

NO KAD PENGENALAN

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ANGKA GILIRAN

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Nama:

Tingkatan:



MODUL ULANGKAJI BERFOKUS SPM 2021 (SET B)

4531/2

PHYSICS

Kertas 2

2021

2 ½ jam

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Tuliskan **nombor kad pengenalan** dan **angka giliran** anda pada ruang yang disediakan.
2. Kertas soalan ini adalah dalam dwibahasa.
3. Soalan dalam Bahasa Melayu mendahului soalan yang sepadan dalam Bahasa Inggeris.
4. Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam Bahasa Inggeris atau Bahasa Melayu.
5. Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.

Kod Pemeriksa			
Bahagian	Soalan	Markah Penuh	Markah Diperoleh
A	1	4	
	2	5	
	3	6	
	4	9	
	5	9	
	6	9	
	7	9	
	8	9	
B	9	20	
	10	20	
C	11	20	
Jumlah			

Kertas soalan ini mengandungi 26 halaman bercetak

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

1. $a = \frac{v - u}{t}$
2. $v^2 = u^2 + 2as$
3. $s = ut + \frac{1}{2}at^2$
4. Momentum, $p = mv$
5. $F = ma$
6. Daya Impuls, $F = \frac{mv - mu}{t}$ / Impulsive force, $F = \frac{mv - mu}{t}$
7. Daya graviti, $F = \frac{Gm_1 m_2}{r^2}$ / Gravitational force, $F = \frac{Gm_1 m_2}{r^2}$
8. Pecutan graviti, $g = \frac{GM}{r^2}$ / Gravitational acceleration, $g = \frac{GM}{r^2}$
9. Daya memusat, $F = \frac{mv^2}{r}$ / Centripetal force, $F = \frac{mv^2}{r}$
10. Jisim bumi, $m = \frac{4\pi^2 r^3}{GT^2}$ / Mass of Earth, $m = \frac{4\pi^2 r^3}{GT^2}$
11. Laju linear satelit, $v = \sqrt{\frac{GM}{r}}$ / Linear speed of satellite, $v = \sqrt{\frac{GM}{r}}$
12. Halaju lepas, $v = \sqrt{\frac{2GM}{r}}$ / Escape velocity, $v = \sqrt{\frac{2GM}{r}}$
13. $\frac{T_1^2}{T_2^2} = \frac{r_1^3}{r_2^3}$
14. Haba, $Q = mc\Delta\theta$ / Heat, $Q = mc\Delta\theta$
15. Haba, $Q = m\ell$ / Heat, $Q = m\ell$
16. $P_1V_1 = P_2V_2$
17. $\frac{P_1}{T_1} = \frac{P_2}{T_2}$
18. $\frac{V_1}{T_1} = \frac{V_2}{T_2}$
19. $v = f\lambda$
20. $\lambda = \frac{ax}{D}$
21. $n_1 \sin \theta_1 = n_2 \sin \theta_2$
22. $n = \frac{\text{dalam nyata, } H}{\text{dalam ketara, } h}$ / $n = \frac{\text{real depth, } H}{\text{apparent depth, } h}$
23. $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$
24. Pembesaran linear, $m = \frac{h_i}{h_o} = \frac{v}{u}$ / Linear magnification, $m = \frac{h_i}{h_o} = \frac{v}{u}$

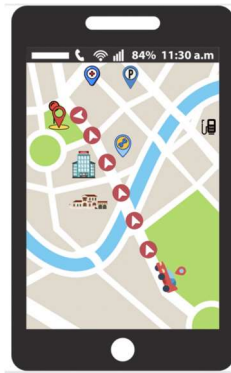
25. Tenaga kinetik, $E_k = \frac{1}{2}mv^2$ / Kinetic energy, $E_k = \frac{1}{2}mv^2$
26. Tenaga keupayaan graviti, $E_p = mgh$ / Gravitational potential energy, $E_p = mgh$
27. Tenaga keupayaan kenyal, $E_p = \frac{1}{2}Fx = \frac{1}{2}kx^2$ / Elastic potential energy, $E_p = \frac{1}{2}Fx = \frac{1}{2}kx^2$
28. Kuasa, $P = \frac{\text{Tenaga}, E}{\text{masa}, t}$ / Power, $P = \frac{\text{Energy}, E}{\text{time}, t}$
29. Tekanan, $P = \frac{F}{A}$ / Pressure, $P = \frac{F}{A}$
30. Tekanan cecair, $P = h\rho g$ / Liquid pressure, $P = h\rho g$
31. Cas, $Q = It$ / Charge, $Q = It$
32. Beza keupayaan, $V = \frac{E}{Q}$ / Potential difference, $V = \frac{E}{Q}$
33. Tenaga elektrik, $E = VIt$ / Electrical energy, $E = VIt$
34. Rintangan, $R = \frac{V}{I}$ / Resistance, $R = \frac{V}{I}$
35. Kuasa, $P = IV$ / Power, $P = IV$
36. Tenaga keupayaan elektrik, $E = eV$ / Electric potential energy, $E = eV$
37. $\frac{V_s}{V_p} = \frac{N_s}{N_p}$
38. Kecekapan = $\frac{I_s V_s}{I_p V_p} \times 100\%$ / Efficiency = $\frac{I_s V_s}{I_p V_p} \times 100\%$
39. $E = mc^2$
40. $E = hf$
41. $\lambda = \frac{h}{p}$
42. $P = nhf = \frac{nhc}{\lambda}$
43. $hf = W + \frac{1}{2}mv^2$
44. $W = hf_o$
45. $g = 9.81 \text{ m s}^{-1}$
46. Pemalar graviti, $G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$ / Gravitational constant, $G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
47. $1 u = 1.66 \times 10^{-27} \text{ kg}$
48. Pemalar Planck, $h = 6.63 \times 10^{-34} \text{ J s}$ / Planck constant, $h = 6.63 \times 10^{-34} \text{ J s}$
49. $1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$
50. $c = 3.0 \times 10^8 \text{ m s}^{-1}$
51. Jisim matahari = $1.99 \times 10^{30} \text{ kg}$ / Mass of the sun = $1.99 \times 10^{30} \text{ kg}$
52. Jisim bumi, $M = 5.97 \times 10^{24} \text{ kg}$ / Mass of Earth, $M = 5.97 \times 10^{24} \text{ kg}$
53. Jejari bumi, $R = 6.37 \times 10^6 \text{ m}$ / Radius of earth, $R = 6.37 \times 10^6 \text{ m}$

Bahagian A
Section A

[60 markah]
[60 marks]

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

1. Rajah 1 menunjukkan lokasi Sistem Kedudukan Sejagat (GPS) dari bandar Batu Pahat ke Parit Raja yang dilalui oleh sebuah kereta yang bergerak dengan laju purata 80 km j^{-1} dalam masa 15 minit pada jarak yang tertentu.
*Diagram 1 shows **Global Positioning System (GPS)** location from Batu Pahat to Parit Raja which is followed by a car with an average speed of 80 km h^{-1} in 15 minutes at certain distance.*



Rajah 1
Diagram 1

- a) Berdasarkan maklumat yang diberikan, nyatakan dua kuantiti asas dan unit SI masing - masing.

*Based on the statements given, state **two basic quantities** and their **respective SI units**.*

speed = ms^{-1} time = s

[1 markah/ 1 mark]

- b) Namakan gelombang elektromagnet yang digunakan di dalam Sistem Kedudukan Sejagat (GPS)

Name the electromagnetic wave used in Global Positioning System (GPS)

*Radio wave ← ↑ increase
easily to be diffracted*

[1 markah/ 1 mark]

- c) Tentukan jarak dalam kilometer (km) yang dilalui oleh kereta tersebut dari Batu Pahat ke Parit Raja.

Determine the distance in kilometer (km) that passes by the car from Batu Pahat to Parit Raja.

