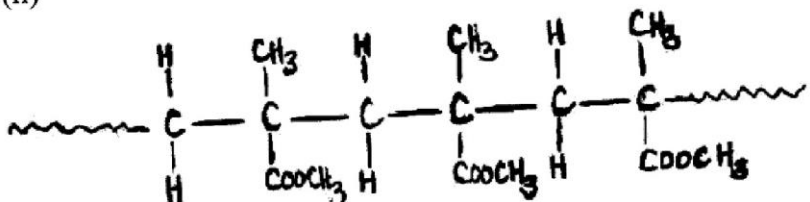


KCSE 2017

4.7.2 Chemistry Paper 2 (233/2)

Qn No.	Responses	Marks
1	<p>(a)</p> <p>(i) $C_nH_{2n-alkyne}$ ✓1</p> <p>(ii) $C_nH_{2n-alkene}$ ✓1</p> <p>(b)</p> <p>(i) Solid because it is saturated. ✓1</p> <p>(ii) I. $CH_2OHCHOHCH_2OH$ ✓ 1</p> <p>II. $CH_3(CH_2)_{16}COONa$ ✓ 1</p> <p>III. Cleaning agent /cleansing agent ✓ 1</p> <p>(c)</p> <p>(i) Calcium carbide ✓ ½ and water. ✓ ½</p> <p>(ii) $CaC_{2(s)} + H_2O_{(s)} \rightarrow Ca(OH)_{2(aq)} + C_2H_{2(g)}$ ✓ 1</p> <p>(d)</p> <p>(i) When many unsaturated molecules called monomers combine to form a giant / macro molecule of high relative molecular mass called a polymer. ✓ 1</p> <p>(ii)</p>  <p>(iii)</p> <ul style="list-style-type: none"> • Used as a glass substitute; ✓ 1 • Electronic instruments housing; • Wind screen; • Safety glasses; • vehicle headlamps; • Bullet proofing. 	<p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p>

<p>(iv)</p> <ul style="list-style-type: none"> • Emit toxic fumes when burned affecting human life. ✓ ½ • They are non-biodegradable hence pollutes the environment. ✓ ½ • Accelerates fires when burned / highly flammable. <p>(Any two correct @½ mk)</p>	<p>(1 mark)</p>
<p>2(a)</p> <p>(i) G✓ 1 – Contains delocalized electrons ✓ 1 present in solid and molten state.</p> <p>(ii) In solid state, the ions are rigidly held in position and cannot move, hence will not conduct. ✓ 1</p> <p>In molten/aqueous state, the ions are mobile and will be able to conduct electric current. ✓ 1</p> <p>(b) (i)</p> <ul style="list-style-type: none"> • The blue electrolyte fades and finally changes from blue to colourless. ✓ ½ • Effervescence / bubbles of a colourless gas. ✓ ½ • A brown deposit forms on the cathode. ✓ ½ <p>(ii) $4OH^-(aq) \rightarrow O_{2(g)} + 2H_2O_{(l)} + 4e^-$ ✓ 1</p> <p>(iii) The pH will change from 6 to less than 4 i.e. the resulting solution will be acidic. ✓ ½</p> <p>(c) With copper electrodes:</p> <p>Anode will go into solution as copper ions hence it decreases in mass/size. ✓ ½</p> <p>Brown deposit forms at the cathode hence the cathode increases in mass. ✓ ½</p> <p>(d) (i) This is the coating of an article / object with another metal by electrolytic method./ electrolysis. ✓ 1</p>	<p>(2 marks)</p> <p>(2 marks)</p> <p>(1½ marks)</p> <p>(1 mark)</p> <p>(½mark)</p> <p>(½ mark)</p> <p>(½mark)</p> <p>(1 mark)</p>

OR

Iron is more reactive than hydrogen hence it reacts with sulphuric(VI) acid to produce hydrogen gas and iron(III) sulphate which is green.

Beaker II:

Copper is below hydrogen hence no reaction will take place. ✓ 1

- (b) (i) To dry hydrogen gas. ✓ 1 (1 mark)
- (ii) Calcium oxide /anhydrous calcium chloride /silica gel. ✓ 1 (1 mark)
- (Accept the formulae)**
(Any one correct @ 1mk) (1 mark)
- (iii) To suck the products of the burning into the boiling tube. ✓ 1 (1 mark)
- (iv) Water ✓ 1 (1 mark)
- (v) Boil the liquid. If it boils at 100°C/ constant, then this confirms that it is water. ✓ 1 (1 mark)

OR

Freeze the liquid. If it freezes at 0°C, then this confirms that it is water ✓/
Determine density of liquid, if it is 1g/cm³ then it is water.

(Accept any one correct @ 1mk)

- (vi) Dry -The substance is free from moisture. ✓ 1 (2 marks)
- Anhydrous - The substance has lost its water of crystallization through heating,
to form anhydrous substances. ✓ 1

4 (a)

- (i) W is acidic. ✓1
- (ii) Sulphuric(VI) acid, H_2SO_4 . ✓1
- (iii) (II) - Magnesium sulphate. ✓1
 (III) - Sodium sulphate. ✓1
- (iv) $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_{4(s)}$ ✓1

(1 mark)
 (1 mark)
 (1 mark)
 (1 mark)
 (1 mark)

(b) (i)

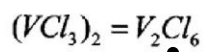
	V	Cl
Mass (g)	19.75	80.25
RAM	27	35.5
Moles	$\frac{19.75}{27}$	$\frac{80.25}{35.5}$ ✓ $\frac{1}{2}$
÷ smaller	$\frac{0.73}{0.73}$ 1	$\frac{2.26}{0.73}$ ✓ $\frac{1}{2}$ 3 ✓ $\frac{1}{2}$

(2 marks)

Empirical - VCl_3 ✓ $\frac{1}{2}$

- (II) Molar mass = 267
 Empirical mass $VCl_3 = 27 + 35.5 \times 3$
 $= 27 + 106.5$
 $= 133.5$ ✓ $\frac{1}{2}$

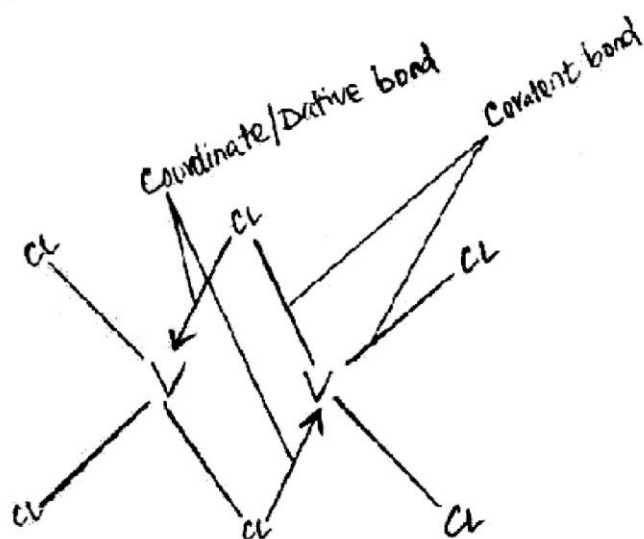
(Empirical mass) n = molecular mass
 $133.3n = 267$
 $n = 267 \div 133.5$
 $n = 2$ ✓ 1



(2 marks)

∴ Molecular formula = V_2Cl_6 ✓ ½

(ii)



(1 mark)

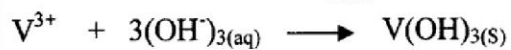


(1 mark)

OR

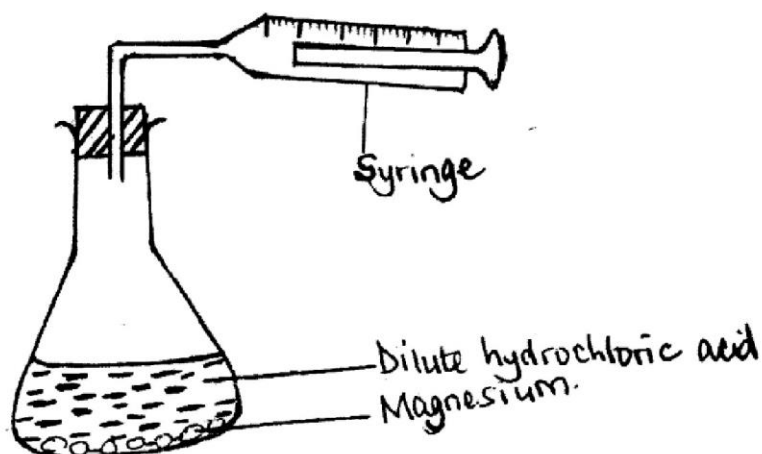


OR



5. (a)

