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5.5 CHEMISTRY (233)

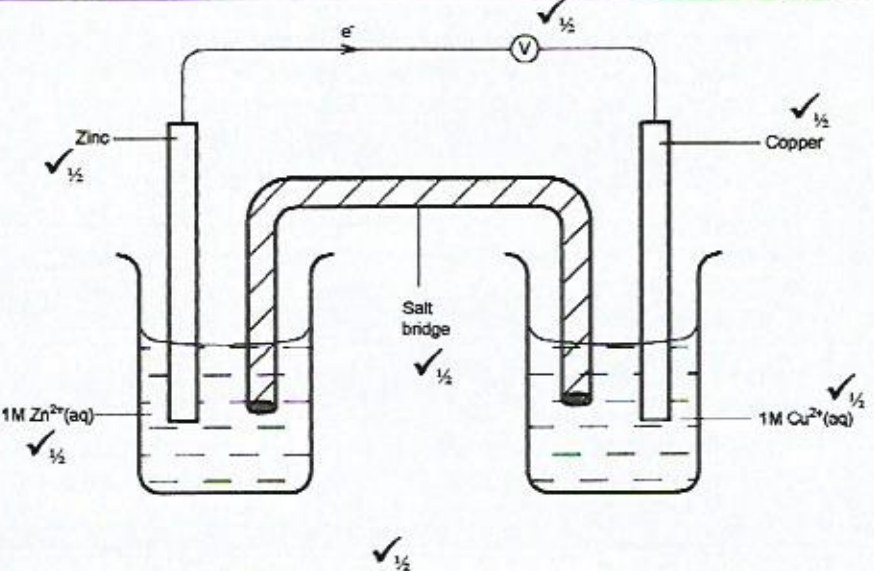#### 5.5.1 Chemistry Paper 1 (233/1)

No.		Responses	Marks
1.	(a)	A = 2.8.8.1	(1 mark)
	(b)	Group 1 Period 4	(½ mark) (½ mark)
	(c)	Metal	(1 mark) **3 marks**
2.		As the concentration increases, the number of reacting particles increases leading to increase in effective collisions. This leads to increase in the rate of reaction.	(2 marks)
3.	(a) (i)	Copper pyrites/$CuFeS_2$	(1 mark)
	(ii)	Froth floatation	(½ mark)
	(iii)	Copper(I) suphide/Cu_2S	(½ mark)
	(b)	$FeO(s) + SiO_2(s) \rightarrow FeSiO_3(l)$	(1 mark) **3 marks**
4.	(a)	✓1 (1 mark)	(1 mark)
	(b)	RFM of monomer $= (12 \times 8) + 8 = 104$	(1 mark)
		Numbers of monomers $= \dfrac{4992}{104} = 48\text{units}$	(1 mark) **3 marks**
5.	(a)	$Mg(s) + H_2O(g) \rightarrow MgO(s) + H_2(g)$	(1 mark)
	(b)	To prevent suck-back of water which would crack the boiling tube.	(1 mark)
	(c)	Sodium is a very reactive metal hence reacts explosively with steam.	(1 mark) **3 marks**
6.		Add calcium oxide /lime to raise the soil pH. Calcium oxide is a basic oxide hence dissolves in water in the soil to form alkaline solution that reacts with acidic soil raising soil pH.	(2 marks)

