Essay {Paper02}

[MRSM10-09a]

(*a*) $2\ Na + Cl_2 \rightarrow 2\ NaCl$

Mol Na = 2.3/23 = 0.1 mol

2 mol Na produce 2 mol NaCl
0.1 mol Na produce 0.1 mol NaCl

Mass of NaCl = mol X molar mass = 0.1 X 58.5 = 5.85 g

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[MRSM10-08]

(*a*) 1. correct elements [ie: carbon and hydrogen]
2. The simplest ratio of mole/atom of carbon to hydrogen is 2:5
3. The molecular formula shows the actual number of carbon and hydrogen atoms in a molecule
4. 1 molecule of butane contains 4 carbon atoms and 10 hydrogen atoms.

(*b*) (i) % of oxygen

$$= \frac{6(16)}{64} \times 100 \qquad 14(2) + 16(6)$$

= 51.06 %

1. Correct RMM shown
2. Calculation
3. and answer

(ii) Number of mole of CuO = 3.2 /[64 + 16]
= 0.04 mol

2 mol of CuO is released with 1 mol of O_2
0.04 mol of CuO is released with 0.02 mol of O_2

Volume of O_2 evolved = 0.02 (24) $dm^3\ mol^{-1}$
= 0.48 dm^3

(*c*) 1. Magnesium is a reactive metal
2. Magnesium can combine / react [readily] with oxygen to form magnesium oxide
3. Copper is less reactive than hydrogen // copper situated lower than hydrogen in Reactivity Series
4. Hydrogen can reduce copper(II) oxide to copper.

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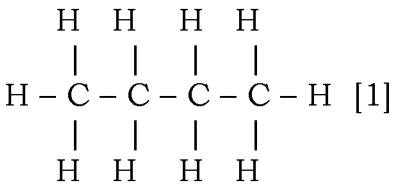
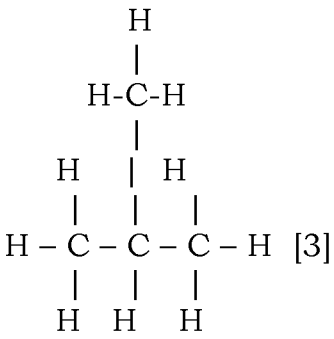
[SPM10-07a]

(ii) // $CH_3 – CH_2 – CH_2 – CH_3$



[1]

Butane [2]



[3]

// CH_3-CH – CH_3
|
CH_3

Reject : $CH_3CH(CH_3)CH_3$

2- Methylpropane [4] r: if no "-"between 2 methyl

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[SBPtrial07-08]

(a)	Formula that shows the simplest ratio of the number of atoms for each element in the compound.	1
(b)		

Element	C	H
Mass (%)	92.3	7.7
Number of moles	$\frac{92.3}{12} = 7.7$	$\frac{7.7}{1} = 7.7$
Ratio of moles	1	1

1
1
1

Empirical formula : CH
RMM of $(CH)_n$ = 78
[12 + 1]n = 78
13 n = 78
n = 6
Molecular formula : C_6H_6

1
1

(c) Procedure:

1. Clean magnesium ribbon with sand paper — 1
2. Weigh crucible and its lid — 1
3. Put magnesium ribbon into the crucible and weigh the crucible with its lid — 1
4. Heat strongly the crucible without its lid
5. Cover the crucible when the magnesium starts to burn and lift/raise the lid a little at intervals — 1 1
6. Remove the lid when the magnesium burnt completely
7. Heat strongly the crucible for a few minutes — 1
8. Cool and weigh the crucible with its lid and the content — 1
9. Repeat the processes of heating, cooling and weighing until a constant mass is obtained — 1 1
10. Record all the mass — 1

Results:

	Mass/g
Crucible + lid	x
Crucible + lid + magnesium	y
Crucible + lid + magnesium oxide	z

— 1

Calculations:

Element	Mg	O
Mass (g)	y-x	z-y
Number of moles	$\frac{y-x}{24}$	$\frac{z-y}{16}$
Simplest ratio of moles	a	b

