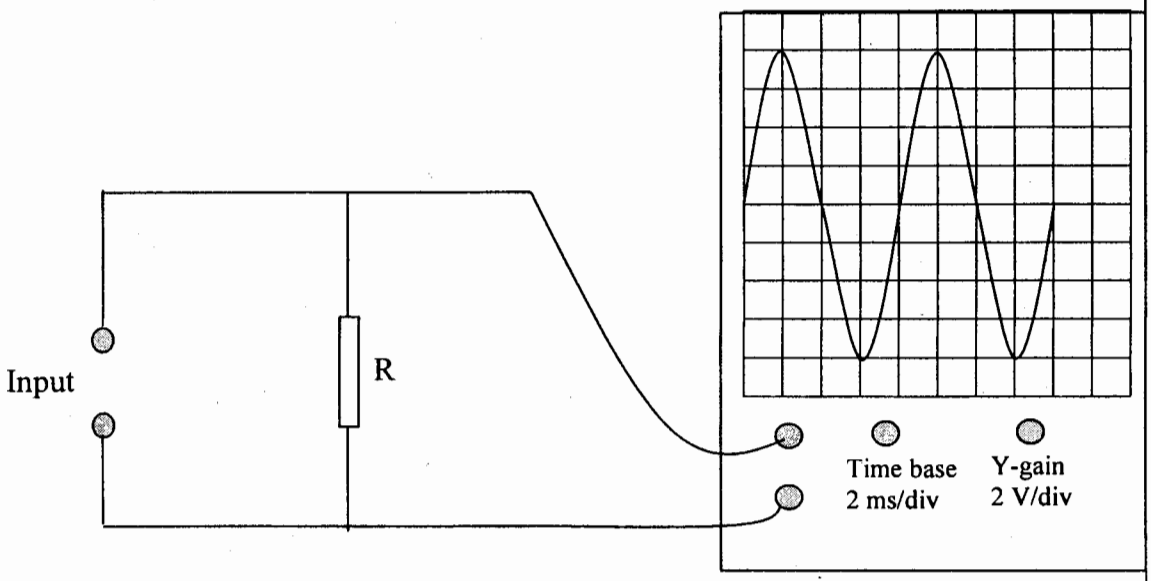


Diagram 6.1
Rajah 6.1

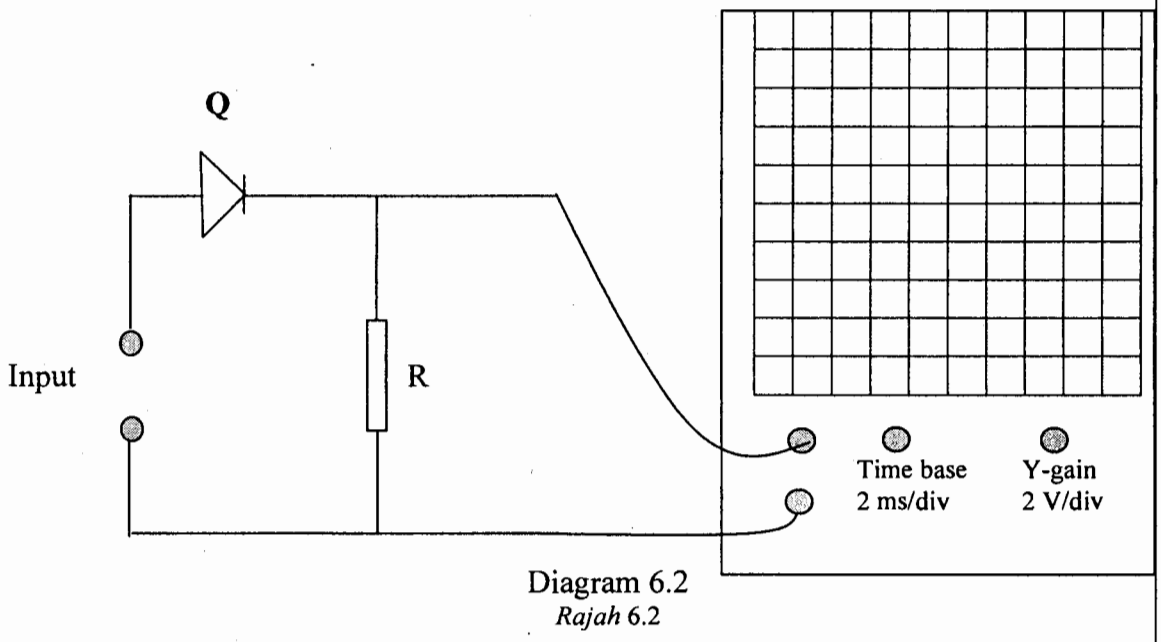


Diagram 6.2
Rajah 6.2

(i) Tick (√) the correct answer in the box provided.
The input power supply in Diagram 6.1 is connected to
Tandakan (√) jawapan yang betul dalam kotak yang disediakan.
Input sumber kuasa dalam gambarajah 6.1 disambungkan ke

☐ alternating current
arus ulangalik

☐ direct current
arus terus

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

6(a)

(ii) What is the function of component **Q** in Diagram 6.2?
Apakah fungsi komponen **Q** *dalam Rajah* 6.2?

.....

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

For Examiner's use
6(a)(ii) 1

(iii) Draw the waveform produced on the screen in Diagram 6.2.
Lukiskan bentuk gelombang pada skrin dalam Rajah 6.2.

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

6(a)(iii) 2

(iv) Compare the waveforms in Diagram 6.1 and Diagram 6.2. Name the process involved in Diagram 6.2.
Bandingkan bentuk gelombang dalam Rajah 6.1 dan Rajah 6.2. Namakan proses yang terlibat dalam Rajah 6.2.

.....

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

6(a)(iv) 1

(*b*) Name the component **Q** in Diagram 6.2.
Namakan komponen Q dalam Rajah 6.2.

.....

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

6(b) 1

(*c*) Component **Q** is made from a semiconductor material. One type of semiconductor is the n-type.
Explain how the n-type semiconductor is produced.
Komponen Q diperbuat dari bahan semikonduktor. Salah satu jenis semikonduktor ialah semikonduktor jenis-n.
Terangkan bagaimana semikonduktor jenis-n dihasilkan.

.....

.....

.....

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

6(c) 2

Total A6 8

7 Diagram 7 shows a wooden sampan of mass 200 kg with a volume of 2 m^3 floating at sea.
Rajah 7 menunjukkan sebuah sampan kayu berjisim 200 kg dengan isipadu 2 m^3 terapung di laut.

For Examiner use

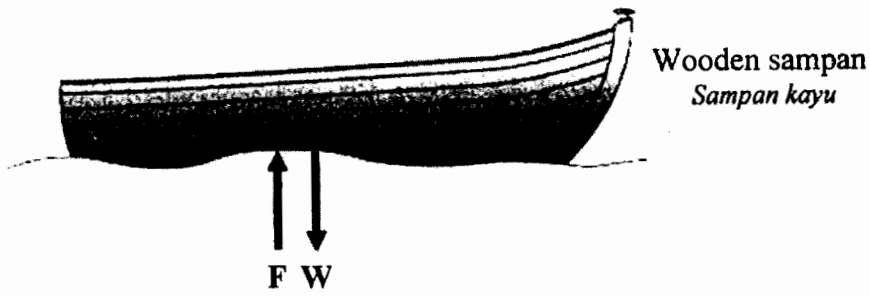


Diagram 7
Rajah 7

(*a*) (i) Name the force **F** shown in Diagram 7.
*Namakan daya **F** yang ditunjukkan dalam Rajah 7.*

.....

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

7(a)(i) 1

(ii) What is the relationship between **F** and **W**?
*Apakah hubungan antara **F** dan **W**?*

.....

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

7(a)(ii) 1

(*b*) Determine the magnitude of **F**.
*Tentukan magnitud **F**.*

[2 marks] / [2 *markah*]

7(b) 2

(*c*) Another boat of similar mass and volume is built from fibre glass to replace the wooden sampan. Fibre glass is stronger and can support a greater load.
Satu sampan dengan jisim dan isipadu yang serupa dibina menggunakan kaca gentian untuk menggantikan sampan kayu. Kaca gentian adalah lebih kuat dan boleh menyokong beban yang lebih besar.

For Examiner's use

(i) Give another reason why fibre glass is chosen.
Berikan satu sebab lain mengapa kaca gentian dipilih.

.....

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

7(c)(i) 1

(ii) Calculate the maximum weight which can be carried by the fibre glass sampan and still remain afloat.(Given the the density of sea water is 1020 kg m^{-3})
Hitung berat maksimum yang boleh dibawa oleh sampan yang diperbuat dari kaca gentian dan masih kekal terapung. (Diberi ketumpatan air laut ialah 1020 kg m^{-3})

[2 marks] / [2 *markah*]

7(c)(ii) 2

(iii) What will happen if the fibre glass sampan carrying the maximum weight moves from the sea to a river?
Apa akan terjadi sekiranya sampan kaca gentian yang membawa berat maksimum tersebut bergerak dari laut ke sungai?

.....

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

7(c)(iii) 1

(iv) Explain your answer in c(iii)
Terangkan jawapan anda dalam c(iii)

.....

.....

.....

[2*mark*] / [2 *markah*]

7(c)(iv) 2

10

8 Diagram 8 shows a galvanometer with a resistance of 5Ω and a full-scale deflection of 5 mA.
Rajah 8 menunjukkan sebuah galvanometer dengan rintangan 5Ω dan pesongan skala penuh 5 mA .

For Examin use

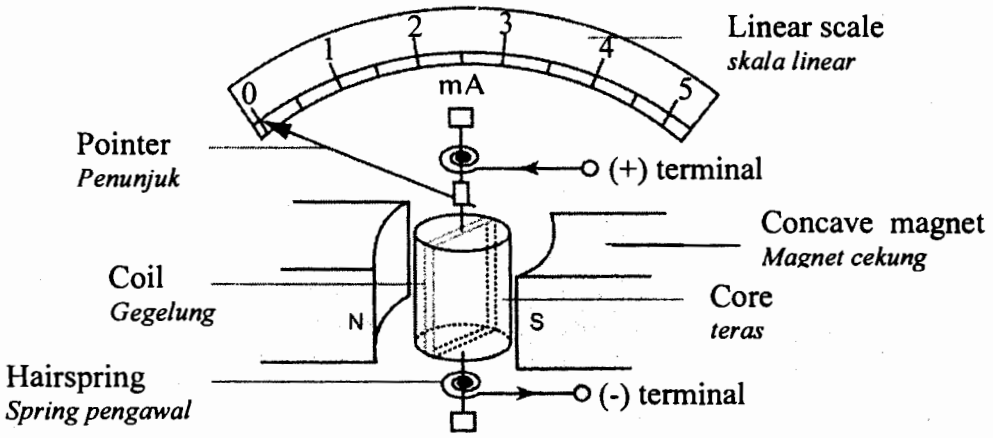


Diagram 8
Rajah 8

The galvanometer uses the interaction between the magnetic field of a permanent magnet and the magnetic field of an electromagnet to measure a small current. The coil of the galvanometer gets heated up quickly, thus affecting the reading shown by the pointer.
Galvanometer di atas menggunakan tindakbalas di antara medan magnet kekal dan medan magnet sebuah elektromagnet untuk mengukur arus yang kecil. Gegelung galvanometer menjadi panas dengan cepat dan ini mempengaruhi bacaan yang diberikan oleh penunjuk.

(a) What is meant by electromagnet?
Apakah yang dimaksudkan dengan elektromagnet?

8(

.....

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

Table 8 shows the specifications of four galvanometers J, K, L and M.
Jadual 8 menunjukkan spesifikasi empat galvanometer J, K, L dan M.

Galvanometer *Galvanometer*	Wire used for the coil *Wayar yang digunakan untuk gegelung*	Core material *Bahan teras*	Number of turns of coil *Bilangan lilitan gegelung*
J	Thin *Halus*	Soft iron *Besi lembut*	Large *Banyak*
K	Thick *Tebal*	Steel *Keluli*	Small *Sedikit*
L	Thin *Halus*	Steel *Keluli*	Small *Sedikit*
M	Thick *Tebal*	Soft iron *Besi lembut*	Large *Banyak*

Table 8
Jadual 8

(*b*) Based on Table 8, state the suitable specifications for the coil and the core to make the galvanometer more efficient.
Give the reason for the suitability of the aspects.
Berdasarkan Jadual 8, nyatakan spesifikasi gegelung dan bahan teras yang sesuai untuk menjadikan galvanometer lebih cekap.
Berikan sebab mengapa spesifikasi itu sesuai.

For Examiner's use

(i) Wire used for the coil
Wayar yang digunakan untuk gegelung

.....

Reason
Sebab

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

8(b)(i) 2

(ii) Core material
Bahan teras

.....

Reason
Sebab

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

8(b)(ii) 2

(iii) Number of turns of the coil
Bilangan lilitan gegelung

.....

Reason
Sebab

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

8(b)(iii) 2

(*c*) Based on the answers in 8(*b*), determine the most suitable galvanometer in Table 8 to measure a small current.
Berdasarkan jawapan dalam 8(b), tentukan galvanometer yang paling cekap dalam Jadual 8.

.....
[1*marks*] / [1 *markah*]

8(c) 1

(*d*) A resistor is added to the galvanometer to enable it to produce a full-scale deflection when the current is 1 ampere.
Satu perintang ditambah kepada galvanometer itu untuk membolehkannya menghasilkan pesongan skala penuh bila arus ialah 1 ampere.

For Examiner's use

(i) State how the resistor should be connected to the galvanometer.
Tick (√) the correct answer in the box provided.
Nyatakan bagaimana perintang tersebut perlu disambungkan kepada galvanometer.
Tanda (√) pada jawapan yang betul dalam kotak yang disediakan.

☐ In series with the galvanometer
Sesiri dengan galvanometer

☐ Parallel to the galvanometer
Selari dengan galvanometer

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

8(d)(i) 1

(ii) Explain your answer in **8**(*d*)(i)
Terangkan jawapan anda dalam **8**(*d*)(i)

.....

