PHYSICS
Paper 1
September
2013

1 ¼ hours

MAKTAB RENDAH SAINS MARA

SIJIL PELAJARAN MALAYSIA
TRIAL EXAMINATION 2013

PHYSICS

Paper 1

One hour and fifteen minutes

DO NOT OPEN THIS QUESTION BOOKLET UNTIL TOLD TO DO SO

1. This paper is written in English and bahasa Melayu
Kertas soalan ini adalah dalam dwibahasa.

2. The question in English is written on top while the bahasa Melayu version is below.
Soalan di atas adalah dalam bahasa Inggeris dan soalan dalam bahasa Melayu terdapat di bawahnya.

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

This question booklet consists of 43 printed pages and 1 blank page

The following information maybe useful. The symbols have their usual meaning.

Maklumatberikutmungkinberfaedah.Simbol-simbolmempunyaimakna yang biasa.

1. $a = \frac{v-u}{t}$
2. $v^2 = u^2 + 2as$
3. $s = ut + \frac{1}{2}at^2$
4. Momentum $= mv$
5. $F = ma$
6. Kinetic energy / *Tenaga kinetik* $= \frac{1}{2}mv^2$
7. Gravitational potential energy / *Tenaga keupayaan graviti* $= mgh$
8. Elastic potential energy / *Tenaga keupayaan kenyal* $= \frac{1}{2}Fx$
9. $\rho = \frac{m}{V}$
10. Pressure / *Tekanan*, $p = h\rho g$
11. Pressure / *Tekanan*, $p = \frac{F}{A}$
12. Heat / *Haba*, $Q = mc\theta$
13. Heat / *Heat*, $Q = ml$
14. $\frac{PV}{T}$ = constant / *pemalar*
15. $E = mc^2$
16. $v = f\lambda$
17. Power, $P = \frac{\text{Energy}}{\text{time}}$

    Kuasa, $P = \frac{tenaga}{masa}$
18. $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

19. $\lambda = \frac{ax}{D}$

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

$n = \frac{1}{\sin c}$

21. $n = \frac{\text{real depth}}{\text{apparent depth}}$

$n = \frac{dalam\ \ nyata}{dalam\ \ ketara}$

22. $Q = It$

23. $V = \frac{E}{Q}$

24. $V = IR$

25. Power / *Kuasa*, $P = IV$

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

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

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

29. $c = 3.0 \times 10^8\ \text{m s}^{-1}$

1 Which of the following is a derived quantity?

Antara berikut yang manakah kuantiti terbitan?

A Mass
Jisim

B Time
Masa

C Length
Panjang

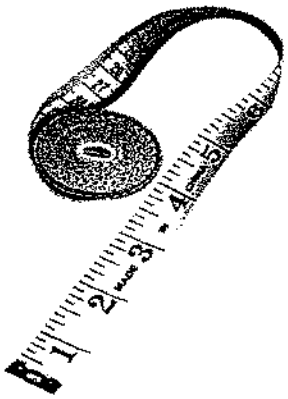
D Weight
Berat

2 Which of the following is most suitable to measure the depth of a test tube?

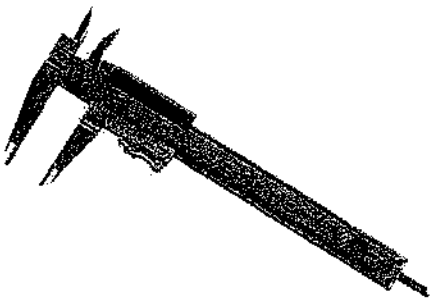
Antara berikut yang manakah paling sesuai untuk mengukur kedalaman sebuah tabung uji?

A

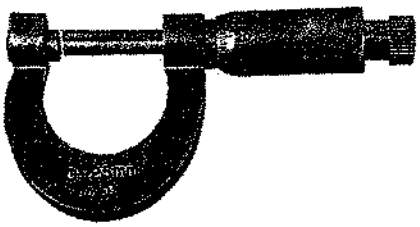
B



C



D



3 Which of the following frequencies is the same as 185.6 MHz?

Manakah antara frekuensi berikut sama dengan 185.6 MHz?

A 1.856×10^{-1} Hz

B 1.856×10^{2} Hz

C 1.856×10^{6} Hz

D 1.856×10^{8} Hz

4 Diagram 1 shows a pattern on a ticker tape.

Rajah 1 menunjukkan corak pada pita detik.

Direction of motion
Arah gerakan

Diagram 1
Rajah 1

Which statement describes the motion of the trolley?

Penyataan manakah yang menerangkan gerakan troli tersebut?

A It moves with constant velocity
Ia bergerak dengan halaju seragam

B It moves with an acceleration
Ia bergerak dengan pecutan

C It moves at constant speed and then decelerates
Ia bergerak dengan halaju seragam dan kemudian nyahpecut

D It moves at constant speed and then accelerates
Ia bergerak dengan halaju seragam dan kemudian memecut

5 Diagram 2 shows a displacement-time graph for the motion of a car.

Rajah 2 menunjukkan graf sesaran-masa bagi gerakan sebuah kereta.

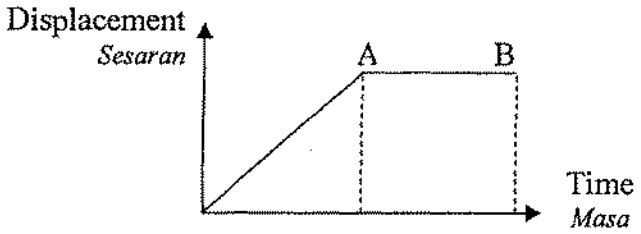


Diagram 2
Rajah 2

Based on the graph, which statement explains the motion of the car from A to B?

Berdasarkan graf, pernyataan manakah yang menerangkan pergerakan kereta tersebut dari A ke B?

A Stationary
Tidak bergerak

B Decelerating
Nyahpecut

C Accelerating
Memecut

D Constant velocity
Halaju seragam

6 Diagram 3 shows a velocity-time graph for the motion of an object.

Rajah 3 menunjukkan graf halaju-masa bagi satu objek bergerak.

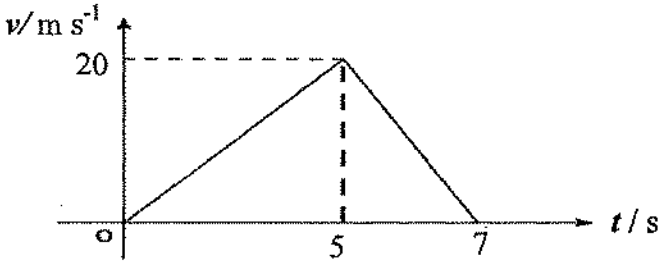


Diagram 3
Rajah 3

What is the displacement of the object in the first 5 s?

Berapakah sesaran objek tersebut dalam masa 5 saat pertama?

A 20 m

B 50 m

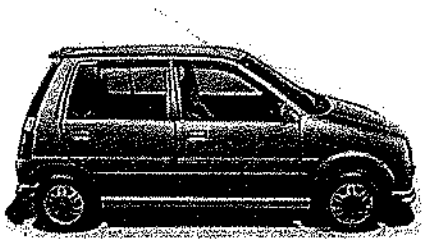
C 70 m

D 100 m

7 Which of the following vehicles takes the longest time to start moving?

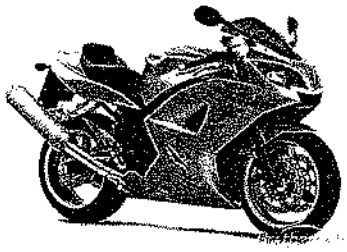
Kenderaan yang manakah mengambil masa yang paling lama untuk mula bergerak?

A



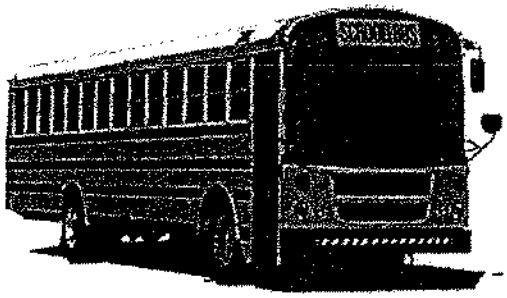
Mass = 750 kg
Jisim

B



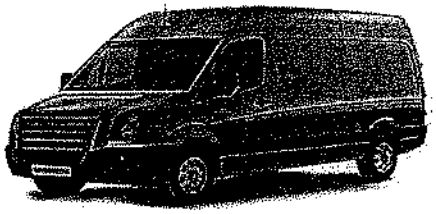
Mass = 250 kg
Jisim

C



Mass = 12 000 kg
Jisim

D



Mass = 5 000 kg
Jisim

8 Diagram 4 shows an aeroplane flying at constant altitude and velocity.

Rajah 4 menunjukkan sebuah kapal terbang bergerak pada ketinggian dan kelajuan yang tetap.

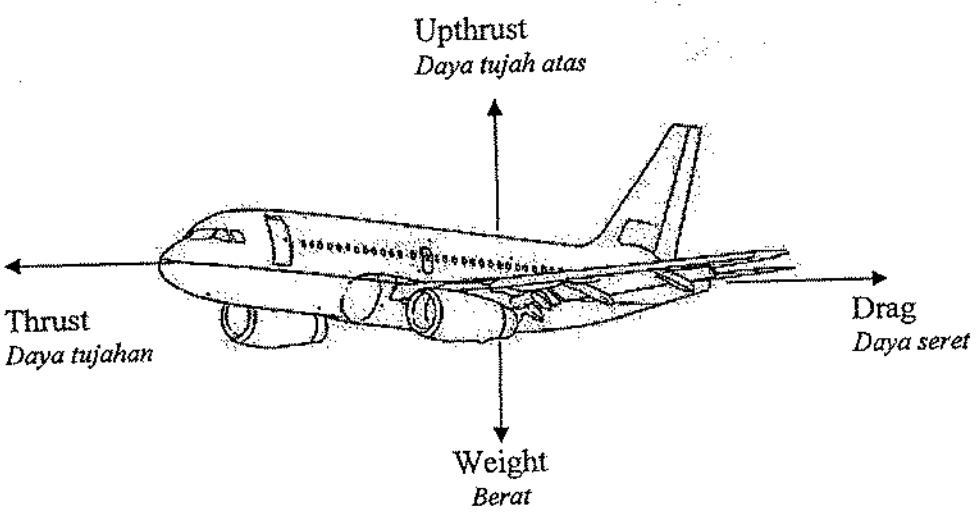


Diagram 4
Rajah 4

Which Physics concept explains the above situation?

Apakah konsep Fizik yang menerangkan situasi di atas?

A Resultant force
Daya paduan

B Resolution of forces
Leraian daya

C Forces in equilibrium
Keseimbangan daya

9 Diagram 5 shows an air bag being released during collision.
Rajah 5 menunjukkan sebuah beg udara berfungsi semasa pelanggaran.

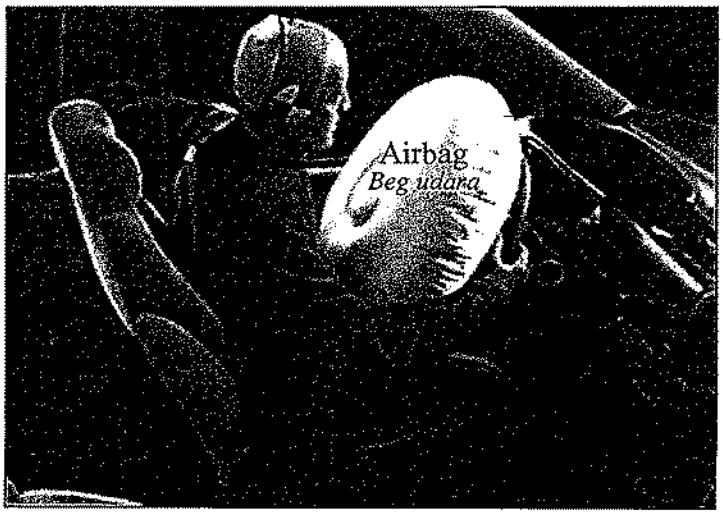


Diagram 5
Rajah 5

The released air bag is to reduce
Beg udara dilepaskan untuk mengurangkan

A inertia
inersia

B the change of momentum of the driver
perubahan momentum pada pemandu

C the rate of change of momentum acting on the driver
kadar perubahan momentum yang bertindak ke atas pemandu

D the collision time between the driver and the steering
masa perlanggaran antara pemandu dan stering kereta

10 Diagram 6 shows a ticker tape representing the motion of a 1.0 kg trolley before, during and after a collision.

Rajah 1 menunjukkan pita detik yang mewakili gerakan sebuah troli berjisism 1.0 kg sebelum, semasa dan selepas perlanggaran.

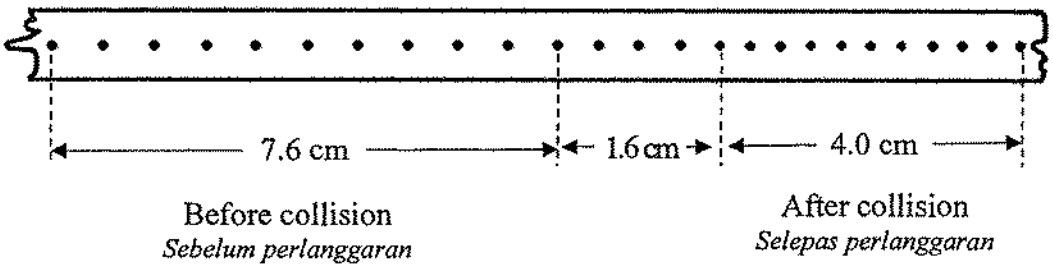


Diagram 6

Rajah 6

If the ticker timer produces 50 dots every second, what is the impulsive force during the collision?

Jika jangka masa detik menghasilkan 50 titik setiap saat, berapakah daya impuls semasa perlanggaran ?

A 225 N

B 180 N

C 2.25 N

D 2.00 N

11 Diagram 7 shows a roller coaster sliding down its track.

Rajah 7 menunjukkan "roller coaster" menggelonsor menuruni landasannya.

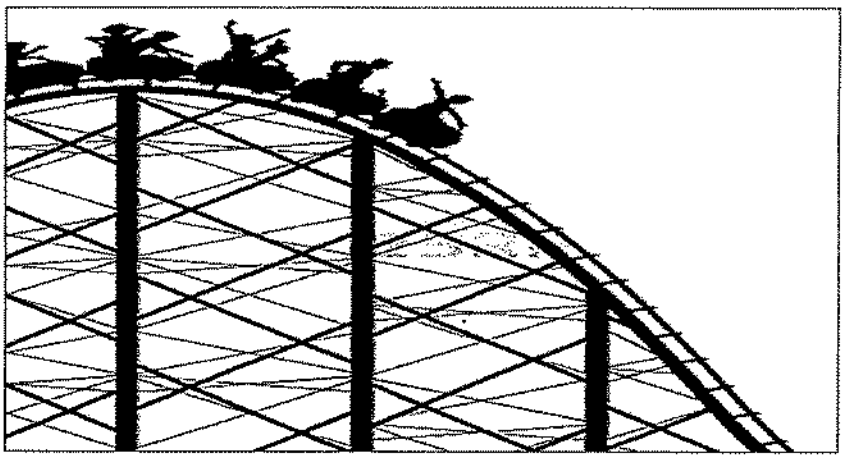
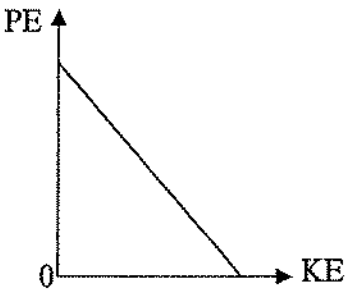


Diagram 7
Rajah 7

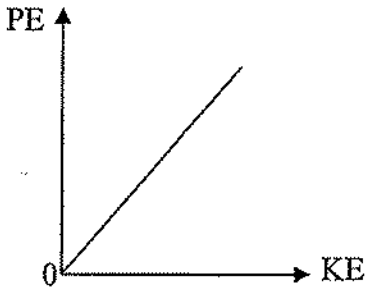
Which graph shows the relationship between the gravitational potential energy (PE) and kinetic energy (KE) of the roller coaster as it moves down the track?

Graf manakah menunjukkan hubungan antara tenaga keupayaan graviti (PE) dan tenaga kinetik (KE) "roller coaster" ketika menuruni landasan?

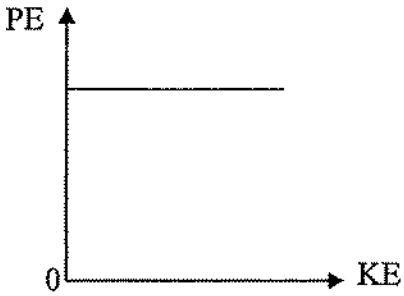
A



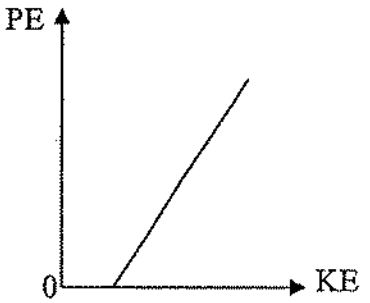
B



C



D



12 Diagram 8 shows a load M supported by three different arrangements of identical springs.

Rajah 8 menunjukkan beban M yang digantung mengikut tiga susunan berbeza, menggunakan spring yang serupa.

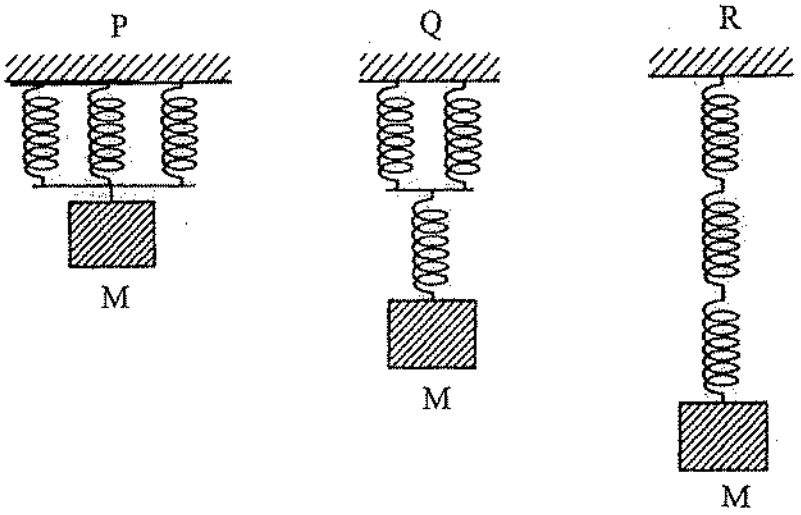


Diagram 8
Rajah 8

Which comparison is correct about the extension of arrangements P, Q and R?

Perbandingan yang manakah betul tentang pemanjangan susunan P, Q dan R?

A Q < R < P

B P < Q < R

C R < P < Q

D R < Q < P

13 Diagram 9 shows three different shoes.

Rajah 9 menunjukkan tiga kasut berlainan.

Diagram 9
Rajah 9

Arrange the shoes based on the pressure exerted on the ground in ascending order if worn by the same person.

Susunkan kasut di atas berdasarkan tekanan yang dikenakan pada permukaan tanah dalam urutan menaik jika kasut-kasut tersebut dipakai oleh orang yang sama.

A X, Y, Z

B Y, Z, X

C Z, Y, X

D Z, X, Y

14 Diagram 10 shows a container with water spurting out from a hole, P.

Rajah 10 menunjukkan satu bekas di mana air memancut keluar dari lubang, P.

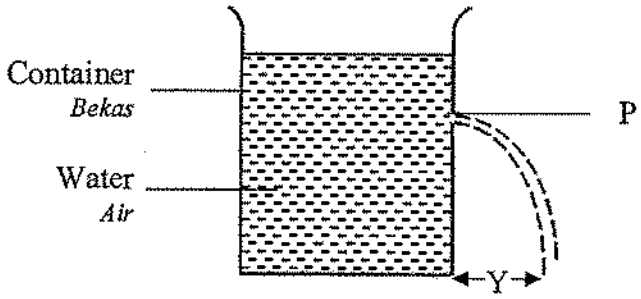


Diagram 10
Rajah 10

Distance Y can be reduced by

Jarak Y boleh dikurangkan dengan

A replacing water with cooking oil
menggantikan air dengan minyak masak

B using a taller container
menggunakan bekas yang lebih tinggi

C lowering the level of hole P
merendahkan kedudukan lubang P

D increasing the water depth
menambahkan kedalaman air

15 Diagram 11 shows a manometer connected to a gas container.

Rajah 11 menunjukkan sebuah manometer yang disambung ke sebuah bekas berisi gas.

