

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 g dm^{-3} of sodium hydroxide, NaOH.

FA 2 is hydrochloric acid, HCl.
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

- Fill the burette with **FA 1**.
- Pipette **25.0 cm³** 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 cm³.

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 cm³ of **FA 3** required cm³ 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.

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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⁻³, of hydrochloric acid in **FA 2**.

concentration of HCl in **FA 2** = mol dm⁻³ [2]

[Total: 13]