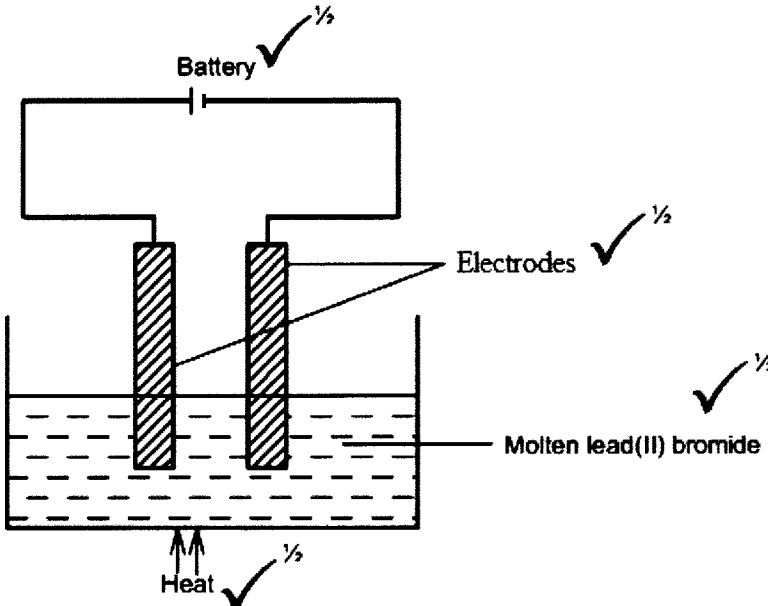
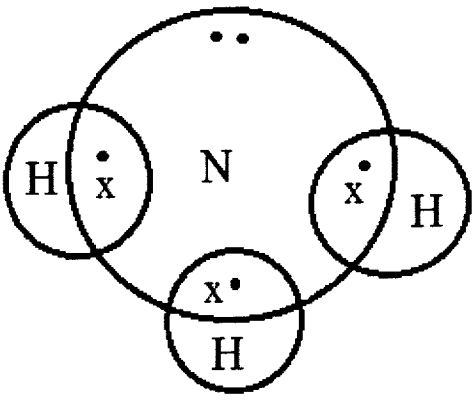


## 4.7 CHEMISTRY (233)

### 4.7.1 Chemistry Paper 1 (233/1)

No.		Responses	Marks
1.	(a)	Number of electrons = number of protons Mass number - Neutrons = 40 - 21 = 19 ✓ ½ ∴ Electron arrangement = 2.8.8.1 ✓ ½ Electron arrangement of sulphur is 2.8.6	(1 mark)
	(b)	$A^1 \times S^2 \longrightarrow A_2S$ ✓ 1	(1 mark)
			(2 marks)
2.	(a)	One of the products of the burning candle, water (H <sub>2</sub> O) ✓ ½ reacted / combined with anhydrous Solid B to form hydrated Solid B. ✓ ½	(1 mark)
	(b)		(1 mark)
	(c)	$CO_{2(g)} + Ca(OH)_{2(aq)} \rightarrow CaCO_{3(s)} + H_2O_{(l)}$ ✓ 1  To suck the gaseous product from the system. ✓ 1	(1 mark)
3.	(a)(i)	Density of the gas ✓ ½ If the gas is lighter than air, downward displacement of air is used. If the gas is denser than air, upward displacement of air is used. ✓ ½	(½ mark)
	(ii)	Solubility in water. ✓ ½ If the gas is insoluble in water, it is collected by downward displacement of water. ✓ ½ If the gas is soluble in water, then it is not collected over water.	(½ mark)
	(b)	By use of a syringe / liquefaction and freezing. ✓ 1	(1 mark)
			(3 marks)

