



KEMENTERIAN  
PENDIDIKAN  
MALAYSIA

[4531]

# WAY TO SCORE PHYSICS SPM

Q5 | Q6 | Q7 | Q8 | SEC B | SEC C



# PAPER 2 & 3

Name: \_\_\_\_\_

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GURU CEMERLANG FIZIK

Kementerian Pendidikan Malaysia

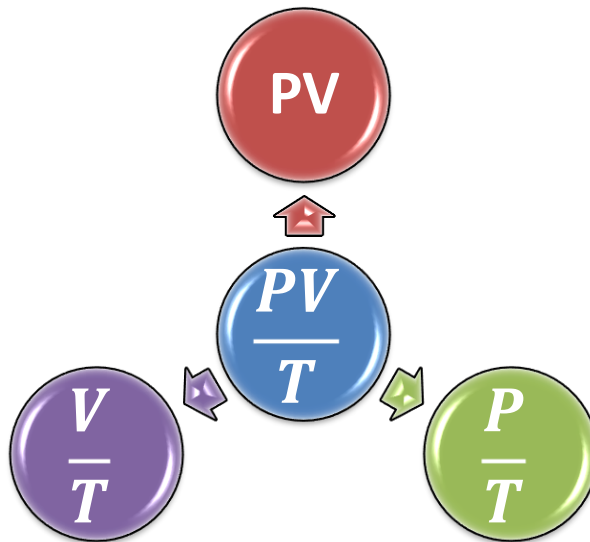
**Convert Prefixes: "P – P"**



**Must memorize:**

T	G	M	k	d	c	m	μ	n	p
12	9	6	3	-1	-2	-3	-6	-9	-12

**THE GAS LAWS: "Read ABC – P&P"**

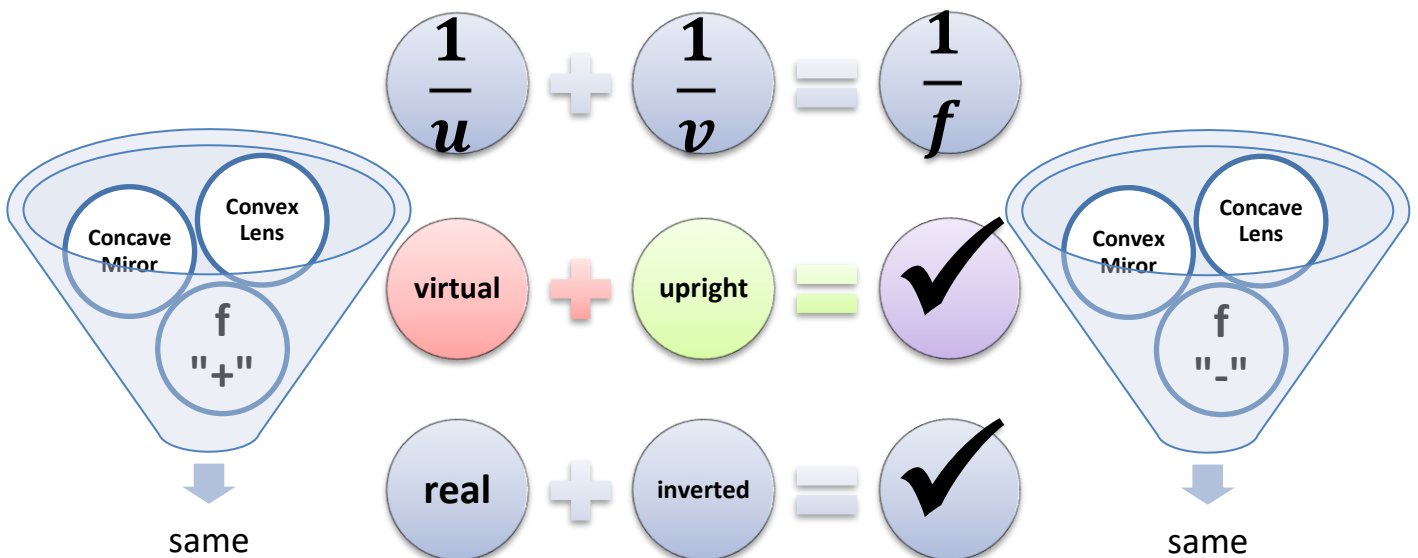


**Boyle's law**

**Charles' law**

**Pressure law**

**The characteristics of an image formed: "Let's Calculate it!"**



## **Paper 2: Section A – 60 marks**

- Consists of 8 questions. Must answer all the 8 questions.
- Total marks are 60.
- **Read** the question at least **twice & highlight the key words**.
- Answer questions that you are most confidence and sure of **First**.
  - **Answer slowly** to make sure the **score**.
- **1M** only a **short answer**.
- **2M & 3M** must have working steps.
- **3M & above** complete the diagram or explanations.
- Write down all the answer and working steps in the **space provided**.
- **Don't add extra line for the answer**.
- **Don't write extra answer or more than required**.
- Comparison question **can use symbol**: > or < to answer.
- Decision making question **cannot answer with number** but answer with: higher, lower, bigger, smaller...
- **Relationship question can use keyword**: directly proportional, inversely proportional, or when \_\_\_\_\_ higher, the \_\_\_\_\_ higher or lower.
- **Definition can use formula (for some cases only)**: density = mass / volume, velocity = displacement / time
- **Can answer without unit (not encouraging)**.
- **Must score Q5(8m), Q6(8m), Q7(10m) & Q8(12m). (38/60)**

**SPM 2018, Paper 2, Question 5 (8m) (Section A)**

5 Diagram 5 shows how water is supplied to a house from an outdoor storage tank. The water pipe in the house leaks at two points, P and Q.

Rajah 5 menunjukkan cara air dibekalkan ke sebuah rumah dari sebuah tangki simpanan di luar rumah. Paip air di dalam rumah bocor pada dua kedudukan, P dan Q.

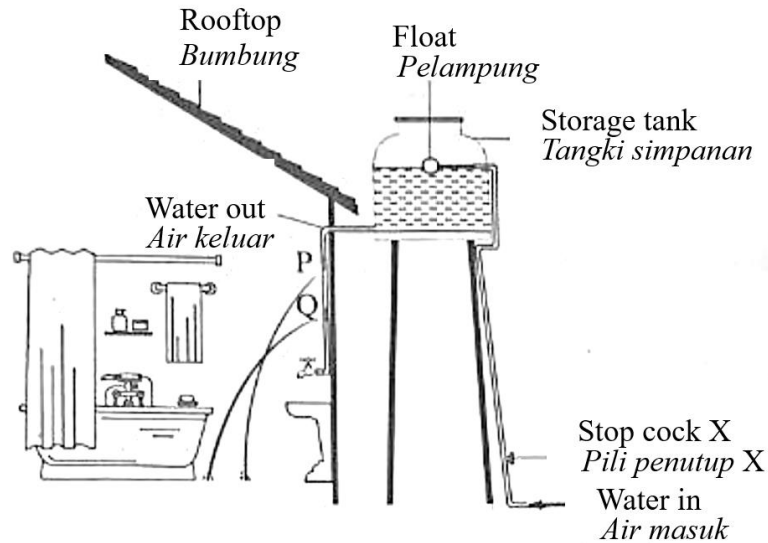


Diagram 5

(a) What is the meaning of pressure?

Apakah yang dimaksudkan dengan tekanan?

[1 mark]

[1 markah]

(b) Based on Diagram 5, compare

Berdasarkan Rajah 5, bandingkan

(i) the depth of water at point P and Q.

kedalaman air pada kedudukan P dan kedudukan Q.

[1 mark]

[1 markah]

(ii) the horizontal distance of water spurting out from point P and point Q.

jarak mengufuk pancutan air yang keluar dari kedudukan P dan kedudukan Q.

[1 mark]

[1 markah]

(iii) the pressure of water at point P and point Q.

tekanan air pada kedudukan P dan kedudukan Q.

[1 mark]

[1 markah]

(c) Based on the answers in 5(b),

*Berdasarkan jawapan dalam 5(b),*

(i) Relate the pressure of water with the horizontal distance of water spurting out.

*Hubungkaitkan tekanan air dengan jarak mengufuk pancutan air.*

---

[1 mark]

[1 markah]

(ii) State the relationship between the pressure and the depth of water.

*Nyatakan hubungan antara tekanan dengan kedalaman air.*

---

[1 mark]

[1 markah]

(iii) the pressure of water at point P and point Q.

*tekanan air pada kedudukan P dan kedudukan Q.*

---

[1 mark]

[1 markah]

(d) To prevent wastage of water, stop cock X at the pipe that supplies water to the storage tank is turned off.

What will happen to the distance of water spurting out from point Q?

Give **one** reason for your answer.

*Bagi mengelakkan pembaziran air, pili penutup X pada paip yang membekalkan air ke tangki simpanan ditutup.*

*Apakah yang akan berlaku kepada jarak mengufuk pancutan air dari kedudukan Q?*

*Berikan **satu** sebab bagi jawapan anda.*

---

[2 marks]

[2 markah]

**SPM 2010, Paper 2, Question 6 (8m) (Section A)**

- 6 Diagram 6.1 and Diagram 6.2 shows a study on a sound wave.  
*Rajah 6.1 dan Rajah 6.2 menunjukkan suatu kajian mengenai gelombang bunyi.*

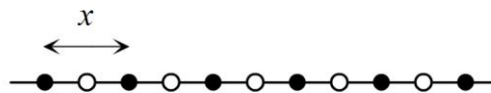
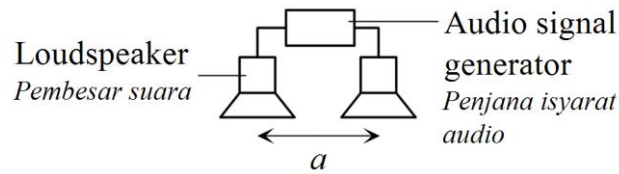


Diagram 6.1  
*Rajah 6.1*

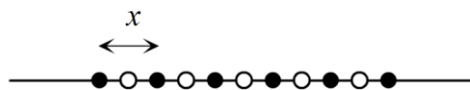
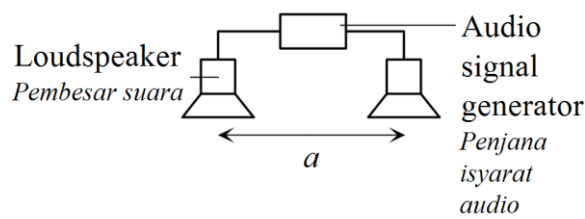


Diagram 6.2  
*Rajah 6.2*

- (a) Observe Diagram 6.1 and Diagram 6.2.  
*Perhatikan Rajah 6.1 dan Rajah 6.2.*
- (i) Compare the distance,  $x$ , between two consecutive loud sounds.  
*Bandingkan jarak,  $x$ , di antara dua bunyi kuat yang berturutan.*

---

[1 mark]  
[1 markah]

- (ii) Compare the distance,  $a$ , between the two loudspeakers.  
*Bandingkan jarak,  $a$ , di antara dua pembesar suara itu.*

---

[1 mark]  
[1 markah]

(iii) State the relationship between  $a$  and  $x$ .

*Nyatakan hubungan di antara  $a$  dan  $x$ .*

---

[1 mark]

[1 markah]

(iv) Name the physics phenomenon involved.

*Namakan fenomena fizik yang terlibat.*

---

[1 mark]

[1 markah]

(v) State the principle involved in 6(a)(iv).

*Nyatakan prinsip yang terlibat dalam 6(a)(iv).*

---

[1 mark]

[1 markah]

(b) What will happen to the distance between two consecutive loud sounds if the frequency of the audio signal generator is increased?

*Apakah yang akan berlaku kepada jarak di antara dua bunyi kuat yang berturutan jika frekuensi penjana isyarat audio ditinggikan?*

---

[1 mark]

[1 markah]

(c) Give **one** reason for the answer in 6(b).

*Berikan **satu** sebab bagi jawapan di 6(b).*

---

[1 mark]

[1 markah]

(d) Underline the correct answer in the bracket to complete the sentence below.

*Garis jawapan yang betul dalam kurungan untuk melengkapkan ayat di bawah.*

Two waves are coherent if they have the (same, different) phase.

*Dua gelombang adalah koheren jika kedua-duanya mempunyai fasa yang (sama, berbeza).*

[1 mark]

[1 markah]

**SPM 2013, Paper 2, Question 7 (10m) (Section A)**

- 7 Diagram 7 shows a load hung on a spring.  
*Rajah 7 menunjukkan satu beban digantung pada satu spring.*

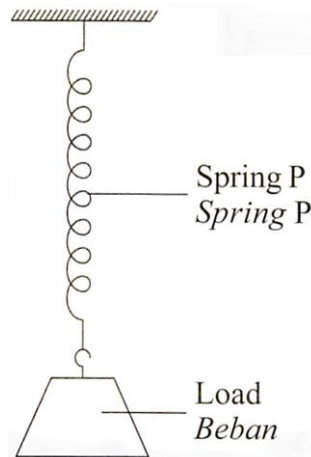


Diagram 7  
*Rajah 7*

- (a) The mass of the load can be determined by using the formula  $F=kx$ , where  $F$  is force,  $k$  is spring constant and  $x$  is extension of spring.

*Jisim beban boleh ditentukan dengan menggunakan formula  $F=kx$ , di mana  $F$  adalah daya,  $k$  adalah pemalar spring dan  $x$  adalah pemanjangan spring.*

- (i) Name the physics law related to the above formula.

*Namakan hukum fizik yang terlibat dengan formula di atas.*

[1 mark]

[1 markah]

- (ii) The mass of the load is 1 kg.

Calculate the spring constant of spring P when the extension of the spring is 2 cm.

*Jisim beban adalah 1 kg.*

*Hitung pemalar spring bagi spring P apabila pemanjangan spring itu adalah 2 cm.*

[2 marks]

[2 markah]

(b) Spring P breaks when it is used to hang a heavy load.

Suggest a modification that can be made to hang the heavy load through these aspects:

*Spring P putus apabila digunakan untuk menggantung beban berat.*

*Cadangkan satu pengubahsuaian yang boleh dibuat untuk menggantung beban yang berat melalui aspek-aspek berikut:*

(i) Stiffness of the spring

*Kekerasan spring*

---

Reason

*Sebab*

---

[2 marks]

[2 markah]

(ii) Thickness of the wire

*Ketebalan dawai*

---

Reason

*Sebab*

---

[2 marks]

[2 markah]

(iii) Type of material

*Jenis bahan*

---

Reason

*Sebab*

---

[2 marks]

[2 markah]

(c) Another identical spring, Q is used to hang the heavy load.

Suggest the arrangement of these springs to hang the heavy load without breaking the springs.

*Satu lagi spring yang serupa, Q digunakan untuk menggantung beban yang berat.*

*Cadangkan susunan spring bagi spring-spring tersebut untuk menggantung beban yang berat tanpa memutuskan spring-spring itu.,*

---

[1 mark]

[1 markah]

**SPM 2017, Paper 2, Question 8 (12m) (Section A)**

8 Diagram 8 shows how electricity is transmitted from power station to a school using transmission cables and transformers.

Rajah 8 menunjukkan bagaimana elektrik dihantar dari stesen janakuasa ke sekolah menggunakan kabel penghantaran dan transformer.

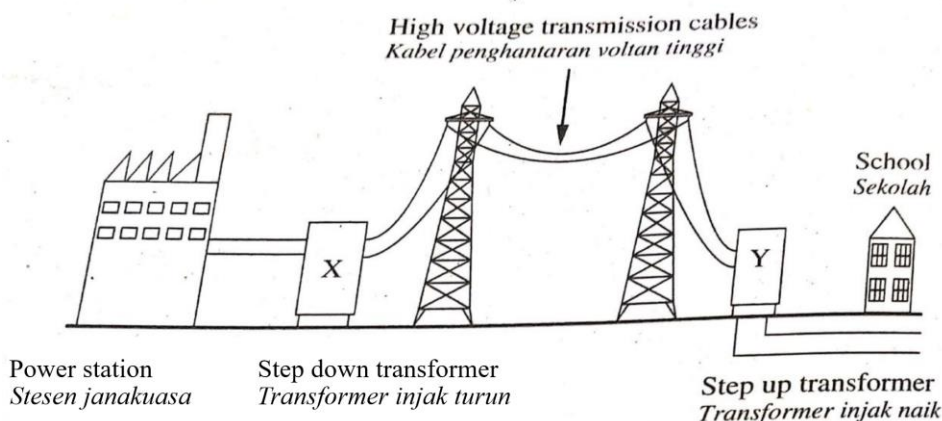


Diagram 8  
Rajah 8

- (a) State **one** characteristic of the material that is used to make the transmission cables.  
*Nyatakan **satu** ciri bahan yang digunakan untuk membuat kabel penghantaran.*

[1 mark]

[1 markah]

- (b) The output power and the output voltage at the transmission cables are 10 MW and 132 kV, respectively. The total resistance of the transmission cables is 600  $\Omega$ .  
*Kuasa output dan voltan output pada kabel penghantaran masing-masing ialah 10 MW dan 132 kV.  
Jumlah rintangan kabel penghantaran ialah 600  $\Omega$ .*

Calculate,  
*Hitung,*

- (i) the current flow through the cable  
*arus yang mengalir melalui kabel.*

[2 marks]

[2 markah]

- (ii) the power loss in the cable.  
*kehilangan kuasa dalam kabel itu.*

[2 marks]

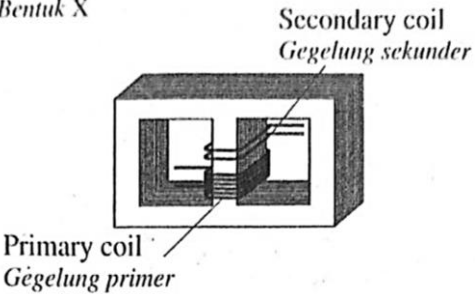
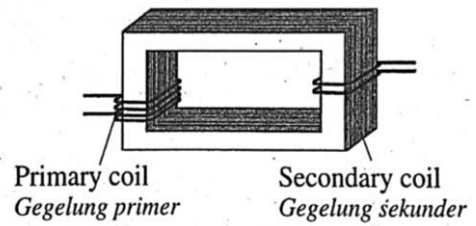
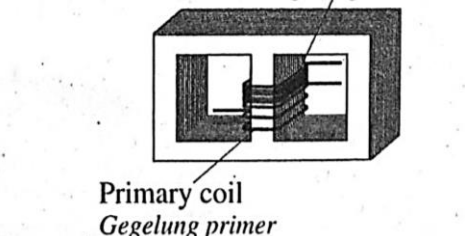
[2 markah]

- (c) In the school laboratory, a step-down transformer is used to light up a 12 V bulb. P, Q and R are three different step-down transformers that can be used to step down the voltage from 240 V to 12 V.