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

8(d)(ii) 1

(iii) Calculate the resistance of the added resistor.
Hitung rintangan perintang yang ditambah itu.

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

8(d)(i

Total A8

1

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HALAMAN KOSONG

Section B
Bahagian B

[20 marks]
[20 *markah*]

Answer any **one** question from this section

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

9 (*a*) Diagram 9.1 represents a 50 sen coin and a leaf falling in a vacuum container. The coin is heavier than the leaf.

Rajah 9.1 mewakili sekeping duit syiling 50 sen dan sehelai daun jatuh di dalam sebuah bekas vakum. Duit syiling adalah lebih berat dari daun.

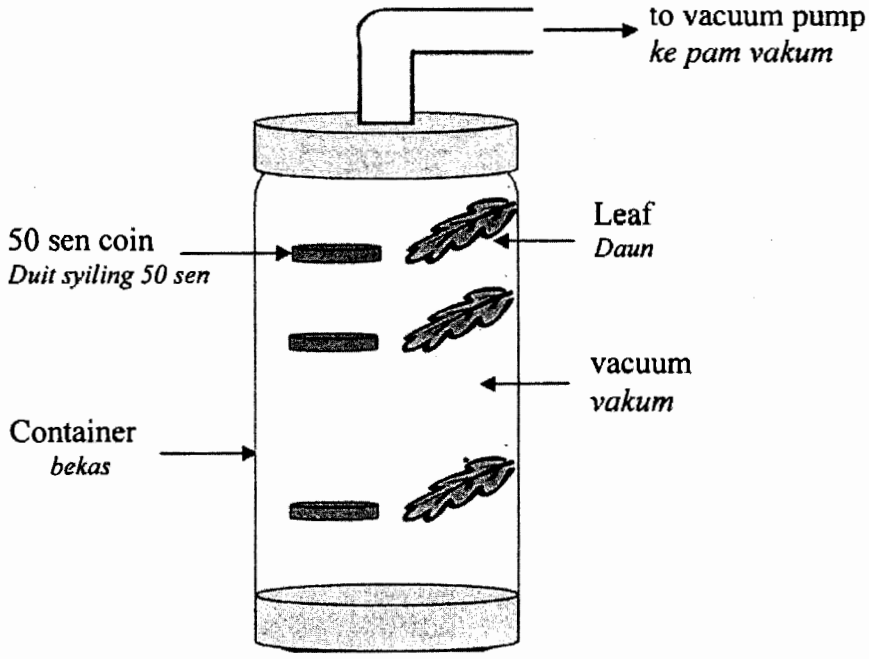


Diagram 9.1
Rajah 9.1

Using Diagram 9.1 and the information given about the weight of the two objects, compare the mass of the coin and the leaf, the time taken to fall, the positions of the coin and the leaf and finally, deduce the physical quantity which causes the objects to fall.

Dengan menggunakan Rajah 9.1 dan maklumat yang diberikan mengenai berat objek, bandingkan jisim duit syiling dan daun, masa yang diambil untuk jatuh, kedudukan duit syiling dan daun dan seterusnya, simpulkan satu kuantiti fizik yang menyebabkan objek-objek tersebut jatuh.

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

(*b*) Diagram 9.2 shows a student trying to launch a water rocket.

Rajah 9.2 menunjukkan seorang pelajar sedang mencuba untuk melancarkan sebuah roket air.

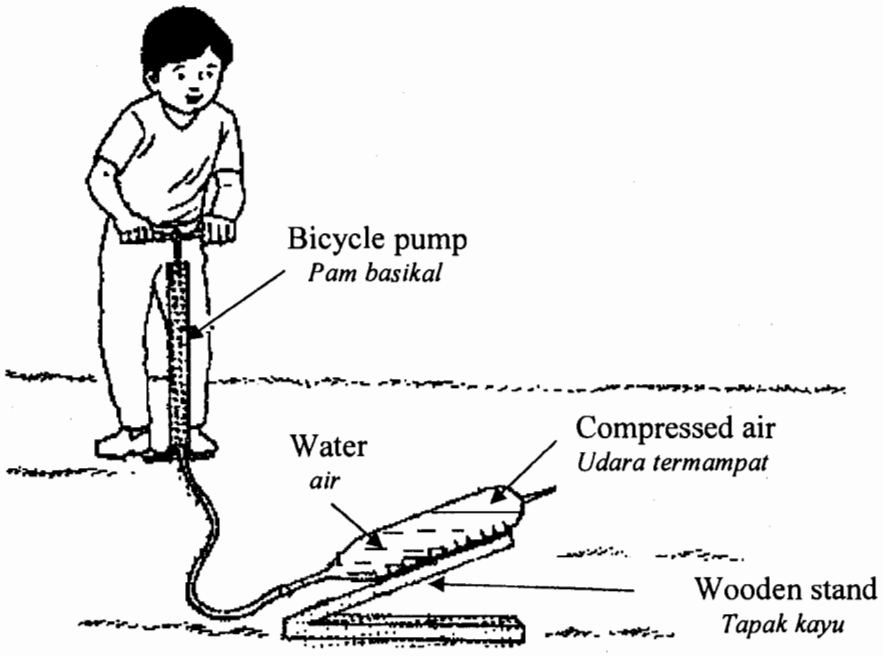


Diagram 9.2
Rajah 9.2

You are required to give some suggestions on how to design a water rocket for a national competition. Using the knowledge on forces, motion and properties of materials, explain the suggestions based on the following aspects:

Anda dikehendaki memberi beberapa cadangan untuk mereka bentuk sebuah roket air untuk satu pertandingan peringkat kebangsaan. Menggunakan pengetahuan tentang daya, gerakan dan sifat-sifat bahan, terangkan cadangan itu yang merangkumi aspek-aspek berikut:

(i) Material used
Bahan yang digunakan

(ii) Shape of the rocket
Bentuk roket

(iii) Angle of launching
Sudut pelancaran

(iv) Volume of water in the rocket
Isipadu air dalam roket

(v) Added structure for the motion of the rocket
Stuktur tambahan untuk pergerakan roket.

MOZ@C [10 *marks*] / [10 *markah*]

  [Turn over

(*c*) A stone which is released from a tall building falls down in the air. During the fall, the stone experiences an energy change.

Seketul batu yang dilepaskan dari sebuah bangunan tinggi jatuh ke bawah di udara. Semasa batu itu jatuh, ia mengalami suatu perubahan tenaga.

(*d*) What is meant by energy?

Apakah yang dimaksudkan dengan tenaga?

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

(*e*) Explain the energy changes in the stone.

Terangkan perubahan tenaga pada batu.

[4 *marks*] / [4 *markah*]

10 Diagrams10.1(a) and Diagram 10.2(a) show the apparatus set-up for a Young's double-slit experiment, to determine the wavelength of a ***monochromatic*** light. Diagrams 10.1(b) and 10.2(b) show the fringes formed on the screen for each situation.

Rajah 10.1(a) dan Rajah 10.2(a) menunjukkan susunan radas untuk eksperimen dwi celah Young, untuk menentukan panjang gelombang suatu cahaya ***monokromatik.*** *Rajah 10.1(b) dan 10.2(b) menunjukkan pinggir yang terhasil pada skrin untuk setiap situasi.*

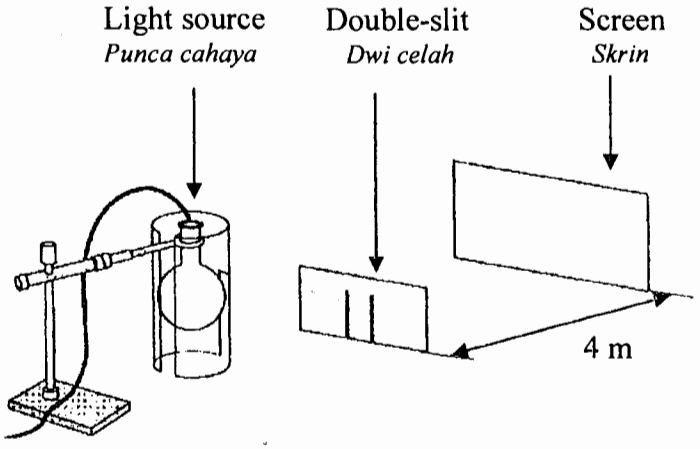


Diagram 10.1(a)
Rajah 10.1(a)

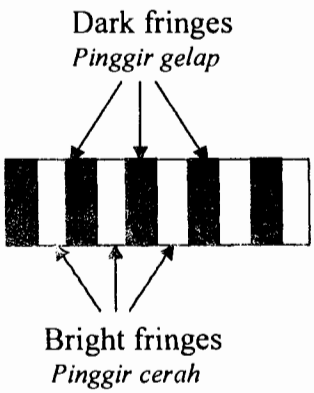


Diagram 10.1(b)
Rajah 10.1(b)

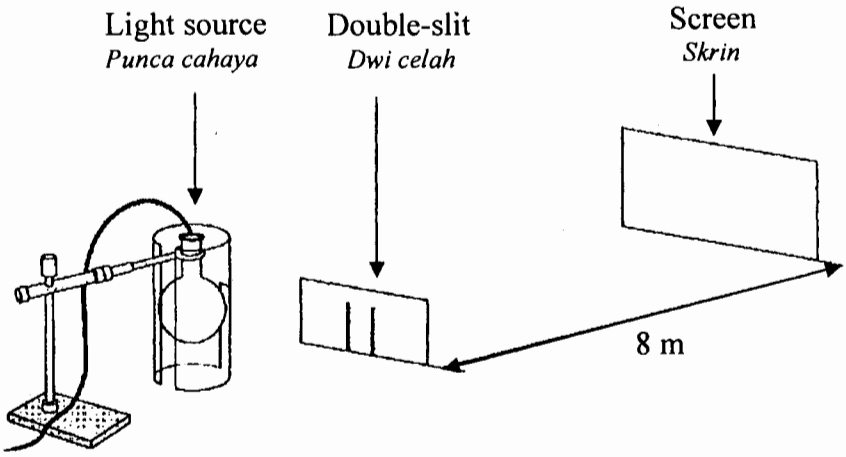


Diagram 10.2(a)
Rajah 10.2(a)

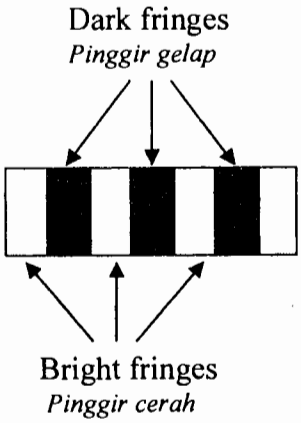


Diagram 10.2(b)
Rajah 10.2(b)

(*a*) What is meant by ***monochromatic*** light?

Apakah yang dimaksudkan dengan cahaya ***monokromatik****?*

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

(*b*) Using all the diagrams given, compare the distance between the double-slit and the screen, the distance between two successive bright fringes, the number of fringes and the width of fringes.

Deduce the relationship between the distance of the double-slit and the screen and the distance between two successive bright fringes.

Menggunakan semua rajah yang diberikan,bandingkan jarak antara dwi celah dengan skrin, jarak antara dua pinggir cerah berturutan, bilangan pinggir dan lebar pinggir.

Buat satu kesimpulan yang menghubungkan jarak antara dwi celah dengan skrin dan jarak antara dua pinggir cerah berturutan.

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

(*c*) The assembly hall of SRK Taman Hijau is small in size and produces too much echo. The administrator intends to replace the old building with a new one. The new hall should be able to accommodate at least 800 students and is suitable for holding other activities like concerts.

Suggest modifications that need to be done to the old hall.
Using the knowledge on wave characteristics, explain the modifications based on the following aspects:

Dewan perhimpunan SRK Taman Hijau bersaiz kecil dan menghasilkan terlalu banyak gema.Pihak pentadbiran bercadang unuk menggantikan bangunan yang lama itu dengan yang baru.
Dewan yang baru perlu memuatkan sekurang-kurangnya 800 pelajar dan sesuai untuk mengadakan aktiviti-aktiviti lain seperti konsert.

Cadangkan pengubahsuaian yang perlu dilakukan kepada dewan yang lama.
Dengan menggunakan pengetahuan tentang ciri-ciri gelombang, terangkan pengubahsuaian itu berdasarkan aspek-aspek berikut:

- the design of the hall
  rekabentuk dewan

- the furnishings in the hall
  kelengkapan di dalam dewan

- the sound and lighting systems in the hall
  sistem bunyi dan cahaya di dalam dewan.

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

(*d*) Explain why strong double-glazed glass is used as walls of the observation tower in an airport.

Terangkan mengapa kaca dua lapisan yang sangat kuat digunakan sebagai dinding menara cerapan di lapangan terbang.

[4 *marks*] / [4 *markah*]

Section C
Bahagian C

[20 marks]
[20 *markah*]

Answer any **one** question from this section

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

11 Diagram 11.1 represents the parts of a slide projector designed to produce a real and magnified image of the slide on the screen, as shown in Diagram 11.2.

Rajah 11.1 mewakili bahagian-bahagian sebuah projektor slaid yang direka bentuk untuk menghasilkan satu imej slaid yang nyata dan besar di skrin seperti pada Rajah 11.2.