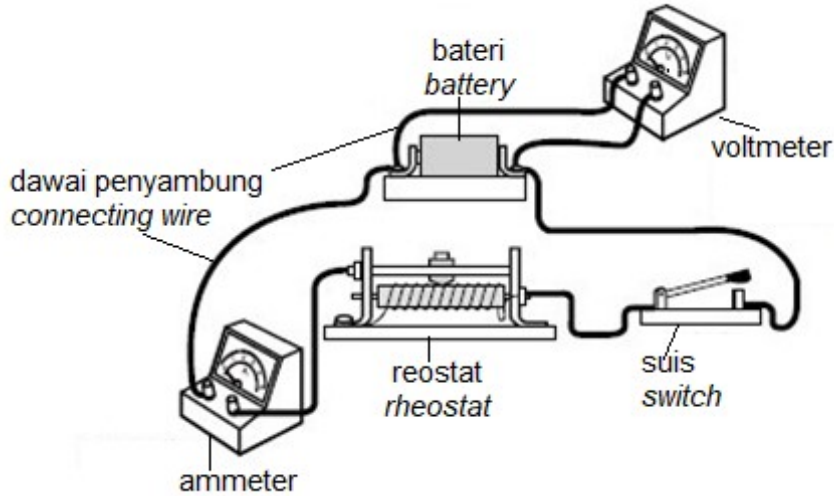
*$v = 80 \text{ kmh}^{-1}$
 $t = 15 \text{ minutes} = 0.25 \text{ h}$*

$$v = \frac{s}{t}$$

$$s = vt = 80(0.25) \\ = \underline{\underline{20 \text{ km}}}$$

[2 markah/ 2 marks]

- 2 Rajah 2.1 menunjukkan susunan radas eksperimen untuk menentukan daya gerak elektrik, d.g.e dan rintangan dalam, r suatu bateri.
 Diagram 2.1 shows the apparatus set up in the experiment to determine electromotive force e.m.f., E , and internal resistance, r , of battery.



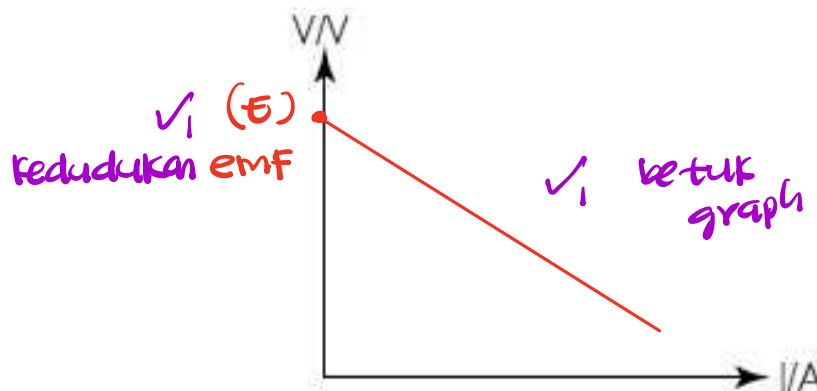
Rajah 2.1
 Diagram 2.1

- a) Apakah yang dimaksudkan dengan rintangan dalam?
 What is meant by *internal resistance*?

resistance against the moving charge due to the electrolyte in the cell

[1 markah/ 1 mark]

- b) (i) Berdasarkan Rajah 2.2, lakarkan graf voltan, V melawan arus, I bila suis ditutup dan reostat dilaraskan
 Based on the Diagram 2.2, sketch the graph voltage, V against current, I when switch is closed and rheostat is adjusted.



Rajah 2.2
 Diagram 2.2

[1 markah/ 1 mark]

- (ii) Dalam Rajah 2.2, tandakan E untuk menentukan daya gerak elektrik, d.g.e.
In the Diagram 2.2, mark E to determine the electromotive force, e.m.f.

[1 markah/ 1 mark]

- c) Apabila suis ditutup, bacaan pada voltmeter dan ammeter ialah 1.25 V dan 0.25 A masing-masing. Bateri dilabelkan 1.5 V.
When the switch is closed, the readings on the voltmeter and ammeter are 1.25 V and 0.25 A respectively. Battery is labelled 1.5 V.

Hitungkan rintangan dalam bateri itu.
Calculate the internal resistance of the battery

$$\begin{aligned}
 E &= V + Ir \\
 r &= \frac{E - V}{I} = \frac{1.5 - 1.25}{0.25} \checkmark_1 \\
 &= \underline{1\text{-}\Omega} \checkmark_2 \text{ unit}
 \end{aligned}$$

[2 markah/ 2 marks]

3. Rajah 3 menunjukkan daya-daya yang bertindak pada sebuah basikal yang ditunggang oleh seorang penunggang basikal. Penunggang basikal itu menunggang dengan daya ke hadapan 150 N.

Diagram 3 shows forces acting on a bicycle pedalled by a cyclist. The cyclist cycles with a forward force of 150 N.



Rajah 3/ Diagram 3

- a) Apakah yang dimaksudkan dengan pecutan?
What is the meaning of acceleration?

$$a = \frac{v - u}{t} = \text{rate of change of velocity}$$

[1 markah/1 mark]

- b) Nyatakan jenis gerakan basikal itu jika daya geseran antara tayar basikal dengan jalan adalah 150 N.
State the type of motion of the bicycle if the frictional force between the tyre and the road is 150 N.

constant speed (Forward thrust = friction)

[1 markah/1 mark]

- c) Daya ke hadapan yang bertindak terhadap basikal itu meningkat ke 250 N. Jumlah jisim basikal dan penunggang basikal itu ialah 80 kg.
Forward force that acting on the bicycle increased to 250 N. The total mass of the bicycle and the cyclist are 80 kg.

Hitungkan,
 Calculate,

- (i) Daya paduan yang bertindak ke atas basikal itu.
Resultant force acted on the bicycle.

$$\begin{aligned} F_{\text{net}} &= \text{Forward} - \text{Friction} \\ &= 250 - 150 \\ &= \underline{100 \text{ N}} \quad \checkmark \text{ unit} \end{aligned}$$

[1 markah/1 mark]

- (ii) Pecutan basikal itu
Acceleration of the bicycle

$$\begin{aligned} F &= ma \\ F_{\text{net}} &= ma \\ 100 &= 80a \end{aligned} \quad \therefore a = \frac{100}{80} = \underline{1.25 \text{ m s}^{-2}} \quad \checkmark \text{ unit}$$

[1 markah/1 mark]

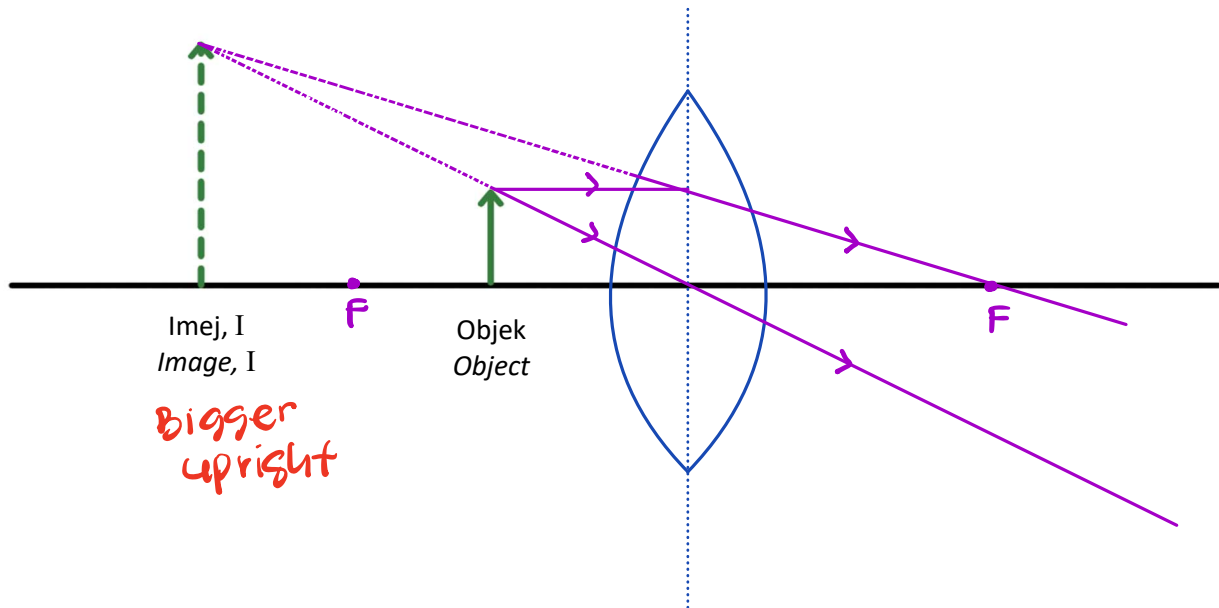
- d) Mengapa penunggang basikal itu akan mengalami kecederaan teruk jika dia terjatuh di atas permukaan yang keras?
Why the cyclist will experience serious injury if he falls on the road with hard surface?

short time impact

higher Impulsive force

[2 markah/2 marks]

- 4 Rajah 4 menunjukkan suatu objek dan imej maya yang dibentuk oleh sebuah kanta cembung.
Diagram 4 show an object and its virtual image formed by **convex lens**.