Table 2 shows the characteristics of those transformers.

*Dalam makmal sekolah, sebuah transformer injak turun digunakan untuk menyalakan mentol 12 V. P, Q dan R adalah tiga transformer injak turun yang berlainan yang boleh digunakan untuk menurunkan voltan dari 240 V kepada 12 V.*

*Jadual 2 menunjukkan ciri-ciri bagi transformer tersebut.*

Transformer Transformer	Material of the core <i>Bahan untuk teras</i>	Shape of the core <i>Bentuk teras</i>	$N_P : N_S$
P	Iron <i>Besi</i>	Shape X <i>Bentuk X</i> 	1 : 20
Q	Soft iron <i>Besi lembut</i>	Shape Y <i>Bentuk Y</i> 	16 : 1
R	Soft iron <i>Besi lembut</i>	Shape X <i>Bentuk X</i> 	20 : 1

**Table 2**  
**Jadual 2**

Based on Table 2, state the suitable characteristics of the transformer which can light up the bulb with normal brightness and least energy loss.

Give reason for the suitability of the characteristics.

*Berdasarkan Jadual 2, nyatakan kesesuaian ciri-ciri transformer yang digunakan untuk menyalakan mentol dengan kecerahan normal dan kehilangan tenaga yang paling kecil.*

*Beri sebab untuk kesesuaian ciri-ciri tersebut.*

(i) Material of the core

*Bahan untuk teras*

Reason:

*Sebab:*

[2 marks]

[2 markah]

(ii) Shape of the core

*Bentuk teras*

Reason:

*Sebab:*

[2 marks]

[2 markah]

(iii)  $N_P : N_S$

Reason:

*Sebab:*

[2 marks]

[2 markah]

(iv) Based on the answer in **8(c)(i)**, **8(c)(ii)** and **8(c)(iii)**, choose the most suitable transformer.

*Berdasarkan jawapan di **8(c)(i)**, **8(c)(ii)**, dan **8(c)(iii)**, pilih transformer yang paling sesuai.*

[1 mark]

[1 markah]

**Paper 2: Section B – 20 marks**

- Consists of 2 questions. Answer only **1** question.
- Total marks are 20.
- Can answer both questions, only a **higher score** is **counted** for result.
- **4M** explanation question based on a diagram of a situation, application or phenomenon. **Can use diagram for explanation.**
- **5M** normally given diagram for **observe, compare** and **relate** to a specific Physics concept.
- Comparison **can use symbol**: “>” or “<” to answer.
- **Relationship can use keyword**: directly proportional, inversely proportional, or when \_\_\_\_\_ higher, the \_\_\_\_\_ higher or lower.

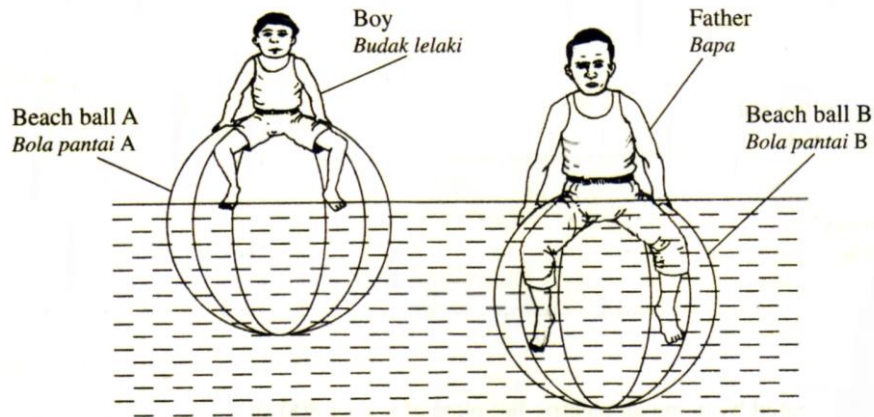
- **10M** problem solving by giving suggestions. Answer in table form:

<b>Suggestions</b>	<b>Explanation</b>
1.	1. 2.
2.	1.
3.	1. 2.
4.	1.
5.	1.

- **Can repeat same explanation** for different suggestion.
- **Can give more explanations.**

**SPM 2010, Paper 2, Question 9 (Section B)**

- 9 Diagram 9.1 shows a boy and his father sitting on two identical beach balls, A and B, respectively.  
*Rajah 9.1 menunjukkan seorang budak lelaki dan bapanya, masing-masing duduk di atas dua bola pantai, A dan B, yang serupa..*



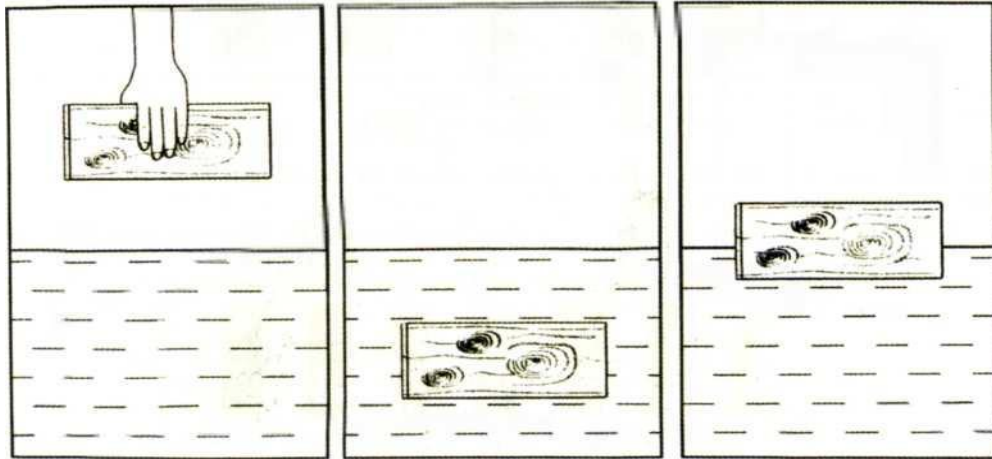
**Diagram 9.1**  
**Rajah 9.1**

Their weights are balanced by the buoyant force.  
*Berat mereka diseimbangkan oleh daya apung.*

- (a) What is the meaning of weight? [1 mark]  
*Apakah maksud berat?* [1 markah]
- (b) (i) Using Diagram 9.1, compare the weight of the boy and his father, the volume of the water displaced and the buoyant force acted on both of them. [3 marks]  
*Menggunakan Rajah 9.1, bandingkan berat budak lelaki itu dengan bapanya, isi padu air yang disesarkan dan daya apung yang bertindak ke atas kedua-dua mereka.* [3 markah]
- (ii) State the relationship between the buoyant force and:  
*Nyatakan hubungan antara daya apung dengan:*
- (a) The volume of water displaced.  
*Isipadu air yang disesarkan*
- (b) The weight of water displaced. [2 marks]  
*Berat air yang disesarkan.* [2 markah]
- (iii) Name the physics principle involved. [1 mark]  
*Namakan prinsip fizik yang terlibat.* [1 markah]

- (c) Diagram 9.2 shows what happens when a wooden block is held above the water surface and then released into the water.

*Rajah 9.2 menunjukkan apa yang berlaku apabila sebuah blok kayu dipegang di atas permukaan air dan kemudian dilepaskan ke dalam air.*



**Diagram 9.2**

**Rajah 9.2**

When the wooden block is released, it falls into the water and goes completely under the water surface. Then it moves upwards and floats on the water surface.

Using the concept of buoyant force, explain why the wooden block moves upwards and then floats on the water surface. [3 marks]

*Apabila blok kayu dilepaskan, blok itu jatuh ke dalam air dan tenggelam sepenuhnya di bawah permukaan air. Kemudian blok itu bergerak ke atas dan terapung pada permukaan air.*

*Dengan menggunakan konsep daya apung, terangkan mengapa blok kayu itu bergerak ke atas dan kemudian terapung pada permukaan air.* [3 markah]

- (d) The State Forestry Department is going to organise a raft competition. As a team leader, you are required to give some suggestions to design a raft which can accommodate 15 participants and be able to move quickly in water.