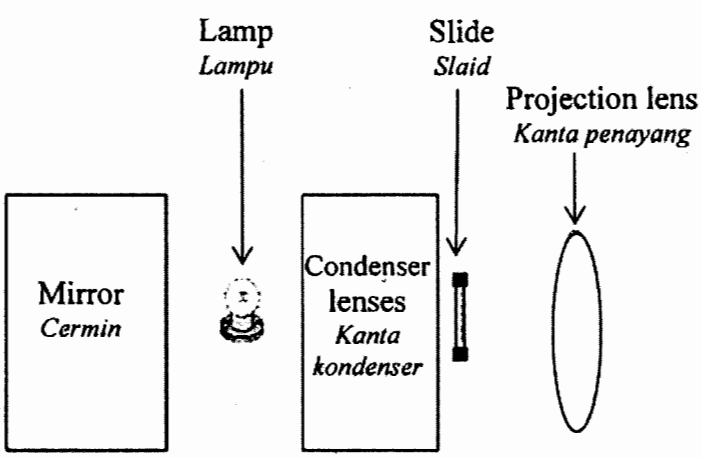


Diagram 11.1
Rajah 11.1

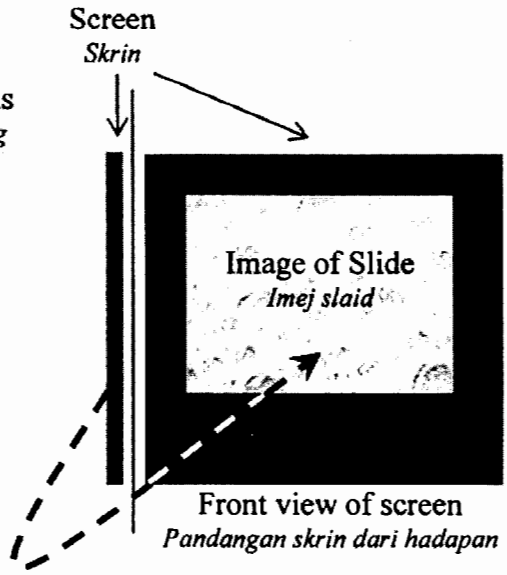


Diagram 11.2
Rajah 11.2

(a) What is meant by real image?

Apakah yang dimaksudkan dengan imej nyata?

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

Table 11.3 shows four specifications P, Q, R and S for the design of a slide projector.
Jadual 11.3 menunjukkan empat spesifikasi P, Q, R dan S bagi reka bentuk sebuah projektor slaid.

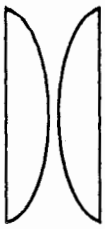
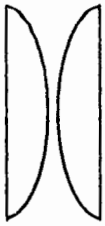
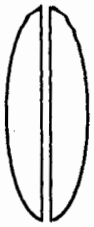
Projector specifications *Spesifikasi projektor*	**P**	**Q**	**R**	**S**
Type of mirror *Jenis cermin*				
Arrangement of condenser lenses *Susunan kanta kondensor*				
Distance of slide from the projection lens *Jarak slaid dari kanta penayang*	Same as *f* *Sama dengan f*	Between *f* and 2*f* *Antara f dan 2f*	Between *f* and 2*f* *Antara f dan 2f*	Same as *f* *Sama dengan f*
The way the slide should be placed *Cara slaid harus diletakkan.*	Upright *Tegak*	Inverted *Songsang*	Upright *Tegak*	Inverted *Songsang*

Table 11.3
Jadual 11.3

(*b*) You are required to determine the most suitable specifications for the design of a slide projector based on Diagram 11.1 .
Study all the specifications given, based on the following aspects:

Anda dikehendaki menentukan spesifikasi yang paling sesuai untuk mereka bentuk sebuah projektor slaid berdasarkan Rajah 11.1.
Kaji semua spesifikasi yang diberikan, berdasarkan aspek aspek berikut:

- The type of mirror used
  Jenis cermin yang digunakan

- The arrangement of lenses for the condenser lens
  Susunan kanta bagi kanta kondenser

- The distance of slide from the projection lens
  Jarak slaid dari kanta penayang

- The way the slide should be placed
  Cara slaid harus diletakkan

(i) Explain the suitability of the aspects.

Terangkan kesesuaian aspek aspek tersebut.

(ii) Determine the most suitable specification for the design of the slide projector and give your reasons.

Tentukan spesifikasi yang paling sesuai untuk mereka bentuk sebuah slaid projektor dan berikan alasan anda.

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

(*c*) On a very hot day, vehicle drivers often see images which look like pools of water on a road surface. This phenomenon is known as a mirage.

Pada hari yang sangat panas, pemandu kenderaan sering ternampak imej seperti lopak air di atas permukaan jalanraya. Fenomena ini di namakan logamaya.

(i) Explain how a mirage is formed.

Terangkan bagaimana logamaya terbentuk.

(ii) Can a mirage be formed in very cold places like the Artic?

Bolehkah logamaya terbentuk di kawasan yang sangat sejuk seperti di Artik?

[4 *marks*] / [4 *markah*]

(*d*) Diagram 11.4 shows a boy aiming his spear at a fish before throwing it. Unfortunately the spear did not hit the fish.

Rajah 11.4 menunjukkan seorang budak lelaki mensasarkan lembingnya pada seekor ikan sebelum merejamnya.Malangnya lembing tersebut tidak terkena ikan.

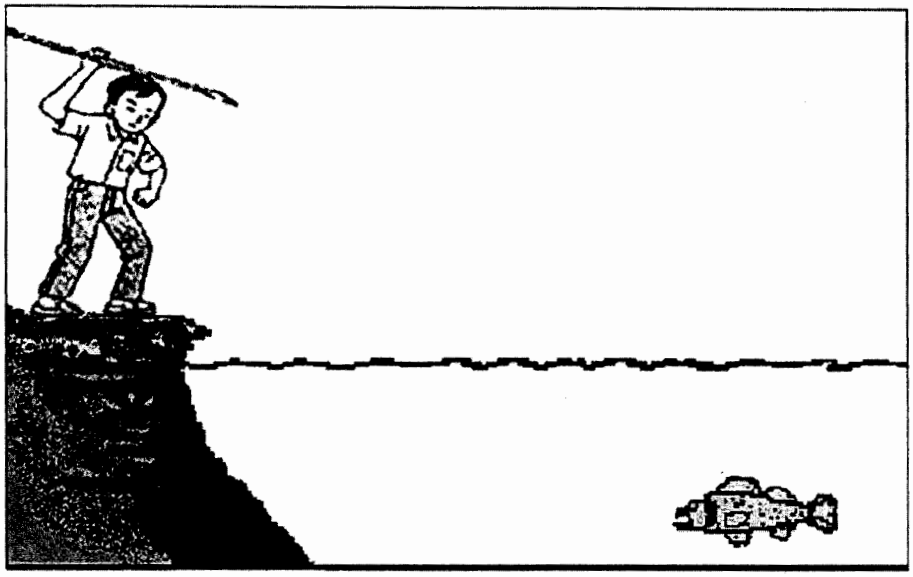


Diagram 11.4
Rajah 11.4

(i) Explain why the spear did not hit the fish when it was thrown.

Terangkan mengapa lembing tersebut tidak terkena ikan apabila dibaling.

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

(ii) Calculate the real depth of the fish if the image of the fish is 0.4 m from the water surface. (Refractive index of water =1.33)

Hitung kedalaman sebenar ikan jika imej ikan berada 0.4 m dari permukaan air.
(Indeks biasan air = 1.33)

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

12 As a researcher, you are assigned to investigate the characteristics of radioactive substances with different half-lives to be used for the treatment of cancer.
Diagram 12.1 shows radioactive rays directed towards the cancer cells in a patient's brain.

Sebagai seorang penyelidik, anda ditugaskan untuk menyiasat ciri-ciri bahan radioaktif yang mempunyai separuh hayat yang berbeza untuk digunakan dalam rawatan kanser.
Rajah 12.1 menunjukkan sinaran radioaktif ditujukan ke arah sel kanser di dalam otak seorang pesakit.

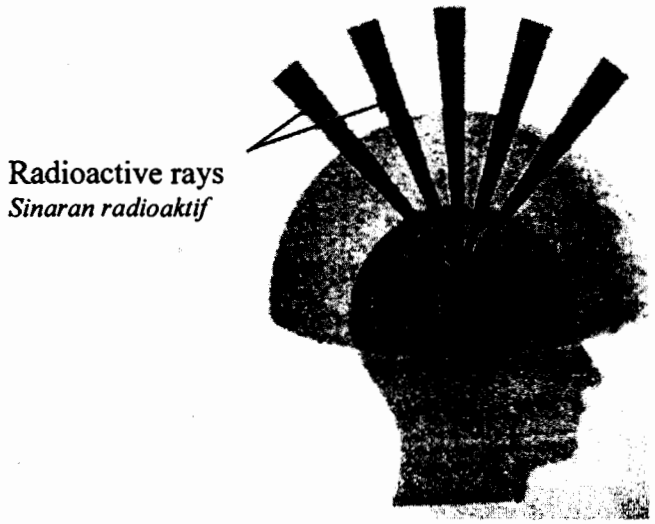


Diagram 12.1
Rajah 12.1

(*a*) What is meant by half–life?

Apakah yang dimaksudkan dengan separuh hayat ?

[1 mark] / [1 *markah*]

(*b*) Sketch a graph of activity against time to illustrate the decay rate of a radioactive substance. Use your graph to explain how the half-life is determined.

Lakarkan graf aktiviti melawan masa untuk menggambarkan proses pereputan suatu bahan radioaktif. Dengan menggunakan graf anda , terangkan bagaimana separuh hayat ditentukan.

[4 marks] / [*4 markah*]

Table 12.1 shows the properties of four radioactive substances, J, K , L and M.

Jadual 12.1 menunjukkan sifat-sifat empat bahan radioaktif J, K, L dan M.

Radioactive Substance *Bahan radioaktif*	**Type of radiation** *Jenis sinaran*	**Half – life** *Separuh hayat*	**State of matter** *Keadaan jirim*	**Ionizing power** *Kuasa pengionan*
J	Beta	1620 years *1620 tahun*	Solid *Pepejal*	High *Tinggi*
K	Gamma	6 hours *6 jam*	Liquid *Cecair*	Low *Rendah*
L	Gamma	5.27 years *5.27 tahun*	Solid *Pepejal*	Low *Rendah*
M	Beta	15 days *15 hari*	Liquid *Cecair*	High *Tinggi*

Table 12.1
Jadual 12.1

(c) (i) Based on Table 12.1 above, explain the suitable properties of the radioactive substance for use to kill cancer cells in a patient.

Berdasarkan Jadual 12.1, terangkan kesesuaian ciri-ciri bahan radioaktif untuk digunakan bagi membunuh sel kanser pada seorang pesakit..

(ii) Determine which radioactive substance is the most suitable for the treatment of cancer cells in a patient and give your reasons.

Tentukan bahan radioaktif yang paling sesuai digunakan dalam rawatan sel kanser pada seorang pesakit dan berikan alasan anda.

[10 marks] / [10 *markah*]

(*d*) Diagram 12 .2 shows a radioactive decay series, beginning for Rn-222 nucleus to Pb-210.

Rajah 12.2 menunjukkan satu siri pereputan radioaktif bagi nukleus Rn-222 kepada Pb-210.

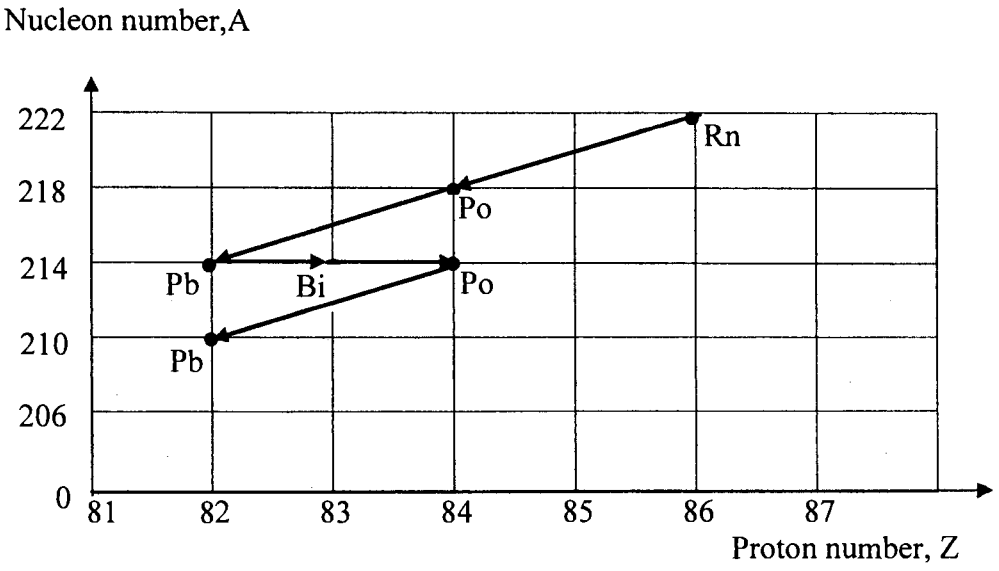


Diagram 12.2
Rajah 12.2

(i) Describe what happens to a nucleus when it undergoes a radioactive decay.

Jelaskan apa yang berlaku kepada satu nukleus yang mengalami pereputan radioaktif.

(ii) Write an equation to represent the radioactive decay series of Rn-222 to Pb-210 in Diagram 12.2

Tuliskan persamaan untuk menunjukkan siri pereputan radioaktif bagi Rn-222 kepada Pb-210 dalam Rajah 12.2.

(iii) State the number of alpha particles and beta particles produced in the decay.

Nyatakan bilangan zarah alfa dan zarah beta yang terhasil dari pereputan itu.

[5 marks] / [5 *markah*]

END OF QUESTION PAPER

KERTAS SOALAN TAMAT

INFORMATION TO CANDIDATES
(MAKLUMAT UNTUK CALON)

1. This question paper consists of **three** sections: **Section A, Section B** and **Section C**.
Kertas soalan ini mengandungi tiga bahagian: **Bahagian A, Bahagian B** *dan* **Bahagian C**.

2. Answer **all** questions in **Section A**. Write your answers for **Section A** in the spaces provided in the question paper.
Jawab **semua** *soalan daripada* **Bahagian A**. *Jawapan kepada* **Bahagian A** *hendaklah ditulis dalam ruang yang disediakan dalam kertas soalan.*

3. Answer **one** question from **Section B** and **one** question from **Section C**. Write your answers for **Section B** and **Section C** on the paper provided by the invigilators. Answer questions in **Section B** and **Section C** in detail. Answers should be clear and logical. Equations, diagrams, tables, graphs and other suitable methods can be used to explain your answer.
Jawab **satu** *soalan daripada* **Bahagian B** *dan* **satu** *soalan daripada* **Bahagian C**. *Jawapan kepada* **Bahagian B** *dan* **Bahagian C** *hendaklah ditulis dalam kertas yang disediakan oleh pengawas peperiksaani. Anda diminta menjawab dengan lebih terperinci untuk* **Bahagian B** dan **Bahagian C**. *Jawapan mestilah jelas dan logik. Persamaan, gambar rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda boleh digunakan.*

4. Show your working, it may help you to get marks.
Tunjukkan kerja mengira, ini membantu anda mendapatkan markah.

5. The diagrams in the questions provided are not drawn to scale unless stated.
Rajah yang mengiringi soalan tidak dilukiskan mengikut skala kecuali dinyatakan.

