3 Jadual 3 menunjukkan komposisi sebatian X.
Table 3 shows the composition of compound X.

Komposisi unsur dalam sebatian X (%) *Composition of elements in compound* **X (%)**		
Karbon, C *Carbon*, C	Hidrogen, H *Hydrogen*, H	Oksigen, O *Oxygen*, O
48.65	8.11	43.24

Jadual 3
Table 3

(*a*) Apakah maksud formula empirik?
What is the meaning of empirical formula?

3(*a*) 1

.....

.....

[1 *markah*]
[1 *mark*]

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Untuk Kegunaan Pemeriksa

(*b*) (i) Tentukan formula empirik bagi sebatian X.
[Jisim atom relatif: C = 12, H = 1, O = 16]

Determine the empirical formula of compound X.
[*Relative atomic mass*: C = 12, H = 1, O = 16]

[3 *markah*]
[3 *marks*]

3(*b*)(i)
3

(ii) Jisim molekul relatif sebatian X ialah 148. Tentukan formula molekul sebatian X.

The relative molecular mass of compound X *is* 148. *Determine the molecular formula of compound* X.

[2 *markah*]
[2 *marks*]

3(*b*)(ii)
2

Total
A3
6

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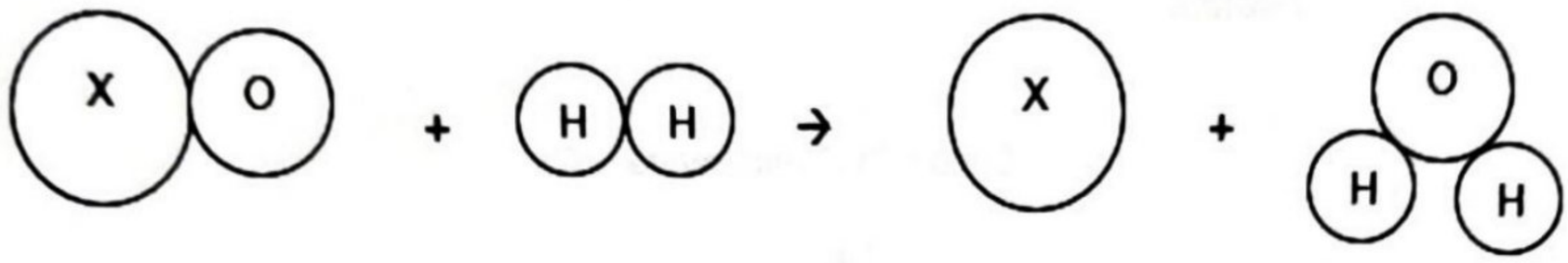
2. Rajah 2 menunjukkan tindak balas antara oksida X dan gas hidrogen.
Diagram 2 shows reaction between X oxide and hydrogen gas.



Rajah 2 / *Diagram 2*

(a) Apakah yang dimaksudkan dengan formula kimia?
What is meant by chemical formula?

_____

[1 markah/mark]

(b) Nyatakan formula kimia bagi gas hydrogen.
State the chemical formula of hydrogen gas.

_____

[1 markah/mark]

(c) Deduksikan dua maklumat berdasarkan Rajah 2.
Deduce two informations based on Diagram 2.

_____

_____

[2 markah/marks]

(d) Jisim formula relatif oksida X ialah 80. Hitungkan jisim atom relatif X.
Relative formula mass of X *oxide is* 80. *Calculate the relative atomic mass of* X.

[1 markah/mark]

4 Jadual 4 menunjukkan monomer yang membentuk polimer semulajadinya serta formula molekul untuk monomer tersebut.
Table 4 shows examples of monomers that form its natural polymers and molecular formula for the monomer.

Monomer ***Monomer***	**Formula molekul** ***Molecular formula***	**Polimer** ***Polymer***
Glukosa *Glucose*	$C_6H_{12}O_6$	Kanji dan selulosa *Starch and cellulose*
Isoprena *Isoprene*	C_5H_8	Getah asli *Natural rubber*
Asid amino *Amino acid*	$C_2H_4NH_2COOH$	Protein *Protein*

Jadual 4
Table 4

(a) Nyatakan maksud formula molekul.
State the meaning of empirical formula.