Rajah 4
Diagram 4

- a) Satu daripada ciri imej, I dalam Rajah 4 ialah maya. Nyatakan dua ciri lain bagi imej, I.
One of the characteristics of image, I in Diagram 4 is **virtual**. State other two characteristics of image, I.

upright, magnified

[2 markah/ 2 marks]

- b) Lengkapkan gambar rajah sinar pada Rajah 4 dan tentukan kedudukan kanta dan titik fokus kanta. Tandakan kedudukan titik fokus kanta dengan huruf, F.
Complete the ray diagram in Diagram 4 and determine the position of the lens and focal point of the lens. Mark the position of the focal point of the lens with, F.

[3 markah/ 3 marks]

- c) Jika objek itu digerakkan perlahan - lahan menjauhi kanta, nyatakan perubahan yang mungkin berlaku kepada imej tanpa melukis gambar rajah sinar.
If the object is slowly moved away from the lens, state changes that might happen to the image without drawing a ray diagram.

Increase

[1 markah/ mark]

- d) Pembentukan imej ditunjukkan seperti dalam Rajah 4. Jika objek dengan ketinggian 5 cm diletakkan pada jarak 12 cm dari satu kanta cembung yang mempunyai panjang focus 10 cm.
The formation of the image of an object is shown in the Diagram 4. If an object with a height of 5 cm is placed at a distance of 12 cm from a convex lens of focal length 10 cm.

Tentukan
 Determine

- (i) Jarak imej jika jarak objek yang terbentuk ialah 12 cm dibelakang kanta.
the image distance if the object formed is 12 cm behind the lens.

$$h_o = 5 \text{ cm}$$

$$u = 12 \text{ cm}$$

$$f = +10 \text{ cm}$$

$$u > f$$

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

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{10} - \frac{1}{12} \quad \checkmark_1$$

$$= \underline{60 \text{ cm}} \quad \checkmark_2 \text{ unit!}$$

magnified

[2 markah/ marks]

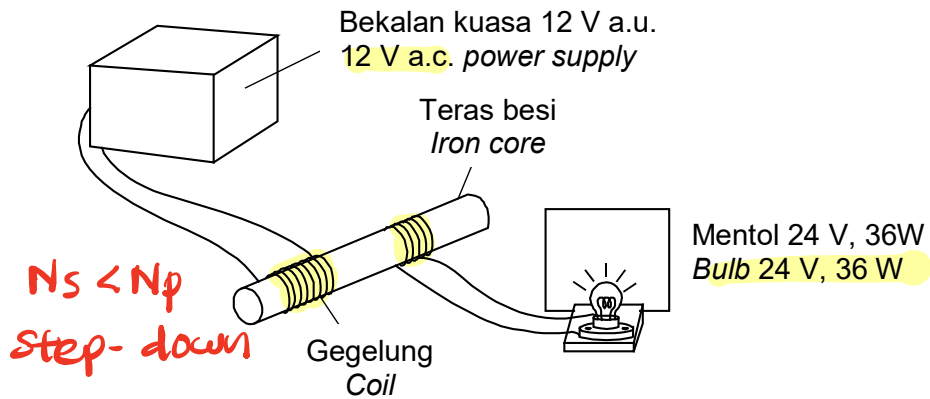
- (ii) pembesaran linear
the linear magnification

$$m = \frac{v}{u} = \frac{60}{12} = \underline{5} \quad \checkmark_1$$

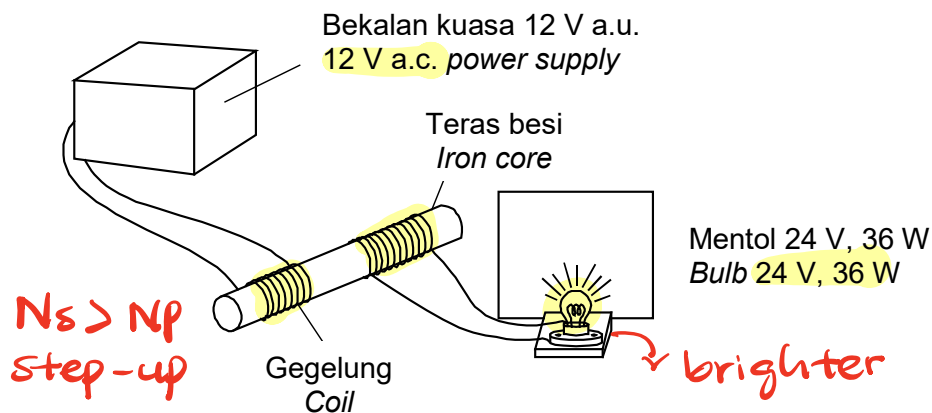
no unit

[1 markah/ mark]

5. Rajah 5.1 dan Rajah 5.2 menunjukkan dua gegelung dengan dawai yang serupa dililitkan pada sebatang teras besi. Gegelung primer disambungkan kepada 12 V bekalan kuasa a.u, manakala gegelung sekunder kepada sebiji mentol.
 Diagram 5.1 and Diagram 5.2 show two coils of identical wire wound around an iron core. The primary coil is connected to 12 V a.c power supply while the secondary coil is connected to a bulb.



Rajah 5.1/ Diagram 5.1



Rajah 5.2/ Diagram 5.2

- (a) Apakah yang dimaksudkan dengan aruhan elektromagnet?
 What is the meaning of **electromagnetic induction**?

producing of induced current when there is a change (cutting) in magnetic flux [1 markah/1 mark]

- (b) Terangkan secara ringkas bagaimana mentol dapat dinyalakan.
 Explain briefly how bulb can be light up.

- ① alternating current flow to primary coil
- ② change in magnetic flux occur
- ③ soft iron core linked the change of magnetic flux to secondary coil [2 markah/2 marks]
- ④ Induced current flow to the secondary coil and bulb light up

- (c) Perhatikan Rajah 5.1 dan Rajah 5.2.
Observe *Diagram 5.1 and Diagram 5.2.*

- (i) Bandingkan kecerahan mentol.
Compare the brightness of the bulb.

Brightness: Diagram 5.2 > Diagram 5.1

[1 markah/1 mark]

- (ii) Bandingkan bilangan lilitan pada gegelung sekunder.
Compare the number of turns in the secondary coil.

