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62. Metals and acids

Topic

Metals, salts.

Timing

60 min.

Description

Zinc and sulfuric acid are reacted to form zinc sulfate.

Apparatus and equipment (per group)

Lesson 1

- 100 cm^3 Conical Flask
- 250 cm^3 Beaker
- Labels
- 50 cm^3 or 100 cm^3 Measuring cylinder
- Filter funnel & paper
- Evaporating basin
- Crystallising dish
- Bunsen burner
- Tripod
- Gauze.

Lesson 2

- Hand lens.

Chemicals (per group)

- Sulfuric acid 1 mol dm^{-3} (**Irritant**)
- Eight lumps of zinc.

Teaching tips

Immerse the zinc lumps in copper(II) sulfate solution (very dilute) prior to the lesson for half an hour or so. They will react much more readily.

Background theory

Acid + metal → salt + water

Safety

Wear eye protection. Care with hot acid.

Answers

1. Zinc + sulfuric acid → zinc sulfate + hydrogen
2. (*a*) Zinc + hydrochloric acid → zinc chloride + hydrogen
   (*b*) Magnesium + sulfuric acid → magnesium sulfate + hydrogen
3. $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$
   $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
   $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

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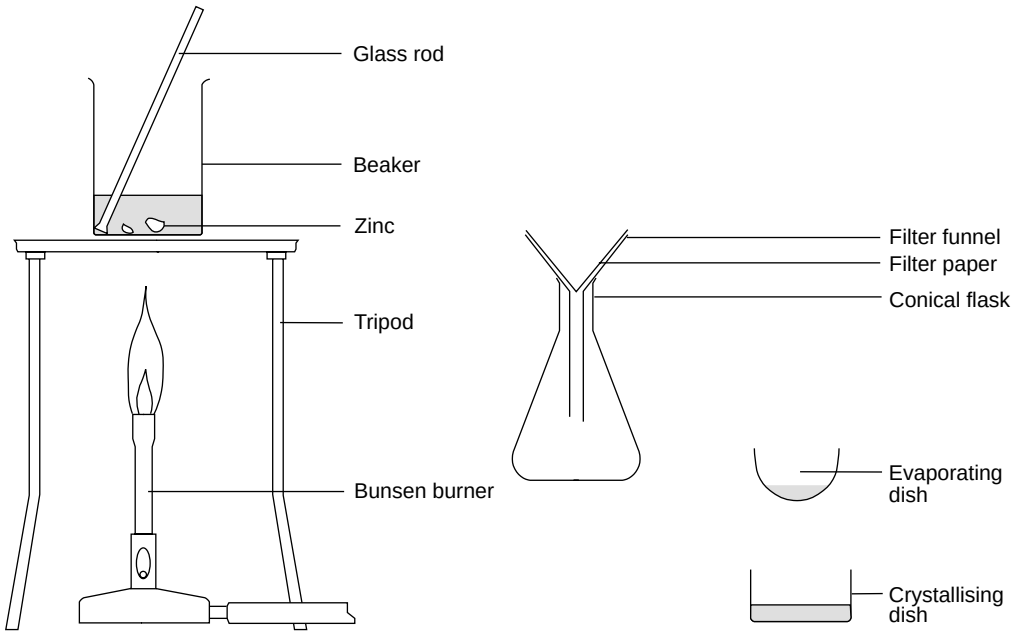
Metals and acids

Introduction

Many, but not all, metals react with acids. Hydrogen gas is formed and the metal reacts with the acid to form a salt.



What to do

Lesson 1

1. Measure 50 cm^3 of dilute sulfuric acid and pour it into the beaker. Warm this acid but turn off the Bunsen burner before it reaches the boiling point.
2. Carefully remove the beaker of acid from the tripod and stand it on the bench.
3. To this acid, add two lumps of zinc.
4. If all the zinc reacts, add two more lumps. Add more zinc until no more bubbles form. The acid is now used up.
5. Filter into the conical flask to remove the excess zinc and transfer the filtrate into an evaporating basin.
6. Gently heat the filtrate. Dip in a glass rod and hold it up to cool. When small crystals form on the glass rod stop heating.
7. Pour the solution into a crystallising dish. Label the dish and leave it to crystallise for next lesson.

Lesson 2

1. Examine the crystals with a hand lens.

Safety

Wear eye protection. Care with hot acid.

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Questions

1. Write a word equation for the reaction between zinc and sulfuric acid.
2. Write word equations for the reactions of:
   (a) zinc and hydrochloric acid.
   (b) magnesium and sulfuric acid.
3. Write equations for these three reactions using chemical formulas.