WAKISSHA JOINT MOCK EXAMINATIONS
MARKING GUIDE
Uganda Advanced Certificate of Education
UACE August
CHEMISTRY P525/3

1. (a) Procedure I

Table 1

Volume of pipette used = 25.0cm³. (0½)

Titration number	1	2	3
Final burette reading (cm³)	16.10	31.90	47.70
Intial burette reading (cm³)	0.00	16.10	31.90
Volume of FA1used (cm³)	16.10	15.80	15.80

(4½)

Titre values for calculating average volume of FA1 15.80 and 15.80 cm³. (0½)

Average volume of FA1 used $= \frac{15.80+15.80}{2}$

$= 15.80 \text{ cm}^3$ (2½)

±0.1
±0.2
±0.3
±0.4
±0.5

Question

(b) Calculate the concentration of potassium manganite (VII) in moldm^{-3} in FA1.

R.F.M of $Na_2SO_3 = 23 \times 2 + 32 + 16 \times 3$

$= 126$

126g of Na_2SO_3 contain 1 mole.

2.016g of Na_2SO_3 contain $\frac{1}{126} \times 2.016$

$= 0.016$ moles.

500 cm³ of solution of FA_2 contain 0.016 moles.

25.0 cm³ of solution of FA_2 $\frac{0.016}{500} \times 25$

$= 8.0 \times 10^{-4}$ moles

5 moles of SO_3^{2-} react with 2 moles of MnO_4^-

8.0×10^{-4} moles of SO_3^{2-} react with $\frac{2}{5} \times 8.0 \times 10^{-4}$

$= 3.4 \times 10^{-4}$ moles

15.80cm³ of solution contain 3.4×10^{-4} moles of FA1

1000cm³ of solution contain $\frac{3.2 \times 10^{-4}}{15.80} \times 1000$

∴ Molar concetration of $FA_1 = 0.02025$ moldm^{-3} (4½)

Procedure II

Results:

Mass of empty bottle + D = 15.60g

Mass of empty bottle alone = 15.40g

Mass of D alone = 0.20 g (02)

Table II

Volume of pipette used = 25.0cm³

Final burette reading (cm³)	35.50	40.20	37.70
Initial burette reading (cm³)	0.00	05.00	2.50
Volume of FA_1 used. (cm³)	35.50	35.20	35.20

(4 ½)

Titre values for calculating average

Volume of FA_1 35.20 and 35.20 cm³. (0 ½)

Average volume of FA_1 used $= \frac{35.20+35.20}{2}$

$= 35.20\ cm^3$

±0.1 (2½)
±0.2 (2)
±0.3 (1½)
±0.4 (01)
±0.5 (½)

(c) Calculate the number of moles of

(i) excess ethanedioic acid in FA_4 that reacted with FA_1

1000 cm³ of FA_1 contain 0.02025 moles

35.20 cm³ of FA_1 contain $\frac{0.02025}{1000} \times 35.20 = 7.128 \times 10^{-4}$ moles.

2 moles of MnO_4^- react with 5 moles of $C_2O_4^{2-}$

7.128×10^{-4} moles of MnO_4^- react with $\frac{5}{2} \times 7.128 \times 10^{-4} = 1.782 \times 10^{-3}$

(2½)

(ii) ethanedioic acid that reacted with manganese (IV) Oxide in D.

1000 cm³ of FA_3 contain 0.2 moles.

1000 cm³ of FA_3 contain $\frac{0.2}{1000} \times 100$

0.02 moles.

25 cm³ of FA_4 contain 17.82×10^{-3} moles of $H_2C_2O_4$.

250 cm³ of FA_4 contain $\frac{1.782 \times 10^{-3}}{25} \times 250$

$= 0.01782$ moles of $H_2C_2O_4$.

Number of moles $H_2C_2O_4$ that reacted with MnO_2 in D = 0.02 – 0.01782.

$= 2.18 \times 10^{-3}$ moles.

(2½)

(d) Determine the percentage of Manganese (IV) oxide in D.

Mole ratio $H_2C_2O_4 : MnO_2 = 1:1$

Number of moles of MnO_2 that reacted.

