

Acid–alkali conductometric titration

This resource accompanies the Exhibition Chemistry video and article Shocking revelations, which demonstrates a conductometric titration of barium hydroxide with sulfuric(VI) acid and can be viewed at: <https://rsc.li/3ldVQoD>

Learning objectives

- Identify the ions present in acidic and alkaline solutions.
- Describe the changes in ionic concentrations in an acid-alkali neutralisation.

Answers

1. This revises the learners' understanding of **ions**, and their ability to identify the ions that are present in the acid and alkali.
In barium hydroxide, there are **barium cations, Ba²⁺**, and **hydroxide anions, OH⁻**, present and in sulfuric acid there are **hydrogen cations, H⁺**, and **sulfate anions, SO₄²⁻**.
2. At the end point, there is a **fall in the total ion concentration**. The ions are the current carriers in solution, and conductivity depends on the concentration of ions. In asking which ions are removed in the formation of barium sulfate, there is an opportunity to write the ionic equation for the precipitation reaction. **Barium cations, Ba²⁺**, and **sulfate anions, SO₄²⁻**, have been removed, with the ionic equation being:
Ba²⁺ (aq) + SO₄²⁻ (aq) → BaSO₄ (s)
3. Having dealt with the barium and sulfate ions, the students are then in a position to focus on what else is happening, starting with identifying **hydrogen cations, H⁺**, and **hydroxide anions, OH⁻**, as potential reactants. **These ions react to form water.**
4. The ionic equation for the reaction between the hydrogen and hydroxide ions is:
H⁺ (aq) + OH⁻ (aq) → H₂O (l)
5. Any reactant added once an end point has been reached is 'surplus', and so **ions are again present and the conduction of the solution rises again**. It is unlikely that the end point will be marked by zero conductivity. The titration method used is too crude to find the exact point at which almost no ions are present, and even a drop of barium hydroxide added nearly at the end point will take the reaction past the end point.

Acknowledgements

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