Using your knowledge of motion, forces and properties of materials, state and explain the suggestions, based on the following aspects:

*Jabatan Perhutanan Negeri akan menganjurkan pertandingan berakit. Sebagai ketua pasukan, anda dikehendaki memberikan cadangan dalam mereka bentuk sebuah rakit yang boleh memuatkan 15 peserta dan berupaya untuk bergerak dengan laju dalam air.*

*Dengan menggunakan pengetahuan anda dalam gergalcan, daya-daya dan sifat bahan, nyatakan dan terangkan cadangan berdasarkan aspek-aspek berikut:*

- (i) The shape of the raft. [2 marks]  
*Bentuk rakit.* [2 markah]
- (ii) The material used for the raft. [2 marks]  
*Bahan yang digunakan untuk membuat rakit.* [2 markah]
- (iii) The size of the raft. [2 marks]  
*Saiz rakit.* [2 markah]
- (iv) The design of the raft. [4 marks]  
*Reka bentuk rakit.* [4 markah]

**Paper 2: Section C – 20 marks**

- Consists of 2 questions. Answer only **1** question.
- Total marks are 20.
- Can answer both questions, only a **higher score** is **counted** for result.
- **4M** explanation question based on a diagram of a situation, application or phenomenon. **Can use diagram for explanation.**
- **5M** problem solving by calculation. **Can answer without unit.**
- **10M** problem solving by given table for **investigate, compare** and **making decision** with a specific Physics concept. Answer in table form:

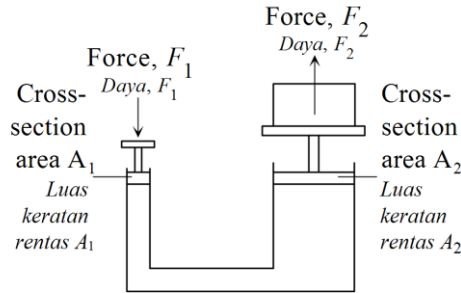
Suitability	Explanation
1.	1. 2.
2.	1.
3.	1. 2.
4.	1.

The choice is \_\_\_\_\_.

- **Can repeat same explanation.**
- **CANNOT answer with number** but answer with: higher, lower, bigger, smaller...
- **Can give more explanations.**

**SPM 2011, Paper 2, Question 11 (Section C)**

- 11 (a) Diagram 11.1 shows a hydraulic jack used to lift a heavy load.  
*Rajah 11.1 menunjukkan sebuah jek hidraulik digunakan untuk mengangkat suatu beban yang berat.*



**Diagram 11.1**  
**Rajah 11.1**

Force,  $F_2$  is produced on large piston when force,  $F_1$  is applied on small piston.  
*Daya,  $F_2$  dihasilkan pada omboh besar apabila daya,  $F_1$  dikenakan pada omboh kecil.*

- (i) Name the physics principle that explains the working principle of the hydraulic jack.  
*Namakan prinsip fizik yang menerangkan prinsip kerja jek hidraulik.*

[1 mark]

[1 markah]

- (ii) Explain how the hydraulic jack can be used to lift a heavy load when force,  $F_1$  is applied on the small piston with cross-section area,  $A_1$ .

Explain why force,  $F_2$  is greater than force,  $F_1$ .

*Terangkan bagaimana jek hidraulik boleh digunakan untuk mengangkat beban yang berat apabila daya,  $F_1$  dikenakan pada omboh kecil dengan luas keratan rentas,  $A_1$ .*

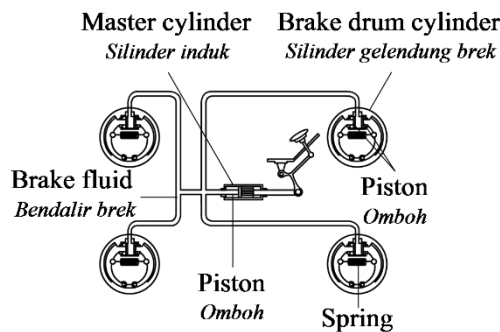
*Terangkan mengapa daya,  $F_2$  adalah lebih besar daripada daya,  $F_1$ .*

[4 marks]

[4 markah]

- (b) Diagram 11.2 shows a hydraulic brake system in a car.

*Rajah 11.2 menunjukkan suatu sistem brek hidraulik dalam sebuah kereta.*



**Diagram 11.2**  
**Rajah 11.2**

Table 11 shows four hydraulic brakes, W, X, Y and Z with different characteristic.

You are required to determine the most effective hydraulic brake to be used in a car brake system.

Jadual 11 menunjukkan empat buah brek hidraulik, W, X, Y, dan Z dengan ciri-ciri yang berbeza.

Anda dikehendaki untuk menentukan brek hidraulik yang paling berkesan untuk digunakan dalam sistem brek sebuah kereta.

Hydraulic brake <i>Brek hidraulik</i>	Type of brake fluid <i>Jenis bendalir brek</i>	Boiling point of brake fluid <i>Takat didih bendalir brek</i>	Spring constant of the spring <i>Pemalar spring bagi spring</i>	Ratio of cross-section area of pistons in the master cylinder to the brake drum cylinder <i>Nisbah luas keratan rentas ombok dalam silinder induk kepada silinder gelendung brek</i>
W	Compressible <i>Boleh dimampatkan</i>	Low <i>Rendah</i>	Low <i>Rendah</i>	1 : 1
X	Incompressible <i>Tidak boleh dimampatkan</i>	Low <i>Rendah</i>	High <i>Tinggi</i>	5 : 1
Y	Compressible <i>Boleh dimampatkan</i>	High <i>Tinggi</i>	Low <i>Rendah</i>	1 : 1
Z	Incompressible <i>Tidak boleh dimampatkan</i>	High <i>Tinggi</i>	High <i>Tinggi</i>	1 : 5

**Table 11**

**Jadual 11**

Study the characteristic of the four hydraulic brakes. Explain the suitability of each characteristic and then determine the most suitable hydraulic brake. Give a reason for your choice.

Kaji ciri-ciri keempat-empat buah brek hidraulik. Terangkan kesesuaian setiap ciri dan seterusnya tentukan brek hidraulik yang paling sesuai. Beri sebab untuk pilihan anda.

[10 marks]

[10 markah]

- (c) In a hydraulic brake system, the cross-section area of piston in the master cylinder and the rear wheel are  $4 \text{ cm}^2$  and  $8 \text{ cm}^2$  respectively. A force of  $88 \text{ N}$  is applied to the piston in the master cylinder.

Dalam sebuah sistem brek hidraulik, luas keratan rentas ombok dalam silinder induk dan tayar belakang masing-masing adalah  $4 \text{ cm}^2$  dan  $8 \text{ cm}^2$ . Daya  $88 \text{ N}$  dikenakan ke atas ombok dalam silinder induk.

- (i) Calculate the pressure transmitted throughout the brake fluid.

Hitungkan tekanan yang dipindahkan ke seluruh bendalir brek.

[2 marks]

[2 markah]

- (ii) Calculate the force exerted on the piston of the rear wheel.

Hitungkan daya yang dikenakan ke atas ombok tayar belakang.

[2 marks]

[2 markah]

### **Paper 3: Section A – 28 marks**

- Consists of 2 questions. Answer **all** questions.
- Total marks are 28. Must score at least **24/28**.
- ☺ • **Answer MUST with unit.**
- Question based on experiment that can carry out in the school laboratory.
- Q1:
  - State the variables (MV, RV & CV)
  - Record data and tabulate the data
  - Plot a graph
  - State the relationship based on the graph:
    - **Directly proportional**
    - Inversely proportional
    - **Increases linearly**
    - **Decreases linearly**
- Q2:
  - Interpretation of graph
  - Determine the gradient of the graph.
  - May involve other calculation with given formula and gradient of the graph.
  - State the precaution:
- ☺ • **Eye must perpendicularly to the reading/scale of ( ) to avoid/prevent parallax error.**

**SPM 2012, Paper 3, Question 1 (Section A)**

- 1 A student carries out a Young's double slit experiment to investigate the relationship between the distance between two slits,  $a$ , and the distance between two consecutive bright red fringes,  $x$ , of red light.

The arrangement of the apparatus is as shown in Diagram 1.1.

