Penyelesaian Lengkap

SET **3**

KERTAS 1

1 D

2 C

Kecerunan graf /*gradient of graph* $= \dfrac{5 - 0}{0 - 250} = \dfrac{1}{50}$

$Y = mX + c$

$R = \dfrac{1}{50}T + 5$

Apabila/*when* $T = 100 \text{ °C}$, $R = \dfrac{1}{5} \times 100 + 5$

$\qquad\qquad\qquad\qquad\quad = 7\ \Omega$

3 C

Diameter/*Diameter* $= \dfrac{c}{\pi} = 6.37$ m

4 C

5 A

$v = \sqrt{2gh} = \sqrt{2 \times 9.8 \times 20} = 19.8$ m s⁻¹

Momentum $= mv = 0.5 \times 19.8$

$\qquad\qquad\qquad = 9.9$ kg m s⁻¹

$\qquad\qquad\qquad = 9.9$ kg m s⁻¹

6 C

Untuk 10 s pertama

For the first 10 s

$v = u + at = 20 + 2(10) = 40$ m s⁻¹

$t = 10$ s ke/*to* $t = 30$ s

$v = 40 + (-1)(20) = 20$ m s⁻¹

Atau / *Or*

$\Delta v = \Delta A = 2 \times 10 + (-1)(20) = 0$

Halaju/*velocity* $= 20 + 0 = 20$ m s⁻¹

7 B

8 A

9 A

10 B

Haba dibebaskan = Haba diserap

Heat lost = Heat gain

$mc\Delta\theta = Mc\Delta\theta'$

$0.3(90 - 50) = M(50 - 30)$

$M = 0.6$ kg $= 600$ g

11 D

12 B

$\dfrac{P_1}{T_1} = \dfrac{P_2}{T_2}$

$\dfrac{1.2}{300} = \dfrac{1.5}{T_2}$

$T_2 = 375$ K $= 102$ °C

13 D

$P_1V_1 = P_2V_2$

$1.5 \times P = 50 \times 200$

$\qquad P = 670$ kPa

14 C

15 D

Amplitud gelombang bertambah apabila panjang muka gelombang berkurang.

The amplitude of the wave increases as the length of the wavefront decreases.

16 D

17 A

$n = \dfrac{\sin i}{\sin r} = \dfrac{\sin 50°}{\sin (50° - 15°)} = 1.34$

18 A

$\dfrac{1}{u} + \dfrac{1}{v} = \dfrac{1}{f}$

$\dfrac{1}{u} = \dfrac{1}{10} - \dfrac{1}{-5} = \dfrac{3}{10}$

$u = 3.3$ cm

19 C

20 D

21 C

$F_{\text{ufuk}/horizontal} = F \cos \theta = 6\ 000 \times \cos 30° = 4\ 915$ N

22 B

$F = kx$

Rajah (ii) $\qquad 50 = k(a - 20) \qquad$ (i)

Rajah (iii), $\qquad 150 = k(a - 16) \qquad$ (ii)

(i) ÷ (ii) $\qquad\qquad \dfrac{1}{3} = \dfrac{a - 20}{a - 16}$

$\qquad\qquad a - 16 = 3a - 60$

$\qquad\qquad\qquad a = 22$ cm

23 B

Berat ketara berkurang semasa rod direndam secara linear sehingga *h*. Selepas itu, tiada perubahan pada berat ketara kerana tiada perubahan pada berat air disesarkan.

The apparent weight decreases as the rod is immersed linearly until h. After that, there is no change in apparent weight because there is no change in the weight of the displaced water

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J1

Kertas Model Akses Fizik SPM
PENYELESAIAN LENGKAP

24 C

$$P_P = P_Q$$
$$h_P\rho_P g = h_Q\rho_Q g$$
$$30 \cos 30\rho_P = 30 \times 1\ 200$$
$$\rho_P = 1\ 385\ \text{kg m}^{-3}$$