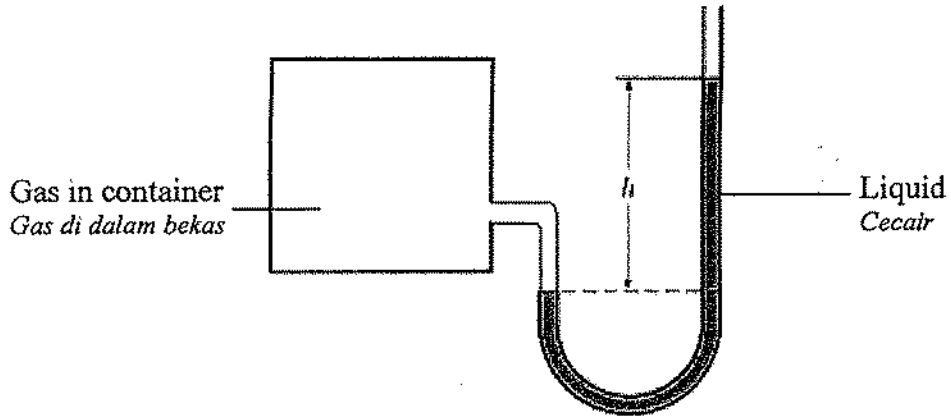


Diagram 11
Rajah 11

What happens to *h* if the temperature of the gas in the container increases?

Apa yang terjadi kepada h jika suhu gas di dalam bekas meningkat?

A Decreases
Berkurang

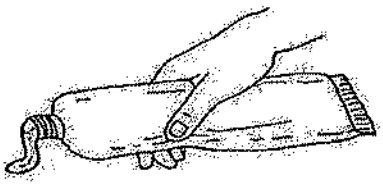
B Increases
Bertambah

C Remains constant
Tidak berubah

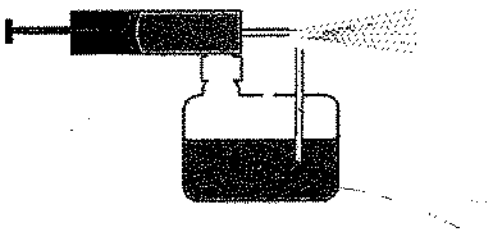
16 Which of the applications below uses Pascal's principle?

Yang manakah aplikasi di bawah menggunakan prinsip Pascal?

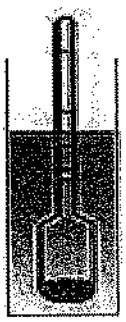
A



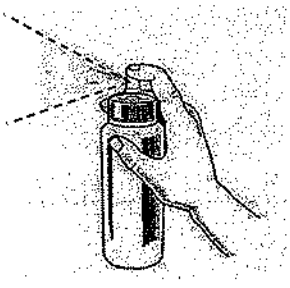
B



C



D



17 Diagram12 shows a hydraulic system. The total weight of load X and piston K is 80 N.

Rajah 12 menunjukkan satu sistem hidraulik.Jumlah berat beban X dan piston K ialah 80 N.

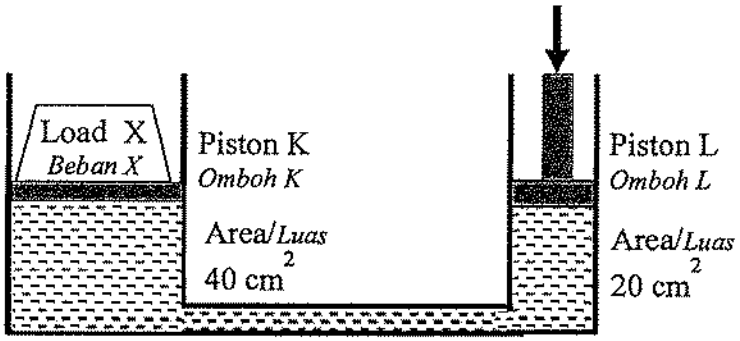


Diagram 12
Rajah 12

What is the magnitude of the force to be exerted on piston L in order to lift load X?

Berapakah magnitud daya yang perlu dikenakan pada piston L untuk mengangkat beban X?

A 10 N

B 40 N

C 80 N

D 160 N

18 Diagrams 13 shows a floating hot air balloon.

Rajah 13 menunjukkan sebuah belon udara panas terapung.

Diagram 13
Rajah 13

The situation can be explained using

Situasi ini boleh diterangkan menggunakan

A Pascal's principle
Prinsip Pascal

B Bernoulli's principle
Prinsip Bernoulli

C Archimedes' principle
Prinsip Archimedes

19 Diagram 14 shows a submarine with volume 5200 m^3 submerged 52 m below the water surface.

Rajah 14 menunjukkan sebuah kapal selam dengan isipadu 5200 m^3 berada 52 m di bawah permukaan air.

(Density of water = 1000 kg m^{-3})

(*Ketumpatan air = 1000 kg m^{-3}*)

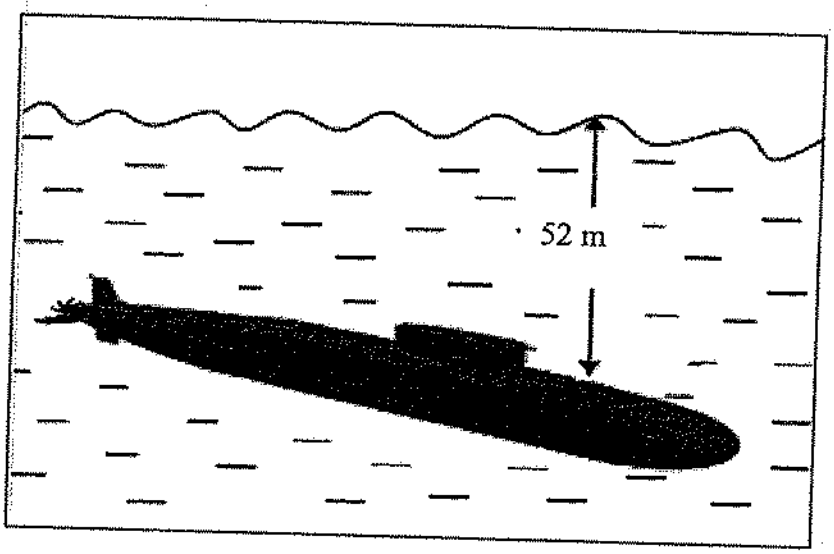


Diagram 14
Rajah 14

What is the buoyant force acting on the submarine?

Berapakah nilai daya apungan yang bertindak keatas kapal selam tersebut?

A 5.2×10^5 N

B 5.2×10^6 N

C 5.2×10^7 N

D 5.2×10^8 N

20 Diagram 15 shows a glass of iced tea.
Rajah 15 menunjukkan segelas teh ais.

Diagram 15
Rajah 15

What happens when the iced tea and glass are in thermal equilibrium?
Apakah yang berlaku apabila teh ais dan gelas dalam keseimbangan terma?

A The temperature of the glass decreases
Suhu gelas berkurangan

B The temperature of the iced tea decreases
Suhu teh ais meningkat

C There is heat flow from the glass to the iced tea
Ada pengaliran haba dari gelas ke teh ais

D There is no net heat flow from the glass to the iced tea
Tiada pengaliran haba bersih dari gelas kepada teh ais

21 Diagram 16 shows three different pots with the same mass and heated with the same amount of heat for 5 minutes.

Rajah 16 menunjukkan tiga jenis periuk dengan jisim yang sama dan dipanaskan dengan jumlah haba yang sama dalam masa 5 minit.

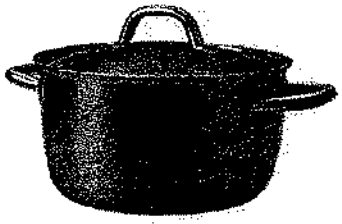
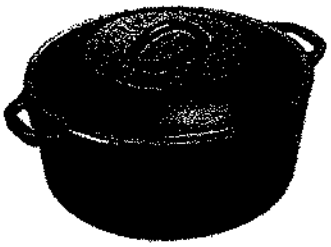
Aluminum pot *Periuk aluminium*	Copper pot *Periuk kuprum*	Glass pot *Periuk kaca*
		
Specific heat capacity *Muatan haba tentu* $= 900\ J\ kg^{-1}\ °C^{-1}$	Specific heat capacity *Muatan haba tentu* $= 387\ J\ kg^{-1}\ °C^{-1}$	Specific heat capacity *Muatan haba tentu* $= 840\ J\ kg^{-1}\ °C^{-1}$

Diagram 16
Rajah 16

Which statement is correct after 5 minutes of heating?

Pernyataan manakah benar selepas 5 minit dipanaskan?

A The copper pot has the lowest temperature
Periuk kuprum mempunyai suhu paling rendah

B The aluminium pot has the highest temperature
Periuk aluminium mempunyai suhu paling tinggi

C The temperature of the copper pot is equal to glass pot
Suhu periuk kuprum sama dengan periuk kaca

D The temperature of the copper pot is higher than glass pot
Suhu periuk kuprum lebih tinggi dari periuk kaca

22 Diagram 17 shows the temperature-time graph for a substance X when heated by a 100 W electric heater.

Rajah 17 menunjukkan graf suhu-masa bagi suatu bahan X bila dipanaskan oleh pemanas elektrik 100 W.

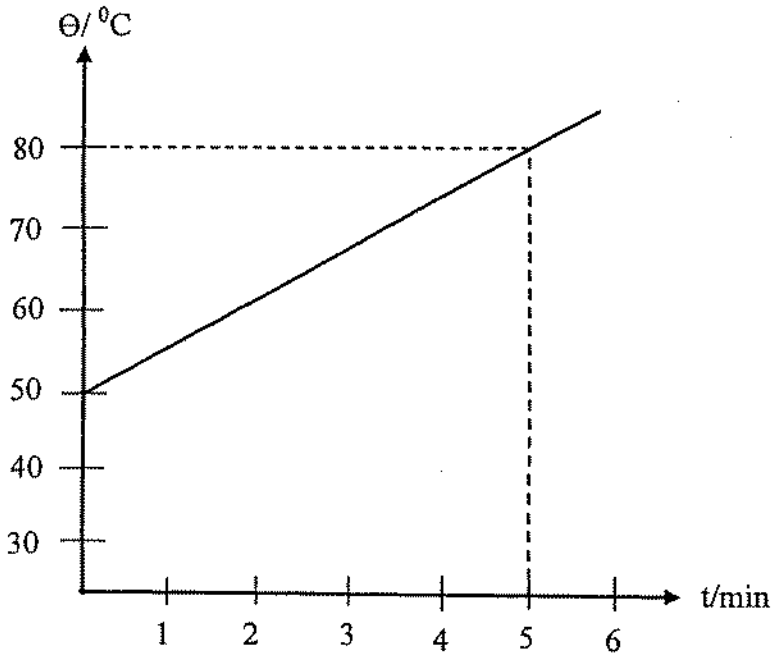


Diagram 17
*Rajah*17

Determine the mass of the substance.

Tentukan jisim bahan tersebut.

[Specific heat capacity of the substance is 500 J kg^{-1} $^0C^{-1}$]

[Muatan haba tentu bahan itu ialah 500 J kg^{-1} $^0C^{-1}$]

A 0.03 kg

B 0.75 kg

C 1.20 kg

D 2.00 kg

23 Diagram 18 shows ice melting.

Rajah 18 menunjukkan ais mencair.

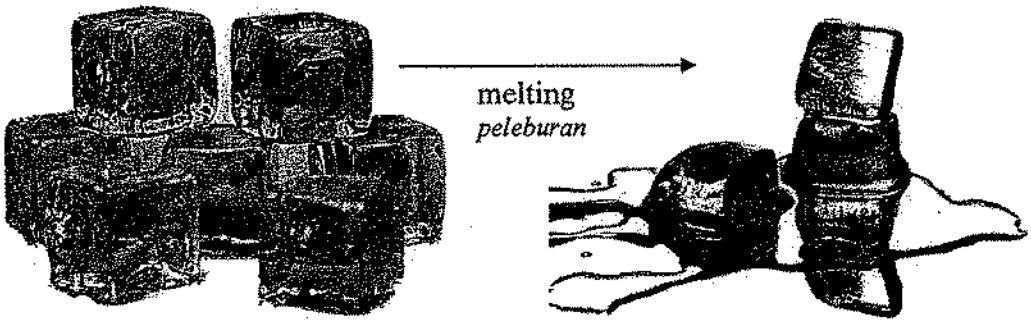


Diagram 18
Rajah 18

The heat absorbed during the process is

Tenaga haba yang diserap semasa proses adalah

A latent heat of fusion
haba pendam pelakuran

B latent heat of vaporization
haba pendam pengewapan

C heat capacity of solid
muatan haba pepejal

D heat capacity of liquid
muatan haba cecair

24 Diagram 19 shows the same balloon before and after it was placed in a refrigerator for an hour.

Rajah 19 menunjukkan sebiji belon yang sama sebelum dan selepas diletakkan di dalam peti sejuk selama satu jam.

Before
Sebelum

After
Selepas

Diagram 19
Rajah 19

The situation above can be explained by

Situasi di atas boleh dijelaskan oleh

A Gas law
Hukum gas

B Boyle's law
Hukum Boyle

C Pressure law
HukumTekanan

D Charles' law
Hukum Charles

25 Diagram 20 shows the path of light rays reflected by a concave mirror and points A, B, C and D in front of the mirror.

Rajah 20 menunjukkan lintasan sinar cahaya dipantulkan oleh sebuah cermin cekung dan titik-titik A, B, C dan D di hadapan cermin.

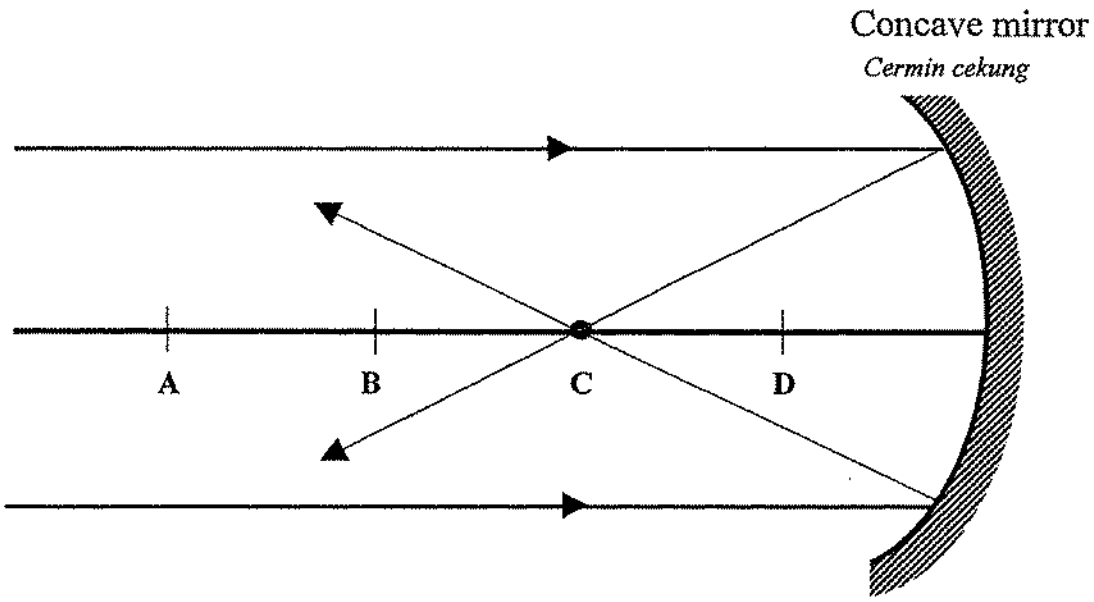


Diagram 20
Rajah 20

Which point is the centre of curvature of the concave mirror?

Titik manakah pusat kelengkungan cermin cekung itu?

26 On Diagram 21, which light ray undergoes the phenomenon of total internal reflection?

Pada Rajah 21 sinar cahaya manakah yang menunjukkan fenomena pantulan dalam penuh?

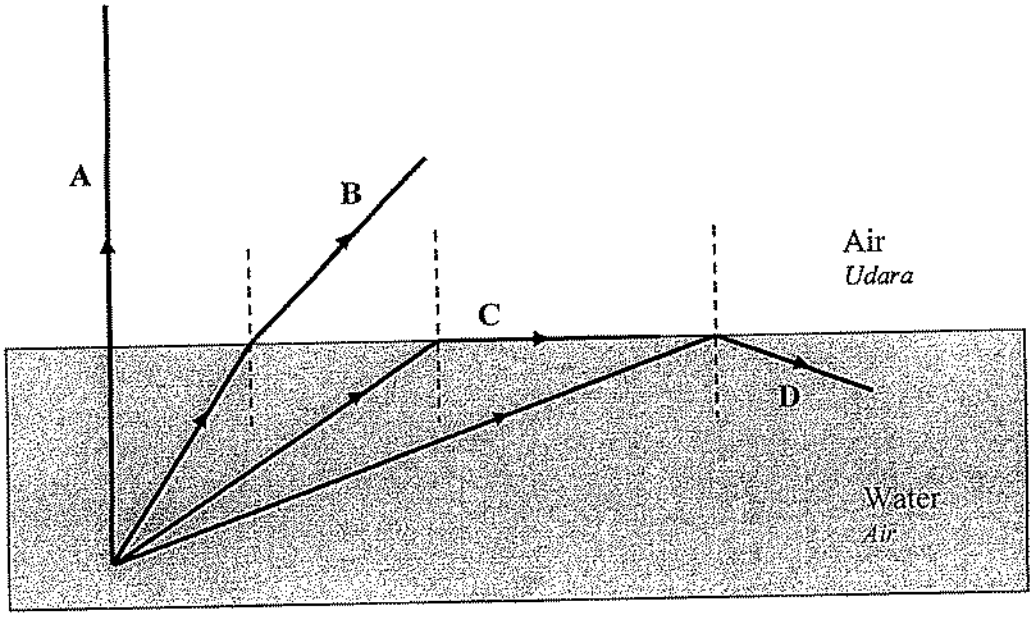
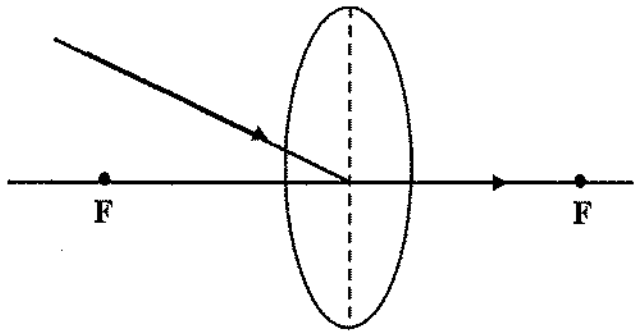


Diagram 21
Rajah 21

27 Which of the following ray diagrams is correct?

Manakah di antara rajah sinar yang berikut adalah betul?

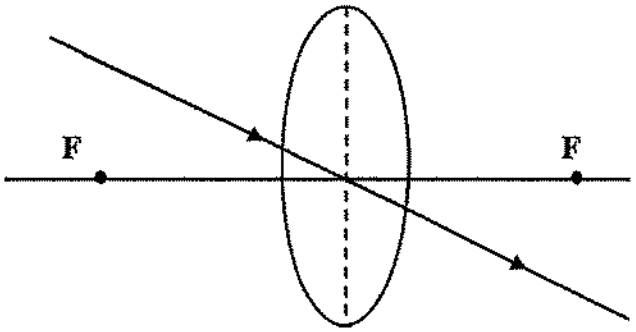
A



Key
Kekunci

F : Focal point
Titik fokus

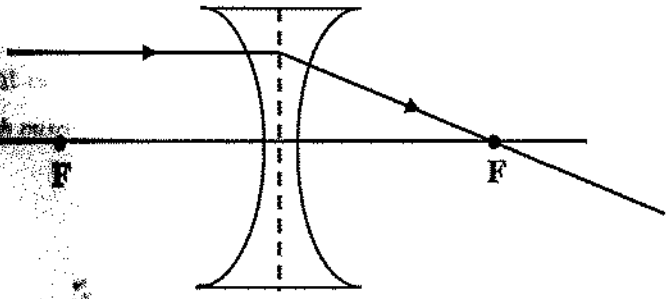
B



Key
Kekunci

F : Focal point
Titik fokus

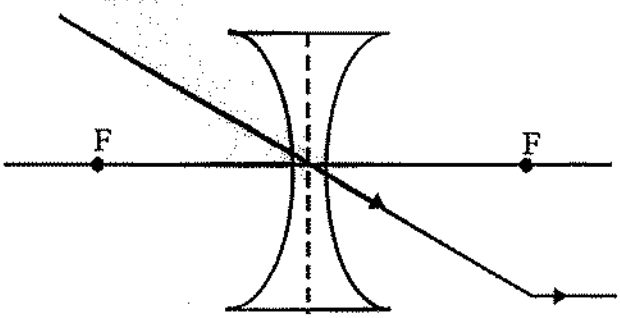
C



Key
Kekunci

F : Focal point
Titik fokus

D



Key
Kekunci

F : Focal point
Titik fokus

28 Diagram 22 shows an object which is placed 25 cm from the centre of a convex lens. The focal length of the lens is 20 cm.

Rajah 22 menunjukkan objek diletak pada jarak 25cm dari pusat sebuah kanta cembung. Panjang fokus kanta itu ialah 20 cm.