*Seorang murid menjalankan eksperimen dwicelah Young untuk mengkaji hubungan antara jarak antara dua celah,  $a$ , dengan jarak antara dua pinggir merah cerah yang berturutan,  $x$ , bagi cahaya merah.*

*Susunan radas ditunjukkan dalam Rajah 1.1.*

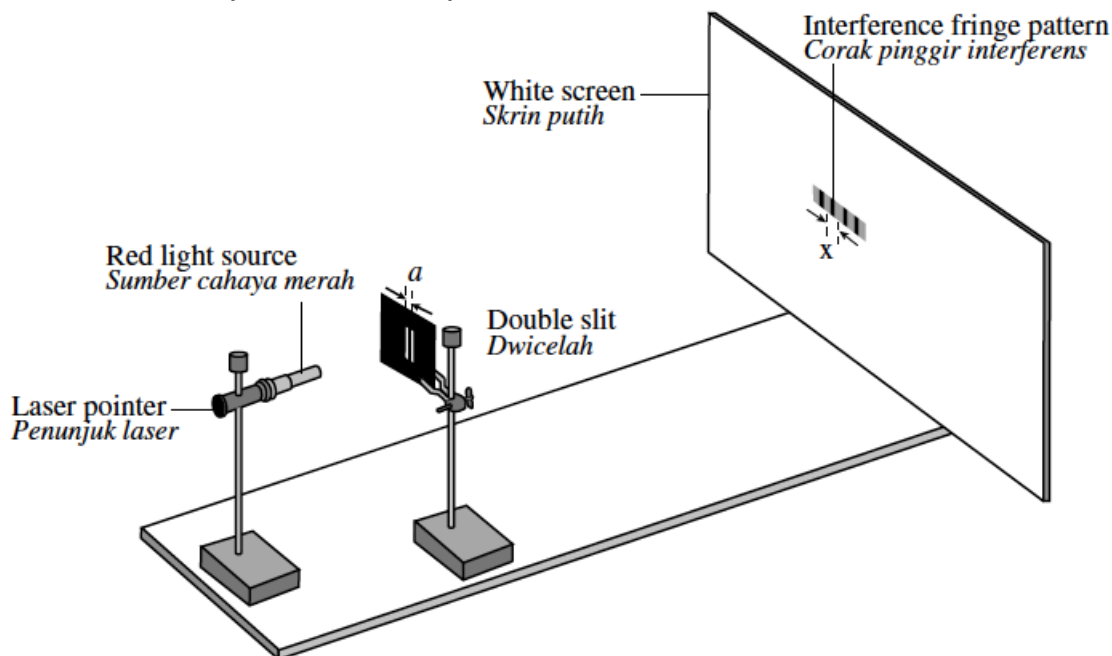


Diagram 1.1  
Rajah 1.1

The student starts the experiment by using a double slit with the distance between the two slits,  $a = 0.2$  mm as shown in Diagram 1.2. Red and dark fringes are formed on the screen. The distance between five consecutive bright red fringes,  $y$ , is measured and recorded. The distance between two consecutive bright red fringes,  $x$ , is calculated and recorded.

The student also calculates  $\frac{1}{a}$  and records its value.

The experiment is repeated with distances,  $a$ , of 0.4 mm, 0.6 mm, 0.8 mm and 1.0 mm. The corresponding readings for  $y$  and  $x$  are shown in Diagram 1.3, 1.4, 1.5 and 1.6.

*Murid itu memulakan eksperimen dengan menggunakan satu dwicelah dengan jarak antara dua celah,  $a = 0.2$  mm seperti ditunjukkan dalam Rajah 1.2. Pinggir-pinggir merah dan gelap terbentuk di atas skrin. Jarak antara lima pinggir merah cerah yang berturutan,  $y$ , diukur dan direkod. Jarak antara dua pinggir merah cerah yang berturutan,  $x$ , diukur dan direkod. Jarak antara dua pinggir merah cerah yang berturutan,  $x$ , dihitung dan direkod.*

*Murid juga menghitung  $\frac{1}{a}$  dan merekod nilainya.*

*Eksperimen diulang dengan jarak,  $a$ , 0.4 mm, 0.6 mm, 0.8 mm dan 1.0 mm. Bacaan yang sepadan untuk  $y$  dan  $x$  ditunjukkan pada Rajah 1.3, 1.4, 1.5 dan 1.6.*

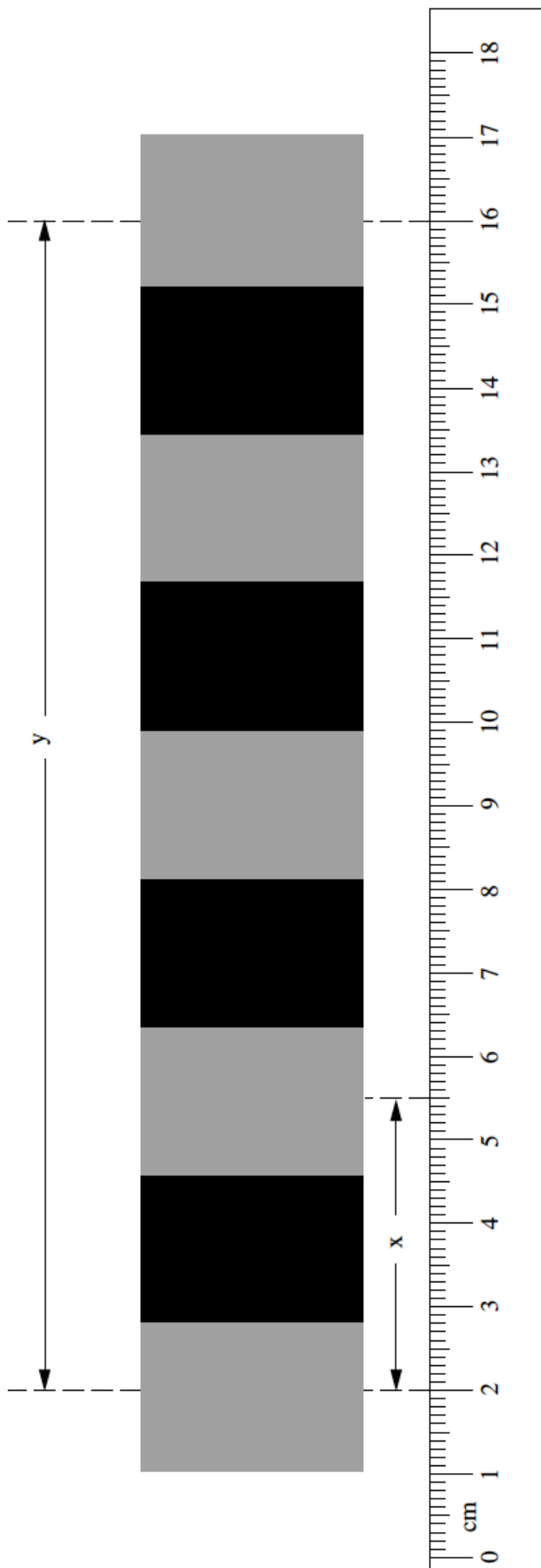


Diagram 1.2  
Rajah 1.2

$a = 0.2 \text{ mm}$
$\frac{1}{a} = \text{_____} \text{ mm}^{-1}$
$y = \text{_____} \text{ cm}$
$x = \text{_____} \text{ cm}$

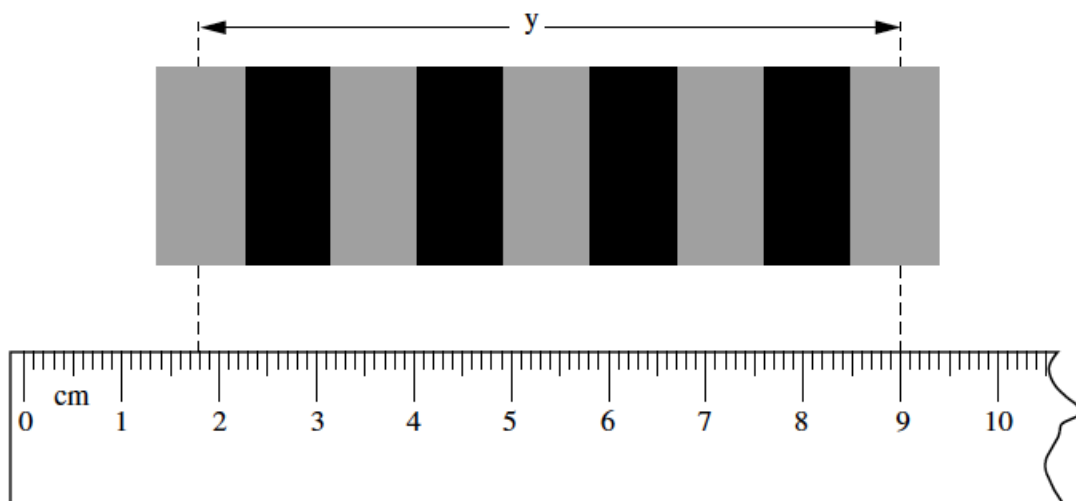


Diagram 1.3  
Rajah 1.3

$a = 0.4 \text{ mm}$
$\frac{1}{a} = \underline{\hspace{2cm}} \text{ mm}^{-1}$
$y = \underline{\hspace{2cm}} \text{ cm}$
$x = \underline{\hspace{2cm}} \text{ cm}$

