4.7.2 Chemistry Paper 2 (233/2)

Qn No.	Responses	Marks
1	**(a)**	
	(i) $C_nH_{2n} - alkyne$ ✓1	(1 mark)
	(ii) $C_nH_{2n} - alkene$ ✓1	(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 (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 (ii) $4OH^-(aq) \rightarrow O_{2(g)} + 2H_2O_{(l)} + 4e^-$ ✓ 1 (iii) The pH will change from 6 to less than 4 i.e. the resulting solution will be acidic. ✓ ½ (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 (d) (i) This is the coating of an article / object with another metal by electrolytic method./ electrolysis. ✓ 1	(2 marks) (2 marks) (1½ marks) (1 mark) (½mark) (½ mark) (½mark) (1 mark)

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

(1 mark)

(iv) Quantity of electricity $= \frac{3}{2} \times 60 \times 60 \times 0.6$ ✓1

$= 3240$ coulombs. ✓ ½

108g   Ag $\equiv$ 96,500 coulombs
? $\equiv$ 3240 coulombs

$= \dfrac{108 \times 3240}{96,500}$ ✓1

$= 3.626\text{g}$ ✓½

OR

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

$= 3.626 \text{ g}$ ✓ 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; ✓
- the size of iron rod decreases ✓.

(1 mark)

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

(1 mark)

(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
    (iv)   Water ✓ 1   (1 mark)
    (v)   Boil the liquid. If it boils at 100°C/ constant, then this confirms that it is   (1 mark)
          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/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

    (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)

(1mark)

(1 mark)

(b) (i)

    (I)

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

Empirical - **VCl₃** ✓½

(2 marks)

    (II)   Molar mass = 267

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

                    = 27 + 106.5

                    = 133.5 ✓½
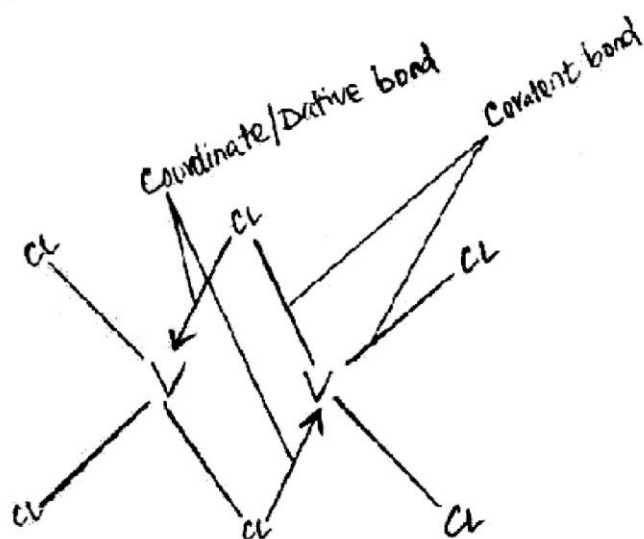
    (Empirical mass) n = molecular mass

        133.3n = 267

            n = 267 ÷ 133.5

            n = 2 ✓1

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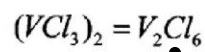
(2 marks)

∴ Molecular formula = V_2Cl_6 ✓ ½

(ii)

(1 mark)

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

OR

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

OR

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

(1 mark)

5. (a)

(i)

Syringe

Dilute hydrochloric acid
Magnesium.
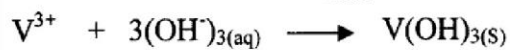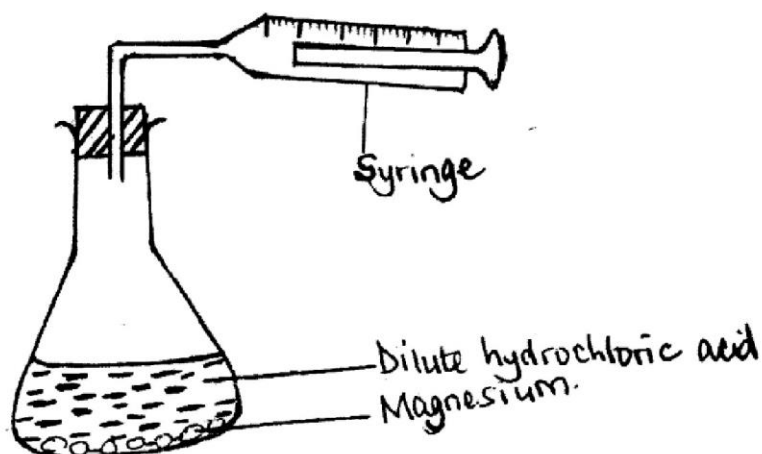
Workability - 1mark
Measurement of the gas- 1 mark
Labeling of reactants and gas - 1mark

(3 marks)

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

(iii) $Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$
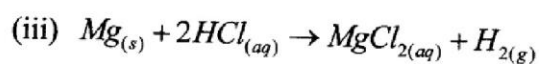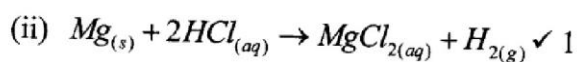
Moles of Mg $= \dfrac{0.048}{24} = 0.002$ ✓½