No.		Responses	Marks												
4.	(a)	<table><tr><th>Element</th><th>Cu</th><th>O</th></tr><tr><td>Mass (g)</td><td>3.29</td><td>0.81 ✓ ½</td></tr><tr><td>Number of moles</td><td><math>\frac{3.29}{64.0}</math> 0.051 ✓ ½</td><td><math>\frac{0.81}{16.0}</math> 0.051 ✓ ½</td></tr><tr><td>Mole ratio</td><td>1</td><td>1</td></tr></table>	Element	Cu	O	Mass (g)	3.29	0.81 ✓ ½	Number of moles	$\frac{3.29}{64.0}$ 0.051 ✓ ½	$\frac{0.81}{16.0}$ 0.051 ✓ ½	Mole ratio	1	1	(½ mark)
		Element	Cu	O											
		Mass (g)	3.29	0.81 ✓ ½											
		Number of moles	$\frac{3.29}{64.0}$ 0.051 ✓ ½	$\frac{0.81}{16.0}$ 0.051 ✓ ½											
Mole ratio	1	1													
Empirical formula = CuO ✓ ½	(2 marks)														
(b)	Reducing agent 1 ✓ 1	(1 mark)													
		(3 marks)													
5.	(a)	<div><div><div><div>H</div><div>H-C</div><div>H</div></div><div><div>H</div><div>C</div><div>H-C-H</div><div>H</div></div><div><div>H</div><div>C</div><div>H</div></div></div><div><div>H</div><div>C</div><div>H</div></div><div><div>H</div><div>C</div><div>H</div></div><div><div>H</div><div>C</div><div>H</div></div></div> <div>✓ 1</div>	(1 mark)												
		(b)	(i) Bromine is decolourized / Bromine water changed from orange/brown/yellow to colourless. ✓ 1	(1 mark)											
		(ii) Addition reaction. ✓ 1	(1 mark)												
				(3 marks)											
6.	(a)	(i) F ✓ ½	(½ mark)												
		(ii) E ✓ ½	(½ mark)												
	(b)	✓ ½ ✓ ½ D and G	(1 mark)												
	(c)	Amphoteric oxides react with both strong acids and alkalis. ✓ 1	(1 mark)												
		(3 marks)													

No.	Responses	Marks
7.	 <p style="text-align: right;">Workability</p>	<p>(2 marks)</p> <p>(1 mark)</p> <p><b>(3 marks)</b></p>
8.	<p>(a) In a covalent bond, shared electrons are contributed by both atoms/species while in a dative covalent bond, the shared electrons are from one of the atoms/species ✓ 1</p> <p>(b)  ✓ 1</p> <p>(c) The nitrogen in ammonia contains a lone pair of electrons. ✓ 1</p>	<p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p><b>(3 marks)</b></p>

No.		Responses	Marks
9.	(a)	Concentrated Sulphuric(VI) acid / $\text{H}_2\text{SO}_4(\text{l})$ ✓ 1	(1 mark)
	(b)	Sulphur(IV) Oxide / $\text{SO}_2$ ✓ 1	(1 mark)
	(c)	$[\text{Cu}(\text{NH}_3)_4]^{2+}$ ✓ 1	(1 mark)
			<b>(3 marks)</b>
10.	(a)	$3\text{Cl}_2(\text{g}) + 6\text{NaOH}(\text{aq}) \rightarrow \text{NaClO}_3(\text{aq}) + 5\text{NaCl}(\text{aq}) + 3\text{H}_2\text{O}(\text{l})$ ✓ 1	(1 mark)
	(c)	Fractional crystallization. ✓ 1	(1 mark)
	(c)	<ul style="list-style-type: none"> <li>- Manufacture of dyes</li> <li>- Bleaching agent</li> <li>- Treatment of sewerages ✓ 1</li> <li>- Weed killer (herbicides)</li> <li>- Oxidizers in fireworks and explosives/matches</li> </ul>	(1 mark)
			<b>(3 marks)</b>
11.	(a)	-effervescence ✓ 1 - colourless solution formed ✓ ½ - brown residue ✓ ½	(2 marks)
	(b)	$\text{Zn}^{2+}(\text{aq}) + 4\text{OH}^-(\text{aq}) \rightarrow [\text{Zn}(\text{OH})_4]^{2-}(\text{aq})$ ✓ 1  <b>OR</b> $\text{Zn}(\text{OH})_2(\text{s}) + 2\text{OH}^-(\text{aq}) \longrightarrow [\text{Zn}(\text{OH})_4]^{2-}(\text{aq})$	(1 mark)
			<b>(3 marks)</b>

No.		Responses	Marks
12.	(a)	Metals ✓ ½	(½ mark)
		- Ionic radius is smaller than their corresponding atomic radius. ✓ ½	(½ mark)
	(b)	(i) I M ✓½	(½ mark)
		II N ✓ ½	(½ mark)
		(ii) The more/greater the ionization energy, the less reactive the element; ✓ ½ The less/smaller the ionization energy the more reactive the element. ✓ ½	(1 mark)
			(3 marks)
13.	(a)	$2\text{Pb}(\text{NO}_3)_2(\text{s}) \xrightarrow{\text{Heat}} 2\text{PbO}(\text{s}) + 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$ ✓ 1	(1 mark)
	(b)	The yellow colour intensifies. ✓ 1	(1 mark)
		- Decrease in temperature shifts the equilibrium to the right ✓½ leading to formation of more dinitrogen tetroxide since	(1 mark)
		forward reaction is exothermic. ✓ ½	(3 marks)

