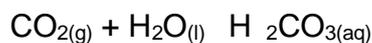


Investigating the acidity and alkalinity of water

Background

Acidity of water is often due to the presence of dissolved carbon dioxide.

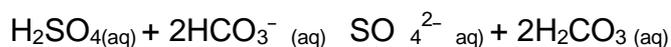
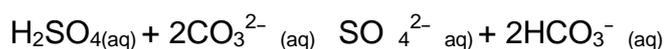


If this is the case then titration of the sample with an alkali can determine the acidity of the water.



The amount of alkali need to bring the pH of the solution to 8.3 can be used to calculate the acidity of the water.

Alkalinity of water is often due to the presence dissolved carbonate and hydrogen carbonate. If this is the case then titration of the sample with an acid can determine the alkalinity of the water.



The amount of acid need to bring the pH of the solution initially to 8.3 (reaction with carbonate - if the initial sample is below pH 8.3 then there is no carbonate present) and then to pH 4.5 (reaction with the hydrogen carbonate) can be used to calculate the alkalinity of the sample.

Practical Techniques

You will need to find out about volumetric analysis (titrations) and how to make up accurate solutions. You also need to find out how to use a pH meter.

Where to start

You can use $0.005 \text{ mol dm}^{-3}$ sodium hydroxide solution for the determination of the acidity and $0.005 \text{ mol dm}^{-3}$ sulphuric acid solution for the determination of the alkalinity. You can follow the change in pH of the solution with a pH meter.

Possible Investigations

- Investigate the acidity of various sparkling mineral waters and compare to still mineral waters
- Investigate the effect of temperature on the acidity of water

Sources of Information

- Shipton M., *Water, Unilever Educational Booklet: Advanced Series* (2000), Unilever
- Lindsey D., Measuring pH, *Chemistry Review*, September 1998
- Battye P., Titrations, *Chemistry Review*, February 2003
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- Thorpe A., Making a standard solution, *Chemistry Review*, November 2002
- Ferguson M., Volumetric Analysis. *Chemistry Review*, September 1996
- Thorpe A., Assessing the risks in practical work, *Chemistry Review*, September 2000
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Teachers' Notes

General

This investigation is based around an experiment in the Unilever booklet: *Water*, where more details can be found. The practical techniques are based around the titration technique. The suggested concentrations for the sulphuric acid and the sodium hydroxide may need to be adjusted depending on the water samples being analysed. This investigation could be combined with other aspects of water analysis.

Chemical Principles

Acids and Bases, pH, Volumetric Analysis.

Essential Equipment

Burettes, pipettes, standard flasks, pH meter.

Essential Chemicals

Sulphuric acid, sodium hydroxide, buffer solutions to calibrate the pH meter.

Safety

No risk assessment has been given. It is essential that students prepare a detailed risk assessment before they start. Teachers must be satisfied that this is suitable for the proposed investigation.