N_s : Diagram 5.2 > Diagram 5.1

[1 markah/1 mark]

- (iii) Bandingkan magnitud arus aruhan yang terhasil.
Compare the magnitude of induced current produced.

magnitude induced current:
Diagram 5.2 > Diagram 5.1

[1 markah/1 mark]

- (iv) Hubungkan kecerahan mentol dengan magnitud arus aruhan.
Relate the brightness of bulb with the magnitude of induced current.

magnitude induced current increase, brightness of bulb increase

[1 markah/1 mark]

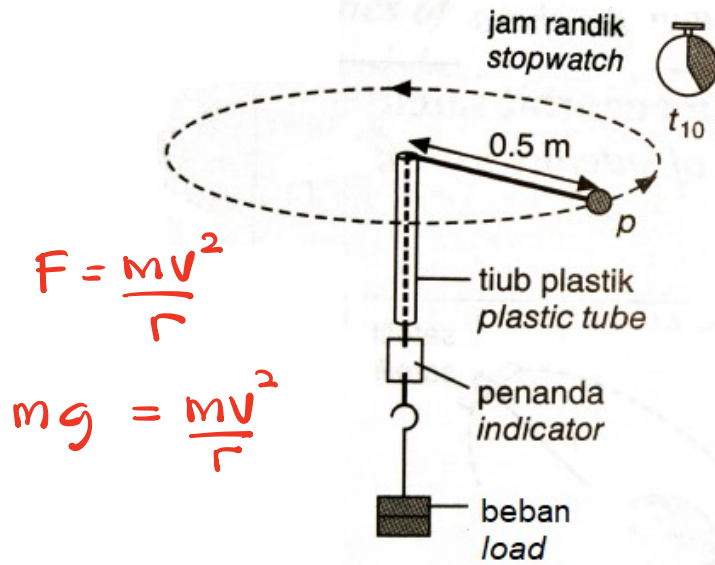
- (d) Apakah yang akan berlaku jika gegelung primer disambung kepada bekalan kuasa arus terus? Terangkan.
What will happen if the primary coil is connected to a direct current power supply? Explain.

bulb not light up

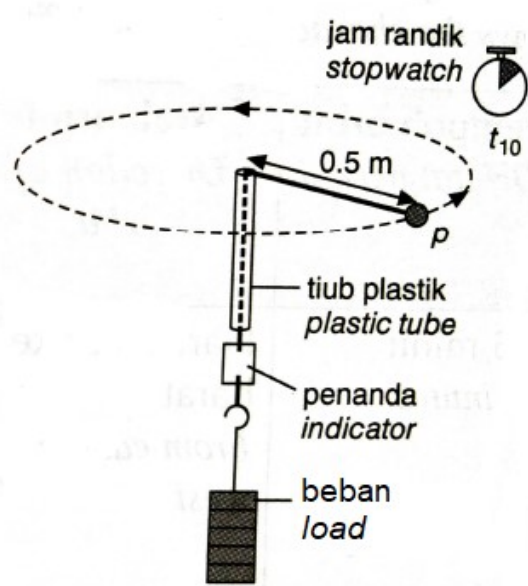
no change in magnetic flux

[2 markah/2 marks]

6 Rajah 6.1 dan 6.2 menunjukkan eksperimen menggunakan kit daya memusat. Pemberat membekalkan daya memusat iaitu ketegangan dalam tali yang diperlukan untuk memutar P dalam bulatan mengufuk. Masa untuk 10 putaran dicatatkan menggunakan jam randik. Diagram 6.1 dan 6.2 show experiment using the centripetal force kit. The weights supply the centripetal force that is tension in the string needed to whirl P in horizontal circles. The time for 10 revolution is recorded by using stopwatch.



Rajah 6.1
Diagram 6.1



Rajah 6.2
Diagram 6.2

a) Apakah yang dimaksudkan dengan daya memusat?
What is meant by centripetal force?

the force that act to an object in circular motion

[1 markah/ 1 mark]

Berdasarkan Rajah 6.1 and Rajah 6.2, bandingkan
Based on Diagram 6.1 and Diagram 6.2, compare:

(i) berat beban yang menarik tali
the weight of load pulling the string.

weight of load pulling the string:
Diagram 6.2 > Diagram 6.1

[1 markah/ 1 mark]

(ii) masa untuk 10 putaran
time for 10 revolutions

time for 10 revolutions: Diagram 6.1 > Diagram 6.2

[1 markah/ 1 mark]

c) Berdasarkan jawapan di 6 (b), nyatakan kesimpulan hubungan antara
Based on the answer at 6 (b), state the conclusion relationship between

- (i) ketegangan tali dengan berat beban
tension of the string with the weight of load

weight of load Increase, tension of the string increase
[1 markah / 1 mark]

- (ii) ketegangan tali dengan daya memusat
tension of the string with centripetal force

tension of string Increase, centripetal force Increase
[1 markah/ 1 mark]

- (iii) berat beban dengan masa putaran
weight of load with time of revolution

weight of load Increase, time of revolution decrease
[1 markah/ 1 mark]

d) (i) Jika berat beban ialah 1.5 N, jisim bebola P ialah 200 g, jejari putaran ialah 0.5 m, kirakan halaju putaran bebola p semasa ia berputar secara mengufuk.
If weight of the load is 1.5 N, mass of the spherical P is 200 g, radius revolution is 0.5 m, calculate the velocity of the spherical P while it whirls horizontally.

$$\begin{aligned} W &= 1.5 \text{ N} \\ m &= 200 \text{ g} \\ &= 0.2 \text{ kg} \\ r &= 0.5 \text{ m} \end{aligned}$$

$$\begin{aligned} F &= \frac{mv^2}{r} \\ W &= \frac{mv^2}{r} \end{aligned}$$

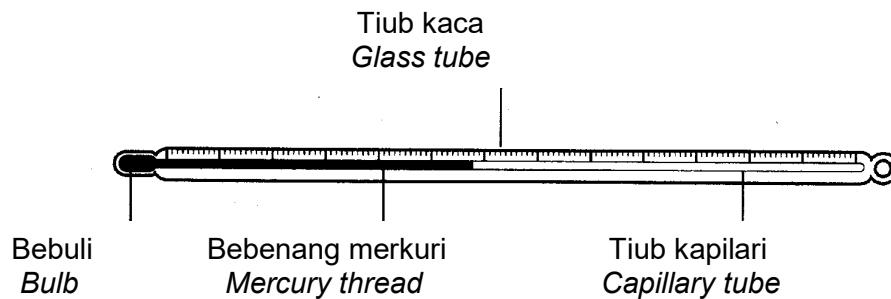
$$\begin{aligned} v &= \sqrt{\frac{Wr}{m}} = \sqrt{\frac{1.5(0.5)}{0.2}} \checkmark \\ &= \underline{1.936 \text{ ms}^{-1}} \checkmark \text{ unit!} \end{aligned}$$

[2 markah/ 2 marks]

- (ii) Nyatakan perubahan pada daya memusat bila jejari putaran dipanjangkan menjadi 1.0 m.
State the changes of the centripetal force when the revolution radius is increase to 1.0 m

centripetal force Increase : $F \propto \frac{1}{r}$
 $r \downarrow \therefore F \uparrow$ [1 markah/ 1 mark]

- 7 Rajah 7.1 menunjukkan sebuah termometer makmal yang digunakan untuk mengukur suhu suatu cecair.
 Diagram 7.1 shows a laboratory thermometer used to measure the temperature of liquid.



Rajah 7.1
 Diagram 7.1

- a) (i) Lengkapkan ayat berikut dengan menandakan (\checkmark) pada kotak yang betul.
 Complete the following sentence by ticking (\checkmark) the correct box.

Bacaan suhu dicatatkan apabila termometer dan objek mencapai
 Temperature reading is recorded when the thermometer and liquid reach

muatan haba tentu
 specific heat capacity

keseimbangan terma
 thermal equilibrium. *net flow of heat = 0 J*
same temperature

(1 markah/1 mark)

- (ii) Apakah perubahan fizikal yang berlaku terhadap merkuri apabila suhu meningkat?
 What is the physical change in the mercury when the temperature increases?

volume expands // length increase

(1 markah/1 mark)

- (iii) Terangkan prinsip kerja bagi termometer dalam mengukur suhu air panas.
 Explain the working principle of a thermometer in measuring the temperature of hot water.

① *thermometer inserted to hot water* *thermal contact*

② *heat transfer from higher temperature to low temperature*

③ *net flow of heat is zero (0 J)* (3 markah/3 marks)

④ *temperature of thermometer equal to temperature hot water*

- (iv) Berikan dua kaedah untuk meningkatkan sensitiviti termometer dalam Rajah 7.1.
Give two methods to increase the sensitivity of the thermometer in Diagram 7.1.