25 D

78 cm Hg sama dengan tekanan atmosfera + tekanan disebabkan atmosfera

Maka tekanan oleh 2 cm Hg sama dengan tekanan oleh 20 cm cecair

78 cm Hg is equal to atmospheric pressure + atmospheric pressure

So the pressure by 2 cm of Hg is equal to the pressure by 20 cm of liquid

$$h\rho g = h_P\rho_P g$$
$$2 \times 13\ 600 = 20 \times \rho_P$$
$$\rho_P = 1\ 360\ \text{kg m}^{-3}$$

26 A

27 D

Untuk graf *V-I*, kecerunan sama dengan rintangan

For V-I graph, the gradient gives the resistance.

$$\text{Nisbah rintangan/}\textit{Resistance ratio} = \frac{\tan 60°}{\tan 30°} = \frac{\sqrt{3}}{\frac{1}{\sqrt{3}}} = 3$$

28 B

Apabila suis dihidupkan, dua perintang adalah dalam susunan selari, dan rintangan berkesan 3Ω.

When the switch is on, the two resistors are im parallel and has a effective resistance of 3Ω.

$$I = \frac{E}{R + r} = \frac{12}{3 + 1} = 3\ \text{A}$$

Bacaan ammeter/*Ammeter reading* $= \dfrac{3}{2} = 1.5\ \text{A}$

29 C

30 C

31 A

32 B

$$P_i = P_o$$
$$V_i I_i = 48$$
$$240I = 48$$
$$I = 0.2A$$

33 B

34 A

35 A

$$eV = \frac{1}{2}mv^2$$
$$1.25eV = \frac{1}{2}mv_1^2$$
$$v_1^2 = 1.25v^2$$
$$v_1 = 1.12v$$
$$\%\Delta = 11.8\%$$

36 D

15 hari/*days* $= 3T_{\frac{1}{2}}$

10 g → 20 g → 40 g → 80 g

37 D

$$\left(\frac{1}{2}\right)^n = \frac{1}{256} = \left(\frac{1}{2}\right)^5$$
$$n = 8$$

38 D

39 B

40 B
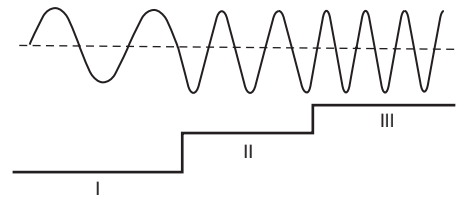
$$P = \frac{nhc}{\lambda}$$
$$12 = \frac{n \times 6.63 \times 10^{-34} \times 3 \times 10^8}{6.5 \times 10^{-7}}$$
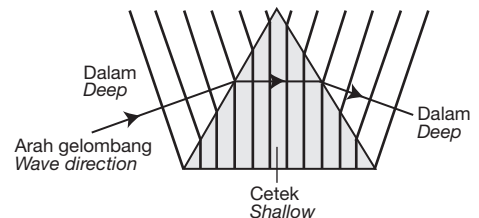$$n = 3.9 \times 10^{19}\ \text{s}^{-1}$$

KERTAS 2

Bahagian A
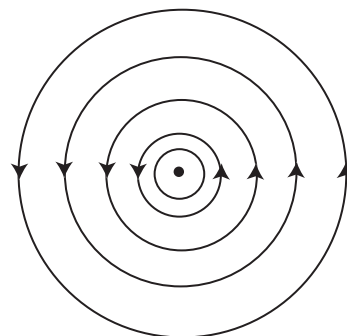
1 (a) (i)

(ii) Frekuensi
Frequency

(b)

2 (a)