$= 0.00218$ moles.

R.F.M of $MnO_2 = 55 + 16 \times 2 = 87$

1 mole of MnO_2 weighs 87 g.

0.00218 moles of MnO_2 weigh 87×0.00218

$= 0.18966$g

Percentage of MnO_2 in D $= \frac{0.18966}{0.2} \times 100 = 94.83\%$

(2½)

30 Marks

2.

TESTS	OBSERVATIONS	DEDUCTIONS
(a)	White powder decomposed to give colourless gas that turned moist blue litmus paper red and lime water milky. Colourless condensed that turned anhydrous copper (II) sulphate blue. Solid residue was yellow when hot and white when for both cold.	CO_2 evolved $\therefore CO_3^{2-}$, HCO_3^-, CH_3COO^- $C_2O_4^{2-}$ Present. Hydrated salt. ZnO formed $\therefore Zn^{2+}$ suspected present. (5½)
(b)	Effervescence of a colourless gas that turned moist blue litmus red and formed dense white fumes with concentrated ammonia solution on warming Reddish brown fumes were formed.	HBr for both And Br_2 formed $\therefore Br^-$ present. (03)
(c)	White solid dissolves in the acid with effervescence of a colourless gas that turned blue moist litmus paper red and lime water milky Colourless solution formed, White ppt insoluble in excess. Colourless filtrate White residue.	CO_2 evolved $\therefore CO_3^{2-}$ comfirmed present . Al^{3+}, Zn^{2+}, Pb^{2+} present in the filtrate Ca^{2+}, Mg^{2+}, Ba^{2+} present in the residue.
(d)	White ppt dissolve in the acid to form colourless solution.	Al^{3+}, Zn^{2+}, Pb^{2+} present.
(i)	White ppt soluble in excess to form a colourless solution.	Al^{3+}, Zn^{2+}, Pb^{2+} present
(ii)	No observable change.	Al^{3+}, Zn^{2+} present
(iii)	White ppt soluble in excess	Zn^{2+} present.
(iv) Add solid ammonium chloride, followed by disodium hydrogen phosphate solution then ammonia solution drop wise until in excess.	White ppt soluble in ammonia solution.	Zn^{2+} confirmed present.
(v)	White ppt	SO_4^{2-} Cl^-, Br^- present. Br^{-1} present.
(vi) Add silver nitrate solution followed by dilute nitric acid.	Pale yellow ppt insoluble in the acid	Br^- Confirmed
(d)	Dissolves to form a colourless solution.	Mg^{2+}, Ca^{2+}, Ba^{2+} present.
(i)	White ppt insoluble in excess.	Mg^{2+} Ca^{2+}, Ba^{2+}

(ii)	White ppt soluble in ethanoic acid	Ba^{2+} present.
(iii) Add potassium chromate solution followed ethanoic acid.	Yellow ppt insoluble in ethanoic acid	Ba^{2+} confirmed present

(f) (i) Cations Z Zn^{2+} and Ba^{2+}

(ii) Anions in Z CO_3^{2-} and Br^-

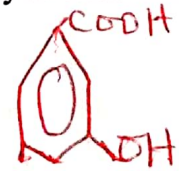
33 Marks

3.

TEST	OBSERVATIONS	DEDUCTION
3(a)	burns with yellow sooty flame	Aromatic compound with high C:H ratio (2½)
(b)	Dissolves in sodium hydroxide to form a colourless solution	Acidic compound present. Phenol carboxylic acid (2½)
(c)	White solid dissolves on heating to form a colourless solution. Blue litmus paper turned red.	Aromatic compound with polar functional group. Aromatic carboxylic acid. (03)
(i)	Violet coloration	Phenol confirmed present. (03)
(ii)	Sodium carbonate dissolves with effernscence of colourless gas.	Aromatic carboxylic acid present. (02)
(iii)	No observable change	Carbonyl compound absent. (01)
(iv)	Sweet fruity smell detected	Esterification has taken place. Aromatic carboxylic acid confirmed present. (2½)

(c) Comment on the nature of S.

Aromatic carboxylic acid with a phenol group.



(1½)

17 Marks

END