.....

.....

[1 markah]
[1 *mark*]

(b) Nyatakan formula empirik bagi glukosa.
State the empirical formula for glucose.

.....

[1 markah]
[1 *mark*]

(c) Glukosa diperlukan oleh tubuh badan manusia untuk menghasilkan tenaga melalui proses aerobik. Persamaan kimia keseluruhan untuk repirasi aerobik ialah
Glucose is needed by the human body to produce energy through aerobic processes. The overall chemical equation for aerobic respiration is

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 12H_2O + 6CO_2$$

Nyatakan maklumat kualitatif yang boleh diperolehi berdasarkan persamaan kimia tersebut.
State the qualitative information that can be obtained based on the chemical equation.

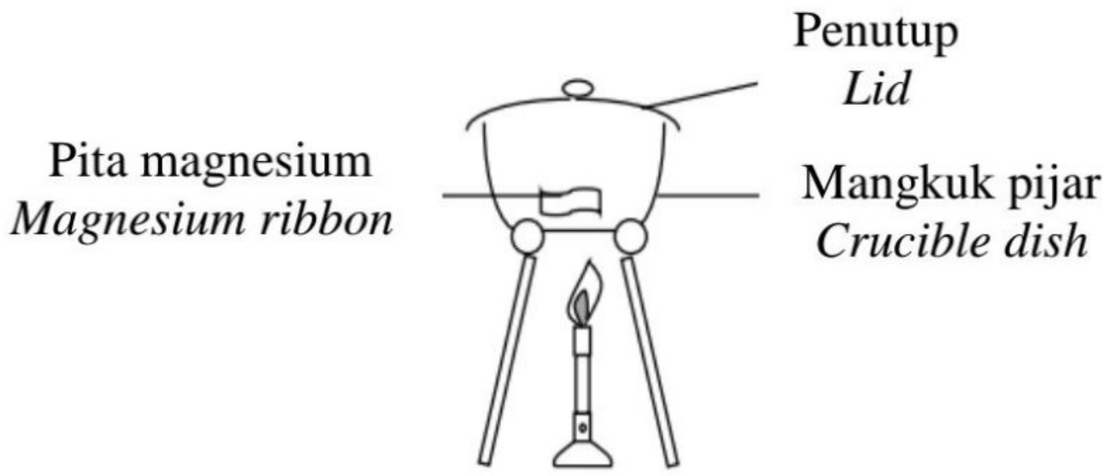
.....

.....

[1 markah]
[1 *mark*]

3. Rajah 2 menunjukkan susunan radas untuk menentukan formula empirik bagi magnesium oksida

Diagram 2 shows the apparatus set-up to determine the empirical formula of magnesium oxide



Rajah 2/ *Diagram* 2

(a) Semasa menjalankan eksperimen ini, mengapakah penutup mangkuk pijar perlu dibuka sekali sekala?

When carrying out this experiment, why does the crucible lid need to be opened once a while?

.....

[1 markah/ *mark*]

(b) Keputusan eksperimen ditunjukkan dalam Jadual 2.

The result of the experiment is shown in Table 2.

Penerangan ***Description***	**Jisim (g)** ***Mass (g)***
Mangkuk pijar + penutup *Crucible + lid*	26.35
Mangkuk pijar + penutup + pita magnesium *Crucible + lid + magnesium ribbon*	28.75
Mangkuk pijar + penutup + magnesium oksida *Crucible + lid + magnesium oxide*	30.35

Jadual 2/ *Table* 2

Berdasarkan keputusan dalam Jadual 2,

Based on the results in Table 2,

(i) hitung jisim bagi:

calculate the mass of:

Magnesium : .....
Magnesium

Oksigen : .....
Oxygen

[2 markah/ *marks*]

(ii) Hitung bilangan mol magnesium dan oksigen.
Calculate the number of moles of magnesium and atom.

