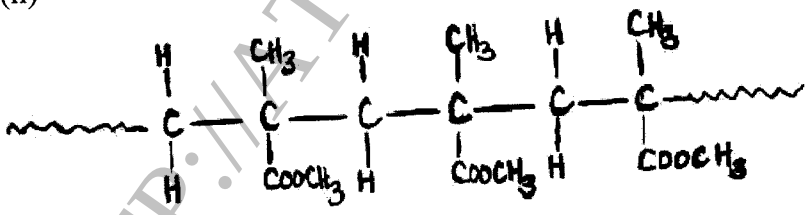
4.7.2 Chemistry Paper 2 (233/2)

Qn No.	Responses	Marks
1	(a) (i) $C_nH_{2n}-alkyne$ ✓1 (ii) $C_nH_{2n}-alkene$ ✓1	(1 mark) (1 mark)
	(b) (i) Solid because it is saturated. ✓1	(1 mark)
	(ii) I. $CH_2OHCHOHCH_2OH$ ✓ 1	(1 mark)
	II. $CH_3(CH_2)_{16}COONa$ ✓ 1	(1 mark)
	III. Cleaning agent /.cleansing agent ✓ 1	(1 mark)
	(c) (i) Calcium carbide✓ ½ and water. ✓ ½	(1 mark)
	(ii) $CaC_{2(s)} + H_2O_{(s)} \rightarrow Ca(OH)_{2(aq)} + C_2H_{2(g)}$ ✓ 1	(1 mark)
	(d) (i) When many unsaturated molecules called monomers combine to form a giant / macro molecule of high relative molecular mass called a polymer.✓ 1	(1 mark)
	(ii) 	(1 mark)
	(iii) • Used as a glass substitute;✓ 1 • Electronic instruments housing; • Wind screen; • Safety glasses; • vehicle headlamps; • Bullet proofing.	(1 mark)

(iv) • Emit toxic fumes when burned affecting human life. ✓ ½ • They are non-biodegradable hence pollutes the environment. ✓ ½ • Accelerates fires when burned / highly flammable. **(Any two correct @½ mk)**	(1 mark)
2(a) (i) G✓ 1 – Contains delocalized electrons✓ 1present in solid and molten state. (ii) In solid state, the ions are rigidly held in position and cannot move, hence will not conduct.✓ 1 In molten/aqueous state, the ions are mobile and will be able to conduct electric current.✓ 1	(2 marks)
(b) (i) •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	(2 marks) (1½ marks)
(ii) $4OH^-(aq) \rightarrow O_{2(g)} + 2H_2O_{(l)} + 4e^-$ ✓ 1	(1 mark)
(iii) The pH will change from 6 to less than 4 i.e. the resulting solution will be acidic. ✓ ½	(½mark)
(c) With copper electrodes: Anode will go into solution as copper ions hence it decreases in mass/size. ✓ ½ Brown deposit forms at the cathode hence the cathode increases in mass.✓ ½	(½ mark) (½mark)
(d) (i) This is the coating of an article / object with another metal by electrolytic method./ electrolysis. ✓ 1	(1 mark)

(ii) To prevent articles from rusting and to make them attractive. (1 mark)

(iv) Quantity of electricity = $\frac{3}{2}$ x ~~60~~ x 60 x0.6 ✓1

= 3240 coulombs. ✓½

108g Ag ≡ 96,500 coulombs
? ≡ 3240 coulombs

$= \frac{108 \times 3240}{96,500}$ ✓1

= 3.626g ✓½

OR

$= \frac{0.6 \times 1.5 \times 60 \times 108}{96,500}$ ✓2½

= 3.626 g ✓ ½ (3 marks)

3 (a) (i) To remove oxide layer on the metal.✓ 1 (1 mark)

(ii) **Beaker I:**

- Bubbles of a colourless gas / effervescence ;✓1
- Solution turns green; ✓ (1 mark)
- the size of iron rod decreases✓.

Beaker II: (1 mark)

- The solution remained colourless.✓1
- No bubbles/effervescence

(iii) **Beaker I:**
Iron is above hydrogen in the reactivity

Series therefore will react with the acid to form iron(II) sulphate ($FeSO_4$) (1 mark)

which is green and produces hydrogen gas.✓1

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) (1 mark)
(Any one correct @ 1mk)

(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 $1 g/cm^3$ 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 (1 mark)

(ii) Sulphuric(VI) acid, H_2SO_4. ✓1 (1 mark)

(iii) (II) - Magnesium sulphate. ✓1 (1 mark)

(III) - Sodium sulphate. ✓1 (1mark)

(iv) $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_{4(s)}$ ✓1 (1 mark)