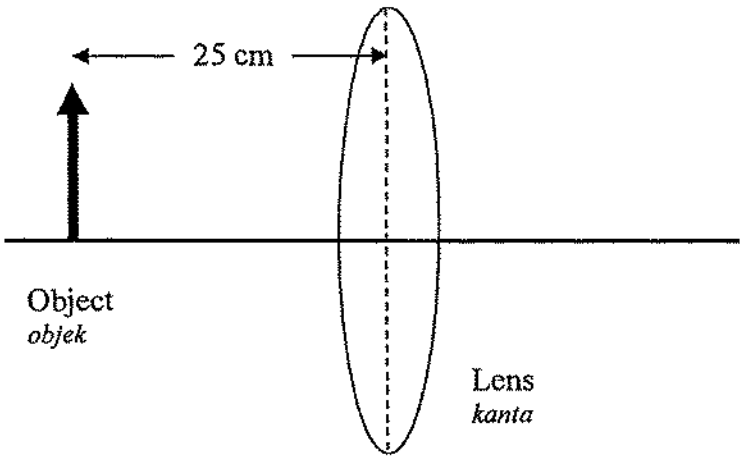


Diagram 22
Rajah 22

Calculate the image distance.

Kirakan jarak imej.

A 25 cm

B 45 cm

C 90 cm

D 100 cm

29 What does wave carry when propagating from one point to another?

Apakah yang dibawa oleh gelombang apabila merambat dari satu titik ke titik yang lain?

A Energy
Tenaga

B Power
Kuasa

C Particle
Zarah

D Medium
Medium

30 Diagram 23 shows a graph of displacement against time of a simple pendulum

Rajah 23 menunjukkan graf sesaran lawan masa bagi sebuah bandul ringkas.

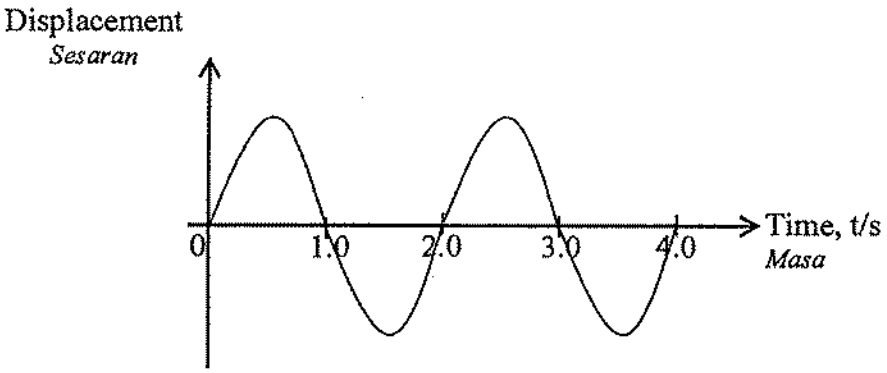


Diagram 23
Rajah 23

What is the frequency of oscillations?

Apakah frekuensi getaran tersebut?

A 0.4 Hz

B 0.5 Hz

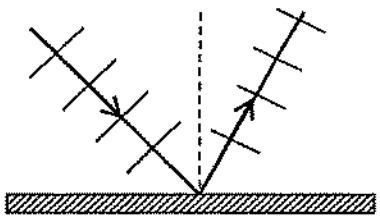
C 2.0 Hz

D 2.5 Hz

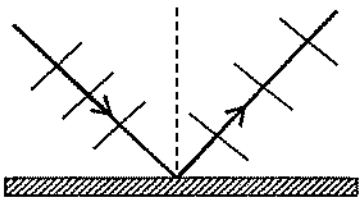
31 Which of the following diagrams shows the correct pattern of the reflection of water waves?

Manakah di antara rajah berikut yang menunjukkan corak pantulan gelombang air yang betul?

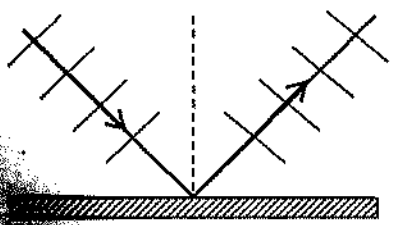
A



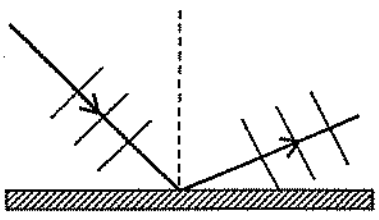
B



C



D



32 Diagram 24 shows a spoon in a glass of water.

Rajah 24 menunjukkan sebatang sudu berada di dalam gelas berisi air.

Diagram 24
Rajah 24

What phenomenon explains the situation above?

Apakah fenomena yang menjelaskan situasi di atas?

A Reflection of light
Pantulan cahaya

B Refraction of light
Pembiasan cahaya

C Diffraction of light
Pembelauan cahaya

D Interference of light
Interferens cahaya

33 Diagram 25 shows diffraction of water waves.

Rajah 25 menunjukkan pembelauan gelombang air.

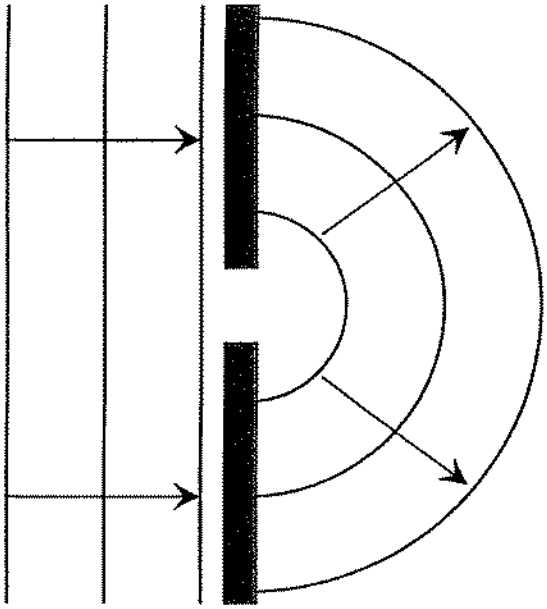


Diagram 25
Rajah 25

Which quantity decreases when the water waves diffract?

Manakah di antara kuantiti berikut yang berkurang apabila gelombang air mengalami pembelauan?.

A Speed
Laju

B Period
Tempoh

C Amplitude
Amplitud

D Wavelength
Panjang gelombang

C

34 Diagram 26 shows an astronaut in outer space.

Rajah 26 menunjukan seorang angkasawan di ruang angkasa lepas

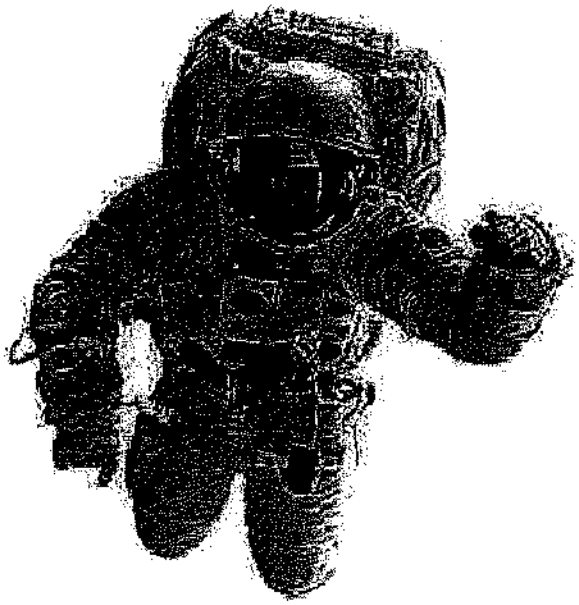


Diagram 26
Rajah 26

An astronaut could not hear direct sound in outer space because

Angkasawan tidak dapat mendengar sebarang bunyi secara terus di angkasa lepas kerana

A sound cannot travel in vacuum
bunyi tidak dapat bergerak melalui vakum

B the density of outer space is low
ketumpatan angkasa lepas rendah

C the speed of sound is greater than the speed of light
kelajuan bunyi lebih tinggi daripada kelajuan cahaya

D the speed of light is greater than the speed of sound
kelajuan cahaya lebih tinggi daripada kelajuan bunyi

35 Diagram 27 shows a Global Positioning Sytem (GPS) device.
Rajah 27 menunjukan sebuah peranti Sistem Kedudukan Sejagat.

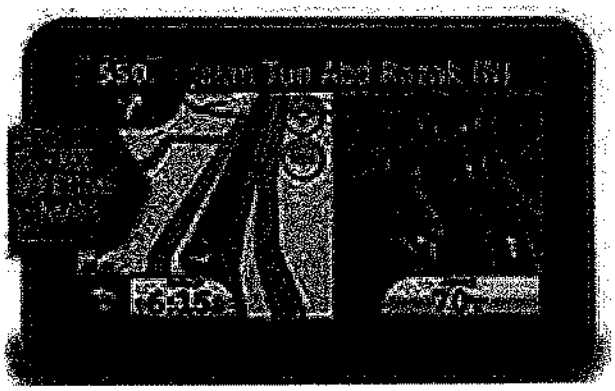


Diagram 27
Rajah 27

Which part of electromagnetic spectrum is used by the device?
Bahagian manakah daripada spektrum elektromagnet yang digunakan oleh alat tersebut?

A X rays
Sinar X

B Radio wave
Gelombang radio

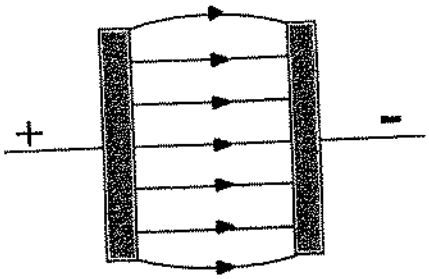
C Microwave
Gelombang mikro

D Infrared
Infra merah

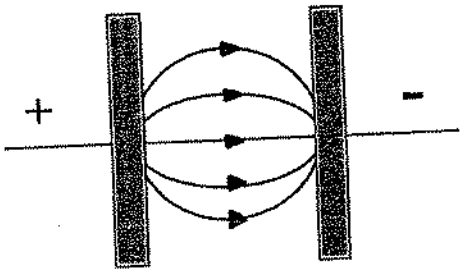
36 Which diagram shows the correct electric field pattern?

Rajah manakah yang menunjukkan corak medan elektrik yang betul?

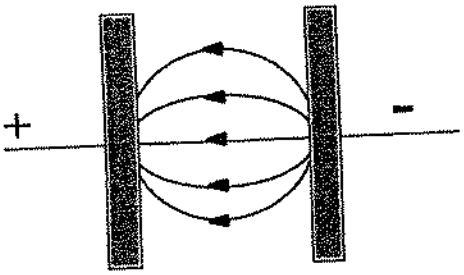
A



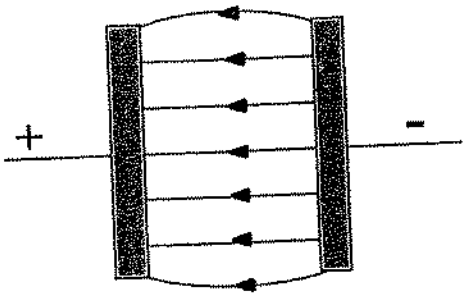
B



C



D



37 Diagram 28 shows an electric circuit.

Rajah 28 menunjukkan satu litar elektrik.

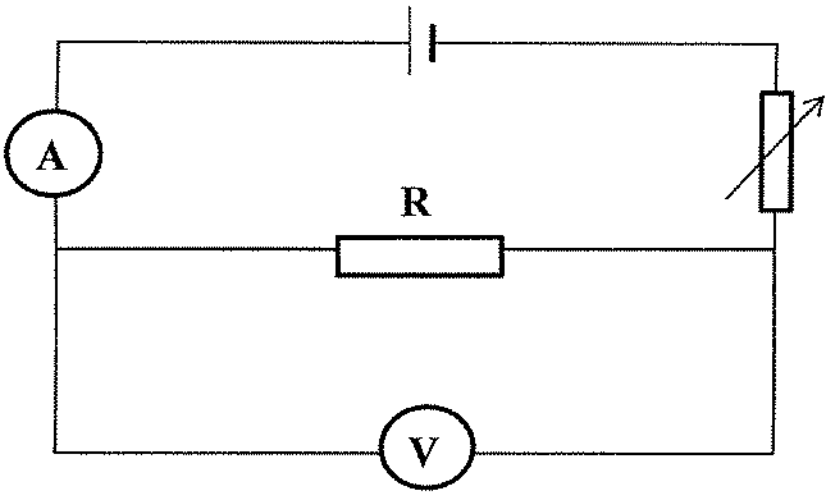
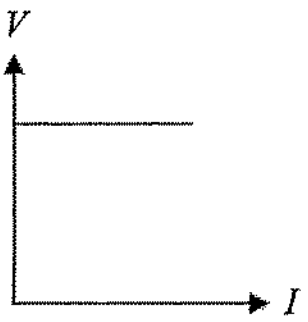


Diagram 28
Rajah 28

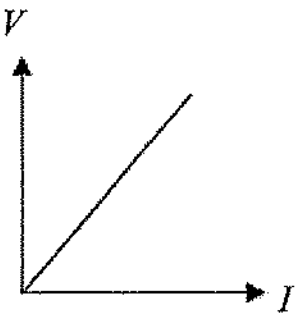
Which graph shows the relationship between potential difference, V and current, I when the rheostat is adjusted?

Graf manakah yang menunjukkan hubungan antara beza keupayaan V dan arus, I apabila reostat dilaraskan?

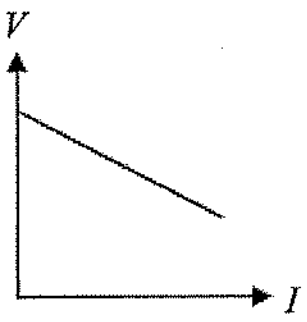
A



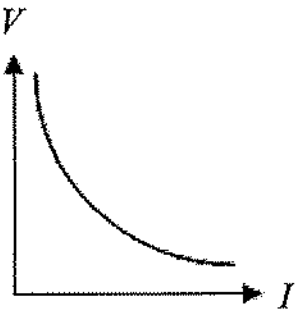
B



C



D



38 Diagram 29 shows an electric circuit.

Rajah 29 menunjukkan litar elektrik.

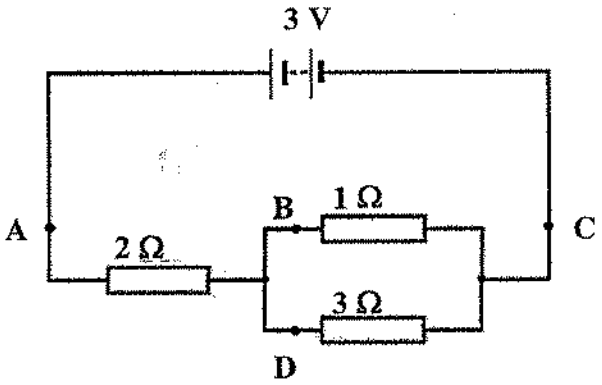


Diagram 29
Rajah 29

At which point the current is the least?

Pada titik manakah nilai arus adalah terkecil?

39 Diagram 30 shows a voltage–current graph.

Rajah 30 menunjukkan graf voltan-arus.

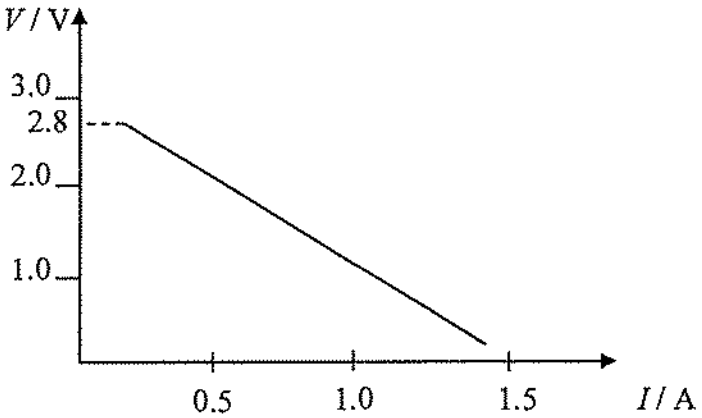


Diagram
Rajah 30

Determine the value of electromotive force.

Tentukan nilai bagi daya gerak elektrik.

A 1.87 V

B 2.00 V

C 2.80 V

D 3.00 V

40 Diagram 31 shows a light bulb connected to a resistor and a battery.

Rajah 31 menunjukkan sebuah mentol yang disambungkan kepada perintang dan sebuah bateri.

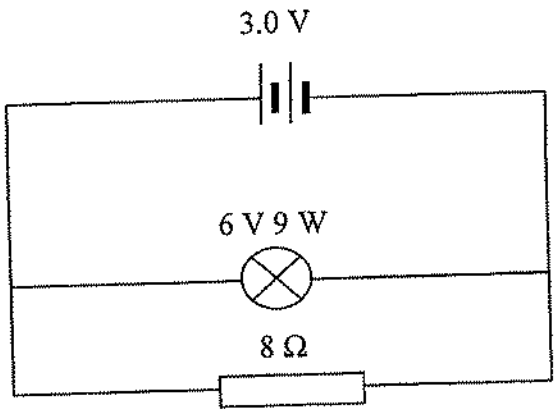


Diagram 31
Rajah 31

Calculate the power used by the light bulb.

Hitungkan kuasa yang digunakan oleh mentol.

A 0.90 W

B 1.92 W

C 2.25 W

D 3.00 W

41 Diagram 32 shows the arrangement of apparatus to investigate the magnetic field produced by the current in a straight wire

Rajah 32 menunjukkan susunan radas untuk mengkaji medan magnet yang dihasilkan oleh arus dalam wayar lurus

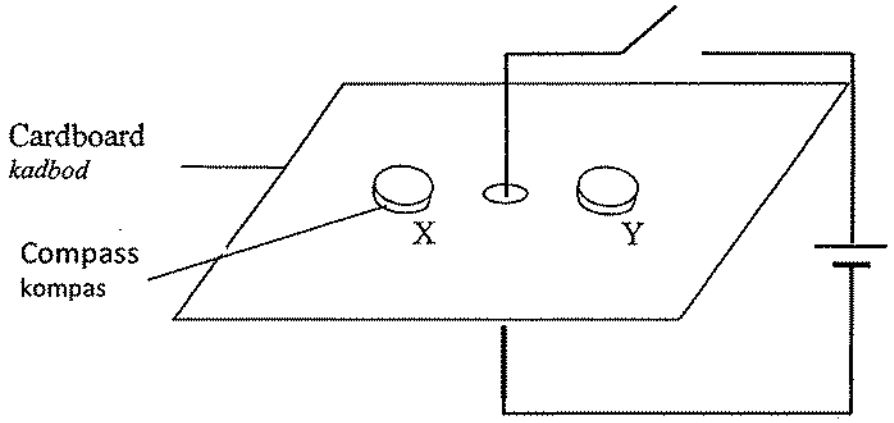


Diagram 32
Rajah 32

What are the directions shown by the pointers of compass X and Y when the circuit is switched on?

Apakah arah yang ditunjuk oleh jarum kompas X *dan* Y *apabila suis ditutup?*

	Compass X *Kompas* X		Compass Y *Kompas* Y
A			
B			
C			
D			

42 Diagram 33 shows a solenoid connected to a galvanometer.

Rajah 33 menunjukkan solenoid yang disambungkan kepada galvanometer.

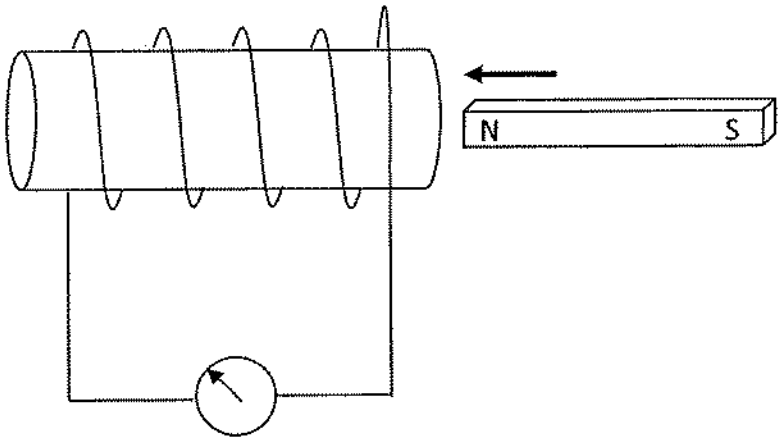


Diagram 33
Rajah 33

Which of the following factors will increase the deflection of galvanometer pointer?

Antara berikut yang manakah akan meningkatkan pesongan pada penunjuk galvanometer?

A Use thinner wire
Gunakan wayar yang lebih nipis

B Increase the current
Tambahkan arus

C Move the magnet away from the solenoid
Menggerakkan magnet menjauhi solenoid

D Increase the number of turns of the solenoid
Tambahkan bilangan lilitan solenoid

43 Diagram 34 shows a circuit where the bulb lights up at normal brightness.

Rajah 34 menunjukkan litar di mana mentol menyala dengan kecerahan normal.