① narrow capillary tube - to increase in volume of mercury

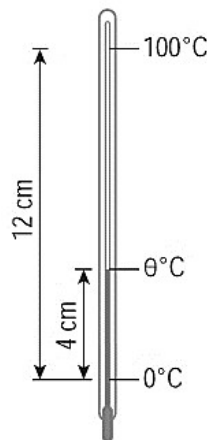
② thin glass wall - heat transfer faster

③ small scale - can detect small changes in temperature

(2 markah/2 marks)

- b) Seorang murid dikehendaki menggunakan sebuah termometer makmal yang tidak berskala untuk menentukan suhu bagi suatu larutan, θ . Panjang turus cecair dalam termometer apabila dimasukkan ke dalam larutan tersebut adalah seperti yang ditunjukkan dalam Rajah 7.2.

A student is required to use a non-scaled laboratory thermometer to determine the temperature of a solution, θ . The length of the column of liquid in the thermometer when placed in the solution is as shown in the Diagram 7.2.



Rajah 7.2
Diagram 7.2

Hitungkan suhu larutan, θ .

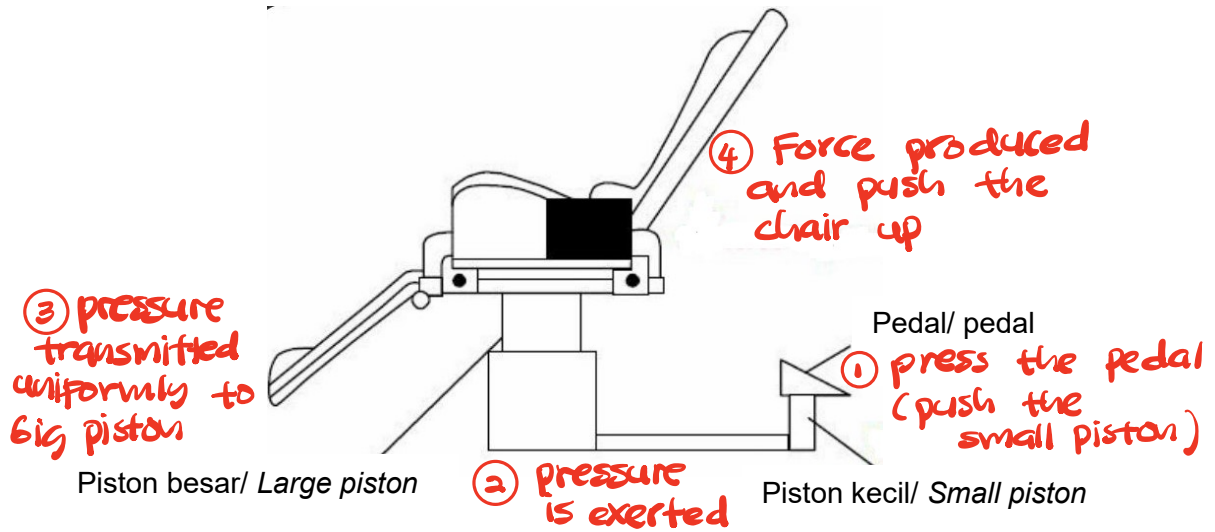
Calculate the temperature of the solution, θ .

$$T = \frac{4}{12} \times 100 \quad \checkmark_1$$

$$= 33.33^\circ\text{C} \quad \checkmark_2 \text{ unit!}$$

(2 markah/2 marks)

8. Rajah 8 menunjukkan struktur kerusi doktor gigi yang digunakan semasa memberi rawatan gigi pada kanak-kanak. Kerusi ini menggunakan sistem hidraulik.
 Diagram 8 shows a structure of a dentist chair that used when giving dental treatment for children. The chair uses a hydraulic system.



Rajah 8/ Diagram 8

- (a) Namakan prinsip fizik yang digunakan dalam sistem hidraulik.
 Name the physics principle used in a hydraulic system.

Pascal's principle

[1 markah/ 1 mark]

- (b) Mengapakah sistem ini kurang berkesan jika gelembung udara wujud dalam cecair hidraulik.
 Why is the system less effective if air bubbles are present in hydraulic fluid.

force use to compress the air bubble

[1 markah/ 1 mark]

- (c) Luas keratan rentas omboh kecil dan omboh besar masing-masing adalah 30 cm² dan 150 cm². Daya yang dikenakan pada omboh kecil untuk mengangkat seorang kanak-kanak ialah 80 N.
 The cross sectional area of the small piston and the big piston are 30 cm² and 150 cm² respectively. The force exerted on the small piston to lift up the child is 80 N.

Hitungkan jisim kanak-kanak itu.
 Calculate the mass of the child.

$$F_2 = \frac{F_1 A_2}{A_1} = \frac{80(150)}{30} = 400 \text{ N}$$

$$P_1 = P_2$$

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

$$m = \frac{400}{9.81} = 40.77 \text{ kg}$$

[2 markah/ 2 marks]

- (d) Jadual 8 menunjukkan pengubahsuaian selanjutnya yang perlu dilakukan untuk menjadikan kerusi ini sesuai dan selamat digunakan untuk orang dewasa.
Table 8 shows a further modifications need to be done to make the chair is suitable and safe for the use of adults.

Jenis kerusi <i>Type of chair</i>	Luas keratan rentas ombok kecil <i>Cross sectional area of small piston</i>	Luas permukaan tempat duduk kerusi <i>Surface area of the seater</i>
J	Bertambah <i>Increase</i>	Lebih besar <i>Bigger</i>
K	Bertambah <i>Increase</i>	Lebih kecil <i>Smaller</i>
L	Berkurang <i>Decrease</i> ✓	Lebih besar <i>Bigger</i> ✓

Jadual 8/ *Table 8*

Berdasarkan Jadual 8, nyatakan ciri yang sesuai bagi pengubahsuaian kerusi itu. Berikan sebab.

Based on Table 8, state the suitable characteristics of the modifications of the chair. Give the reasons.

- (i) Luas keratan rentas ombok kecil
Cross sectional area of small piston

small

Sebab / Reason

to produce bigger force at the big piston

[2 markah/ 2 marks]

- (ii) Surface area of the seater
Luas permukaan tempat duduk

higher

Sebab/ Reason

Withstand greater force

[2 markah/ 2 marks]

- (e) Berdasarkan jawapan di 8(d), tentukan kerusi yang paling sesuai.
Based on the answer in 8(d), determine the most suitable chair.

L

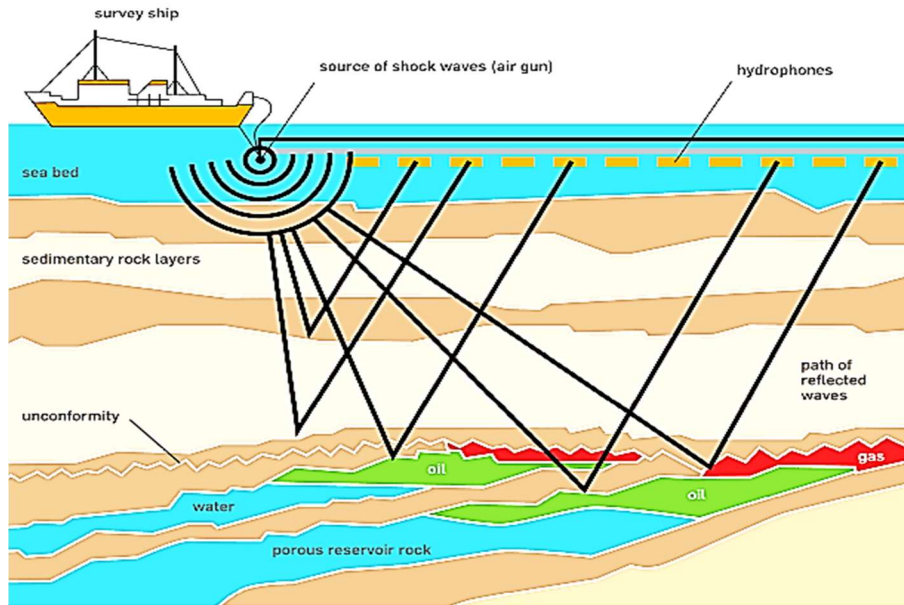
[1 markah/ 1 mark]

18
Bahagian B
Section B

[20 markah]
 [20 marks]

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

9. Rajah 9 menunjukkan denyutan gelombang seismik yang dihalakan ke arah pusat bumi untuk mengenal pasti kawasan yang mempunyai sumber gas asli.
 Diagram 9 shows the pulses of seismic waves directed towards the center of the earth to identify areas that have natural gas resources.