[Jisim atom relatif: Mg = 24, O = 16]
[*Relative atomic mass*: Mg = 24, O = 16]

[2 markah/ *marks*]

(iii) Tentukan formula empirik bagi magnesium oksida dalam eksperimen itu.
Determine the empirical formula for the magnesium oxide in the experiment.

.....

[1 markah/ *mark*]

4. Jadual 4 menunjukkan formula empirik dan formula molekul bagi dua sebatian.
Table 4 shows the empirical formulae and molecular formulae of two compounds.

Sebatian *Compound*	Formula empirik *Empirical formula*	Formula molekul *Molecular formula*
P		C_5H_{10}
Q	$Zn(NO_3)_2$	$Zn(NO_3)_2$

Jadual 4 / *Table 4*

(a) Nyatakan maksud formula empirik.
State the meaning of empirical formula.

.....

[1 markah / *mark*]

(b) Tulis formula empirik bagi sebatian P.
Write empirical formula of compound P.

.....

[1 markah / *mark*]

(c) Apabila sebatian Q dipanaskan dengan kuat, ia akan terurai membentuk zink oksida, gas oksigen dan gas nitrogen dioksida.
When compound Q is heated strongly, it will decompose to form zinc oxide, oxygen gas and nitrogen dioxide gas.

(i) Tuliskan persamaan kimia yang seimbang bagi penguraian sebatian Q.
Write a balance chemical equation for the decomposition of compound Q.

.....

[2 markah/*marks*]

(ii) Jika 0.5 mol sebatian Q dipanaskan, hitungkan isi padu gas nitrogen dioksida yang terhasil pada keadaan bilik.
[Isi padu molar gas pada keadaan bilik iatah 24 $dm^3 mol^{-1}$]
If 0.5 *mole of compound Q is heated, calculate the volume of nitrogen dioxide gas produced at room condition.*
[Molar volume of gas at room condition is 24 $dm^3 mol^{-1}$*]*

[3 markah/*marks*]

5 Sebatian X terdiri daripada unsur karbon, hidrogen dan oksigen.
Compound X consists of the elements carbon, hydrogen and oxygen.

(a) Apakah itu unsur?
What is an element?

.....

.....

[1 markah/*mark*]

(b) Lengkapkan jadual di bawah untuk menentukan formula empirik bagi sebatian X.
[Jisim atom relatif: H = 1, C = 12, O = 16]
Complete the table below to determine the empirical formula of a compound X.
[*Relative atomic mass*: H = 1, C = 12, O = 16]

Unsur ***Element***	**C**	**H**	**O**
Peratus (%) *Percentage* (%)	48.65	8.11	43.24
Bilangan mol atom *Number of moles of atoms*			
Nisbah mol atom *Mole ratio*			
Nisbah mol atom paling ringkas *Simplest mole ratio of atom*			

Formula empirik : ……
Empirical formula

[3 markah/*marks*]

(c) Paku besi yang terdedah kepada udara dan air menghasilkan karat, ferum(III) oksida terhidrat, $Fe_2O_3.H_2O$. Persamaan kimia untuk tindak balas itu adalah seperti berikut :
An iron nail that is exposed to air and water to form rust, hydrated iron(III) *oxide*, $Fe_2O_3.H_2O$. *Chemical equation for the reaction is as follow*:

$$\mathbf{x}Fe + \mathbf{y}O_2 + \mathbf{z}H_2O \longrightarrow 2Fe_2O_3.H_2O$$

(i) Seimbangkan persamaan kimia untuk tindak balas itu dengan menentukan nilai x, y dan z.
Balanced the chemical equation for the reaction by determine the value of x, y and z.

x : …… **y** : …… **z** : ……

[2 markah/*marks*]

(ii) Nyatakan bilangan mol ferum yang diperlukan untuk menghasilkan 1 mol ferum(III) oksida terhidrat.
State the number of moles of iron that is required to produce 1 mole *of hydrated iron* (III) *oxide.*

……

[1 markah/*mark*]

(iii) Hitung jisim formula relatif bagi ferum(III) oksida terhidrat.
Calculate the relative formula mass of hydrates iron (III) *oxide.*
[Jisim atom relatif / *Relative atomic mass* : H = 1, O = 16, Fe = 56]

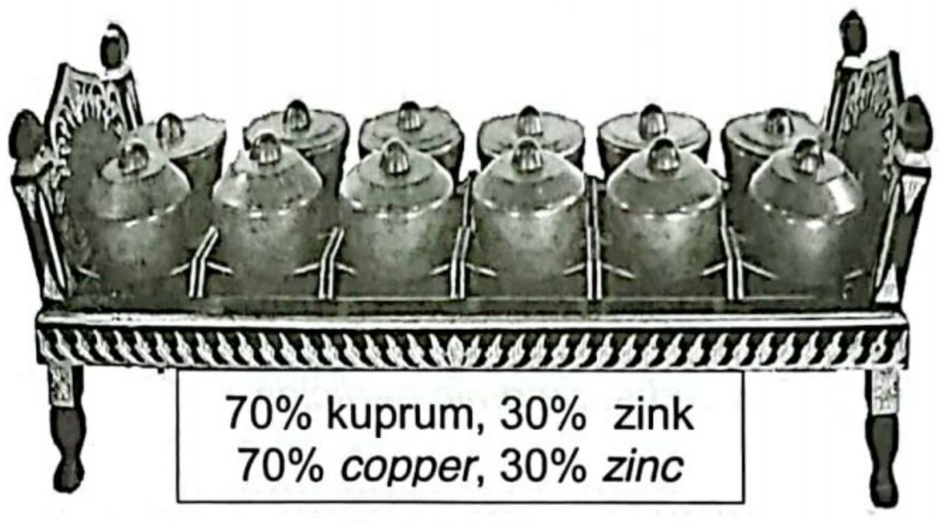
[1 markah/*mark*]

Bahagian A
Section A

[60 markah]
[60 *marks*]

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

1 Rajah 1 menunjukkan satu set warisan seni muzik gamelan. Alat muzik gamelan diperbuat daripada aloi P dengan komposisi tertentu di mana logam tulennya ialah kuprum.
Diagram 1 *shows a heritage set of gamelan music art. Gamelan musical instrument is made of an alloy* P *with a certain composition where the pure metal is copper.*



Rajah/ *Diagram* 1

(a) Namakan aloi P yang terbentuk apabila zink ditambah kepada kuprum.
Name the alloy P *formed when zinc is added to copper.*

.....

[1 *mark*]

(b) Lukis susunan atom dalam aloi yang dinyatakan dalam 1(a) dan label atom-atom yang hadir.
Draw an atom arrangement in alloy that is stated in 1(a) *and label the atoms present.*

[2 *marks*]

(c) (i) Bandingkan dari segi kekerasan aloi P dengan logam tulennya, kuprum.
Compare in terms of hardness of alloy P *with its pure metal, copper.*

.....

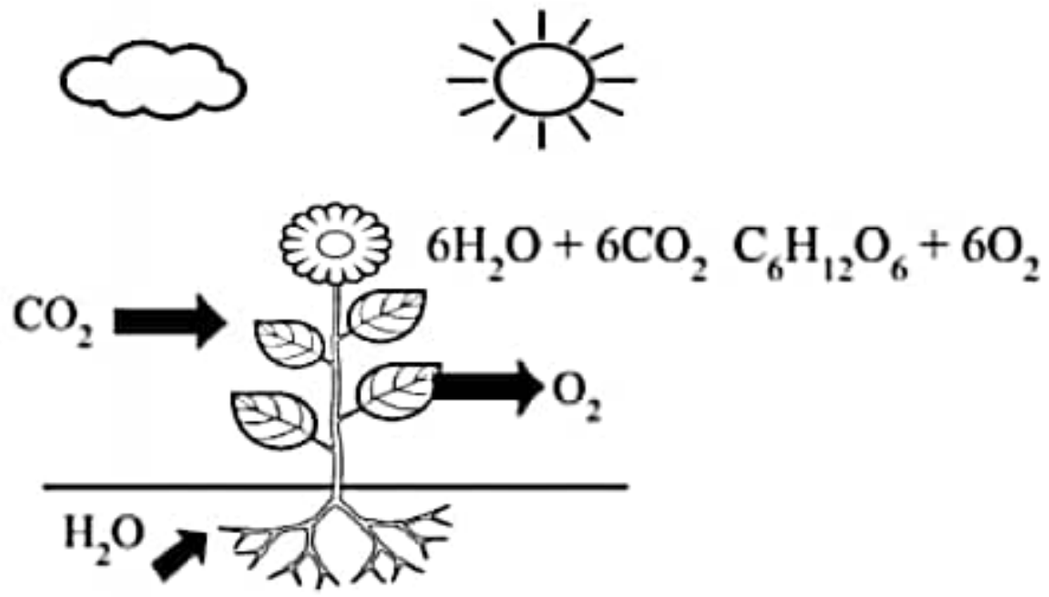
[1 *mark*]

