

# Investigating the analytical techniques for detecting copper ions

## Background

There are many analytical techniques for detecting the presence of metal ions. This investigation focuses on the detection of copper (II) ions.

## Practical Techniques

You need to find out how to make up accurate solutions. You may need to find out about volumetric analysis, using a colorimeter, using an ion exchange resin and setting up electrochemical cells depending on the type of analysis that you choose to carry out.

## Where to start

This investigation is based on an article in *Chemistry Review* by Derek Denby in September 1999.

The methods suggested for copper(II) ion analysis are

- Redox titration with excess iodide ions
- Complexiometric titration with EDTA
- Cation exchange followed by acid base titration
- Gravimetric analysis using zinc powder
- Colorimetric analysis
- Using electrochemical cells for analysis

You need to make up an accurate solution of copper (II) ions and compare methods of analysis. Brief details of the analytical techniques are given in the article but you may wish to consult standard textbooks for further instructions. It might be sensible to choose to compare two methods to start with.

## Sources of Information

- Denby D., The concentration of copper ions, *Chemistry Review*, September 1999
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## Teachers' Notes

### General

This investigation is based around standard experiments and details can be found in most practical chemistry books. The article by Derek Denby is an excellent source and students should be strongly recommended to consult this.

Students can use the methods to analyse the copper in brass or bronze. They will need to dissolve the metal in concentrated nitric acid to get the metal in solution. The presence of the acid may affect the analytical technique that they are using and could lead to useful comparisons of the most suitable technique.

### Chemical Principles

Transition metals, quantitative analysis, ion exchange, electrochemical cells, redox

### Essential Equipment

Burettes, pipettes, colorimeter

### Essential Chemicals

Copper (II) sulphate, sodium thiosulphate, iodine, EDTA, zinc powder, sulphuric acid, ammonia, copper metal

### 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.