

Section A:

1. Match each quantity below with the correct units.

Concentration
Mass
Volume
Amount of substance

g/dm^3
dm^3
g
mol
mol/dm^3

2. Which of these is the correct definition of concentration?

Tick one box.

The amount of solute per unit volume of solvent

☐

The amount of space a solution takes up

☐

The amount of substance in a solution

☐

3. Which is the correct function of an indicator in a titration?

Tick one box.

To measure the concentration of an unknown reactant

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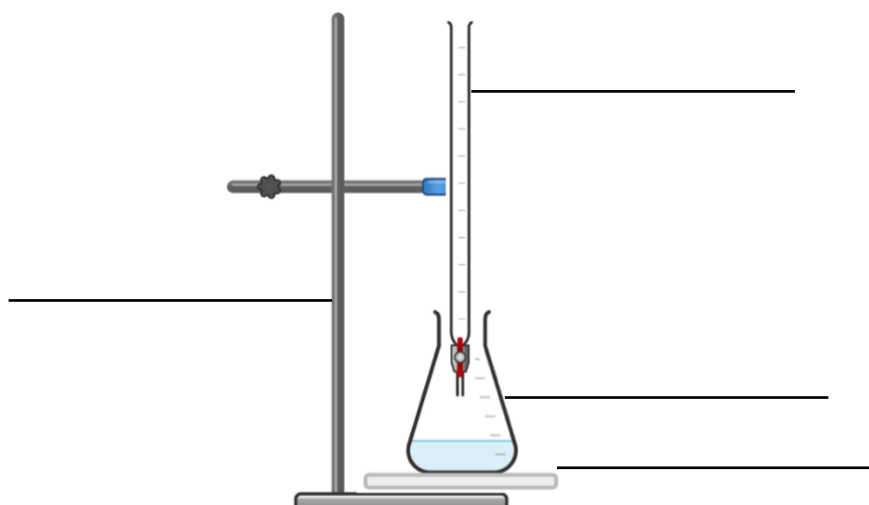
To signify the end point of a reaction

☐

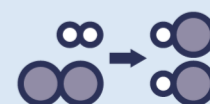
To speed up the rate of reaction

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4. Label the following pieces of apparatus that are involved in a titration.



Section B

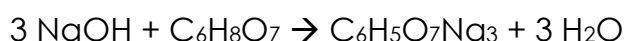




5. A student is investigating the concentration of a sample of sodium hydroxide solution using titration. They use citric acid solution as the acid and phenolphthalein as the indicator.

a. Explain why phenolphthalein is used rather than Universal Indicator.

The equation for the reaction is:

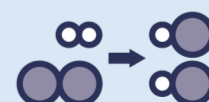


b. Identify the chemical formula for citric acid.

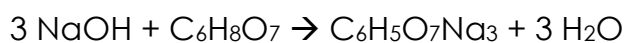
- c. The student required 12.5 cm^3 of 0.1 mol/dm^3 citric acid to neutralise 20 cm^3 of sodium hydroxide solution.

Calculate the concentration of the sodium hydroxide solution in mol/dm^3 .

d. Explain how the student could make their results more reliable.



6. Another student uses a similar method to find the concentration of an unknown citric acid solution using 25 cm³ of sodium hydroxide. The equation for the reaction is:



The table below shows the student's results.

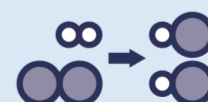
Titration	1	2	3	4	5
Volume of citric acid solution (cm ³)	12.50	12.15	11.75	12.10	12.10

- a. State the word used to describe the volume of citric acid.

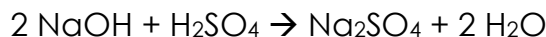
- b. 3 of these results are concordant. Explain what is meant by concordant results.

- c. Use the concordant results to calculate the mean volume of citric acid required. Write your answer to 2 decimal places.

- d. The concentration of sodium hydroxide was 0.15 mol/dm³. Calculate the concentration of citric acid solution. Write your answer to 2 significant figures.



7. A student carried out a titration to determine the concentration of a sulfuric acid sample. They found that 27.1 cm³ of sulfuric acid was needed to neutralise 25 cm³ of 0.1 mol/dm³ of sodium hydroxide.
The equation for the reaction is:



- a. Calculate the concentration of the sulfuric acid sample.

- b. Calculate the mass of sodium hydroxide that would have been dissolved to produce 25 cm³ of 0.1 mol/dm³ solution.

Section C

8. Scientists can use titration to determine the concentration of sulfuric acid in a sample of rainwater to provide evidence of acid rain.
- Briefly describe a method that could be used to determine the concentration of sulfuric acid in a rainwater sample.
 - Describe how acid rain is formed.
 - Suggest some environmental impacts of acid rain.
 - One of the main causes of acid rain is the burning of fossil fuels. Explain what fossil fuels are.
 - Suggest why people continue to burn fossil fuels even though they are aware of the environmental consequences.

