Amount of substance - AS 2022 Chemistry P1

1. June/2022/Paper_7404/1/No.2

0 2

This question is about acid-base titrations.

Citric acid reacts with sodium hydroxide.

 $C_6H_8O_7(aq) \ + \ 3\,NaOH(aq) \ \rightarrow \ Na_3C_6H_5O_7(aq) \ + \ 3\,H_2O(I)$



A student makes a solution of citric acid by dissolving some solid citric acid in water.

Describe a method to add an accurately known mass of solid to a beaker to make a solution.

[2 marks]



The student dissolves 0.834 g of citric acid in water and makes the solution up to 500 cm³

Calculate the concentration, in mol dm⁻³, of citric acid in this solution.

[3 marks]

Concentration _____ mol dm⁻³

0 2 . 3 The student uses this method to complete a titration.

- Rinse a burette with distilled water.
- Fill the burette with sodium hydroxide solution.
- Use a measuring cylinder to transfer 25 cm³ of the citric acid solution into a conical flask.
- Add 5 cm³ of indicator.
- Slowly add the sodium hydroxide solution from the burette into the conical flask.
- Add the sodium hydroxide solution dropwise near the end point until the indicator just changes colour.
- Repeat the titration to get concordant results.

The method used by the student includes three practical steps that will lead to an inaccurate final result.

For each of these three steps

- · identify the mistake
- explain why it is a mistake
- suggest how the mistake can be overcome.

[6 marks]

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Table 1 shows the student's burette readings after the mistakes in the practical procedure have been corrected.

	Rough	Run 1	Run 2	Run 3
Final reading / cm ³	23.65	22.95	46.05	26.30
Start reading / cm ³	0.00	0.00	22.95	3.40
Titre / cm ³	23.65			

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Complete Table 1.

Use the data in Table 1 to calculate the mean titre.

[2 marks]

Mean titre cm³



0 2 . 5 The total uncertainty in the use of the burette is ±0.15 cm³

Calculate the percentage uncertainty in the use of the burette in Run 1.

[1 mark]

Percentage uncertainty _____

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5.0 g of an oxide contains 4.0 g of molybdenum.

What is the empirical formula of this oxide?

[1 mark]