(ii) Namakan satu aloi lain bagi kuprum.
Name one other alloy of copper.

.....

[1 *mark*]

3. Rajah 3 menunjukkan tumbuhan hijau mengalami fotosintesis untuk menghasilkan sebatian X dengan formula molekul $C_6H_{12}O_6$ dan gas oksigen.
Diagram 3 shows green plant undergoes photosynthesis to produce compound X with the molecular formula of $C_6H_{12}O_6$ and oxygen gas.



Rajah 3/ *Diagram* 3

(a) Apakah maksud formula molekul?
What is the meaning of molecular formula?

.....

.....

[1 markah/ 1 *mark*]

(b) Namakan sebatian X.
Name compound X.

.....

[1 markah/ 1 *mark*]

(c) (i) Huraikan maklumat kualitatif dan kuantitatif yang boleh didapati daripada persamaan kimia dalam Rajah 3.
Describe the qualitative and quantitative information that can be obtained from the chemical equation in Diagram 3.

.....

.....

[2 markah/ 2 *marks*]

(ii) Hitungkan isipadu gas karbon dioksida yang diperlukan untuk menghasilkan 1 mol sebatian X.
Calculate the volume of carbon dioxide gas required to produce 1 mole of compound X.
[Isipadu molar/*Molar volume*: 24 dm^3 mol^{-1}]

[2 markah/ 2 *marks*]

Untuk Kegunaan Pemeriksa

3 Sebatian karbon P mengandungi 6.67% hidrogen, 40.00% karbon dan 53.33% oksigen.

Carbon compound P *contains* 6.67% *hydrogen*, 40.00% *carbon and* 53.33% *oxygen.*

(*a*) (i) Apakah maksud formula empirik?

What is the meaning of empirical formula?

.....

.....

[1 *markah*]

[1 *mark*]

3(*a*)(i) 1

(ii) Hitungkan formula empirik bagi sebatian P.

[Jisim atom relatif: C = 12, H = 1, O = 16]

Calculate the empirical formula of compound P.

[*Relative atomic mass*: C = 12, H = 1, O = 16]

[3 *markah*]

[3 *marks*]

3(*a*)(ii) 3

(*b*) Jisim molekul relatif bagi sebatian P ialah 180.

Hitungkan formula molekul bagi sebatian P.

The relative molecular mass of compound P *is* 180.

Calculate the molecular formula of compound P.

[2 *markah*]

