



Teachers' guide

1. Aluminium foil

Introduction

Teachers who have not used these problems before should read the section *Using the problems* before starting.

Prior knowledge

Reaction of metals with acid; and catalysis. A detailed knowledge is unnecessary as students are encouraged to consult textbooks and data books during the exercise.

Resources

Data books and inorganic textbooks should be available for reference. The following chemicals should be provided at the start of the exercise:

- ▼ aluminium foil;
- ▼ dilute (approximately 2 mol dm⁻³) hydrochloric acid; and
- ▼ labelled bottles of solid sodium chloride, sodium nitrate, sodium sulphate, copper(II) chloride, copper(II) nitrate and copper(II) sulphate.

The reactions should be carried out in test tubes. Other apparatus and chemicals may be requested during the practical session.

Risk assessment

A risk assessment must be carried out for this problem.

Group size

2–3.

Results

Copper(II) salts were best. Most trial schools found that the copper(II) chloride was best of all, but some reported that all the copper(II) salts tested were equally good.¹ Perhaps this variation was due to impurities present in the reagents.



Suggested approach

During trialling the following instructions were given to students and proved to be extremely effective:

You should divide the practical work amongst the group and keep one another informed of progress.

1. Working as a group discuss the problem and decide how you are going to carry out the investigation. Such discussion plays an important part in deciding upon suitable experimental methods. Start with the simplest method possible, and refine it if necessary.
2. Write up what you plan to do.
3. Get your method for checked safety and then carry out the practical work.
4. As a group, discuss your results; look closely for any patterns that may have emerged in them.
5. Again working as a group, prepare a short (ca 5-minute maximum) presentation to give to the rest of the class. If possible all group members should take part: any method of presentation (such as a blackboard, overhead projector, etc) can be used.

Outline the problem, describe what you did and explain your conclusion. After the presentation, be prepared to accept and answer questions and to discuss what you did with the rest of the class.

Possible extension

Other metal salts could be tested to find out if they act as catalysts; the difference between transition metal salts and other metal salts could be investigated. Another activity is to decide whether the rate depends on the quantity of salt added.

Additional salts could include: silver nitrate because silver like copper, is much less reactive than aluminium; another set of transition metal salts, eg nickel, cobalt or another set of non-transition metal salts, eg magnesium, calcium.

Note

1. G. Lloyd, *School Science Review*, 1978, **60**, 308. Lloyd concludes that both copper(II) and chloride ions are needed before aluminium will react.



1. Aluminium foil

From the salts provided, find out which salt or ion is the best catalyst for the reaction between aluminium and dilute hydrochloric acid. A few crystals of one of the salts should be dissolved in a little dilute hydrochloric acid in a test tube and the aluminium foil added to the mixture.

Aluminium is a reactive metal, but in most situations it appears to be unreactive because of the oxide layer on its surface – eg it does not react with dilute hydrochloric acid.

You should refer to any sources of information that you think might help such as your notebooks, textbooks and data books. Ask for assistance if you get stuck.

Safety

There are no special safety requirements. Normal safety procedures when handling chemicals should be adhered to and eye protection worn.

You must get your method checked for safety before starting on the practical work.