Objectives

C0.1 Recall the formulae of elements, simple compounds and ions.

C0.2 Write word equations.

C0.3 Write balanced chemical equations, including the use of the state symbols (s), (l), (g) and (aq).

C3.6 *Investigate the change in pH on adding powdered calcium hydroxide or calcium oxide to a fixed volume of dilute hydrochloric acid.*

C3.10 Recall that alkalis are soluble bases.

C3.11c Explain the general reactions of aqueous solutions of acids with metal hydroxides to produce salts.

Maths requirements

1c Use ratios, fractions and percentages.

4a Translate information between graphical and numeric form.

4c Plot two variables from experimental or other data.

Learning outcomes

6th **SC0.1** Recall the chemical formulae of some common compounds.

6th **SC0.3** Recall and use state symbols.

9th **SC0.3** Balance chemical equations.

4th **SC3.10** Recall that alkalis are soluble bases.

6th **SC3.11c** Describe the reactions of alkalis with acids.

Exploring

1. Neutralising an acid – Core practical

This is a Core practical in which students add successive weighed portions of calcium hydroxide powder to a fixed amount of dilute hydrochloric acid, and estimate the pH of the reaction mixture using universal indicator paper. They then plot a graph of pH against mass of calcium hydroxide added.

The practical activity on Students' sheet CP2 (Investigating pH) is written for the use of universal indicator paper to estimate pH, but you may prefer to use pH meters to measure the pH instead.

Support: Provide eight 0.3 g pre-weighed portions of calcium hydroxide powder to each group that needs it. Provide graph paper with suitable axes already drawn on it (pH 0–14 on vertical axis; mass of calcium hydroxide 0–2.4 g on horizontal axis). Additionally, or alternatively, Skills Sheets PD5 and PD6 may be useful in helping students to draw their graphs.

Stretch: Give students narrow range indicator paper to increase the precision of their pH estimates.

Expected results

The pH will increase as more calcium hydroxide is added, with the end-point at approximately 1.85 g of calcium oxide. Calcium hydroxide is sparingly soluble (about 0.17 g/100 cm^3 H_2O) so beyond this excess calcium hydroxide will be seen.

Course resources

Chem Students' sheet CP2

Equipment

eye protection, 100 cm^3 beaker, 50 cm^3 measuring cylinder, ±0.1 g balance, spatula, stirring rod, white tile, universal indicator paper, pH colour chart, dilute hydrochloric acid, calcium hydroxide powder, graph paper

⚠ Safety

Eye protection should be worn. Students should wash their hands afterwards. Calcium hydroxide is an irritant, with a risk of serious damage to eyes. Dilute hydrochloric acid is an irritant.