

Penyelesaian Lengkap

SET 2

KERTAS 1

1 D

2 C

3 A

$$m = \frac{1.5 + 2.5}{2} = 2.0 \text{ cm}$$

$$\Delta = 0.5 \text{ cm}$$

$$n = 2.5 + 0.5 = 3.0 \text{ cm}$$

4 A

Untuk/for P,

$$v = u + at = 0 + 9.8 \times 1 = 9.8 \text{ m s}^{-1}$$

$$\text{Momentum} = 2mv = 19.6 \text{ kg m s}^{-1}$$

Untuk/for Q

$$v = u + at = 0 + 9.8 \times 2 = 19.6 \text{ m s}^{-1}$$

$$\text{Momentum} = mv = 19.6 \text{ kg m s}^{-1}$$

$$\text{Nisbah/Ratio} = 1 : 1$$

5 C

6 B

$$F = \frac{mv - mu}{t} = \frac{0 - 0.43 \times 25}{1.2} = -9 \text{ N}$$

$$\text{Daya/Force} = 9.0 \text{ N}$$

7 A

$$v_1^2 = \frac{GM}{r_1}$$

$$v_2^2 = \frac{GM}{r_2}$$

Bahagi/Dividing

$$\left(\frac{v_1}{v_2}\right)^2 = \frac{r_2}{r_1}$$

$$3^2 = \frac{r_2}{r_1}$$

$$r_1 = r_2 = 1 : 9$$

8 A

9 B

$$\text{Halaju lepas di Q/Escape velocity at Q} = \sqrt{\frac{2GM}{R}}$$

Isi padu X 8 kali isipadu Y

Oleh sebab ketumpatan sama,

$$M \text{ planet X} = 8M_Y$$

The volume of X is 8 times the volume of Y

Because of the same density,

$$M \text{ planet X} = 8M_Y$$

$$\text{Halaju lepas di P/Escape velocity at P} = \sqrt{\frac{2G8M}{2R}} = 2\sqrt{\frac{2GM}{R}}$$

$$= 2\text{Halaju lepas di Q/Escape velocity at Q}$$

$$\text{Ratio} = 2 : 1$$

10 C

11 A

Hitung $Q = mc\theta$ yang diperlukan untuk mendidih keempat-empat cecair.

Jawapannya ialah A kerana $mc\theta$ adalah yang paling kecil dan oleh itu paling cepat mendidih.

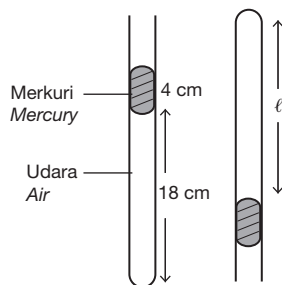
$$\text{Untuk A, } Q = mc\theta = m \times 0.6 \times 125 = 75 \text{ kJ}$$

Calculate $Q = mc\theta$ needed to boiling for all four liquids

Answer is A as its $mc\theta$ is the least and therefore fastest to start boiling.

$$\text{For A, } Q = mc\theta = m \times 0.6 \times 125 = 75 \text{ kJ}$$

12 B



$$P_1 = 76 + 4 = 80 \text{ cm Hg}$$

$$V_1 = 18$$

$$P_2 = 76 - 4 = 72 \text{ cm Hg}$$

$$V_2 = l$$

$$P_1 V_1 = P_2 V_2$$

$$80 \times 18 = 72l$$

$$l = 20 \text{ cm}$$

13 D

Kawasan cetek/shallow region

$$2\lambda = 12 \text{ cm}$$

$$\lambda = 6 \text{ cm}$$

Frekuensi sama dalam kawasan cetek dan kawasan dalam.