No.		Responses	Marks
7.	(a)	$H_2SO_4(g) + 2XOH(aq) \rightarrow X_2SO_4(aq) + 2H_2O(l)$	
		$\quad\quad 1 \quad : \quad 2$	
		Moles of $H_2SO_4 = \dfrac{30 \times 0.3}{1000} = 0.009$ moles	(½ mark)
		Moles of XOH $= 2 \times 0.009$	(½ mark)
		$= 0.018$ moles	(½ mark)
	(b)	Molarity of XOH $= \dfrac{0.018 \times 1000}{25}$	
		$= 0.72M$	(½ mark)
		$R.F.M = \dfrac{g/1}{molaity} = \dfrac{40.3}{0.72} = 55.972$	
		$RFM = \dfrac{g/1}{molaity} = \dfrac{40.3}{0.72} = 55.972$	(½ mark)
		$= 56$	
		$x + 16 + 1 = 56$	
		$x = 56 - 17$	
		$x = 39$	(½ mark)
			3 marks
8.	(a) (i)	Ionic/electrovalent.	(1 mark)
	(ii)	Covalent (Van der Waals)	(1 mark)
	(b)	Chloride of **D** giant ionic; when in molten state the ions are mobile hence conducts electric current. E is giant molecular and therefore does not have mobile ions to carry electric current.	(1 mark)
			3 marks
9.	(a)	**F** - Dilute hydrochloric acid / dilute HCl acid	(1 mark)
		- Dilute sulphuric (VI) acid/dilute H_2SO_4	
		Any one correct (1 mark)	
	(b)	$Na_2SO_3(s) + 2HCl(aq) \rightarrow SO_2(g) + 2NaCl(aq) + H_2O(l)$	(1 mark)
		or	
		$Na_2SO_3(s) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + H_2O(l) + SO_2(g)$	
		Any one correct (1 mark)	

No.		Responses	Marks
	(c)	To dry the gas	(1 mark)
			3 marks
10.	(a)	Impure	(1 mark)
	(b)	The substance does not have a sharp melting point or boiling point.	(1 mark)
			2 marks
11.	(a)	Concentrated sulphuric(VI) acid / Al_2O_3/ H_3PO_4	(1 mark)
	(b)	Temperature $160°C-180°C$	(1 mark)
	(c)	$CH_3CH_2OH \xrightarrow{H_2SO_{4(l)}} CH_2CH_2 + H_2O$	(1 mark)
			3 marks
12.	(a)	- The colour of the solution changes from yellow to colourless. - Colourless gas collected/ level of solution drops.	(½ mark)
	(b)	The sunlight decomposed chloric(I) / hypochlorous acid to oxygen and hydrochloric acid.	(½ marks) (1 mark)
	(c)	$2HOCl(aq) \rightarrow 2HCl(aq) + O_2(g)$	(1 mark) **3 marks**
13.		$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$	(1 mark)
		No. of moles of $CaCO_3 = \dfrac{5}{100} = 0.05$ moles	
		Moles CaO $= 0.05$ Mass of CaO $= 0.05 \times 56$ $= 2.8g$	(1 mark) (½ mark) (½ mark) **3 marks**
14.	(a)	Hydrogen peroxide	(1 mark)
	(b)	Catalyst, to speed up the production of oxygen gas.	(1 mark)
	(c)	$2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g)$	(1 mark) **3 marks**
15.	(a)	Separating funnel	(1 mark)
	(b)	Immiscibility/different densities	(1 mark)
	(c)	R - Hexene S - Water	(½ mark) (½ mark) **3 marks**

No.		Responses	Marks
16.	(a)		
			(2 marks)
	(b)	Ammonia in methylbenzene is molecular/ does not dissociate, while it ionizes in water to form ions.	(1 mark) **3 marks**
17.		$\Delta H_{soln} = \Delta H_{latt} + \Delta H_{hyd}$ $-17.2 = \Delta H_{latt} + (-689)$ $\Delta H_{latt} = +689 - 17.2$ $= +671.8kJmol^{-1}$	(1 mark) (1 mark) **2 marks**
18.	(a)	The amount of heat energy evolved or absorbed during a chemical reaction between molar quantities of reactants.	(1 mark)
	(b)	$CH_4 + 4Cl_2 \rightarrow CCl_4 + 4HCl$	
			(2 marks)
			3 marks

In question 16 (a), the table reads:

Solution	pH	Nature of Solution
H	1.0	**Strong acid**
I	7.0	Neutral
J	4 - 6.9	Weak acid
K	12	**Strong base**

In question 18 (b), the table and calculation read:

Bond Breaking	Bond Formation
$4 \times 412 = 1648$	$4 \times -338 = -1352$
$4 \times 242 = 968$	$4 \times 431 = -1724$
Total $= +2616$	Total $= -3076$

$\Delta H = +2616 + -3076$

$= -460kJmol^{-1}$

No.		Responses	Marks
19.	(a)		3 marks
20.	(a)	L - Calcium carbonate/CaCO₃/Marble chips / (any other suitable carbonate)	(1 mark)
	(b)	$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$	(1 mark)
	(c)	White precipitate formed which dissolves in excess to form a colourless solution.	(1 mark)
			3 marks
21.	(a)	Atomic radii decreases across the period. Across the period the number of protons increases increasing the nuclear attraction for the outermost electrons contributing to decrease in atomic radii.	(1 mark)
	(b)	AlCl₃ is molecular/ covalent. It differs from other metal chlorides because it exits as a dimmer. Two molecules of AlCl₃ pair through co-ordinate bonds while the other metal chlorides are ionic. **OR** AlCl₃ hydrolyzes in water while the other chlorides do not.	(2 marks)
			3 marks

No.		Responses	Marks
22.	(a) (i)	M – Alpha/α	(2 marks)
	(ii)	N – Beta/β	
	(b)	The alpha (α) particles will be stopped while beta (β) particles will penetrate the sheet of paper. This is because beta particles have higher penetrating power than alpha particles.	(1 mark)
			3 marks
23.		$R.A.M = \left(\dfrac{9}{10}\times16\right)+\left(\dfrac{1}{10}\times18\right)$	(1 mark)
		$=14.4+1.8$	(½ mark)
		$=16.2$	(½ mark)
			2 marks
24.		Heat copper turnings in air to form copper(II) oxide.	(1 mark)
		Add dilute sulphuric(VI) acid filter to obtain copper(II) sulphate solution.	(1 mark)
		Heat to saturation and allow to cool for crystals to form. Dry between filter papers.	(1 mark)
			(3marks)
25.	(i)	$Pb^{2+}, Ag^{+}, CO_3^{2-}$ and SO_4^{2-} absent	(1 mark)
	(ii)	CO_3^{2-} absent	(1 mark)
	(iii)	SO_4^{2-}, SO_3^{2-} absent	(1 mark)
			3 marks
26.		Rate of diffusion of $N_2 = \dfrac{140}{70} = 2cm^3s^{-1}$	(½mark)

$$\dfrac{RN_2}{RCO_2}=\sqrt{\dfrac{44}{28}}$$
$$\dfrac{2}{RCO_2}=1.2535 \text{ (1)}$$
$$RCO_2 = \dfrac{2}{1.2535}=1.595$$

$$1.595=\dfrac{200}{\text{Time}}$$
$$\text{Time}=\dfrac{200}{1.595}$$
$$=125.39s$$
$$=125.4 \text{ seconds (1)}$$

OR

No.		Responses	Marks
		$140 cm^3$ of N_2 diffuses by 70 seconds. $\therefore 200 cm^3$ of N_2 diffuses by $\dfrac{200}{140} \times 70 = 100 \, secs$ (1) $\dfrac{100}{TCO_2} = \sqrt{\dfrac{28}{44}}$ $TCO_2 = \dfrac{100}{0.7977}$ (1) $\dfrac{100}{TCO_2} = 0.7977$ (1) $= 125.36 \, seconds$	(3 marks)
27.	(a)	$3Mg(s) + N_2(g) \rightarrow Mg_3N_2(s)$	(1 mark)
	(b)	Burning magnesium produces a lot of heat that is enough to break N-N triple bond hence reacts with it while burning of sulphur produce little heat not enough to break N - N triple bond.	(1 mark)

	(c)	— In refrigeration e.g. storage of semen for artificial insemination
		   — Manufacture of ammonia; Haber process
		   — In light bulbs
		Anyone correct (1 mark)
			(1 mark)
			
			3 marks

28. .			3 marks
29.		Volumetric flask	1 mark