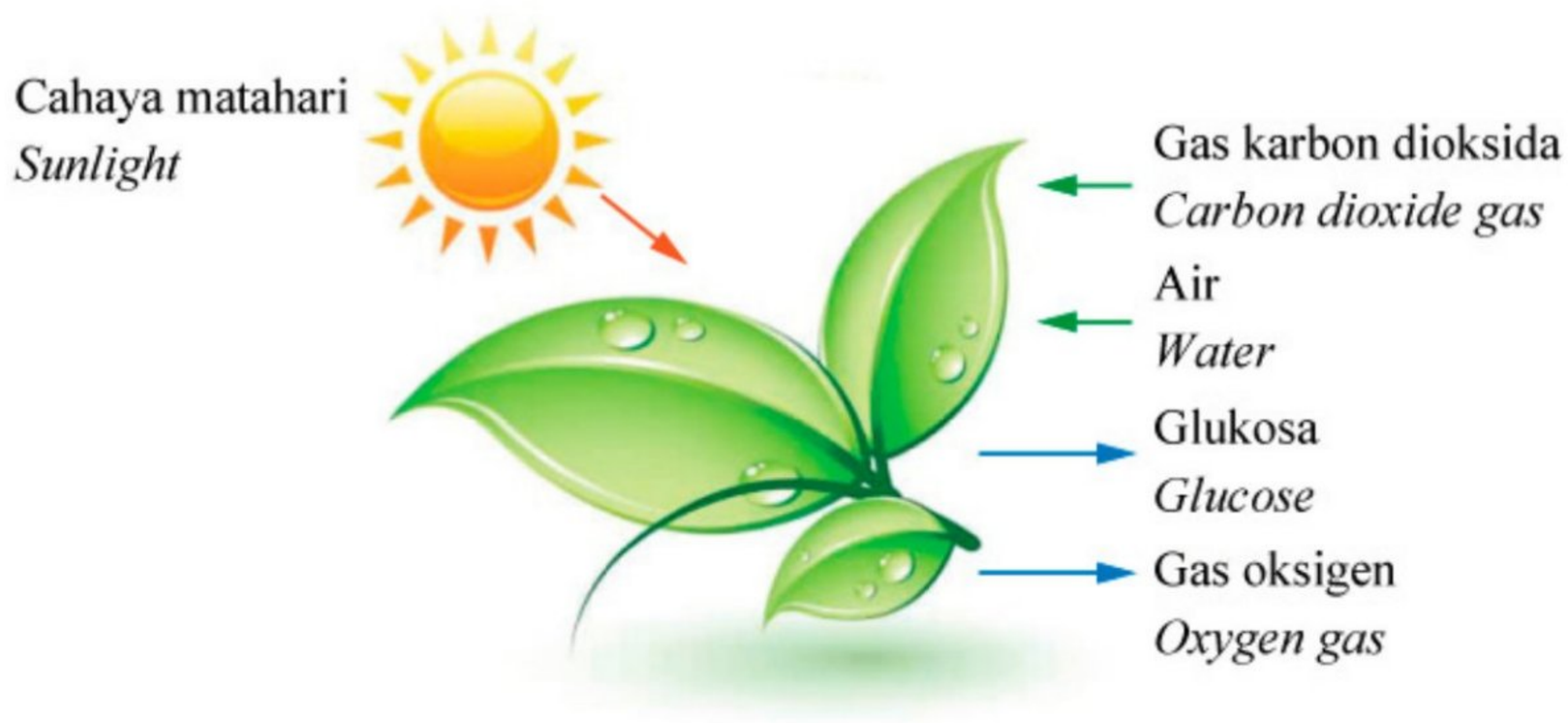
[2 *marks*]

3(*b*) 2

Total A3 6

3 Rajah 3 menunjukkan proses fotosintesis untuk penghasilan glukosa dalam tumbuhan hijau.

Diagram 3 shows the photosynthesis process for the formation of glucose in green plants.



Rajah 3
Diagram 3

(*a*) Tulis formula empirik bagi glukosa.
Write the empirical formula of glucose.

3(*a*)

.....

[1 *markah*]
[1 *mark*]

(*b*) Nyatakan **satu** perbezaan antara formula empirik dan formula molekul.
State **one** *difference between empirical formula and molecular formula.*

3(*b*)

.....

[1 *markah*]
[1 *mark*]

(*c*) Tulis persamaan kimia yang seimbang bagi proses fotosintesis.
Write a balanced chemical equation of photosynthesis process.

3(*c*)

.....

[2 *markah*]
[2 *marks*]

(*d*) Berapakah peratus jisim karbon dalam glukosa?
[Jisim atom relatif: H = 1, C = 12, O = 16]

What is the percentage of mass of carbon in glucose?
[*Relative atomic mass*: H = 1, C = 12, O = 16]

[2 *markah*]
[2 *marks*]

3(*d*)
2

Total A3
6