**SERIES 29 EXAMS**

**233/3**
**CHEMISTRY**
**PAPER 3**
**PRACTICAL**

**MARKING SCHEME**

TABLE I

| | I | II | III |
|---|---|---|---|
| Final burette reading ($cm^3$) | 25.0 | 25.0 | 35.0 |
| Initial burette reading ($cm^3$) | 0.0 | 0.0 | 10.0 |
| Volume of solution A used ($cm^3$) | 25.0 | 25.0 | 25.0 |

Complete table ( converted ) √1
Correct arithmetic √1
Decimal place √1
Consistency √1
Accuracy √1
5m

(ii) Average volume of solution A used

$\frac{25.0 + 25.0 + 25.0}{3}$ √ ½ $= 25.0cm^3$ √ ½

(b) (i) Moles of HCl used $= 0.1 \times {}^{25}/_{1000}$
$= 0.0025$ mol √ ½

Moles ratio of acid : $B_2X.10H_2O$ = 2 : 1 √ ½
∴ Moles of $B_2X.10H_2O$ used = ½ x 0.0025 √ ½
= 0.00125 mol √ ½

(ii) $25cm^3$ of $B_2X.10H_2O$ contains 0.00125 mol
$1000cm^3$ of $B_2X.10H_2O$ contains ${}^{100}/_{25} \times 0.00125$ √1
= 0.05M √1
Penalise ½ m for missing or wrong units

***This paper consists of 4 printed pages***

***Turn Over***

(iii) 0.05 mol of $B_2X.10H_2O$ weighs 19.1g √ ½

1 mol of $B_2X.10H_2O$ weighs $\frac{1}{0.05} \times 19.1$ √ ½

= 382g

R.F.M of $B_2X.10H_2O$ = 382 √1

Penalise ½ m if units are used

(iv) $B_2X.10H_2O$ = 382 √ ½

2B + 156 + 180 = 382 √ ½

2B = 382 – 336

2B = 46 √ ½

B = 23 √ ½

2. (a) TABLE II

| | |
|---|---|
| Final temperature ($^0$C) | |
| Initial temperature ($^0$C) | |

Complete table √ ½
Trend and accuracy √ ½

(ii) $\Delta T_1$ = Final temperature – initial temperature = -ve value



(b) (i) $\Delta H = MC\Delta T$

$= \frac{30 \times 4.2 \times \Delta T_1}{1000}$

= +ve value in kJ

Penalize ½ m for missing or wrongly written units

(ii) 1 mol of $H_2C_2O_4.2H_2O$ = 126g √ ½

∴ 2g of $H_2C_2O_4.2H_2O$ = $\frac{2}{126}$ √ ½ x 1 √ ½

= 0.015873 mol √ ½

(iii) 0.015873 mol of acid absorbs kJ in (b) (i) above

1 mol of acid absorbs $\frac{1}{0.015873}$ √ ½ x kJ in b(i)

= +ve value in $kJmol^{-1}$ √ ½

Penalize the ½ m for answer if units are missing or wrongly written.

2.

**TABLE III**

(c ) (i)

| | |
|---|---|
| Temperature of solution D, $T_1$ ($^0$C) | |

| | |
|---|---|
| Temperature of solution E, $T_2$ ($^0C$) | |
| Initial temperature $\frac{T_1 + T_2}{2}$ ($^0C$) | |
| Final temperature of mixture ($^0C$) | |

Complete table = 1 mark
Trend and accuracy = 1 mark

(ii) $\Delta T_2$ = Final temperature – initial temperature = +ve value $^0C$ √1

(d) (i) = $\Delta H = MC\Delta T$

= $\frac{60}{1000} \times 4.2 \times \Delta T_2$ √1

= -ve value of kJ

Penalize ½ mark if units are missing or wrongly written.

(ii) Moles of oxalic acid in solution D used

= $\frac{30 \times 0.5}{1000}$ √ ½

= 0.015 mol √ ½

(iii) $\Delta H_2$ (Heat of reaction of one mole of oxalic acid with sodium hydroxide )

= $\frac{1}{0.015}$ √ ½ x volume – d(i) above

= -ve value of kJ. √ ½

(iv) Oxalic acid $H_2C_2O_4.2H_2O$ is dibasic

Thus:

$2H^+_{(aq)} + 2OH^-_{(aq)}$ $2H_2O_{(l)}$ ; $\Delta H_2$ = -ve value in d (iii) above in kJ. √ ½

Hence

$H^+_{(aq)} + OH^-_{(aq)}$ $H_2O_{(l)}$ $\Delta H_{Neutr}$ = $\frac{\text{-ve value in d(ii) above}}{2}$

3.

(e) $H_2C_2O_{4(s)}$ $\Delta H_1$ $2H^+_{(aq)} + C_2O_4^{2-}{}_{(aq)}$

$+2OH^-_{(aq)}$ $+2OH^-_{(aq)}$

$\Delta H_3$ $\Delta H_2$

$2H_2O_{(l)} + C_2O_4^{2-}{}_{(aq)}$

$\Delta H_3 = \Delta H_1 + \Delta H_2$ √1

= -ve value in kJ √1

Penalize ½ mark if units are missing or wrongly written.

3. (a)

| OBSERVATIONS | INFERENCES |
|---|---|
| - Colourless gas evolved with pungent chocking smell √ ½<br>- Gas turns red litmus paper blue √ ½<br>- Blue litmus paper remains blue √ ½ ( 1 ½ marks ) | - Gas evolved in basic √ ½<br>- $NH_3$ gas evolved √ ½<br>( 1 mark ) |

(b)

| | |
|---|---|
| - Burns with a golden yellow flame. √1<br>( 1 mark ) | $Na^+$ ions present √1<br>( 1 mark ) |

(c )

| | |
|---|---|
| Purple acidified √ $KMnO_4$ decolorised<br><br>Rej. Colour disappears<br>Colourless solution formed ( 1 mark ) | $SO_3^{2-}$ ions present √ ½ / presence of a reducing agent √1<br>( 1 ½ marks ) |

(d)

| | |
|---|---|
| White precipitate formed √ ½ which dissolves in dilute HCl acid. √ ½<br>( 1 mark ) | $SO_3^{2-}$ ions present √1<br>( 1 mark ) |

4.