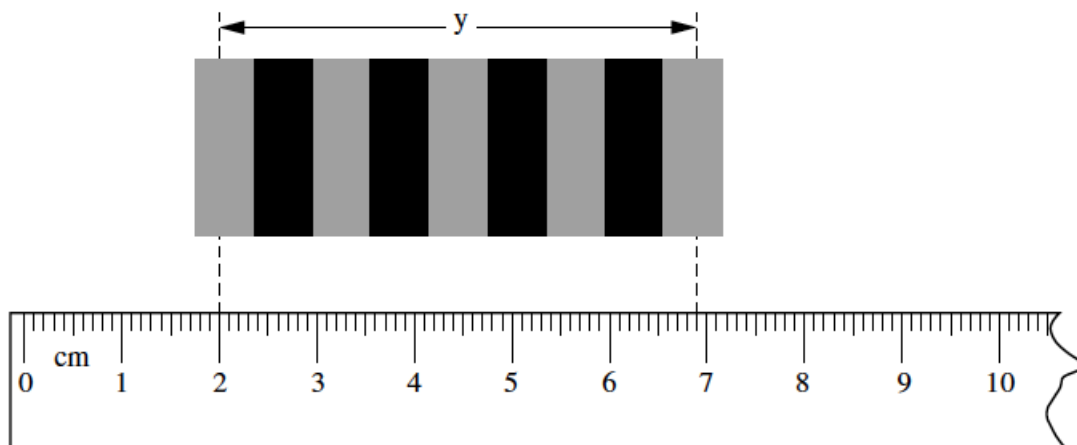


Diagram 1.4  
Rajah 1.4

$a = 0.6 \text{ mm}$
$\frac{1}{a} = \underline{\hspace{2cm}} \text{ mm}^{-1}$
$y = \underline{\hspace{2cm}} \text{ cm}$
$x = \underline{\hspace{2cm}} \text{ cm}$

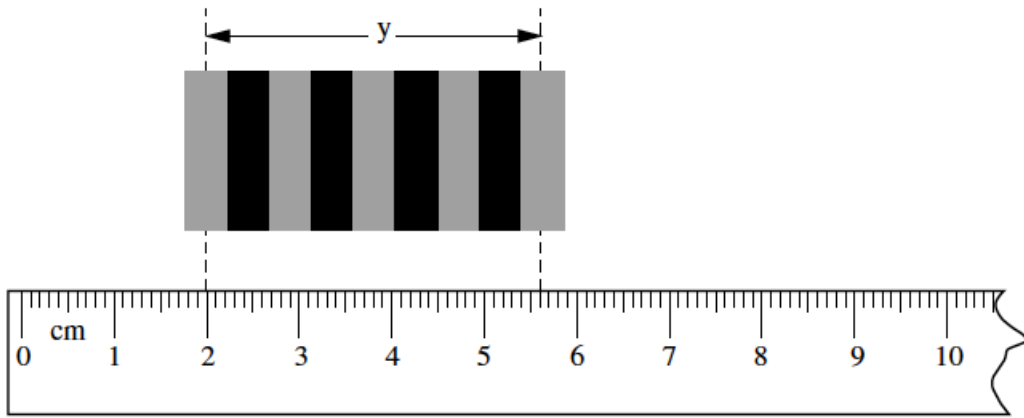


Diagram 1.5  
Rajah 1.5

$a = 0.8 \text{ mm}$
$\frac{1}{a} = \underline{\hspace{2cm}} \text{ mm}^{-1}$
$y = \underline{\hspace{2cm}} \text{ cm}$
$x = \underline{\hspace{2cm}} \text{ cm}$

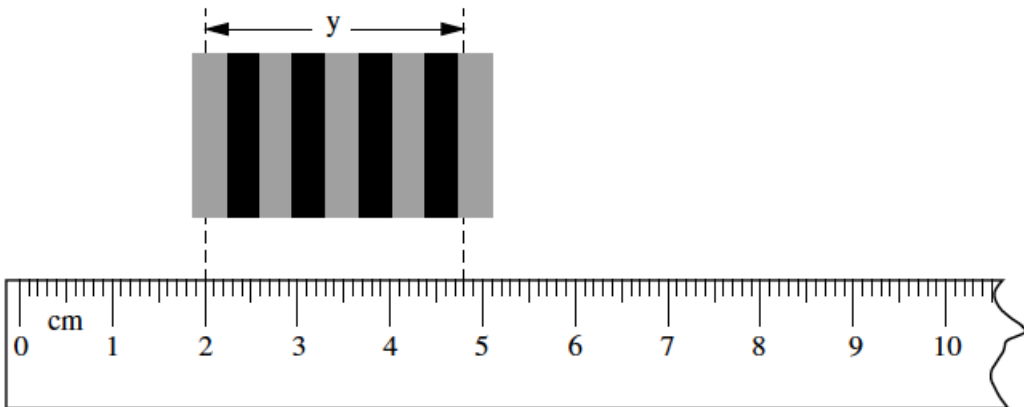


Diagram 1.6  
Rajah 1.6

$a = 1.0 \text{ mm}$
$\frac{1}{a} = \underline{\hspace{2cm}} \text{ mm}^{-1}$
$y = \underline{\hspace{2cm}} \text{ cm}$
$x = \underline{\hspace{2cm}} \text{ cm}$

- (a) For the experiment described above, identify:  
*Bagi eksperimen yang diterangkan di atas, kenal pasti;*
- (i) The manipulated variable  
*Pemboleh ubah dimanipulasikan,*

.....

[1 mark]  
[1 markah]

- (ii) The responding variable  
*Pemboleh ubah bergerak balas,*

.....  
[1 mark]

[1 markah]

- (iii) The constant variable  
*Pemboleh ubah dimalarkan.*

.....  
[1 mark]

[1 markah]

- (b) For this part of the question, write your answers in the spaces provided in the corresponding diagrams. Your answers must be correct to one decimal place.  
*Untuk bahagian soalan ini, tulis jawapan anda dalam ruang yang disediakan dalam rajah-rajah yang sepadan. Jawapan anda hendaklah ditulis betul kepada satu tempat perpuluhan.*

Based on Diagram 1.2, 1.3, 1.4, 1.5 and 1.6:

*Berdasarkan Rajah 1.2, 1.3, 1.4, 1.5 dan 1.6:*

- (i) Calculate  $\frac{1}{a}$  for each value of  $a$ .

*Hitung  $\frac{1}{a}$  untuk setiap nilai  $a$ .*

[1 mark]

[1 markah]

- (ii) Record the reading of  $y$ .  
*Catat bacaan bagi  $y$ .*

[2 marks]

[2 markah]

- (iii) Calculate  $x$  for each value of  $y$  in (b)(ii). Record the values of  $x$ .  
*Hitung  $x$  bagi setiap nilai  $y$  dalam (b)(ii). Catat nilai-nilai bagi  $x$ .*

[2 marks]

[2 markah]

- (c) Tabulate your results for all values of  $a$ ,  $\frac{1}{a}$ ,  $y$  and  $x$  in the space below.

*Jadualkan keputusan anda bagi semua nilai  $a$ ,  $\frac{1}{a}$ ,  $y$  dan  $x$  dalam ruang di bawah.*

[2 marks]

[2 markah]

(d) On the graph paper on page 25, plot a graph of  $x$  against  $\frac{1}{a}$ .

*Pada kertas graf di muka surat 25, lukiskan graf  $x$  melawan  $\frac{1}{a}$ .*

[5 marks]

[5 markah]

