

NAMA: .....

TINGKATAN: .....



MAJLIS PENGETUA SEKOLAH MALAYSIA (MPSM)  
NEGERI PERAK

MODUL KECEMERLANGAN SPM 2024  
SET 1

KIMIA  
KERTAS 2  
2 JAM 30 MINIT

JANGAN BUKA KERTAS PEPERIKSAAN INI SEHINGGA DIBERITAHU

ARAHAN:

- 1. Kertas soalan ini mengandungi tiga bahagian : **Bahagian A**, **Bahagian B** dan **Bahagian C**.
- 2. Jawab **semua** soalan daripada **Bahagian A**, pilih **satu** soalan daripada **Bahagian B** dan jawab **semua** soalan daripada **Bahagian C**
- 3. Jawapan hendaklah ditulis dalam kertas jawapan yang disediakan
- 4. Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan
- 5. Penggunaan kalkulator saintifik yang tidak boleh diprogramkan adalah dibenarkan

| KEGUNAAN PEMERIKSA |        |              |                  |
|--------------------|--------|--------------|------------------|
| Bahagian           | Soalan | Markah Penuh | Markah Diperoleh |
| A                  | 1      | 5            |                  |
|                    | 2      | 5            |                  |
|                    | 3      | 6            |                  |
|                    | 4      | 7            |                  |
|                    | 5      | 8            |                  |
|                    | 6      | 9            |                  |
|                    | 7      | 10           |                  |
|                    | 8      | 10           |                  |
| B                  | 9      | 20           |                  |
|                    | 10     | 20           |                  |
| C                  | 11     | 20           |                  |
| JUMLAH             |        | 100          |                  |



Bahagian A

[60 markah]

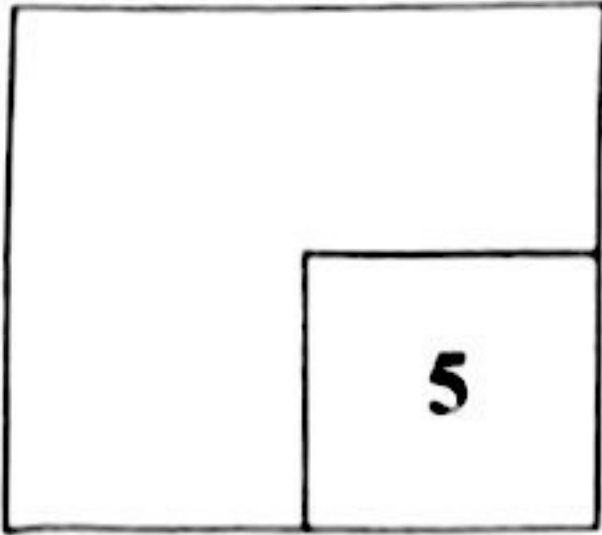
Jawab semua soalan.

- 1 Jadual 1 menunjukkan dua jenis kosmetik M dan N yang digunakan secara meluas oleh pengguna.  
*Table 1 shows two types of cosmetics M and N which are widely used by consumers.*

| Jenis kosmetik<br><i>Type of cosmetics</i> | Kegunaan<br><i>Use</i>                                                                   |
|--------------------------------------------|------------------------------------------------------------------------------------------|
| M                                          | Sebagai pelembap kulit dan masker muka.<br><i>As skin moisturisers and facial masks.</i> |
| N                                          | Sebagai deodoran dan minyak wangi.<br><i>As deodorants and perfumes.</i>                 |

Jadual / Table 1

- (a) Apakah yang dimaksudkan dengan kosmetik?  
*What is meant by cosmetics?*
- .....  
[1 markah / mark]
- (b) Berdasarkan Jadual 1, kenal pasti jenis kosmetik M dan N.  
*Based on Table 1, identify type of cosmetics M and N.*
- M: .....
- N: .....  
[2 markah / marks]
- (c) Terangkan mengapa nanoteknologi digunakan secara meluas dalam pembuatan bahan kosmetik.  
*Explain why nanotechnology is widely used in the manufacturing of cosmetics.*
- .....  
.....  
[2 markah / marks]





- 2 Jadual 2 menunjukkan beberapa sifat fizik bagi unsur Kumpulan 17 dalam Jadual Berkala Unsur.

*Table 2 shows some physical properties of Group 17 elements in the Periodic Table of Elements.*

| Unsur<br><i>Element</i> | Takat lebur (°C)<br><i>Melting point (°C)</i> | Takat didih (°C)<br><i>Boiling point (°C)</i> | Jejari atom (nm)<br><i>Atomic radius (nm)</i> |
|-------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Klorin, Cl              | -101                                          | -34                                           | 0.099                                         |
| Bromin, Br              | -7                                            | 59                                            | 0.114                                         |
| Iodin, I                | 114                                           | 184                                           | 0.133                                         |

Jadual / Table 2

- (a) Nyatakan nama lain bagi unsur Kumpulan 17.

*State the other name for Group 17 elements.*

.....  
[1 markah / mark]

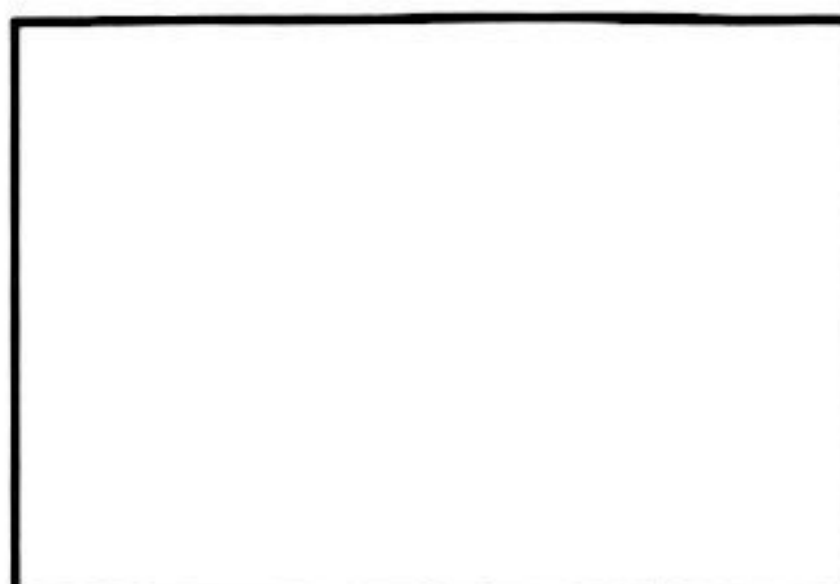
- (b) Nyatakan perubahan jejari atom apabila menuruni Kumpulan 17. Terangkan.

*State the change in atomic radius when going down Group 17. Explain.*

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

- (c) Lukiskan susunan zarah bagi bromin pada suhu bilik.

*Draw the arrangement of particles for bromine at room temperature.*

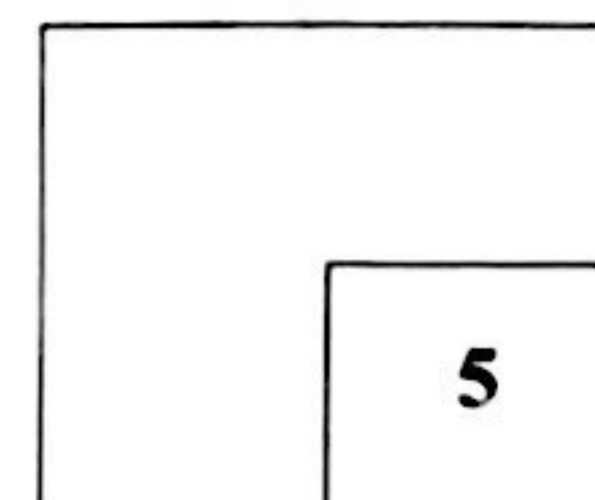


[1 markah / mark]

- (d) Nyatakan **satu** langkah keselamatan yang harus diamalkan apabila mengendalikan klorin dan bromin di makmal.

*State **one** safety step that should be practised when handling chlorine and bromine in the laboratory.*

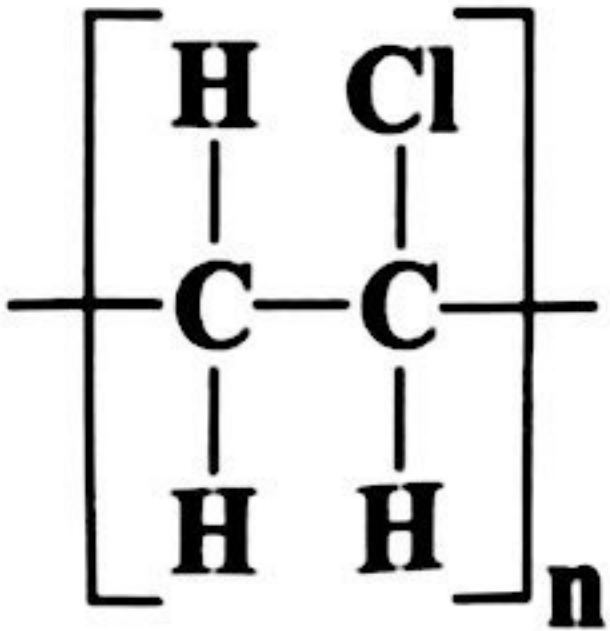
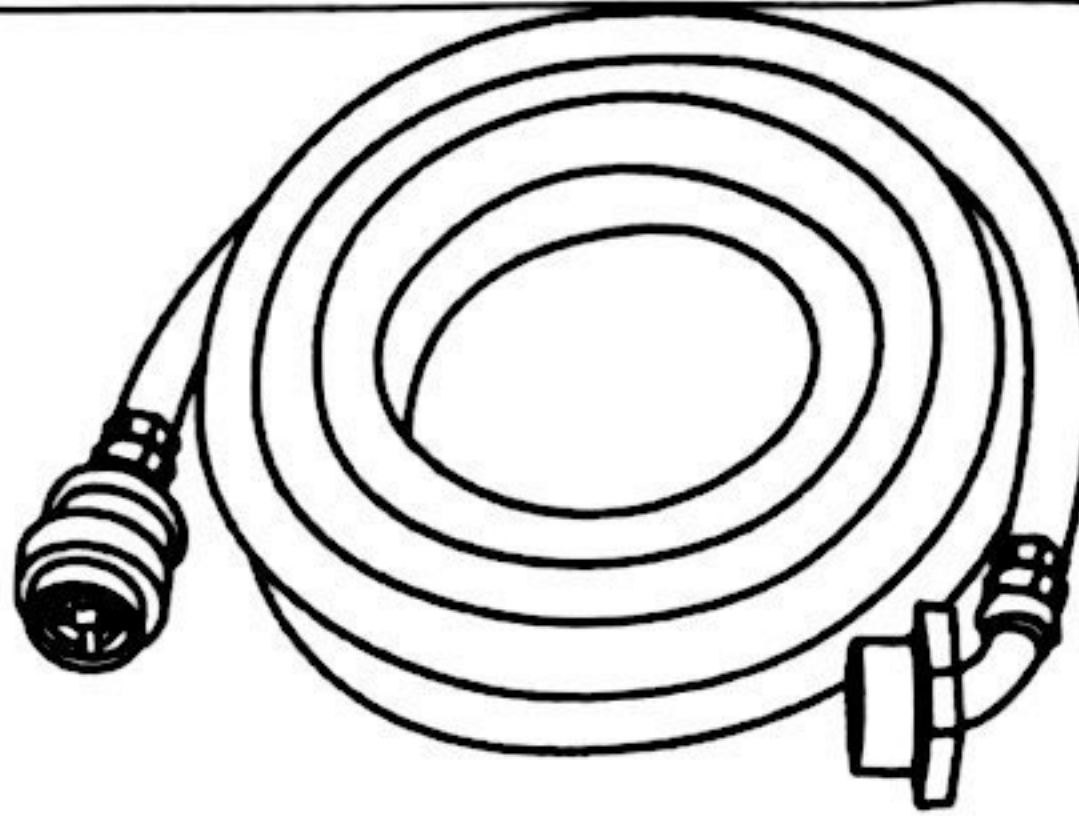
.....  
[1 markah / mark]





- 3 (a) Rajah 1 menunjukkan formula struktur polimer X yang digunakan untuk menghasilkan produk Y.

*Diagram 1 shows the structural formula of polymer X which is used to make product Y.*

|                                                                                   |                                                                                     |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |
| <p>Polimer X<br/><i>Polymer X</i></p>                                             | <p>Produk Y<br/><i>Product Y</i></p>                                                |

Rajah / Diagram 1

- (i) Apakah maksud polimer?  
*What is the meaning of polymer?*

.....  
[1 markah / mark]

- (ii) Lukis formula struktur bagi monomer yang membentuk polimer X.  
*Draw the structural formula of the monomer that forms polymer X.*

[1 markah / mark]



- (b) Jadual 3 menunjukkan dua pemerhatian bagi keadaan lateks apabila ditambah bahan A dan bahan B.

*Table 3 shows two observations for the condition of latex when substances A and substances B are added.*

| Bahan<br>Substance | Pemerhatian<br>Observation             |
|--------------------|----------------------------------------|
| A                  | Menggumpal<br>Coagulates               |
| B                  | Tidak menggumpal<br>Does not coagulate |

Jadual / Table 3

- (i) Namakan bahan yang ditambah ke dalam cecair lateks.

*Name the substances that are added to the liquid latex.*

Bahan A : .....  
Substance A

Bahan B : .....  
Substance B

[2 markah / marks]

- (ii) Terangkan secara ringkas proses penggumpalan lateks yang berlaku selepas terdedah kepada udara selama beberapa hari.

*Explain briefly the process of coagulation of latex that occurs after the latex is exposed to air for a few days.*

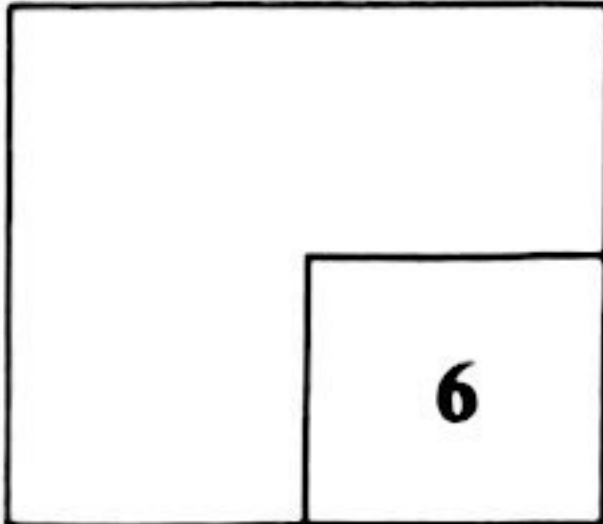
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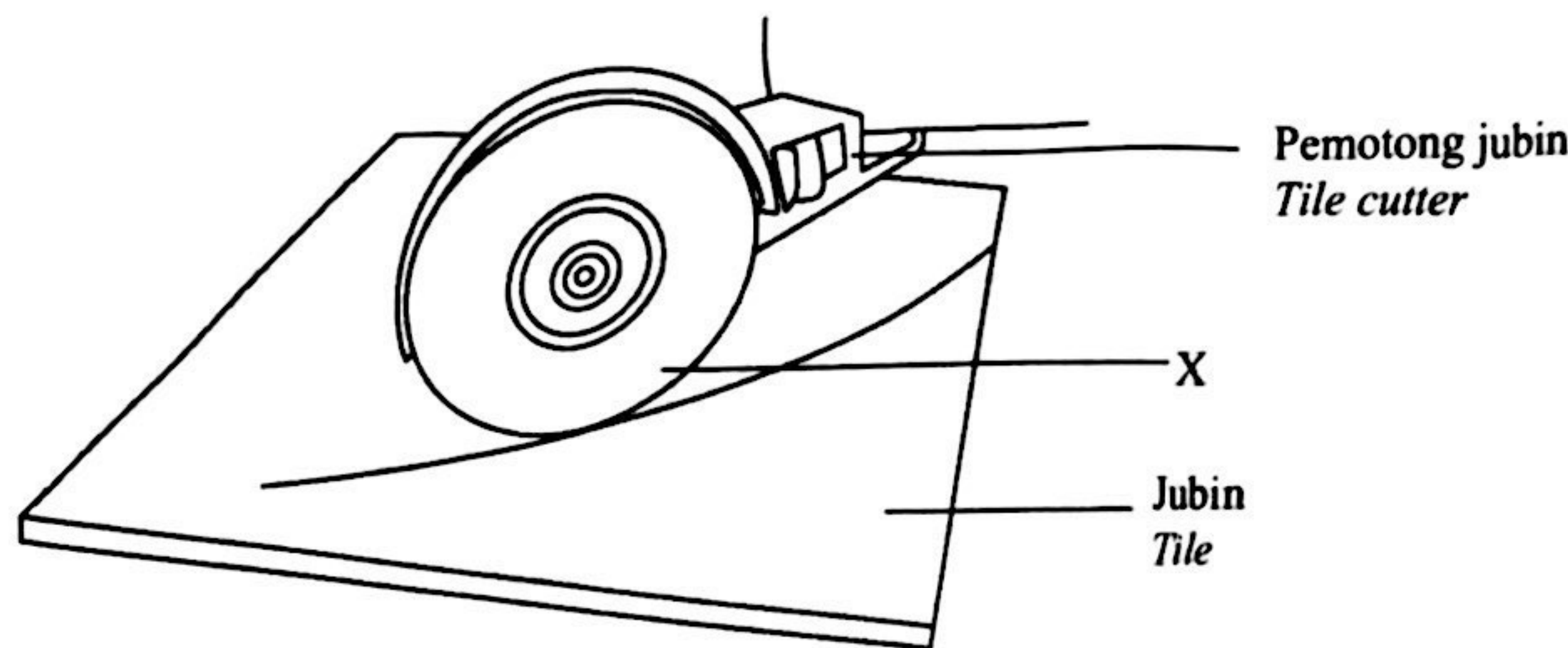
.....

[2 markah / marks]





- 4 (a) Rajah 2.1 menunjukkan satu alat yang lazim digunakan oleh pekerja binaan untuk memotong jubin.  
*Diagram 2.1 shows a tool that is normally used by construction worker to cut tiles.*

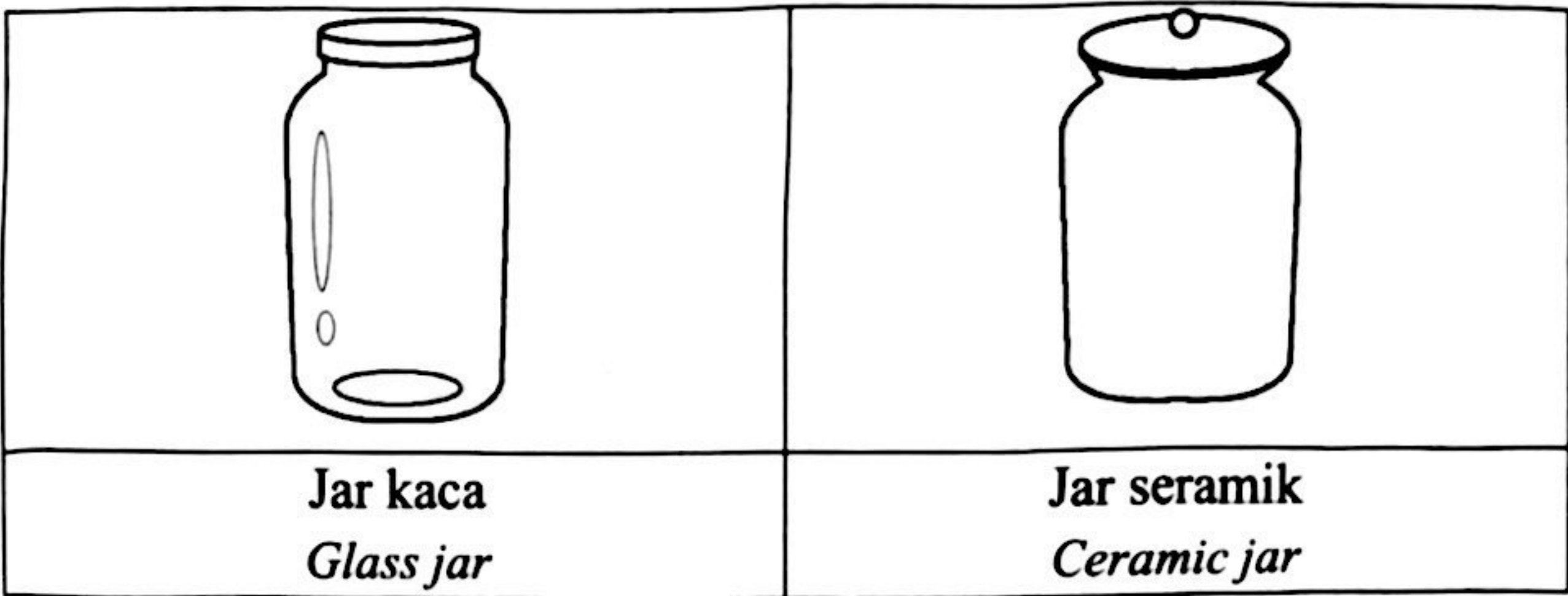


Rajah / Diagram 2.1

- (i) Nyatakan jenis seramik yang digunakan untuk menghasilkan jubin.  
*State the type of ceramic used to make tiles.*
- .....
- [1 markah / mark]
- (ii) Berdasarkan Rajah 2.1, namakan X dan nyatakan sifat X yang membolehkan ia digunakan untuk memotong jubin.  
*Based on Diagram 2.1, name X and the state the property of X that makes it be used as tiles cutter.*
- .....
- .....
- [2 markah / marks]

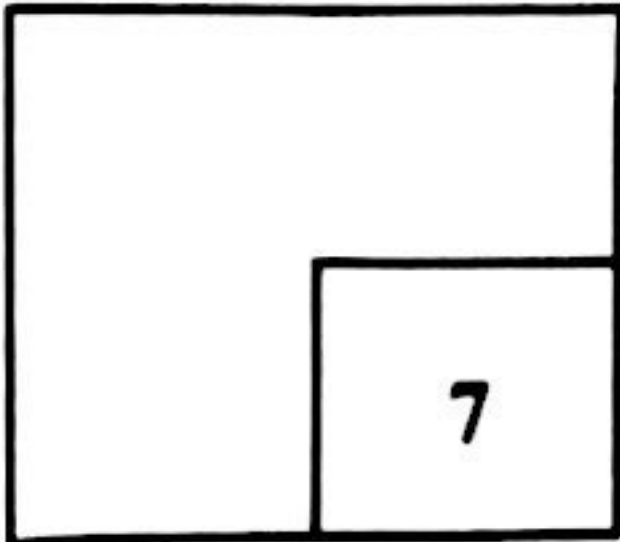


- (b) Maya ingin memilih bekas yang sesuai untuk menyimpan jeruk buah. Rajah 2.2 menunjukkan bekas yang boleh digunakan untuk tujuan itu.  
*Maya wants to choose a suitable container to keep fruit pickles. Diagram 2.2 shows the containers that can be used for that purpose.*



Rajah / Diagram 2.2

- (i) Bekas manakah yang lebih sesuai? Wajarkan jawapan anda.  
*Which container is more suitable? Justify your answer.*
- .....
- .....
- .....
- [3 markah / marks]
- (ii) Nyatakan **satu** kekurangan bekas tersebut, berdasarkan jawapan anda di 4(b)(i).  
*State **one** disadvantage of the container, based on your answer in 4(b)(i).*
- .....
- [1 markah / mark]





- 5 Jadual 4 menunjukkan persamaan bagi dua tindak balas melibatkan oksida logam P dan logam Q. Formula empirik bagi oksida P dan oksida Q ditentukan melalui Kaedah I dan Kaedah II.

Table 4 shows the equations for two reactions involving oxide of metal P and metal Q. The empirical formulae of P oxide and Q oxide are determined through Method I and Method II.

| Kaedah<br>Method | Persamaan<br>Equation           |
|------------------|---------------------------------|
| I                | $H_2 + PO \rightarrow P + H_2O$ |
| II               | $2Q + O_2 \rightarrow 2QO$      |

Jadual / Table 4

- (a) Apakah yang dimaksudkan dengan formula empirik?

What is meant by empirical formula?

.....

.....

[1 markah / mark]

- (b) Cadangkan nama logam Q.

Suggest name of metal Q.

.....

[1 markah / mark]

- (c) Apabila 4.5 g unsur Q terbakar dengan lengkap menghasilkan 7.5 g oksida Q. Apakah formula empirik bagi oksida logam tersebut?

[Jisim atom relatif : Q = 24, O =16]

When 4.5 g of element Q is burnt completely forming 7.5 g of oxide of Q. What is the empirical formula of the metal oxide?

[Relative atomic mass : Q = 24, O = 16]

[4 markah / marks]



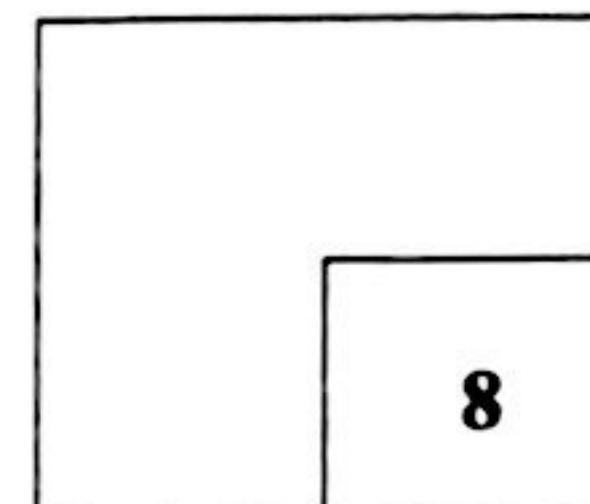
- (d) Kaedah yang manakah lebih sesuai digunakan untuk menentukan formula empirik bagi kuprum(II) oksida, CuO? Terangkan.

*Which method is suitable to be used to determine the empirical formula of copper(II) oxide, CuO? Explain.*

.....

.....

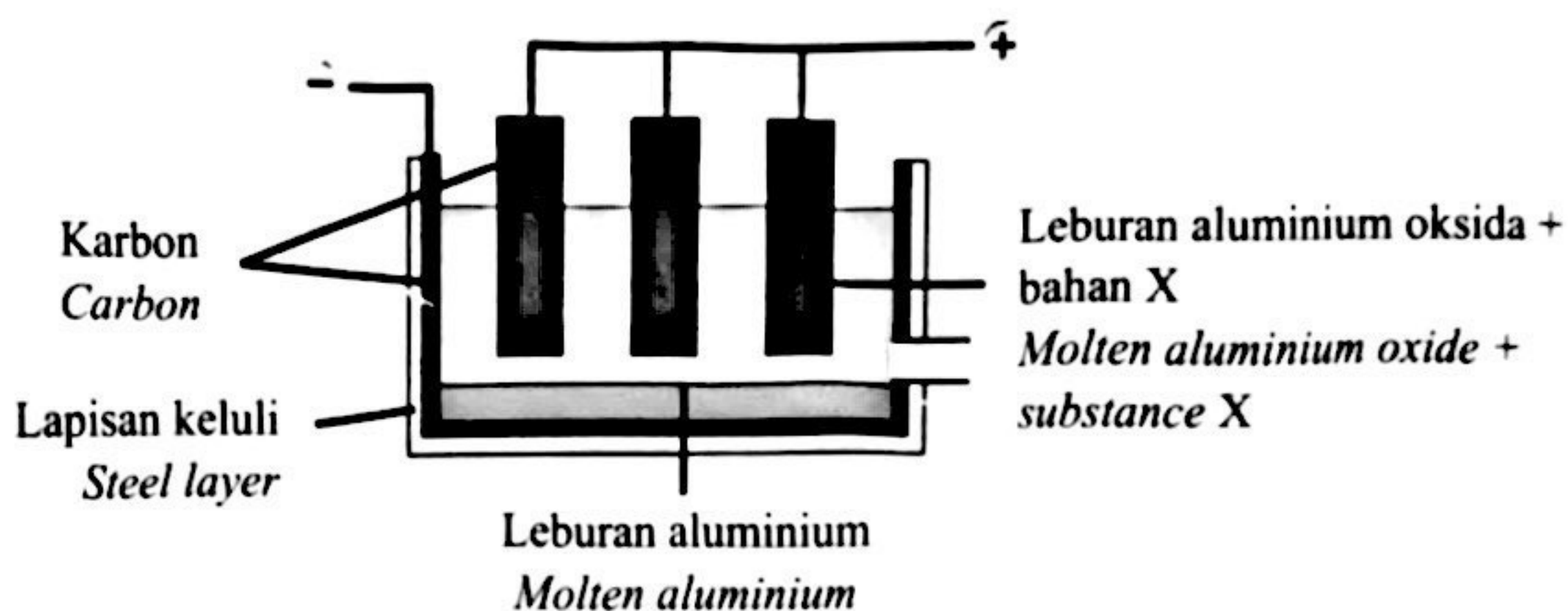
[2 markah / marks]





- 6 (a) Rajah 3 menunjukkan satu model susunan radas untuk pengekstrakan logam dalam industri.

*Diagram 3 shows a model of apparatus set-up for the extraction of metal in the industry.*



Rajah / Diagram 3

Berdasarkan Rajah 3,  
Based on Diagram 3,

- (i) Namakan proses untuk mengekstrak logam daripada bijihnya.  
*Name the process to extract the metal from its ore.*

.....  
[1 markah / mark]

- (ii) Bahan X ditambah untuk merendahkan takat lebur aluminium oksida.  
Apakah bahan X?  
*Substance X is added to lower the melting point of aluminium oxide. What is substance X?*

.....  
[1 markah / mark]

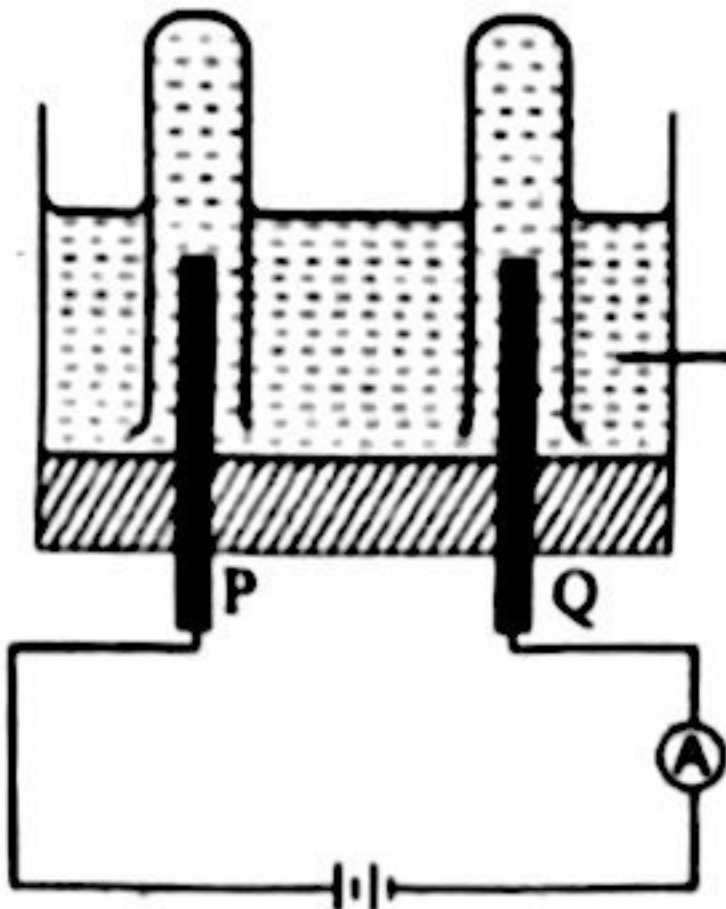
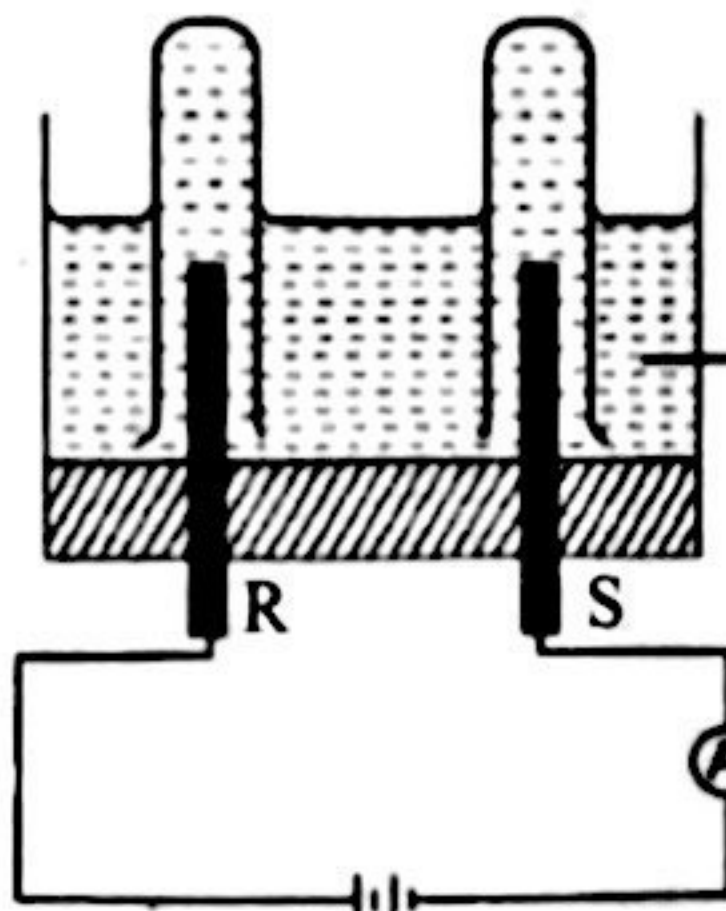
- (iii) Nyatakan **satu** kegunaan logam yang diekstrakkan.  
*State **one** use of the extracted metal.*

.....  
[1 markah / mark]



(b) Rajah 4 menunjukkan susunan radas elektrolisis larutan kalium hidroksida dan larutan kalium klorida dengan menggunakan elektrod karbon.

Diagram 4 shows the apparatus set-up for the electrolysis of potassium hydroxide solution and potassium chloride solution using carbon electrodes.

| Sel<br>Cell | Susunan radas<br>Set-up of apparatus                                                                                                                                                                                                   |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I           | <div></div> <div>Larutan kalium hidroksida, KOH<br/>1.0 mol dm<sup>-3</sup><br/>1.0 mol dm<sup>-3</sup> potassium hydroxide,<br/>KOH solution</div> |
| II          | <div></div> <div>Larutan kalium klorida, KCl<br/>1.0 mol dm<sup>-3</sup><br/>1.0 mol dm<sup>-3</sup> potassium chloride,<br/>KCl solution</div>    |

Rajah / Diagram 4

Jadual 5 menunjukkan nilai keupayaan elektrod piawai.

Table 5 shows the standard electrode potential value.

| Persamaan setengah sel<br>Half-cell equations             | Keupayaan elektrod piawai, E <sup>0</sup> / V(298 K)<br>Standard electrode potential, E <sup>0</sup> / V(298 K) |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| K <sup>+</sup> + e ⇌ K                                    | -2.92                                                                                                           |
| 2H <sup>+</sup> + 2e ⇌ H <sub>2</sub>                     | 0.00                                                                                                            |
| O <sub>2</sub> + H <sub>2</sub> O + 4e ⇌ 4OH <sup>-</sup> | +0.40                                                                                                           |
| Cl <sub>2</sub> + 2e ⇌ 2Cl <sup>-</sup>                   | +1.36                                                                                                           |

Jadual / Table 5



Berdasarkan Rajah 4 dan Jadual 5,

*Based on Diagram 4 and Table 5,*

- (i) Nyatakan semua kation yang hadir dalam kedua-dua sel elektrolisis.

*State all the cations that present in both electrolytic cells.*

.....  
[1 markah / mark]

- (ii) Huraikan satu ujian kimia bagi menentusahkan hasil yang terbentuk pada elektrod Q dan S.

*Describe a chemical test to verify the product formed at electrode Q and S.*

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

- (iii) Nyatakan nama hasil yang terbentuk pada elektrod R.

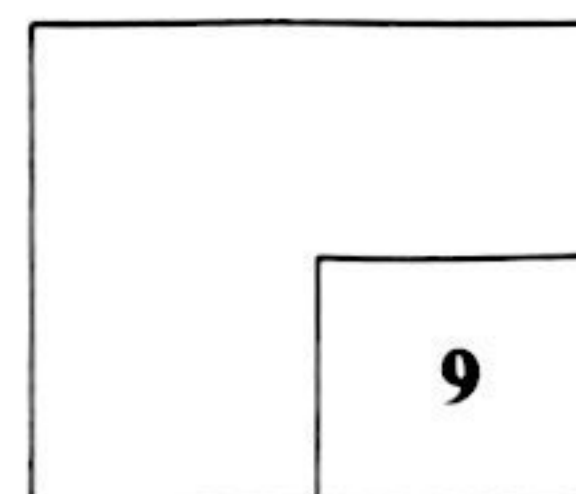
*State the name of product formed at electrode R.*

.....  
[1 markah / mark]

- (iv) Terangkan jawapan anda di 6(b)(iii).

*Explain your answer in 6(b)(iii).*

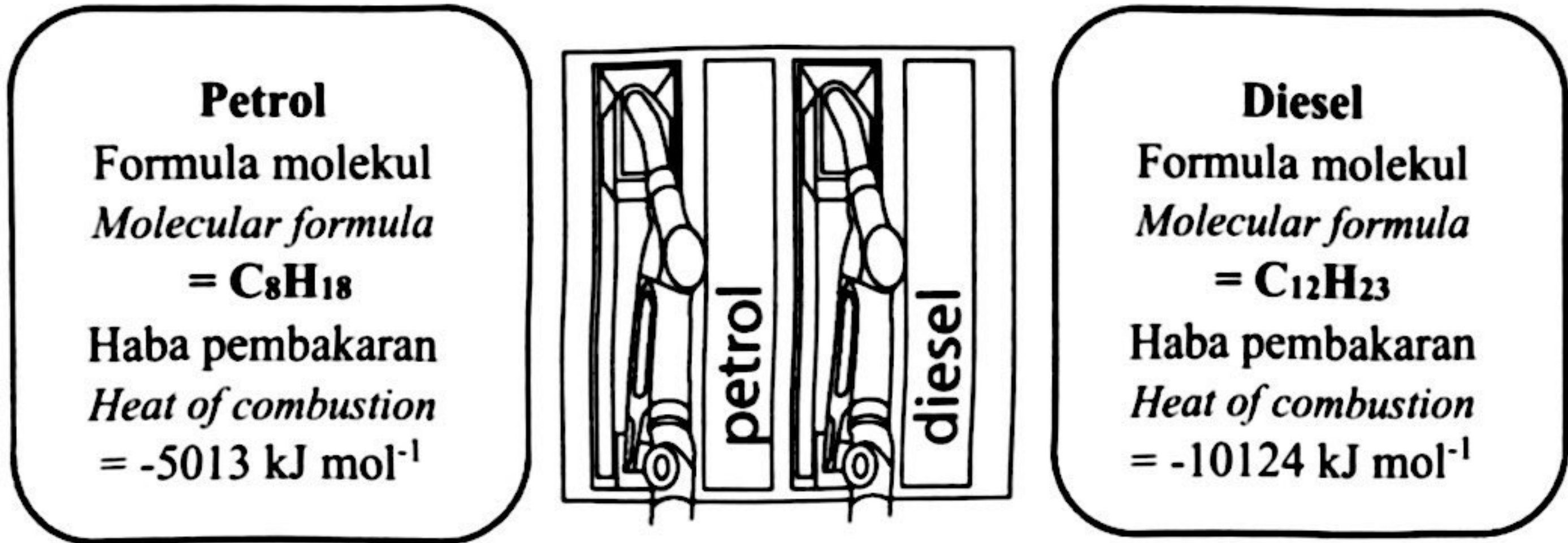
.....  
.....  
.....  
[2 markah / marks]





- 7 (a) Rajah 5 menunjukkan dua bahan api yang berlainan yang boleh didapati dengan mudah di semua stesen petrol seluruh Malaysia.

Diagram 5 shows two different fuels that are easily available at all petrol stations throughout Malaysia.



Rajah / Diagram 5

- (i) Nyatakan maksud haba pembakaran.  
State the meaning of heat of combustion.
- .....
- .....
- [1 markah / mark]
- (ii) Bandingkan haba pembakaran bagi petrol dan diesel.  
Compare the heat of combustion of petrol and diesel.
- .....
- [1 markah / mark]
- (iii) Vishantan telah mengisi 2.28 liter petrol ke dalam tangki motosikalnya. Hitungkan haba yang terbebas jika petrol terbakar lengkap dalam oksigen berlebihan.  
[Jisim molekul relatif petrol = 114 ; Anggap 1 liter bersamaan 1000 g]  
Vishantan had filled 2.28 liters of petrol into the tank of his motorcycle. Calculate the heat liberated if petrol burns completely in excess oxygen.  
[The relative molecular mass of petrol = 114 ; Assume 1 liter equals 1000 g]

[3 markah / marks]





- (b) Jadual 6 menunjukkan nilai bahan api bagi beberapa jenis bahan api.

*Table 6 shows the fuel value for several types of fuel.*

| Bahan api<br><i>Fuel</i>            | Nilai bahan api (kJ g <sup>-1</sup> )<br><i>Fuel value (kJ g<sup>-1</sup>)</i> |
|-------------------------------------|--------------------------------------------------------------------------------|
| Petrol<br><i>Petrol</i>             | 34                                                                             |
| Metanol<br><i>Methanol</i>          | 30                                                                             |
| Gas asli<br><i>Natural gas</i>      | 50                                                                             |
| Gas hidrogen<br><i>Hydrogen gas</i> | 143                                                                            |

Jadual / Table 6

Petrol telah digunakan secara meluas di dalam negara kita. Berdasarkan Jadual 6, pilih bahan api yang sesuai digunakan bagi menggantikan petrol. Wajarkan pilihan anda.

*Petrol has been widely used in our country. Based on Table 6, choose the appropriate fuel to be used to replace petrol. Justify your choice.*

.....  
 .....  
 .....

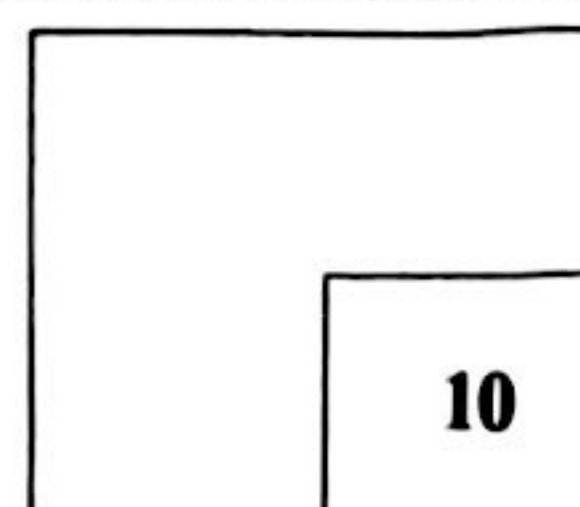
[2 markah / marks]

- (c) Daziel dan rakan-rakan telah menyertai satu perkhemahan STEM. Mereka ditugaskan untuk memasak tanpa menggunakan api. Sebagai murid kimia, anda dikehendaki membantu Daziel untuk mereka cipta satu pek panas. Pilih bahan-bahan yang sesuai dan terangkan bagaimana ia berfungsi.

*Daziel and friends have participated in a STEM camp. They were assigned to cook without using fire. As a chemistry student, you are required to help Daziel to create a heat pack. Choose the appropriate ingredients and explain how they work.*

- Pek makanan  
*Food package*
- Air  
*Water*
- Besen  
*Basin*
- Ammonium nitrat  
*Ammonium nitrate*
- Kalsium oksida  
*Calcium oxide*

.....  
 .....  
 .....  
 .....

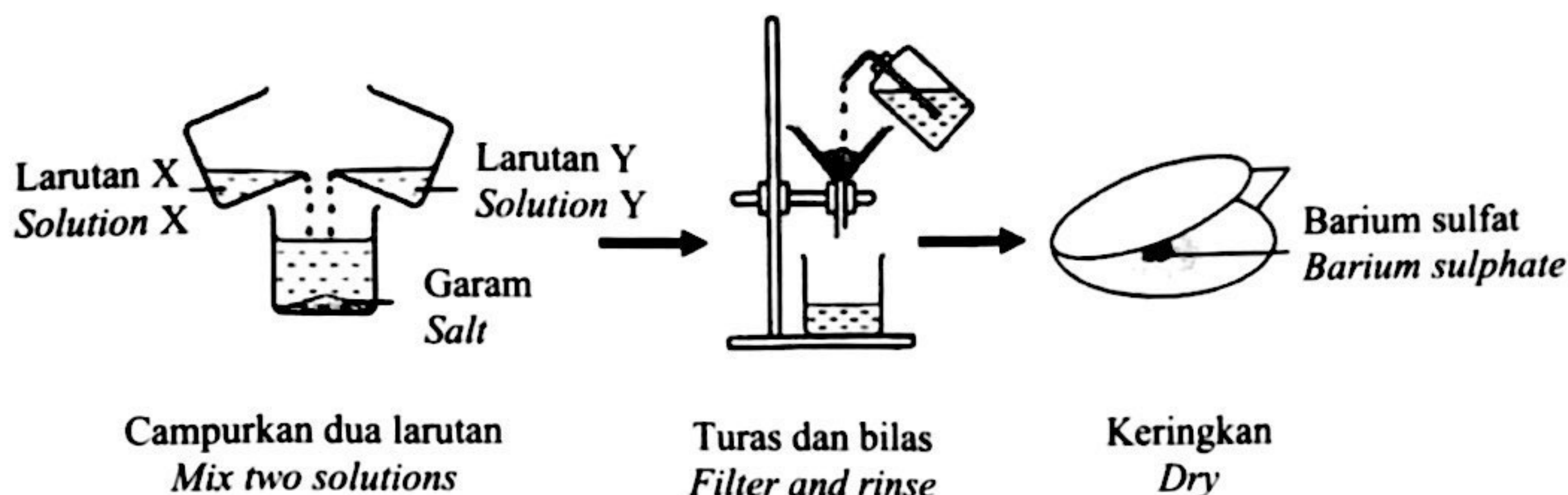


[3 markah / marks]



- 8 (a) Rajah 6 menunjukkan kaedah penyediaan garam barium sulfat.

*Diagram 6 shows the method of preparing barium sulphate salt.*



Rajah / Diagram 6

Berdasarkan Rajah 6,  
*Based on Diagram 6,*

- (i) Namakan jenis tindak balas ini.

*Name the type of reaction.*

.....  
[1 markah / mark]

- (ii) Cadangkan larutan X dan Y yang digunakan di dalam tindak balas tersebut.  
*Suggest solution X and Y used in the reaction.*

Larutan X: .....  
*Solution X*

Larutan Y: .....  
*Solution Y*

[2 markah / marks]

- (iii) Tuliskan persamaan kimia untuk tindak balas tersebut.

*Write the chemical equation for the reaction.*

.....  
[2 markah / marks]

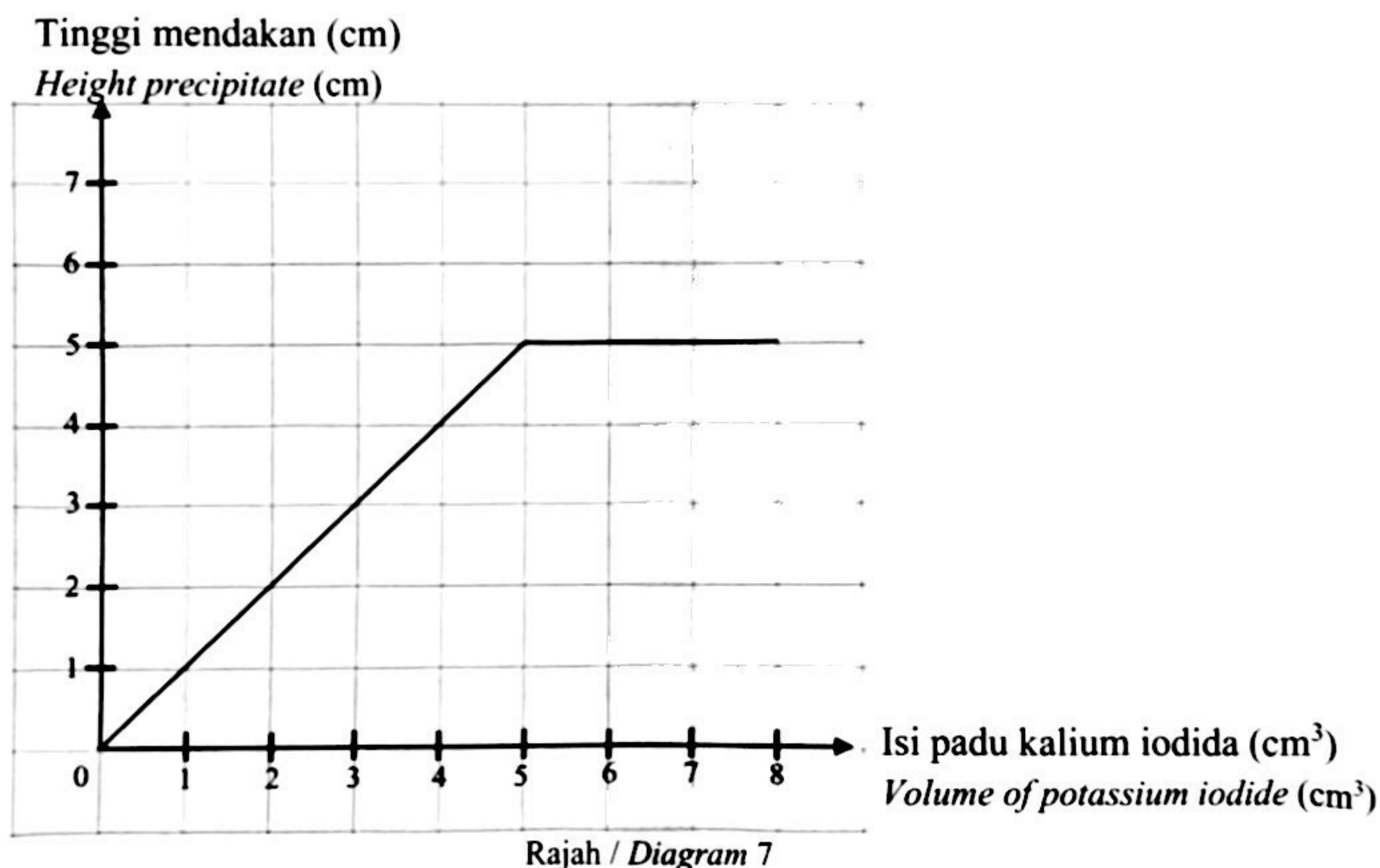


(b) Satu eksperimen dijalankan untuk membina persamaan ion bagi pembentukan plumbum(II) iodida menggunakan kaedah perubahan berterusan.

- Isi padu tetap  $5.00 \text{ cm}^3$  larutan plumbum(II) nitrat,  $\text{Pb}(\text{NO}_3)_2$   $0.5 \text{ mol dm}^{-3}$  diisikan ke dalam setiap 8 tabung uji yang sama saiz.
- Isi padu yang berbeza larutan kalium iodida,  $\text{KI}$   $1.0 \text{ mol dm}^{-3}$  ditambahkan ke dalam setiap tabung uji.
- Tinggi mendakan kuning plumbum(II) iodida yang terbentuk dalam setiap tabung uji diukur dan direkod. Satu graf tinggi mendakan melawan isi padu kalium iodida diplot.

*An experiment is carried out to construct an ionic equation for the formation of lead(II) iodide by using continuous variation method.*

- *A fixed volume of  $5.00 \text{ cm}^3$  of  $0.5 \text{ mol dm}^{-3}$  lead(II) nitrate,  $\text{Pb}(\text{NO}_3)_2$  solution is placed into each of the 8 test tube of the same size.*
- *Different volumes of  $1.0 \text{ mol dm}^{-3}$  potassium iodide solution,  $\text{KI}$  is added into each test tube.*
- *The height of the yellow precipitate, lead(II) iodide formed in each test tube is measured and recorded. A graph of height of precipitate against volume of potassium iodide is plotted.*





Berdasarkan Rajah 7,  
*Based on Diagram 7,*

- (i) Hitung bilangan mol ion iodida yang bertindak balas dengan 1 mol ion plumbum(II).

*Calculate the number of mole of iodide ion that reacts with 1 mole of lead(II) ion.*

[3 markah / marks]

- (ii) Berdasarkan jawapan di 8(b)(i), bina persamaan ion bagi pembentukan plumbum(II) iodida.

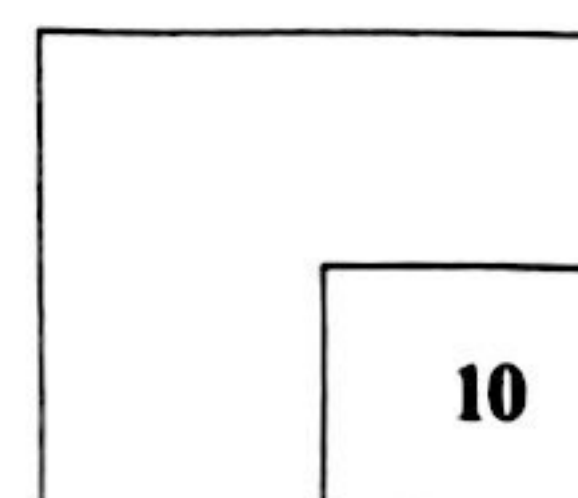
*Based on the answer in 8(b)(i), construct an ionic equation for the formation of lead(II) iodide.*

.....  
[1 markah / mark]

- (iii) Terangkan mengapa kelapan-lapan tabung uji yang digunakan adalah bersaiz sama.

*Explain why the eight test tubes used are the same size.*

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





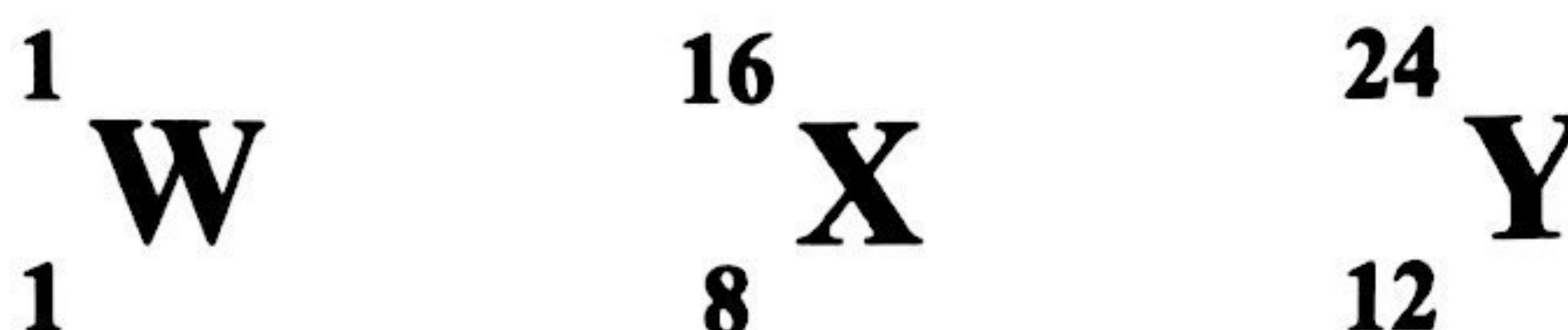
**Bahagian B**

[20 markah]

*Bahagian ini mengandungi dua soalan. Jawab satu soalan.*

- 9 Rajah 8.1 menunjukkan perwakilan piawai bagi tiga unsur W, X dan Y. Huruf-huruf ini bukan simbol sebenar unsur dalam Jadual Berkala Unsur.

*Diagram 8.1 show the standard representative for three elements W, X and Y. These letters are not the actual symbols of the elements in The Periodic Table of Elements.*



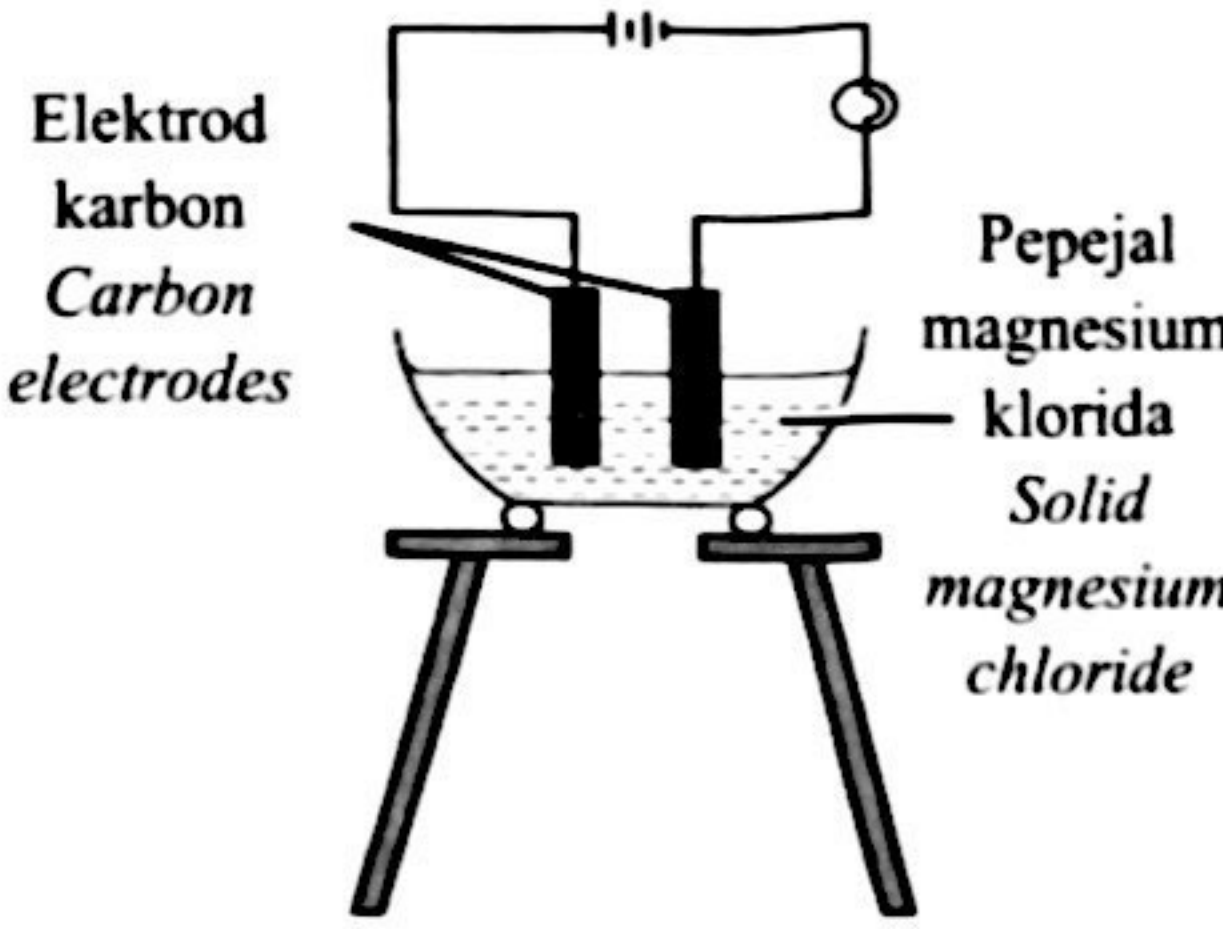
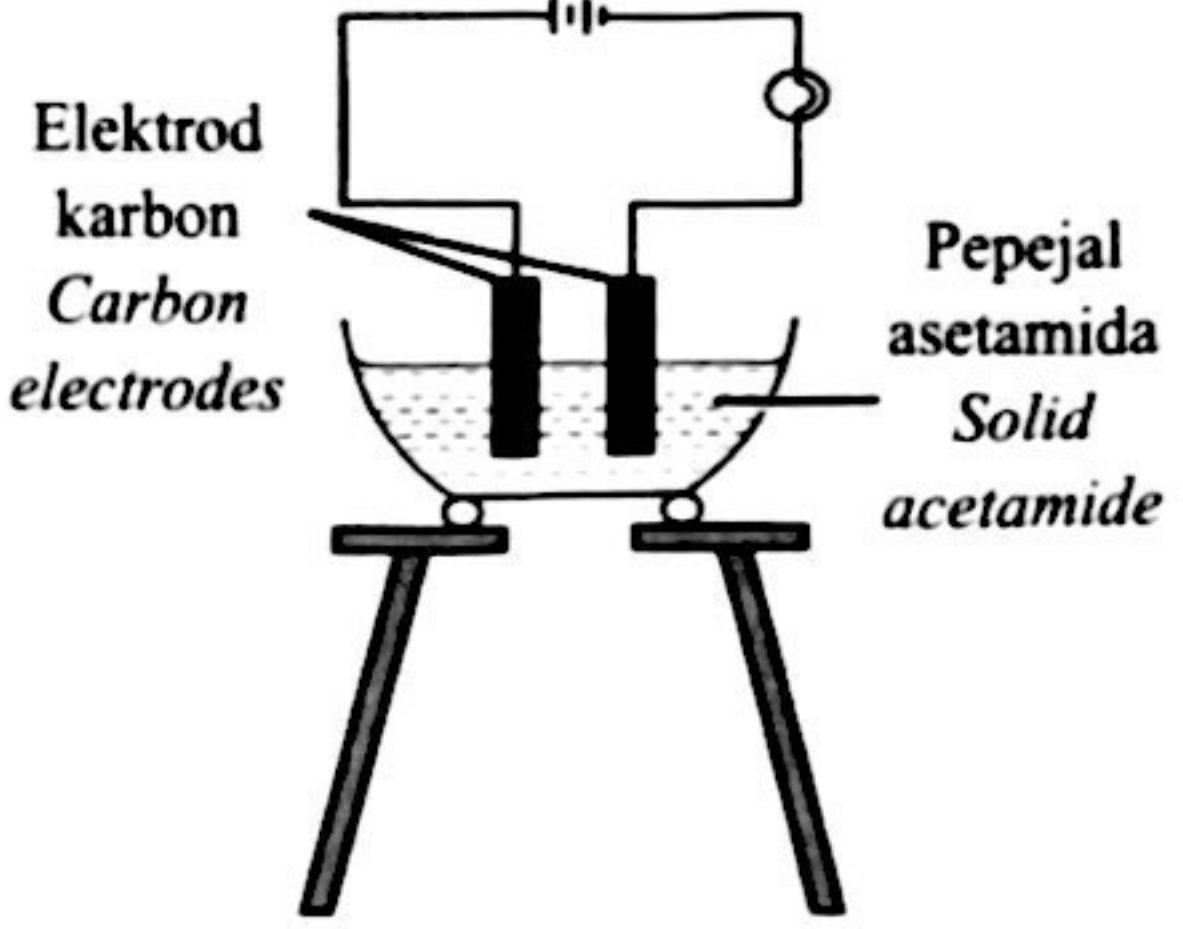
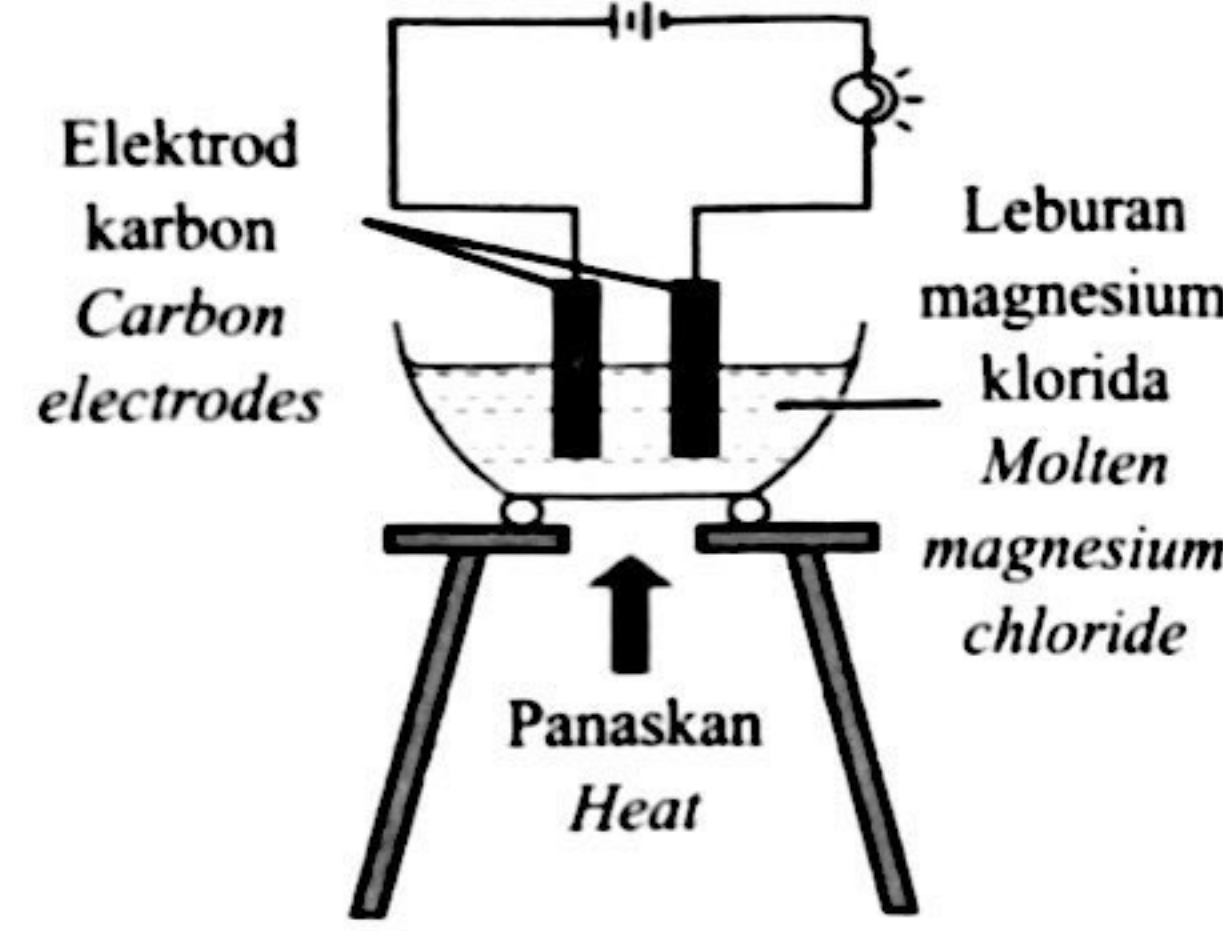
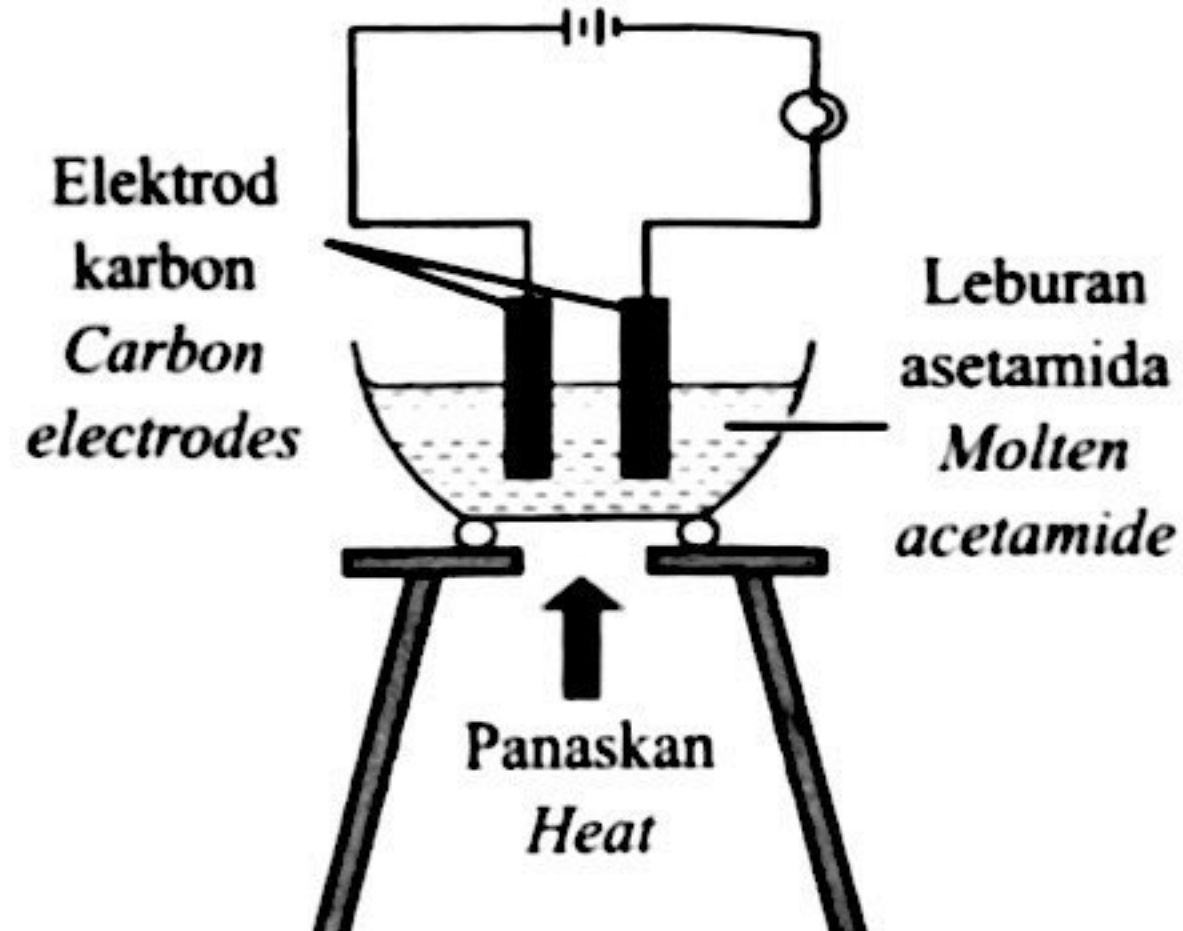
Rajah / Diagram 8.1

- (a) (i) Apakah maksud ikatan kovalen?  
*What is the meaning of covalent bond?*
- [1 markah / mark]
- (ii) Berdasarkan Rajah 8.1, pilih dua jenis unsur yang berlainan untuk membentuk satu sebatian kovalen. Terangkan pembentukan sebatian tersebut, sertakan formula molekul dan rajah susunan elektron.  
*Based on Diagram 8.1, choose two different elements to form a covalent compound. Explain the formation of the compound, include the molecular formula and the electron arrangement diagram of the compound.*
- [7 markah / marks]
- (b) Molekul ammonia boleh membentuk ikatan datif dengan ion hidrogen. Lukis struktur Lewis bagi ion yang terbentuk dan labelkan ikatan datif.  
*Ammonia molecule can form dative bond with hydrogen ion. Draw the Lewis structure for the ion formed and label the dative bond.*
- [2 markah / marks]



- (c) Rajah 8.2 dan 8.3 menunjukkan susunan radas dan pemerhatian bagi satu eksperimen untuk mengkaji kekonduksian elektrik dan takat lebur dua jenis sebatian.

*Diagram 8.2 and 8.3 shows the apparatus set-up and observations for an experiment to study the electrical conductivity and melting point of two types of compounds.*

|                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;"><b>Suhu bilik</b><br/><i>Room temperature</i></p>  <p>Elektrod karbon<br/><i>Carbon electrodes</i></p> <p>Pepejal magnesium klorida<br/><i>Solid magnesium chloride</i></p> | <p style="text-align: center;"><b>Suhu bilik</b><br/><i>Room temperature</i></p>  <p>Elektrod karbon<br/><i>Carbon electrodes</i></p> <p>Pepejal asetamida<br/><i>Solid acetamide</i></p> |
| Rajah / Diagram 8.2(a)                                                                                                                                                                                                                                                                        | Rajah / Diagram 8.2(b)                                                                                                                                                                                                                                                        |
|  <p>Elektrod karbon<br/><i>Carbon electrodes</i></p> <p>Leburan magnesium klorida<br/><i>Molten magnesium chloride</i></p> <p>Panaskan<br/><i>Heat</i></p>                                                |  <p>Elektrod karbon<br/><i>Carbon electrodes</i></p> <p>Leburan asetamida<br/><i>Molten acetamide</i></p> <p>Panaskan<br/><i>Heat</i></p>                                                |
| Rajah / Diagram 8.3(a)                                                                                                                                                                                                                                                                        | Rajah / Diagram 8.3(b)                                                                                                                                                                                                                                                        |

Berdasarkan pemerhatian dalam Rajah 8.2 dan Rajah 8.3, nyatakan jenis sebatian bagi magnesium klorida dan asetamida. Jelaskan perbezaan pemerhatian bagi kedua-dua jenis sebatian ini berdasarkan aspek berikut:

- Kekonduksian elektrik
- Takat lebur

*Based on the observations in Diagram 8.2 and Diagram 8.3, state the type of compound for magnesium chloride and acetamide. Explain the difference in the observations for both compounds in term of:*

- *Electrical conductivity*
- *Melting point*

[10 markah / marks]



- 10 (a)** Maklumat berikut menunjukkan dua situasi untuk melarutkan garam di dalam air.  
*The following information shows two situations to dissolve salt in water.*

|                     |                                                                                 |
|---------------------|---------------------------------------------------------------------------------|
| Situasi I           | : Garam halus lebih mudah larut di dalam air panas berbanding dengan air sejuk. |
| <i>Situation I</i>  | : <i>Fine salt is easier to dissolve in hot water compared to cold water.</i>   |
| Situasi II          | : Garam halus lebih mudah larut berbanding garam kasar di dalam air sejuk.      |
| <i>Situation II</i> | : <i>Fine salt is easier to dissolve compared to coarse salt in cold water.</i> |

Berdasarkan situasi tersebut, nyatakan dua faktor yang terlibat. Dengan memilih salah satu situasi, jelaskan bagaimana faktor tersebut mempengaruhi keterlarutan garam.

*Based on the situations, state the two factors involved. By choosing one of the situations, explain how the factor affects the solubility of salt.*

[4 markah / marks]



- (b) Jadual 7 menunjukkan tiga set eksperimen yang dijalankan untuk mengkaji kadar tindak balas antara zink dengan asid nitrik.

*Table 7 shows three sets of experiment that are carried out to study the rate of reaction between zinc and nitric acid.*

| Set | Bahan tindak balas<br><i>Reactants</i>                                                                                                                                                                                     | Suhu (°C)<br><i>Temperature (°C)</i> |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| I   | 9 g serbuk zink + 25 cm <sup>3</sup> asid nitrik 0.2 mol dm <sup>-3</sup><br>9 g zinc powder + 25 cm <sup>3</sup> of 0.2 mol dm <sup>-3</sup> nitric acid                                                                  | 30                                   |
| II  | 9 g serbuk zink + 25 cm <sup>3</sup> asid nitrik 0.2 mol dm <sup>-3</sup><br>9 g zinc powder + 25 cm <sup>3</sup> of 0.2 mol dm <sup>-3</sup> nitric acid                                                                  | 50                                   |
| III | 9 g serbuk zink + 25 cm <sup>3</sup> asid nitrik 0.2 mol dm <sup>-3</sup><br>+ larutan kuprum(II) sulfat<br>9 g zinc powder + 25 cm <sup>3</sup> of 0.2 mol dm <sup>-3</sup> nitric acid +<br>copper(II) sulphate solution | 30                                   |

Jadual / Table 7

- (i) Tuliskan persamaan kimia bagi tindak balas antara zink dan asid nitrik. Hitung isi padu maksimum gas yang terbebas dalam Set I.  
[Jisim atom relatif : Zn = 65; Isi padu molar gas = 24 dm<sup>3</sup> mol<sup>-1</sup> pada keadaan bilik]

*Write the chemical equation for the reaction between zinc and nitric acid. Calculate the maximum volume of gas produced in Set I.*

*[Relative atomic mass : Zn = 65; Molar volume of gas = 24 dm<sup>3</sup> mol<sup>-1</sup> at room condition]*

[6 markah / marks]

- (ii) Bandingkan kadar tindak balas bagi:

*Compare the rate of reaction for:*

- Set I dan Set II  
*Set I and Set II*
- Set I dan Set III  
*Set I and Set III*

Terangkan jawapan anda berdasarkan Teori Pelanggaran.

*Explain your answer based on Collision Theory.*

[10 markah / marks]



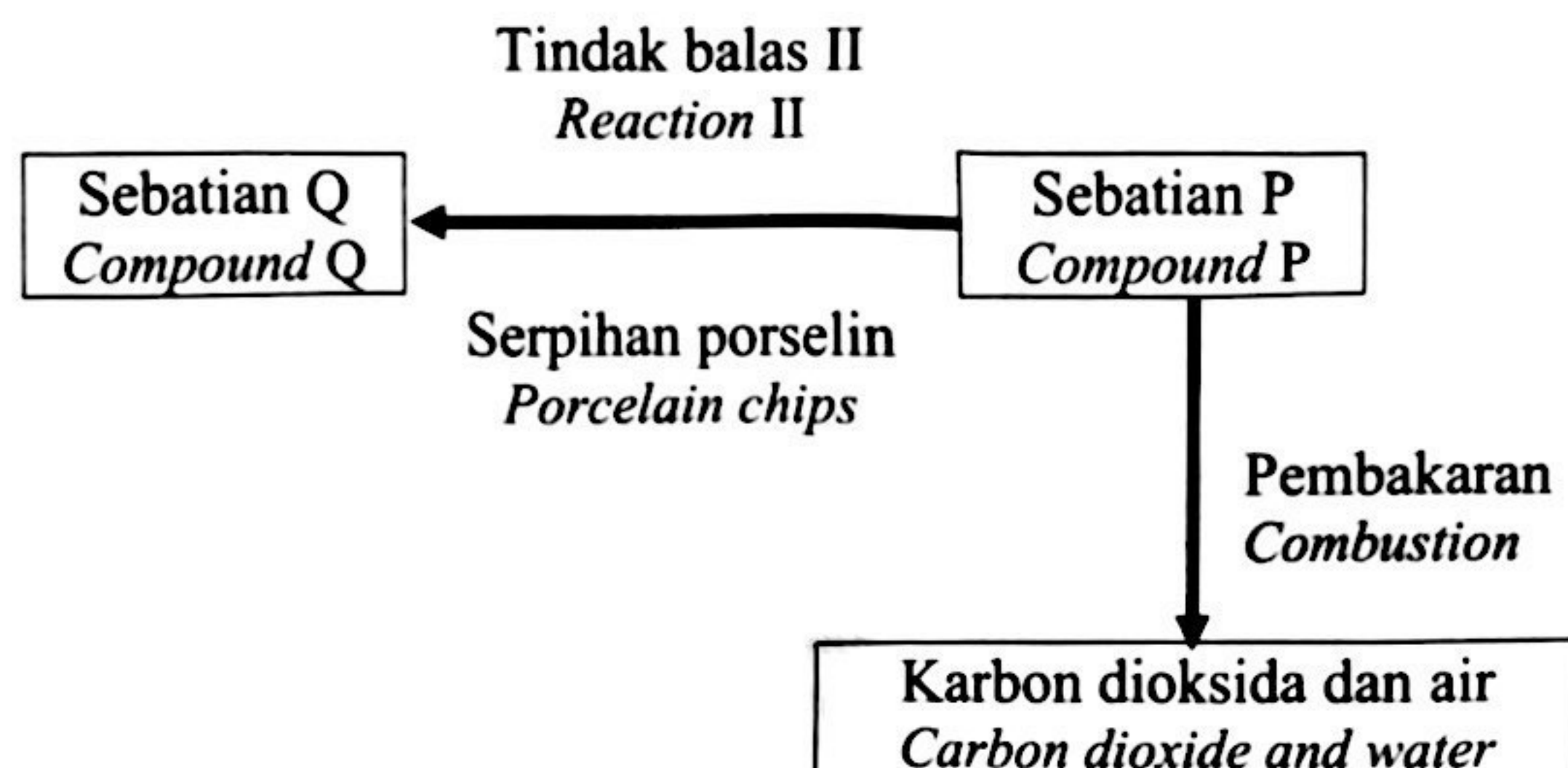
**Bahagian C**

[20 markah]

*Soalan ini mesti dijawab.*

- 11 (a) Rajah 9.1 menunjukkan pertukaran sebatian P kepada sebatian Q. Sebatian P mempunyai formula molekul  $C_4H_{10}O$ .

*Diagram 9.1 shows the conversions of compound P to compound Q. Compound P has a molecular formula of  $C_4H_{10}O$ .*



Rajah / Diagram 9.1

Berdasarkan Rajah 9.1,

*Based on Diagram 9.1,*

- (i)
- Nyatakan siri homolog bagi sebatian P.  
*State the homologous series of compound P.*
  - Sebatian P boleh membentuk isomer. Lukiskan formula struktur bagi **satu** isomer itu dan namakannya mengikut sistem penamaan IUPAC.  
*Compound P can form isomers. Draw the structural formula for **one** of the isomer and name it according to the IUPAC system.*
  - Namakan tindak balas II dan lukis gambar rajah berlabel bagi menunjukkan susunan radas penyediaan sebatian Q dalam makmal.  
*State the name of the reaction II and draw a labelled diagram to show apparatus set-up in order to prepare compound Q in laboratory.*

[6 markah / marks]

- (ii) Tulis persamaan kimia seimbang bagi pembakaran lengkap 2.1 g sebatian P dan hitung isipadu gas karbon dioksida yang terhasil.