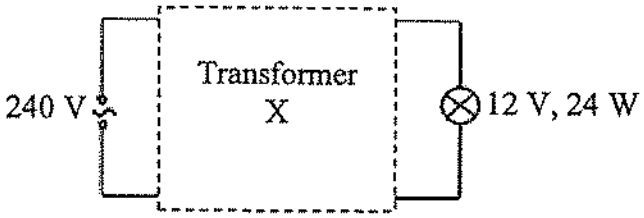
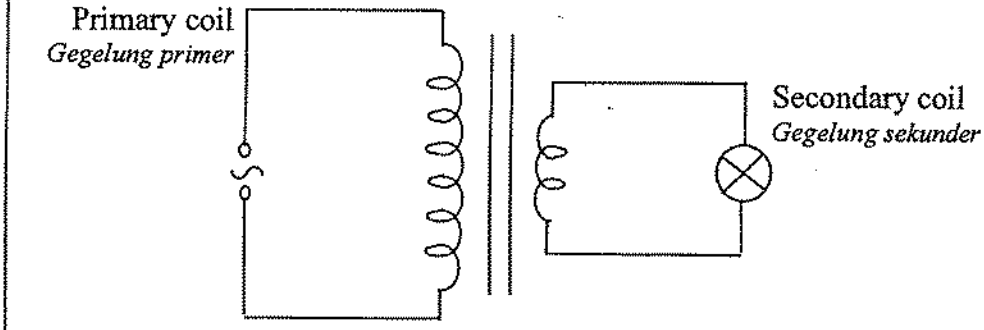


Diagram 34
Rajah 34

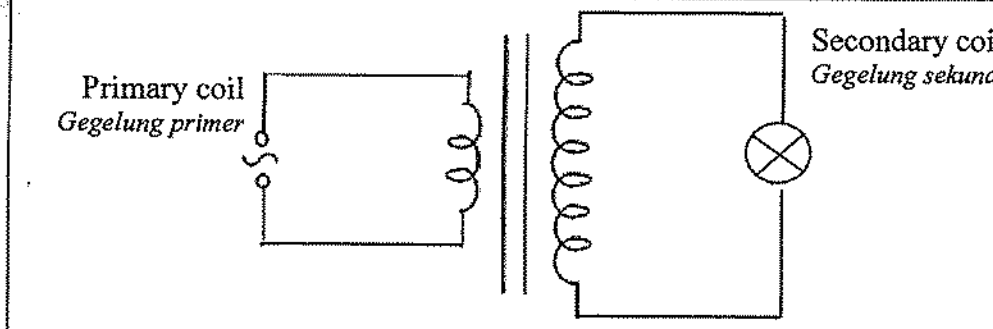
Which of the following is the transformer X?

Antara berikut adalah transformer X?

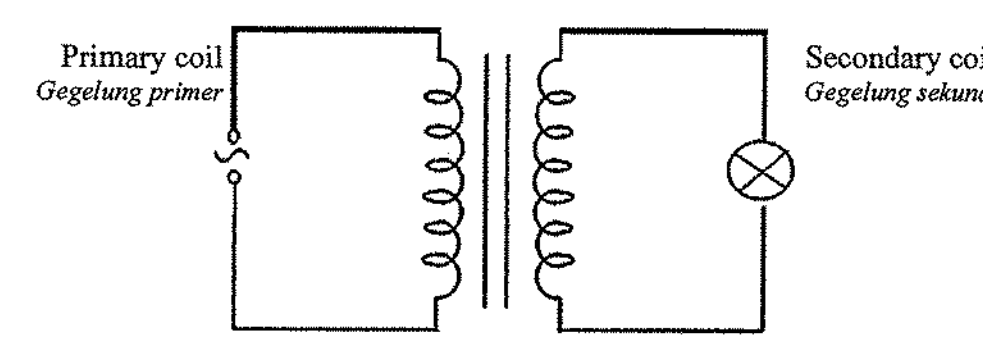
A



B



C



44 Which characteristics are the most suitable for transmission of electricity through the National Grid Network?

Ciri manakah yang paling sesuai untuk penghantaran elektrik melalui Rangkaian Grid Nasional?

	Type of current *Jenis arus*	Magnitude of voltage *Magnitud voltan*
A	Direct current *Arus terus*	High *Tinggi*
B	Direct current *Arus terus*	Low *Kecil*
C	Alternating current *Arus ulangalik*	Low *Rendah*
D	Alternating current *Arus ulangalik*	High *Tinggi*

45 Which of the following information cannot be obtained directly from a cathode ray oscilloscope (C.R.O) display?

Antara maklumat berikut, yang manakah tidak boleh didapati secara terus dari paparan osiloskop sinar katod (O. S. K.)?

A Frequency
Frekuensi

B Waveforms display
Paparan bentuk gelombang

C Short time interval measurement
Ukuran sela masa

D Potential difference measurement
Ukuran beza keupayaan

46 Diagram 35 shows an automatic lamp circuit.

Rajah 35 menunjukkan sebuah litar lampu automatik.

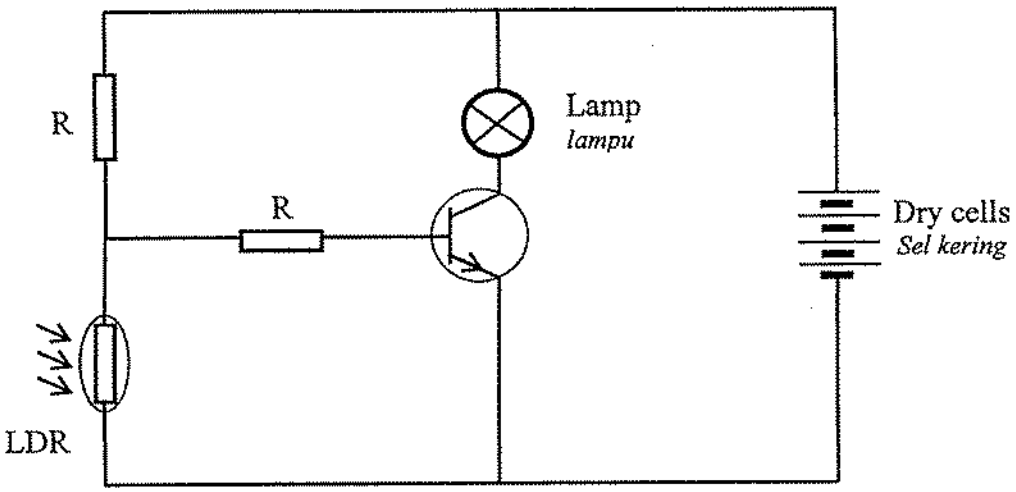


Diagram 35
Rajah 35

Which of the following is correct about the circuit?

Antara berikut, yang manakah betul mengenai litar tersebut?

	Surrounding brightness *Kecerahan persekitaran*	Resistance of LDR *Rintangan LDR*	Lamp *Lampu*
A	Dark *Gelap*	Low *Rendah*	Does not light up *Tidak menyala*
B	Dark *Gelap*	High *Tinggi*	Lights up *Menyala*
C	Bright *Cerah*	High *Tinggi*	Does not light up *Tidak menyala*
D	Bright *Cerah*	Low *Rendah*	Lights up *Menyala*

47 Diagram 36 shows a logic gate circuit.

Rajah 36 menunjukkan litar get logik.

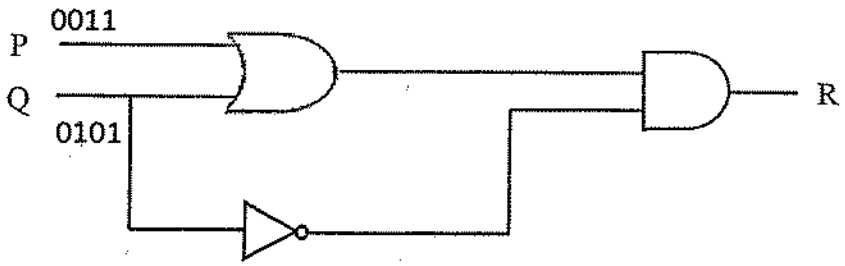
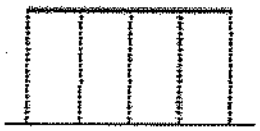


Diagram 36
Rajah 36

Which of the following is the correct output, R?

Manakah di antara berikut adalah betul untuk output, R?

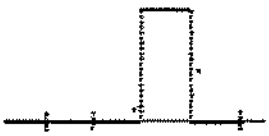
A



B

C

D



48 Diagram 37 shows a nuclide notation for cobalt-60

Rajah 37 menunjukkan notasi nuklid kobalt-60.

$$^{60}_{27}Co$$

Diagram 37
Rajah 37

Which of the following combination is **correct**?

*Manakah antara berikut adalah **betul**?*

	Proton number *Nombor proton*	Nucleon number *Nombor nucleon*	Number of neutrons *Bilangan neutron*
A	27	60	33
B	60	27	33
C	27	33	60
D	33	60	27

49 The diagram 38 shows how the thickness of steel sheet is monitored using a radioisotope and a detector.

Rajah 38 menunjukkan bagaimana ketebalan kepingan keluli dikawal menggunakan radioisotop dan pengesan

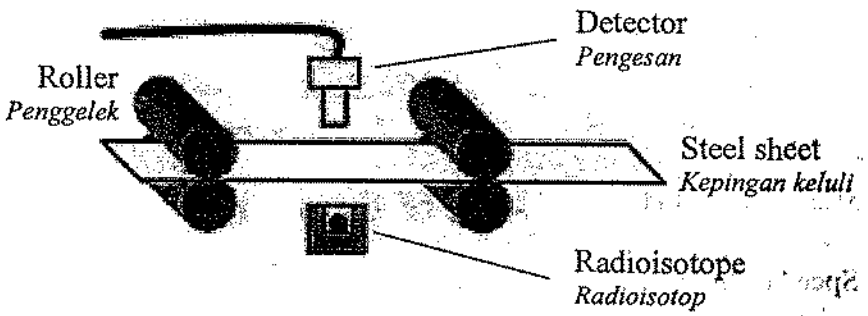


Diagram 38
Rajah 38

Which is the most suitable radiation?

Sinaran manakah yang paling sesuai?

A X-ray
Sinar-X

B Gamma ray
Sinar gamma

C Beta particles
Zarah beta

D Alpha particles
Zarah alfa

4531/2
PHYSICS
Paper 2
September 2013
2 ½ hours

Index Number : .....

Identity Card No.: ……..…

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MAKTAB RENDAH SAINS MARA

SIJIL PELAJARAN MALAYSIA
TRIAL EXAMINATION 2013

PHYSICS

Paper 2

Two hours and thirty minutes

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

1. Write down your name and class in the space provided.
2. The questions are written in English and bahasa Melayu
3 Candidates are required to read the information at the back of the booklet

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	

This booklet consists of 36 printed pages and 1 unprinted pages

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*), $n = \frac{\text{real depth (}\textit{dalam nyata}\text{)}}{\text{apparent depth (}\textit{dalam ketara}\text{)}}$
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 m s^{-2}

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

For Examiner's Use

Section A
Bahagian A

[60 marks]
[60 *markah*]

Answer **all** questions in this section

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

1 Diagram 1 shows plane waves travelling towards a barrier.

Rajah 1 menunjukkan gelombang satah menuju ke satu penghalang.

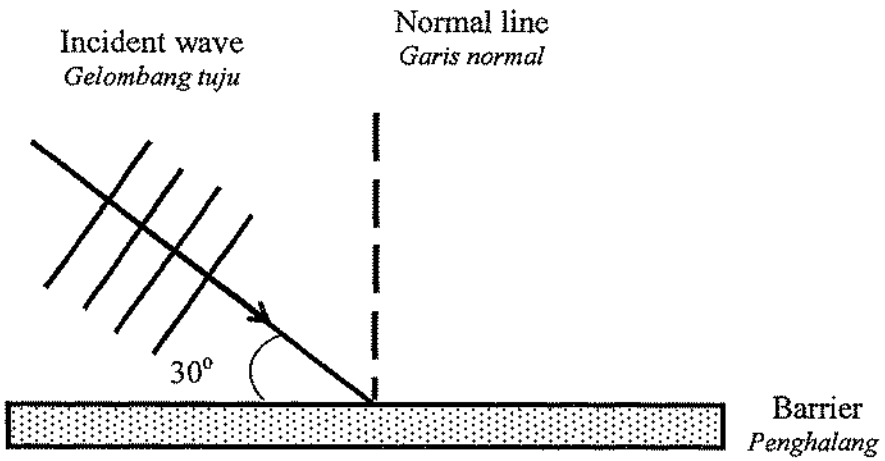


Diagram 1
Rajah 1

(*a*) What is the incident angle in Diagram 1?
Berapakah sudut tuju dalam Rajah 1?

1 (*a*)

.....

[1 mark]
[1 *markah*]

1

For Examiner's Use

(*b*) Complete the following sentence by underlining the correct phrase in the bracket.

Lengkapkan ayat berikut dengan menggariskan frasa yang betul di dalam kurungan.

The angle of incident is { greater than / the same as / smaller than } the angle of reflection

Sudut tuju adalah { *lebih besar daripada* / *sama* / *lebih kecil daripada* } *sudut pantulan*

1 (*b*) [1]

[1 mark]
[1 *markah*]

1 (*c*) [2]

(*c*) Draw the pattern and direction of the reflected waves on Diagram 1.

Lukiskan corak dan arah gelombang pantulan pada Rajah 1.

[2 marks]
[2 *markah*]

Total A1 4

2 Diagram 2.1 shows the reading of a measuring instrument when the switch is open. Diagram 2.2 shows the reading of the measuring instrument when the switch is closed.

Rajah 2.1 menunjukkan bacaan satu alat pengukur apabila suis dibuka.
Rajah 2.2 menunjukkan bacaan alat pengukur tersebut apabila suis ditutup.

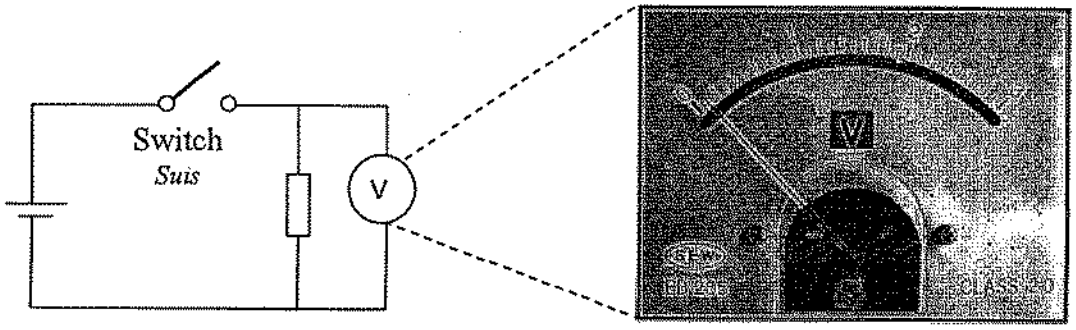


Diagram 2.1
Rajah 2.1

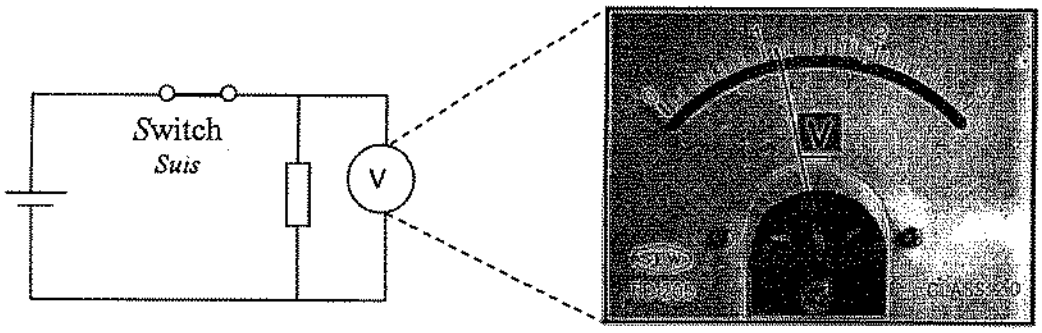


Diagram 2.2
Rajah 2.2

For Examiner's Use

2 (*a*) 1

2 (*b*)(i) 1

2 (*b*)(ii) 1

2 (*c*)(i) 1

2 (*c*)(ii) 1

Total A2 5

2 (*a*) What is the physical quantity measured by this instrument?
Apakah kuantiti fizik yang diukur oleh alat ini?

.....

[1 mark]
[1 *markah*]

(*b*) (i) Name the type of zero error found on this instrument.
Namakan jenis ralat sifar yang terdapat pada alat ini.

.....

[1 mark]
[1 *markah*]

(ii) What is the value of the zero error in Diagram 2.1?
Berapakah nilai ralat sifar dalam Rajah 2.1?

.....

[1 mark]
[1 *markah*]

(*c*) (i) What is the reading shown in Diagram 2.2?
Berapakah bacaan yang ditunjukkan dalam Rajah 2.2?

.....

[1 mark]
[1 *markah*]

(ii) What is the actual reading of the physical quantity measured?
Berapakah bacaan sebenar kuantiti fizik yang diukur?

.....

[1 mark]
[1 *markah*]

For Examiner's Use

3 Diagram 3 shows a copper rod being moved downwards between two opposite magnetic poles.
The rod is connected to the galvanometer and the pointer of the galvanometer deflects.

Rajah 3 menunjukkan rod kuprum digerakkan ke bawah di antara dua kutub magnet yang bertentangan. Rod disambung ke galvanometer dan jarum penunjuk galvanometer terpesong.

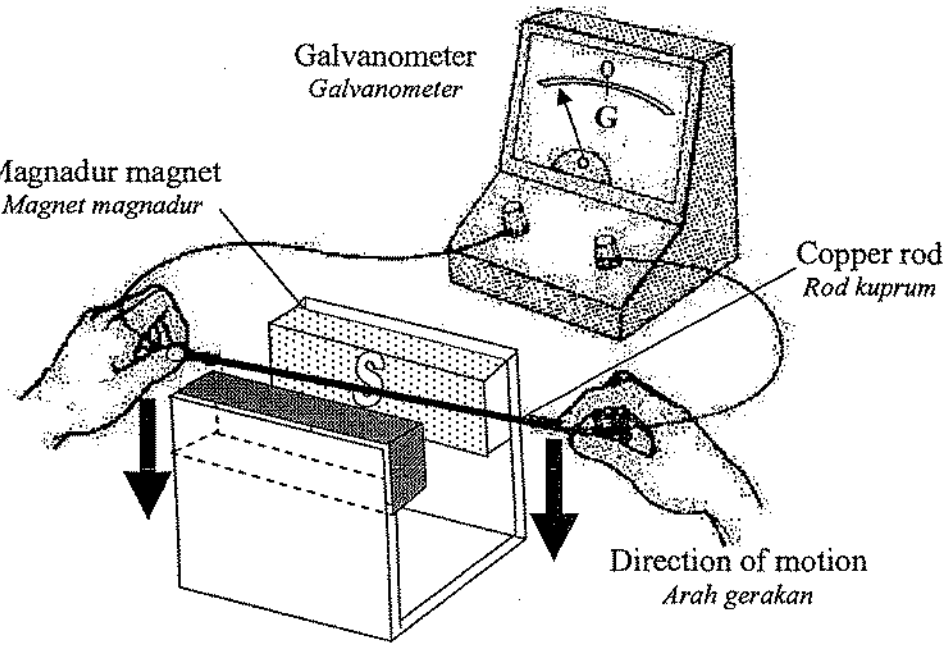


Diagram 3
Rajah 3

(*a*) (i) Name the physical quantity shown by the deflection of galvanometer.
Namakan kuantiti fizik yang ditunjukkan oleh pesongan galvanometer.

.....

[1 mark]
[1 *markah*]

3 (*a*)(i) 1

(ii) How is this physical quantity produced?
Bagaimanakah kuantiti fizik ini dihasilkan?

.....

[1 mark]
[1 *markah*]

3 (*a*)(ii) 1

For Examiner's Use

3 (*b*)

1

(*b*) Name the physics principle involved in Diagram 3.
Namakan prinsip fizik yang terlibat dalam Rajah 3.

.....

[1 mark]
[1 *markah*]

(*c*) (i) What happens to the galvanometer pointer when the rod is moved upwards?

Apakah yang berlaku kepada penunjuk galvanometer apabila rod digerakkan ke atas?

3 (*c*)(i)

1

.....

[1 mark]
[1 *markah*]

(ii) Name the physics rule used to determine the direction of the physical quantity measured.

Namakan hukum fizik yang digunakan untuk menentukan arah kuantiti fizikal yang diukur.

3 (*c*)(ii)

1

.....

[1 mark]
[1 *markah*]

(*d*) State one way to increase the degree of deflection of the pointer in Diagram 3.
Nyatakan satu kaedah untuk meningkatkan darjah pesongan jarum penunjuk dalam Rajah 3.

3 (*d*)

1

.....

[1 mark]
[1 *markah*]

Total A3

6

For Examiner's Use

4 Diagram 4 shows an arrangement of logic gates in an electronic device.
Rajah 4 menunjukkan susunan bagi get-get logik dalam satu peranti elektronik.