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

Volume of hydrogen gas $= 0.002 \times 0.048$ litres✓ ½

$= 0.048 dm^3$✓½

(1 mark)

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

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

Volume $= \dfrac{0.004 x 1000}{0.1}$ ✓ ½

$= 4/0.1 = 40 cm^3$✓1

(2 marks)

(3 marks)

390

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 (1 mark)

       colourless solution. ✓ [½]

   (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)
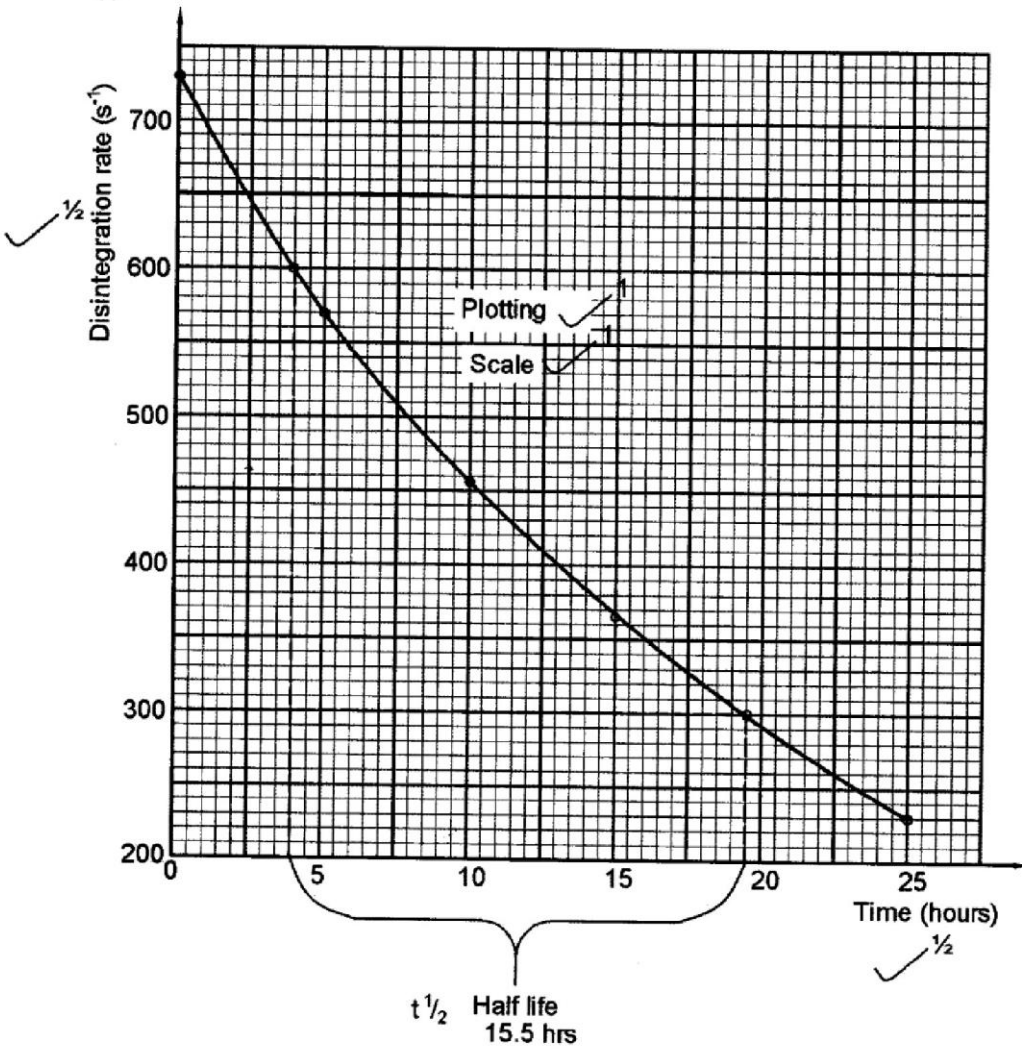
Plotting ✓ 1
Scale ✓ 1
Labeling ✓ 1

(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 ✓ 1

radiotherapy.

- Provide power to the heart pace setters. (1 mark)

(Any one correct @ 1mk)

(ii) **Applications in agriculture**

- Monitor photosynthesis and other related processes.

- Preservation of foodstuffs, by exposing ✓1

Micro-organisms to gamma rays.

- Rate of absorption of a fertilizer by the plant. (1 mark)

(Any one correct @ 1mk)

(iii)**Applications in Tracers**
- Detecting leakages in underground water or oil
pipes. ✓ 1 (1 mark)

(iv)**Applications in Nuclear power stations.**
(1 mark)
- To generate electricity. ✓ 1

(d) **Dangers of radioactivity**

- Long term exposure causes genetic mutation;✓ 1

- Radioisotopes can be used as weapon of mass ✓ 1

Destruction;

- Causes skin cancer;
(2 marks)

- When tested causes environmental pollution.

(**Any 2 correct @ 1mk)**