

MARKING SCHEME FOR CHEMISTRY PRACTICAL

U.C.E. PAPER 3 : 545/3

TABLE 1

Volume of pipette used = 25.0 cm^3 ✓

Titration number	1	2	3
Final reading (cm^3)	25.10 ✓	25.10 ✓	24.90 ✓
Initial reading (cm^3)	0.00 ✓	0.20 ✓	0.00 ✓
Volume of BA2 used (cm^3)	25.10 ✓	24.90 ✓	24.90 ✓

(a)(i) Volumes of BA2 used to calculate the average volume are: 24.90, 24.90 ✓

(ii) Average Volume of BA2 = $\frac{24.90 + 24.90}{2}$

$\pm 0.5 \rightarrow \frac{1}{2} \text{ mks}$

$\pm 0.4 \rightarrow 01 \text{ mks}$

$\pm 0.3 \rightarrow 1\frac{1}{2} \text{ mks}$

$\pm 0.2 \rightarrow 02 \text{ mks}$

$\pm 0.1 \rightarrow 2\frac{1}{2} \text{ mks}$

= 24.90 cm^3 ✓

(b)(i) 39g of J contain 1 mole ✓

1.98g of J contain $\frac{1.98}{39}$ moles ✓

= 0.05077 moles ✓

$\Rightarrow 500 \text{ cm}^3$ of BA1 contain 0.05077 moles ✓

25 cm^3 of BA1 contain $\frac{0.05077 \times 25}{500}$ ✓

= 0.002539 moles ✓

Accept any of the methods

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(ii) 126 g contain 1 mole of $\text{H}_2\text{X} \cdot 2\text{H}_2\text{O}$ ✓
6.30 g contain $\frac{1}{126} \times 6.30$ moles ✓

= 0.05 moles per litre ✓

∴ 1000 cm³ of BA2 contain 0.05 moles of acid ✓

24.90 cm³ of BA2 contain $\frac{0.05 \times 24.9}{1000}$ ✓

= 0.001245 moles ✓

(C) (i) Acid, $\text{H}_2\text{X} \cdot 2\text{H}_2\text{O}$: base J.

- moles : 0.001245 : 0.002539 ✓

- mole ratio: $\frac{0.001245}{0.001245} : \frac{0.002539}{0.001245}$ ✓

- Simplest ratio : 1 : 2 ✓

(ii) R.F.M of $\text{H}_2\text{X} \cdot 2\text{H}_2\text{O} = 126$

$$(1 \times 2) + X + (2 \times 18) = 126 \quad \checkmark$$

$$2 + X + 36 = 126$$

$$X + 38 - 38 = 126 - 38 \quad \checkmark$$

$$X = 88 \quad \checkmark$$

TOTAL = 25 MARKS

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat R strongly in a dry test tube	<ul style="list-style-type: none"> Colourless gas turns blue litmus paper to red and lime water milky (or Calcium hydroxide solution forms a white ppt) Black residue 	CO_2 evolved $\therefore \text{CO}_3^{2-}$ or HCO_3^- (Ignore) $\text{CuO} \therefore \text{Cu}^{2+}$ $\text{FeO} \therefore \text{Fe}^{2+}$
(b) Dissolve R in about 5cm^3 of dil. HNO_3 . - Add dil NaOH drop-wise until in excess. - Filter, keep both filtrate and residue.	Green solid dissolves in acid to form a blue solution Effervescence/bubbles of a colourless gas turned blue litmus red and lime water milky Blue ppt insoluble Colourless filtrate Blue residue	Cu^{2+} $\text{CO}_2 \therefore \text{CO}_3^{2-}$ Cu^{2+} $\text{Zn}^{2+}, \text{Al}^{3+}, \text{Pb}^{2+}$ Cu^{2+} (Any two)
(c) To the filtrate add HNO_3 (i) To the 1st part, add NaOH drop-wise until in excess.	white ppt soluble in acid forming a colourless solution white precipitate soluble forming a colourless solution	$\text{Zn}^{2+}, \text{Al}^{3+}, \text{Pb}^{2+}$ (Any two) $\text{Zn}^{2+}, \text{Al}^{3+}, \text{Pb}^{2+}$

TESTS	OBSERVATIONS	DEDUCTIONS
(ii) To the second Part add $\text{NH}_3(\text{aq})$ drop wise until in excess.	White precipitate \checkmark insoluble \checkmark in excess	\checkmark Al^{3+} \checkmark Pb^{2+}
(iii) To the 3 rd Part, add dil $\text{H}_2\text{SO}_4(\text{aq})$	A white precipitate \checkmark	PbSO_4 formed $\therefore \text{Pb}^{2+}$ \checkmark present
(iv) Test of own Choice: Test: Add \checkmark Potassium iodide solution.	A yellow precipitate \checkmark	Pb^{2+} \checkmark Confirmed.
(d) Dissolve the residue in dil. HNO_3	Residue dissolves to form a <u>blue solution</u> \checkmark	Cu^{2+} \checkmark
(i) To the first Part, add dilute nitric acid $\text{NaOH}(\text{aq})$ drop-wise until in excess.	Blue precipitate \checkmark insoluble \checkmark in excess.	Cu^{2+} \checkmark

(d)(ii) To the second part, add ammonia solution drop-wise until in excess	Blue precipitate ✓ Soluble in excess to form a deep blue solution ✓	Cu^{2+} ✓	05
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(e)(i) The Cations in R are: Pb^{2+} ✓ and Cu^{2+} ✓

(ii) The anion in R is: CO_3^{2-} ✓

01
03

TOTAL = 25 MARKS

NB

→ Pb^{2+} : To be Correctly Confirmed in part (C)(iii) or (iv)

→ Cu^{2+} : To be Correctly Confirmed in part (a) or (b) or d(i) or (ii)

→ CO_3^{2-} : Should be Correctly Confirmed in Part (a) or (b)

END

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