6. The marks allocated for each question or sub-section of a question are shown in brackets.
Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.

7. If you wish to cancel any answer, neatly cross out the answer. Then write down the new answer.
Jika anda anda hendak menukar sesuatu jawapan, batalkan jawapan yang telah dibuat . Kemudian tulis jawapan yang baru.

8. A list of formulae is provided on pages 2 and 3.
Satu senarai rumus disediakan di halaman 2.

9. You may use non-programmable scientific calculator. However, steps in calculation must be shown.
Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram. Walau bagaimanapun, langkah mengira perlu ditunjukkan.)

10. The time suggested to complete **Section A** is 90 minutes, **Section B** is 30 minutes and **Section C** is 30 minutes.
Masa yang dicadangkan untuk menjawab **Bahagian A** *ialah* 90 *minit*, **Bahagian B** *ialah* 30 *minit dan* **Bahagian C** *ialah* 30 *minit.*

11. Attach all your answers together and hand them in at the end of the examination.
Lekatkan semua kertas jawapan dan serahkan kepada pengawas peperiksaan.

Name: ..... MOZ@C Class: .....

SULIT
4531/3
Physics
Paper 3
September
2008

1½ hours

4531/3

MAKTAB RENDAH SAINS MARA

SIJIL PELAJARAN MALAYSIA
TRIAL EXAMINATION 2008

PHYSICS

Paper 3

One hour and thirty minutes

DO NOT OPEN THIS QUESTION BOOKLET UNTIL BEING TOLD TO DO SO

1. Write down your name and class in the space provided
   Tuliskan nama dan kelas anda pada ruang yang disediakan.
2. The questions are written in English and Bahasa Melayu
   Kertas soalan ini adalah dalam bahasa Inggeris dan bahasa Melayu .
3. Candidates are required to read the information at the back of the booklet.
   Calon dikehendaki membaca maklumat di halaman belakang buku soalan ini

Examiner's Code			
Section	Question	Marks	Score
A	1	16	
	2	12	
B	3	12	
	4	12	
Total			

4531/3

This paper consists of 16 printed pages

[See next page

Section A

Bahagian A

[28 marks/ *28 markah]*

Answer **all** questions in this section

Jawab **semua** *soalan dalam bahagian ini.*

1. A student carries out an experiment to investigate the relationship between the pressure of water and its depth, h.
The arrangement of the apparatus for the experiment is shown in Diagram 1.1. A thin rubber sheet is fixed across the mouth of a thistle funnel. A rubber tube is used to attach the funnel to a manometer which contains Liquid P.
x_1 and x_2 are the liquid levels in both arms of the manometer. The pressure exerted by water is determined by the difference in the liquid level, ℓ.

Seorang pelajar menjalankan satu eksperimen untuk mengkaji hubungan antara tekanan air dengan kedalaman, h. Susunan radas untuk eksperimen ditunjukkan pada Rajah 1.1. *Sekeping getah nipis diletakkan pada mulut corong tisel. Tiub getah digunakan untuk menyambung corong itu kepada sebuah manometer yang mengandungi Cecair P.* x_1 *dan* x_2 *adalah aras cecair dalam kedua lengan manometer. Tekanan air ditentukan oleh perbezaan aras cecair,* ℓ

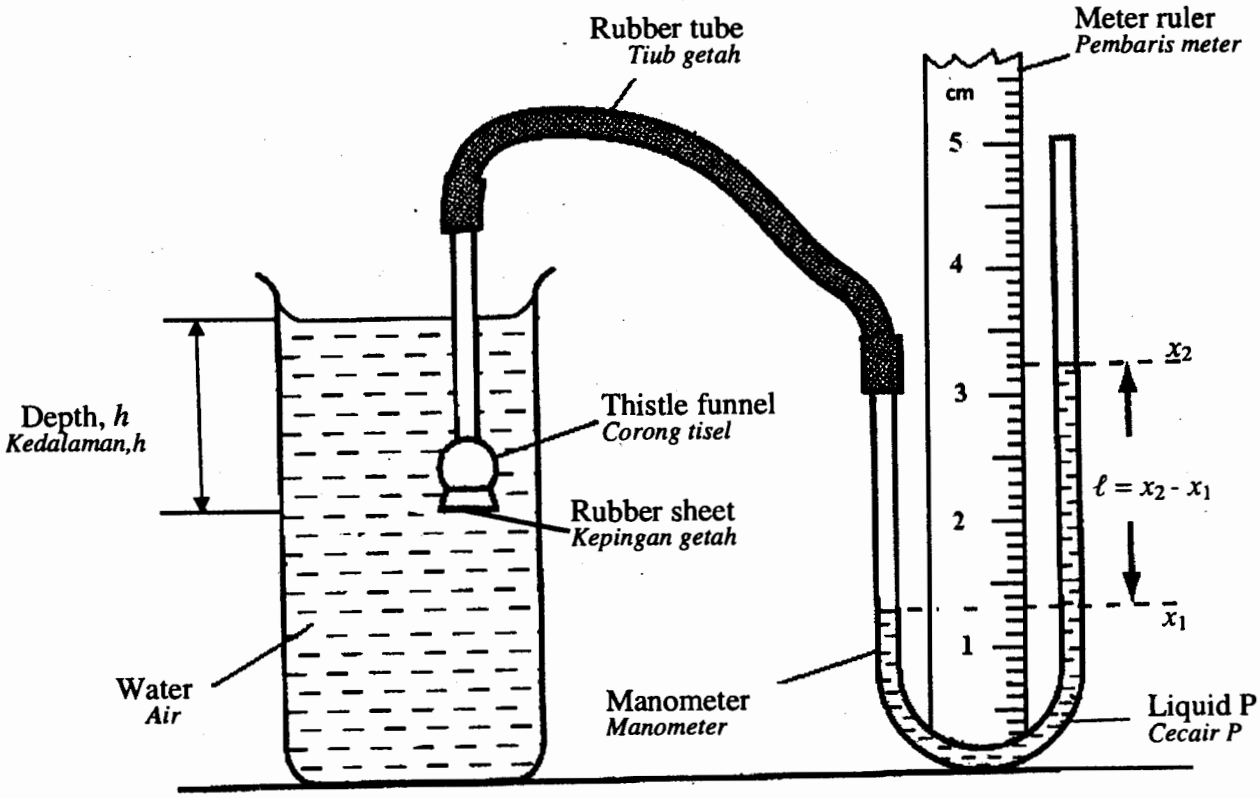


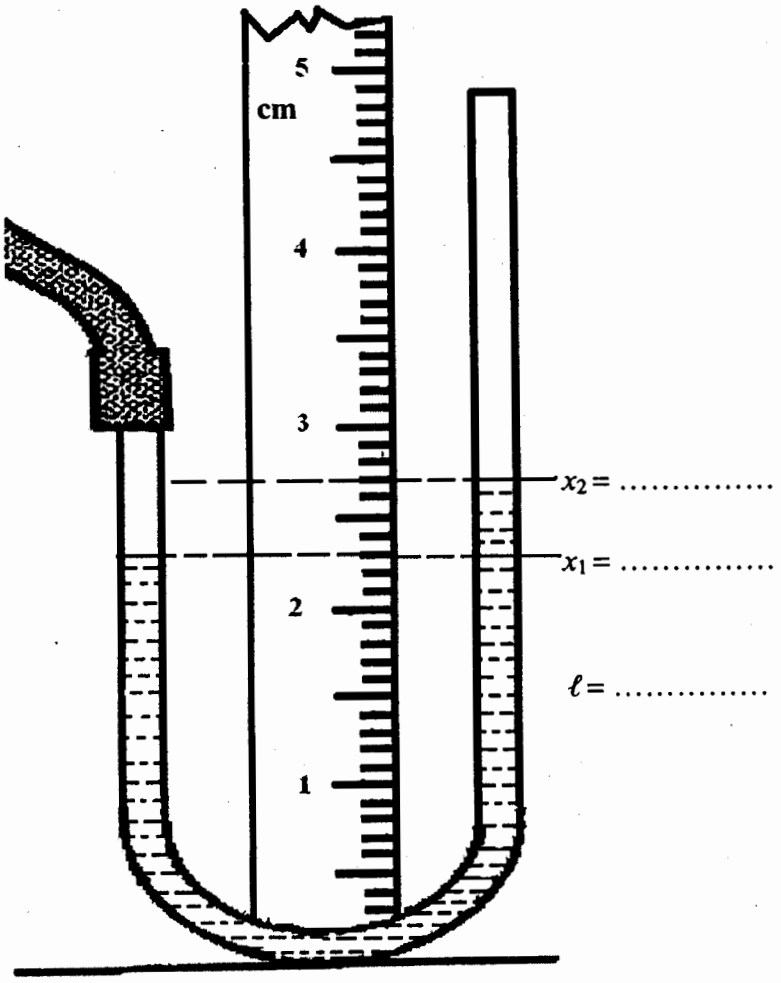
Diagram 1.1/ *Rajah* 1.1

The thistle funnel is immersed in the water at a depth, h = 0.5 cm from the water surface. The manometer reading is as shown in Diagram 1.2.

The procedure is repeated with h = 1.0 cm, 1.5 cm, 2.0 cm and 2.5 cm, and the corresponding manometer readings are shown in Diagram 1.3, 1.4, 1.5 and 1.6 on page 4 and 5.

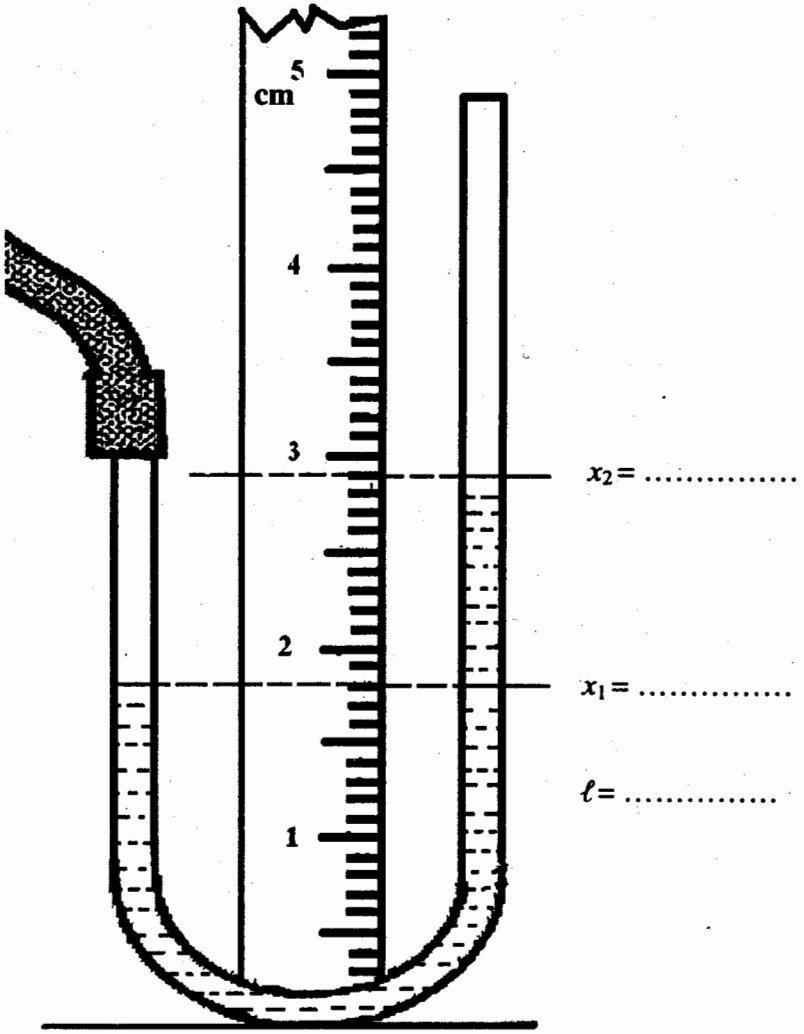
Corong tisel dicelupkan ke dalam air pada kedalaman, h = 5.0 cm dari permukaan cecair. Bacaan manometer ditunjukkan pada Rajah 1.2.

Prodsedur diulangi dengan kedalaman h = 1.0 cm, 1.5 cm, 2.0 cm and 2.5 cm, dan bacaan manometer yang sepadan ditunjukkan pada Rajah 1.3, 1.4, 1.5 dan 1.6 di halaman 4 dan 5.