The frequency is the same in shallow and deep areas.

$$f_1 = f_2$$

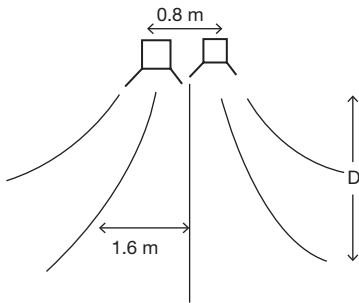
$$\frac{v_c}{v_d} = \frac{\lambda_c}{\lambda_d}$$

$$\frac{12}{v_d} = \frac{9}{6}$$

$$v_d = 8 \text{ cm}$$

14 B

15 C



$$a = 0.8 \text{ m} \quad x = 1.6 \text{ m} \quad D = ?$$

$$v = f\lambda$$

$$340 = 680l$$

$$l = 0.5 \text{ m}$$

$$x = \frac{\lambda D}{a}$$

$$D = \frac{ax}{\lambda} = \frac{0.8 \times 1.6}{0.5} = 2.6 \text{ m}$$

16 D

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$n_1 \sin 40^\circ = n_2 \sin 30^\circ$$

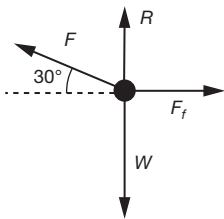
$$\frac{n_1}{n_2} = \frac{\sin 40^\circ}{\sin 30^\circ}$$

17 D

18 A

19 B

20 B



Tiga daya yang lain ialah geseran, F_f daya normal R dan berat W .

The other three forces are friction, F_f normal force R and berat W .

21 D

22 B

23 B

2 pemberat berkurang sebanyak 6 cm

1 pemberat berkurang sebanyak 3 cm

3 pemberat bertambah sebanyak 9 cm

Maka, bacaan = $14 + 9 = 23$ cm

2 weights reduce 6 cm

1 weight reduces 3 cm

3 weights adds 9 cm

So, reading = $14 + 9 = 23$ cm

24 C

25 D

W = berat ombok output/weight of output piston

Rajah/Diagram 15.1

$$\frac{F_{out}}{A_{out}} = \frac{F_{in}}{A_{in}}$$

$$\frac{A_{out}}{A_{in}} = \frac{F_{out}}{F_{in}} = \frac{W}{5}$$

Rajah/Diagram 15.2

$$\frac{F_{out}}{A_{out}} = \frac{W + 100}{25}$$

$$W = 25 \text{ N}$$

$$\frac{A_{out}}{A_{in}} = \frac{W}{5} = \frac{25}{5} = 5$$

26 B

27 A

$$Q = It = 0.35 \times 60 = 21 \text{ C}$$

$$\text{Bilangan electron} = \frac{21}{1.6 \times 10^{-19}} = 1.3 \times 10^{20}$$

$$\text{Number of electrons} = \frac{21}{1.6 \times 10^{-19}} = 1.3 \times 10^{20}$$

28 A

$$\text{Guna/use } R = \frac{\rho l}{A}$$

$$R' = \frac{\rho 2l}{2A} = R$$

29 A

30 A

31 B

32 B

Nisbah voltan/Voltage ratio = $9 : 36 = 1 : 4$

$20 : 80 = 1 : 4$

33 D

34 D

35 B

36 A

37 B

38 D

$$1 = 1 = 2 + 0$$

$$2 + 3 = 4 + 1$$

a = neutron

39 B

$$W = hf_0 = \frac{hc}{\lambda} = \frac{6.63 \times 10^{-34} (3 \times 10^8)}{200 \times 10^{-9}} \text{ J}$$

$$= \frac{6.63 \times 10^{-34} (3 \times 10^8)}{200 \times 10^{-9}} \times \frac{1}{1.6 \times 10^{-19}} \text{ eV}$$

$$= 6.2 \text{ eV}$$

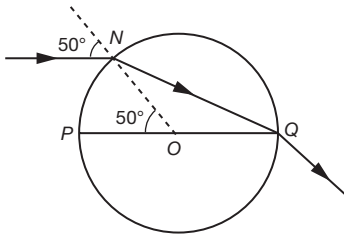
40 C

KERTAS 2

Bahagian A

1 (a) Pembiasan
Refraction

(b)



(c) (i) $\angle NQO = \frac{50^\circ}{2} = 25^\circ$

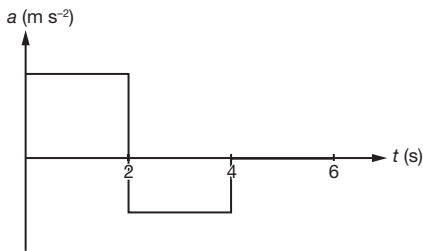
(ii) $n = \frac{\sin 50^\circ}{\sin 25^\circ} = 1.81$

2 (a) 3.36×10^5 J tenaga haba diperlukan untuk melebur 1 kg ais tanpa perubahan suhu.
 3.36×10^5 J of heat energy is required to melt 1 kg of ice without temperature change.

