**JINJA JOINT EXAMINATIONS BOARD**
**MOCK EXAMINATIONS 2022**
**UACE CHEMISTRY**
**P525 /3, 2022**

**MARKING GUIDE**

1. Table of results

Volume of pipette used = 10.0 / 10.00 / 10

| | | | |
|---|---|---|---|
| Final burette reading ($cm^3$) | 12.00 | 21.90 | 31.80 |
| Initial burette reading ($cm^3$) | 2.00 | 12.00 | 21.00 |
| Volume of BA2 used ($cm^3$) | 10.00 | 9.90 | 9.90 |

Titre Range $\pm 3.00$

Titre values used to calculate average volume of FA2 used; 9.90 and 9.90 agree $\pm 0.1$

∴Average volume of FA2 used $\frac{9.90 + 9.90}{2} = 9.90$ $\pm 0.1$
$\pm 0.2$
$\pm 0.3$
$\pm 0.4$
$\pm 0.5$

**Questions**

Moles of $S_2O_3^{2-}$ reacted = $\frac{9.90 \times 0.1}{1000} = 9.90 \times 10^{-4}$

Moles of $I_2$ in $10cm^3$ = ½ $\times 9.90 \times 10^{-4} = 4.95 \times 10^{-4}$

concentration of $I_2$ per litre = $4.95 \times 10^{-4} \times \frac{1000}{10}$

= 0.0495 M

**B: RESULTS**

Mass of weighing container + T = $2.90g$
Mass of weighing container alone = $1.30g$
Mass of T alone = $1.60g$
Volume of pipette used = 10.00 / 10.0/ 10

**Table II**

| | | | |
|---|---|---|---|
| Final burette reading ($cm^3$) | 10.80 | 20.20 | 29.60 |
| Initial burette reading ($cm^3$) | 1.00 | 10.80 | 20.20 |
| Volume of BA2 used ($cm^3$) | 9.80 | 9.40 | 9.40 |

Titre Range $\pm 3.00$

Titre values used to calculate average volume of FA2 used; 9.40 and 9.40 agree $\pm 0.1$

$\therefore$Average volume of FA2 used $\frac{9.40 + 9.40}{2} = 9.40 \quad \pm 0.1$

$\pm 0.2$

$\pm 0.3$

$\pm 0.4$

$\pm 0.5$

**Questions**

(a) (i)

Moles of $S_2O_3^{2-}$ reacted with excess $I_2 = \frac{9.40 \times 0.1}{1000}$

$= 9.4 \times 10^{-4}$

Moles of $I_2$ reacted $= ½ \times 9.4 \times 10^{-4}$

$= 4.7 \times 10^{-4}$

(ii) Moles of $I_2$ in $20cm^3$ of FA1 $= = \frac{20 \times 0.0495}{1000}$

$= 9.9 \times 10^{-4}$

Moles of $I_2$ reacted with X $= (9.9 \times 10^{-4}) - (4.7 \times 10^{-4})$

$= 5.2 \times 10^{-4}$

(b)

Moles of T in $10cm^3$ of FA3 $= = 5.2 \times 10^{-4}$

$250cm^3$ of FA3 contain $= 5.2 \times 10^{-4} \times \frac{250}{10}$

$= 0.013$ moles of T

0.013 moles of T weight $1.6g$

1 mole of T weigh $\frac{1.6 \times 1}{0.013}$

$= 123$

$\therefore$ Molar mass of T is $123gmol^{-1}$

2.