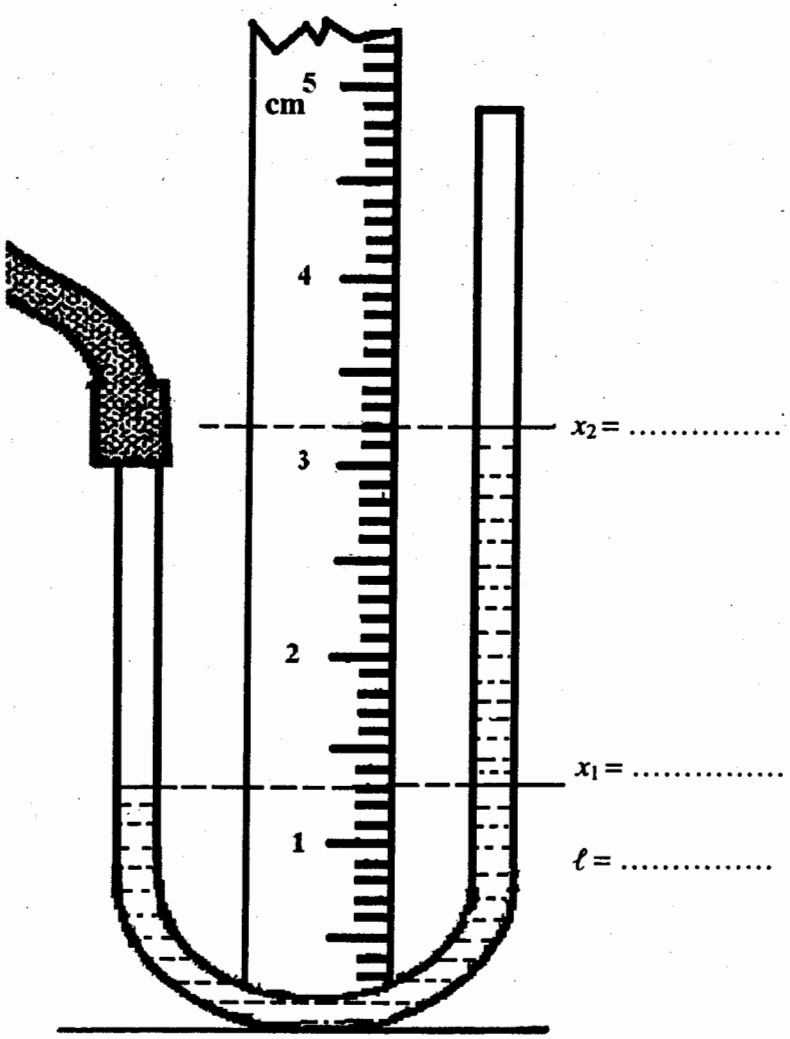
h = 0.5 cm

Diagram 1.2
Rajah 1.2



h = 1.0 cm

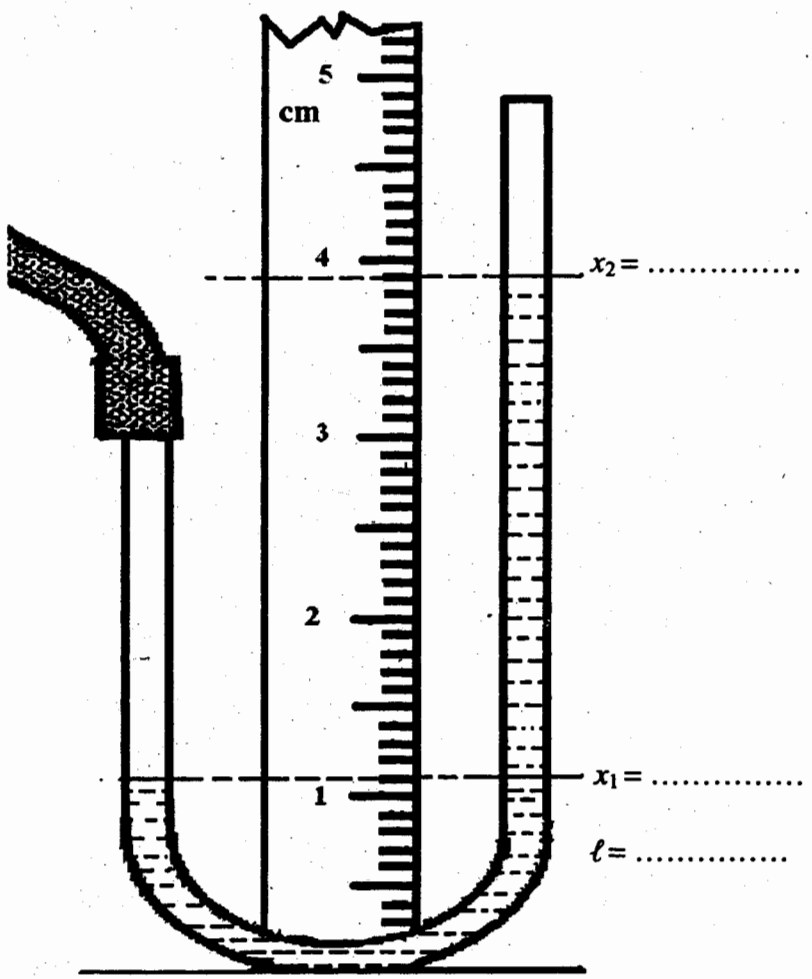
Diagram 1.3
Rajah 1.3



h = 1.5 cm

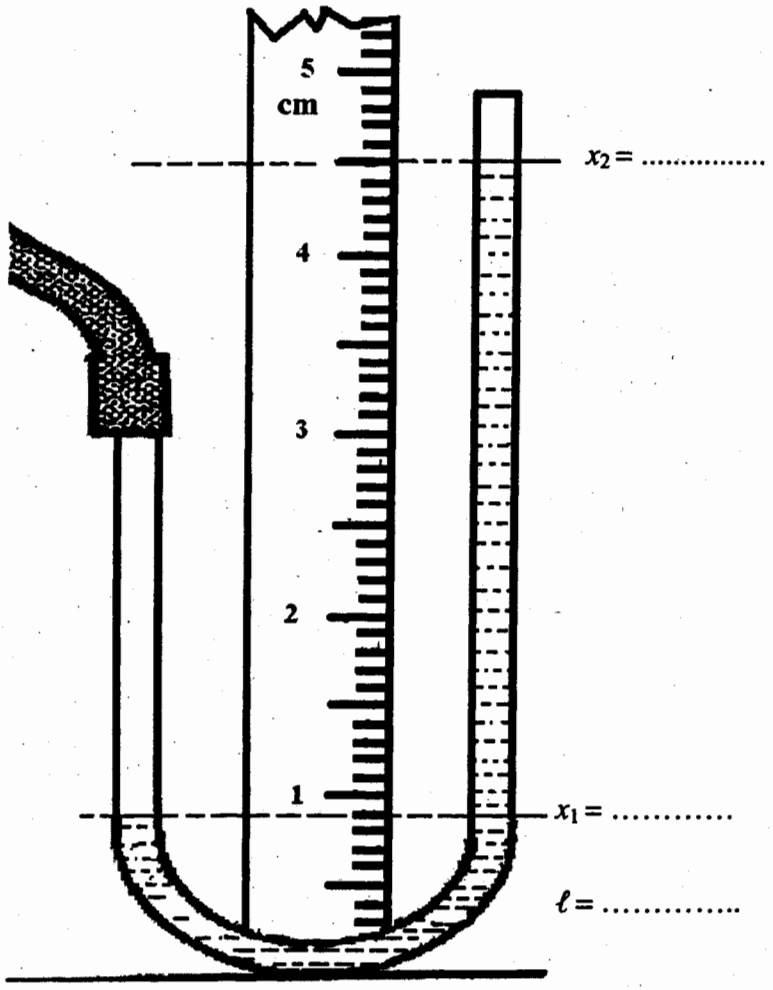
Diagram 1.4
Rajah 1.4

MOZ@C



h = 2.0 cm

Diagram 1.5
Rajah 1.5



h = 2.5 cm

Diagram 1.6
Rajah 1.6

For Examiner's use

(*a*) Based on the experiment described on page 2 and 3, identify:

Berdasarkan eksperimen yang diterangkan di halaman 2 dan 3, kenal pasti:

(i) the manipulated variable.

pembolehubah dimanipulasi

1(*a*)(i) 1

.....

[1 mark/*markah*]

(ii) the responding variable

pembolehubah bergerak balas

1(*a*)(ii) 1

.....

[1 mark/*markah*]

(iii) the constant variable

pembolehubah dimalarkan

1(*a*)(iii) 1

.....

[1 mark/*markah*]

(*b*) Based on Diagrams 1.2, 1.3, 1.4, 1.5 and 1.6 on pages 3, 4 and 5:

Berdasarkan Rajah 1.2, 1.3, 1.4, 1.5 *dan* 1.6 *di halaman 3, 4 dan 5:*

(i) Determine x_1, x_2 and the value of ℓ by using the formula

$$\ell = x_2 - x_1$$

Record all the values of x_1, x_2 and ℓ in the spaces provided.

Tentukan x_1, x_2 *dan nilai* ℓ *dengan menggunakan formula*

$$\ell = x_2 - x_1$$

Catatkan bacaan x_1, x_2 dan ℓ *dalam ruang yang disediakan.*

1(*b*)(i) 3

[3 marks/*markah*]

For Examiner's use

(ii) Tabulate your results for x_1, x_2, and ℓ for all values of h, in the space below.

Jadualkan keputusan anda bagi x_1, x_2, dan ℓ untuk semua nilai h, pada ruang yang disediakan di bawah.

[4 marks/*markah*]

1(*b*)(ii) 4

(*c*) On the graph paper on page 8, plot a graph of ℓ against h.

Pada kertas graf di halaman 8, lukis graf ℓ melawan h.

[5 marks/*markah*]

1(*c*) 5

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

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

.....

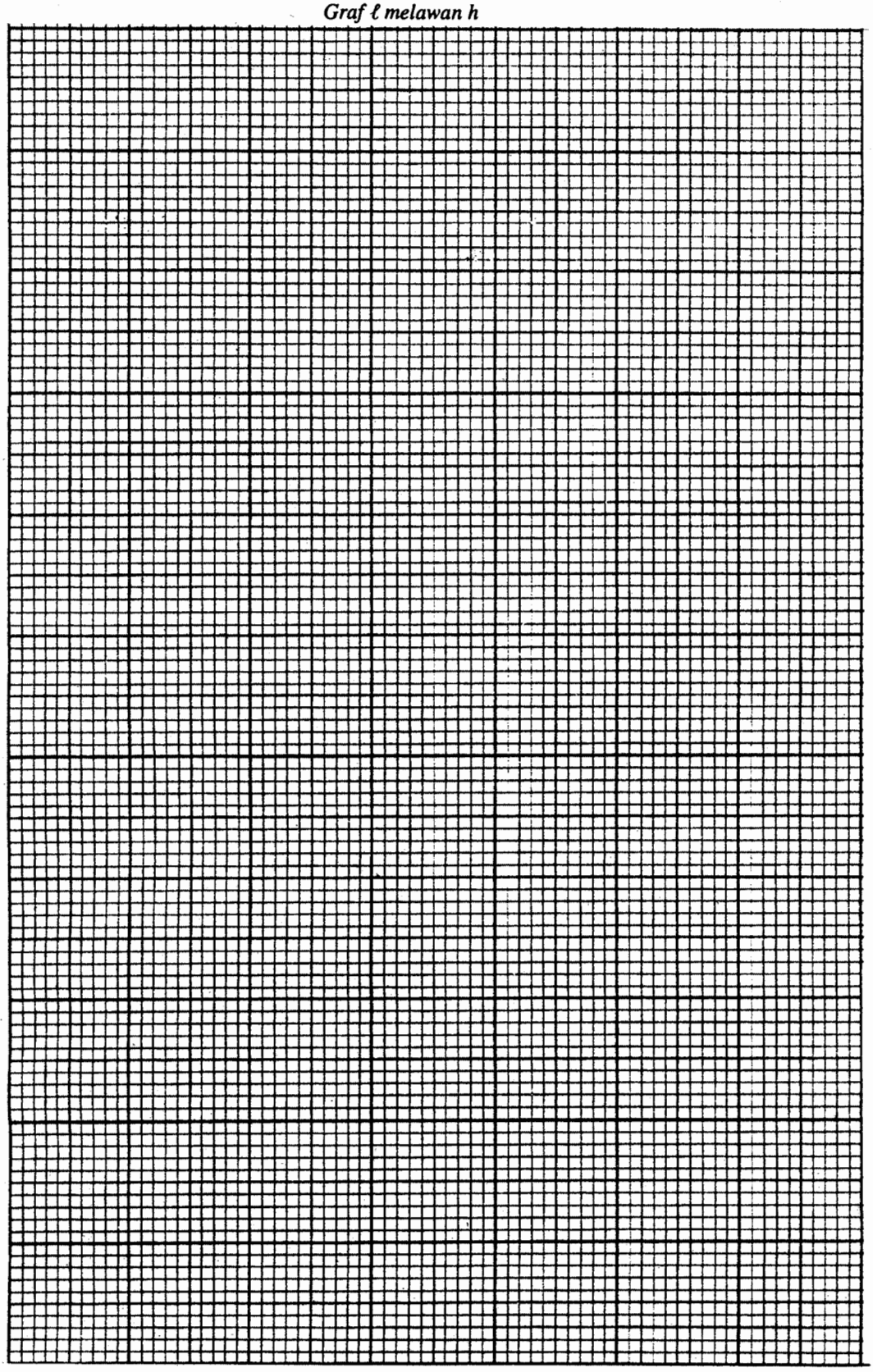
[1 mark/*markah*]

1(*d*) 1

Graph of ℓ against h

Graf ℓ melawan h

For Examiner's use



For Examiner's use

2 A student carries out an experiment to investigate the relationship between the speed of water wave, v and the distance between two consecutive bright bands, s using a ripple tank. The results of the experiment are shown in the graph of v against s as shown in Diagram 2.1

Seorang pelajar menjalankan satu eksperimen untuk mengkaji hubungan antara laju gelombang air, v dan jarak antara dua jalur cerah berturutan, s dengan menggunakan sebuah tangki riak. Keputusan eksperimen ini ditunjukkan pada graf v melawan s pada Rajah 2.1.

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

Berdasarkan graf pada Rajah 2.1,

(i) state the relationship between v and s.

nyatakan hubungan antara v dan s.

.....

[1 mark/*markah*]

2(*a*)(i) 1

(ii) determine the value of s when the speed of the water wave, $v = 4.0$ cm s^{-1}.
Show on the graph how you determine the value.

tentukan nilai s, jika laju gelombang air ,v = 4.0 cm s^{-1}.
Tunjukkan pada graf bagaimana anda menentukan nilai ini.

s = ...

[2 marks/*markah*]

2(*a*)(ii) 2

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

Hitungkan kecerunan graf, k.
Tunjukkan pada graf bagaimana anda menghitung k.

k = ...