(i)

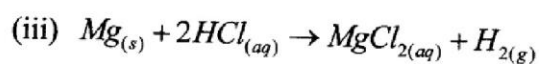
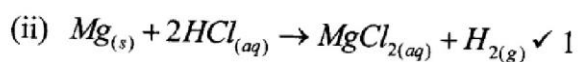


(3 marks)

Workability - 1 mark

Measurement of the gas - 1 mark

Labeling of reactants and gas - 1 mark



$$\text{Moles of Mg} = \frac{0.048}{24} = 0.002 \quad \checkmark \frac{1}{2}$$

$$\text{Moles of Mg} = \text{Moles of } H_2 = 0.002 \quad \checkmark \frac{1}{2}$$

$$\begin{aligned} \text{Volume of hydrogen gas} &= 0.002 \times 0.048 \text{ litres} \quad \checkmark \frac{1}{2} \\ &= 0.048 \text{ dm}^3 \quad \checkmark \frac{1}{2} \end{aligned}$$

(1 mark)

(iv) Moles of HCl = $2 \times 0.002 \checkmark \frac{1}{2} = 0.004 \checkmark \frac{1}{2}$

(2 marks)

$$\frac{\text{volume} \times 0.1}{1000} = 0.004 \quad \checkmark \frac{1}{2}$$

$$\text{Volume} = \frac{0.004 \times 1000}{0.1} \quad \checkmark \frac{1}{2}$$

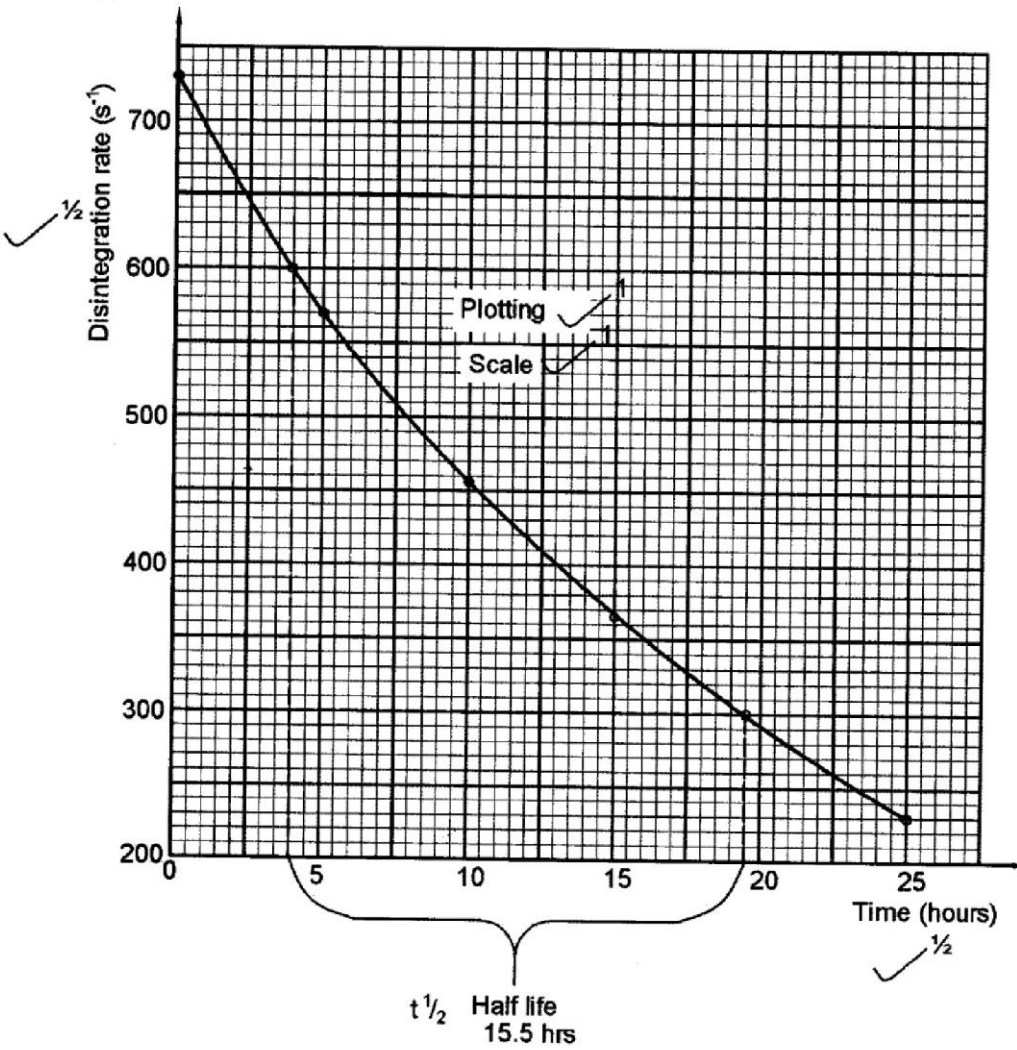
$$= 4/0.1 = 40 \text{ cm}^3 \quad \checkmark 1$$

