

WJEC (Wales) Chemistry GCSE

Specified Practical 1.3

Determination of the amount of hardness in water
using soap solution

[Method is taken from the [WJEC SP 1.3 Practical Specification](#)]

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Hardness in Water

Aim

To determine the amount of **hardness** in water using a **soap solution**.

Background

Soft water readily forms a **lather** with soap, but it is more difficult to form a lather with hard water. **Hard** water contains **dissolved compounds** such as magnesium or calcium. More soap is needed to form a lather with hard water as the calcium and magnesium ions react with the soap to form **scum**.

Temporary hard water contains calcium and magnesium hydrogencarbonate and becomes soft on boiling. **Permanent** hard water doesn't become soft when it's boiled.

Equipment list

- 100 cm³ conical flask and stopper
- Dropping pipette
- 50 cm³ measuring cylinder
- Water samples - **A, B, C, D**, boiled **A**, boiled **B**, boiled **C**, boiled **D**
- Stopwatch
- Soap solution

Method

1. Measure 50 cm³ of water sample **A** into a conical flask.
2. Add 1 cm³ of **soap solution** using a dropping pipette.
3. Insert the stopper and **shake vigorously** for 5 seconds.
4. Repeat step 2 until a **lather** forms and lasts for 30 seconds. Record the total volume of soap solution needed to create the lather.
5. Repeat steps 1-3 with 50 cm³ samples of all the other water samples.

Analysis

1. **Plot** volume of soap solution against water sample on a bar chart.
2. Use the results to **identify** which samples are soft water, temporary hard water and permanent hard water.

Safety Precautions

- Wear **safety goggles** as the soap solution made up in alcohol is an irritant.