① transmitter from ship transmit signal to the sea
 ② signal reflected from the obstacle

③ receiver capture the signal
 ④ location of natural gas detected using CRO
 $s = \frac{vt}{2}$

Rajah 9
 Diagram 9

- a) (i) Namakan fenomena gelombang yang terlibat ?
 Name the phenomenon of wave involved?
reflection [1 markah/ 1 mark]
- (ii) Terangkan bagaimana denyutan gelombang seismik boleh digunakan untuk mengenal pasti kawasan yang mempunyai sumber gas asli.
 Explain how the pulses of seismic waves can be used to identify areas that have natural gas resources.
 [4 markah/ 4 marks]
- b) Satu alur sonar dengan kelajuan 1200 ms^{-1} dihantar ke dasar laut dari sebuah kapal.
 A sonar beam at a speed of 1200 ms^{-1} was sent into the seabed from a ship.

Hitung
 Calculate

- (i) Kedalaman dasar laut jika gema diterima balik selepas 50 milisaat.
 Depth of the seabed if the echoes are received back at 50 milliseconds.

$$s = \frac{vt}{2} = \frac{1200 (50 \times 10^{-3})}{2}$$

[3 markah/ 3 marks]

$$= 30 \text{ m}$$

(ii) Panjang gelombang untuk gelombang sonar apabila frekuensi ialah 25 kHz.

The wavelength of the sonar waves when its frequency is 25 kHz.

$$f = 25 \text{ kHz} \\ = 25 \times 10^3 \text{ Hz}$$

$$v = f \lambda$$

$$\lambda = \frac{v}{f} = \frac{1200}{25 \times 10^3} = 0.048 \text{ m}$$

[2 markah/ 2 marks]

c) Dua bilik darjah di sekolah anda digabungkan untuk menjadi sebuah dewan kuliah. Jadual 9 menunjukkan empat jenis sistem bunyi yang akan digunakan dalam dewan kuliah tersebut.

The two classrooms in your school are combined to form one lecture hall.

Table 9 shows the four types of sound systems that will be used in the lecture hall.

Sistem bunyi <i>Sound system</i>	Lantai dewan <i>Hall flooring</i>	Jarak di antara kedua-dua pembesar suara <i>The distance between two loudspeakers</i>	Bahan yang digunakan untuk menutup dinding <i>The material used to cover the wall</i>	Kedudukan mikrofon <i>The position of the microphone</i>
P	Simen <i>Cement</i>	Kecil <i>Low</i>	Tirai tebal <i>Thick curtain</i> ✓	Di belakang pembesar suara <i>Behind the speaker</i>
Q	Permaidani <i>Carpet</i> ✓	Besar <i>Big</i> ✓	Tirai tebal <i>Thick curtain</i> ✓	Di belakang pembesar suara <i>Behind the speaker</i> ✓
R	Simen <i>Cement</i>	Besar <i>Big</i> ✓	Kayu keras <i>Hardwood</i>	Di hadapan pembesar suara <i>In front of the speaker</i>
S	Permaidani <i>Carpet</i> ✓	Kecil <i>Low</i>	Kayu keras <i>Hardwood</i>	Di hadapan pembesar suara <i>In front of the speaker</i>

Jadual 9
Table 9

Anda dikehendaki menyiasat reka bentuk sistem bunyi untuk menghasilkan kualiti bunyi yang lebih baik. Terangkan kesesuaian setiap ciri pada sistem bunyi tersebut. Tentukan sistem bunyi yang paling sesuai. Berikan sebab-sebab pilihan anda.

You are asked to investigate the design of the sound system to produce better quality of sound. Explain the suitability of each characteristic of the sound system. Determine the most suitable sound system. Give reasons for your choice.

[10 markah/ 10 marks]



ASPEK	JAWAPAN	SEBAB
Bahan untuk dinding (Material for the wall)	Papan lembut (Softboard)	Menyerap gelombang bunyi/ elak gema (Absorb sound waves/ avoid echo)
Kedudukan mikrofon (Position of microphone)	Belakang pembesar suara (Back of speakers)	Elakkan 'bising' (Avoid Noise)
Jenis mikrofon (Type of microphone)	Mikrofon tanpa wayar (Wireless microphone)	Bebas bergerak (free to move)
Kedudukan pembesar suara (Position of speakers)	Tinggi (High)	Elakkan halangan (Avoid obstacle)
Jarak antara dua pembesar suara (Distance between two speakers)	Jauh (Far)	Jarak antara dua bunyi kuat berturutan, x adalah dekat. (Distance between two consecutive loud sounds short)

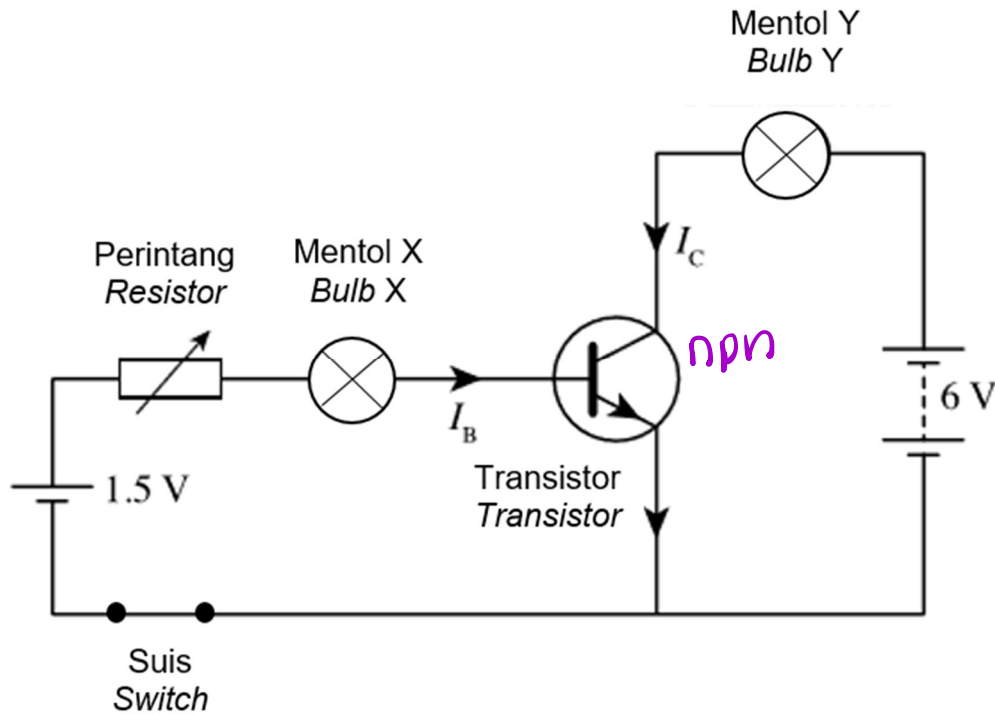
^{✓1} carpet: absorb sound // reduce reflection
^{✓2} of sound
 distance 2 ^{✓3} speakers ^{✓4} big: decrease the distance between
 2 consecutive loud sound
^{✓5} thick curtain: reduce echo
^{✓6}
 microphone ^{✓7} behind the speakers: ^{✓8} avoid noise // distraction

Q	Permaidani Carpet ✓	Besar Big ✓	Tirai tebal ✓ Thick curtain	Di belakang pembesar suara Behind the speaker ✓
---	------------------------	----------------	--------------------------------	--

✓9

✓10

- 10 Rajah 10.1 menunjukkan litar bertransistor yang mengandungi mentol X dan mentol Y.
Diagram 10.1 shows a transistor circuit containing bulb X and bulb Y.