Number of moles — 1

Simplest ratio of moles — 1

Empirical formula: Mg_aO_b / MgO — 1

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[SBPmidyearF508-08]

a Empirical formula- **Formula** shows **simplest ratio of atoms of each element in the compound** **1**

Molecular formula- **Formula** shows **actual number of atoms of each element in the compound** **1**

b Molecular Formula = (Empirical formula)n

= (CH_2)n

Relative Molecular Mass (CH_2)n = 70

12n + 2n= 70 **1**

14n=70

n=5 **1**

Molecular Formula C_5H_{10} **1**

c(i)

1. Metal Z is cleaned using sand paper **1**
2. A crucible and its lid are weighed and the mass is recoded **1**
3. Metal Z is palced in the crucible. The crucible, lid and its content is weighed and the mass is recorded. **1**
4. The crucible with its content is heated **strongly** without lid.
5. When metal Z start burn, the crucible is covered by its lid **1**
6. the covered is raise a little at intervals
7. When there is no more reaction, the lid is removed and the crucible is heated strongly for a few minutes. **1**
8. Cool the crucible and weigh the crucible, its lid and its Content and record the mass. **1**
9. The process of heating, cooling and weighing is repeated until constant is obtained. **1**
10. (Precaution step);

Close the crucible immediately to prevent loss of

Element	Z	O	
Mass(g)	1.30	0.32	
Mol	1.30/65=0.02	0.32/16=0.02	**1**
Simplest ratio	1	1	**1**

Empirical Formula ZO **1**

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[SBPtrial08-09a]

(a)(i)
- The end of the thistle funnel must lower than the level of the hydrochloric acid solution.
- The end of the delivery tube must be above the level of the acid
- The stopper must be tight.

[Accept other suitable precaution steps]
[Any two correct answers] 2

(ii) Anhydrous calcium chloride / Anhydrous Copper (II) Sulphate 1
To dry the hydrogen gas// Absorb water / Moist 1

(iii) The dry hydrogen reacts /reduces the hot oxide of M to produce M and water. 1
[Correct reactants and products] 1

(iv)

	M	Oxygen	
Mass	49.68 g	3.84g	1
Moles of atom	49.68/207=0.24	3.84/16=0.24	1
Simplest ratio	1	1	1

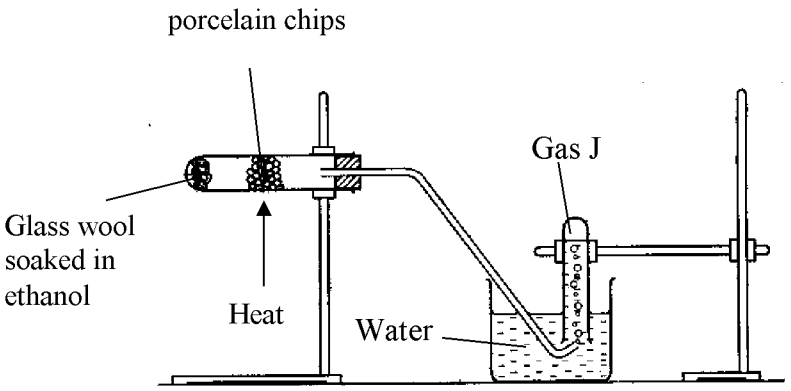
Empirical formula is MO 1

(b)(i) Relative Molecular mass of $(CH_2)_n$ = 28

$$(12 + 2)n = 28$$
$$n = 2$$

Thus, molecular formula = C_2H_4 1
1

(ii)



1 + 1

1. A small amount of glass wool soaked in J is placed in a boiling tube. 1
2. The boiling tube is clamped horizontally 1
3. The unglazed porcelain chips are placed in the middle section of the boiling tube. 1
4. The boiling tube is closed with a stopper fitted with a delivery tube 1
5. The unglazed porcelain chips are heated strongly. Then, the glass wool is warmed gently to vaporize the ethanol. 1
6. The gas released is collected in a test tube. 1

