

Ions in a sea of electrons

Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Lab

Name: _____ Date: _____ Class: _____

Does an alloy bend as easily as the pure metals it is made from? This lab counts how many bends four wires of the same thickness can take before they snap, which is a practical way to compare how easily the layers of atoms slide.

Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE C2

Aim

To compare how many times pure metals and alloys can be bent before they snap, and link the results to the structure of the metals.

Equipment

- 15 cm lengths of 1.0 mm wire: copper, aluminium, brass and steel (at least 3 of each)
- Bench clamp or vice with soft jaws
- Protractor, stopwatch, labels
- Goggles and work gloves

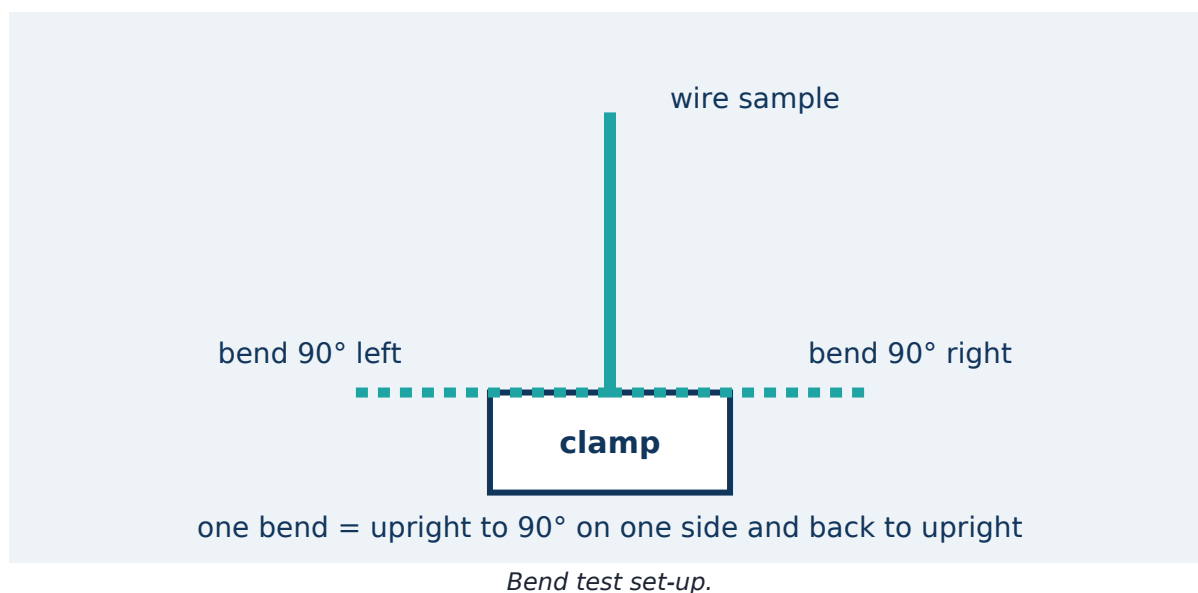
Safety

Safety

Wear goggles and gloves. Snapping wire ends are sharp and can fly off. Do not lean over the clamp, and put broken pieces straight into a tray.

Method

1. Clamp the first wire so that 8 cm stands upright above the jaws.
2. Bend the wire 90° to one side and back to upright at a steady speed. That counts as one bend.
3. Keep going and count the bends until the wire breaks. Record the number.
4. Repeat with two more pieces of the same metal, then test the other metals in the same way.



Results

Sample results from Diego's group:

Metal	Trial 1	Trial 2	Trial 3
Copper	11	13	12
Aluminium	8	7	9
Brass	5	6	11
Steel	3	2	4

Analysis questions

Question 1 Calculating the means

Identify the anomalous result, then calculate the mean number of bends for each metal. Leave the anomaly out.

Question 2 The pattern

Describe the pattern in your means and state which metals are pure metals.

Question 3 Explain with particles

Use the idea of layers of atoms to explain why copper survived more bends than brass.

Question 4 Anomalous result

Suggest two reasons for the anomalous brass result and say what you would do about it.

Question 5 Fair test

State three variables that must be controlled.

Question 6 Making it more reliable

Suggest two improvements so that the results can be trusted more.

Question 7 Uses

Explain why copper is used for wiring in houses but steel is used for the cables of a suspension bridge.