# **EXPERIMENT NO. 4**

### **Quantitative Analysis**

Read through the whole method before starting any practical work. Where appropriate, prepare a table for your results in the space provided.

Show your working and appropriate significant figures in the final answer to **each** step of your calculations.

1 In this experiment you will determine the concentration of a solution of hydrochloric acid by titration with an alkali.

**FA 1** is a solution containing  $6.00\,\mathrm{g\,dm^{-3}}$  of sodium hydroxide, NaOH. **FA 2** is hydrochloric acid, HC *l*. thymolphthalein indicator

## (a) Method

#### Dilution of FA 2

- Pipette **10.0 cm³** of **FA 2** into the 250 cm³ volumetric flask.
- Make the solution up to the mark using distilled water.
- Shake the solution in the volumetric flask thoroughly.
- This solution of hydrochloric acid is **FA 3**. Label the volumetric flask **FA 3**.

#### **Titration**

Ι

П

III

IV

V

VI

VII

- Fill the burette with **FA 1**.
- Pipette 25.0 cm³ of FA 3 into a conical flask.
- Add several drops of thymolphtalein indicator.
- Perform a rough titration and record your burette readings in the space below.

final	buvette	reading/cm3	28-90
initial	burette	reading/cm3	2.80
titue /cm	, 3	· ·	26.10

The rough titre is 26.1D cm<sup>3</sup>.

- Carry out as many accurate titrations as you think necessary to obtain consistent results.
- Make sure any recorded results show the precision of your practical work.
- Record in a suitable form below all of your burette readings and the volume of **FA 1** added in each accurate titration.

final burette reading/cms	31.40	36.20	
initial burette reading/cm3	5.60	10.40	
titre /cm3	25.80	25.80	
Best titres	✓	<b>✓</b>	

[7]

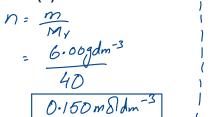
(b) From your accurate titration results, obtain a suitable value for the volume of FA 1 to be used in your calculations.

Show clearly how you obtained this value.

25.0 cm<sup>3</sup> of **FA 3** required .... $\mathcal{A}.\mathcal{L}.\mathcal{A}.\mathcal{L}.$  cm<sup>3</sup> of **FA 1**. [1]

# (c) Calculations

- Give your answers to (ii), (iii) and (iv) to the appropriate number of significant figures. [1]
- (ii) Calculate the number of moles of sodium hydroxide, NaOH, in the volume of FA 1 calculated



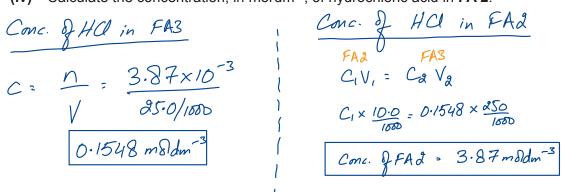
(iii) Write the equation for the neutralisation of hydrochloric acid with sodium hydroxide. Include state symbols.



Deduce the number of moles of hydrochloric acid that reacted with the sodium hydroxide in (ii). mole vatio is 1:1

moles of hydrochloric acid = 
$$\frac{3.87 \times 10^{-3}}{\text{mol}}$$
 [1]

(iv) Calculate the concentration, in mol dm<sup>-3</sup>, of hydrochloric acid in **FA 2**.



concentration of HC
$$l$$
 in **FA 2** =  $3.87$  moldm<sup>-3</sup> [2]

[Total: 13]