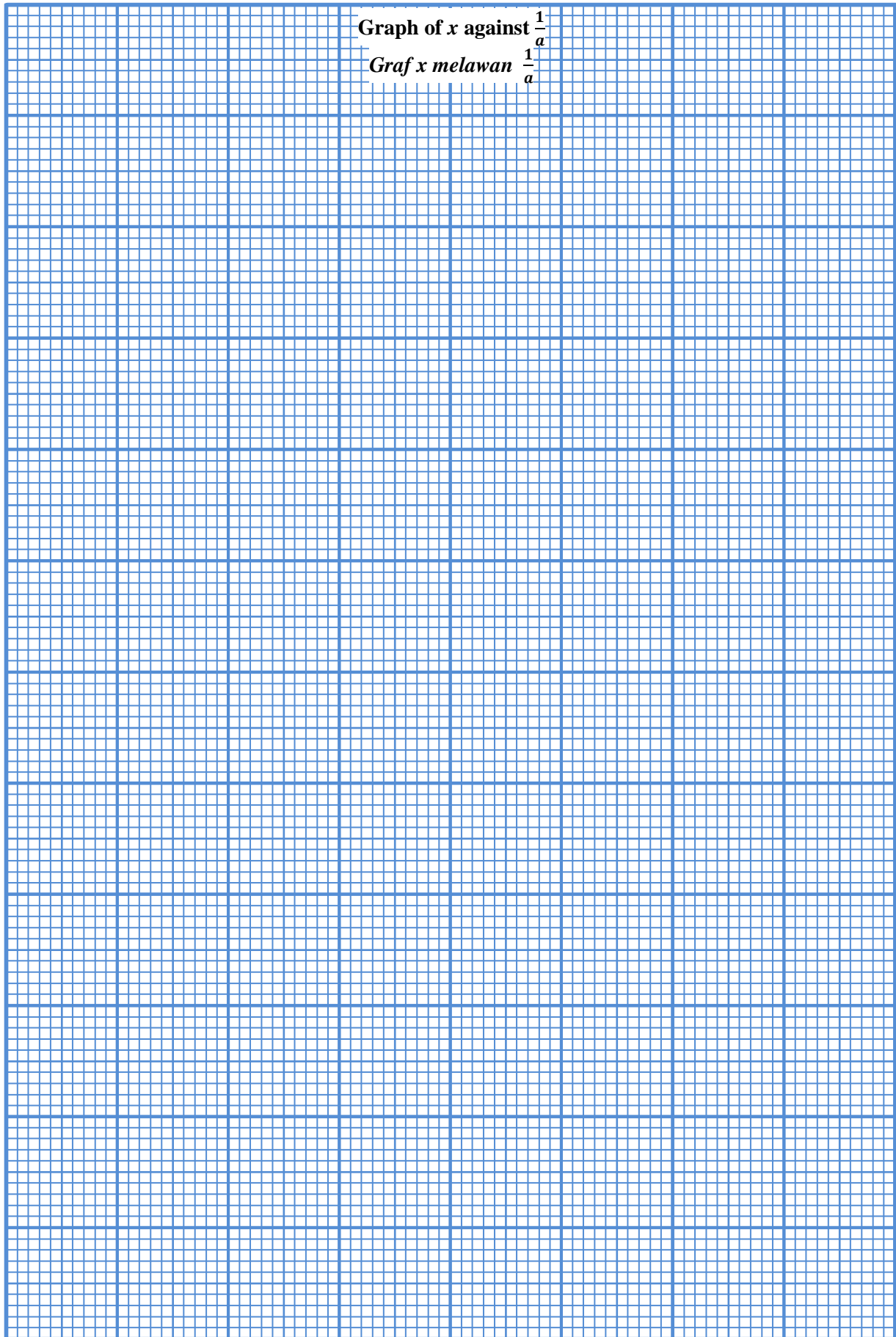
(e) Based on the graph in 1(d), state the relationship between  $x$  and  $\frac{1}{a}$ .

*Berdasarkan graf pada 1(d), nyatakan hubungan antara  $x$  dan  $\frac{1}{a}$ .*

.....

[1 mark]

[1 markah]



- 2 A student carries out an experiment to determine the electromotive force (e.m.f.),  $E$  and the internal resistance,  $r$  of a dry cell. The student used five resistors with different values of resistance,  $R$  and fixed the e.m.f.,  $E$  of the cell. *Seorang murid menjalankan satu eksperimen untuk menentukan daya gerak elektrik (d.g.e.),  $E$  dan rintangan dalaman bagi satu bateri. Murid itu menggunakan lima perintang yang berbeza nilai rintangannya,  $R$  dan d.g.e. bateri yang malar.*

The result of this experiment is shown in the graph of  $\frac{1}{I}$  against  $R$  in Diagram 2 below.

*Keputusan eksperimen ini ditunjukkan oleh graf  $\frac{1}{I}$  melawan  $R$  pada Rajah 2 di bawah.*

Graph of  $\frac{1}{I}$  against  $R$   
*Graf  $\frac{1}{I}$  melawan  $R$*

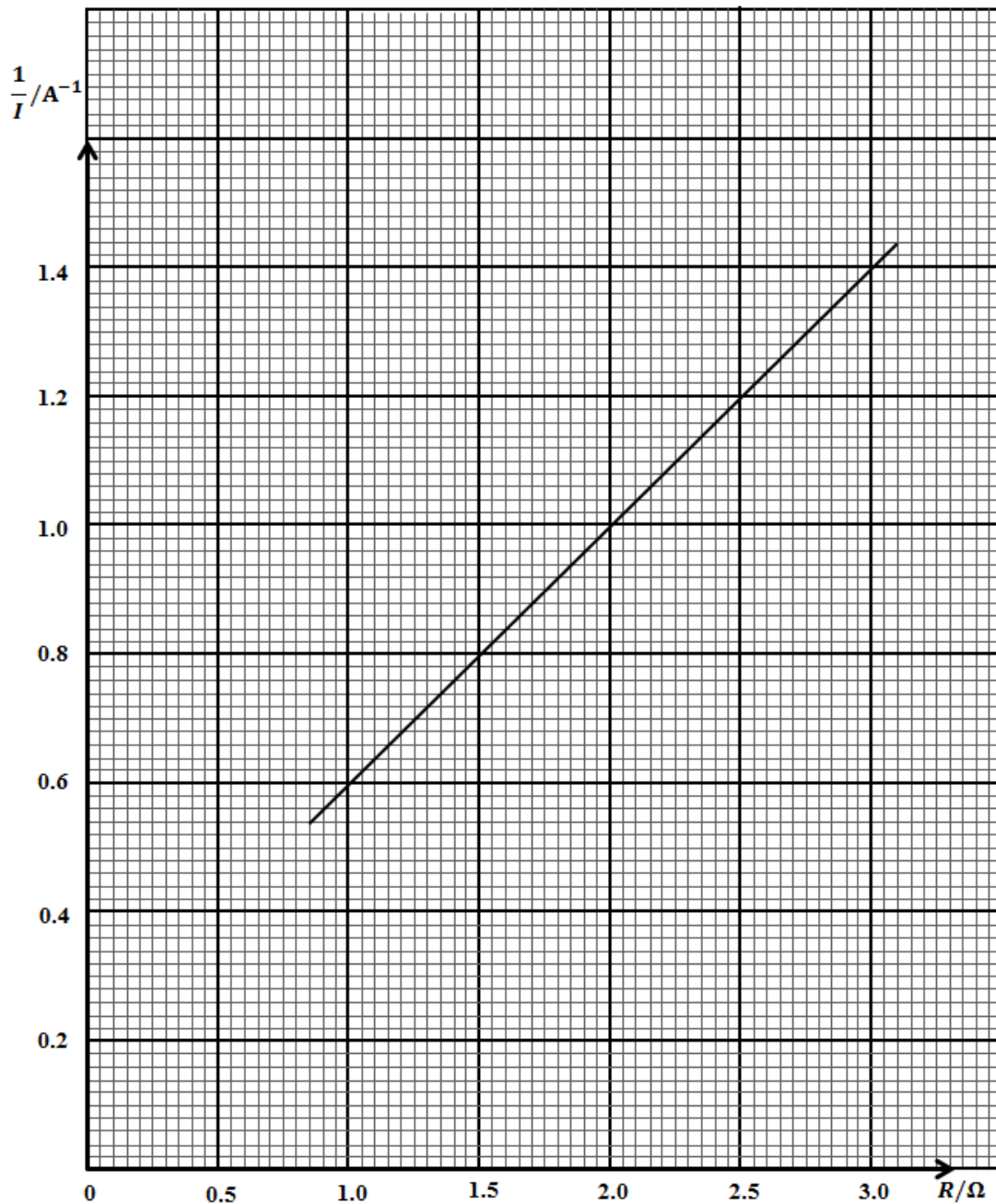


Diagram 2  
*Rajah 2*

(a) Based on the graph in Diagram 2 on page 24,  
*Berdasarkan graf pada Rajah 2 di halaman 24,*

(i) What happens to  $I$  as  $R$  increases?  
*Apakah yang berlaku pada  $I$  apabila  $R$  bertambah?*

.....  
[1 mark]  
[1 markah]

(ii) Determine the value of  $\frac{1}{I}$  when  $R = 0 \Omega$ .  
Show on the graph, how you determine the value of  $\frac{1}{I}$ .  
*Tentukan nilai  $\frac{1}{I}$  apabila  $R = 0 \Omega$ .  
Tunjukkan pada graf itu bagaimana anda menentukan nilai  $\frac{1}{I}$ .*

.....  
[2 marks]  
[2 markah]

(iii) When the  $R = 0 \Omega$ , the internal resistance,  $r$ , of the dry cell can be determine by formula  $\frac{1}{I} = 0.5r$ .  
Calculate the internal resistance,  $r$ .  
*Apabila  $R = 0 \Omega$ , rintangan dalaman,  $r$ , bagi bateri itu boleh ditentukan dengan formula  $\frac{1}{I} = 0.5r$ .  
Hitung rintangan dalaman,  $r$ .*

.....  
[2 marks]  
[2 markah]

(iv) State the relationship between  $\frac{1}{I}$  against  $R$ .  
*Nyatakan hubungan antara  $\frac{1}{I}$  melawan  $R$ .*

.....  
[1 mark]  
[1 markah]

(b) The electromotive force,  $E$ , of the dry cell is given by the formula  $m = \frac{1}{E}$ , where  $m$  is the gradient of the graph.

*Daya gerak elektrik,  $E$ , bagi bateri itu diberi oleh formula  $m = \frac{1}{E}$ , dengan keadaan  $m$  ialah kecerunan graf.*

(i) Calculate the gradient,  $m$ , of the graph.  
Show on the graph how you calculate  $m$ .

