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SERIES 7 EXAMS

233/3 – CHEMISTRY PAPER 3 - MARKING SCHEME

1		1	2	3
	Final burette reading (cm^3)	25.3	25.1	25.2
	Initial burette reading (cm^3)	0.0	0.0	0.0
	Volume of base, solution A used (cm^3)	25.3	25.1	25.2

Complete table - (1mk)
Decimals - (1mk)
Accuracy - (1mk)
(3mks)

(a) (i) Average volume of solution A

$$= \frac{25.3 + 25.1 + 25.2}{3}$$ ✓½

$= 25.2cm^3$ ✓½

(ii) Moles of NaOH $= \frac{25.2 \times 0.08}{1000}$ ✓½

$= 0.00216$ moles ✓½

(b) (i) Mole ratio of acid: base

∴Moles of acid in $25cm^3$

$= \frac{1}{2} \times 0.00216$ ✓½

$= 0.00108$ moles ✓½

(ii) $25cm^3$ _____ 0.00108 moles

$250cm^3$ _____?

$$= \frac{250^{10} \times 0.00108}{25_1}$$ ✓½

$= 0.0108$ moles ✓½

(c) (i) Moles of Na_2CO_3

$$= \frac{2.0}{106}$$ ✓½

$M.Mass\ of\ Na_2CO_3 = 106$

$= 0.0189$ moles ✓½

(ii) Mole ratio of carbonate: dibasic acid

= 1: 1 ✓½

∴Moles of acid ≡ moles of carbonate that reacted

= 0.0189 moles ✓½

(iii) Total no of moles of acid

= Moles of excess acid + moles that reacted with carbonate.

= 0.00108 + 0.0189 ✓½

= 0.01998 moles ✓½

$50cm^3$ of original acid _____ 0.01998 moles

$1000cm^3$ of original acid ____ ?

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$$= \frac{1000 \times 0.01998}{50} \quad \checkmark ½$$

$\therefore$ Concentration = <u>0.3996M</u> ✓½

(d) (i) 15.75g _____ 250cm³

? ← 1000cm³

= 15.75 × 4 ✓½

= 63g/L

$$\text{Molar mass} = \frac{63g/L}{0.3996} \quad \checkmark ½$$

= 157.66g

(ii) $2 + 24 + 4 \times 16 + 18\chi = 157.66$

$90 + 18\chi = 157.66$ ✓½

$18\chi = 67.66$

$$\chi = \frac{67.66}{18} = 3.76$$

$\chi \simeq 4$ ✓½

2. **TABLE 2**

Experiment	1	2	3	4	5
Volume of HCl K(cm³)	5	5	5	5	5
Volume of $Na_2S_2O_3$	10	10	10	10	10
Temp.°C of $Na_2S_2O_3$	22	30	40	50	60
Time (sec)	100	52	31	20	18
$\frac{1}{Time}\left(Sec^{-1}\right)$	1.00 × 10⁻³	19.2 × 10⁻³	32.2 × 10⁻³	50 × 10⁻³	55 × 10⁻³

Complete table (2mks)
Correct trend (1mk)
Accuracy (1mk)

<u>NB</u>: Accuracy mk ± 1°C of Sch. Value ⇒ S. Value is temperature of $Na_2S_2O_3$ at 1st experiment.

(iii) As the temperature increases the rate of reaction increases. (1mk)

(iv) I At 48°C → 40.4 × 10⁻³ ✓½ $10^{-3} \times 40.4 = \frac{1}{\chi}$

$$\frac{1}{0.0404} = \chi = 24.75 \quad \checkmark ½$$

II Temp.°C whose rate is 0.05 sec^{-1} is 50°C. ✓½

3.	I	(a)		Observation	Inference
				- Colourless gas turn ✓½ lime water white ppte - Solid turn to yellow – no white-cold ✓½	CO^{2-}_3 ✓½ HCO^{2-}_3 (any) Zn^{2+} ✓½
				Observation	Inference
		(b)	(i)	- White residue ✓½ - Colourless filtrate ✓½	$ZnCO_3$ ✓½ K^+, Na^+, NH^+_4 ✓1 present Mg^{2+}, Ca^{2+} (any one ion) ✓½
			(ii)	Observation	Inference
				No white ppte ✓½	K^+, Na^+, NH^+_4 ✓1 present (absent Pb^{2+}, Al^{3+})
				Observation	Inference
			(iii)	White ppte ✓½	SO^{2-}_4, SO^{2-}_3, CO^{2-}_3 ✓1 present All 3 – 1mk 2 - ½mk 1 – 0mk
				Observation	Inference
			(iv)	White ppte ✓½	SO^{2-}_3, CO^{2-}_3 present
				Observation	Inference
			(v)	Acidified $KMnO_4$ is decolourised ✓½	SO^{2-}_3 ✓½

3.	II	(a)		Observation	Inference
				- Liquid Z burns with a pale blue flame/non-sooty flame	— C — C — ✓½ present/ C = C , — C ≡ C – absent - Z is a saturated cpd- in words
		(b)		Observation	Inference
				- Forms one layer. - Liquids are miscible ✓½	Z is a polar compound ✓½
				Observation	Inference
		(c)	(i)	Red and blue litmus retains their colour ✓½	- OH ✓1
			(ii)	Observation	Inference
				Ph = 7 ✓½	- OH ✓1
				Observation	Inference
			(iii)	No effervescence ✓½	- OH ✓½ or R-COOH/ — C – OH /H^+ absent
				Observation	Inference

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			(iv)	Colour changes from orange to green ✓½	R – OH ✓1 confirmed