

- (c) To displace air from the apparatus. Heated aluminium may react with oxygen to form an impurity. ( $\text{Al}_2\text{O}_3$ ) **(2 marks)**
- (d) Sublimes. **(1 mark)**
- (e) (i)  $2\text{Al}_{(s)} + 3\text{Cl}_{2(g)} \rightarrow 2\text{AlCl}_{3(s)}$   
 $2 \times 27 \qquad \qquad \qquad 2(27 + 35.5 \times 3)$   
 $54 \qquad \qquad \qquad = 267$   
 $54\text{g of Al} \qquad \qquad \qquad = 267 \text{ of AlCl}_3$   
 Therefore 1.08 produces =  $\frac{267 \times 1.08}{54}$   
 $= 5.34(\text{g})$  **(3 marks)**
- (ii) % yield =  $\frac{3.47}{5.34} \times 100$   
 $= 65\%$  **(1 mark)**
- (f) Replace receiver with a flask in ice-cold water. **(1 mark)**

### 24.6.3 Chemistry Paper 3 (233/3)

1. (A)

	I	II	III
Final burette reading	21.8	21.6	43.6
Initial burette reading	0.0	0.0	22.0
Volume of D used ( $\text{cm}^3$ )	21.8	21.6	21.6

**(3 marks)**

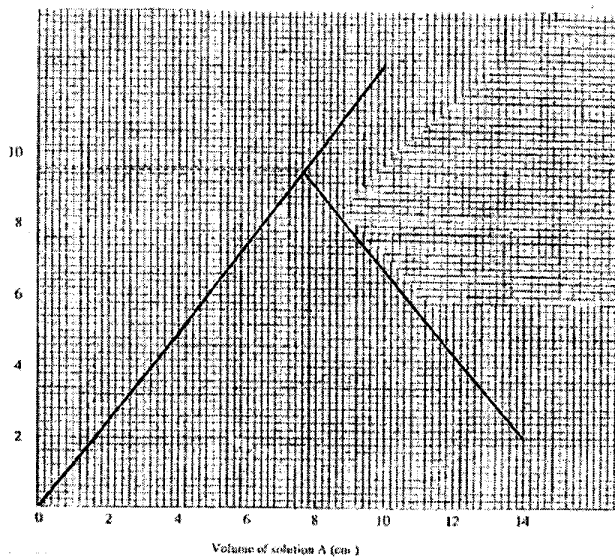
- (i)  $\frac{21.6 + 21.6}{2} = 21.6\text{cm}^3$  **(1 mark)**
- (ii) R.F.M of  $\text{Na}_2\text{CO}_3 = 106$   
 Conc.  $\frac{8}{106} = 0.075\text{M}$  **(1 mark)**
- (iii) Moles of  $\text{Na}_2\text{CO}_3 = \frac{25 \times 0.075}{1000}$   
 $= 0.001875$   
 Moles of  $\text{H}_2\text{SO}_4 = 0.001875$   
 Conc. of  $\text{H}_2\text{SO}_4 = \frac{0.001875}{21.6} \times 1000$   
 $= 0.0868\text{M}$  **(2 marks)**
- (iv)  $0.0868 \times 10 = 0.868\text{M}$  **(1 mark)**

(B)

Test-tube number	1	2	3	4	5	6
Volume of solution A (cm <sup>3</sup> )	2	4	6	8	6	4
Volume of solution C (cm <sup>3</sup> )	14	12	10	8	10	12
Initial temperature of solution C (°C)	20.5	20.5	20.5	20.5	20	20
Highest temperature of mixture (°C)	23	25.5	28.0	29.5	26.5	24.5
Change in temperature $\Delta T$	2.5	5.0	7.5	9.0	6.5	4.5

(6 marks)

(ii)



(3 marks)

- (ii) I  $\Delta T = 9.5 \pm 0.1^\circ\text{C}$  (1 mark)  
II Maximum volume of A =  $7.6 \text{ cm}^3 \pm 0.1$  (1 mark)

- (iii) I Moles of sulphuric Acid =  $\frac{7.6 \times 0.868}{1000}$   
= 0.0066 moles (1 mark)

- II Heat evolved =  $16 \times 4.2 \times 9.5$   
= 638.4 joules  
Molar Heat =  $\frac{638.4}{0.0066}$   
=  $96.727272 \text{ KJ mol}^{-1}$  (2 marks)

2. (a)

**Observations**

**Inferences**

Gas with a pungent/irritating/choking smell.

Colourless liquid formed on cool part of test tube.

Hydrated salt.

Blue litmus paper turns red.

Acidic gas evolved.

Red litmus paper remains red.

Solid turns reddish brown.

(3 marks)

(b)

**Observations**

- i) Reddish brown solution.  
PH 1,2,3,
- ii) Brown precipitate insoluble in excess.
- iii) Brown/Black solid formed or solution changes from yellow to brown.
- iv) White Precipitate settles at the bottom of the test tube.

**Inferences**

Strongly acidic.  
(2 marks)  
 $\text{Fe}^{3+}$   
(2 marks)  
Iodide ions oxidised to Iodine  
(2 marks)  
 $\text{SO}_4^{2-}$  present.  
(2 marks)

3. (a)

**Observations**

- a) Clear blue flame.
- b) No separation or forms a solution  
Two liquids are miscible.
- c) No effervescence.
- d) Solution changes from orange to green.

**Inferences**

Saturated low carbon organic compound.  
(2 marks)  
Mixture is miscible or polar organic compound.  
(1 mark)  
Liquid not acidic or absence of  $\text{H}^+$ .  
(2 marks)  
F is likely to be alcohol OR R-OH.  
(2 marks)