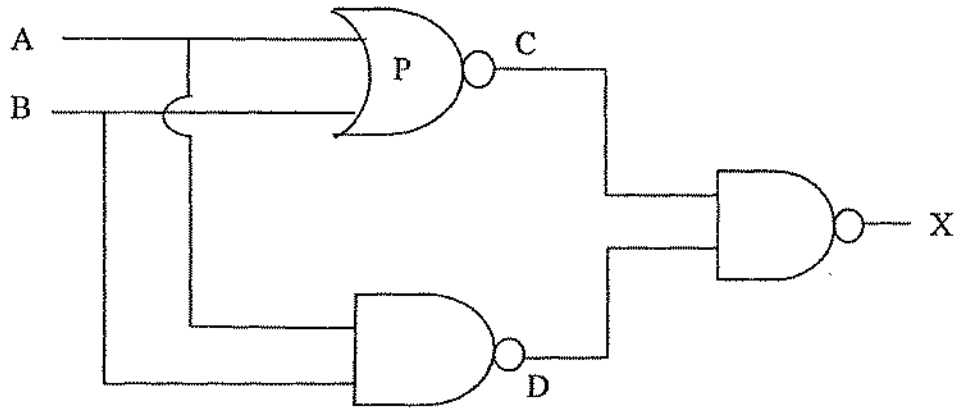


Diagram 4
Rajah 4

Based on Diagram 4,
Berdasarkan pada Rajah 4,

(*a*) Name the logic gate P.
Namakan get logik P.

.....

[1 mark]
[1 *markah*]

4 (*a*) 1

(*b*) (i) Write a Boolean algebra for gate P.
Tuliskan algebra Boolean untuk get P.

.....

[1 mark]
[1 *markah*]

4 (*b*)(i) 1

For Examiner's Use

(ii) Complete the truth table below for the output C, D and X.
Lengkapkan jadual kebenaran di bawah bagi output C, D dan X.

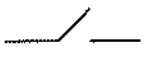
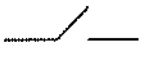
A	B	C	D	X
0	0			
0	1			
1	0			
1	1			

4 (*b*)(ii) 3

[3 marks]
[3 *markah*]

(*c*) Using two switches, one dry cell and a bulb, draw an electric circuit which represents a logic gate where the output is the same as X.

Menggunakan dua suis, satu sel kering dan mentol, lukiskan satu litar elektrik yang mewakili get logik yang outputnya sama dengan X.

			
Switch A *Suis A*	Switch B *Suis B*	Dry cell *Sel kering*	Bulb *Mentol*

4 (*c*) 2

[2 marks]
[2 *markah*]

Total A4 7

For Examiner's Use

5 Diagram 5.1 shows an audio generator connected to a speaker.
Rajah 5.1 menunjukkan sebuah penjana audio disambungkan kepada pembesar suara.

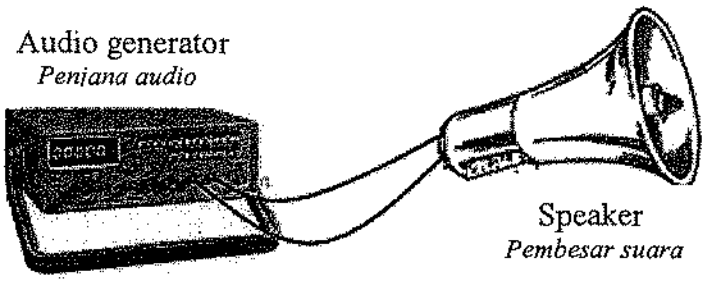


Diagram 5.1
Rajah 5.1

Diagrams 5.2(a) and 5.2(b) show the diffraction of sound waves from the same speaker when sounds of low and high frequency are produced respectively.

Rajah 5.2(a) and 5.2(b) masing-masing menunjukkan pembelauan gelombang bunyi dari pembesar suara yang sama apabila bunyi dengan frekuensi rendah dan frekuensi tinggi dihasilkan.

Low frequency sound
Bunyi berfrekuensi rendah

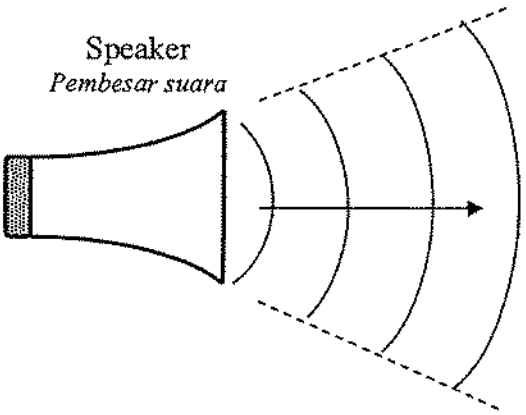


Diagram 5.2 (*a*)
Rajah 5.2 (a)

High frequency sound
Bunyi berfrekuensi tinggi

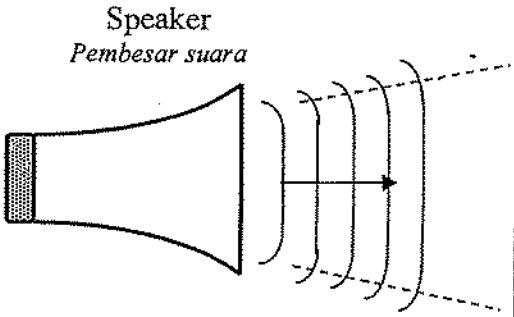


Diagram 5.2 (*b*)
Rajah 5.2 (b)

For Examiner's Use

(a) What is the meaning of diffraction?
Apa yang dimaksudkan dengan pembelauan?

.....

[1 mark]
[1 *markah*]

5 (b) 1

(b) In Diagram 5.2(a) mark and label the wavelength with λ.
Dalam rajah 5.2(a) tanda dan labelkan jarak gelombang dengan λ.

[1 mark]
[1 *markah*]

Observe Diagram 5.2(*a*) and Diagram 5.2(*b*).
Perhatikan Rajah 5.2(a) dan Rajah 5.2(b).

(c) (i) Compare the wavelengths.
Bandingkan jarak gelombang.

5 (c)(i) 1

.....

[1 mark]
[1 *markah*]

(ii) Compare the shape of the diffracted sound waves.
Bandingkan bentuk pembelauan gelombang bunyi.

5 (c)(ii) 1

.....

[1 mark]
[1 *markah*]

(d) (i) What happens to the amplitude of the diffracted sound waves?
Apa akan terjadi kepada amplitud gelombang bunyi yang terbelau?

5 (d)(i) 1

.....

[1 mark]
[1 *markah*]

(ii) Explain your answer.
Terangkan jawapan anda.

.....

5 (d)(ii) 2

.....

[2 marks]
[2 *markah*]

5 (e) 1

(e) State the relationship between wavelength and the amplitude of the diffracted waves.
Nyatakan hubungan antara panjang gelombang dan amplitud gelombang yang terbelau.

Total A5 8

.....

[1 mark]
[1 *markah*]

For Examiner's Use

6 Diagram 6.1 and Diagram 6.2 show trapped gas being heated in an enclosed space.

Rajah 6.1 dan Rajah 6.2 menunjukkan gas yang terperangkap sedang dipanaskan di dalam ruang tertutup.

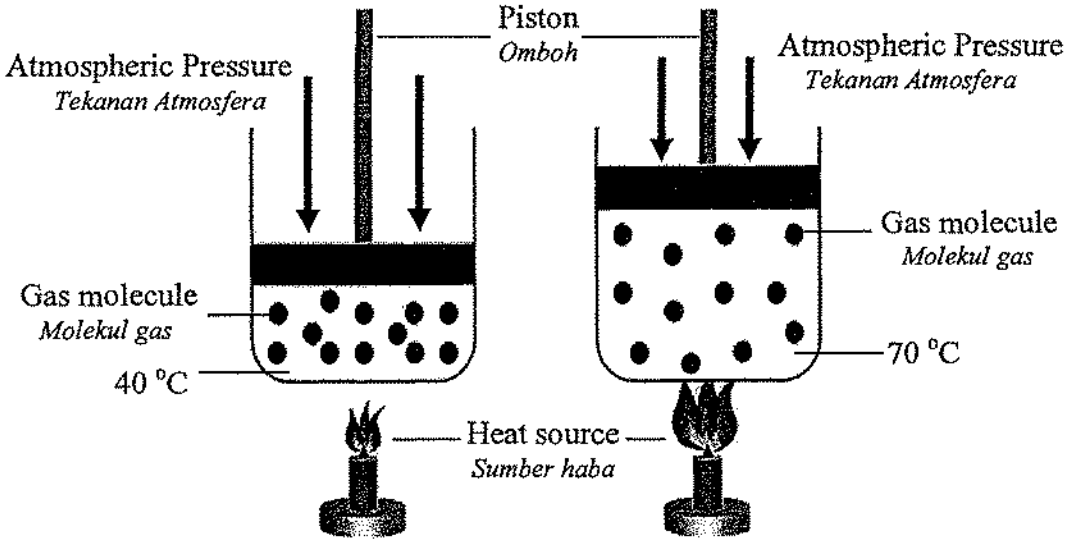


Diagram 6.1
Rajah 6.1

Diagram 6.2
Rajah 6.2

(*a*) State the SI unit for temperature.
Nyatakan unit SI bagi suhu.

.....

[1 mark]
[1 *markah*]

6 (*a*) 1

(*b*) Based on Diagrams 6.1 and 6.2,
Berdasarkan Rajah 6.1 dan 6.2,

(i) Compare the volume of the trapped gas.
Bandingkan isipadu gas yang terperangkap.

.....

[1 mark]
[1 *markah*]

6 (*b*)(i) 1

(ii) Compare the temperature of the trapped gas.
Bandingkan suhu gas yang terperangkap.

.....

[1 mark]
[1 *markah*]

6 (*b*)(ii) 1

For Examiner's Use

6 (b)(iii)
1

(iii) Compare the pressure exerted on the piston.
Bandingkan tekanan yang dikenakan ke atas omboh.

.....

[1 mark]
[1 *markah*]

(c) State the relationship between volume and temperature of the gas.
Nyatakan hubungan antara isipadu dan suhu gas.

6 (c)
1

.....

[1 mark]
[1 *markah*]

(d) Name the Law associated with the relationship above.
Namakan Hukum yang dikaitkan dengan hubungkait di atas.

6 (d)
1

.....

[1 mark]
[1 *markah*]

(e) A gas of volume 35 m^3 at temperature 40°C is heated at a fixed pressure. Calculate the volume of the gas when its temperature reaches 70°C.

Gas dengan isipadu 35 m^3 pada suhu 40°C dipanaskan pada tekanan tetap. Kirakan isipadu gas apabila suhu mencapai 70°C.

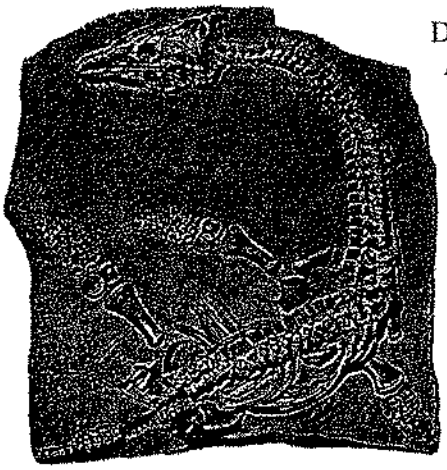
6 (e)
2

[2 marks]
[2 *markah*]

Total A6
8

For Examiner's Use

7 Diagram 7.1 shows dinosaur fossil unearthed at an archaeological site.
Rajah 7.1 menunjukkan fosil dinasour yang dijumpai di satu tapak arkeologi.



Dinasour fossil
Fosil dinasour

Diagram 7.1
Rajah 7.1

Scientist can estimate the age of the dinosaur fossil by determining the amount of undecayed radioisotope carbon-14. Carbon-14 (${}^{14}_{6}C$) decay emits beta particle. The half-life of carbon-14 is 5730 years.

Saintis boleh menganggarkan usia fosil tersebut dengan menentukan jumlah radioisotop karbon-14 yang masih belum mereput. Pereputan karbon-14 memancar zarah beta. Separuh hayat karbon-14 adalah 5730 tahun.

(*a*) What is the meaning of half-life?
Apakah maksud separuh hayat?

.....

[1 mark]
[1 *markah*]

7 (*a*) 1

(*b*) (i) Based on the information above, write the equation for the decay of carbon-14.

Berdasarkan maklumat di atas, tuliskan persamaan bagi reputan karbon-14.

.....

[1 mark]
[1 *markah*]

7 (*b*)(i) 1

(ii) Why does the radioactive substance decay?
Mengapakah bahan radioaktif itu mereput?

.....

[1 mark]
[1 *markah*]

7 (*b*)(ii) 1

For Examiner's Use

On Diagram 7.2,
Pada Rajah 7.2,

(*c*) (i) Sketch the graph of activity against time to show the decay of carbon-14. (The activity of carbon-14 is 16 counts per minute in living organisms)

Lakarkan graf aktiviti melawan masa untuk reputan karbon-14.
(Aktiviti karbon-14 dalam benda hidup adalah 16 bilangan per minit)

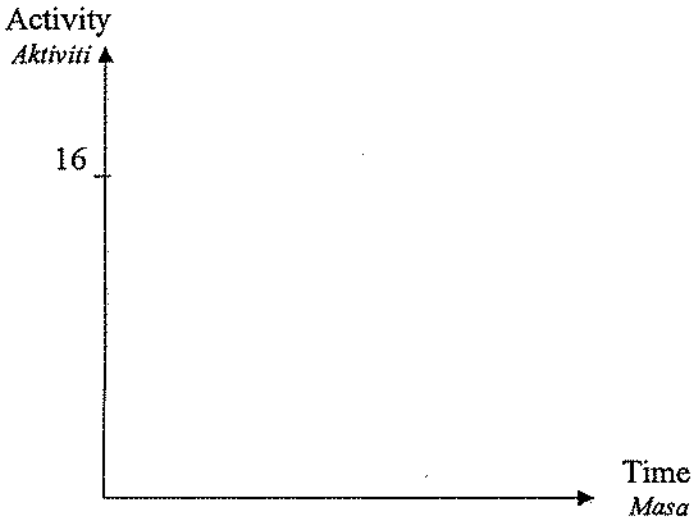


Diagram 7.2
Rajah 7.2

7 (*c*)(i) 2

[2 marks]
[2 *markah*]

(ii) Show how you determine the half-life of carbon-14.
Tunjukkan bagaimana anda menentukan nilai separuh hayat karbon-14.

7 (*c*)(ii) 1

[1 mark]
[1 *markah*]

(iii) Determine the age of the dinosaur fossil if the current decay rate of carbon-14 is 2 counts per minute.

Tentukan umur fosil dinasour tersebut sekiranya kadar pereputan karbon-14 kini adalah 2 bilangan per minit.

7 (*c*)(iii) 2

[2 marks]
[2 *markah*]

(*d*) The carbon-14 decay releases 2.56×10^{-15} J of energy. Calculate the mass defect.

Pereputan karbon-14 membebaskan 2.56×10^{-15} *J tenaga. Hitungkan kecacatan jisim.*

For Examiner's Use

7 (*d*)

[2 marks]
[2 *markah*]

2

Total A7

10

For Examiner's Use

8 Diagram 8 shows a 150 kg billboard hung by two identical cables and where all the forces are in equilibrium.

Rajah 8 menunjukkan papan iklan yang tergantung pada dua kabel serupa yang berada dalam keadaan keseimbangan.

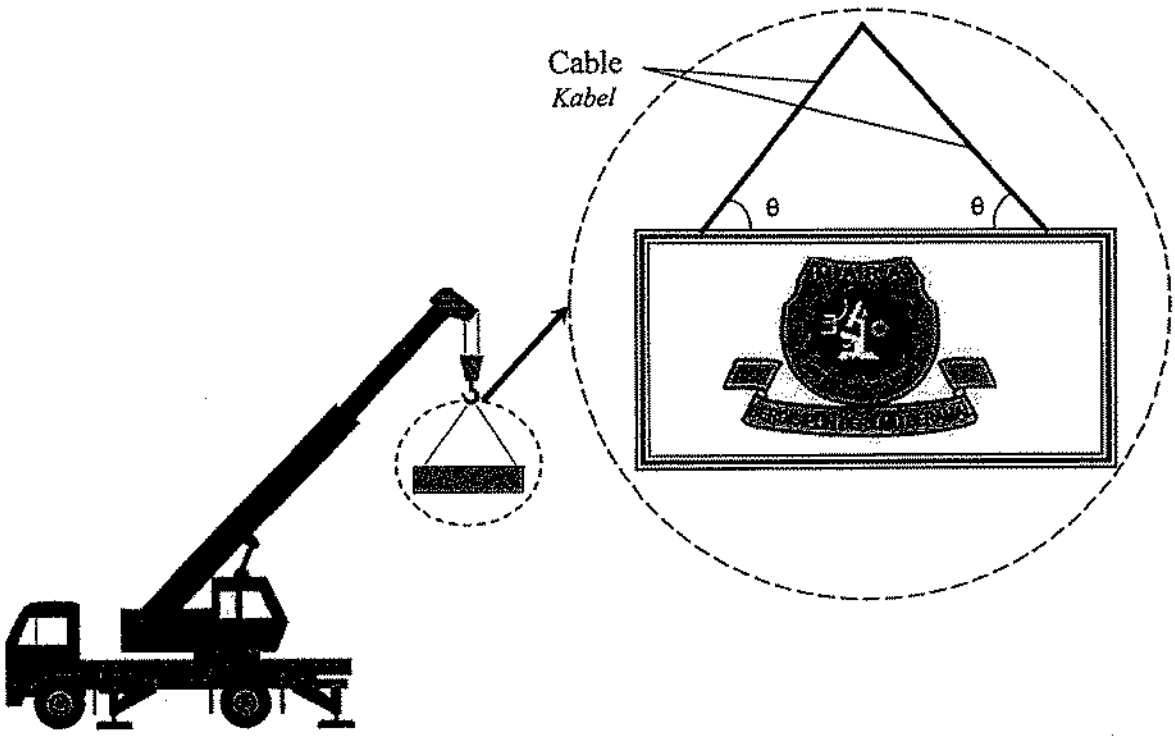


Diagram 8
Rajah 8

(*a*) What is the meaning of forces in equilibrium?
Apakah maksud keseimbangan daya?

.....

.....

[1 mark]
[1 *markah*]

8 (*a*)
1

For Examiner's Use

(*b*) (i) In Diagram 8, mark and label the weight, *W* of the billboard, the tensions of the cable, T_1 and T_2 and their directions.

Pada Rajah 8, tanda dan labelkan berat papan iklan, W, tegangan kabel T_1 dan T_2 serta arahnya.

[2 marks]
[2 *markah*]

8 (*b*)(i) 2

(ii) Calculate the weight of the billboard.
Hitung berat papan iklan tersebut.

[1 mark]
[1 *markah*]

8 (*b*)(ii) 1

(*c*) (i) In the space below, sketch a diagram of triangle of forces that act on the billboard in Diagram 8.

Pada ruang di bawah, lakarkan rajah segitiga keseimbangan daya yang bertindak ke atas papan iklan dalam Rajah 8.

[2 marks]
[2 *markah*]

8 (*c*)(i) 2

(ii) Based on the diagram of the triangle of forces, write the relationship between *W*, T_1 *and* T_2.

Berdasarkan lukisan rajah segitiga keseimbangan daya, tuliskan hubungan antara W, T_1 dan T_2.

.....

[1 mark]
[1 *markah*]

8 (*c*)(ii) 1

[Turn page over

For Examiner's Use

(*d*) Table 8 shows the characteristics and arrangement of cables for hanging the heavy billboard.

Jadual 8 menunjukkan ciri-ciri dan susunan kabel untuk menggantung papan iklan yang berat.

Cable *Kabel*	Maximum tension can be supported by the cable *Tegangan maksimum yang dapat ditampung oleh kabel*	Angle / θ *Sudut / θ*
P	High *Tinggi*	60°
Q	Low *Rendah*	60°
R	Low *Rendah*	30°

Table 8
Jadual 8

Based on Table 8, state the suitable characteristics of the cable to be used for hanging the heavy billboard.

Give one reason for the suitability of each characteristic.
Berdasarkan Jadual 8, nyatakan ciri-ciri kabel yang sesuai digunakan untuk menggantung papan iklan yang berat.

Berikan satu sebab untuk kesesuaian setiap ciri tersebut.

(i) Maximum tension which can be supported by the cable
Tegangan maksimum yang dapat ditampung oleh kabel

.....

Reason
Sebab

.....

.....

[2 marks]
[2 *markah*]

8 (*d*)(i)
2

For Examiner's Use

(ii) The angle of θ
Sudut θ

.....

Reason
Sebab

.....

.....

[2 marks]
[2 *markah*]

8 (*d*)(ii) 2

(*e*) Based on your answer in 8(*d*), determine the most suitable cable for hanging the billboard.

Berdasarkan jawapan di 8(d), tentukan kabel yang paling sesuai untuk digunakan bagi menggantung papan iklan.

.....

[1 mark]
[1 *markah*]

8 (*e*) 1

Total A8 12

Section B
Bahagian B

[20 marks]
[20 *markah*]

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

9 Diagrams 9.1 and 9.2 show a light ray travelling through two gemstones with different critical angle, *c*.

Rajah 9.1 dan 9.2 menunjukkan sinar cahaya melalui 2 batu permata yang berlainan sudut genting, c.