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[SBPmidyearF406-07b]

(b)
1 An empty crucible and its lid are weighed and the mass are recorded 1
2 Magnesium ribbon is cleaned with sandpaper, placed in crucible and weighed again. The mass are recorded 1
3 The crucible and its contents are heated over a strong flame 1
4 The crucible lid opened once in a while during the experiment 1

5 When the magnesium does not burn anymore, the crucible and its contents are cooled in room temperature, 1
6 and then weighed. The mass is recorded 1
7 The heating, cooling and weighing is repeated until the final mass becomes constant 1

8 Result
Mass of crucible + lid = a g
Mass of crucible + lid + magnesium ribbon = b g
Mass of crucible + lid + magnesium oxide = c g 1

9 Mass of magnesium = (b – a) g
Mass of oxygen = (b – c) g 1

10 Mol of magnesium atom = $\frac{b-a}{24}$ 1

Mol of oxygen atom = $\frac{b-c}{24}$

11 Simplest ratio mol of magnesium atom to mol of oxygen atom = x:y/ 1:1 1

12 Empirical formula : Mg_xO_y / MgO 1

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[SBPdiag08-07]

(a) 1. N_2 : 2 X 14 = 28 1

2. CO_2 : 12 + 2(16) = 44 1

3. H_2S : 2(1) + 32 = 34 1

4. H_2O : 2(1) + 16 = 18 1

(b) 1 moles of water vapour = $\frac{0.9}{18}$

= 0.05 1

2 no. of molecules = 0.05 moles X 6 X 10^{23}

= 3 x 10^{22}

1

3 moles of CO_2 = $\frac{2.2}{44}$

= 0.05 moles 1

4 no. of molecules = 0.05 moles X 6 x 10^{23}

= 3 x 10^{22} 1

(c)(i) Volume = 0.1 X 24

= 2.4 dm^3// 2400cm^3 1

(ii) Mass = 0.1 X 44 1

= 4.4g

(iii) No. of molecules = 0.1 X 6.02 X 10^{23} 1

= 6.02 X 10^{22}

(iv) No. of atom = 3 X 0.1 X 6.02 X 10^{22} 1

= 1.806 X 10^{23} 1

d(i) 2 H_2S + 3 O_2 → 2SO_2 + 2H_2O

Correct formula of reactant and product 1

Correct no. of mol of reactant 1

Correct no. of mol of product 1

(ii) 1. Moles of H_2S = $\frac{952}{34}$

= 28 1

2. 2 moles of H_2S produced 2 moles SO_2 1
28 moles of H_2S produced 28 moles of SO_2 1
3. mass of SO_2 = 28 x [32 + 2(16)]
= 1792 g 1

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[SBPdiag06-07c]

(c)(i) Proton number = **13** 1
Nucleon number = 14 + 13 = **27** 1

(c)(ii) Number of moles of Y = $\frac{10.8}{27} = 0.4$ 1
Number of moles of $Y_2O_3 = 0.4 \div 2 = 0.2$ 1
Relative formulas mass of Y_2O_3 = 2(27) + 3(16) = 102 1
Mass of $Y_2O_3 = 0.2 \times 102 = 20.4$ g 1

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[SBPdiag05-essay03]

(a) $2Cu(NO_3)_{2\,(p)} \rightarrow 2CuO_{\,(p)} + 4NO_{2\,(g)} + O_{2\,(g)}$

Persamaan kimia yang seimbang 1
Label keadaan fizik 1
(b)(i) 96/24 = 4 mol 1

4 x 2 = 8 g gas H_2. 1
4 x 32 = 128 g gas O_2 1

Jisim gas hidrogen dan gas oksigen adalah berbeza.
(b)(i)
(12+2+16)n = 90 1
30n = 90
n = 90/30 = 3 1
Formula molekul = $C_3H_6O_3$ 1

(b)(ii) • Formula empirik ialah formula kimia yang menunjukkan nisbah teringkas bilangan atom yang terdapat dalam suatu sebatian 1
• Formula molekul ialah formula kimia yang menunjukkan bilangan sebenar atom-atom yang wujud dalam satu molekul. 1
•
(c) 1. Timbang mangkok pijar kosong bersama dengan penutup 1

2. Sekeping logam X dibersihkan dengan kertas pasir 1

3. kepingan logam yang telah dibersihkan dimasukkan ke dalam mangkok pijar dan ditimbang bersama penutup 1
4. Panaskan mangkok pijar dengan kuat sehingga X terbakar 1

5 Sekali-sekala mangkok pijar dibuka untuk membenarkan oksigen/udara masuk bagi membantu pembakaran. 1

6. Apabila tiada lagi baraan, mangkok pijar dan kandungannya disejukkan dan kemudian ditimbang 1

Keputusan:

Jisim mangkok pijar + penutup = a g
Jisim mangkok pijar + penutup + kepingan X = b g
Jisim mangkok pijar + penutup + oksida X = c g 1

	X	Oksigen
Jisim	(b - a) g	(c – b) g
Bil mol atom	$\frac{(b-a)}{\text{JAR X}}$	$\frac{(c-b)}{\text{JAR Oksigen}}$ 1
Nisbah teringkas	p	q 1

// Formula empirik $X_p O_q$ 1

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[MRSM06-08b]

b(i) ammonium sulphate

(ii) $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$
Permarkahan : Formula bahan dan hasil betul [1] ; Persamaan seimbang [2]

(iii) [1] bil mol NH_3 / bil mol baja = 2/1 // bil mol NH_3 = 2x mol baja
[2] bil mol NH_3 = 2 x 13.2 / 132 = 0.2 mol
[3] isipadu gas = 0.2 x 24.0 = 4.8 dm^3

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[MRSM04-07] – *my Answers*

(a) 1. the element present are Carbon, Hydrogen and Oxygen
2. It contains 1 carbon atoms, 2 hydrogen atoms and 1 oxygen atom.

(b) [empirical formula] n = molar mass
$[CH_2O]$ n = 180
[12 + 2(1) + 16] n = 180
30 n = 180
n = 6.... [markah [1]

$C_6H_{12}O_6$ .... [markah [2]]

(c) (i) 1. Industrial application : extraction of metal from its ores
2. Example : extraction of iron ores

(ii) 1. Magnesium is a reactive metal
2. Magnesium can combine / react [readily] with oxygen to form magnesium oxide
3. Copper is less reactive than hydrogen // copper situated lower than hydrogen in Reactivity Series
4. Hydrogen can reduce copper(II) oxide to copper.

(iii)

Exp I	Exp II
1. Remove oxide layer of magnesium before experiment 2. during experiment, lid of crucible is open and close to allow oxygen enter and prevent the product released	1. before experiment, hydrogen gas is passed to remove oxygen gas in tube 2. after experiment, hydrogen gas still passed to prevent oxygen enter, then oxidised the product

(iv) For Exp I:
$2Mg + O_2 \rightarrow 2MgO$
1. The changing of number of oxidation of Magnesium is 0 to +2
2. The changing of number of oxidation of Magnesium is 0 to -2

For Exp II:
$H_2 + CuO \rightarrow Cu + H_2O$
3. The changing of number of oxidation of hydrogen is 0 to +1
4. The changing of number of oxidation of Copper +2 to 0

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[MRSM03-07b] c3

(b) (i) $C_2H_5OH + 3\ O_2 \rightarrow 2\ CO_2 + 3\ H_2O$

(ii) Mol ethanol = 2.3 / [2(12) + 6(1) + 16] = 2.3/46 = 0.05 mol ....[markah ke 1]

From equation : 1 mol ethanol burn and produce 2 mol carbon dioxide
From calculation : 0.05 mol ethanol burn and produce 0.05 X 2/1 = 0.1 mol carbon dioxide .... [markah ke 2]

Volume of Carbon dioxide = mol X molar volume at room condition
= 0.1 x 24 = 2.4 dm^3 [... markah ke 3]

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