*Hitung kecerunan,  $m$ , bagi graf itu.*

*Tunjukkan pada graf itu bagaimana anda menghitung  $m$ .*

$m = \dots\dots\dots$

[3 marks]

[3 markah]

(ii) Determine the value of  $E$ .  
*Tentukan nilai  $E$ .*

$E = \dots\dots\dots$

[2 marks]

[2 markah]

(c) State **one** precaution that should be taken to improve the accuracy of the readings in this experiment.  
*Nyatakan **satu** langkah berjaga-jaga yang perlu diambil untuk memperbaiki ketepatan bacaan dalam eksperimen ini.*

.....

[1 mark]

[1 markah]

### **Paper 3: Section B – 12 marks**

- Consists of 2 questions. Answer only **1** question.
- Full mark is 13/12.
- Given a diagram of a situation in our daily lives with a brief write-up on the situation.
- Find the variables (MV & RV) in the situation given (diagram & brief write-up in question).
- **Can give different answer for same question.**
- State an **inference**
  - RV **depends on** MV
  - RV **influenced by** MV
  - RV **affected by** MV
- State a **hypothesis**.
  - **When MV increases, RV increases/decreases.**
  - **The more/higher the MV, the more/higher/lower the RV.**
- Describe an experiment to investigate the hypothesis stated with use of suggested apparatus in the question.
  - The aim of the experiment.
    - **To investigate (study) the relationship between MV and RV.**
  - The variables in the experiment.
    - **MV, RV & CV\* (CV can answer whatever possible physical quantities.)**
  - The list of apparatus and materials.
    - Suggested apparatus must copy and paste from the question.
    - **MUST suggest: metre rule.**
    - List the others importance apparatus (**instrument** to measure **MV&RV must have**)
    - Just list whatever can get in laboratory (if you have enough time to write)
  - The arrangement of the apparatus.
    - Diagram **must label.**
    - A **functional** arrangement of the apparatus.
  - The procedure of the experiment
    - one method of controlling the manipulated variable.
    - one method of measuring the responding variable.
    - Repeat at least **4 times.**
  - The way you tabulate the data.
    - **Table of 2 columns (MV & RV)**
  - The way you analyse the data.
    - **2 axis only (MV & RV) without any line of graph**
- Can describe **more than one experiment** for a same question.

**TRIAL SPM MSAB 2016, Paper 3 (Section B)**

- 3 Diagram 3.1 and Diagram 3.2 show two similar electric kettles used to boil water. The power ratings for the kettles are 240 V, 1000 W. It is found that the water in the kettle in Diagram 3.2 boils faster than the water in the kettle in Diagram 3.1.

*Rajah 3.1 dan Rajah 3.2 menunjukkan dua cerek elektrik yang serupa digunakan untuk mendidihkan air. Penarafan kuasa untuk cerek tersebut adalah 240 V, 1000 W. Didapati bahawa air di dalam cerek dalam Rajah 3.2 mendidih lebih cepat daripada air di dalam cerek dalam Rajah 3.1.*



Diagram 3.1  
Rajah 3.1



Diagram 3.2  
Rajah 3.2

Based on the information and observation:

*Berdasarkan maklumat dan pemerhatian itu:*

- (a) State **one** suitable inference. [ 1 mark]  
*Nyatakan **satu** inferens yang sesuai.* [1 markah]
- (b) State **one** hypothesis that could be investigated. [ 1 mark]  
*Nyatakan **satu** hipotesis yang boleh diasasat.* [1 markah]
- (c) With the use of apparatus such as immersion heater, measuring cylinder and other apparatus, describe **one** experiment to investigate the hypothesis stated in 3(b).  
*Dengan menggunakan radas seperti pemanas rendam, silinder penyukat dan lain-lain radas, terangkan **satu** eksperimen 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 variables in the experiment.  
*Pembolehubah-pembolehubah dalam eksperimen*
- (iii) The list of apparatus and materials.  
*Senarai radas dan bahan.*
- (iv) The arrangement of the apparatus.  
*Susunan radas.*

- (v) The procedure of the experiment which should include **one** method of controlling the manipulated variable and **one** method of measuring the responding variable.  
*Prosedur eksperimen yang mesti termasuk satu kaedah mengawal pembolehubah dimanipulasikan dan satu kaedah mengukur pembolehubah bergerak balas.*
- (vi) The way to tabulate the data.  
*Cara untuk menjadualkan data.*
- (vii) The way to analyse the data  
*Cara untuk menganalisis data.*

[ 10 marks]

[10 markah]

4 Diagram 4.1 and Diagram 4.2 show two cross-section of a bicycle dynamo which has a magnet and different number of coil of insulated copper wire. The output of the dynamo is connected to a bicycle lamp.

Diagram 4.2 shows the lamp light up brighter compare to the lamp in Diagram 4.1 when the magnet is rotated by turning the wheel of same speed.

*Rajah 4.1 dan Rajah 4.2 menunjukkan keratan rentas dua dinamo basikal yang mengandungi suatu magnet dan bilangan gegelung dawai kuprum berbeza. Output dinamo itu disambung kepada sebuah lampu basikal.*

*Rajah 4.2 menunjukkan lampu itu menyala dengan lebih terang berbanding dengan lampu dalam Rajah 4.1 apabila magnet itu diputar dengan memusingkan roda basikal pada kelajuan yang sama.*

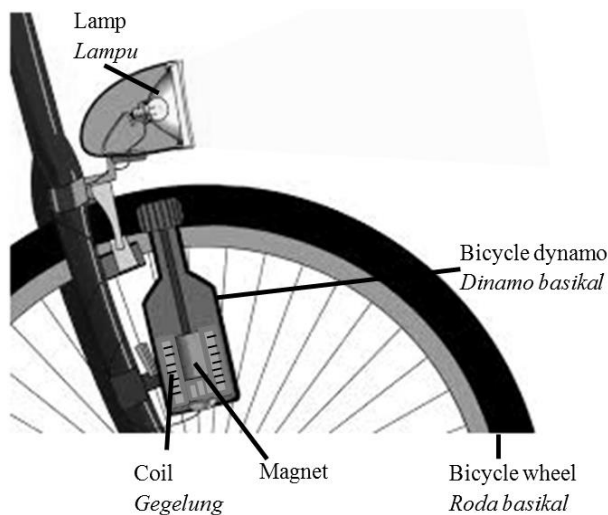


Diagram 4.1

*Rajah 4.1*

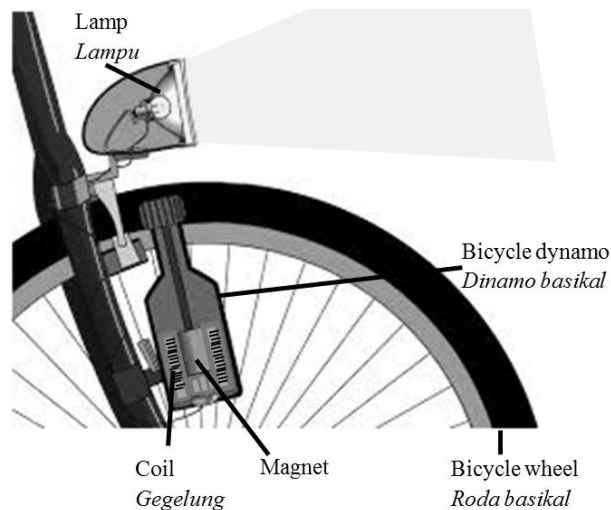


Diagram 4.2

*Rajah 4.2*

Based on the information and observation on Diagram 4.1 and Diagram 4.2 and using your knowledge of electromagnetism:

*Berdasarkan maklumat dan pemerhatian pada Rajah 4.1 dan Rajah 4.2 dan menggunakan pengetahuan anda tentang keelktromagnetan:*

- (a) State **one** suitable inference. [ 1 mark]  
*Nyatakan satu inferens yang sesuai.* [1 markah]
- (b) State **one** hypothesis that could be investigated. [ 1 mark]  
*Nyatakan satu hipotesis yang boleh disiasat.* [1 markah]

- (c) With the use of apparatus such as a bar magnet, a coil of a copper wire and other apparatus, describe **one** experiment to investigate the hypothesis stated in 4(b).

*Dengan menggunakan radas seperti magnet bar, gegelung dawai kuprum dan lain-lain, terangkan **satu** eksperimen 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 variables in the experiment.  
*Pembolehubah-pembolehubah dalam eksperimen*
- (iii) The list of apparatus and materials.  
*Senarai radas dan bahan.*
- (iv) The arrangement of the apparatus.  
*Susunan radas.*
- (v) The procedure of the experiment which should include **one** method of controlling the manipulated variable and **one** method of measuring the responding variable.  
*Prosedur eksperimen yang mesti termasuk **satu** kaedah mengawal pembolehubah dimanipulasikan dan **satu** kaedah mengukur pembolehubah bergerak balas.*
- (vi) The way to tabulate the data.  
*Cara untuk menjadualkan data.*
- (vii) The way to analyse the data  
*Cara untuk menganalisis data.*

[ 10 marks]

[10 markah]