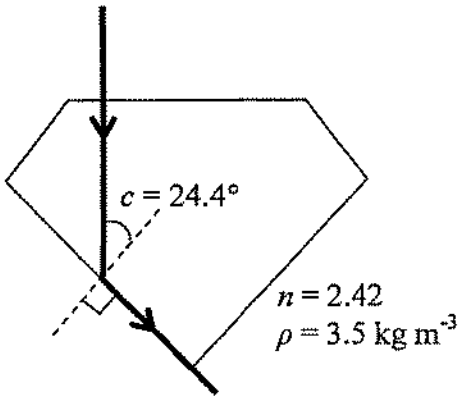


Diagram 9.1
Rajah 9.1

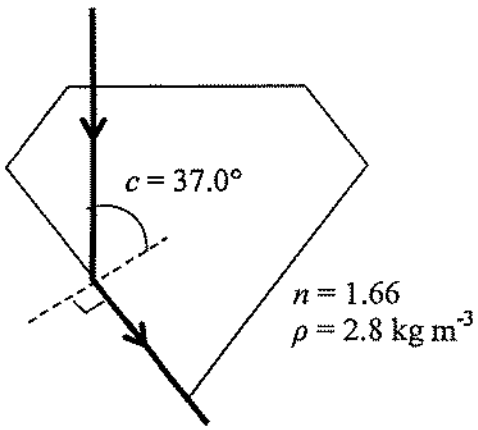


Diagram 9.2
Rajah 9.2

(*a*) What is the meaning of critical angle?
Apakah maksud sudut genting?

[1 mark]
[1 *markah*]

(*b*) Based on Diagrams 9.1 and 9.2, compare the critical angle, *c*, density, *ρ* and refractive index, *n*.

Berdasarkan kepada Rajah 9.1 dan 9.2, bandingkan sudut genting, c, ketumpatan, ρ dan indeks biasan, n.

[3 marks]
[3 *markah*]

(*c*) State the relationship between refractive index and
Nyatakan hubungan antara indeks biasan dan

(i) Density
Ketumpatan

(ii) Critical angle
Sudut genting

[2 markah]
[2 *markah*]

(*d*) Diagram 9.3 shows a submarine which uses a glass prism periscope to see objects above the water surface.

Rajah 9.3 menunjukkan sebuah kapal selam yang menggunakan periskop prisma kaca untuk melihat objek di atas permukaan air.

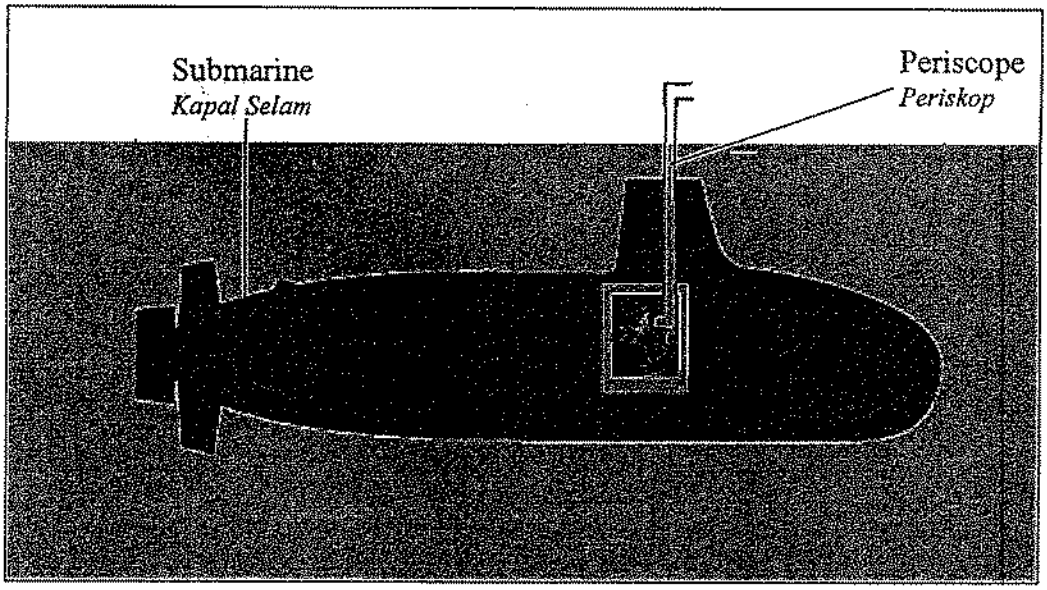


Diagram 9.3
Rajah 9.3

With the help of a diagram, explain how the observer in Diagram 9.3 can see objects above the water surface.

Dengan bantuan gambarajah, terangkan bagaimana pemerhati dalam Rajah 9.3 boleh melihat objek yang berada di atas permukaan air.

[4 marks]
[4 *markah*]

(e) Diagram 9.4 shows an optical fibre in an endoscope which is used in medicine.

Rajah 9.4menunjukkan gentian optik dalam sebuah endoskop yang digunakan dalam bidang perubatan.

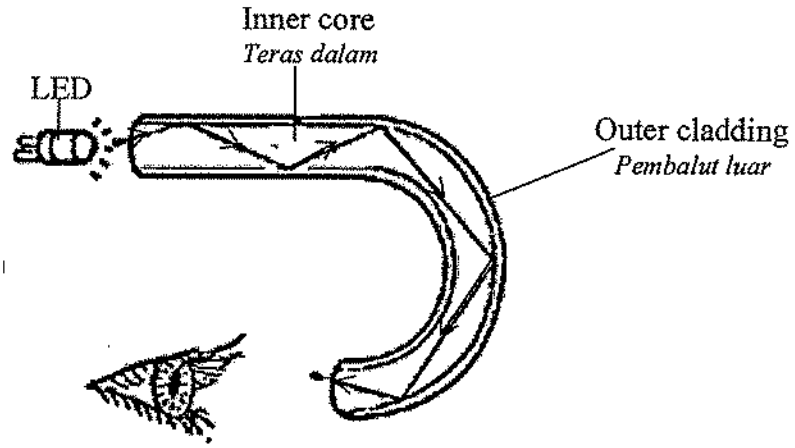


Diagram 9.4
Rajah 9.4

You are required to give some suggestions in designing a more efficient endoscope.
Explain your suggestions based on the following aspects:

Anda dikehendaki memberikan beberapa cadangan untuk mereka bentuk endoskop yang lebih cekap.
Terangkan cadangan anda berdasarkan aspek-aspek berikut:

(i) Comparison between the refractive index of the inner core and the outer cladding.

Perbandingan antara indeks biasan teras dalam dan pembalut luar

(ii) Purity of the inner core

Ketulenan teras dalam.

(iii) Thickness

Ketebalan

(iv) Strength

Kekuatan

(v) Density

Ketumpatan

[10 marks]
[10 *markah*]

10 Diagram 10.1(a) shows a non-rechargeable dry cell.
Diagram 10.1(b) shows a rechargeable dry cell.

Rajah 10.1(a) menunjukkan sel kering boleh dicas semula.
Rajah 10.1(b) menunjukkan sel kering tidak boleh dicas semula.

Diagram 10 (a)
Rajah 10 (a)

Diagram 10 (b)
Rajah 10 (b)

Table 10 shows the characteristics of the rechargeable and non-chargeable dry cells.

Jadual 10 menunjukkan ciri-ciri sel kering yang boleh dicas semula dan sel kering yang tidak boleh dicas semula.

Characteristics *Ciri-ciri*	Rechargeable dry cell *Sel kering boleh dicas semula*	Dry cell *Sel kering tidak boleh dicas semula*
Electromotive force *Daya gerak elektrik*	1.5 V	1.5 V
Current *Arus*	0.6 A	0.4 A
Internal resistance *Rintangan dalam*	0.50 Ω	1.75 Ω

Table 10
Jadual 10

(*a*) What is the meaning of electromotive force?
Apakah yang dimaksudkan dengan daya gerak elektrik?

[1 mark]
[1 *markah*]

(*b*) Using Table 10, compare the
Menggunakan Jadual 10, bandingkan

(i) electromotive force between the rechargeable and non-rechargeable dry cells.

daya gerak elektrik antara sel kering boleh dicas semula dan sel kering tidak boleh dicas semula.

(ii) current between the rechargeable and non-rechargeable dry cells.
arus antara sel kering boleh dicas semula dan sel kering tidak boleh dicas semula.

(iii) internal resistance between the rechargeable and non-rechargeable dry cells.
rintangan dalam antara sel kering boleh dicas semula dan sel kering tidak boleh dicas semula.

(c) (i) Relate internal resistance and current.
Hubungkaitkan rintangan dalam dan arus

(ii) Deduce the relationship between internal resistance and voltage drop.
Rumuskan hubungan antara rintangan dalam dan kejatuhan voltan.

[5 marks]
[5 *markah*]

(d) Explain why batteries connected in parallel and in series will affect the effectiveness of the electromotive force of the batteries differently.

Terangkan mengapa bateri yang disambungkan secara selari dan sesiri memberi kesan berbeza pada kecekapan daya gerak elektrik bateri.

[4 marks]
[4 *markah*]

(e) Diagram 10.3 shows a hand dryer.
This hand dryer needs to be switched on to use it. It also takes a long time to dry hands.

Rajah 10.3 *menunjukkan sebuah pengering tangan.*
Pengering tangan perlu dihidupkan suis untuk menggunakannya. Ia juga mengambil masa yang lama untuk mengeringkan tangan.

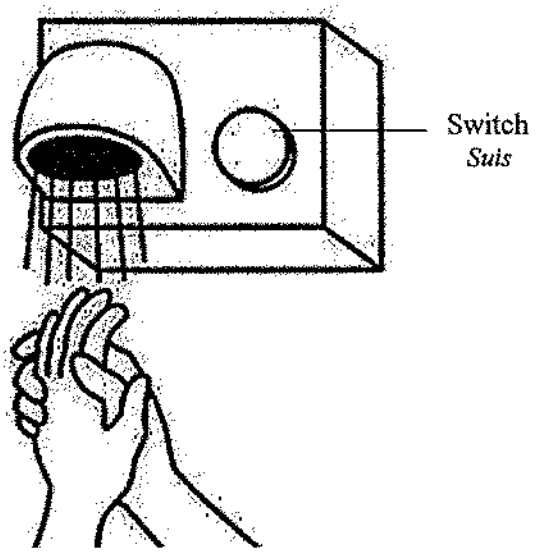


Diagram 10.3
Rajah 10.3

You are required to give some suggestions to design a hand dryer which is more efficient.

Using the knowledge on electricity and electronics, explain your suggestions based on the following aspects:

Anda dikehendaki memberi beberapa cadangan untuk merekabentuk sebuah pengering tangan yang lebih cekap.

Menggunakan pengetahuan tentang elektrik dan elektronik, terangkan cadangan anda berdasarkan aspek-aspek berikut:

(i) The power of the fan
Kuasa kipas

(ii) The diameter of the heating element
Diameter unsur pemanas

(iii) Material for the heating element
Bahan unsur pemanas

(iv) Safety features
Ciri keselamatan

(v) Device to replace the switch
Alat bagi menggantikan suis

[10 marks]
[10 *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 shows a boy looking at a lorry moving in front of him.
Rajah 11.1 menunjukkan seorang budak lelaki melihat sebuah lori bergerak dihadapannya.

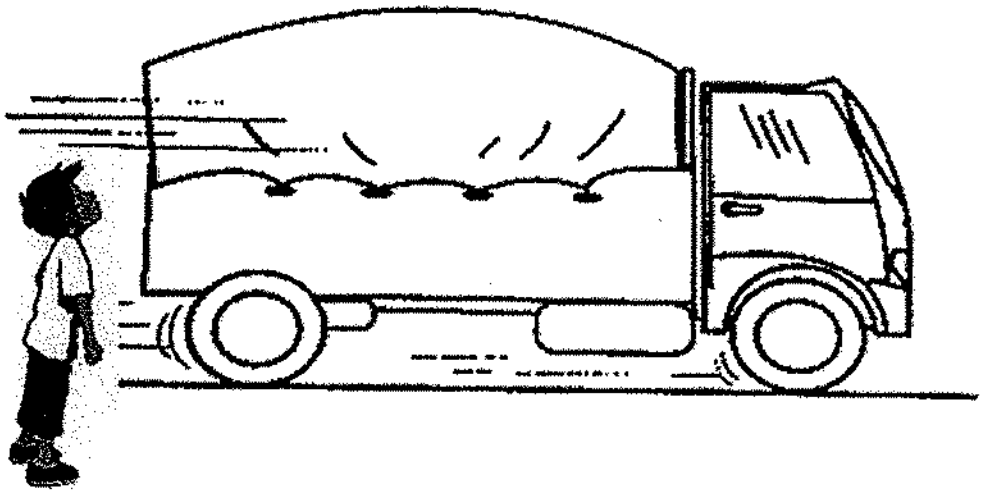


Diagram 11.1
Rajah 11.1

(*a*) (i) What is the meaning of pressure?
Apakah yang dimaksudkan dengan tekanan?

[1 mark]
[1 *markah*]

(ii) When the speeding lorry moves in front of the boy, he feels he is pulled towards the lorry.

By using appropriate physics concept(s), explain the above situation.

Apabila lori yang sedang memecut melintas di hadapan budak itu, dia berasa tertarik ke arah lori.

Dengan menggunakan konsep fizik yang sesuai, terangkan situasi di atas.

[4 marks]
[4 *markah*]

(*b*) Diagram 11.2 shows the curved movement of a ball after being kicked from a corner.

Rajah 11.2 menunjukkan pergerakan melengkung sebiji bola selepas ditendang dari satu sudut.

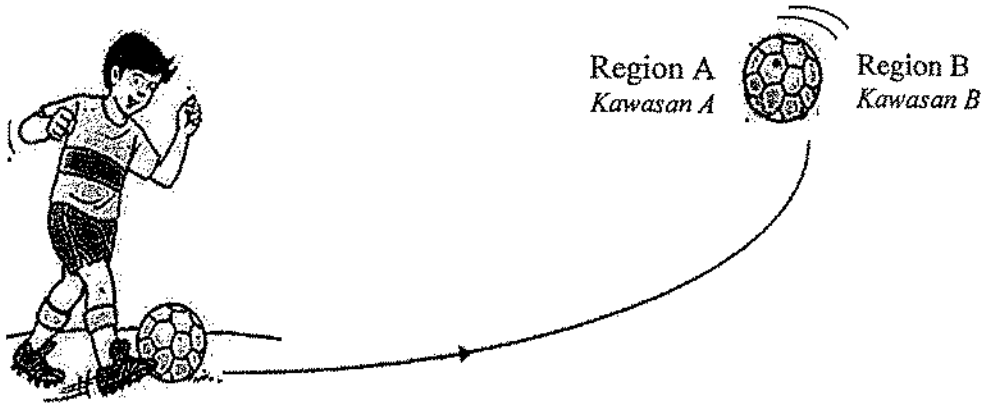


Diagram 11.2
Rajah 11.2

Based on Diagram 11.2,
Berdasarkan Rajah 11.2,

(i) Which region experienced low pressure?
Kawasan manakah yang mengalami tekanan rendah?

[1 mark]
[1 *markah*]

(ii) Explain how the curving effect is produced.
Terangkan bagaimanakah kesan melengkung terjadi.

[2 marks]
[2 *markah*]

(iii) Explain why the curving effect is reduced when a football match takes place during heavy rain.

Terangkan mengapakah kesan lengkungan berkurang apabila perlawanan berlangsung ketika hujan.

[2 marks]
[2 *markah*]

(*c*) Table 11.1 shows the characteristics of four different track helmets used for a track cycling competition in a velodrome.

You are required to determine the most suitable helmet.

Jadual 11.1 menunjukkan ciri-ciri bagi empat topi keledar trek berlainan yang digunakan dalam pertandingan trek berbasikal di dalam velodrom.

Anda dikehendaki menentukan topi keledar trek yang paling sesuai.

Study the specifications of all the four helmets based on the following aspects:
Kaji spesifikasi keempat-empat topi keledar trek berdasarkan aspek aspek berikut:

(i) Front end of helmet
Bahagian hadapan helmet

(ii) Material for inner shell
Bahan untuk bahagian dalam

(iii) Width of strap
Kelebaran tali

(iv) Presence of air hole
Kehadiran lubang udara

Explain the suitability of each characteristic of the track helmets and determine the most suitable track helmet to be used for the indoor cycling competition.

Give reasons for your choice.

Terangkan kesesuian setiap ciri topi keledar trek dan tentukan topi keledar trek yang paling sesuai untuk digunakan dalam pertandingan di dalam dewan.

Beri sebab-sebab bagi pilihan anda.

[10 marks]
[10 *markah*]

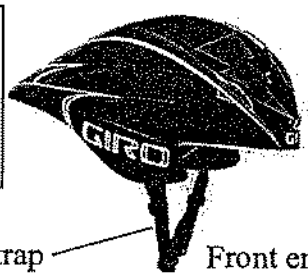
Helmet *Topi Keledar*	Characteristics of Track Helmet *Ciri-ciri Topi Keledar Trek*
K	Material for interior shell: Rubber *Bahan bahagian dalam: Getah*  Air hole: Absent *Lubang udara: Tiada* Narrow strap *Tali halus* Front end: Short & round *Bahagian hadapan: Pendek & bulat*
L	Material for interior shell: Rubber *Bahan bahagian dalam: Getah*  Air hole: Present *Lubang udara: Ada* Narrow strap *Tali halus* Front end: Long & pointed *Bahagian hadapan: Panjang & tirus*
M	Material for interior shell: Polystyrene *Bahan untuk bahagian dalam: Polisterina*  Air hole: Absent *Lubang udara: Tiada* Wide strap *Tali lebar* Front end: Long & pointed *Bahagian hadapan: Panjang & tirus*
N	Material for interior shell: Polystyrene *Bahan untuk bahagian dalam: Polisterin*  Air hole: Present *Lubang udara: Ada* Wide strap *Tali lebar* Front end: Short & round *Bahagian hadapan: Bulat*

Table 11.1
Jadual 11.1

12 Figure 12.1(a) shows an n-type semiconductor produced by a doping process.
Rajah 12.1(a) menunjukkan semikonduktor jenis n yang dihasilkan melalui proses pendopan.

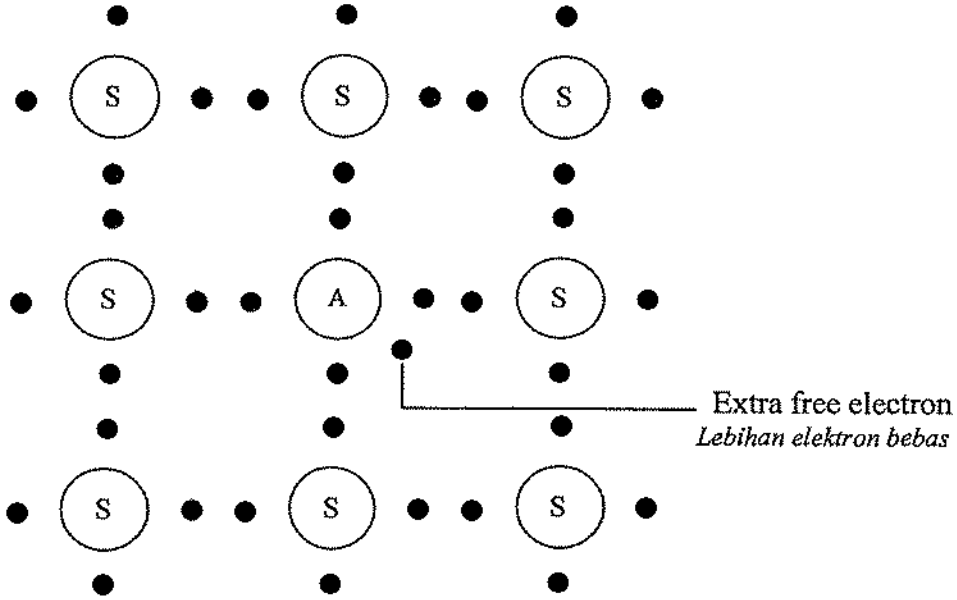


Diagram 12.1
Rajah 12.1

(*a*) (i) What is the meaning of doping?
Apakah yang dimaksudkan dengan pendopan?

[1 mark]
[1 *markah*]

(ii) With the help of a diagram(s), explain how a semiconductor diode functions.
Dengan bantuan gambarajah, terangkan bagaimana diod semikonduktor berfungsi.

[4 marks]
[4 *markah*]

(iii) Draw a circuit to produce a half-wave rectifier and show the waveforms for the input voltage and the output voltage.

Lukiskan litar yang digunakan untuk menghasilkan rektifikasiseparuh gelombang dan tunjukkan bentuk gelombang bagi voltan input dan voltan output.

[3 marks]
[3 *markah*]

(iv) Explain how a capacitor connected in a rectifier circuit smoothens the current output.

Terangkan bagaimana satu kapasitor yang disambungkan dalam litar rektifikasi melicinkan arus output.

[2 marks]
[2 *markah*]

(*b*) Diagram 12.2 shows the characteristics of four transistor circuits, P, Q, R and S proposed for switching on lights automatically when it is dark. The lights switch on when the base voltage is at least 5V.

You are required to determine the most suitable circuit.

Jadual 12.2 menunjukkan ciri-ciri bagi empat litar transistor, P, Q, R dan S yang dicadangkan untuk menutup suis secara automatik apabila gelap.Lampu aakan menyala apabila voltan tapak sekurang-kurangnya 5 V.

Anda dikehendaki menentukan litar yang paling sesuai.