[Jisim atom relatif:  $H = 1$ ,  $C = 12$ ,  $O = 16$  ; 1 mol bagi sebarang gas menempati  $24 \text{ dm}^3$  pada keadaan bilik]

*Write a balanced chemical equation for the complete combustion of 2.1 g of compound P and calculate the volume of carbon dioxide gas released.*

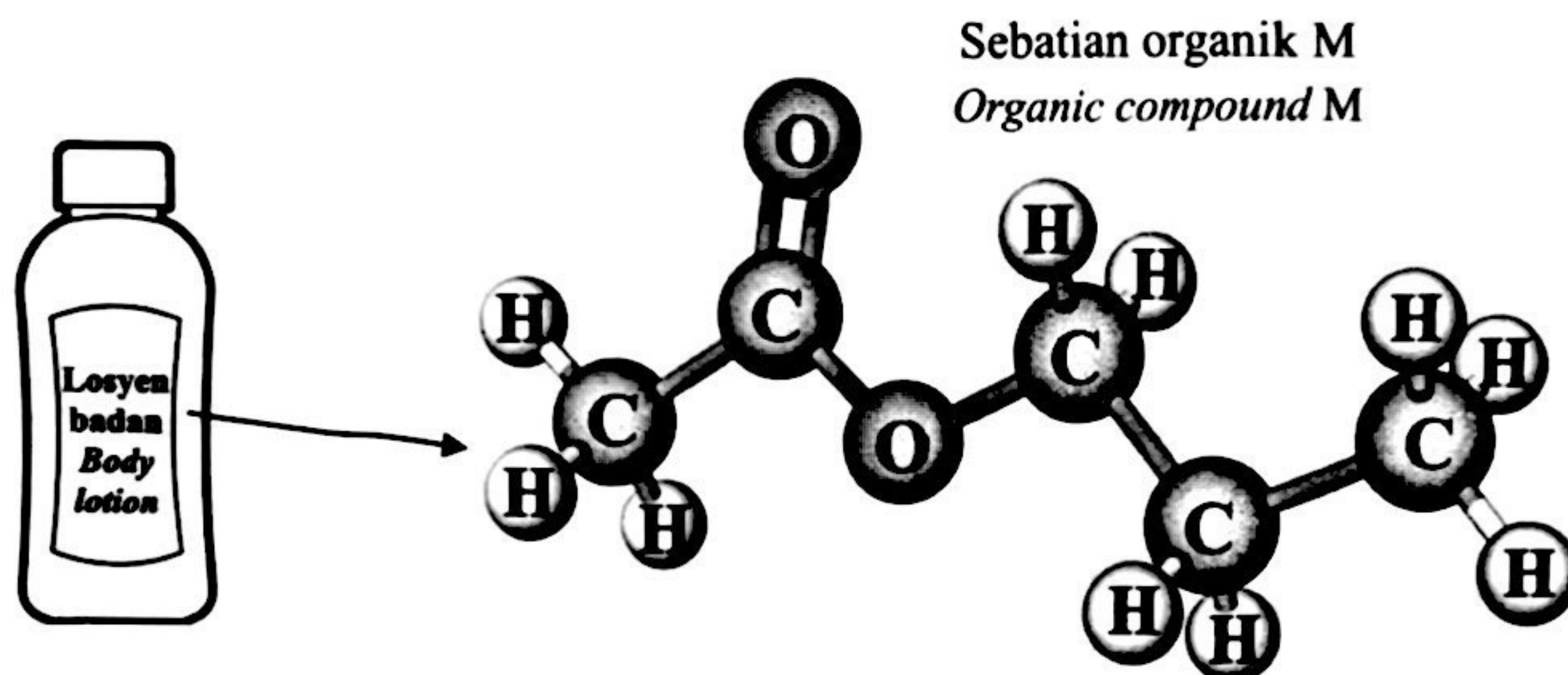
[Relative atomic mass :  $H = 1$ ,  $C = 12$ ,  $O = 16$  ; 1 mole of any gas occupies  $24 \text{ dm}^3$  at room conditions]

[5 markah / marks]



- (b) Rajah 9.2 menunjukkan formula struktur bagi sebatian organik M yang terkandung dalam losyen badan.

*Diagram 9.2 shows the structural formula of organic compound M contained in a body lotion.*



Rajah / Diagram 9.2

Dengan menggunakan bahan dan radas yang sesuai, huraikan penyediaan sebatian organik M di dalam makmal. Dalam penerangan anda, nyatakan pemerhatian bagi hasil yang terbentuk dan tulis persamaan kimia bagi tindak balas itu.

*By using suitable materials and apparatus, describe the preparation of organic substance M in the laboratory. In your explanation, state the observation for the product formed and write the chemical equation for the reaction.*

[9 markah / marks]

**KERTAS PEPERIKSAAN TAMAT**  
**END OF QUESTION PAPER**







THE PERIODIC TABLE OF ELEMENTS

|                                                                    |                                                                      |                                                                                                                                                                         |                                                                        |                                                                       |                                                                      |                                                                       |                                                                       |                                                                      |                                                                       |                                                                        |                                                                   |                                                                     |                                                                     |                                                                     |                                                                   |                                                                      |                                                                        |                                                                      |                                                                       |                                                                      |                                                                      |                                                                       |                                                                        |                                                                     |                                                                        |                                                    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------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <div><div>1</div><div>H</div><div>Hydrogen</div><div>1</div></div> |                                                                      | <div><div>10</div><div>Ne</div><div>Neon</div><div>20</div></div> <div>Proton number</div> <div>Symbol</div> <div>Name of element</div> <div>Relative atomic mass</div> |                                                                        |                                                                       |                                                                      |                                                                       |                                                                       |                                                                      |                                                                       |                                                                        |                                                                   |                                                                     |                                                                     |                                                                     |                                                                   |                                                                      |                                                                        | <div><div>2</div><div>He</div><div>Helium</div><div>4</div></div>    |                                                                       |                                                                      |                                                                      |                                                                       |                                                                        |                                                                     |                                                                        |                                                                      |                                                                         |                                                                         |                                                                         |                                                                       |                                                                         |                                                                      |                                                                       |                                                                      |                                                                   |                                                                        |                                                                         |                                                                     |                                                                     |                                             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       |                                                                            |                                                                         |                                                                           |
| <div><div>3</div><div>Li</div><div>Lithium</div><div>7</div></div> | <div><div>4</div><div>Be</div><div>Beryllium</div><div>9</div></div> | <div><div>11</div><div>Na</div><div>Sodium</div><div>23</div></div>                                                                                                     | <div><div>12</div><div>Mg</div><div>Magnesium</div><div>24</div></div> | <div><div>19</div><div>K</div><div>Potassium</div><div>39</div></div> | <div><div>20</div><div>Ca</div><div>Calcium</div><div>40</div></div> | <div><div>21</div><div>Sc</div><div>Scandium</div><div>45</div></div> | <div><div>22</div><div>Ti</div><div>Titanium</div><div>48</div></div> | <div><div>23</div><div>V</div><div>Vanadium</div><div>51</div></div> | <div><div>24</div><div>Cr</div><div>Chromium</div><div>52</div></div> | <div><div>25</div><div>Mn</div><div>Manganese</div><div>55</div></div> | <div><div>26</div><div>Fe</div><div>Iron</div><div>56</div></div> | <div><div>27</div><div>Co</div><div>Cobalt</div><div>59</div></div> | <div><div>28</div><div>Ni</div><div>Nickel</div><div>59</div></div> | <div><div>29</div><div>Cu</div><div>Copper</div><div>64</div></div> | <div><div>30</div><div>Zn</div><div>Zinc</div><div>65</div></div> | <div><div>31</div><div>Ga</div><div>Gallium</div><div>70</div></div> | <div><div>32</div><div>Ge</div><div>Germanium</div><div>73</div></div> | <div><div>33</div><div>As</div><div>Arsenic</div><div>75</div></div> | <div><div>34</div><div>Se</div><div>Selenium</div><div>79</div></div> | <div><div>35</div><div>Br</div><div>Bromine</div><div>80</div></div> | <div><div>36</div><div>Kr</div><div>Krypton</div><div>84</div></div> | <div><div>37</div><div>Rb</div><div>Rubidium</div><div>86</div></div> | <div><div>38</div><div>Sr</div><div>Strontium</div><div>88</div></div> | <div><div>39</div><div>Y</div><div>Yttrium</div><div>89</div></div> | <div><div>40</div><div>Zr</div><div>Zirconium</div><div>91</div></div> | <div><div>41</div><div>Nb</div><div>Niobium</div><div>93</div></div> | <div><div>42</div><div>Mo</div><div>Molybdenum</div><div>96</div></div> | <div><div>43</div><div>Tc</div><div>Technetium</div><div>98</div></div> | <div><div>44</div><div>Ru</div><div>Ruthenium</div><div>101</div></div> | <div><div>45</div><div>Rh</div><div>Rhodium</div><div>103</div></div> | <div><div>46</div><div>Pd</div><div>Palladium</div><div>106</div></div> | <div><div>47</div><div>Ag</div><div>Silver</div><div>108</div></div> | <div><div>48</div><div>Cd</div><div>Cadmium</div><div>112</div></div> | <div><div>49</div><div>In</div><div>Indium</div><div>115</div></div> | <div><div>50</div><div>Sn</div><div>Tin</div><div>119</div></div> | <div><div>51</div><div>Sb</div><div>Antimony</div><div>122</div></div> | <div><div>52</div><div>Te</div><div>Tellurium</div><div>128</div></div> | <div><div>53</div><div>I</div><div>Iodine</div><div>127</div></div> | <div><div>54</div><div>Xe</div><div>Xenon</div><div>131</div></div> | <div><div>55</div><div>Cs</div><div>Cesium</div><div>133</div></div> | <div><div>56</div><div>Ba</div><div>Barium</div><div>137</div></div> | <div><div>57</div><div>La</div><div>Lanthanum</div><div>139</div></div> | <div><div>58</div><div>Ce</div><div>Cerium</div><div>140</div></div> | <div><div>59</div><div>Pr</div><div>Praseodymium</div><div>141</div></div> | <div><div>60</div><div>Nd</div><div>Neodymium</div><div>144</div></div> | <div><div>61</div><div>Pm</div><div>Promethium</div><div>147</div></div> | <div><div>62</div><div>Sm</div><div>Samarium</div><div>150</div></div> | <div><div>63</div><div>Eu</div><div>Europium</div><div>152</div></div> | <div><div>64</div><div>Gd</div><div>Gadolinium</div><div>157</div></div> | <div><div>65</div><div>Tb</div><div>Terbium</div><div>159</div></div> | <div><div>66</div><div>Dy</div><div>Dysprosium</div><div>163</div></div> | <div><div>67</div><div>Hb</div><div>Holmium</div><div>165</div></div> | <div><div>68</div><div>Er</div><div>Erbium</div><div>167</div></div> | <div><div>69</div><div>Tm</div><div>Thulium</div><div>169</div></div> | <div><div>70</div><div>Yb</div><div>Ytterbium</div><div>173</div></div> | <div><div>71</div><div>Lu</div><div>Lutetium</div><div>175</div></div> | <div><div>90</div><div>Th</div><div>Thorium</div><div>232</div></div> | <div><div>91</div><div>Pa</div><div>Protactinium</div><div>231</div></div> | <div><div>92</div><div>U</div><div>Uranium</div><div>238</div></div> | <div><div>93</div><div>Np</div><div>Neptunium</div><div>237</div></div> | <div><div>94</div><div>Pu</div><div>Plutonium</div><div>244</div></div> | <div><div>95</div><div>Am</div><div>Americium</div><div>243</div></div> | <div><div>96</div><div>Cm</div><div>Curium</div><div>247</div></div> | <div><div>97</div><div>Bk</div><div>Berkelium</div><div>247</div></div> | <div><div>98</div><div>Cf</div><div>Californium</div><div>249</div></div> | <div><div>99</div><div>Es</div><div>Einsteinium</div><div>253</div></div> | <div><div>100</div><div>Fm</div><div>Fermium</div><div>253</div></div> | <div><div>101</div><div>Md</div><div>Mendelevium</div><div>256</div></div> | <div><div>102</div><div>No</div><div>Nobelium</div><div>254</div></div> | <div><div>103</div><div>Lr</div><div>Lawrencium</div><div>257</div></div> |