No.		Responses	Marks
14.	(a)	<p>(i) <math>\Delta H = A - B</math> ✓ 1</p> <p>(ii) <math>EA = C - B</math> ✓ 1</p> <p>(b) As shown in the diagram</p>	<p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p><b>(3 marks)</b></p>
15.	(a)	The products from the carbonator are filtered to obtain sodium hydrogen carbonate as the residue ✓ ½. The residue is then dried ✓ ½ and heated strongly ✓ ½ to produce sodium carbonate.	(1½ marks)
	(b)	Calcium carbonate decomposes to form calcium oxide and carbon(IV) oxide ✓ ½. The calcium oxide reacts with the water and ammonium chloride to form calcium chloride. ✓ 1	<p>(1½ marks)</p> <p><b>(3 marks)</b></p>



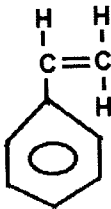
No.		Responses	Marks
		Energy of the products (Bond formation) $= (3 \times -412) + -276 + -366$ $= -1878\text{kJ}$ $\Delta H$ of reaction = $+1841 + -1878$ ✓ ½ $= -37\text{kJ}$ ✓ ½	(½ mark) (½ mark) (½ mark) (½ mark)
			<b>(3 marks)</b>
17.	(a)	CFCs – Chlorofluorocarbons ✓ 1	(1 mark)
	(b)	DDT – Dichlorodiphenyltrichloroethane ✓ 1	(1 mark)
			<b>(2 marks)</b>
18.	(a)	Simple distillation ✓ 1	(1 mark)
	(b)	- The mixture is placed in a separating funnel and allowed to stand. ✓ 1 - The two layers are separated by running out the bottom layer until a little of the bottom layer remains. The interphase is then discarded to remain with the top layer in the separating funnel. ✓ 1	(1 mark) (1 mark)
			<b>(3 marks)</b>
19.		$4\text{P(s)} + 5\text{O}_2(\text{g}) \rightarrow 2\text{P}_2\text{O}_5(\text{g})$ <b>OR</b> $2\text{P(s)} + 2\frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{P}_2\text{O}_5(\text{g})$ No. of moles phosphorus = $\frac{6.2}{31} = 0.2$ ✓ ½ No. of moles of $\text{P}_2\text{O}_5 = \frac{1}{2} \times 0.2 = 0.1$ ✓ ½ RFM of $\text{P}_2\text{O}_5 = (31 \times 2) + (16 \times 5) = 142$ ✓ ½ Mass of $\text{P}_2\text{O}_5 = \text{RFM} \times 0.1$ $= 142 \times 0.1$ $= 14.2\text{g}$ ✓ ½	(½ mark) (½ mark) (1 mark)
			<b>(2 marks)</b>



No.		Responses	Marks									
20.	(a)	$\text{CH}_3\text{CH}=\text{CH}_2$ ✓ 1	(1 mark)									
	(b)	Heat ✓ 1( temperature between $250^\circ\text{C} - 300^\circ\text{C}$ ) High pressure , 60 - 70 atmospheres	(1 mark)									
	(c)	Addition / Oxidation ✓ 1	(1 mark)									
			(3 marks)									
21.	(a)	(i) $\text{HNO}_3$ and $\text{BaO}$ ✓ 1	(1 mark)									
		(ii) $\text{Pb}(\text{NO}_3)_2$ and $\text{NaCl}$ ✓ 1	(1 mark)									
	(b)	- Evaporate the mixture to saturation; ✓ ½ - Allow to cool and filter, residue is the salt. ✓ ½	(1 mark)									
			(3 marks)									
22.	(a)	- Position of the element in the reactivity series ✓ 1 - Concentrations of the ions - Nature of the electrode	(1 mark)									
	(b)	(i) $2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g}) - \text{Cathode}$ ✓ 1	(1 mark)									
		(ii) $4\text{OH}^-(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g}) + 4\text{e}^- - \text{Anode}$ ✓ 1	(1 mark)									
			(3 marks)									
23.		<table><tr><td></td><td>Reactants</td><td>Products</td></tr><tr><td>Sulphur</td><td>-2 ✓ ½</td><td>0 ✓ ½</td></tr><tr><td>Chlorine</td><td>0 ✓ ½</td><td>-1 ✓ ½</td></tr></table>		Reactants	Products	Sulphur	-2 ✓ ½	0 ✓ ½	Chlorine	0 ✓ ½	-1 ✓ ½	(1 mark)
		Reactants	Products									
	Sulphur	-2 ✓ ½	0 ✓ ½									
	Chlorine	0 ✓ ½	-1 ✓ ½									
			(1 mark)									
			(2 marks)									