(b) Jarum penunjuk galvanometer terpesong seketika. Arus aruhan terhasil disebabkan oleh pemotongan garisan magnet.
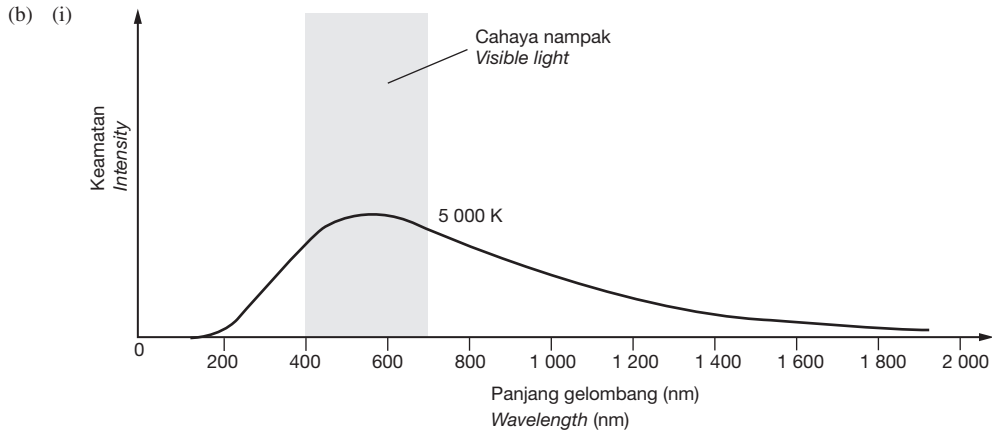*The galvanometer indicator deflects momentarily. Induced current produced due to cutting of magnetic field lines.*
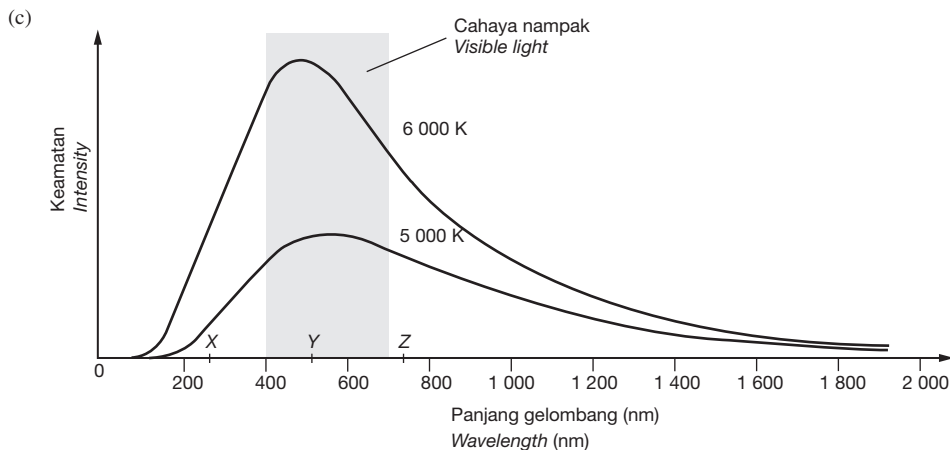
3 (a) $_1^2H + _1^2H \rightarrow _2^3He + _0^1n$ + tenaga/*energy*

 (b) (i) Cacat jisim/*mass defect*
 = (2.015 + 2.015) – 93.017 + 1.009)
 = 0.004u = 0.004 × 1.66 × 10⁻²⁷ kg
 = 6.64 × 10⁻³⁰ kg
 (ii) Tenaga/*Energy* = mc^2
 = 6.64 × 10⁻³⁰ × (3 × 10⁸)²
 = 6.0 × 10⁻¹³ J

4 (a) Jasad unggul yang berupaya menyerap semua sinaran electromagnet yang jatuh padanya.
 A perfect body capable of absorbing all the electromagnetic radiation that falls on it.

 (b) (i)

 (ii) *X* – Ultraungu/*Ultraviolet*
 Y – Cahaya nampak/*Visible light*
 Z – Inframerah/*Infrared*

 (c)

 (d) Panjang gelombang berkeamatan maksimum semakin berkurang
 The wavelength of maximum intensity is decreasing
 Jumlah kuasa terpancar meningkat.
 The amount of radiated power increases.

 (e) Kelihatan menjadi kebiruan.
 Looks bluish

5 (a) (i) Panjang turus udara terperangkap dalam Rajah 5.2 adalah lebih pendek.
 The length of the trapped air column in Diagram 5.2 is shorter.

 (ii) Tekanan ke atas udara yang terperangkap dalam Rajah 5.2 adalah lebih besar.
 The pressure on the trapped air in Diagram 5.2 is greater.
 (iii) Tekanan udara yang terperangkap bertambah apabila isi padu udara berkurangan.
 The pressure of the trapped air increases as the volume of the air decreases.

 (b) Apabila isi padu kecil, ketumpatan udara yang terperangkap lebih besar. Kadar perlanggaran oleh molekul udara meningkat dan seterusnya meningkatkan daya dan tekanan.
 When the volume is small, the density of trapped air is greater. The rate of collisions by the air molecules increases and thereby increases the force and the pressure.

(c) (i) $P_1 = 76$ cm Hg + (11 – 6) cm Hg = 81 cm Hg
(ii) $P_2 = 76$ cm Hg + (y – 8) cm Hg = (68 + y) cm Hg
$V_1 = (15 – 6)$ cm = 9 cm
$V_2 = (15 – 8)$ cm = 7 cm
$p_1V_1 = p_2V_2$
$81 \times 9 = (68 + y)7$
$y = 36$ cm

6 (a) Perubahan arah perambatan atau pengbengkokan cahaya semasa cahaya merambat dari suatu medium ke suatu medium yang lain.
The change in direction or bending of light as it travels from one medium to another.

(b) (i) Indeks biasan kaca lebih tinggi daripada indeks biasan air.
Refractive index of glass is more than refractive index of water.
(ii) Sudut biasan untuk kaca adalah lebih kecil.
Angle of refraction in glass is smaller.

(c) Semakin tinggi indeks biasan, semakin kecil sudut biasan.
The greater the indeks biasan, the smaller the angle of refraction

(d) Lebih tinggi, lebih rendah
higher, lower

(e) Frekuensi cahaya adalah sama dalam air dan kaca. Walau bagaimanapun, di dalam kaca, kelajuan cahaya adalah kurang. Daripada $\lambda = \dfrac{v}{f}$, λ adalah berkadar terus dengan v.
Oleh itu, panjang gelombang cahaya di dalam kaca adalah lebih pendek daripada panjang gelombang cahaya dalam air.
The frequency of light is the same in water and glass. However, in glass the speed of light is slower. From $\lambda = \dfrac{v}{f}$, λ is directly proportional to v. Therefore, the wavelength of light in glass is shorter than the wavelength of light in water.

7 (a) Sinaran elektromagnet yang mempunyai hanya satu frekuensi atau panjang gelombang.
An electromagnetic radiation with a single frequency or wavelength.

(b) (i) Laju cahaya di dalam air kurang berbanding dengan laju cahaya di udara.
The speed of light is slower in the water compared to the speed of light in the air.
(ii) Panjang gelombang cahaya dalam air lebih pendek berbanding panjang gelombang di udara.
The wavelength of light is shorter in water compared to the wavelength in the air.
(iii) Kelebaran pinggir lebih kecil dalam air berbanding kelebaran di udara.
The width of the fringe is smaller in the water compared to the width in the air.
(iv) Semakin pendek panjang gelombang, semakin kecil jarak antara pinggir.
The shorter the wavelength, the smaller the distance between the fringes.
(v) Interferens./*Interferens.*

(c) Pinggir gelap disebabkan oleh interferens memusnah. Pinggir terang disebabkan oleh interferens membina.
Dark fringe is caused by destructive interferens. Bright fringe is caused by constructive interferens.

(d) Frekuensi tetap
Frequensi is constant
$n(\text{air}/water) = \dfrac{v_{\text{udara}/air}}{v_{\text{air}/water}} = \dfrac{f\lambda_{\text{udara}/air}}{f\lambda_{\text{air}/water}} = \dfrac{\lambda_{\text{udara}/air}}{\lambda_{\text{air}/water}}$
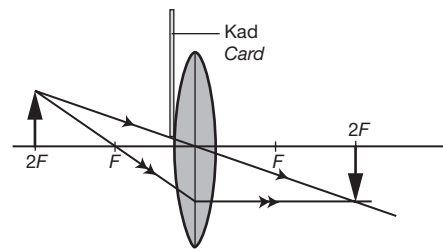x berladar terus dengan λ
$\therefore n = \dfrac{x_{\text{udara}/air}}{x_{\text{air}/water}}$

8 (a) (i) Kanta cembung
Convex lens
(ii) Nyata dan songsang
Real and inverted.