Study the specifications of all the four circuits based on the following aspects:
Kajt spesifikasi keempat-empat litar berdasarkan aspek aspek berikut:

(i) The type of connection of the transistor at B-E
Jenis sambungan transistor di B-E

(ii) The electric component connecting the two circuits
Alat penyambung kedua-dua litar

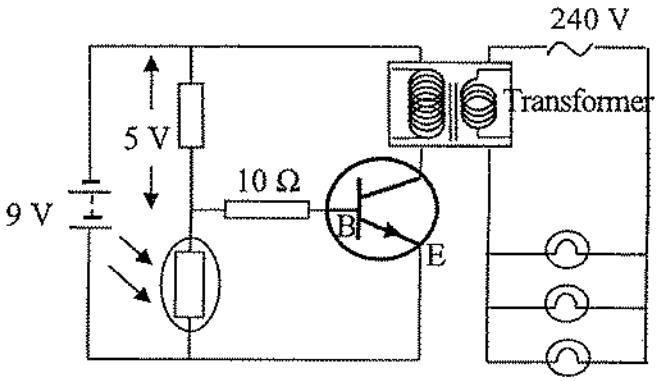
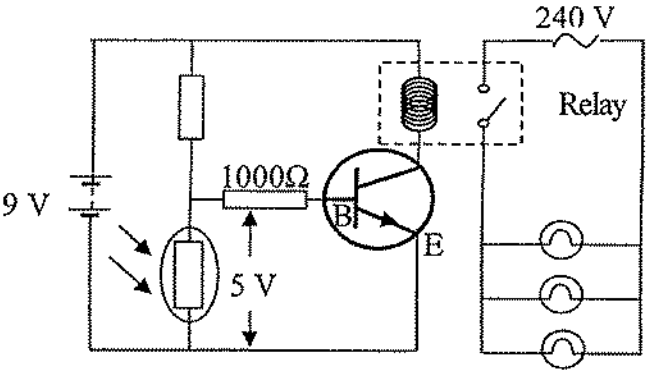
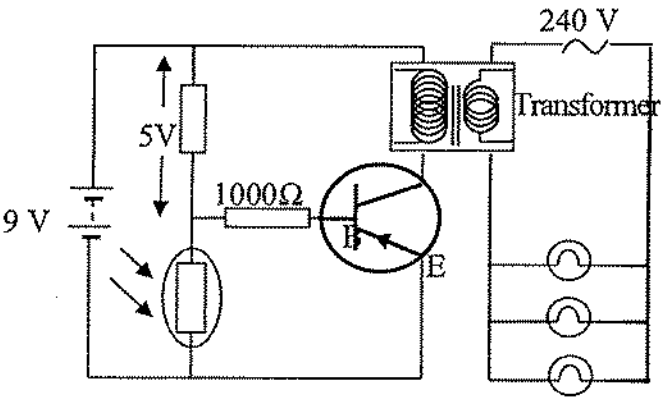
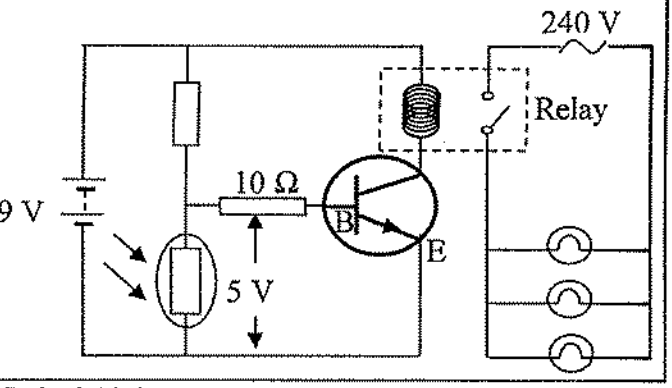
(iii) The magnitude of the base voltage of the transistor
Magnitud voltan tapak transistor

(iv) Resistance of thebase resistor
Rintangan bagi perintang tapak

Explain the suitability of each aspect and then determine the most suitable circuit.
Give reasons for your choice.

Terangkan kesesuian setiap aspek dan tentukan litar yang paling sesuai.
Berikan sebab untuk pilihan anda.

[10 marks]
[10 *markah*]

Type *Jenis*	Connection of Base-Emitter *Sambungan Tapak-Pengeluar*	Diagram *Rajah*
P	Reverse bias *Pincang songsang*	
Q	Forward bias *Pincang hadapan*	
R	Reverse bias *Pincang songsang*	
S	Forward bias *Pincang hadapan*	

Jadual 12.2
Jadual 12.2

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

PHYSICS 4531/3 SPM

4531/3
Physics
Paper 3
Sept 2013
1 ½ hours

NAME:.....

INDEX NO. : ..... CLASS: .....

MAKTAB RENDAH SAINS MARA

SIJIL PELAJARAN MALAYSIA
TRIAL EXAMINATION 2013

PHYSICS

Paper 3

One hour and thirty minutes

DO NOT OPEN THIS QUESTION BOOKLET UNTIL TOLD TO DO SO

1. Write down your name, college no. and your class in the space provided.
   Tulis nama, no. maktab dan kelas anda pada ruang yang disediakan.

2. The questions are written in English and *bahasa Melayu.*
   Kertas soalan ini adalah dalam dwibahasa.

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

For Examiner's Use			
Section	Question	Marks	Score
A	1	16	
	2	12	
B	1	12	
	2	12	
Total			

This booklet consists of printed 19 pages and 1 blank 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 time taken for ice to melt, t and the mass of melted ice, m.

The arrangement of the apparatus is shown in Diagram 1.1.

Seorang murid menjalankan satu eksperimen untuk mengkaji hubungan antara masa untuk ais melebur, t dan jisim ais yang telah melebur, m.

Susunan radas ditunjukkan pada Rajah 1.1.

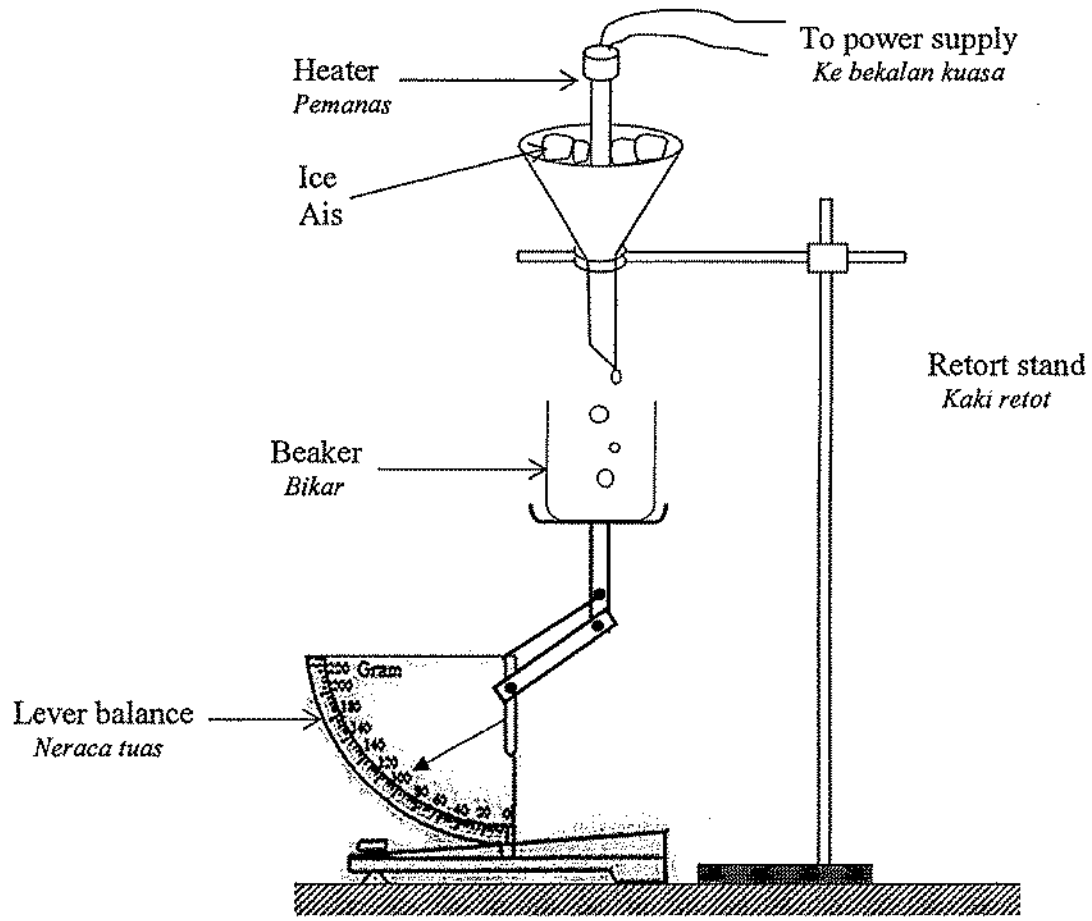


Diagram 1.1
Rajah 1.1

The mass of the empty beaker, m_o is 100 g.

The heater is switched on and the stopwatch started simultaneously. At time, t = 20.0 s, the mass of the melted ice in the beaker, m_i on the lever balance is recorded. Diagram 1.2 shows the reading of the lever balance.

The experiment is continued and the reading of the lever balance is recorded at t = 40.0 s, 60.0 s, 80.0 s and 100.0 s. The corresponding readings of the lever balance are shown in Diagrams 1.3, 1.4, 1.5 and 1.6.

Jisim bikar kosong, m_o adalah 100 g.

Pemanas dan jam randik dihidupkan serentak. Selepas masa, t bersamaan 20.0 s, jisim ais yang telah melebur di dalam bikar, m_i di atas neraca tuas dicatatkan. Rajah 1.2 menunjukkan bacaan pada neraca tuas.

Eksperimen diteruskan dan bacaan pada neraca tuas dicatatkan untuk masa, t = 40.0 s, 60.0 s, 80.0 s dan 100.0 s. Bacaan pada neraca tuas yang berkenaan adalah ditunjukkan pada Rajah 1.3, 1.4, 1.5 dan 1.6.