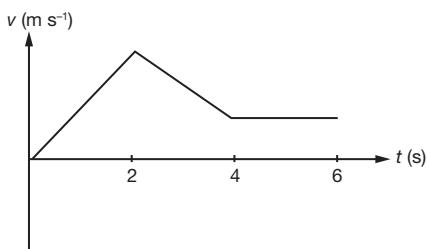
(b) $Q = mL = 1.2 \times 10^{-3} (3.36 \times 10^5) = 403.2$ J

(c) $0.9 \times 5.6 \times s = 403.2$
 $s = 80$ m

3 (a) (i)



(ii)



(b) $s = ut + \frac{1}{2}at^2$

$6 = 0.5(a)2$

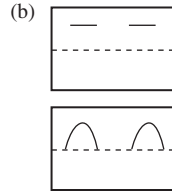
$a = 6 \text{ m s}^{-2}$

(c) $Ft = mv - mu$

$F = \frac{1.6(3.0 - 6.0)}{2} = -2.4 \text{ N}$

4 (a) $T = 0.02$ s

$f = \frac{1}{T} = \frac{1}{0.02} = 50 \text{ Hz}$



(c) (i) P

(ii) $E = \frac{V^2}{R}t = \left(\frac{3^2}{2}\right)(6 \times 60) \div 2 = 810 \text{ J}$

5 (a) (i) Perbezaan aras merkuri dalam tiub Y adalah lebih besar daripada tiub X.

Difference in mercury level in tube Y is greater than in tube X.

(ii) Luas keratan rentas pada titik M adalah lebih besar daripada titik N.

The cross-sectional area at point M is greater than at point N.

(iii) Tekanan pada titik M adalah lebih besar daripada titik N.

The pressure at point M is greater than at point N.

(b) (i) Laju aliran udara lebih tinggi apabila luas keratan rentas lebih kecil.

The airflow speed is higher when the cross-sectional area is smaller.

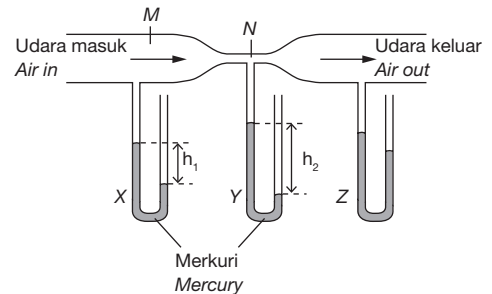
(ii) Semakin laju aliran udara, semakin kecil tekanannya.

The higher the airflow speed, the lower the pressure.

(c) Prinsip Bernoulli.

Bernoulli's principle.

(d)



6 (a) (i) Masa yang diambil untuk Rajah 6.1 lebih lama berbanding dengan Rajah 6.2.

The time taken for Diagram 6.1 is longer compared to Diagram 6.2.

(ii) Laju putaran dalam Rajah 6.2 lebih tinggi berbanding dengan Rajah 6.1.

The rotational speed in Diagram 6.2 is higher compared to Diagram 6.1.

(iii) Spring dalam Rajah 6.2 lebih panjang berbanding dengan Rajah 6.1.

The spring in Diagram 6.2 is longer compared to Diagram 6.1.

(b) (i) Semakin laju putaran, semakin tinggi pemanjangan spring. Semakin laju putaran sfera, semakin besar daya memusat diperlukan.

The faster the rotational speed, the higher the extension of spring. The faster the rotational speed of the sphere, the greater the centripetal force needed.

(ii) Hooke's law.