Rajah 10.1
Diagram 10.1

- a) (i) Nyatakan jenis transistor yang digunakan dalam Rajah 10.1.
State the type of transistor used in Diagram 10.1.
npn transistor (1 markah/ 1 mark)
- (ii) Mentol manakah yang akan menyala dengan terang?
Berikan sebab kepada jawapan anda.
Which bulb will light up brightly? *bulb Y*
Give a reason for your answer. *$I_C > I_B$* (2 markah/ 2 marks)
- (iii) Apakah yang berlaku kepada nyalaan mentol Y jika suis dibuka?
Terangkan jawapan anda.
What will happen to the light of bulb Y when the switch is opened?
Explain your answer. *not light up*
no I_B flow (2 markah/ 2 marks)
- b) Rajah 10.2 menunjukkan empat litar elektronik W, X, Y dan Z dengan spesifikasi yang berbeza. Anda dikehendaki menentukan litar elektronik yang paling sesuai untuk menyalakan ketiga-tiga lampu jalan 95 V, 65 W secara automatik dengan kecerahan normal apabila keadaan gelap.
Diagram 10.2 shows four electronic circuits W, X, Y and Z with different specifications. You are required to determine the most suitable electronic circuit to light up three street lights 95 V, 65 W automatically with normal brightness when it is dark.

Litar Circuit	Rajah litar Circuit diagrams
<p style="text-align: center; background-color: yellow; border-radius: 50%; width: 30px; margin: 0 auto;">W</p>	
<p style="text-align: center;">X</p>	
<p style="text-align: center;">Y</p>	
<p style="text-align: center;">Z</p>	

Rajah 10.2
Diagram 10.2

Kaji semua spesifikasi tersebut berdasarkan aspek-aspek berikut:
 Study the specifications of all of the four circuits based on the following aspects:

- (i) Kedudukan perintang peka cahaya (PPC). *• below*
 The position of the light dependent resistor (LDR). *- Resistance LDR Increase*
- (ii) Penyambungan bateri.
 The connection of the batteries. *• use dry cell to*
- (iii) Susunan litar lampu-lampu jalan. *n-type s/c - forward bias*
 The arrangement of the street lights circuit. *parallel*
- (iv) Penggunaan suis geganti dalam litar. *- one broken, another still function*
 The use of a relay switch in the circuit. *yes*

to switch on secondary circuit

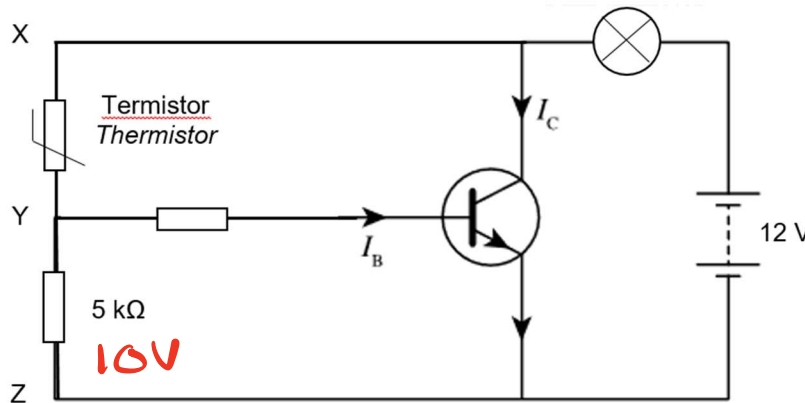
Tentukan gambarajah litar yang paling sesuai dipilih dan berikan satu sebab bagi pilihan anda.

Determine the most suitable circuit diagram to be chosen and give one reason for your choice.

(10 markah/ 10 marks)

- (c) Rajah 10.3 menunjukkan satu litar transistor sebagai suis automatik yang dikawal oleh sebuah termistor. Mentol akan menyala apabila beza keupayaan merentasi perintang 5 kΩ ialah 10 V.

Diagram 10.3 shows a transistor circuit as an automatic switch controlled by a thermistor. The bulb lights up when the potential difference across the 5 kΩ resistor is 10 V.



Rajah 10.3
 Diagram 10.3

ii) V = IR
I_B = V/R

= 10/5000 = 2 x 10⁻³ A

*iii) V₂ = (R₂ / (R₂ + R_T)) * 12*

10(5k) + 10R_T = 60k
10R_T = 10k
R_T = 1kΩ

Hitungkan,
 Calculate,

- (i) beza keupayaan merentasi titik X dengan titik Y.
 the potential difference between point X and point Y.

12V

(1 markah/ 1 mark)

- (ii) arus, I_B yang diperlukan untuk membolehkan transistor dihidupkan.
 current, I_B required to turn on the transistor.

(2 markah/ 2 marks)

- (iii) rintangan termistor apabila mentol itu menyala.
 the resistance of thermistor when the bulb is light up.

(2 markah/ 2 marks)

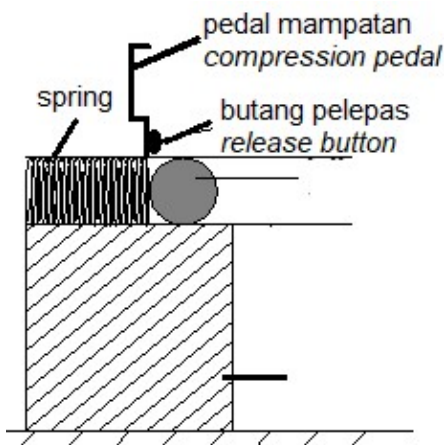
Bahagian C
Section C

[20 markah]
[20 marks]

Jawab hanya **satu** soalan dalam bahagian ini
Answer only one question in this section

- 11 Rajah 11.1 menunjukkan satu alat yang boleh melepaskan bola dengan laju setelah menekan butang pelepas disebabkan oleh mampatan spring yang lebih mampat
Diagram 11.1 shows a tool which can release a ball faster after pressing the release button due to more compression on the spring

Rajah 11.2 menunjukkan satu alat yang boleh melepaskan bola dengan perlahan setelah menekan butang pelepas disebabkan oleh mampatan spring yang kurang mampat.
Diagram 11.2 shows a tool which can release a ball slower after pressing the release button due to less compression on the spring

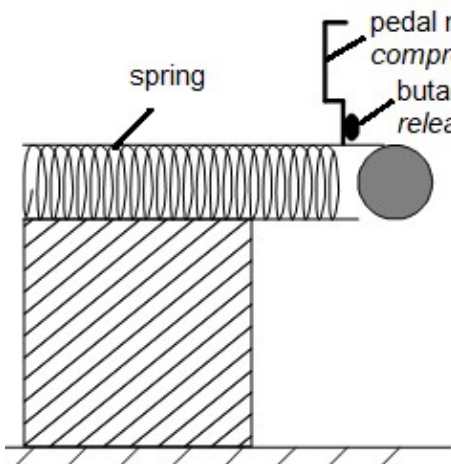


Rajah 11.1
Diagram 11.1

elastic potential energy : Diagram 11.1 > Diagram 11.2

speed : Diagram 11.1 > Diagram 11.2

distance : Diagram 11.1 > Diagram 11.2



Rajah 11.2
Diagram 11.2

- a) Apakah hukum yang menerangkan hubungan di antara mampatan spring dan daya yang dikenakan
What law explains the relation between the compression of the spring and the applied force?