[3 marks/*markah*]

2(*b*)(i) 3

Graph of v against s
Graf v melawan s

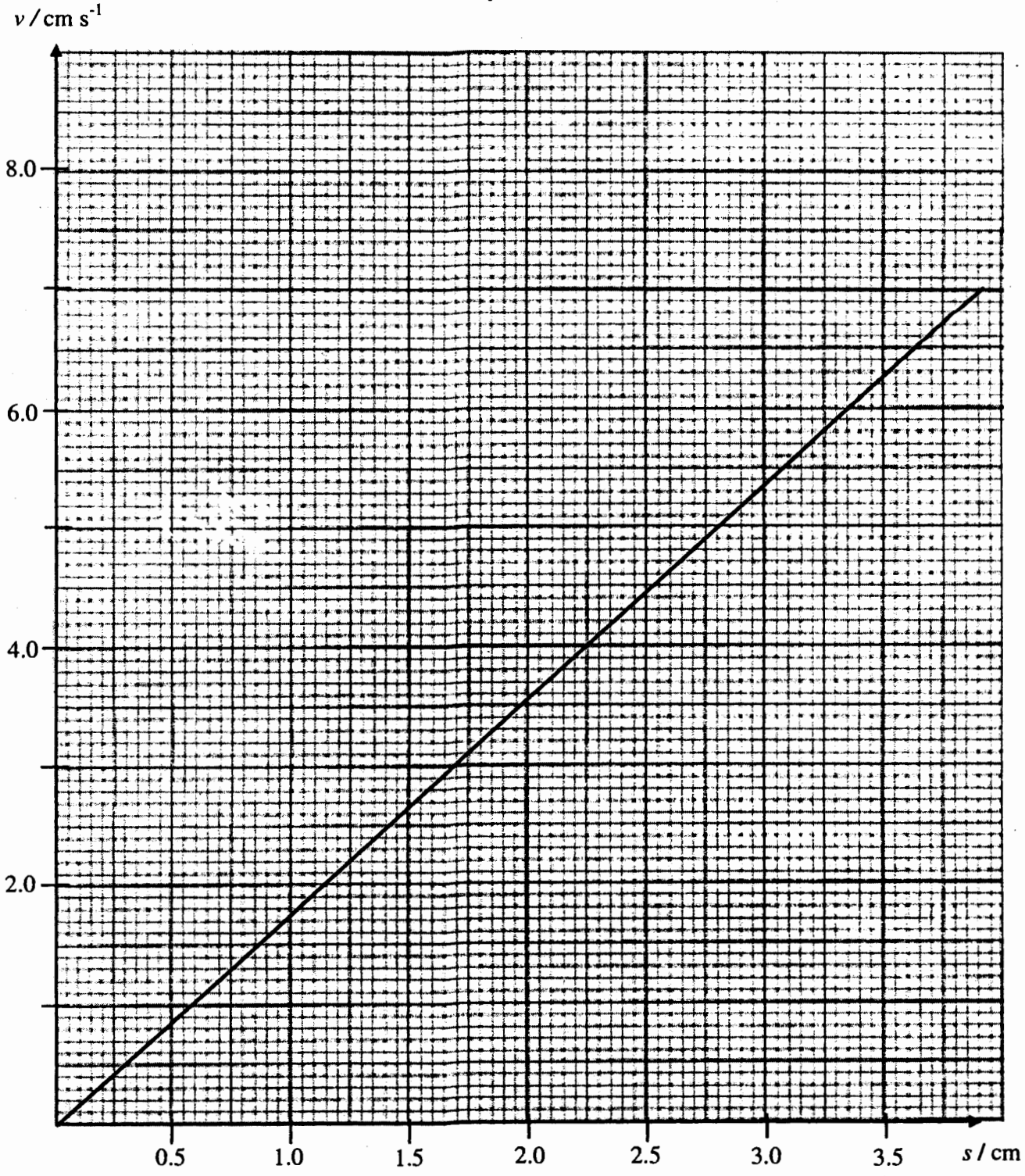


Diagram 2.1
Rajah 2.1

2. (*b*) The gradient of the graph, k is related to a physical quantity, *P* by the following formula:

Kecerunan graf, k dihubungkaitkan dengan kuantiti fizik, P oleh formula:

$$k = 0.1\,P$$

(ii) Calculate the value of *P*.

Hitung nilai P.

P =.....

[2 marks/*markah*]

For Examiner's Use

2(*b*)(ii) 2

(*c*) The time taken, *t* for the waves to travel a distance, *s*, is given by formula:

Masa, t, yang diambil oleh gelombang untuk merambat jarak , s diberi oleh formula:

$$t = \frac{1}{P}$$

Calculate time, *t*

Hitungkan masa,t.

t = ...

[2 marks/*markah*]

2(*c*) 2

(*d*) State **two** precaution steps that can be taken to increase the accuracy of the experiment.

*Nyatakan **dua** langkah berjaga-jaga yang boleh diambil untuk meningkatkan kejituan eksperimen ini.*

1 .....

.....

2 .....

.....

[2 marks/*markah*]

2(*d*) 2

Section B

Bahagian B

[12 marks/12 *markah*]

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

3. Diagram 3.1 shows a man pulling a spring with a force of 20 N. Diagram 3.2 shows the man pulling the same spring with a force of 50 N.

Rajah 3.1 menunjukkan seorang lelaki menarik spring dengan daya 20 N. Rajah 3.2 menunjukkan lelaki tersebut menarik spring yang sama dengan daya 50 N.

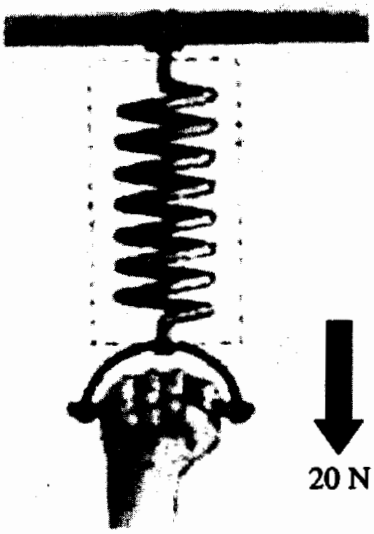


Diagram 3.1
Rajah 3.1

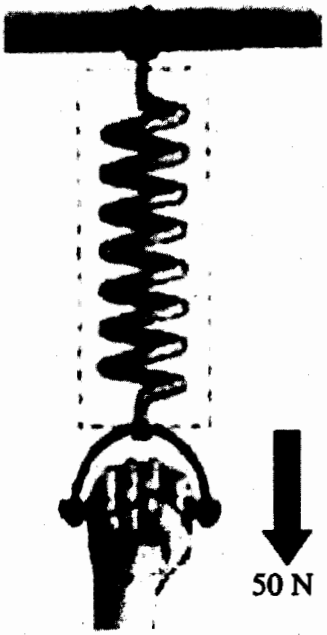


Diagram 3.2
Rajah 3.2

Based on the force exerted and the length of the spring,
Berdasarkan kepada daya yang digunakan dan panjang spring:

(*a*) State **one** suitable inference. [1 mark/*markah*]
Nyatakan **satu** *inferens yang sesuai.*

(*b*) State **one** suitable hypothesis. [1 mark/*markah*]
Nyatakan **satu** *hipotesis yang sesuai.*

(c) With the use of apparatus such as a spring, slotted weights and other apparatus, describe an experiment framework to investigate the hypothesis stated in 3(b).

Dengan menggunakan radas seperti spring, jisim berslot dan lain-lain radas, terangkan satu rangka kerja ekperimen untuk menyiasat hipotesis yang anda nyatakan dalam 3(b).

In your description, state clearly the following :

Dalam penerangan anda, jelaskan perkara berikut:

(i) The aim of the experiment.
Tujuan eksperimen.

(ii) The variables in the experiment.
Pembolehubah-pembolehubah dalam eksperimen.

(iii) The list of apparatus and materials.
Senarai radas dan bahan.

(iv) The arrangement of the apparatus.
Susunan radas.

(v) The procedure used in the experiment.
Describe how you control the manipulated variable and how to measure the responding variable.

Prosedur yang digunakan dalam eksperimen.
Terangkan kaedah mengawal pembolehubah dimanipulasikan dan kaedah mengukur pembolehubah bergerak balas.

(vi) The way you would tabulate the data.
Cara untuk menjadualkan data.

(vii) The way you would analyse the data.
Cara untuk menganalisis data.

[10 marks/*markah*]

4. Diagram 4.1 shows a bulb which lights up when it is connected to one dry cell. Diagram 4.2 shows the condition of the same bulb when it is connected to two dry cells.

Rajah 4.1 menunjukkan sebiji mentol menyala apabila disambungkan kepada sebiji sel kering.
Rajah 4.2 menunjukkan keadaan mentol yang sama apabila disambungkan kepada dua biji sel kering.

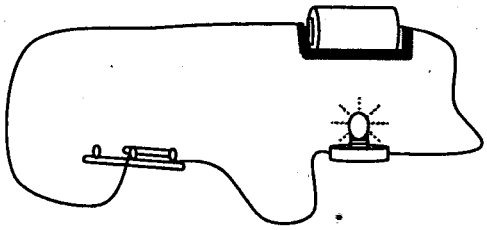


Diagram 4.1
Rajah 4.1

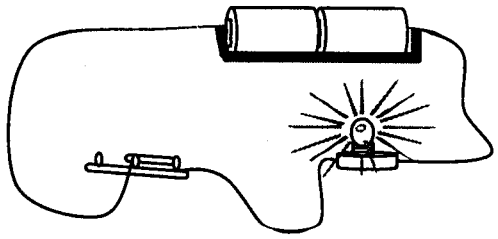


Diagram 4.2
Rajah 4.2

Based on the information and observation above :
Berdasarkan maklumat dan pemerhatian di atas:

(*a*) State **one** suitable inference. [1 *mark/markah*]
Nyatakan **satu** *inferens yang sesuai.*

(*b*) State **one** suitable hypothesis. [1 *mark/markah*]
Nyatakan **satu** *hipotesis yang sesuai.*

(*c*) With the use of apparatus such as a 1.5 V battery, connecting wires and other apparatus, describe an experiment to investigate the hypothesis stated in **4**(*b*).

Dengan menggunakan radas seperti sel kering 1.5 V, voltmeter dan radas lain, terangkan satu ekperimen untuk menyiasat hipotesis yang anda nyatakan dalam **4**(*b*)

In your description, state clearly the following :
Dalam penerangan anda jelaskan perkara berikut :

(i) The aim of the experiment.
Tujuan eksperimen.

(ii) The variables in the experiment.
Pembolehubah-pembolehubah dalam eksperimen.

(iii) The list of apparatus and materials.
Senarai radas dan bahan.

(iv) The arrangement of the apparatus.
Susunan radas.

(v) The procedure used in the experiment
Describe how you control the manipulated variable and how to measure the responding variable.

Prosedur yang digunakan dalam eksperimen.
Terangkan kaedah mengawal pembolehubah dimanipulasikan dan kaedah mengukur pembolehubah bergerak balas.

(vi) The way you would tabulate the data.
Cara untuk menjadualkan data.

(vii) The way you would analyse the data.
Cara untuk menganalisis data.

[10 *marks*/markah]

END OF QUESTION PAPER

KERTAS SOALAN TAMAT

INFORMATION TO CANDIDATES
MAKLUMAT UNTUK CALON

1. This question paper consists of **two** sections: **Section A** and **Section B**.
*Kertas soalan ini mengandungi dua bahagian: **Bahagian A** dan **Bahagian B**.*

2. Answer **all** questions in **Section A**. Write your answers for **Section A** in the spaces provided in this question paper.
*Jawab **semua** soalan daripada **Bahagian A**. Jawapan kepada **Bahagian A** hendaklah ditulis dalam ruang yang disediakan dalam kertas soalan.*

3. Answer **one** question from **Section B.** Write your answers for **Section B** on the paper provided by the invigilators. Answer questions in **Section B** in detail. Answers should be clear and logical. Equations, figures, tables, graphs and other suitable methods may be used to explain your answer.

*Jawab **satu** soalan daripada **Bahagian B** . Jawapan kepada **Bahagian B** hendaklah ditulis pada helaian tambahan yang dibekalkan oleh pengawas peperiksaan. Anda diminta menjawab dengan lebih terperinci. Jawapan mestilah jelas dan logik. Persamaan, gambar rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda boleh digunakan.*

4 Show your workings, it may help you to get marks.
Tunjukkan kerja mengira,ini membantu anda mendapatkan markah.

5. If you wish to cancel any answer, neatly cross out the answer.
Sekiranya anda hendak menukar jawapan, batalkan dengan kemas jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.

6. The diagrams in the questions provided are not drawn to scale unless stated.
Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.

7. The marks allocated for each question or sub-section of a question is shown in brackets.
Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.

8. You may use non-programmable scientific calculator. However, steps in calculation must be shown.
Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.