(b) Imej masih lengkap tetapi kurang cerah kerana hanya separuh cahaya yang membentuk imej.
The image is still complete but less bright because only half of the light forms the image.

(c)

(d) (i) Diameter seharusnya besar supaya imej lebih cerah.
The diameter should be large so that the image is brighter
(ii) Panjang focus kanta mata seharusnya pendek untuk membentukkan imej yang besar
The focal length of the eyepiece should be short to form a large image
(iii) Panjang di antara dua kanta sama dengan jumlah panjang focus objek dan kanta mata supaya imej terbentuk di infiniti
The length between the two lenses is equal to the sum of the focal length of the objectic lens and the eyepiece so that image is formed at infinity.

(e) Susunan L dipilih.
Arrangement L is chosen.

Bahagian B

9 (a) (i) Prinsip keabadian momentum menyatakan jumlah momentum bagi suatu system tertutup adalah malar.
The principle of the conservation of momentum states that the total momentum in a closed system is constant.
(ii) Campuran oksigen dan hydrogen dibakar dalam kebuk pembakaran dan menghasilkan gas ekzos yang berjisim besar. Gas ekzos keluar melalui ekzos dengan kadar yang tinggi dan halaju yang tinggi. Jisim gas ekzos dan halaju gas menghasilkan satu momentum ke belakang yang sangat besar. Satu tujahan / momentum ke hadapan turut dihasilkan untuk menolak roket ke hadapan.
A mixture of oxygen and hydrogen is burned in the combustion chamber and produces a large mass of exhaust gas. Exhaust gas rushed out through the exhaust at a high rate and high velocity. The mass of the exhaust gas and the velocity of the gas produce a very large backward momentum. A thrust / forward momentum is thus generated to propel the rocket forward

(b) Bukaan bagi pengambilan udara mestilah besar supaya lebih banyak udara boleh disedut masuk. Udara ini adalah bahan api bagi enjin jet.
The opening for the air intake must be large so that more air can be drawn in. The air is the fuel for jet engines.

Bilah digunakan mestilah sangat kuat. Titanium lebih baik daripada besi kerana ia lebih kuat dan tidak akan berkarat.
The blade used must be very strong. Titanium is better than iron because it is stronger and will not rust.

Kebuk pembakaran mestilah besar untuk meningkatkan kadar pembakaran bahan api supaya lebih banyak gas ekzos dihasilkan. Gas ekzos yang banyak menghasilkan satu momentum ke belakang yang lebih besar.
The combustion chamber must be large to increase the burning rate of the fuel so that more exhaust gas is produced. More exhaust gas produces a greater backward momentum.

Bukaan ekzos seharusnya kecil untuk menambahkan halaju gas ekzos supaya suatu momentum ke belakang yang lebih besar boleh dihasilkan
The exhaust opening should be small to increase the exhaust gas velocity so that a greater backward momentum can be produced

S ialah enjin jet yang paling sesuai digunakan dalam kapal terbang. S mempunyai bukaan besar untuk pengambilan udara, bilah titanium, kebuk pembakaran besar dan bukaan kecil untuk gas ekzos
S is the most suitable jet engine used in an airplane. S has large openings for air intake, titanium blades, big combustion chamber and a small opening for exhaust gases.

(i) $F_{\text{bersih/net}} = ma$
$$10 - 6 = m(2)$$
$$m = 2 \text{ kg}$$
$$KE = \frac{1}{2}mv^2$$
$$v^2 = 100$$
$$v^2 = u^2 + 2as$$
$$100 = 2(2)s$$
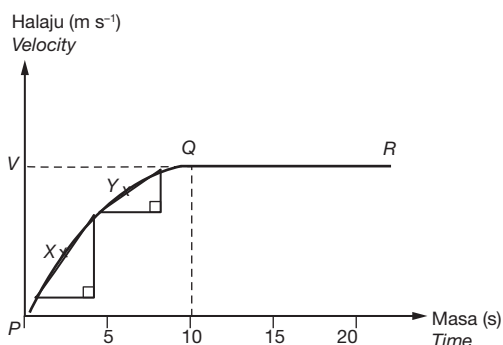$$s = 25 \text{ m}$$

