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

$$\frac{25.0 + 25.0 + 25.0}{3} \quad \surd \tfrac{1}{2}$$

$= 25.0cm^3$ √ 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 (^0C)	
Initial temperature (^0C)	

Complete table √ ½

Trend and accuracy √ ½

(ii) ΔT_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 $H_2C_2O_4.2H_2O$ = $\frac{2 \text{ √ ½} \times 1 \text{ √ ½}}{126}$

= 0.015873 mol √ ½

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

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

= +ve value in $kJmol^{-1}$ √ ½

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

TABLE III

(c) (i)

Temperature of solution D, T_1 (^0C)	

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) ΔT_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) ΔH_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:

$2H^+_{(aq)} + 2OH^-_{(aq)} \rightarrow 2H_2O_{(l)}$; ΔH_2 = -ve value in d (iii) above in kJ. √ ½

Hence

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

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

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

ΔH_3 ΔH_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 - Gas turns red litmus paper blue √ ½ - Blue litmus paper remains blue √ ½ (1 ½ marks)	- Gas evolved in basic √ ½ - NH_3 gas evolved √ ½ (1 mark)
(b)	
- Burns with a golden yellow flame. √1 (1 mark)	Na^+ ions present √1 (1 mark)
(c)	
Purple acidified √ $KMnO_4$ decolorised Rej. Colour disappears Colourless solution formed (1 mark)	SO_3^{2-} ions present √ ½ / presence of a reducing agent √1 (1 ½ marks)
(d)	
White precipitate formed √ ½ which dissolves in dilute HCl acid. √ ½ (1 mark)	SO_3^{2-} ions present √1 (1 mark)