9. The time suggested to complete **Section A** is 60 minutes and **Section B** is 30 minutes.
*Masa yang dicadangkan untuk menjawab **Bahagian A** ialah 60 minit dan **Bahagian B** ialah 30 minit*

10. Hand in your answer sheets at the end of the examination.
Serahkan kertas jawapan anda di akhir peperiksaan.

MAKTAB RENDAH SAINS MARA
MARKING SCHEME

SPM TRIAL EXAMINATION 2008

PHYSICS

PAPER 1
PAPER 2
PAPER 3

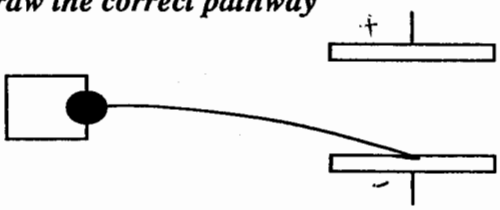
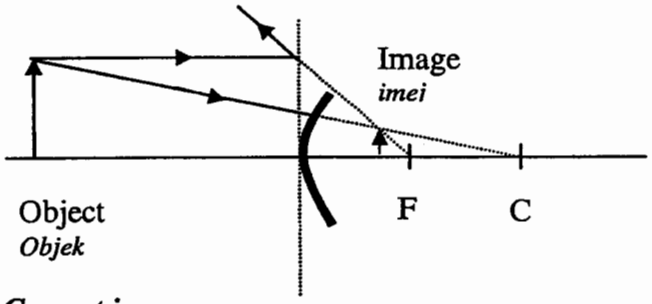
PHYSICS
PAPER 1

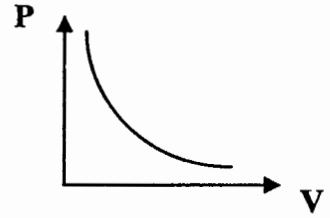
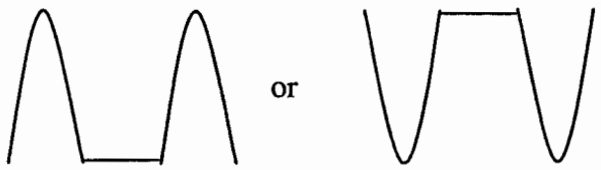
1	B	26	D
2	B	27	C
3	D	28	A
4	C	29	C
5	A	30	A
6	C	31	B
7	C	32	D
8	B	33	B
9	D	34	A
10	C	35	C
11	C	36	B
12	A	37	A
13	B	38	B
14	A	39	B
15	D	40	C
16	C	41	A
17	A	42	A
18	C	43	C
19	D	44	A
20	B	45	B
21	D	46	A
22	C	47	B
23	D	48	B
24	B	49	C
25	A	50	D

ANSWER SCHEME PAPER 2

SECTION A

Question No		Mark	Suggested answer	Note
1	(a)	1	***State the correct physical quantity*** Measures potential difference /voltage	Volt X
	(b) (i)	1	***State the correct relationship*** Increase	
	(ii)	1	***State the correct answer*** Remain unchanged	
	(c)	1	***State the correct physical quantity*** Length/temperature/cross-sectional area /resistivity of conductor / resistance	R ✓
			TOTAL = 4 MARKS	
2	(a)	1	***State the correct answer*** Product of mass and velocity	P = mv ✓ define dan symbols
	(b)	1 1	***State the correct substitution*** P = mv = (80)(100) ***State the correct answer with unit*** = 8 x 10^3 g m s^{-1} // 8 kg m s^{-1}	
	(c)	1	***State the correct answer*** Velocity decreases	
	(d)	1	***State the correct answer*** To increase time of impact// To reduce impulsive force	reduce impact X
			TOTAL = 5 MARKS	
3	(a)(i)	1	***State the correct definition*** Atom of an element which have the same proton number but different nucleon numbers and emit radioactive ray// Unstable isotopes which decay and give out radioactive emissions.	nuclei X unstable isotope ✓
	(a)(ii)	1	***State the correct answer*** Helium nucleus // alpha particle // α - particle	nucleus ^4_2He
	(b)	1 1	***Show the correct calculation*** $E= mc^2$ = 3.35 x 10^{-27} x (3 x 10^8)^2 ***State the correct answer with the correct unit*** =3.02 x 10^{-10} J	

	(c) i)	1	***Draw the correct pathway*** 	
	(c)(ii)	1	***State the correct answer*** An alpha particle is positively charged.	
			TOTAL = 6 MARKS	
4	(a)	1	***State the correct answer*** Convex mirror	
	(b)	1	***State the correct answer*** Wider field of view	
	(c)(i)	 1 1	***Complete the ray diagram***  ***Correct image*** ***Correct pathway for at least 2 rays***	Accept : rays reflected correctly on the **surface** of the curved mirror
	c)(ii)	1	***State the correct answer*** Virtual , Upright, Disminished	Any **2 correct** answers Reject: 1 correct answer
	c)(iii)	1 1	***Show the correct calculation*** m = v / u = 0.4 1.2 ***State the correct answer*** = 0.33	± 0 i cm ratio X
			TOTAL = 7 MARKS	
5	(a)	1	***State the correct instrument*** Bourdon gauge	spell rene be tol
	(b)(i)	1	***State the correct comparison*** Volume of the gas in 5.1 is greater than 5.2 more	

	(b)(ii)	1	***State the correct comparison*** lower Pressure of the gas in 5.1 is less than 5.2	
	(b)(iii)	1	***State the correct physical quantity*** Temperature is constant	Reject : mass (given in question)
	(b)(iv)	1	***Draw the correct shape of graph*** 	**Correct axes**
	(b)(v)	1	***State the correct physics law*** Boyle`s Law	**Correct spelling for Boyle**
	(c)	1 1	***State the reason of change correctly*** When volume decreases, the number of collision per unit area increases. Pressure increases.	
			TOTAL = 8 MARKS	
6	(a)(i)	1	***Tick the correct answer*** Alternating current,AC.	
	(a)(ii)	1	***State the function correctly*** To change alternating current to direct current allow current to flow in one direction	convert ✓
	(a)(iii)	1 1	***Draw the correct waveform***  ***Draw the correct amplitude & frequency*** Same amplitude & frequency	
	(a)(iv)	1	***State the correct answer*** Rectification	
	(b)	1	***State the correct component*** Diode e s/c diode	
	(c)	1 1	***State the correct pure and foreign semiconductor*** Add pentavalent atoms (5 electrons atom) to tetravalent atom (4 electrons atom) ***State the extra electron correctly*** A free electron as a charge carrier	
			TOTAL = 8 MARKS	

7	(*a*)(i)	1	***State the correct answer*** Buoyant force // upthrust	
	(*a*)(ii)	1	***State the correct answer*** F = W	
	(*b*)	1 1	***Show the correct calculation*** F =W= mg = 200 x 10 ***State the correct answer and unit*** 2 000 N	
	(*c*)(i)	1	***State the correct answer*** Lower density // does not rust easily // anti-rust lighter // water resistance	stronger ✗ durable ✓
	(*c*)(ii)	1 1	***Show the correct calculation*** W = ρgV = 1020(10)(2) ***State the correct answer and unit*** = 2.04 x 10^4 N	
	(*c*)(iii)	1	***State the correct answer*** Sink	Rej: sink more Level underwater increase
	(*c*)(iv)	 1 1	***State the correct answer*** River has a lower density Weight is greater than buoyant force	
			TOTAL = 10 MARKS	
8	(*a*)	1	***State the correct meaning of electromagnet*** Electromagnet is a magnet in which a magnetic field is produced by the flow of electric current	
	(*b*) (i)	1 1	***State the suitable wire use as a coil*** Thick ***State the correct reason*** Because less resistance	
	(*b*) (ii)	1 1	***State the suitable type of core needed*** Soft iron ***State the correct reason*** Because easy to magnetise and demagnetise	
	(*b*)(iii)	1 1	***State the suitable number of turn on the coil*** Larger ***State the correct reason*** Because the strength of electromagnet increases.// Stronger magnetic field	

	(*c*)	1	***State the most suitable galvanometer to be used*** M	
	(*d*) (i)	1	***State the most suitable connection*** Parallel to the galvanometer	
	(*d*) (ii)	1	***State the correct reason*** Less effective resistance	
	(*d*) (iii)	1 1	***Show the correct calculation*** $V_R = V_G$ $(IR)_R = (IR)_G$ $(1A - 5mA)R = (5mA)(5\Omega)$ ***State the correct answer and unit*** $R = 2.51 \times 10^{-2}\Omega$	
			TOTAL = 12 MARKS	

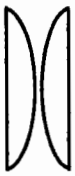
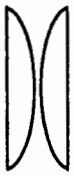
SECTION B

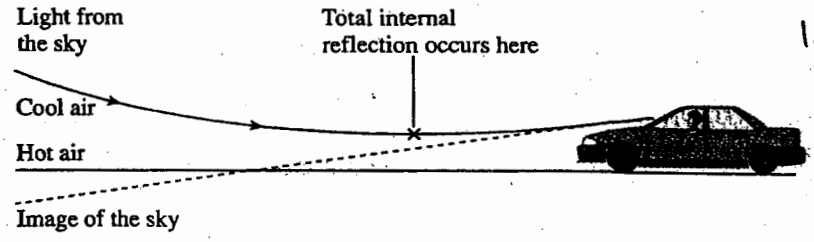
Question No		Mark	Suggested Answers
9	(a)		***Comparing the mass of both objects correctly***
		1	The coin is heavier than the ~~feather~~ // leaf mass of coin is greater than the mass of ~~feather~~ leaf
			Comparing the time taken to fall correctly
		2	Both objects reach the ground at the same time
			Comparing the positions of the objects correctly
		3	While falling, both objects are at the same position / both objects travel the same distance at any time
			Comparing the increase in velocity correctly
		4	The coin and ~~feather~~ leaf have the same increase in velocity // acceleration
			Deduce the physical quantity correctly , gravitational force X
		5	✓All objects falling under the influence of same gravitational field strength, g // all objects fall with the same gravitational acceleration due to gravity, g
	(b)		***State the suitable properties and their reasons correctly*** bottle X
		1	The material must be tough / strong - ℓ ↓
		2	Does not break easily when pressure is applied - easy to ~~launch~~ launch
		3	The shape is aerodynamic / streamlined aerofoil X
		4	Can move with the least amount of friction / reduce air resistance
		5	Angle of launching is 45° small / big X
		6	So that the rocket can travel very far // max. distance
		7	The volume of water is 1/3 of the whole volume // less // half ✓
		8	~~The rocket is light and can take off easily~~ // to increase momentum + impulsive force
		9	Attach/ fix fins at the tail of the rocket
		10	Rocket can move smoothly and stable / does not wobble X to pusing
	(c)(i)		***State the correct meaning of energy***
		1	Energy is the ability to do work
	(c)(ii)		***State the correct energy changes***
		1	Total energy at any time is constant potential energy X
		2	As the stone falls, gravitational potential energy converts to kinetic energy
		3	gravitational potential energy is maximum at the highest point
		4	Kinetic energy converts to heat and sound when it hits the ground
			TOTAL = 20 MARKS MOZ@C

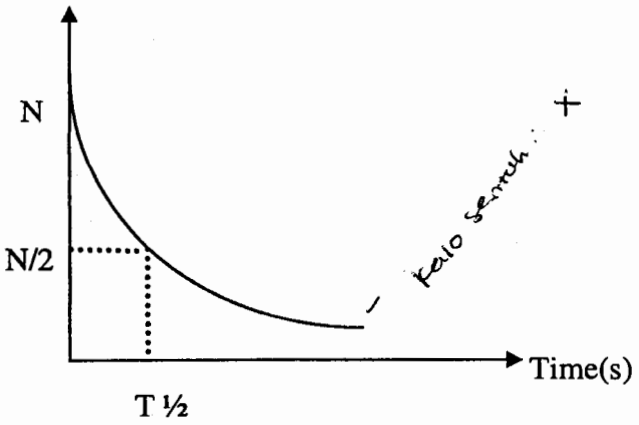
Question No		Mark	Suggested Answer
10	(a)	 1	***State the correct meaning*** Light of one frequency / wavelength // one colour
	(b) Reject nilai	 1 2 3 4 5	***State the correct comparison*** In figure 10.1(a), distance between the double slit and screen, D is smaller In figure 10.1(b), distance between two successive bright fringes, x is smaller In figure 10.1(b), the number of fringes is bigger / more fringes In figure 10.1(b), the width of fringes is smaller/ fringes are narrower (***accept : opposite answers for figure 10.2(a)***) ***State the correct relationship*** When the distance between the double slit and screen, D increases, the distance between two successive fringes, x increases
	(c)	 (i) 1 2 3 4 (ii) 5 6 7 8 (iii) 9 10 **Max:** **10**	***State the suitable characteristics and the justifications correctly*** ***Design (maximum 2 characteristics):*** Build a dome-shaped or circular roof It improves the acoustic effect of sound * increase the size - able to accommodate more no. of students Reduce the number of gaps/holes/opening like doors and windows Reduce the effect of diffraction ***Furnishing (maximum 2 characteristics):*** -bunyi keluar +bunyi luar masuk Build the walls from sound-proof materials To avoid disturbance from outside / prevent loss of sound or diffraction Use soft materials/fabrics/cushion for the chairs To absorb the sound / to avoid reflection of sound Hang curtains on the walls / put carpets on the floors To absorb the sound / to avoid reflection of sound ***Sound and lighting systems (maximum 2 characteristics):*** Place the loud speakers far away from each other / at the corners of the hall ~~To prevent destructive~~ interference // to produce more constructive interference. Increase the number of lamps or lights To get sufficient amount of light * place one speakers - to avoid interference

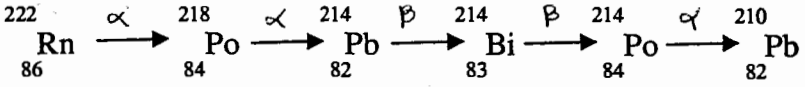
	(d)		***Explain the reason correctly***
		1	All particles in a material/matter/glass vibrate at its natural frequency
		2	The airplane engine produces noise which cause the air to vibrate
		3	Due to resonance, the glass particles vibrate at a higher / maximum amplitude
		4	Need strong glasses to withstand the effect of resonance/ the strong vibration/high amplitude so that it does not break easily.
			Total=20 MARKS

SECTION C

Question No		Mark	Suggested Answers
11	(a)		***State the correct meaning*** captured it can be seen
		1	Real image is the image that can be formed/caught on a screen
	(b)(i)		***State the correct specifications and the reasons***
		1	Type of mirror used is concave / draw the mirror 
		2	To focus light from the source to the slide
		3	The suitable arrangement is  P or R
		4	Light from the source is spread evenly to the slide to form a **bright** image on the screen
		5	The distance of slide from the projection slides is between f and 2f
		6	So that the image formed is **real**
		7	The slide should be placed inverted in the slide holder
		8	So that the image formed on the screen is **upright**
	(b)(ii)		***State the best choice and the reasons correctly***
		9	The most suitable is Q 
		10	Because the mirror used is concave or the arrangement of lenses is  The distance of slide is between f and 2f and the slide is placed inverted.