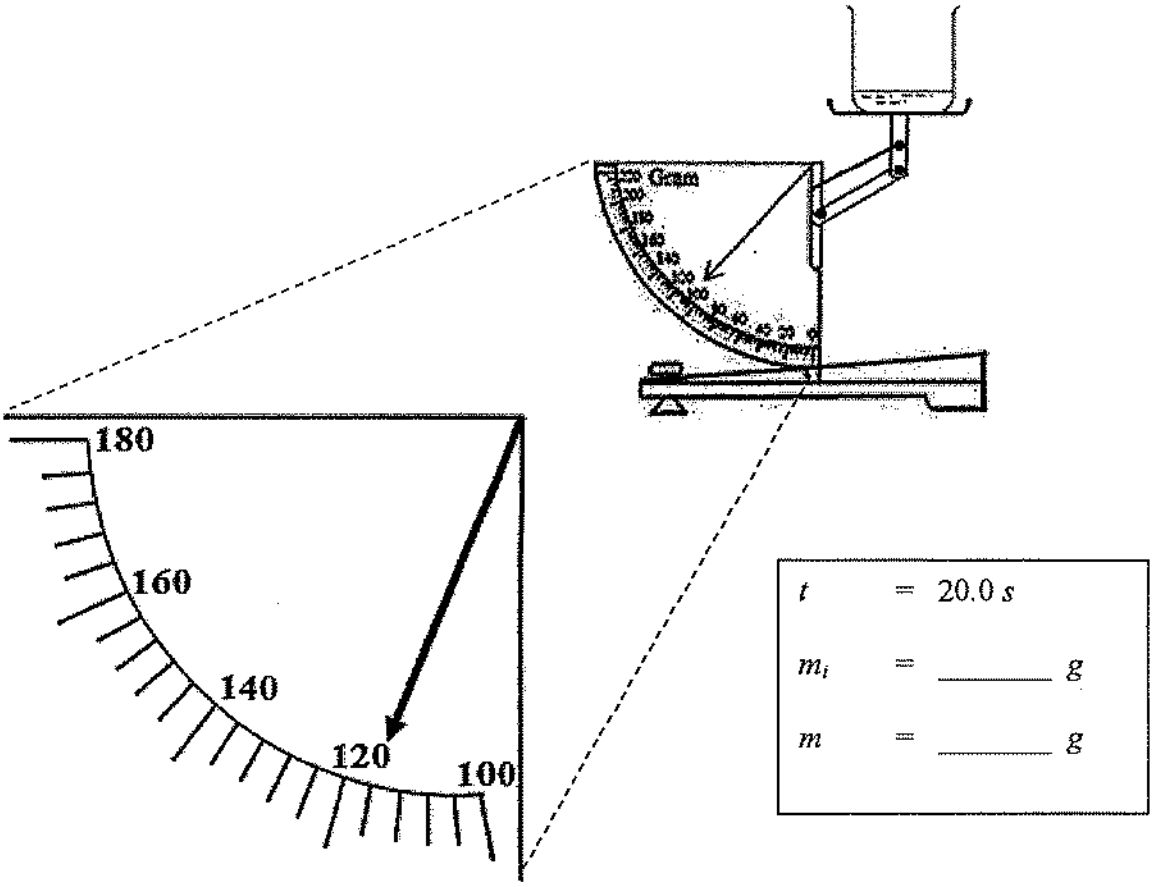


Diagram 1.2
Rajah 1.2

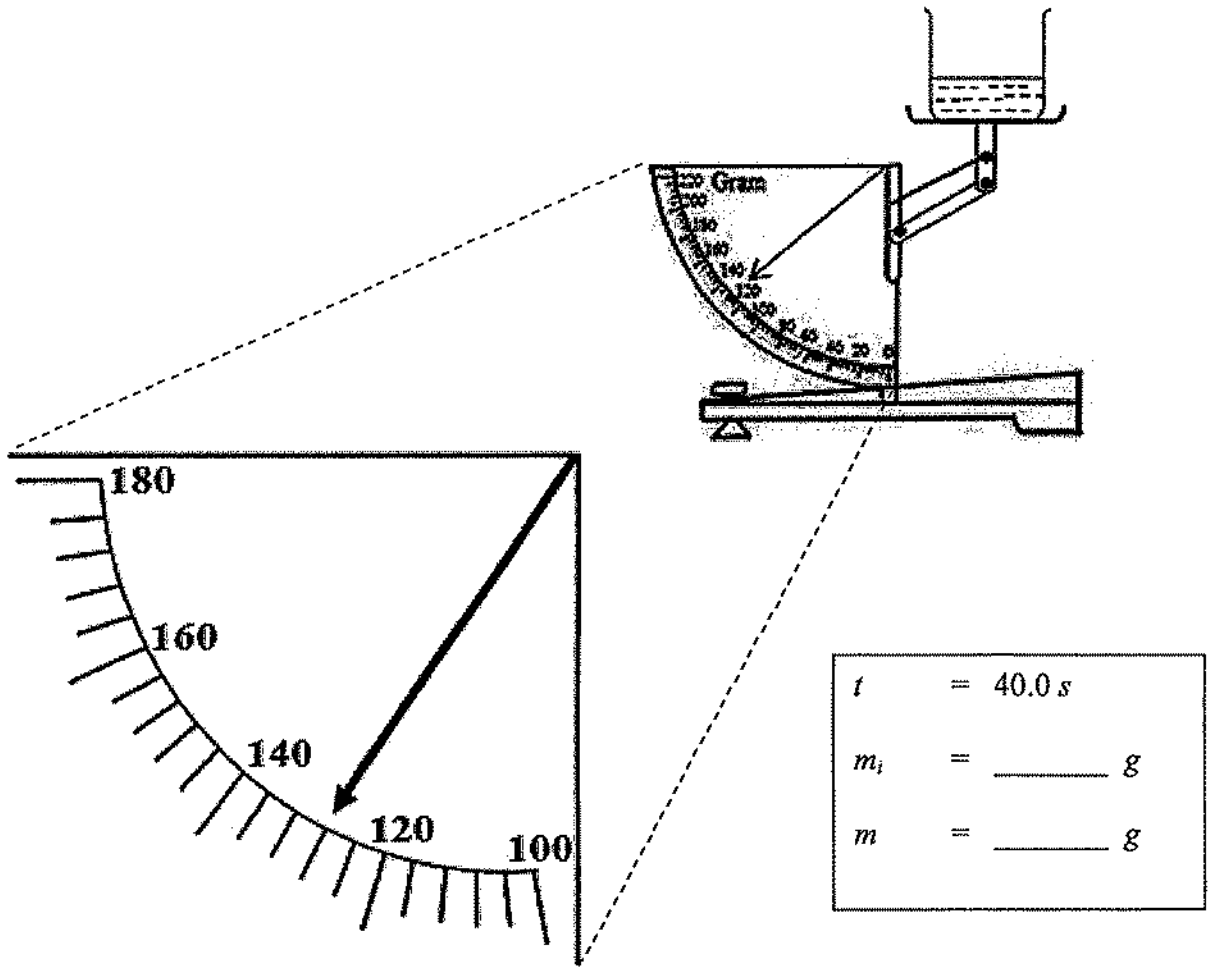


Diagram 1.3
Rajah 1.3

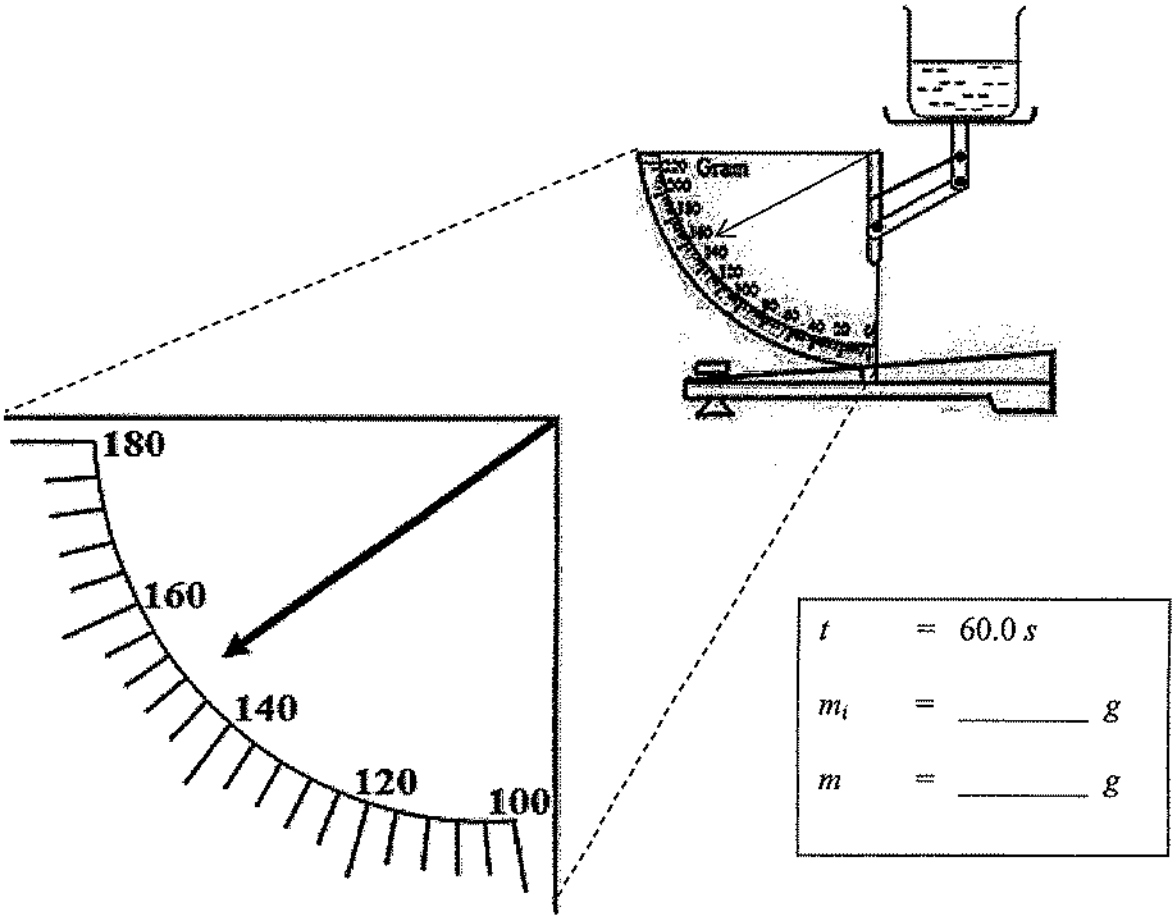


Diagram 1.4
Rajah 1.4

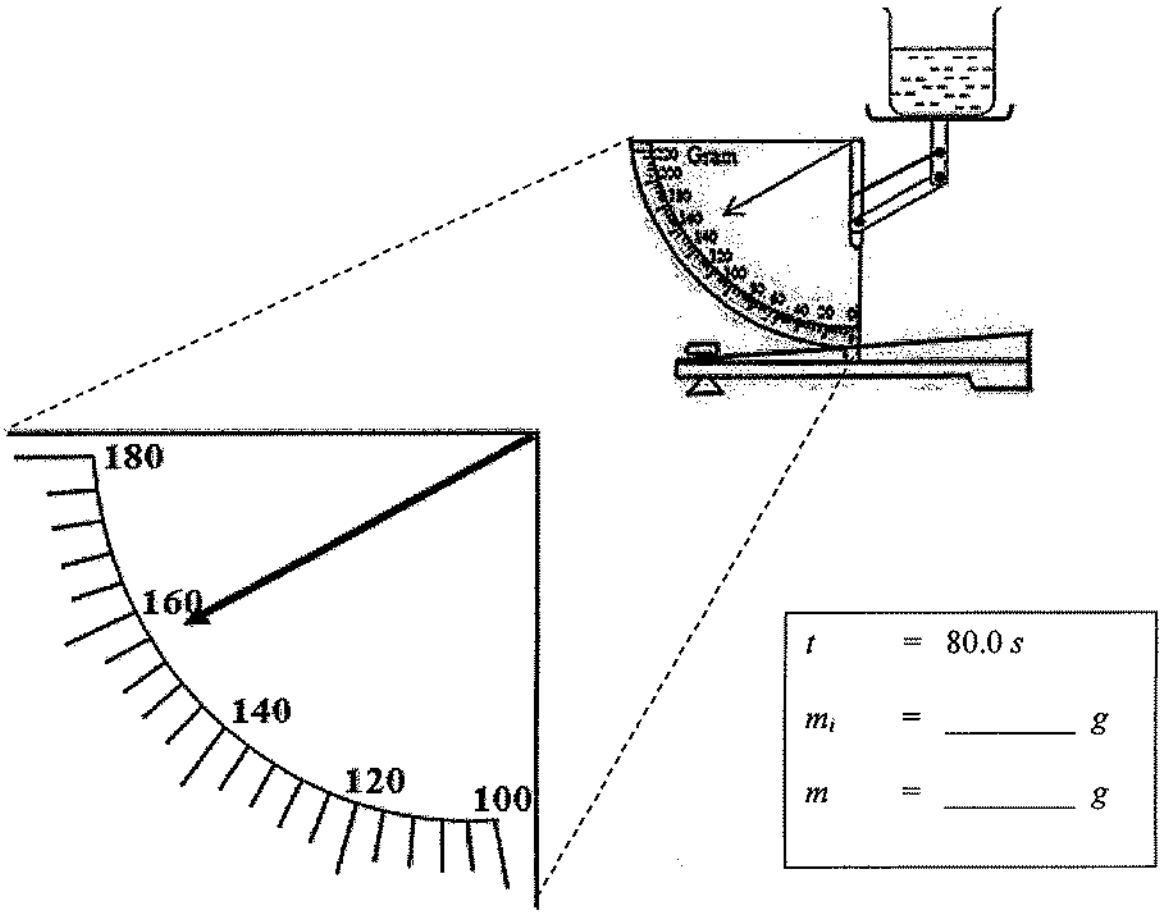


Diagram 1.5
Rajah 1.5

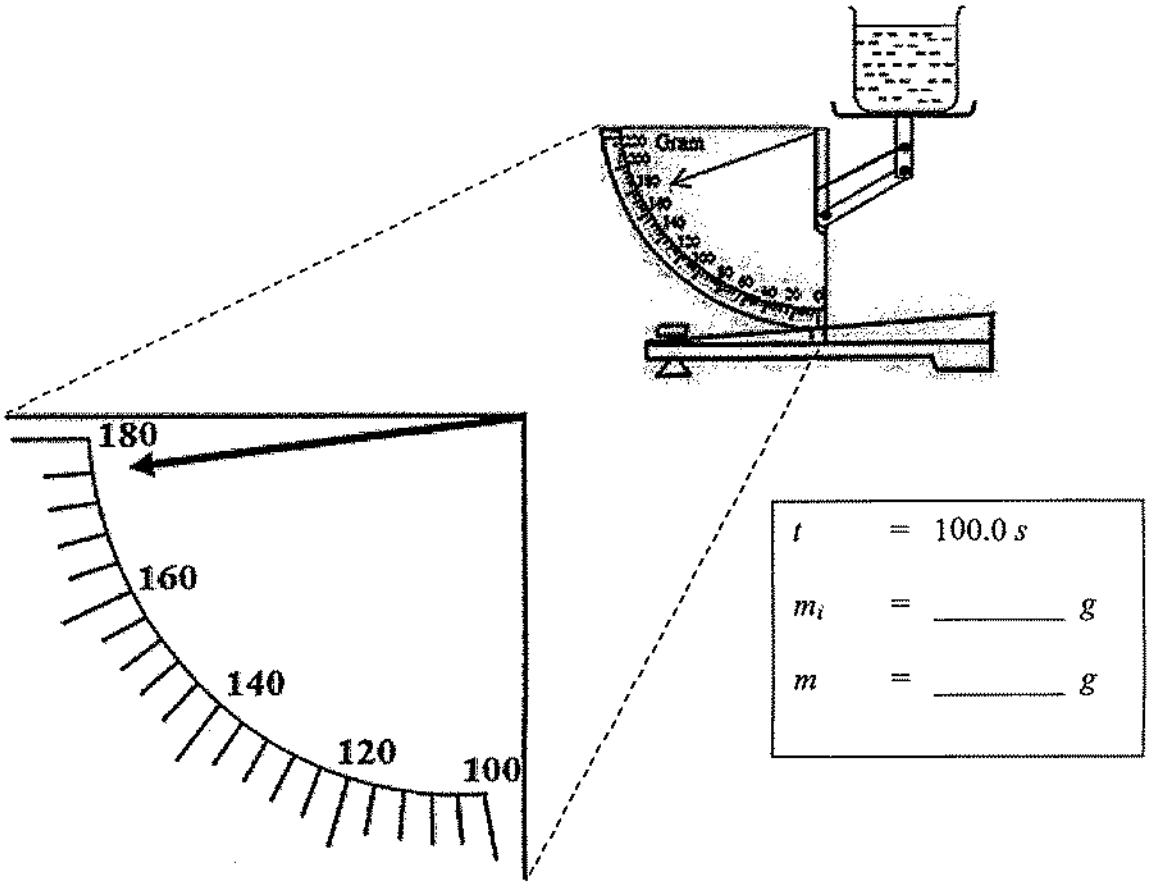


Diagram 1.6
Rajah 1.6

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

(i) The manipulated variable
Pembolehubah dimanipulasikan

.....

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

1(*a*)(i) 1

(ii) The responding variable
Pembolehubah dimalarkan

.....

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

1(*a*)(ii) 1

(iii) The constant variable
Pembolehubah dimalarkan

.....

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

1(*a*)(iii) 1

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

(i) Based on Diagram 1.2, 1.3, 1.4, 1.5 and 1.6 on pages 3, 4, 5, 6 and 7, record the readings of m_l.
Berdasarkan Rajah 1.2, 1.3, 1.4, 1.5 dan 1.6 di halaman 3, 4, 5, 6 dan 7, catatkan bacaan m_l.

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

1(*b*)(i) 2

For Examiner's Use

(ii) Calculate m for each value of m_i in **1**(b)(i) using equation:

$$m = (m_i - m_0)$$

Record the value of m on pages 3, 4, 5, 6 and 7.

Hitungkan nilai m bagi setiap nilai m_i di 1(b)(i) dengan menggunakan persamaan:

$$m = (m_i - m_0)$$

Catatkan nilai m pada halaman 3, 4, 5, 6 dan 7.

1(*b*)(ii) 2

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

(iii) Tabulate your results for t, m_i and m in the space below.
Jadualkan keputusan anda bagi semua nilai t, m_i dan m dalam ruangan di bawah.

1(*b*)(iii) 3

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

1(*c*) 5

(*c*) On the graph paper on page 10, plot a graph of m against t.
Pada sehelai kertas graf di halaman 10, lukiskan graf m melawan t.

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

1(*d*) 1

(*d*) Based on your graph in **1**(*c*), state the relationship between m and t.
Berdasarkan graf anda di 1(c), nyatakan hubungan antara m dan t.

.....

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

Total A1 16

For Examiner's Use

A student carries out an experiment to investigate the relationship between the length of a simple pendulum, ℓ, and the period, T.

In this experiment, a slotted weight is hung on a string that is attached to a retort stand. The slotted weight is pulled to the side slightly and released. The time for 20 complete oscillations is recorded. The results of the experiment are shown in the graph T^2 against ℓ in Diagram 2.1 on page 13.

Seorang murid menjalankan eksperimen bandul ringkas untuk menyiasat hubungan antara panjang bandul, ℓ dengan tempoh, T.

Dalam eksperimen ini, pemberat digantung pada seutas tali yang disambung pada kaki retot. Pemberat ditarik ke tepi dan dilepaskan. Masa untuk 20 ayunan lengkap direkodkan. Keputusan eksperimen tersebut ditunjukkan oleh graf T^2 melawan ℓ pada Rajah 2.1 di halaman 13.

(*a*) Based on the graph in Diagram 2.1:
Berdasarkan graf pada Rajah 2.1:

(i) State the relationship between T^2 and ℓ.
Nyatakan hubungan antara T^2 dengan ℓ.

2(*a*)(i) [1]

.....

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

(ii) Determine the value of T when $\ell = 0.35$ m.
Show on the graph, how you determine the value of T.

Tentukan nilai T apabila $\ell = 0.35$ m.
Tunjukkan pada graf bagaimana anda menentukan nilai T.

2(*a*)(ii) [3]

T = ...

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

(*b*) Calculate the gradient, *m*, of the graph T^2 against ℓ.
Show on the graph how you determine the value of *m*.

Hitung kecerunan, m, bagi graf T^2 *melawan* ℓ.
Tunjukkan pada graf itu bagaimana anda menentukan nilai m.

m = ...

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

2(*b*) 3

Graph of T^2 against ℓ
Graf T^2 melawan ℓ

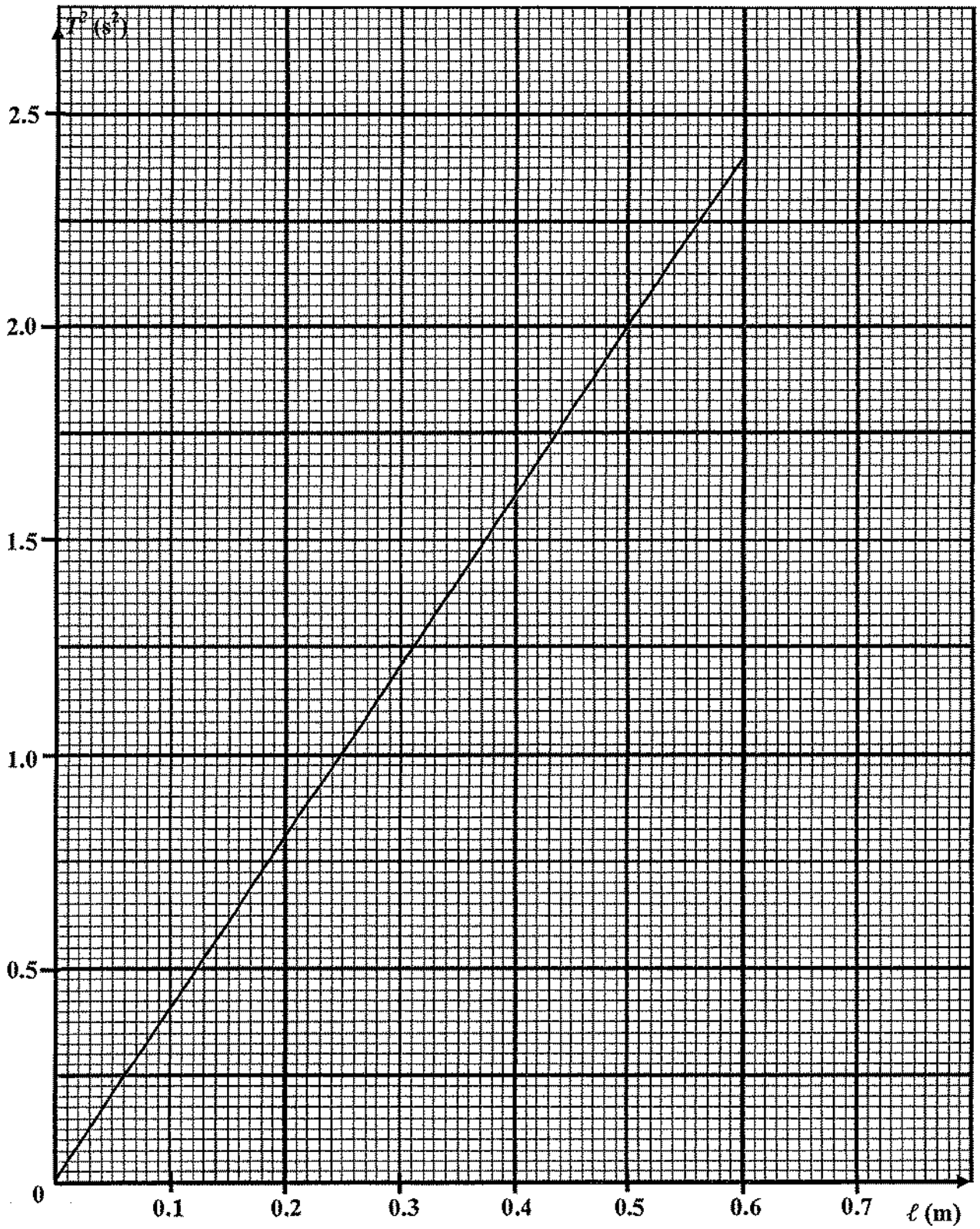


Diagram 2.1
Rajah 2.1

(*c*) The gravitational acceleration, g, is calculated using the equation:

$$g = \frac{39.49}{m}$$

Use your graph to determine the gravitational acceleration.

Pecutan graviti, g, *dikira menggunakan persamaan:*

$$g = \frac{39.49}{m}$$

Gunakan graf anda untuk menentukan pecutan graviti.

g = ... m s^{-2}

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

2(*c*) 2

(*d*) (i) Predict what happens to the gradient of the graph, *m* if the experiment is carried out on the moon.
Ramalkan apakah yang berlaku kepada kecerunan graf, m sekiranya eksperimen ini dijalankan di bulan.

.....

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

2(*d*)(i) 1

(ii) Give **one** reason for the answer in 2 (*d*)(i)
*Berikan **satu** sebab bagi jawapan di 2(d)(i)*

.....

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

2(*d*)(ii) 1

(*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*]
[1 *markah*]

2(*e*) 1

Total A2 12

Section B
Bahagian B

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

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

3 Diagram 3.1 and Diagram 3.2 show the path of a light ray from a fish to an observer's eye. It is observed that the bending of light is different when the position of the observer changes.

Rajah 3.1 dan Rajah 3.2 menunjukkan rajah sinar dari ikan ke mata pemerhati. Didapati pembengkokan cahaya adalah berbeza apabila kedudukan mata pemerhati berubah.

Observer's eye at position A
Mata pemerhati pada kedudukan A

Observer's eye at position B
Mata pemerhati pada kedudukan B

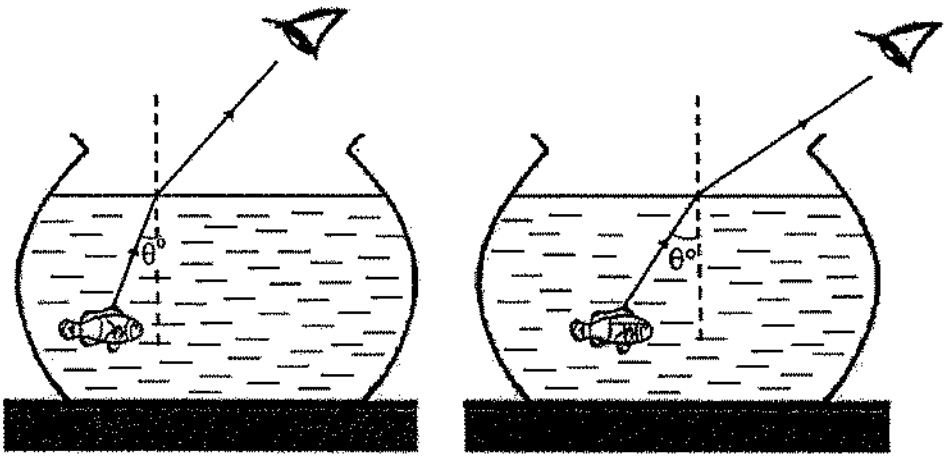


Diagram 3.1
Rajah 3.1

Diagram 3.2
Rajah 3.2

Observe the magnitude of the angle, θ in both diagrams.
Perhatikan nilai sudut, θ pada kedua-dua rajah.

Based on the information and observation ;
Berdasarkan maklumat dan pemerhatian tersebut;

(*a*) State **one** suitable inference,
Nyatakan ***satu*** *inferens yang sesuai.*

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

(*b*) State **one** suitable hypothesis
Nyatakan ***satu*** *hipotesis yang sesuai*

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

(*c*) With the use of apparatus such as a glass block, a ray box and other apparatus, describe an experiment to investigate the hypothesis stated in 3 (b).
Dengan menggunakan radas seperti blok kaca, kotak sinar dan radas lain, terangkan satueksperimen untuk menyiasat hipotesis yang dinyatakan di 3(b).

In your description, state clearly the following :
Dalam penerangan anda nyatakan dengan jelas perkara berikut:

(i) The aim of the experiment
Tujuan eksperimen

(ii) The variable in the experiment
Pembolehubah dalam eksperimen

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

(iv) The arrangement of the apparatus
Susunan radas

(v) The procedure of the experiment, which includes **one** method of controlling the manipulated variable and **one** method of measuring the responding variable
*Prosedur eksperimen yang mesti termasuk **satu** kaedah mengawal pemboleh ubah dimanipulasikan dan **satu** kaedah mengukur pemboleh ubah bergerak balas.*

(vi) The way to tabulate the data
Cara menjadualkan data

(vii) The way to analyse the data
Cara menganalisis data

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

4 Diagrams 4.1 and 4.2 show a moving coil ammeter. The magnitude of current in Diagram 4.1 is lower than in Diagram 4.2.

Rajah 4.1 dan 4.2 menunjukkan ammeter gegelung bergerak. Nilai arus pada Rajah 4.1 adalah lebih rendah berbanding pada Rajah 4.2.

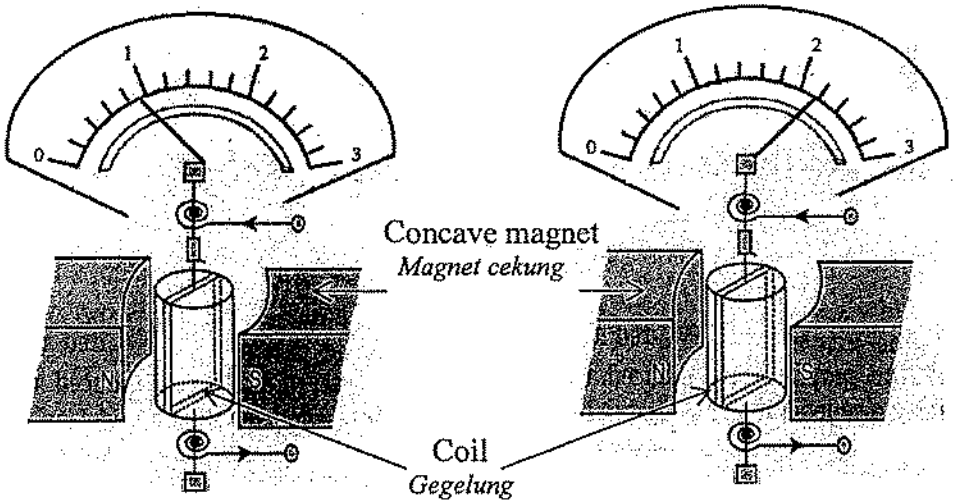


Diagram 4.1
Rajah 4.1

Diagram 4.2
Rajah 4.2

Observe the deflection of the pointer in both diagrams.
Perhatikan pesongan jarum penunjuk pada kedua-dua rajah.

Based on the information and observation ;
Berdasarkan maklumat dan pemerhatian tersebut;

(*a*) State **one** suitable inference,
*Nyatakan **satu** inferens yang sesuai.*

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

(*b*) State **one** suitable hypothesis
*Nyatakan **satu** hipotesis yang sesuai*

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

(c) With the use of apparatus such as a d.c power supply, ammeter, C-shaped steel yoke, bare copper rod and other apparatus, describe an experiment to investigate the hypothesis stated in 4 (b).

Dengan menggunakan radas seperti bekalan a.t, ammeter, dening besi berbentuk-C, dawai kuprum tak berpenebat dan radas lain, terangkan satueksperimen untuk menyiasat hipotesis yang dinyatakan di 4(b).

In your description, state clearly the following :
Dalam penerangan anda nyatakan dengan jelas perkara berikut:

(i) The aim of the experiment
Tujuan eksperimen

(ii) The variable in the experiment
Pembolehubah dalam eksperimen

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

(iv) The arrangement of the apparatus
Susunan radas

(v) The procedure of the experiment, which includes **one** method of controlling the manipulated variable and **one** method of measuring the responding variable
*Prosedur eksperimen yang mesti termasuk **satu** kaedah mengawal pemboleh ubah dimanipulasikan dan **satu** kaedah mengukur pemboleh ubah bergerak balas.*

(vi) The way to tabulate the data
Cara menjadualkan data

(vii) The way to analyse the data
Cara menganalisis data

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

END OF QUESTION PAPER
KERTAS SOALAN TAMAT