Types of oxides: reactions with acid and bases Transcript

pH can be measured using Universal indicator solution which produces a rainbow of colours and classifies solutions as acidic, basic or neutral.

Soluble oxides can dissolve in water to form acidic, basic or amphoteric solutions.

These solutions can then become involved in neutralisation reactions, which involve moving the pH of a solution towards 7.

In these experiments the changes in pH that occur when ‘metal oxide and water’ solutions are reacted with an acid, and non-metal oxides are reacted with a base will be explored.

The first experiment is the reaction of the metal oxide and water solutions with an acid.

Thirty centimetres cubed of 0.1 moles per decimetre cubed hydrochloric acid is measured out using a measuring cylinder.

The liquid needs to be measured out accurately.

The acid is added to each of the labelled beakers: potassium oxide and water, sodium oxide and water, and lithium oxide and water.

Then ten drops of Universal Indicator are added to each beaker.

The colour of the acid is then recorded in the results table and the pH scale is used to work out a pH number.

A magnetic stirrer is added to each beaker and placed on the magnetic stirrer plate one at a time. A stirring rod could also be used.

Fifteen centimetres cubed of the metal oxide and water solutions are added to the correspondingly labelled beakers of acid, using a syringe.

Once all the metal oxide and water solutions have been added, the pH of the solutions can be measured and the results table filled in.

When an acid is reacted with a soluble metal oxide solution its pH increases towards neutral, or pH 7.

Some metal oxides, like aluminium oxide and zinc oxide can act as both an acid and a base. These are known as amphoteric oxides.

It is also important to look at the chemistry of soluble non-metal oxides.

Non-metal oxides can dissolve in water to form acids.

When fossil fuels are burnt non-metal oxide pollutant gases are released. These gases dissolve in rainwater forming acid rain.

When acid rain falls back to Earth it causes the acidity of the soil and groundwater to increase leading to environmental damage.

In this experiment, the gases nitrogen dioxide, sulfur dioxide and carbon dioxide are produced and bubbled through sodium hydroxide.

Using a syringe, two centimetres cubed of sodium hydroxide is measured out three times and transferred into the three test-tubes labelled: NO_2, SO_2 and CO_2.

Then two drops of Universal Indicator are added to each test-tube.

The colour and the pH is recorded in the results table.

To create nitrogen dioxide, half a spatula of sodium nitrate is added to a test-tube.

Using a syringe, two centimetres cubed of one mole per decimetre cubed hydrochloric acid is also added to the test-tube and a bung is placed immediately on the tube.

Bubbles of brown nitrogen dioxide gas are produced.

After a few minutes, the bung is removed from the test-tube and the gas is removed using the syringe with tubing attached to it.

The tubing is placed into the test-tube labelled NO_2 and the gas is slowly bubbled into the solution. The pH of the solution is measured and the value recorded.

Sulfur dioxide is created using sodium hydrogen sulfate and hydrochloric acid.

Again the syringe with the tubing is used to remove the gas formed, which is bubbled into the test-tube labelled SO_2.

The pH of the solution is measured and the value recorded.

Carbon dioxide is created using sodium carbonate and hydrochloric acid.

The gas produced is bubbled into the test-tube labelled CO_2 and the pH of the solution is measured and the value recorded.

The table is now complete.

When a base is reacted with a soluble non-metal oxide the pH decreases and become more acidic. Neutralisation reactions are used to lower pollutant gas emissions and reduce the likelihood of acid rain being formed.