Hooke's Law

[1 markah/ 1 mark]

- b) Berdasarkan Rajah 11.1 dan Rajah 11.2,
Based on Diagram 11.1 and Diagram 11.2,

- (i) bandingkan tenaga keupayaan kenyal dalam spring, halaju bola apabila dilepaskan dan jarak yang dilalui oleh bola apabila dilepaskan
compare the elastic potential energy in the spring, the speed of the ball after being ejected, the distance travelled by the ball after ejection

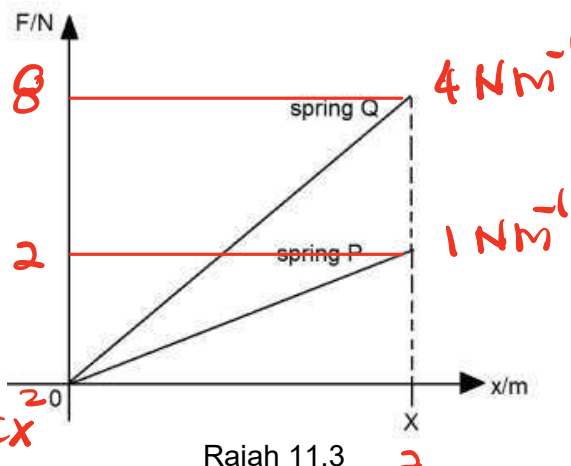
[3 markah/ 3 marks]

- (ii) Nyatakan hubungan antara jarak mampatan spring dengan halaju bola selepas dilepaskan dan jarak yang dilalui bola apabila dilepaskan
State the relationship between distance of the compression of the spring with the speed of the ball after being ejected and the distance travelled by the ball after ejection

distance compression decrease, speed increase.
 distance compression decrease, distance travel increase

[2 markah/ 2 marks]

- c) Rajah 11.3 menunjukkan graf daya, F melawan pemanjangan, x bagi dua spring berbeza yang sama panjang, P dan Q.
Diagram 11.3 shows a force, F against extension, x graph for two varies spring but same length, P and Q



Rajah 11.3
 Diagram 11.3

$\uparrow E_k = \frac{1}{2} Fx = \frac{1}{2} kx^2$

- (i) Berdasarkan Rajah 11.3:
Based on Diagram 11.3:

Tentukan spring yang mana mempunyai tenaga keupayaan kenyal dan pemalar spring yang tinggi
Determine which spring has the greater elastic potential energy and spring constant.

spring Q

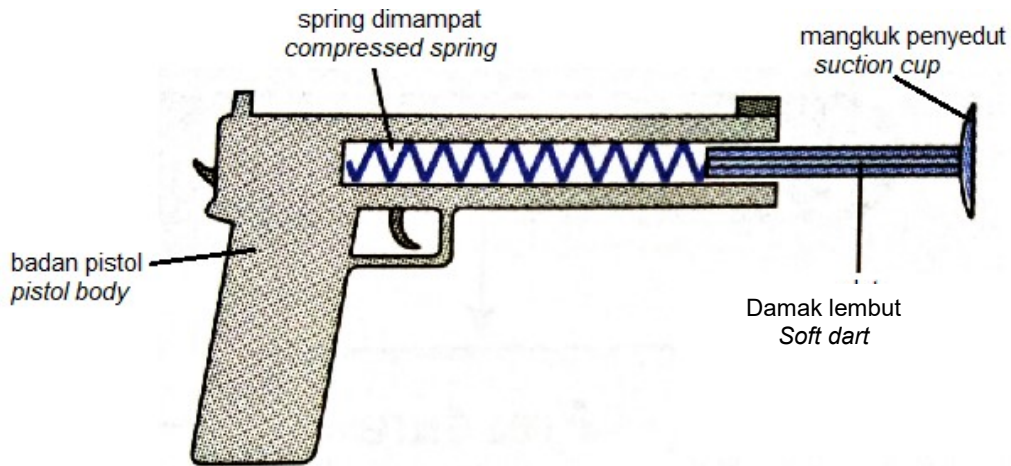
[1 markah/ 1 mark]

- ① Q is stiffer than P
 ② area under the graph $Q > P$
 ③ spring constant increase \Rightarrow E_p increase

- (ii) Terangkan jawapan anda dalam 11 (c) (i). Dalam penerangan anda, nyatakan hubungan antara tenaga keupayaan kenyal dan pemalar spring.
 Explain your answer in 11(c) (i). In your explanation, state the relationship between elastic potential energy and spring constant.

[3 markah/ 3 marks]

- d) Rajah 11.4 menunjukkan pistol damak mainan yang boleh melepaskan damak lembut ke arah papan sasaran
 Diagram 11.4 shows a toy dart gun which can release the soft dart toward the dart board



Rajah 11.4
 Diagram 11.4

Berdasarkan pengetahuan konsep fizik, anda dikehendaki mengubahsui ciri-ciri yang sesuai untuk pistol damak mainan itu menembak lebih jauh dan tepat.

Cadangan ciri-ciri seperti dibawah:

Based on the knowledge of physics concepts, you are required to modify the suitable characteristics for the toy dart gun to shoot farther and more accurately.

Suggested characteristics are as below:

- kekenyalan spring *higher = stiffer*
 elasticity of the spring
- ketumpatan damak lembut *lower = low density // can move at higher speed*
 density of the soft dart
- badan damak *aerodynamic*
 body of the soft dart
- mangkuk penyedut *= reduce air resistance // increase speed*
 the suction cup
- bahan badan pistol *strong = durable*
 material of pistol body

[10 markah/10 marks]

low density = easy to carry / handle

SOALAN TAMAT
 END OF QUESTION

**MAKLUMAT UNTUK CALON
INFORMATION FOR CANDIDATES**

1. Kertas soalan ini mengandungi **tiga** bahagian: **Bahagian A**, **Bahagian B** dan **Bahagian C**.
*This question paper consists of **three** sections: **Section A**, **Section B** and **Section C**.*
2. Jawab **semua** soalan dalam **Bahagian A** dan **Bahagian C**. Jawapan anda bagi **Bahagian A** hendaklah ditulis pada ruang yang disediakan dalam kertas soalan ini dan Jawapan anda bagi **Bahagian C** hendaklah ditulis dalam helaian tambahan yang dibekalkan oleh pengawas peperiksaan
*Answer **all** questions in **Section A** and **Section C**. Write your answer for **Section A** in the spaces provided in the question paper and Write your answer for **Section C** on the additional sheets provided by the invigilators*
3. Jawab **satu** soalan daripada **Bahagian B**. Jawapan anda bagi **Bahagian B** hendaklah ditulis dalam helaian tambahan yang dibekalkan oleh pengawas peperiksaan.
*Answer **one** question from **Section B**.
Write your answer for **Section B** on the additional sheets provided by the invigilators.*
4. Tunjukkan kerja mengira, ini membantu anda mendapatkan markah.
Show your working, it may help you to get marks.
5. Jika anda hendak menukar sesuatu jawapan, batalkan jawapan yang telah dibuat. Kemudian, tulis jawapan yang baru.
If you wish to change your answer, cross out the answer that you have done. Then, write down the new answer.
6. Rajah yang mengiringi soalan tidak dilukiskan mengikut skala kecuali dinyatakan.
The diagrams in the questions provided are not drawn to scale unless stated.
7. Satu senarai formula disediakan di halaman 2 dan 3.
A list of formulae is provided on page 2 and 3.
8. Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.
The marks allocated for each question or part question are shown in brackets.
9. Anda dinasihatkan supaya mengambil masa 90 minit untuk menjawab soalan dalam **Bahagian A**, 30 minit untuk **Bahagian B** dan 30 minit untuk **Bahagian C**
*You are advised to spend 90 minutes to answer questions in **Section A**, 30 minutes for **Section B** and 30 minutes **Section C**.*
10. Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogramkan.
You may use a non-programmable scientific calculator.
11. Ceraikan **Bahagian B** dan **Bahagian C** daripada kertas soalan ini. Ikat helaian tambahan bersama - sama kertas soalan ini dan serahkan kepada pengawas peperiksaan pada akhir peperiksaan.
*Detach **Section B** and **Section C** from this question paper. Tie additional sheets together with this question paper and hand in to the invigilator at the end of the examination.*