

## EXPERIMENT NO. 2

### 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.

Acids are defined as substances that can donate hydrogen ions,  $H^+$ , to bases. Monoprotic acids contain one  $H^+$  that can be donated per molecule. Diprotic acids contain two  $H^+$  that can be donated per molecule.

You will determine by a titration method whether acid **Z** is monoprotic or diprotic.

**FA 1** is a solution containing  $6.10 \text{ g dm}^{-3}$  of acid **Z**.

**FA 2** is  $0.105 \text{ mol dm}^{-3}$  aqueous sodium hydroxide, NaOH.  
bromophenol blue indicator

#### (a) Method

- Pipette  $25.0 \text{ cm}^3$  of **FA 1** into a conical flask.
- Fill a burette with **FA 2**.
- Add several drops of bromophenol blue indicator to the conical flask.
- Carry out a rough titration and record your burette readings in the space below.

The rough titre is .....  $\text{cm}^3$ .

- Carry out as many accurate titrations as you think necessary to obtain consistent results.
- Make sure any recorded results show the accuracy of your practical work.
- Record, in a suitable form below, all of your burette readings and the volume of **FA 2** added in each accurate titration.

I	
II	
III	
IV	
V	
VI	
VII	

[7]

- (b) From your accurate titration results, obtain a suitable value for the volume of **FA 2** to be used in your calculations. Show clearly how you obtained this value.

25.0 cm<sup>3</sup> of **FA 1** required ..... cm<sup>3</sup> of **FA 2**. [1]

**(c) Calculations**

- (i) Calculate the number of moles of sodium hydroxide present in the volume of **FA 2** calculated in (b).

moles of NaOH = ..... mol

Then deduce the number of moles of H<sup>+</sup> present in 25.0 cm<sup>3</sup> of **FA 1**.

moles of H<sup>+</sup> in 25.0 cm<sup>3</sup> of **FA 1** = ..... mol [1]

- (ii) Calculate the number of moles of H<sup>+</sup> present in 1 dm<sup>3</sup> of **FA 1**.

moles of H<sup>+</sup> in 1 dm<sup>3</sup> of **FA 1** = ..... mol [1]

- (iii) **FA 1** contains 6.10 g dm<sup>-3</sup> of acid **Z**. The relative molecular mass of **Z** is 126.

Calculate the number of moles of **Z** in 1 dm<sup>3</sup> of **FA 1**.

moles of **Z** in 1 dm<sup>3</sup> of **FA 1** = ..... mol [1]

- (iv) Use your answers to (ii) and (iii) to determine whether **Z** is a monoprotic or a diprotic acid. Explain your answer.

.....  
..... [1]

[Total: 12]