No.		Responses	Marks
24.	(a)	$\frac{R_{SO_2}}{R_{CO_2}} = \frac{\sqrt{M_{CO_2}}}{\sqrt{M_{SO_2}}} \quad ; \quad \frac{t_{SO_2}}{t_{CO_2}} = \frac{\sqrt{M_{SO_2}}}{\sqrt{M_{CO_2}}}$ $RMM \text{ of } SO_2 = 32 + (16 \times 2) = 64 \quad \checkmark \frac{1}{2}$ $RMM \text{ of } CO_2 = 12 + 32 = 44$ $\frac{96}{t_{CO_2}} = \frac{\sqrt{64}}{\sqrt{44}} \quad \checkmark \frac{1}{2}$ $t_{CO_2} = \sqrt{\frac{96^2 \times 44}{64}}$ $t_{CO_2} = 79.60s \quad \checkmark \frac{1}{2}$	(1½ marks)
	(b)	$\frac{Rate_{Ne}}{Rate_x} = 1.45 = \sqrt{\frac{\text{Mass of X}}{20}} \quad \checkmark \frac{1}{2}$ $\text{Mass of X} = 2.1025 \times 20 \quad \checkmark \frac{1}{2}$ $= 42.05$ $= 42.0 \quad \checkmark \frac{1}{2}$	(1½ marks)
			(3 marks)
25.	(a)	(i) 4 Moles of $H_2O = 8H \quad \frac{1}{2} \checkmark$ $yH + H = 8H$ $yH = 8H - H$ $yH = 7H$ $y = 7 \frac{1}{2} \quad \checkmark$	(1 mark)
	(b)	(ii) $C_x H_{2x+1} OH$ , where x is the number of carbon atoms $\therefore 2x+1 = 7 \quad \frac{1}{2} \checkmark$ $2x = 6$ $x = 3 \quad \frac{1}{2} \checkmark$	(1 mark)

No.	Responses	Marks
	<p>Moles of O is <math>4\text{H}_2\text{O} + 3\text{CO}_2 = 10 \text{ Oxygen } \checkmark \frac{1}{2}</math></p> <p><math>\text{O} + 2x\text{O} = 10 \text{ O}</math></p> <p><math>2x\text{O} = 10 \text{ O}</math></p> <p><math>2x = 9</math></p> <p><math>x = 4.5</math></p> <p>9 Oxygen atoms required = 4.5 moles of <math>\text{O}_2 \checkmark \frac{1}{2}</math></p>	(1 mark)
	<p><b>OR</b></p> <p><math>\text{C}_x\text{H}_y\text{OH} + \text{O}_2 \longrightarrow \text{XCO}_2 + 4\text{H}_2\text{O}</math></p> <p>But <math>y = 2x+1</math></p> <p>Where <math>x=3</math></p> <p><math>y=2x3+1=7</math></p> <p><math>2x+1=8</math></p> <p><math>2x=6</math></p> <p><math>X=3</math></p> <p><math>\text{C}_3\text{H}_7\text{OH} + \frac{9}{2}\text{O}_2 \longrightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}</math></p> <p><math>\therefore \text{Moles of } \text{O}_2 = 4.5</math></p>	(2 marks)

No.		Responses	Marks
26.	(a)	Mass number of X = 228 - 224 = 4 Atomic number of X = 90 - 88 = 2 X is ${}^4_2\text{He}$   $\alpha$   alpha ✓ ½ ${}^{228}_{90}\text{Th} \rightarrow {}^{224}_{88}\text{Ra} + {}^4_2\text{He} + \gamma$ ✓ 1	(½ mark)
	(b)	No. of half-life = $\frac{5.7}{1.9} = 3$ ✓ ½ If initial mass is X g, after 3 half -lives mass remaining is $\frac{x}{8}$ g ✓ ½	(1 mark) (½ mark)
	(c)	$\frac{x}{8} = 1.25$ x = 10.0 ✓ (½ mark) ∴ Initial mass = 10.0g	(½ mark) (½ mark)
			(3 marks)
27.	(a)	Polyphenylethene or polystyrene ✓ 1	(1 mark)
	(b)	 ✓ 1 Monomer Uses of polystyrene ✓ 1	(1 mark)
	(c)	<ul style="list-style-type: none"> <li>- Manufacture of packaging materials</li> <li>- Insulators</li> <li>- Ceiling boards</li> </ul> (Any one correct)	(1 mark) (3 marks)

No.		Responses	Marks
28.	(a)	(i) $a_1 = 1$ ✓ 1	(1 mark)
		(ii) $a_3 = 8$ ✓ 1	(1 mark)
	(b)	Both elements have a tendency of losing electrons. ✓ 1 (Both form positive ions).	(1 mark)
			(3 marks)