(i) $F_{\text{bersih/net}} = ma$
$$10 + 6 = 2a$$
$$a = 8 \text{ m s}^{-2}$$

10 (a)

Halaju (m s⁻¹)
Velocity

Kecerunan di X > kecerunan di Y → pecutan di X > pecutan di Y
Gradient at X > gradient at Y → acceleration at X > acceleration at Y

Sfera keluli bermula dari pegun, Halajunya bertambah secara tidak linear selama 5 saat. Pecutan sfera (diwakili oleh kecerunan graf) berkurangan dengan masa. Selepas 5 s, ia bergerak dengan halaju malar.
The steel sphere starts from rest. Its velocity increases non-linearly for 5 seconds. The acceleratiob of the sphere (represented by the gradient of the graph) decreases over time. After 5 s, it moves with constant velocity.

Semasa sfera bergerak melalui air, ia mengalami daya seretan yang bertambah dengan halaju. Maka, apabila halaju sfera bertambah, daya seretan turut bertambah, menyebabkan daya bersih (dan pecutan) ke bawah berkurang. Apabila daya seretan sama dengan berat sfera, daya bersih dan pecutan menjadi sifar dan dengan itu, sfera bergerak dengan halju malar.
When the sphere moves through the water, it experiences drag force that increases with velocity. Thus, when velocity of the sphere increases, the drag force also increases, causing the net force on the sphere (and thus acceleration) to decrease. When the drag force in equal to the weight of the sphere, the net force and acceleration become zero and thus, the sphere moves with constant velocity.

(b) (i) Arah tarikan seharusnya selari dengan ladasan condong supaya kesemua daya itu (bukan daya komponennya) digunakan untuk menarik beban itu.
The direction should be parallel to the inclined plane so that the whole force (not its component force) is used to pull the load.

(ii) Panjang landasan kayu seharusnya panjang untuk mengurangkan sudut condong. Hal ini dapat mengurangkan daya yang diperlukan untuk menarik beban ke atas landasan.
The length of the wooden plank should be long so as to reduced the incline angle. This will reduce the force needed to pull the load up.

(iii) Permukaan landasan haruslah licin untuk mengurangkan daya geseran.
The surface should be smooth to reduce friction.

(iv) Landasan kayu itu seharusnya kukuh. Sekiranya landasan tidak kukuh digunakan, beban akan melentur atau mematahkan landasan itu. Papan yang melentur akan menyukarkan proses menarik beban.
The wooden plank should be rigid. If non-rigid wooden plank is used, the load will sag the plank or break the plank. the sagging will make the pulling more difficult.

Kaedah yang paling sesuai ialah kaedah Q kerana tali itu ditarik secara selari dengan landasan condong, landasan adalah panjang, licin dan kukuh.
The most suitable method is method Q because the rope is pulled parallel to the inclined plane, the plank is longer withe smooth surface and is rigid.

(c) (i) Apabila sisi digandakan tiga, isi padu dan jisim juga menjadi 9 kali ganda.
When the sides are tripled, the volume and thus the mass is 9 times.
$$F = ma$$
$$F = 9ma'$$
$$a' = \frac{1}{9}a$$
$$a' = \frac{1}{9}(5)$$
$$= 0.56 \text{ m s}^{-2}$$

