

Types of chemical reactions



Background

In chemistry there are many different types of chemical reactions. Chemists use chemical equations as shorthand representations for reactions. The purpose of this experiment is to observe several important types of chemical reactions and to write equations for these reactions.

Equipment required

Balance	Steel wool
Spatula	Zinc strips (two)
Bunsen	Copper strip (one)
Metal tongs	Copper(II) carbonate [CuCO_3] (2 g)
Wax taper	Calcium carbonate [CaCO_3] marble chips (2 g)
Dropper	Magnesium ribbon (two 3 cm strips)
Beaker (100 mL)	Silver nitrate solution [AgNO_3] 0.1 mol L ⁻¹ (30 mL)
	Sodium bromide solution [NaBr] 0.1 mol L ⁻¹ (5 mL)
	Copper(II) sulfate solution [CuSO_4] 0.1 mol L ⁻¹ (30 mL)
	Sodium hydroxide solution [NaOH] 2 mol L ⁻¹ (5 mL)
	Sodium hydroxide solution [NaOH] 0.1 mol L ⁻¹ (30 mL)
	Hydrochloric acid [HCl] 2 mol L ⁻¹ (10 mL) Hydrochloric acid [HCl] 0.1 mol L ⁻¹ (30 mL)
	Limewater [$\text{Ca}(\text{OH})_2$] saturated (10 mL) Universal indicator (5 drops)
	Lead(II) nitrate solution [$\text{Pb}(\text{NO}_3)_2$] 0.1 mol L ⁻¹ (25 mL)

Procedure

#1 Prepare a table including space for reactants, observations and products for the following reactions.

Decomposition of a carbonate by heating

#2 Place a spatula of copper(II) carbonate into a large test tube and fit the test tube with a stopper and delivery tube. Heat the test tube with a bunsen and pass any gas evolved through 5 mL of limewater in another test tube.

Decomposition of a carbonate with an acid

#3 Place a spatula of calcium carbonate (marble chips) into a large test tube, add 2 mol L⁻¹ hydrochloric acid to a depth of about 2-3 cm, and fit the test tube with the stopper and delivery tube as before. Again note the effect of any gas evolved on limewater solution.

Oxidation of a metal

#4 Place a protective mat on the laboratory bench. Cut a 3 cm strip of magnesium ribbon. Hold the ribbon in some tongs and heat in a bunsen flame above the mat.

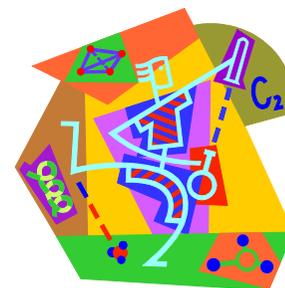
Reaction of a reactive metal with a dilute acid

#5 Place another 3 cm strip of magnesium in a small test tube and add 2 mol L⁻¹ hydrochloric acid to a depth of about 3 cm. Note the reaction and collect any gas evolved by inverting another small test tube and holding it directly above the reaction tube. Test the gas evolved by placing a lighted taper in the inverted test tube.

Precipitation reactions

#6 Place 2-3 mL of 0.1 mol L⁻¹ AgNO₃ solution into a test tube and add about the same volume of 0.1 mol L⁻¹ NaBr solution.

#7 Place 2-3 mL of 0.1 mol L⁻¹ CuSO₄ solution into a test tube and add about the same volume of 2 mol L⁻¹ NaOH solution.



Metal displacement reactions

#8 Place about 25 mL of 0.1 mol L⁻¹ CuSO₄ solution into a 100 mL beaker and place into the beaker a freshly cleaned zinc strip.

#9 Place about 25 mL of 0.1 mol L⁻¹ Pb(NO₃)₂ solution into a 100 mL beaker and place into the beaker a freshly cleaned zinc strip.

#10 Place about 25 mL of 0.1 mol L⁻¹ AgNO₃ solution into a 100 mL beaker and place into the beaker a freshly cleaned copper strip.

Neutralisation reaction - reaction of an acid and a base

#11 Place about 20 mL of 0.1 mol L⁻¹ HCl into a beaker and add 5 drops of universal indicator. Using a dropper gradually add 0.1 mol L⁻¹ NaOH solution until about 25 mL of the base has been added. Note any colour changes which take place.

Processing of results, and questions

1 Write word equations and balanced chemical equations for each of the reactions observed.

2 Write word equations and balanced chemical equations for the following reactions. a heating magnesium carbonate

