Pahang 2009 Section A

(28 *marks*)

Answer **all** *questions in this section.*

The time suggested to complete this section is **60** *minutes.*

A student carries out an experiment to study the relationship between the electromotive force (e.m.f), E, and internal resistance, r, of the dry cells. The arrangement of the apparatus for the experiment is shown in Figure 1.1

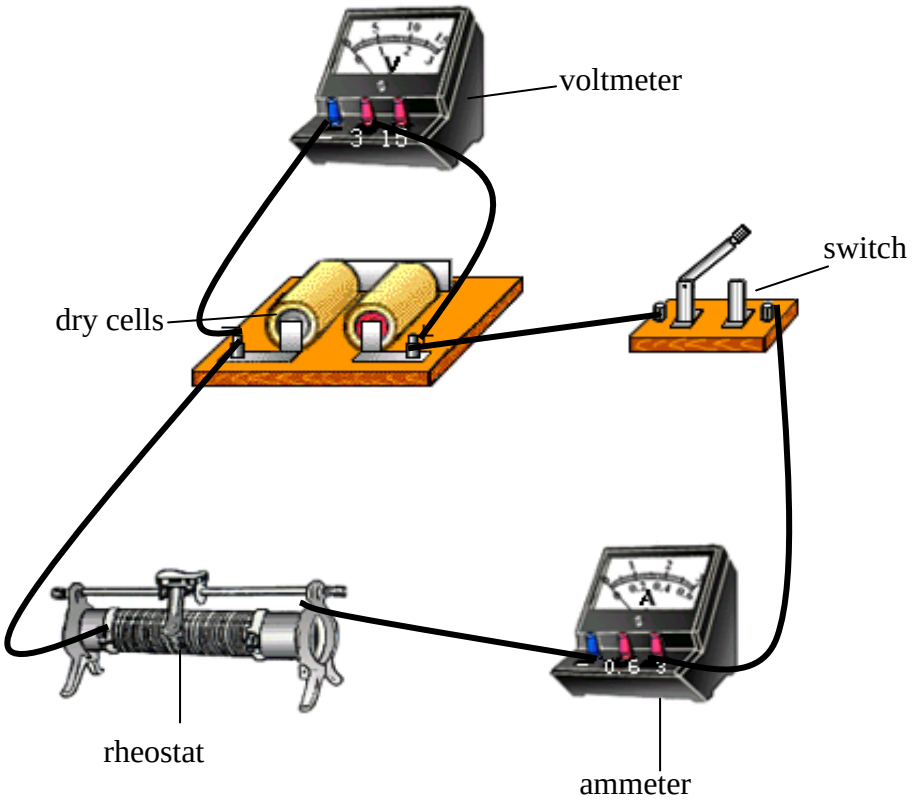

FIGURE 1.1

When the switch is closed, the rheostat is adjusted so that the reading of the ammeter, I = 0.1 A. The reading of the voltmeter, V_1, is shown in Figure 1.2 on page 6.

The experiment is repeated by adjusting the rheostat to obtain the readings of the current, I = 0.20 A, 0.30 A, 0.40 A and 0.50 A . The readings of the voltmeter (0 V- 3 V) are shown in Figure 1.3, 1.4, 1.5 and 1.6 on page 6.

When the cells are connected to a circuit, the e.m.f of the cells, E, and its internal resistance, r, can be determined by the formula,

$$\mathbf{E = V + Ir.}$$

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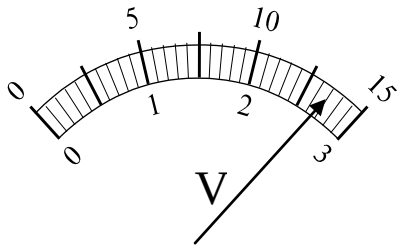
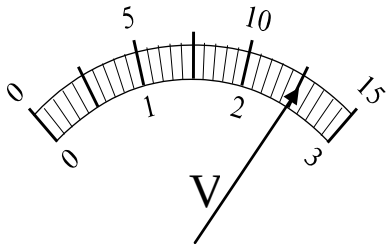


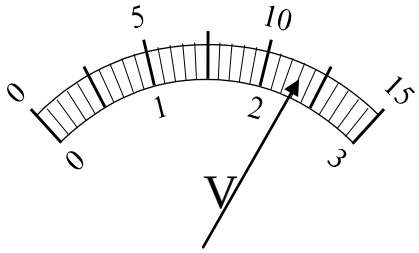
Current, I = 0.10 A

FIGURE 1.2



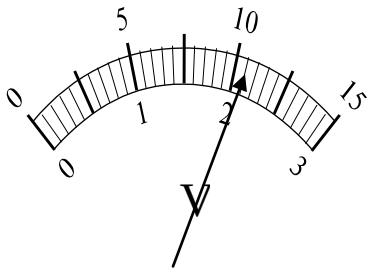
Current, I = 0.20 A

FIGURE 1.3



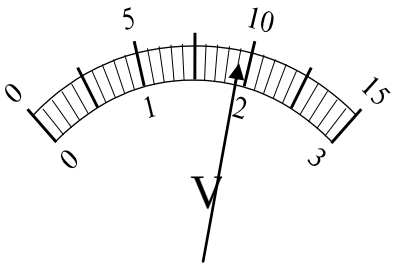
Current, I = 0.30 A

FIGURE 1.4



Current, I = 0.40 A

FIGURE 1.5



Current,I = 0.50 A

FIGURE 1.6

(a) For the experiment described on page 4, identify;

1(a)(i)

(i) the manipulated variable,

…..…….

[1 mark]

1(a)(ii)

(ii) the responding variable,

…..…….

[1 mark]

1(a)(iii)

(iii) a fixed variable.

…..…….

[1 mark]

(b) Based on Figure 1.2, 1.3, 1.4, 1.5 and 1.6, determine the values for V_1, V_2, V_3, V_4 and V_5 when I = 0.10 A, 0.20 A, 0.30 A, 0.40 A and 0.50 A.

Tabulate your results for I and V in the space below.

[7 marks]

1(b)

(c) On the graph paper on page 10, plot a graph of *V against I.*. [5 marks]

1(c)

….…….

(d) Based on your graph, state the relationship between *V* and *I* .

1(d)

.....…….

[1 mark]

2. An experiment is carried out to investigate the relationship between the object distance, u and the magnification, m using a convex lens of a focal length, f.

   From the data obtained, a graph of u against $\frac{1}{m}$ is plotted as shown in Figure 2.