(b) (i)

(I)

	V	**Cl**
Mass (g)	19.75	80.25
RAM	27	35.5
Moles	$\frac{19.75}{27}$	$\frac{80.25}{35.5}$ ✓½
÷ smaller	$\frac{0.73}{0.73}$	$\frac{2.26}{0.73}$ ✓½ (2 marks)
	1	3 ✓½

Empirical - $\mathbf{VCl_3}$ ✓ ½

(II) Molar mass = 267

Empirical mass $VCl_3 = 27 + 35.5 \times 3$

$= 27 + 106.5$

$= 133.5$ ✓ ½

(Empirical mass) n = molecular mass

$133.3n = 267$

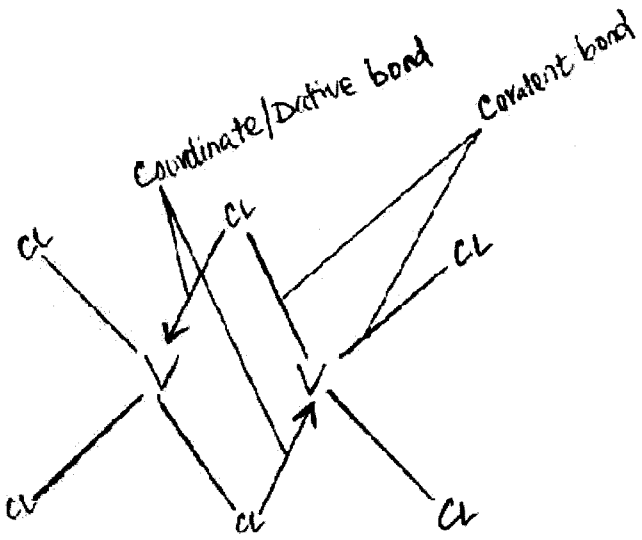
$n = 267 \div 133.5$

$n = 2$ ✓ 1

$(VCl_3)_2 = V_2Cl_6$ (2 marks)

∴ Molecular formula = V_2Cl_6 ✓ ½

(ii)



(1 mark)

(iii) $VCl_3(s) + 3NaOH(aq) \longrightarrow V(OH)_3(s) + 3\,NaCl(aq)$ ✓ 1

(1 mark)

OR

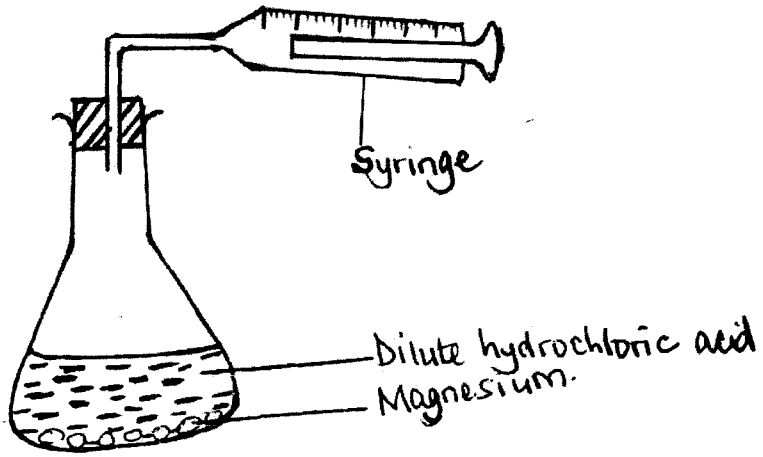
$V_2Cl_6(s) + 6NaOH(aq) \longrightarrow 2V(OH)_3(s) + 6\,NaCl(aq)$

OR

$V^{3+} + 3(OH^-)_{3(aq)} \longrightarrow V(OH)_{3(S)}$

5. (a)

(i)



(3 marks)

Workability - 1mark
Measurement of the gas- 1 mark
Labeling of reactants and gas - 1mark

(ii) $Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$ ✓ 1

(iii) $Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$

(1 mark)

Moles of Mg $= \frac{0.048}{24} = 0.002$ ✓½

Moles of Mg = Moles of $H_2 = 0.002$✓½

Volume of hydrogen gas = 0.002 × 0.048 litres✓ ½

$= 0.048 dm^3$✓½

(2 marks)

