

OCR B GCSE Chemistry

Topic 5: Chemical analysis

How are the amounts of chemicals in solution measured?

Notes





1. Identify the difference between qualitative and quantitative analysis (separate science only)

- Quantitative analysis = used to make measurements and calculations to show the amounts of each component in a sample
- qualitative analysis: used to identify the components of a sample

2. (HT only) explain how the mass of a solute and the volume of the solution is related to the concentration of the solution and calculate concentration using the formula:

concentration (g/dm³) = mass of solute (g) ÷ volume (dm³)

- 1dm³ = 1000cm³

3. (HT only) explain how the concentration of a solution in mol/dm³ is related to the mass of the solute and the volume of the solution and calculate the molar concentration using the formula:

concentration (mol/dm³) = number of moles of solute ÷ volume (dm³)

4. Describe neutralisation as acid reacting with alkali to form a salt plus water including the common laboratory acids hydrochloric acid, nitric acid and sulfuric acid and the common alkalis, the hydroxides of sodium, potassium and calcium

- neutralisation: acid + alkali → salt + water
- salts produced:
 - first part of name comes from metal in alkali e.g. sodium from sodium hydroxide
 - second part of name comes from acid used:
 - HCl (hydrochloric acid) → chloride
 - HNO₃ (nitric acid) → nitrate
 - H₂SO₄ (sulfuric acid) → sulfate

5. Recall that acids form hydrogen ions when they dissolve in water and solutions of alkalis contain hydroxide ions

- acids release H⁺ ions in solution and alkalis release OH⁻

6. Recognise that aqueous neutralisation reactions can be generalised to hydrogen ions reacting with hydroxide ions to form water

- H⁺(aq) + OH⁻(aq) → H₂O(l) is the ionic equation of any neutralisation reaction between an alkali and an acid (not all neutralisation reactions as some bases aren't soluble)



7. Describe and explain the procedure for a titration to give precise, accurate, valid and repeatable results

The volumes of acid and alkali solutions that react with each other can be measured by titration using a suitable indicator.

- method:
 - add acid to burette using a funnel, record the volume in the burette to start
 - add known volume of alkali to a conical flask and add some indicator
 - place conical flask on white tile (so you can see colour change clearly)
 - add acid to alkali until you reach the end point
 - calculate how much acid has been added (titre)
 - repeat until you get concordant titres

8. Evaluate the quality of data from titrations

- How many repetitions did the student do? (the more the better)
- Have students only included concordant titres in any calculations? (if they've included all results, this makes it less accurate, as they've included anomalies)

9. (HT only) explain the relationship between the volume of a solution of known concentration of a substance and the volume or concentration of another substance that react completely together (separate science only)

- once you have carried out a titration, you know the exact volume of an acid that reacts with the exact volume of an alkali
- if you only knew the concentration of the acid and wanted to calculate the concentration of the alkali:
 - calculate moles of acid using $\text{moles} = \text{concentration} \times \text{volume}$
 - calculate the mole ratio of acid to alkali using the equation for the reaction
 - work out how many moles of alkali you have using the mole ratio and moles of acid (e.g. if you have 5 moles of acid and the ratio of acid to alkali is 1:2, you will have 10 moles of alkali)
 - calculate the concentration of the alkali using $\text{concentration} = \frac{\text{mol}}{\text{volume}}$
- follow the same method for if you have both concentrations but only one volume