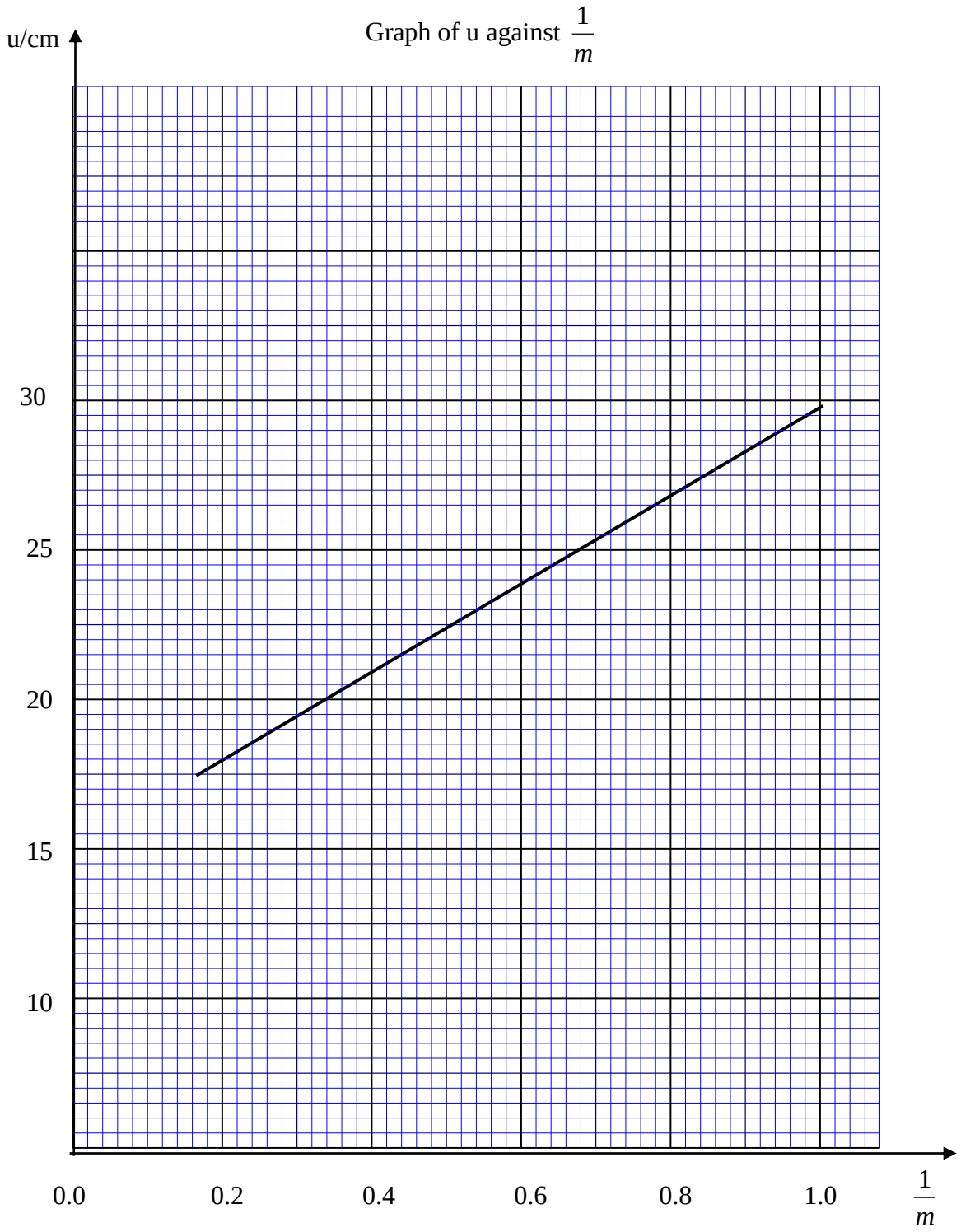


FIGURE 2

(a) Based on the graph in Figure 2,

(i) determine the value of u when $\frac{1}{m}$ = 0.0. Show on the graph, how you determine u,

……

[1marks]

2(a)(i)

(ii) state the relationship between u and $\frac{1}{m}$.

2(a)(ii)

……

……

[2 marks]

(b) The relationship between u and m is given by the equation;

$$\mathbf{u = f\left(\frac{1}{m}\right) + f}$$

(i) calculate the gradient of the graph u against $\frac{1}{m}$,

[3 marks]

(ii) determine the value of the focal length, f,

2(b)(i)

[2 marks]

(iii) determine the value of m if the object is placed at a distance of u = 22 cm from the lens.

2(b)(ii)

[3 marks]

(c) State **one** precaution that should be taken during this experiment.

2(c)

…….

…….

[1 mark]

2(b)(iii)

2 A student carried out an experiment to study the relationship between the period of oscillation, T and mass, m for a loaded spring of oscillation. The results of the experiment is shown in the graph of T^2 against m as in Diagram 2.1.

