JINJA JOINT EXAINATION BOARD

CHEMISTRY PAPER TWO, 545/2 PROPOSSED MARKING GUIDE 2017

QTNS			MARKS
1.(a)	(i)	Fractional distillation (of liquid air)	½
	(ii)	At low temperature, they would form solid which can block the pipes	1½
	(ii)	Difference in boiling points	½
	(iv)	-Refining petroleum,	½
(b)		-Distillation of ethanol *or equivalent*	½
		(Burns with a brick red flame forming a white solid)	1
			4½ marks
2.(a)	(i)	A normal salt is a compound formed when all the ionizable hydrogen of an acid is replaced by a metal or ammonium ion	1
	(ii)	-Softening of hard water	
		-In fire extinguisher	1
(b)	(i)	Red litmus turns to blue	½
	(ii)	Sodium hydroxide is a **strong base** which ionizes to produce **more hydroxide ions** than the **weak carbonic** which produces **few hydrogen ions**; the solution has **excess hydroxide** ions.	2½
			4½marks
3.(a)		Moles of sodium hydroxide = $\frac{20 \times 2}{1000}$ = 0.04 moles	
		Moles of barium hydroxide formed = $\frac{1}{2}$ x 0.04 = 0.02 moles	3½
		Molecular mass of $Ba(OH)_2$ = 137 + 2(16 + 1) = 171gm	
		Mass of $Ba(OH)_2$ = 171 x 0.02 = 3.42gm	
(b)		$Ba(OH)_2(s) \longrightarrow BaO(s) + H_2O(g)$	1½
			5 marks
4. (a)	(i)	Sample X contains Magnesium sulphate *or equivalent*	½
		Magnesium sulphate **does not decompose, no change in volume** of soap solution	1
	(ii)	Sample Z contains Calcium hydrogen carbonate *or equivalent*	½
		Boiling decomposes it, Ca^{2+} ions are removed leading to **decrease in volume of soap solution**	1
(b)		- Addition of sodium carbonate	1
		- Distillation	

(c)		It does not contain minerals It does not prevent lead poisoning	1
5.(a)	(i)	**Concentrated hydrochloric** acid	5 marks ½
	(ii)	An oxidizing agent	½
	(iii)	$MnO_2(s) + 4HCl(aq) \longrightarrow MnCl_2(aq) + Cl_2(g) + 2H_2O(l)$	1½
(b)	(i)	The colourless solution turns to brown	1
	(ii)	Chlorine **oxidizes** the iodide ions to **iodine**	1
(c)		The outermost energy level contains seven electrons	½
6.(a)	(i)	-Blue/green solution turns to colourless -Brown solid deposited	5 marks 1
	(ii)	$Zn(s) + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu(s)$	
(b)	(i)	Mass of solution = 40 x 1 = 40gm Change in temperature = 33 – 24 = 9°C Heat change.ΔH = 40 x 4.2 x 9 = 1,512J	1½ 1½
	(ii)	Moles of Cu^{2+} ions = $\frac{40 \times 0.15}{1000}$ = 0.006 moles 0.006 moles of Cu^{2+} ions react to produce 1,512 J of heat 1 mole of Cu^{2+} ions will react to produce $\frac{1,512 \times 1}{0.006}$ = 252,000J Heat of reaction is – 252KJ/mol	2
7.(a)	(i)	Heat and steam	6 marks
	(ii)	$Mg(s) + H_2O(g) \longrightarrow MgO(s) + H_2(g)$	1
(b)		The white powder dissolves to form a cloudy solution	1½
(c)		$Mg(OH)_2(aq) + 2HNO_3(aq) \longrightarrow Mg(NO_3)_2(aq) + 2H_2O(l)$	1 1½
8.(a)	(i)	An allotrope is one of the different forms of an element but in the same physical state	5 marks 1