	(c)		***State the correct process***
		1	Light which travels from high density (cold) to low density (hot) is refracted away from normal/ diagram
		2	Near the road surface, the angle of incidence exceeds / greater than the critical angle
		3	Total internal reflection occurs and light bends towards the eye of the observer / diagram
			 label length → 3m
		4	***State the correct answer*** Yes
	(d)(i)		***State the correct explanation***
		1	Light from object travels from high density to low density
		2	Light is refracted away from normal ⇒ accept diagram.
		3	Image is formed nearer to the water surface
	(d)(ii)		***Show the correct substitution and correct answer***
		1	$1.33 = \frac{h}{0.4}$
		2	h = 0.53 m
			Total=20 MARKS

Question No		Mark	Suggested Answers
12	(a)		***State the correct meaning***
		1	Half-life is the time taken for half the atoms in a given sample to decay / for the activity remaining to become half
	(b)		***Sketch the correct graph***
		1	***Label the axes and unit correctly*** (Accept : any other units)
		2	***Draw the shape of decay curve correctly***
			Activity (number per s) 
		3	***Label N and N/2 correctly on the graph***
		4	***Label T ½ correctly on the graph***
	(c) (i)		***State the suitable properties and the justifications correctly***
		1	The type of radiation is gamma
		2	Gamma has a high penetrating power /can penetrate the ~~body~~ easily
		3	The half-life is ~~short~~ long
		4	~~Prevent over exposure to radiation/ Less harmful to the healthy cells / sufficient time to get the results~~
		5	The radioactive substance should be ~~liquid~~ solid
		6	~~Can flow easily into the blood system~~
		7	Ionizing power is low
		8	Does not ionize healthy cells / does not cause cell mutation
	(ii)		***State the best choice and the reasons correctly***
		9	The most suitable is K L K and L
		10	Because it radiates gamma ray, the half-life is ~~short~~ long, the state of matter is ~~liquid~~ solid and it has low ionizing power

	(d)(i)		***State the answer correctly*** ✓ ✓ increase ✗
		1	The number of nucleon changes // ~~decrease~~ // constant ═ Fakta proton no. changes ✓
	(ii)	2	***State the correct decay series***
		3	***State the correct nucleon number and the proton number for each radioactive substance in the series*** 
	(iii)		***State the number of alpha and beta particles correctly***
		4	3 alpha particles
		5	2 beta particles Kene nyatakan.
			TOTAL = 20 MARKS

508
510
505
502
501
518

ANSWER SCHEME (PAPER 3)

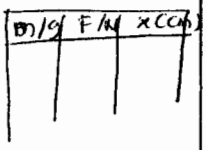
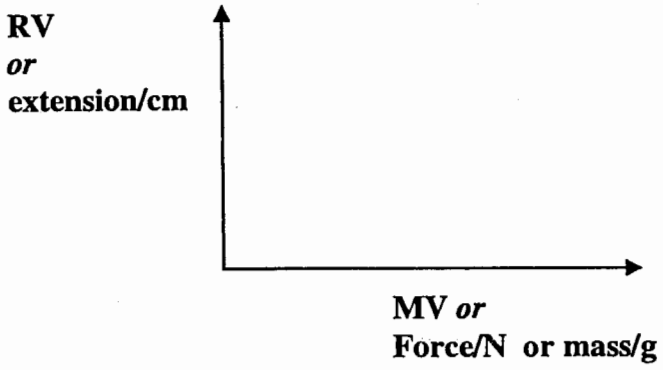
No.	Marks	Rubric and Answer	Notes
1(*a*)(i)	1	***State the manipulated variable correctly.*** Depth of water // *h*	
1(*a*)(ii)	1	***State the responding variable correctly*** Pressure of the liquid, *P* // different level in the manometer // *ℓ* // length of liquid rises in manometer ✗	
1(*a*)(iii)	1	***State the fixed variable correctly*** Density of water//atmospheric pressure // type of liquid ✓	Reject: the type of water
1(*b*)(i)	1 1 1	***Tabulate the data correctly.*** ***All values of x_1 and unit are correct*** 2.7, 2.9, 3.2, 3.9 and 4.5 ***All values of x_2 and unit are correct*** 2.3, 1.8, 1.3, 1.1 and 0.9 ***All values of ℓ for each depth of water using the formulae $\ell = x_1 - x_2$ are correct*** ***4 value of ℓ for each depth of water using the formulae $\ell = x_1 - x_2$ are correct*** When h = 0.5 cm, $\ell = 2.7 - 2.3 = 0.4$ cm h = 1.0 cm, $\ell = 2.9 - 1.8 = 1.1$ cm h = 1.5 cm, $\ell = 3.2 - 1.3 = 1.9$ cm h = 2.0 cm, $\ell = 3.9 - 1.1 = 2.8$ cm h = 2.5 cm, $\ell = 4.5 - 0.9 = 3.6$ cm	All answers in 1 decimal point Accept: without unit
1(b)(ii)			

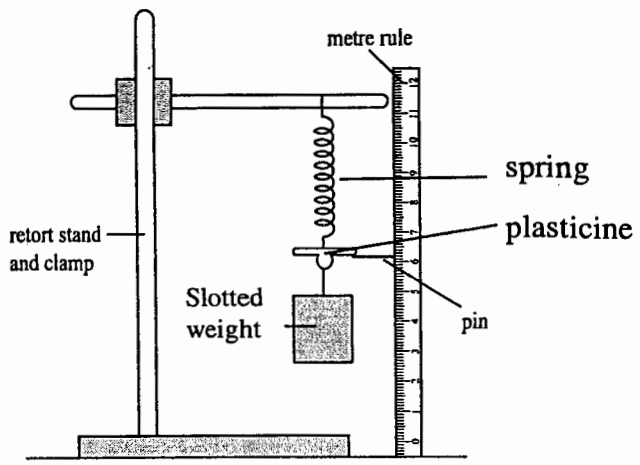
***h*/cm**	***x_1*/cm**	***x_2*/cm**	***ℓ* /cm**
0.5	2.3	2.7	0.4
1.0	1.8	2.9	1.1
1.5	1.3	3.2	1.9
2.0	1.1	3.9	2.8
2.5	0.9	4.5	3.6

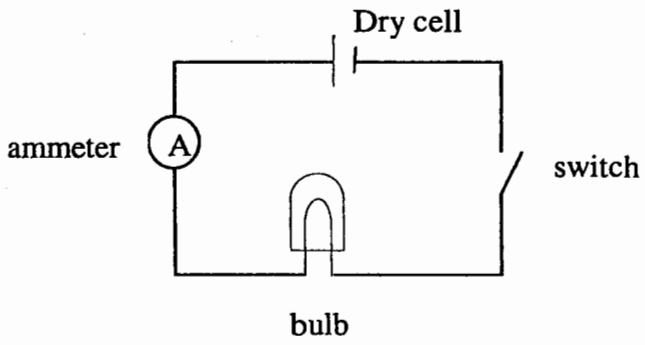
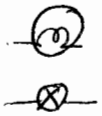
		Give one ✓ based on these:	
	A	Table consists of h, x_1, x_2, *and* ℓ (4 columns)	Give ✓
	B	State the unit for each of the above physical quantities	Give ✓
	C	State the values of h correctly	Give ✓
	D	State the values of x_1 correctly	Give ✓
	E	State the values of x_2 correctly	Give✓
	F	All values of h, x_1, x_2 are written in 1 decimal place	Give ✓

			No. of ✓	
	4		6	
	3		5	
	2		4	
	1		3	
	0		2/1	
1(*c*)			***Draw the graph correctly***	
	1	A	Label axes and unit x -axis : *h*/cm y- axis : ℓ /cm	Give ✓
	1	B	Even and uniform scales on both axes	Give ✓
	1	C	5 points plotted correctly	Give ✓
	1	D	Draw the best straight line (Balance)	Give ✓
	1	E	Large graph, minimum size: 10 cm x 8 cm	Give ✓
1(*d*)	1		***State the relationship correctly*** Pressure in liquid is directly proportional to its depth (through origin) // Pressure in liquid is linearly proportional to its depth (straight line, does not pass through origin)	
Total	**16**			

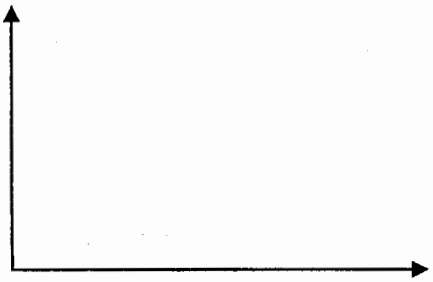
No.	Marks	Rubric and Answer	Notes
2(*a*)(i)	1	***State the relationship correctly*** v is directly proportional to x	
2(a)(ii)	1 1	***Show /Draw the dotted line on graph at $v = 4.0\ cms^{-1}$*** ***Correct answer and unit*** x = 2.25 cm	Solid line ✓
2(b)(i)	1 2 3	***Draw the triangle on the graph.*** (minimum size : 8 cm x 8 cm) ***Show the substitution correctly*** k = (6.7 –1.7) / (3.75 -1.0) ***Correct answer with correct unit*** = 1.82//1.818 s^{-1}@Hz	
2(*b*)(ii)	1 1	***Show the substitution correctly*** *P* = k/0.1 = 1.82/0.1//1.818/0.1 ecf ***Correct answer and unit*** 18.2//18.18 s^{-1} @Hz	
2(c)	1 1	***Show the substitution correctly*** t= 1/P = 1/18.2// 1/18.18 ecf ***Correct answer and unit*** 0.055 s e 0.0549 s	
2(*e*)	1 1	***State the precaution correctly*** ▪ Make sure that the depth of water in the ripple tank is constant (tank is horizontal) ▪ Use a sponge to avoid reflection of wave ▪ Use the same motor frequency	Accept other logical answers
Total	**12**	- do in dark room - repeat the exp. to calculate average reading.	

<table>
<tr><td></td><td>7</td><td>State the method of controlling the responding variable
Calculate the extension of the spring,x using the formula (length,l) – (initial length, l_o)</td><td></td></tr>
<tr><td></td><td>8</td><td>Repeat the experiment at least 4 times
Repeat the experiment using mass 100g, 150 g, 200g and 250 g (or force, F = 1.0 N, 1.5N, 2.0 N and 2.5 N)</td><td></td></tr>
<tr><td>(vi)</td><td>9</td><td>Tabulating the data
<table><tr><td>Mass / g or Force/N</td><td>Extension, x/cm</td></tr><tr><td>50.0 g or 0.5 N</td><td></td></tr><tr><td>100.0 g or 1.0 N</td><td></td></tr><tr><td>150.0 g or 1.5 N</td><td></td></tr><tr><td>200.0g or 2.0 N</td><td></td></tr><tr><td>250.0 g or 2.5 N</td><td></td></tr></table></td><td>Ifect cm
  </td></tr>
<tr><td>(vii)</td><td>10</td><td>State how the data will be analysed
 
</td><td></td></tr>
<tr><td>Total</td><td>12</td><td></td><td></td></tr>
</table>

No.	Marks	Rubric and Answer	Notes
3(*a*)	1	***State the suitable inference correctly.*** The pulling force influences the extension of the spring// The length spring is influenced by the pulling force // Length of spring depends on the force acting on it.	
3(*b*)	1	***State the hypothesis correctly*** The bigger the force, the longer the spring // the bigger the extension mass When the force increases, the length of spring increases	mass ✓
3(*c*)	***Explain the suitable frame of experiment correctly***		
(i)	1	***State the aim of experiment*** mass ✓ To study the relationship between force and the extension of spring.	
(ii)	2	***State the manipulated and responding variables correctly*** Manipulated variable : Force, F//mass,m ✓ Responding variable : extension of spring, x	no. of slotted weight ✗
	3	***State the constant / fixed variable*** Diameter//stiffness of spring/ The initial length, l_o/ Force constant of spring(k)	type of the spring ✗
(iii)	4	***List of apparatus and materials*** ✓ Spring ✓, pin, slotted weight ✓, retort stand with clamp, meter ✓ rule and plasticine. ***Mark for*** 6/5 item – 1 mark <= 4 item – 0 mark	at least 4 ∠4 ∴ 0
(iv)	5	***Show the arrangement of apparatus.***  ***Marks for labeling*** **6/5 – 1 mark** **<= 4 – 0 mark**	pemberat cefuk ∴ ✗
(v)	6	***State the method of controlling the manipulated variable*** Determine the initial length, l_o, without any slotted weight hang to the spring. Hang a slotted weight of mass 50 g (or force / weight of 0.5 N) and measure the length of the spring, l	

No	Marks	Rubrics and Answer	Notes
4(*a*)	1	***State the suitable inference correctly.*** The brightness of the bulb is influenced by// depends on the number of dry cell// The number of cells influences the brightness of the bulb	
4(*b*)	1	***State the hypothesis correctly*** voltage / potential different When the number of dry cell increases, the current passing through the bulb increases	Brightness ✗ V α I ✓
4(*c*)	***Explain the suitable frame of experiment correctly***		directly proportional ✗
4(*c*)(i)	1	***State the aim of the experiment*** voltage & current To study the relationship between the number of the dry cells//e.m.f and the current	
	2	***State the manipulated and responding variables correctly*** Manipulated variable : number of dry cell//e.m.f // voltage Responding variable : current	
	3	***State the constant / fixed variable*** Fixed variable: power of bulb// resistance of bulb ✓	only resistance ✗
	4	***List of apparatus and materials*** Dry cell, bulb, ammeter, switch, connecting wire, battery holder ***Mark for*** 6/5 item – 1 mark <= 4 item – 0 mark	power supply ✓ rheostat, voltmeter } Ohm's Law
	5	***Show the correct arrangement of apparatus.***  ***Marks for labeling*** **4 items – 1 mark** **<= 3 items – 0 mark**	
	6	***State the method of controlling the manipulated*** Connect one dry cell and close the switch	
	7	***State the method of controlling the responding variable*** Record the current shown by the ammeter	
	8	***Repeat the experiment at least 4 times*** Repeat the experiment by increasing the number of dry cell to 2, 3, 4 and 5	

<table>
<tr>
<td></td>
<td>9</td>
<td>Tabulate the data correctly
<table>
<tr><th>Number of dry cell</th><th>current, I/A</th></tr>
<tr><td>1</td><td></td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
<tr><td>5</td><td></td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>State how the data will be analysed

RV
or
I / A


MV or number of dry cells / voltage</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</table>

END OF ANSWER SCHEME