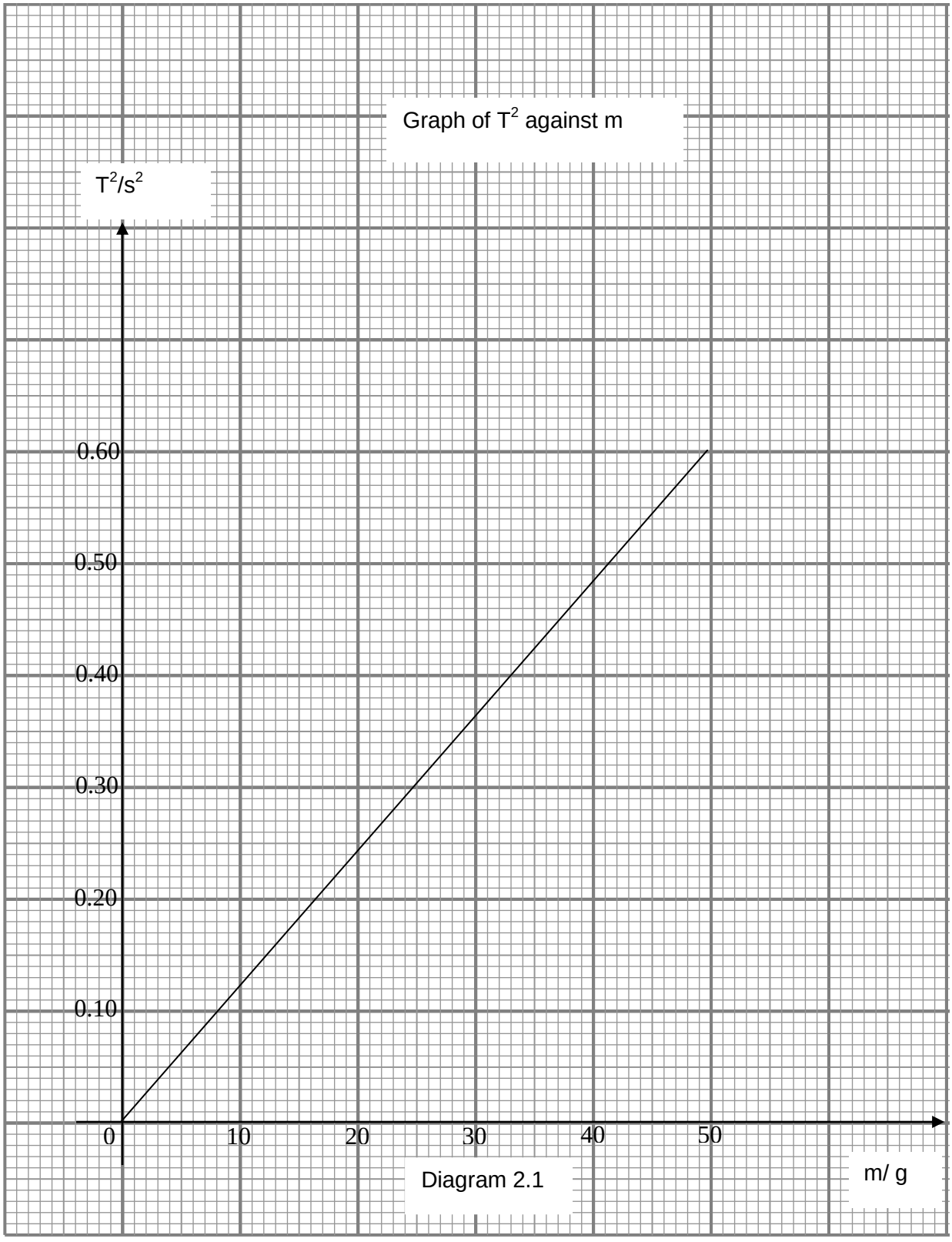


Diagram 2.1

(a) State the relationship between T^2 and m.

……..

[1 mark]

(b) Based on the graph in Diagram 2.1 on page 7,

(i) Determine the value of T when m = 25 g. Show on the graph how you determine the value of T.

[2 marks]

(ii) Determine the value of m when $T^2 = 0.75\ s^2$. Show on the graph how you determine the value of m.

[2 marks]

(c) The stiffness of spring, k is given by the formula

$$k = \frac{39.45\ m}{T^2}$$

(i) Calculate the gradient of graph T^2 against m. Show how you determine the gradient.

[3 marks]

(ii) By using the formula $k = \frac{39.45\ m}{T^2}$ and the value obtained in (c)(i) calculate the stiffness of spring, k.

[3 marks]

(e) State **one** precaution that should be taken during this experiment.

……..

[1 mark]