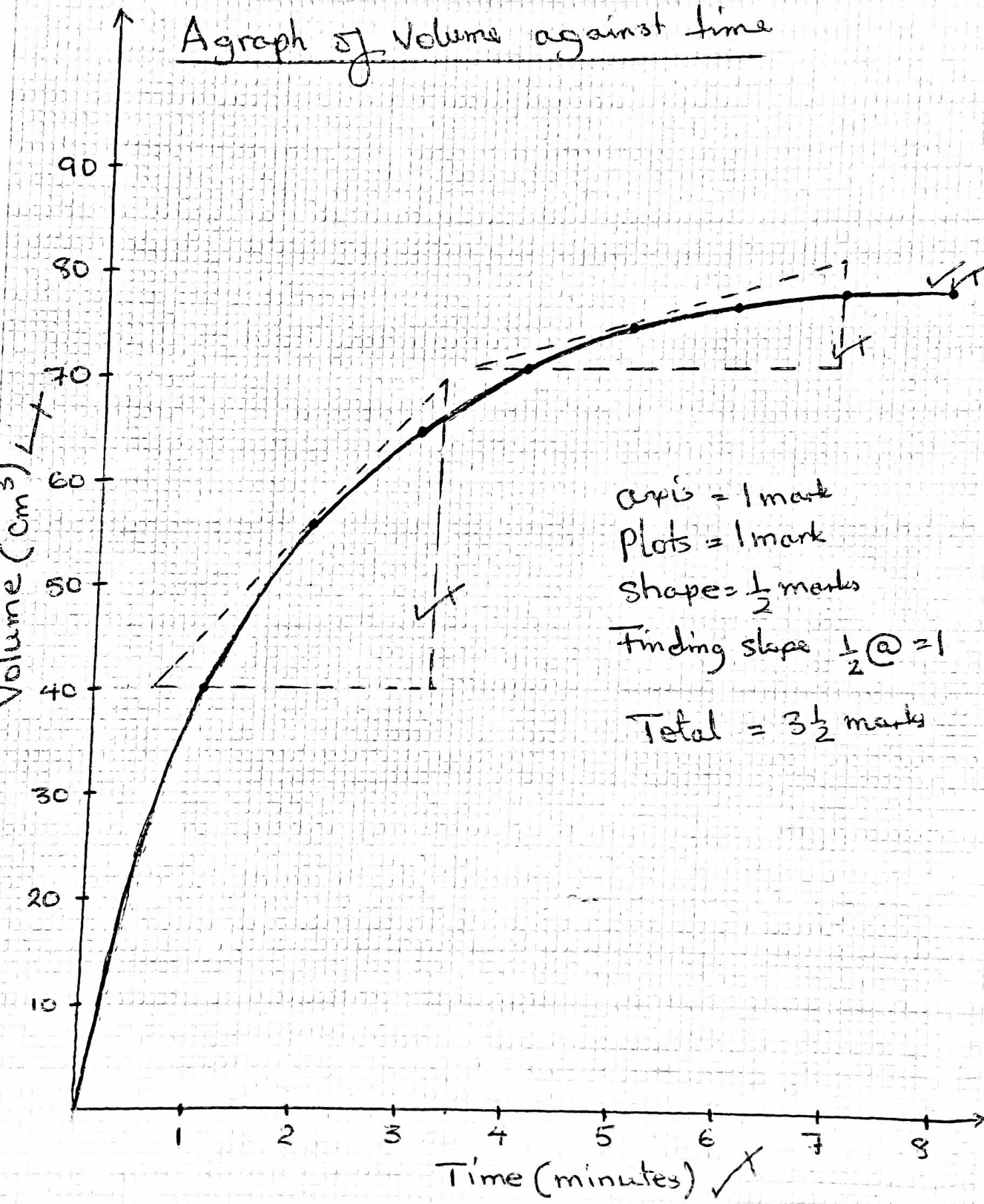
	(ii)	Graphite , Diamond	1
(b)	(i)	Graphite – soft and slippery, conducts electricity	½
		Diamond – very hard, sparkles, does not conduct electricity	½
	(ii)	Graphite – for making pencil lead, dry lubricant, making electrodes.	½
		Diamond – for making jewellery, making drill heads(bits)	½
		- making glass cutters	
(c)	(i)	Lamp black	½
	(ii)	Animal charcoal	½
			5 marks
9.(a)	(i)	Water of crystallization is the definite amount of water with which some substances chemically combine when they form crystalls in solution.	1
	(ii)	Colour of crystalls	1
		Texture or shape and size	
(b)	(i)	Na C O H_2O	
		Number of moles $\frac{16.1}{23}=0.7$, $\frac{4.2}{12}=0.35$, $\frac{16.8}{16}=1.05$, $\frac{62.9}{18}=3.49$	2
		Divide by the smallest $\frac{0.7}{0.35}=2$, $\frac{0.35}{0.35}=1$, $\frac{1.05}{0.35}=3$, $\frac{3.49}{0.35}=9.97$	
		Mole ratio 2 1 3 10	
		Formular **is $Na_2CO_3.10H_2O$**	
	(ii)	The white crystalls turns to a white powder because it has lost water of crystallization(efflorescent)	1
			5 marks
10.(a)	(i)	P = salt bridge	½
	(ii	Q = Copper	½
	(iii)	R = Iron(II) sulphate *or equivalent*	½
(b)	(i)	To complete the circuit *or equivalent*	½
	(ii)	Potassium chloride *or equivalent*	½
(c)		Check on the diagram	½
(d)		$Cu^{2+}(aq) + 2e \longrightarrow Cu(s)$ * Copper is the positive electrode.	1½
		Section A total marks = 50	4½ mark

