JINJA JOINT EXAMINATIONS BOARD
MOCK EXAMINATIONS 2023
P525/3 - CHEMISTRY
MARKING GUIDE

1. Table of results : PART A

Mass of container + W = 3.70g ✓

Mass of container alone= 1.00g ✓

Mass of W used =2.70g ✓

Volume of pipette used=10.00/10.0/10cm^3 ✓

02

Table1

Final burette reading (cm^3)	10.80	20.40	30.00
Initial burette reading(cm^3)	1.00	1.80	20.40
Volume of FA2 used (cm^3)	9.80 ✓✓	9.60 ✓✓	9.60 ✓✓

4 ½

TR ±3

Values of FA2 used to calculate average volume; ✓

9.60 and 9.60 ± 0.1 agress

0 ½

∴ Average volume of FA2 $\frac{9.60+9.60}{2}$ =9.60 ± 0.1 ✓✓✓

± 0.2

± 0.3

± 0.4

± 0.5

03

QUESTIONS;

RFM of KIO_3 =39+127+3 (16) ✓

= 39+127+48

=214 ✓

02

250 cm^3 of FA4 contains $^{2.7}/_{214}$ = 1.262×10^{-2}mole of IO_3^-

$\therefore 10cm^3$ of FA4 contains $1.262\times 10^{-2} \times {}^{10}/_{250} = 5.048 \times 10^{-4} moles\ of\ IO_3^-$

(ii) Ratio IO_3^-: $S_2O_3^{2-}$ is 1:6

Moles of $SO_3^{2-} reacted = 6 \times 5.048\times 10^{-4} = 3.0288\times 10^{-3}$

$\Longrightarrow 9.60cm^3$ of FA2 contain $3.0288\times 10^{-3} mole\ of\ S_2O_3^{2-}$ (03½)

$\therefore 1000cm^3$ of FA2 contains $3.0288\times 10^{-3} \times \frac{1000}{9.60}$

$= 0.316$moles of SO_3^{2-}

OR AH:

1 mole of IO_3^- produces 3 moles of iodine

5.048×10^{-4} moles of IO_3^- produces $3 \times 5.048 \times 10^{-4}$ moles of Iodine

1 mole of iodine reacts with 2 moles of $S_2O_3^{2-}$

1.5144×10^{-3} moles of iodine reacts with $2\times 1.5144\times 10^{-3}$ moles of $S_2O_3^{2-}$

$= 3.0288 \times 10^{-3} moles\ of\ S_2O_3^{2-}$

$\Longrightarrow 9.60cm^3$ of FA2 contains $3.0288 \times 10^{-3} moles\ of\ S_2O_3^{2-}$

$\therefore 1000cm^3$ of FA2 contains $3.0288\times 10^{-3} \times \frac{1000}{9.60}$

$= 0.316$moles of SO_3^{2-}

PART B

Volume of pipette used =10.00/10.0/10cm^3 (0½)

Final burette reading (cm^3)	23.90	46.70	24.80
Initial burette reading (cm^3)	1.00	23.90	2.00
Volume of FA2 used (cm^3)	22.90	22.80	22.80

(04 ½)

Values of FA2 used to calculate average volume;

22.80 and 22.80 ± 0.1 agree 0½

∴ Average volume of FA2 used $= \frac{22.8+22.80}{2}$

$= 22.80 \pm 0.1$ (03)

± 0.2

± 0.3

± 0.4

± 0.5

Questions

(b) (i)

1000cm^3 of FA2 contain 0.316 moles of $S_2O_3^{2-}$

∴ 22.80cm^3 of FA2 contain $\frac{0.316 \times 22.80}{1000}$

$= 7.205 \times 10^{-3}$ moles of $S_2O_3^{2-}$ (01)

(ii)

Ration $Cr_2O_7^{2-} : S_2O_3^{2-}$ *is* 1:6

Moles of $Cr_2O_7^{2-}$ *reacted* $= \frac{1}{6} \times 7.205 \times 10^{-3}$

$= 1.201 \times 10^{-3}$

$\Longrightarrow$ 10cm^3 of FA1 contain 1.201×10^{-3} moles of $Cr_2O_7^{2-}$ (03)

∴ 1000cm^3 of FA1 contain $1.201 \times 10^{-3} \times \frac{1000}{10}$

$= 0.12$ moles of $Cr_2O_7^{2-}$

Or Alternatively

Ratio of $S_2O_3^{2-} : I_2$ *is* 2 : 1

2 moles of $S_2O_3^{2-}$ react with 1 mole of iodine

7.205×10^{-3} moles of $S_2O_3^{2-}$ react with $\frac{1}{2} \times 7.205 \times 10^{-3}$

$= 3.6025 \times 10^{-3}\ moles\ of\ Iodine$

3 moles of Iodine are produced by 1 mole of $Cr_2O_7^{2-}$

3.6025×10^{-3} moles of Iodine are produced by $\frac{1}{3} \times 3.602 \times 10^{-3}$

$= 1.201 \times 10^{-3}\ moles\ of\ Cr_2O_7^{2-}$

$\Rightarrow$ 10cm^3 of FA1 contain 1.201×10^{-3} moles of $Cr_2O_7^{2-}$

$\therefore$ 1000cm^3 of FA1 contain $1.201 \times 10^{-3} \times \frac{1000}{10}$

$= 0.12$ moles of $Cr_2O_7^{2-}$

(c) RFM $K_2Cr_2O_7 = (39 \times 2) + (52 \times 2) + (16 \times 7)$

$= 78 + 104 + 112$

$= 294$

$\therefore$Mass of $K_2Cr_2O_7 = 0.12 \times 294$ in $1dm^{-3}$ (02)

$= 35.28g$

$\Rightarrow \%\ K_2Cr_2O_7 = \frac{35.28}{45} \times 100$ in FA1

$= 78.4\%$

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2.

OBSERVATIONS	DEDUCTIONS	
(a) White solid - Colourless condensate / liquid which turns white anhydrous $CuSO_4$ blue. - Colourless gas which turns blue litmus red and limewater milky - Residues is reddish brown / orange when hot and yellow on cold	- Hydrated salt or water of crystallization - $CO_2: CO_3^{2-} / HCO_3^- / CH_3COO^- / C_2O_4^{2-}$ - PbO / Pb^{2+}	Max 4 ½
(b) Effervescence / bubbles of a colourless gas turns blue litmus red and limewater milky Colourless solution	$CO_2: CO_3^{2-}$ Non transition metal ions present.	02
(c) White ppt insoluble in excess - White residue - Colourless filtrate	-Probably Ba^{2+} or $Ca^{2)}$ or Mg^{2+} present -Probably $Al^{3+} or Pb^{2+} or Zn^{2+} or Sn^{2+} or Sn^{4+}$ present	02
(d) White ppt soluble in acid.	Probably $Al^{3+} or Pb^{2+} or Zn^{2+} or Sn^{2+} or Sn^{4+}$ present	01
(i) White ppt soluble in excess giving a colourless solution	Probably $Al^{3+} or Pb^{2+} or Zn^{2+} or Sn^{2+} or Sn^{4+}$ present	01½
(ii) White ppt insoluble in excess ammonia	Probably $Al^{3+} or Pb^{2+} or Sn^{2+} or Sn^{4+}$ present	
(iii) White ppt	Probably Pb^{2+} present	01
(iv) Add $K_2CrO_{4(aq)}$ followed by NaOH (excess) / ethanoic acid	Pb^{2+} present	02

gives Yellow ppt soluble in excess NaOH Or Add $KI_{(aq)}$ Gives Yellow ppt	Or Pb^{2+} present	
(e) Colourless solution	Probably *or* Mg^{2+} *or* Ca^{2} *or* Ba^{2+} present	
(i) White ppt insoluble in excess	Probably *or* Mg^{2+} *or* Ca^{2} *or* Ba^{2+} present	01
(ii) White ppt insoluble in excess	Probably Ba^{2+} or Mg^{2+} present	01½
(iii) White ppt	Probably Ba^{2+} present	01
(iv) Add $K_2CrO_{4(aq)}$ followed by NaOH (excess) / ethanoic acid Gives Yellow Ppt insoluble in excess NaOH	Ba^{2+} present	02
(f) partly soluble colorless filtrate white residue	Probably Ba^{2t} or Pb^{2t} present	01
(i) White ppt	Probably SO_4^{2-} or SO_3^{2-} or CO_3^{2-} or $C_2O_4^{2-}$ present.	01½
(ii) White ppt	Probably Cl^- or $C_2O_4^{2-}$ present	01½
• White ppt soluble in excess giving a colourless solution.	Probably Cl^- or $C_2O_4^{2-}$ present.	02
• White ppt soluble in acid without efferv	Cl^- absent $\therefore C_2O_4^{2-}$ present	02
(iii) Purple acidified $KMnO_4$ turns colourless	$C_2O_4^{2-}$ confirmed	

Effervescence / bubbles of colourless gas turns blue litmus red and litmus milky.	$CO_{2(g)}$ from $C_2O_4^{2-}$

2 ½

(g)(i) Cation in Y are Pb^{2+} d(iv) and Ba^{2+} e (iv)

(ii) anions in Y are CO_3^{2-} $_{(b)}$ and $C_2O_4^{2-}$ f (iii)

02

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3.

OBSERVATIONS	DEDUCTIONS	
(a) Colourless liquid burns with a yellow non sooty flame	Aliphatic saturated compound of low carbon content.	02
(b) Miscible/soluble in water giving a colourless solution Has no effect on both blue and red litmus paper.	Polar compound of low molecular mass. Neutral compound probably alcohol/carbonyl/ester present.	03½
(i) no purple colouration or no observable change	Phenol absent	01½
(ii) no observable change or orange colour of acidified $K_2Cr_2O_7$ solution persists.	Non reducing compound present Probably Ketone or Tertiary alcohol reagent.	02
(c) Yellow PPt	Ketone present	01½
(d) pale yellow Ppt	Ketone of the form $CH_3C(=O)-$ present	02
(e) No observable change Or No reddish brown ppt	Aldehyde absent ∴ Ketone present	01½
(f) No Silver mirror Or No observable change	Aldehyde absent ∴ Ketone present	01½

(c) (c) or (e) or (f) (d)

(g) Aliphatic Ketone of the form $CH_3C(=O)-$ present 01½

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E N D