Essay

1. Diagram 12.1 shows two transformers P and Q.
Rajah 12.1 menunjukkan 2 tranformer P dan Q

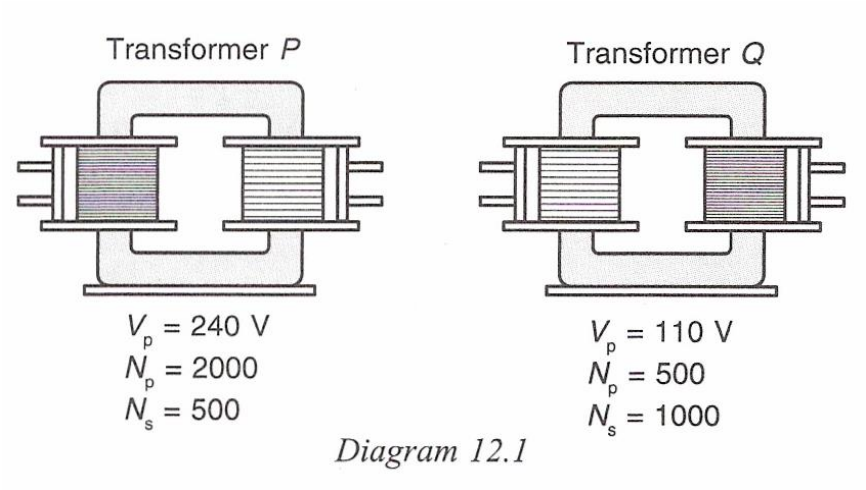


Diagram 12.1

(a) (i) What is meant by a transformer?

Apakah yang dimaksudkan dengan transformer.

[1 *mark*]

(ii) Based on Diagram 12.1, which transformer is a step-up transformer? Give one reason for your choice.
Berdasarkan Rajah 12.1, yang manakah merupakan transformer injak naik? Beri satu sebab atas pilihan anda.

[2 *marks*]

(b) Calculate the output voltage of
(i) transformer P
(ii) transformer Q

Hitungkan voltan output pada
(i) transformer P
(ii) transformer Q

[4 *marks*]

(c) Practically a transformer is not 100% efficient. Some energy is lost in the transformer. List the factors that cause the energy loss in a transformer.
Secara praktik kecekapan transformer bukanlah 100%. Terdapat tenaga yang hilang dalam transformer. Senaraikan faktor-faktor yang menyebabkan tenaga hilang dalam transformer.

[3 *marks*]

(d) The transmission of electricity over the National Grid Network uses high voltage cables. You are assigned to study the characteristics of cables which could be used as transmission cable. Table 12 shows the characteristics of four transmission cables.

Penghantaran tenaga elektrik melalui Rangkaian Grid Nasional menggunakan kabel yang mempunyai voltan yang tinggi. Anda diminta unuk mengkaji ciri-ciri kabel yang sesuai digunakan sebagai kabel penghantaran.. Jadual 12 menunjukkan ciri-ciri bagi 4 jenis kabel penghantaran.

Cable	Resistivity /Ωm^{-1}	Density / kg m^{-3}	Cost	Rate of thermal expansion
P	3.0×10^{-7}	5×10^{5}	Low	High
Q	1.8×10^{-8}	2×10^{3}	Medium	Low
R	7.5×10^{-7}	8×10^{2}	High	Medium
S	7.0×10^{-8}	4×10^{3}	Medium	High

TABLE 12

Based on the table 12;
Berdasarkan jadual 12;

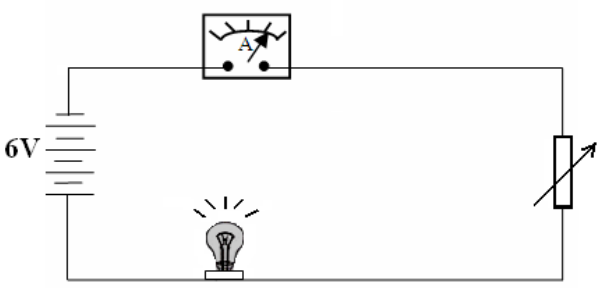
(i) Explain the suitability of the characteristics of the cables to be used as transmission cable.
Jelaskan ciri-ciri kabel yang sesuai dijadikan kabel penghantaran.

(ii) Determine the most suitable transmission cable to be used and give reasons for your choice.
Tentukan kabel yang paling sesuai digunakan sebagai kabel penghantaran dan beri sebab atas pilihan anda.

[10 *marks*]

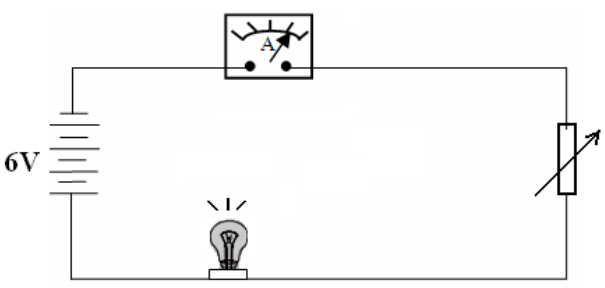
2. Diagram 10.1 and Diagram 10.2 show two circuits. Each circuit contains an ammeter, 4 cells, rheostat and a filament lamp labeled 6V, 24 W. Diagram 10.3 and Diagram 10.4 show the thickness of coiled wire of the filament lamp M and N, respectively.

