

# Using symbols and the periodic table

Grade 8 science (Year 9 · Class 8) · Lab

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

Can we tell metals from non-metals by testing their properties? In this lab you test six materials for shine, electrical conduction, magnetism and brittleness, then decide which are probably metals and which are not.

**Level:** Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-PS1-1

## Aim

To test six everyday materials for shine, electrical conduction, magnetism and brittleness, and use the results to decide which are metals and which are non-metals.

## Equipment

- Battery pack (3 × 1.5 V cells), 2.5 V lamp in a holder, leads with crocodile clips
- Strong magnet
- Small hammer, a flat wooden block and safety goggles
- Samples: copper wire, iron nail, aluminium foil, pencil lead (graphite), chalk, candle wax

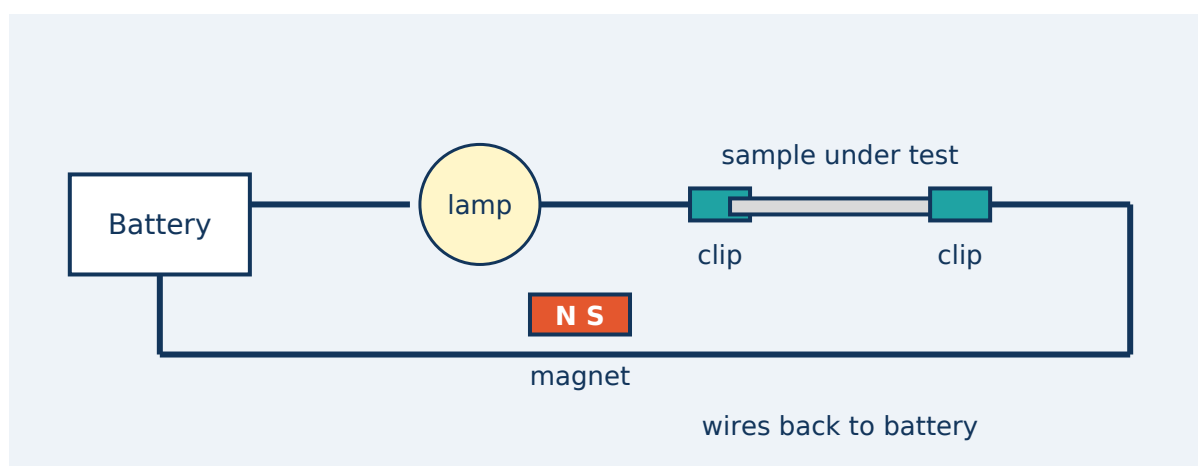
## Safety

### Safety

Wear safety goggles when you tap samples with the hammer, because chips can fly off. Keep fingers away from the hammer. Leads and cells may get warm if left connected, so disconnect between tests. Wash hands afterwards.

## Method

1. Build the circuit in the figure, leaving a gap between two crocodile clips.
2. Look at each sample and record whether it is shiny or dull.
3. Place the sample across the gap and record the brightness of the lamp: 0 off, 1 dim, 2 medium, 3 bright.
4. Hold the magnet against the sample and record whether it is attracted.
5. Place the sample on the wooden block and tap it once, gently, and record whether it flattens or bends, or breaks and crumbles.
6. Repeat for every sample, disconnecting the circuit between tests.



Set-up for testing whether a sample conducts electricity (the lamp lights if the sample is a conductor).

## Results

A class in Mombasa recorded these sample results.

| Sample                 | Appearance          | Lamp brightness (0-3) | Magnet attracts? | Effect of tap |
|------------------------|---------------------|-----------------------|------------------|---------------|
| Copper wire            | shiny, orange-brown | 3                     | no               | flattens      |
| Iron nail              | shiny, grey         | 3                     | yes              | flattens      |
| Aluminium foil         | shiny, silver       | 3                     | no               | bends         |
| Pencil lead (graphite) | dull, dark grey     | 1                     | no               | crumbles      |
| Chalk                  | dull, white         | 0                     | no               | crumbles      |
| Candle wax             | waxy, white         | 0                     | no               | dents         |

## Analysis questions

### Question 1 Sorting the samples

Sort the six samples into "probably metals" and "probably not metals" using the results. State the tests that you used.

### Question 2 Percentage that conduct

Calculate the percentage of samples that lit the lamp, and the percentage of those conductors that are metals.

### Question 3 The graphite exception

Graphite is a form of carbon, a non-metal, yet it lit the lamp dimly. Explain how this affects your use of conduction as a test.

**Question 4 Using the magnet**

State what the magnet result tells you about iron, and whether magnetism is a test for all metals.

**Question 5 Elements and compounds**

Chalk is  $\text{CaCO}_3$  and candle wax is a mixture of carbon-hydrogen compounds. Explain why they cannot be given a single place in the periodic table.

**Question 6 Anomalous results**

The class found that one group got a lamp brightness of 0 for the iron nail. Suggest two possible causes and how to check.

**Question 7 Improving the test**

Suggest one change that would make the conduction test give numbers instead of a brightness scale.