

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?

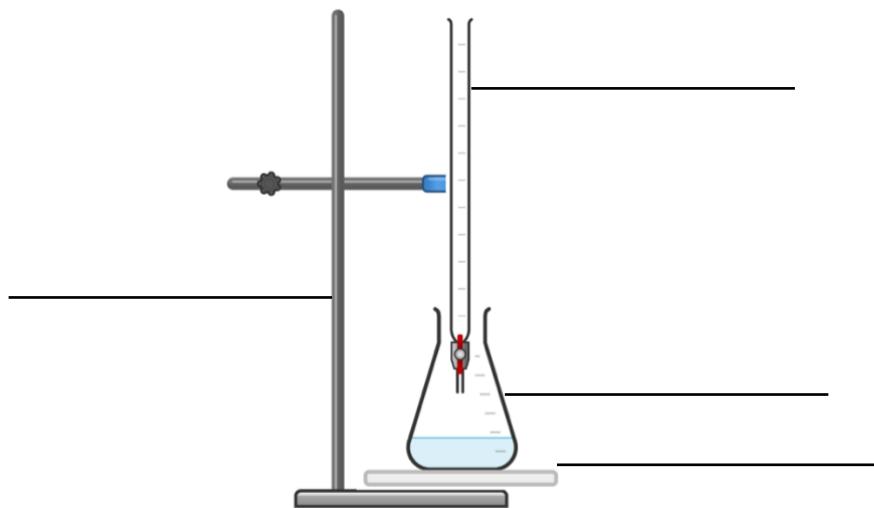
Tick one box.

To measure the concentration of an unknown reactant

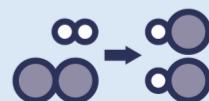
To signify the end point of a reaction

To speed up the rate of reaction

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



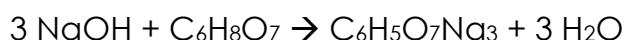
Section B



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.

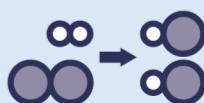
The equation for the reaction is:



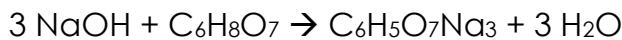
- b. Identify the chemical formula for citric acid.

- c. The student required 12.5 cm³ of 0.1 mol/dm³ citric acid to neutralise 20 cm³ of sodium hydroxide solution.
Calculate the concentration of the sodium hydroxide solution in mol/dm³.

- 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.

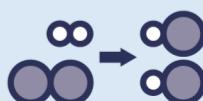
Titration	1	2	3	4	5
Volume of citric acid solution (cm ³)	12.50	12.15	11.75	12.10	12.10

- 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.

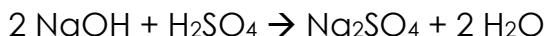
- c. Use the concordant results to calculate the mean volume of citric acid required. Write your answer to 2 decimal places.

- 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 cm^3 of sulfuric acid was needed to neutralise 25 cm^3 of 0.1 mol/dm^3 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 cm^3 of 0.1 mol/dm^3 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.