Rajah 10.1 dan Rajah 10.2 menunjukkan dua litar. Setiap litar itu mengandungi satu ammeter, empat sel, reostat dan satu lampu filamen berlabel 6V, 24 W. Rajah 10.3 dan Rajah 10.4 menunjukkan ketebalan gegelung dawai bagi lampu filamen M dan N, masing-masing



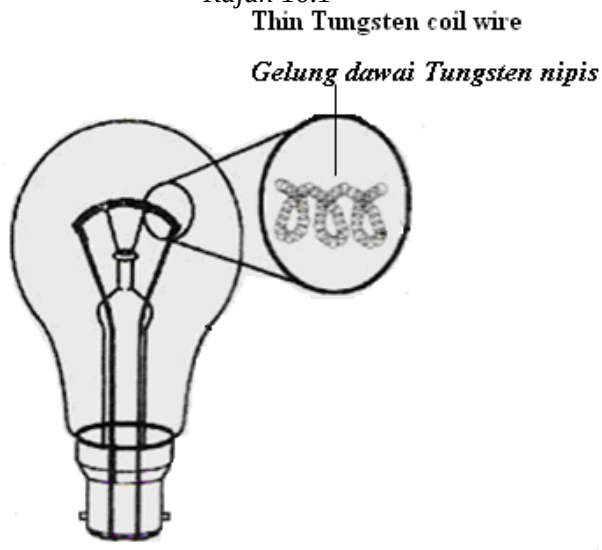
Filament lamp M
Lampu filamen M

Diagram 10.1
Rajah 10.1



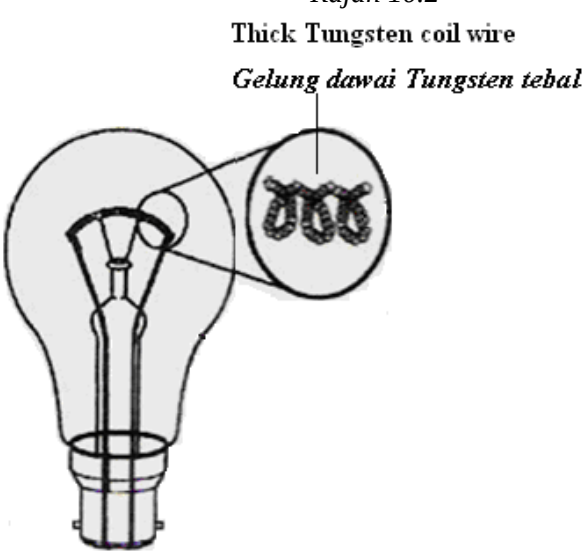
Filament lamp N
Lampu filamen N

Diagram 10.2
Rajah 10.2



Filament lamp M
Lampu filamen M

Diagram 10.3
Rajah 10.3



Filament lamp N
Lampu filamen N

Diagram 10.4
Rajah 10.4

(a) What is the meaning of the labeled "6V, 24 W" on the filament lamp?
Apakah yang dimaksudkan dengan label "6V, 24 W" pada lampu filamen?
[1 mark]

(b) (i)Observe Diagram 10.1and Diagram 10.2. Compare the reading of the ammeter and the brightness of the filament lamp M and N.
Perhatikan Rajah 10.1 dan Rajah 10.2. Bandingkan bacaan pada ammeter dan kecerahan lampu filamen M dan N.
[2 marks]
[*2 markah*]

(ii) Observe Diagram 10.3 and Diagram 10.4. Compare the thickness of coiled wire of the filament lamps.
Perhatikan Rajah 10.3 dan Rajah 10.4. Bandingkan ketebalan gegelung dawai bagi lampu-lampu filamen itu.
[1 mark]

[*1 markah*]

(iii) Relate the brightness of the filament lamp with the thickness of coiled wire to make a deduction on the relationship between thickness of coil wire and the heat produced by the filament lamp

Hubungkaitkan kecerahan lampu filamen dengan ketebalan gegelung dawai untuk membuat kesimpulan tentang hubungan antara ketebalan gegelung dawai dengan haba yang dihasilkan oleh filamen lampu tersebut.

[2 marks]
[*2 markah*]

(c) Diagram 10.5 shows two types of plug for the electric kettle that can be connected to the electric supply. Diagram 10.5(a) uses two pin plug, while Diagram 10.5(b) uses a three pin plug with an earth wire.

Rajah 10.5 menunjukkan dua jenis plug untuk cerek elektrik yang boleh disambungkan pada bekalan kuasa. Rajah 10.5(a) menggunakan palam dua pin, manakala Rajah 10.5(b) menggunakan palam tiga pin dengan dawai bumi.

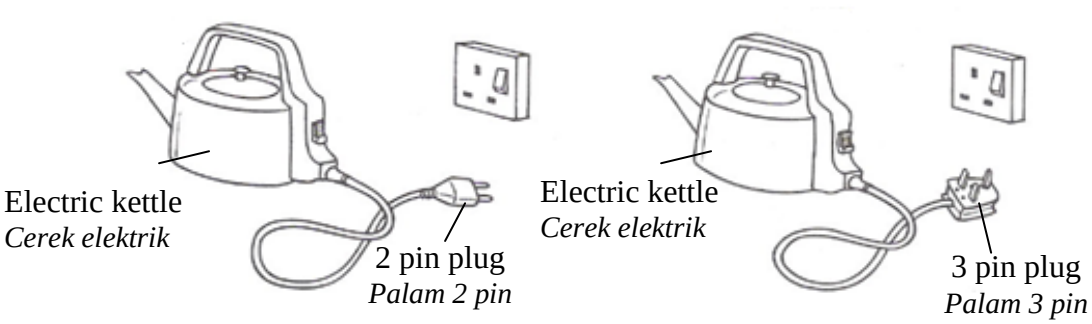


Diagram 10.5(a)
Rajah 10.5(a)

Diagram 10.5(b)
Rajah 10.5(b)

Diagram 10.5
Rajah 10.5

(i)Explain why a three pin plug is more suitable compared with a two pin plug.

Terangkan mengapa palam tiga pin adalah lebih sesuai berbanding dengan palam dua pin. [4 marks]

(d) Diagram 10.6 shows a water heater used to boil water.
Rajah 10.6 menunjukkan satu pemanas rendam digunakan untuk mendidihkan air.

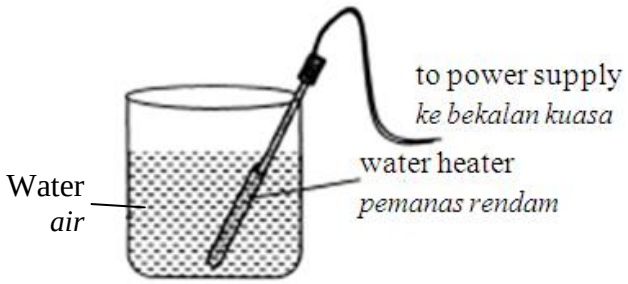


Diagram 10.6
Rajah 10.6

Using appropriate physics concepts, suggest and explain how to build a water heater which can boil a larger quantity of water faster , more efficient, and more safety based on the following aspects;
Dengan menggunakan konsep-konsep Fizik yang sesuai, cadang dan terangkan bagaimana untuk membina satu pemanas rendam yang boleh mendidihkan kuantiti air yang lebih besar dengan lebih cepat, lebih cekap dan lebih selamat , berdasarkan aspek-aspek berikut ;

(i)type of material used for the heating element of the water heater
Jenis *bahan yang digunakan untuk elemen pemanas bagi pemanas rendam*

(ii) shape of the heating element of the water heater
bentuk elemen pemanas bagi pemanas rendam

(iii) melting point of the heating element of the water heater
takat lebur elemen pemanas bagi pemanas rendam

(iv) rate of rusting of the heating element of the water heater
kadar pengaratan elemen pemanas bagi pemanas rendam

(v) additional component used for safety when the water boil
Komponen tambahan yang digunakan untuk keselamatan bila air mendidih
[10 marks]