(ii) Jisim/*Mass P* = $m = \rho V = \rho x^3$

Jisim/*Mass R* = $\rho'V' = \dfrac{1}{2}\rho(2x)^3$

$\qquad\qquad\qquad = 4\rho x^3$

$\qquad\qquad\qquad = 4m$

$F = ma$

$F = 4ma'$

$ma = 4ma'$

$a' = \dfrac{1}{4}a$

$a' = \dfrac{1}{4}(5)$

$\quad = 1.25 \text{ m s}^{-2}$
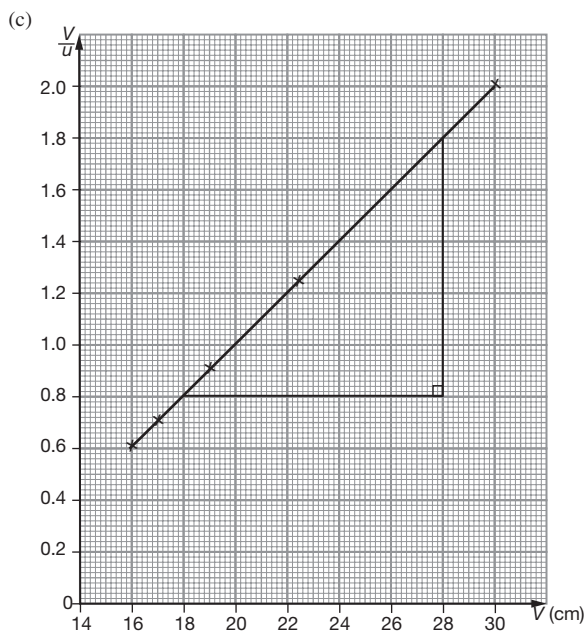
Bahagian C

11 (a) Medan magnet adalah kawasan di mana daya magnet bertindak. Garis medan magnet adalah garis yang dilalui oleh kutub utara suatu magnet 'bebas'.
A magnetic field is an area where magnetic forces act. Magnetic field lines are the paths taken by 'free' magnetic north pole.

   (b) (i) Semakin jauh jarak dari konduktor, semakin besar jarak antara garisan medan magnet.
   The further away from the conductor, the greater the distance between the magnetic field lines.

   (ii) Semakin rapat garisan medan magnet, semakin kuat medan magnet.
   The closer the magnetic field lines are, the stronger the magnetic field.

   (iii) Semakin jauh dari konduktor pembawa arus, semakin lemah kekuatan medan magnet.
   The further away from the current-carrying conductor, the weaker the strength of the magnetic field.

   (c) (i) Gelang itu akan berayun ke belakang. Apabila kutub utara magnet bar menghampiri gelang, arus pusar teraruh dalam gelang, Mengikut Hukum Lenz, muka hadapan gelang akan teraruh menjadi kutub utara. Cincin itu ditolak ke belakang kerana kutub yang sama menolak.
   The ring will swing backwards. When the north pole of the bar magnet is approaching the ring, eddy current is induced in the ring. According to Lenz's law, the front face is induced to be north pole. The ring is thus pushed backwards as like poles repel.

   (ii) Gelang itu berayun ke arah hadapan.
   The ring swings towards the front.

   (d) (i) Tapak bangunan hendaklah berada di kawasan berangin – Untuk mempunyai kuasa angin yang mencukupi untuk memutarkan bilah turbin.
   The building site should be in windy area. – To have sufficient wind power to turn the turbine blades.

   (ii) Menara hendaklah tinggi dari tanah. – Angin lebih kencang pada altitud yang lebih tinggi dari atas tanah.
   Tower should be high from ground. – Windier at higher altitude above the ground level.

   (iii) Aerodinamik. – Bilah berputar lebih pantas.
   Aerodynamics. – The blades will spin faster.

(iv) Ketumpatan yang rendah untuk bilah. – Untuk mengurangkan berat bilah besar dan berputar lebih cepat.
Low density material for blade. – To reduce the weight of the large blades and to spin faster.
Sistem pengesanan angin dan sistem komputer diperlukan untuk memutarkan turbin supaya menghadap angin. – Untuk memastikan bilah sentiasa berputar tanpa henti, iaitu memaksimumkan kuasa angin.
Wind detection system and computer system are needed to turn the turbine to be facing the wind. – To ensure the blades are always spinning without stop, that is to maximises the wind power.

KERTAS 3

(a) (i) Jarak objek, u
   Object distance u
   (ii) Jarak imej, v
   Image distance

(b)

u (cm)	v (cm)	$\dfrac{v}{u}$
15.0	30.0	2.00
18.0	22.5	1.25
21.0	19.1	0.91
24.0	17.1	0.71
27.0	15.9	0.59

(c)

(d) $k = 0.10 \text{ cm}^{-1}$
(e) $f = 10.0 \text{ cm}$
(f) Kanta selari dengan skrin
   Lens parallel to the screen.