

# 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  $6.00 \text{ g dm}^{-3}$  of sodium hydroxide, NaOH.

**FA 2** is hydrochloric acid, HCl.  
thymolphthalein indicator

### (a) Method

#### Dilution of FA 2

- Pipette **10.0 cm<sup>3</sup>** of **FA 2** into the 250 cm<sup>3</sup> 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

- Fill the burette with **FA 1**.
- Pipette **25.0 cm<sup>3</sup>** of **FA 3** into a conical flask.
- Add several drops of thymolphthalein indicator.
- Perform a **rough** titration and record your burette readings in the space below.

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

I	
II	
III	
IV	
V	
VI	
VII	

- 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.

[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 ..... cm<sup>3</sup> of **FA 1**. [1]

**(c) Calculations**

- (i) 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 in (b).

moles of NaOH = ..... mol [1]

- (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).

moles of hydrochloric acid = ..... mol [1]

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

concentration of HCl in **FA 2** = ..... mol dm<sup>-3</sup> [2]

[Total: 13]