Hukum Hooke

$$(c) v = \frac{30 \times 2\pi r}{12} = \frac{60 \times \pi \times 0.2}{12} = 3.14 \text{ m s}^{-1}$$

$$F = \frac{mv^2}{r} = \frac{0.05 \times 3.14^2}{0.2} = 2.5 \text{ N}$$

- 7 (a) (i) P adalah lebih dalam daripada Q .
 P is deeper than Q .
- (ii) Isi padu di Q adalah lebih daripada isi padu belon di P .
The volume at Q is more than the volume at P .
- (iii) Tekanan pada belon di P adalah tinggi daripada tekanan pada belon di Q .
The pressure on the balloon at P is higher than the pressure on the balloon at Q .
- (b) (i) Semakin dalam kedudukan dari permukaan, semakin tinggi tekanan.
The deeper the position from the surface, the higher the pressure.
- (ii) Semakin kecil isi padu, semakin tinggi tekanan.
The smaller the volume, the higher the pressure.
- (iii) Semakin tinggi ketumpatan, semakin tinggi tekanan.
The higher the density, the the higher the pressure.
- (c) $V_p : V_Q = 2 : 3$
- (d) Apabila ketumpatan gas bertambah, kadar perlanggaran antara molekul-molekul gas dengan dinding akan bertambah. Perlanggaran ini meningkatkan daya impuls pada dinding. Oleh itu, daya dan tekanan yang dikenakan pada dinding akan turut meningkat.
When the density of gas is increasing, the rate of collision between the molecules of gas and the wall increases. This collision will increase the impulsive force. Thus, the force and pressure exerted on the wall will also increase.
- 8 (a) Transformer injan turun
Step down transformer
- (b) (i) Teras besi lembut/*Soft iron core*
Boleh dimagnet dan dinyahmagnet dengan mudah.
Can be magnetised and demagnetised easily.
- (ii) Berlamina/*Laminated*
Untuk mengurangkan arus pusing dalam teras.
To reduce eddy current.
- (iii) 2 400 lilitan pada gegelung primer/2 400 turns on the primary coil
Supaya nisbah lilitan sama dengan nisbah voltan.
So that the turns ratio is equal to voltage ratio.
- (c) Susunan K
Arrangement K
- (d) Kecerahan mentol berkurang kerana kecekapan transformer dikurangkan
The brightness of the bulb is reduced because the efficiency of the transformer is reduced
- (e) $V_p I_p = V_s I_s$
 $240 I_p = 3(0.36)$
 $I_p = 0.0045 \text{ A}$

Bahagian B

- 9 (a) (i) Prinsip Archimedes menyatakan bahawa daya apungan pada objek yang tenggelam sepenuhnya atau sebahagiannya adalah sama dengan berat bendalir yang disesarkan.

The Archimedes' principle states that the buoyant force on a fully or partially submerged object is equal to the weight of fluid displaced.

- (ii) Dalam kedua-dua situasi, berat air disesarkan sama iaitu sama dengan berat bot dan kandungannya. Oleh kerana jisim berkadar terus dengan berat, jisim air yang disesarkan adalah sama. Jisim adalah sama dengan ketumpatan kali isi padu. Oleh sebab air laut mempunyai ketumpatan yang lebih tinggi, isi padu air yang disesarkan kurang. Oleh itu bot kurang tenggelam (terapung lebih tinggi) di atas air laut.
In both situations, the weights of water displaced are equal i.e. equal to the weight of boat and its contents. As mass is directly proportional to weight, the masses of water displaced are equal. Mass is equal to density times volume. As sea water has a higher density, volume of water displaced is less. Thus, the boat sink less (float higher) on sea water.
- (b) (i) Saiz bebuli perlu besar untuk memberikan kesan keapungan yang mencukupi untuk membolehkan hidrometer terapung secara menegak dalam semua cecair.
The size of the bulb needs to be large to provide enough buoyancy effect to enable the hydrometer to float upright on all liquids.
- (ii) Tapak hidrometer perlu berat untuk memberikan kestabilan dan untuk membolehkan hidrometer terapung tegak.
The base of the hydrometer needs to be heavy to provide stability and to enable the hydrometer to float upright.
- (iii) Diameter batang perlu sempit untuk meningkatkan sensitiviti hidrometer.
Diameter of the stem needs to be narrow to increase the sensitivity of the hydrometer.
- (iv) Batang yang lebih panjang diperlukan kerana ia meningkatkan julat ketumpatan untuk diukur.
Longer stem is needed to increase the range of densities to be measured.
- Hidrometer Q dipilih kerana ia mempunyai bebuli bersaiz besar, tapak yang berat, batang sempit dan panjang.
Hydrometer Q is chosen as it has big sizes bulb, heavy base, narrow and long stem.
- (c) Dalam kedua-dua situasi, berat objek terapung = berat air yang disesarkan.
In both situations, weight of floating objects = weight of water displaced.
- $$W_{\text{kotak/box}} = W_{\text{air disesarkan/water displaced}}$$
- $$= \rho V g$$
- $$= 1000(0.8 \times 0.5) \times 9.8$$
- $$= 3920 \text{ N}$$
- $$W + W_{\text{kotak/box}} = 1000(0.8 \times 0.8)9.8$$
- $$= 6272 \text{ N}$$
- $$W + 3920 = 6272$$
- $$W = 2352 \text{ N}$$