(iv) Moles of HCl = 2 x 0.002✓½ = 0.004. ✓½

$\frac{\text{volume} \times 0.1}{1000} = 0.004$✓ ½

Volume $= \frac{0.004x1000}{0.1}$ ✓ ½

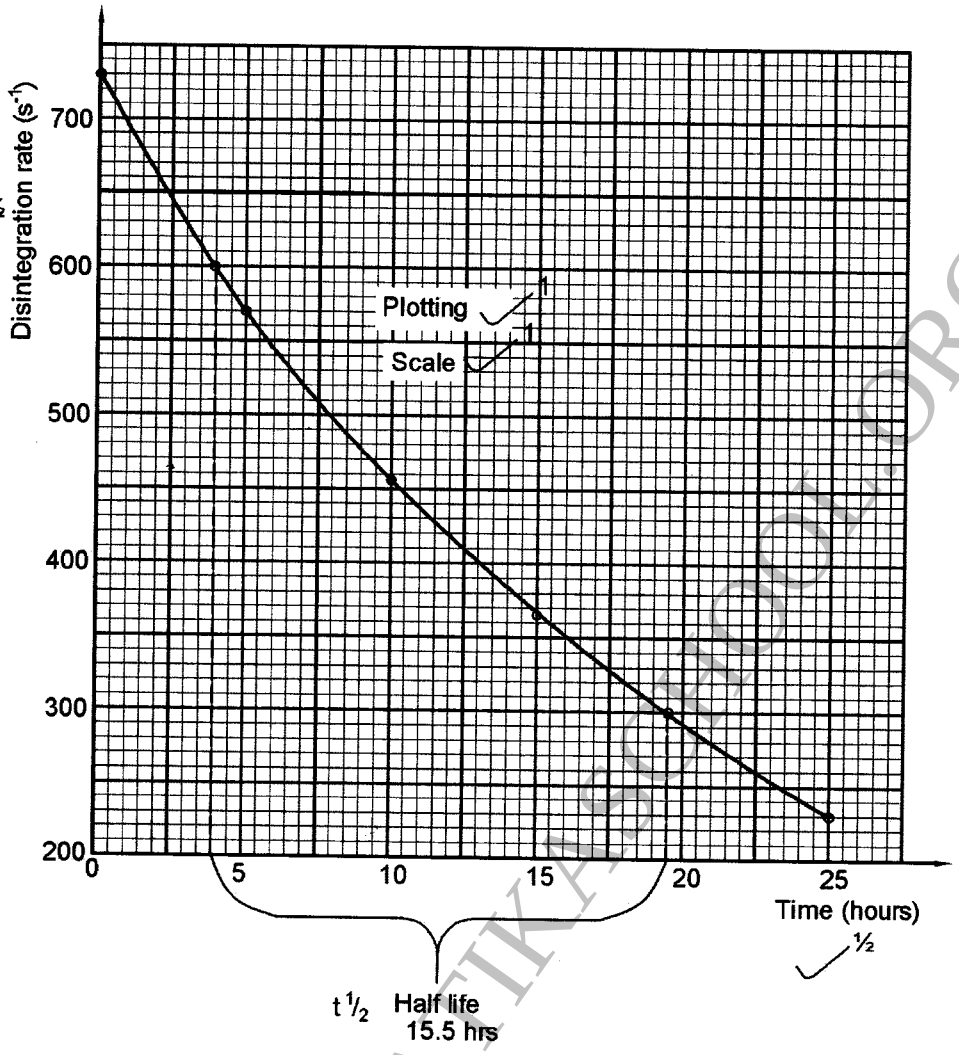
$= 4/0.1 = 40cm^3$✓1

(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) $2O^{2-}(l) \longrightarrow 2O_2(g) + 4e^-$ ✓ 1	(1 mark)
(f) $Pb^{2+}_{(aq)} + 2I^-(aq) \rightarrow PbI_2(s)$. ✓ 1	(1 mark)
(g) A white precipitate ✓ ½ was formed which dissolves in excess to form a colourless solution. ✓ ½	(1 mark)
(h) (i) Displacement / Redox reaction ✓ 1	(1 mark)
(ii) $Pb^{2+}(aq) + Zn(s) \rightarrow Pb(s) + Zn^{2+}(aq)$. ✓ 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)

(ii) It would have no effect on the curve as the quantity of bismuth does not affect half-life. ✓ 1	(1 mark)
(b) (i) **Applications in medicine** • Sterilizing surgical instruments. • Destroying cancerous tissues during radiotherapy. ✓ 1 • Provide power to the heart pace setters. **(Any one correct @ 1mk)**	(1 mark)
(ii) **Applications in agriculture** • 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. **(Any one correct @ 1mk)**	(1 mark)
(iii)**Applications in Tracers** • Detecting leakages in underground water or oil pipes. ✓ 1	(1 mark)
(iv)**Applications in Nuclear power stations.** • To generate electricity. ✓ 1	(1 mark)
(d) **Dangers of radioactivity** • 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. **(Any 2 correct @ 1mk)**	(2 marks)