QTNS		SECTION B	MARKS
11.(a)		Rate of a chemical reaction is the amount of product formed or reactants used up per unit time	1
(b)	(i)	Rate of a reaction increases **with increase in temperature**. At high temperature more particles **gain kinetic energy** and **move faster** leading to **more frequent collision** hence increase in the rate of a chemical reaction	2
	(ii)	The **smaller the size** of the particle, **the higher the surface area** which provides **greater chances** for **more particles** in the reaction and the faster the reaction rate.	2
	(iii)	When the concentration of the **reactant is high**, the reacting particles are **close** to one another and the **frequency of collision is high** leading **to increase** in the rate of a chemical reaction	2
(c)	(i)	See the graph	3½
	(ii)	Excess acid is used to react with all the zinc powder	1
	(iii)	At 2 minutes $\frac{70-40}{3.2-0.6}=\frac{30}{2.6}=11.54\text{cm}^3\text{min}^{-1}$	1
		At 5 minutes $\frac{82-71}{7.0-3.5}=\frac{11}{3.5}=3.14\text{cm}^3\text{min}^{-1}$	1
	(iv)	The rate at 2 minutes is higher than the rate at 5 minutes because at 2 minutes the concentration of the reactants are still high	1½
			15 marks
12(a).	(i)	To **dilute nitric** acid in a beaker, calcium carbonate is added little at a time while **stirring** until it is added **in excess** and when **effervescence stops**. Calcium nitrate forms in the solution as in the equation	3
		$CaCO_3(s) + 2HNO_3(aq) \longrightarrow Ca(NO_3)_2(aq) + H_2O(l) + CO_2(g)$	1½
		Excess calcium carbonate is **filtered off**; the filtrate is **heated** to **saturation** point and allowed **to cool** to allow crystalls to form. The crystalls **filtered** off, **washed** with little water and **dried**	3½
	(ii)	The **solid melts**, reddish **brown fumes** given off a **white powder**/solid residue remains.	2
		$2Ca(NO_3)_2(s) \longrightarrow 2CaO(s) + 4NO_2(g) + O_2(g)$	1½
(b).	(i)	White precipitate, insoluble in excess	1
	(ii)	Molecular mass of $Ca(OH)_2 = 40+ 2(1+16) = 74$gm	3
		Moles of $Ca(OH)_2 = \frac{1.85}{74} = 0.025$ moles, moles of $Ca(NO_3)_2 = 0.025$ moles	
		50cm^3 contains 0.025 moles	
		1000cm^3 will contain $\frac{0.025x1000}{50} = 0.5\text{M}$	
			15 mark

a)	(i)	The yield of ammonia **will increase,** ✓ The forward reaction proceeds by **decrease in volume**, it **require high pressure** to reduce from **4 volumes to 2 volumes**.	2
	(ii)	The yield of ammonia will **increase** ✓ The reaction of nitrogen and hydrogen to form ammonia is **exothermic**, it requires **low temperature**.	2
b)	(i)	Catalyst ✓	½
c)	(ii)	Platinum ✓	½
		$4NH_3(g) + 5O_2(g) \longrightarrow 4NO(g) + 6H_2O(l)$ ✓✓ $2NO(g) + O_2(g) \longrightarrow 2NO_2(g)$ ✓✓ $4NO_2(g) + O_2(g) + 2H_2O(l) \longrightarrow 4HNO_3(aq)$ ✓✓	4½
d)	(i)	A fertilizer is a chemical substance applied to soil to provide plant nutrients. ✓	1
	(ii)	Ammonium nitrate dissolves in water forming ammonium hydroxide, **a weak alkali** and nitric acid which is **a strong acid**. Nitric acid ionizes to produce **more hydrogen ions** than **the few hydroxide ions** from ammonium hydroxide making the soil **acidic**. Calcium oxide being **a base** is added to **neutralize** (react with) the acid in the soil. $CaO(s) + 2HNO_3(aq) \longrightarrow Ca(NO_3)_2(aq) + H_2O(l)$ ✓	3½ 1
			15 marks
a)		Sodium chloride, NaCl ✓	1
b)		Sodium is extracted by **electrolysis** of **fused/ molten** solution of **sodium chloride** to which **calcium chloride** is added to **lower the melting point** of sodium chloride in the Down cell using **iron (steel) as the cathode** and **graphite** as the **anode.** Sodium ions are **reduced** to sodium at the cathode. $Na^+(l) + e \longrightarrow Na(l)$ ✓✓ Sodium is then collected and stored **under dry nitrogen** ✓	5½
c)	(i)	Sodium burns with a bright **yellow flame** forming a **white solid**. $4Na(s) + O_2(g) \longrightarrow 2Na_2O(s)$ ✓✓	2½
	(ii)	**Melts** into a **silvery ball** that moves (darts) on top of water with a **hissing sound**. $2Na(s) + 2H_2O(l) \longrightarrow 2NaOH(aq) + H_2(g)$ ✓✓	3½
	(iii)	Burns in chlorine with a bright **yellow flame** forming **white fumes** (solid) $2Na(s) + Cl_2(g) \longrightarrow 2NaCl(s)$ ✓✓	2½
			15 marks

TOTAL=30 MARKS

Question 11 - c (i)



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