- 10 (a) Transistor npn
- (b) (i) PPC mesti disambungkan antara S dan T .
The LDR must be connected between S and T .
Untuk meningkatkan arus tapak apabila keamatan cahaya yang jatuh pada PPC meningkat.
To increase the base current as light intensity falling on LDR increases.

- (ii) Terminal positif bateri mesti disambungkan kepada terminal pengumpul transistor npn.
The positive terminal of the battery must be connected to the collector terminal of the npn transistor.
 Supaya transistor pincang ke hadapan dan boleh berfungsi.
So that the transistor is forward biased and can function.
- (iii) Suis geganti perlu dipasang.
A relay switch needed to be installed.
 Untuk menghidupkan litar sekunder yang berjalan pada arus yang lebih besar.
To switch on the secondary circuit which runs at much greater current.
- (iv) Sumber kuasa hendaklah bersiri dengan motor.
The power source should be in series with the motor.
 Motor dihidupkan hanya setelah suis geganti dihidupkan.
The motor is on only when the relay is turned on.
 Litar N dipilih kerana PPC disambungkan pada kedudukan yang betul dan berada dalam keadaan pincang ke hadapan, litar geganti dipasang bersiri dengan sumber kuasa.
Circuit N is chosen because LDR is connected at the correct position and is in forward biased condition, a relay circuit is installed and power source is in series with the motor.
- (c) (i) $K.E = eV = 1.6 \times 10^{-19} \text{ C} \times 3000 = 4.8 \times 10^{-16} \text{ J}$
- (ii) $KE = \frac{1}{2}mv^2$
 $4.8 \times 10^{-16} = \frac{1}{2} \times 9.1 \times 10^{-31}v^2$
 $v = 3.2 \times 10^7 \text{ m s}^{-1}$
- (iii) Laju di P lebih tinggi kerana elektron dipecutkan ke atas disebabkan oleh daya elektrik.
The speed at P is higher because the electrons are accelerated upwards due to the electric force.
- (iv) Menghalakan medan magnet secara mengufuk memasuki kertas. Daya magnetik yang terhasil menolak elektron ke bawah. Dengan melaraskan kedua-dua kekuatan medan magnet dan medan elektrik akan memulihkan sinar katod kepada lintasan asal.
Directing a magnetic field horizontally into the paper. The magnetic force pushes the electrons down. By adjusting both the magnetic field and the electric field strength will restore the cathode ray to its original path.

Bahagian C

- 11 (a) Haba pendam tentu ialah jumlah haba yang diperlukan untuk menukar 1 kg bahan daripada keadaan pepejal kepada keadaan cecair tanpa mengubah suhu.
Specific latent heat is the amount of heat required to change 1 kg of the material from solid state to liquid state without changing the temperature.
- (b) (i) Suhu air dalam Rajah 11.2 adalah lebih tinggi berbanding dengan Rajah 11.1.
The temperature of water in Diagram 11.2 is higher compared to Diagram 11.1.
- (ii) Jisim ais yang tinggal dalam Rajah 11.2 adalah kurang berbanding dengan Rajah 11.1.
The mass of ice left in Diagram 11.2 is lower compared to Diagram 11.1.

