Oxford Cambridge and RSA

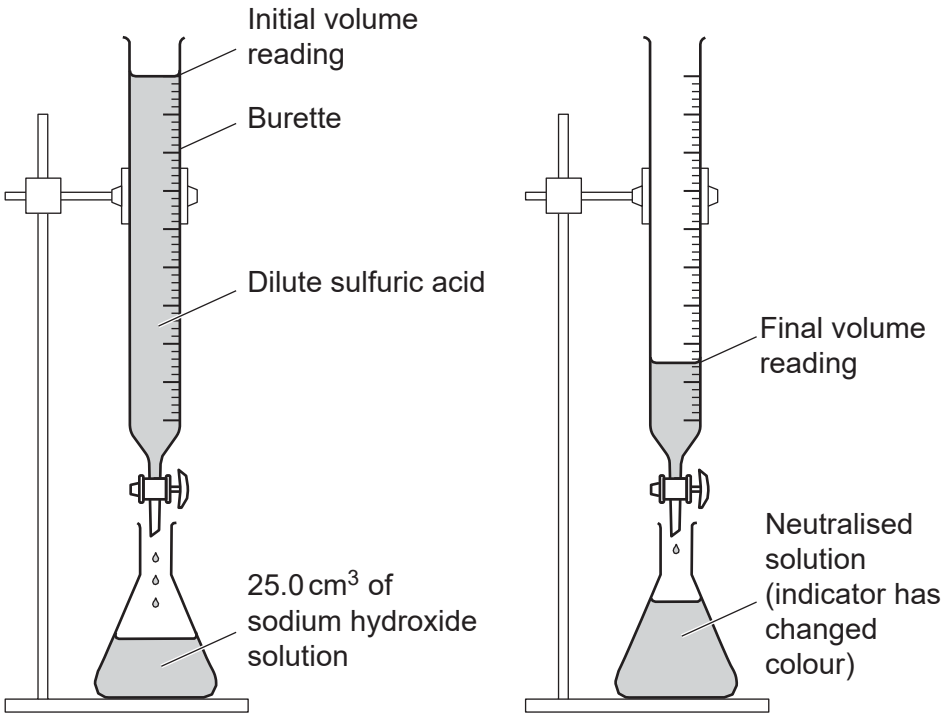
GCSE Chemistry A (Gateway Science)

J248/02 C4-C6 and C7 Foundation (Foundation Tier)

Question Set 18

1 A student does a titration with an acid and an alkali.

He uses dilute sulfuric acid, sodium hydroxide solution and an indicator solution.



The student's method is:

- Use a measuring cylinder to pour 25.0 cm^3 of sodium hydroxide solution into a conical flask
- Add a few drops of an indicator to the sodium hydroxide solution
- Use a burette to add dilute sulfuric acid to the sodium hydroxide solution until the indicator changes colour.

(a) The student wants to get a more accurate value for how much acid reacts with 25.0 cm^3 of sodium hydroxide solution.

Describe and explain how the student could improve his experiment to get a more accurate value.

[4]

- Use a pipette and a pipette filler to measure 25.0 cm^3 of NaOH
- Use pH meter instead of indicator to accurately find the endpoint
- Add the dilute sulfuric acid dropwise near the end point
- Swirl the conical flask after every addition of acid to ensure all the acid is reacted

(b) Another student does a titration. She also uses dilute sulfuric acid, sodium hydroxide solution and an indicator solution.

The table shows her results.

Titration number	**1**	**2**	**3**	**4**
Volume of acid (cm^3)	26.4	25.2	25.6	25.4

The student decides that the best value for the mean (average) volume of acid is 25.4 cm^3.

Show how she calculated this value.

$$\frac{25.2 + 25.6 + 25.4}{3}$$

$$= 25.4\ cm^3$$

[2]

(c) The equation for this reaction is

$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$

	Relative formula mass, M_r
H_2SO_4	98
NaOH	40
Na_2SO_4	142
H_2O	18

Water is a waste product in this reaction.

Calculate the **atom economy** for the reaction.

Give your answer to **1** decimal place.

$$\text{atom economy} = \frac{M_r \text{ of desired product}}{\text{sum of } M_r \text{ of all products}} \times 100$$

$$= \frac{142}{142 + 2 \times 18} \times 100$$

$$= 79.775...$$

Answer = 79.8 **[3]**

Total Marks for Question Set 18: 9