(3 marks)

6. (a) Sulphur(IV) oxide ✓ ¹	(1 mark)
(b) Oxygen ✓ ¹ and nitrogen(IV) oxide. ✓ ¹	(2 marks)
(c) Lead(II) oxide/ PbO. ✓ ¹	(1 mark)
(d) Lead. ✓ ¹	(1 mark)
(e) (i) Grey beads formed at cathode ; ✓ ¹ Bubbles/ effervescence of a colourless gas at the anode ✓ ¹	(2 marks)
(ii) $2\text{O}^{2-}(\text{l}) \longrightarrow 2\text{O}_2(\text{g}) + 4\text{e}^{-}$ ✓ ¹	(1 mark)
(f) $\text{Pb}_{(\text{aq})}^{2+} + 2\text{I}^{-}(\text{aq}) \rightarrow \text{PbI}_2(\text{s})$. ✓ ¹	(1 mark)
(g) A white precipitate ✓ ^{1/2} was formed which dissolves in excess to form a colourless solution. ✓ ^{1/2}	(1 mark)
(h) (i) Displacement / Redox reaction ✓ ¹	(1 mark)
(ii) $\text{Pb}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Pb}(\text{s}) + \text{Zn}^{2+}(\text{aq})$. ✓ ¹	(1 mark)

7 (a)

(i)



Plotting ✓¹
Scale ✓¹
Labeling ✓¹

(3 marks)

- (i) 600 counts to 300 counts
Half-life = $19.5 - 4 = 15.5$ hours ± 0.1 ✓¹

OR

•
500 counts to 250 counts
 $23.0 - 7.5 = 15.5$

(1 mark)

<p>(ii) It would have no effect on the curve as the quantity of bismuth does not affect half-life. ✓ 1</p>	(1 mark)
<p>(b) (i) Applications in medicine</p> <ul style="list-style-type: none"> • Sterilizing surgical instruments. • Destroying cancerous tissues during radiotherapy. ✓ 1 • Provide power to the heart pace setters. 	(1 mark)
<p>(Any one correct @ 1mk)</p>	
<p>(ii) Applications in agriculture</p> <ul style="list-style-type: none"> • Monitor photosynthesis and other related processes. • Preservation of foodstuffs, by exposing Micro-organisms to gamma rays. ✓ 1 • Rate of absorption of a fertilizer by the plant. 	(1 mark)
<p>(Any one correct @ 1mk)</p>	
<p>(iii) Applications in Tracers</p> <ul style="list-style-type: none"> • Detecting leakages in underground water or oil pipes. ✓ 1 	(1 mark)
<p>(iv) Applications in Nuclear power stations.</p> <ul style="list-style-type: none"> • To generate electricity. ✓ 1 	(1 mark)
<p>(d) Dangers of radioactivity</p> <ul style="list-style-type: none"> • Long term exposure causes genetic mutation; ✓ 1 • Radioisotopes can be used as weapon of mass Destruction; ✓ 1 • Causes skin cancer; • When tested causes environmental pollution. 	(2 marks)
<p>(Any 2 correct @ 1mk)</p>	