- (iii) Semakin tinggi suhu, semakin banyak ais melebur.
The higher the temperature, the more ice is melted.
- (iv) Semakin tinggi suhu air, semakin banyak haba yang disimpan.
The higher the temperature of water, the more heat it stores.
- (c) (i) Tenaga kinetik molekul bergantung pada suhunya sahaja. Oleh kerana P dan Q mempunyai suhu yang sama, mereka mempunyai tenaga kinetik yang sama.
The kinetic energy of a molecule depends on its temperature only. Since P and Q are of the same temperature, they possess the same kinetic energy.
- (ii) Tenaga haba yang diserap oleh air mendidih digunakan untuk melakukan kerja mengatasi daya tarikan antara molekul dan melakukan kerja melawan tekanan atmosfera semasa air mengembang menjadi wap.
Heat energy absorbed by the boiling water is not to increase the kinetic energy of water molecules. The energy is used to do work to overcome the attraction force between molecules to do work against the atmospheric pressure while the water expands to become steam
- (d) Takat didid hendaklah tinggi supaya bendalir tidak mengewap atau bertukar kepada gas dengan mudah. Sebaik sahaja gas terbentuk, kecekapan sistem akan terjejas.
The boiling point should be high so that the fluid does not vaporises or change to gas easily. Once the gas is formed, the efficiency of the system will be affected.
 Muatan haba tentu hendaklah tinggi supaya bendalir tidak akan dipanaskan dengan cepat.
The specific heat capacity should be high so that the fluid will not be heated up fast.
 Faktor pendaraban = $\left(\frac{\text{Luas ombok output}}{\text{Luas ombok input}} \right)$.
 Maka, luas keratan rentas ombok output seharusnya besar untuk menghasilkan daya yang besar.
The multiplying factor = $\left(\frac{\text{Area of output piston}}{\text{Area of input piston}} \right)$.
 Oleh itu, luas keratan rentas untuk output piston haruslah besar dalam order to produce greater output force.
 Luas keratan rentas ombok input perlu lebih kecil supaya menghasilkan faktor pendaraban yang tinggi seterusnya menghasilkan daya yang besar.
The cross-sectional area of the input piston should be small so that the multiplying factor is greater and produces greater force.
 Kadar kakisan hendaklah rendah untuk mengelakkan kakisan atau pengaratan pada paip dan dengan itu memanjangkan hayat perkhidmatan sistem hidraulik.
The rate of corrosion should be low to prevent corrosion or rusting on the pipe and thus extends the service life of the hydraulic system.

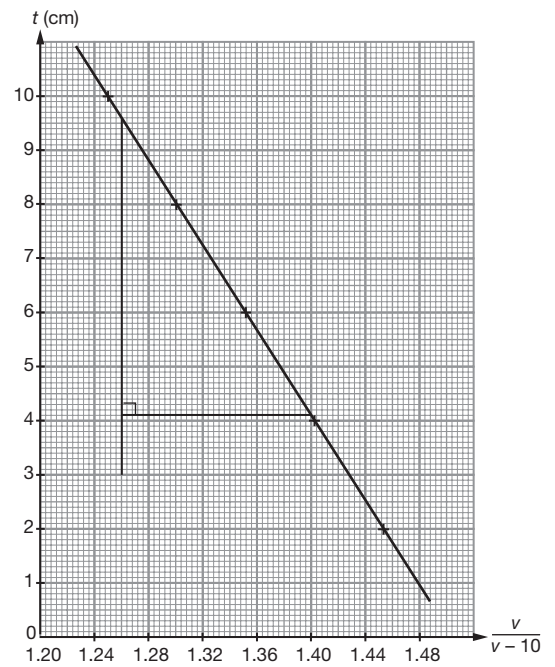
KERTAS 3

- (a) (i) lebar bekas t
Width of container
- (ii) Jarak imej, v
Image distance

(b)

t (cm)	v (cm)	$(v - 10)$ cm	$\left(\frac{v}{v - 10}\right)$
2.0	32.2	22.2	1.45
4.0	34.5	24.5	1.41
6.0	38.6	28.6	1.35
8.0	43.3	33.3	1.30
10.0	50.0	40.0	1.25

(c)



(d) $m = -36.7$ cm

(e) $n = 1.37$

(f) Mentol seharusnya pada tinggi yang sama dengan pusat kanta.
The bulb should be at the same height as the centre of convex lens.