| OBSERVATIONS | DEDUCTIONS |
|---|---|
| (a)<br>- White solid<br>- Colourless condensate turns white anhydrous $CuSO_4$ blue<br>- Colourless gas turns blue litmus red and limewater milky<br>- Solid yellow when hot and white on cooling | $CO_{2(g)} \therefore CO_3^{2-} / HCO_3^- / C_2O_4^{2-}$<br><br>$ZnO \therefore Zn^{2+}$ |
| (b) - Effervescence<br>- Purple vapour / gas / fumes turns blue litmus red | $I_{2(g)} \therefore I^-$ |
| (c)<br>- Effervescence of colourless gas turns blue litmus red and limewater milky<br>- Colourless solution ` | $CO_{2\,(g)} \therefore CO_3^{2-}$ confirmed<br>(reject $HCO_3^-$) |
| (d)<br>- White ppt soluble in excess<br>- White residue<br>- Colourless filtrate | Probably<br>$Ba^{2+}$ or $Mg^{2+}$ or $Al^{3+}$ or $Pb^{2+}$ or $Sn^{2+}$ or $Zn^{2+}$ present |
| (e) - White ppt soluble in acid | Probably $Zn^{2+}$ present |
| (i) White ppt soluble in excess giving a colourless solution | Probably $Zn^{2+}$ present |
| (ii) White ppt soluble in excess giving a colourless solution. | Probably $Zn^{2+}$ present |
| (iii) Test: Add half spatula endful of solid $NH_4Cl$ + $Na_2HPO_4$ solution + excess ammonia solution.<br>Observations:<br>White ppt soluble in excess ammonia | $Zn^{2+}$ present |

| OBSERVATIONS | DEDUCTIONS |
|---|---|
| (f)<br>- Colourless solution | Probably $Mg^{2+} or\ Al^{3+}\ or\ Sn^{2+}\ or\ Sn^{4+}$ Present (reject $Ba^{2+}\ or\ Pb^{2+}$) |
| (i) White ppt insoluble in excess | Probably $Mg^{2+}$ present (reject $Ba^{2+}$) |
| (ii) white ppt insoluble in excess | probably $Mg^{2+}$ present |
| (iii) Test: Add half spatula end ful of solid $NH_4Cl + Na_2HPO_4$ solution + excess ammonia solution.<br>Observations:<br>White ppt insoluble in excess ammonia | $Mg^{2+}$ present |
| (g)<br>- Partly soluble<br>- White residue<br>- Colourless filtrate | Probably non transition metal ions present in both filtrate and residue |
| (i) Pale yellow ppt insoluble in Ammonia | Probably $I^-\ or\ Br^-$ present |
| (ii) Colourless solution turns<br>Brown<br>Brown solution turns<br>colourless<br>on addition of sodium thiosulphate | $I^-_{(aq)}$ Oxidised to $I_{2(aq)}$<br>$\therefore\ I^-$ present |
| (iii) Yellow ppt | $I^-$ confirmed |

(h) Cations in X : $Zn^{2+}$ e(iii) and $Mg^{2+}$ f(iii)
Anions in X : $CO_3^{2-}$(c) and $I^- g$(iii)

3.

| OBSERVATION | DEDUCTION |
|---|---|
| (a)<br>- Colourless liquid burns with a blue non – sooty flame | Aliphatic saturated compound with a low carbon content |
| (b)<br>Miscible with water forming a colourless solution that has no effect on both blue and red litmus | - Polar compound of low molecular mass<br>- Neutral compound.<br>- Probably carbonyl, alcohol, ester etc |
| (i) No yellow / orange ppt | - Carbonyl cpd absent |
| (ii) No purple colouration or<br>No observable change | - Phenol absent |
| (c) Purple acidified $KMnO_4$ turns colourless | Primary or secondary alcohol<br>(Reject aldehyde) |
| (i) Yellow / orange ppt | Primary or secondary alcohol oxidized to carbonyl cpd |
| (ii) Orange acidified $K_2Cr_2O_7$ turns green | Aldehyde formed from a primary alcohol. |
| (iii) Reddish Brown ppt | Aldehyde formed from a primary alcohol |
| (d) No cloudy solution<br>Or<br>No observation change at room temperature | Primary alcohol |
| (e) No yellow ppt | Primary alcohol of the form $CH_3\underset{\vert}{C}HR$ or Ethanol absent OH |

(f) Aliphatic primary alcohol without $CH_3\underset{\vert}{C}HR$ structure

OH

**E N D**