

LINDI MUNICIPAL COUNCIL

FORM FOUR UMEKTA EXAMINATION – JULY 2023

032/2A

CHEMISTRY 2A (PRACTICAL)

MARKING SCHEME

1. (a) TABLE OF RESULTS (BURETTE READINGS)

- For volume of pipette 25cm³

Titration	Pilot	1	2	3
Final reading cm ³	25.40	25.20	25.10	25.00
Initial reading cm ³	0.00	0.00	0.00	0.00
Volume used cm ³	25.40	25.20	25.10	25.00

(10 marks) @ 0.5 mark

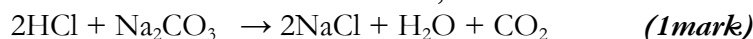
- For volume of pipette 20cm³

Titration	Pilot	1	2	3
Final reading cm ³	20.40	20.20	20.10	20.00
Initial reading cm ³	0.00	0.00	0.00	0.00
Volume used cm ³	20.40	20.20	20.10	20.00

(b) 25cm³ BB required 25.10cm³ of AA for complete reaction (1mark) @ 0.5 mark

(c) The colour change at the end point was from yellow to orange (1mark) @ 0.5 mark

(d), The balanced chemical reaction is as follows;



Then, $n_a = 2$, $n_b = 1$

$$\text{Molarity of acid (Ma)} = \frac{\text{conc in g/dm}^3}{\text{Molar mass of HCl}}$$

$$= \frac{3.65\text{g/dm}^3}{36.5\text{g/mol}}$$

$$M_a = 0.1\text{M} \quad (1.5 \text{ marks})$$

$$\text{From mole ratio; } \frac{M_a V_a}{n_a} = \frac{M_b V_b}{n_b}$$

$$M_b = \frac{M_a V_a n_b}{V_b n_a}$$

(1mark)

Where; $M_a = 0.1\text{M}$

$$V_a = 25.10\text{cm}^3$$

$$n_b = 1$$

$$V_b = 25\text{cm}^3$$

$$n_a = 2$$

$$\text{Therefore } M_b = \frac{0.1 \times 25.10 \times 1}{25 \times 2} \text{ (1mark)}$$

$$M_b = 0.05\text{M} \quad (1.5 \text{ marks})$$

$$\begin{aligned} \text{ALSO Conc of pure base (an anhydrous)} &= M_b \times \text{Molar mass of Na}_2\text{CO}_3 \\ &= 0.05 \times 106 \\ &= 5.3\text{g/dm}^3 \quad (1.5 \text{ marks}) \end{aligned}$$

$$\text{From } \frac{\text{Mass/conc of hydrated salt}}{\text{Mass/conc of anhydrous salt}} = \frac{\text{Molar mass of hydrated salt}}{\text{Molar mass of anhydrous salt}} \quad (1\text{mark})$$

$$\frac{14.3}{5.3} = \frac{106 + 18x}{106}$$

$$2.698 \times 106 = 106 + 18x$$

$$286 = 106 + 18x$$

$$18x = 286 - 106$$

$$18x = 180$$

$$X = 180/18$$

$$\text{The value of X is 10.} \quad (2.5 \text{ marks})$$

(e) Application of volumetric analysis are;

- Manufacturing of chemicals such acids and bases
 - Applied in neutralization process
 - Determining the colour changes
 - Determine the unknown volume
- (2 marks) @ 1mark. Required two points

2.

S/N	Experiment	Observation	Inference
(a)	The appearance of sample Q was observed	White crystals was observed	Zn^{2+} , Ca^{2+} , NH_4^+ , Pb^{2+} may be present
(b)	Spoonful of a sample Q was placed in a test, water was added and then shaken	The sample Q was dissolved in water	NO_3^- may be present
(c)	The sample Q in a test tube was heated to maximum with red and blue litmus paper, burning splint was applied	-Reddish brown residue and yellow when cold was observed - Reddish brown gas was evolves which turn blue litmus to red. The gas was Nitrogen dioxide	Pb^{2+} may be present NO_3^- may be present
(d)	Concentrated sulphuric acid was added to sample Q in a test tube	Reddish brown gas which had irritating smell was evolved (Nitrogen dioxide)	NO_3^- may be present
(e)	To original portion of solution of sample Q few drops of sodium hydroxide was added, then in excess	White precipitate soluble in excess was observed	Pb^{2+} may be present
(f)	To original portion of solution of sample Q few drops of ammonia solution was added, then in excess	White gelatinous precipitate insoluble in excess was observed	Pb^{2+} may be present
(g)	To original portion of solution of sample Q few drops of potassium iodide solution was added	Yellow precipitate was observed	Pb^{2+} present, confirmed
(h)	To original portion solution of sample Q in a test tube freshly prepared ferrous sulphate solution was added followed by carefully addition of conc. H_2SO_4 along the side of the test tube	Brown ring developed at the junction of the two layers was observed	NO_3^- present, confirmed

(20 marks)

CONCLUSION

- (i) The cation present in Q is Pb^{2+} (1mark)
- (ii) The anion present in Q is NO_3^- (1mark)
- (iii) The chemical formula of Q is $\text{Pb}(\text{NO}_3)_2$ (1mark)
- (iv) The chemical name of Q is Lead (II) Nitrate (1mark)
- (v) The balanced chemical equation for the reactions taking place in experiment (c) is $\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$ (1mark)