

## **AS level Chemistry A**

**H032/02** Depth in chemistry

### **Question Set 7**

1. (a) (i) A student carries out a titration to determine the molar mass and structure of a weak acid **A**.

The student follows the method below.

- Dissolve a weighed mass of **A** in  $100\text{cm}^3$  of distilled water and make the solution up to  $250\text{cm}^3$  in a beaker.
- Add the solution of **A** to a burette.
- Titrate the solution of **A** with a standard solution of sodium hydroxide, NaOH.

- (ii) What is meant by the term standard solution?  $1\text{ mol dm}^{-3}$

[1]

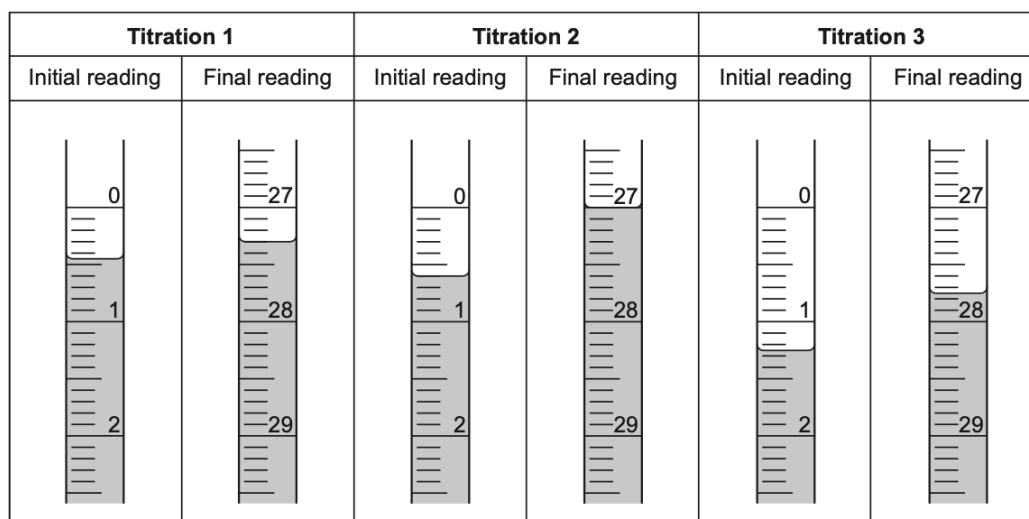
- (b) Sodium hydroxide is an alkali. *a soluble base that releases  $\text{OH}^-$  ions*

What is meant by the term alkali? *in solution*

[1]

- (c) The student carries out a trial, followed by three further titrations. The diagram shows the initial and final burette readings for the three **further** titrations.

The student measures all burette readings to the nearest  $0.05\text{cm}^3$ .



- (i) Record the student's readings and the titres in the table below.

Calculate the mean titre, to the nearest  $0.05\text{cm}^3$ , that the student should use for analysing the results.

|                                | Titration 1 | Titration 2 | Titration 3 |
|--------------------------------|-------------|-------------|-------------|
| Final reading/ $\text{cm}^3$   | 27.30       | 27.10       | 27.75       |
| Initial reading/ $\text{cm}^3$ | 0.45        | 0.60        | 1.25        |
| Titre/ $\text{cm}^3$           | 26.85       | 26.50       | 26.50       |

[4]

- (ii) The uncertainty in each burette reading is  $\pm 0.05\text{cm}^3$ .

Calculate the percentage uncertainty for the titre in **Titration 1**.

$$\text{i) mean titre} = \frac{26.50 + 26.50}{2} = 26.50$$

$$\text{ii) } \frac{0.05 \times 2}{26.85} \times 100 = 0.372\%$$

[1]

(iii) The student realised that the solution of **A** had not been prepared correctly.

How should the student have made up the solution? [1]

ii) Transfer the solution in the beaker to a volumetric flask and make up the solution to the 250 cm<sup>3</sup> mark with distilled water. Invert the flask several times to ensure the solute is well distributed.

(d) A student repeats the titration to determine the molar mass and structure of **A**.

The student prepares a 250.0 cm<sup>3</sup> solution from 1.513 g of **A**.

- The solution of **A** is added to the burette and titrated with 25.0 cm<sup>3</sup> volumes of 0.112 mol dm<sup>-3</sup> NaOH(aq).
- 1 mol of **A** reacts with 2 mol of NaOH.
- The student obtains a mean titre of 27.30 cm<sup>3</sup>.

(di) Calculate the molar mass of **A** from these results.

Give your answer to the nearest whole number.

Show your working. [4]

$$\begin{aligned} \text{moles of NaOH} &= 0.025 \times 0.112 \\ &= 0.0028 \end{aligned}$$

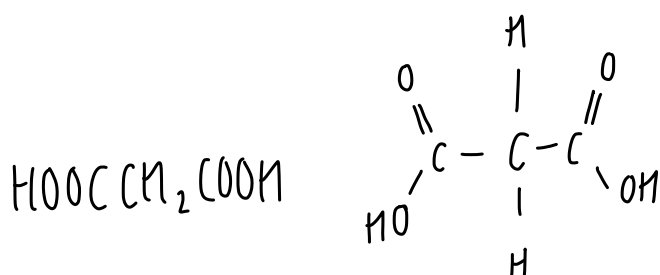
$$\text{moles A} = 0.0028 \div 2 = 0.0014 \times 10 = 0.014 \quad [1]$$

$$M_r = \frac{\text{mass}}{\text{moles}} = \frac{1.513}{0.014} = 108$$

(dii) **A** is an organic acid, containing C, H and O only.

One molecule of **A** contains two COOH groups.

Suggest the structure of **A**.



**Total Marks for Question Set 1: 13**

---

# OCR

Oxford Cambridge and RSA

## **Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge