WJEC Chemistry GCSE

Specified Practical 1B

Separation of Liquids

[Methods are adapted from the Royal Society of Chemistry]

England Specification

1. Fractional Distillation

Aim

When solutions are boiled, pure water vapour is produced. This can be captured and condensed using a water-cooled condenser (distillation apparatus). Copper(II) sulphate solution is used in this method.

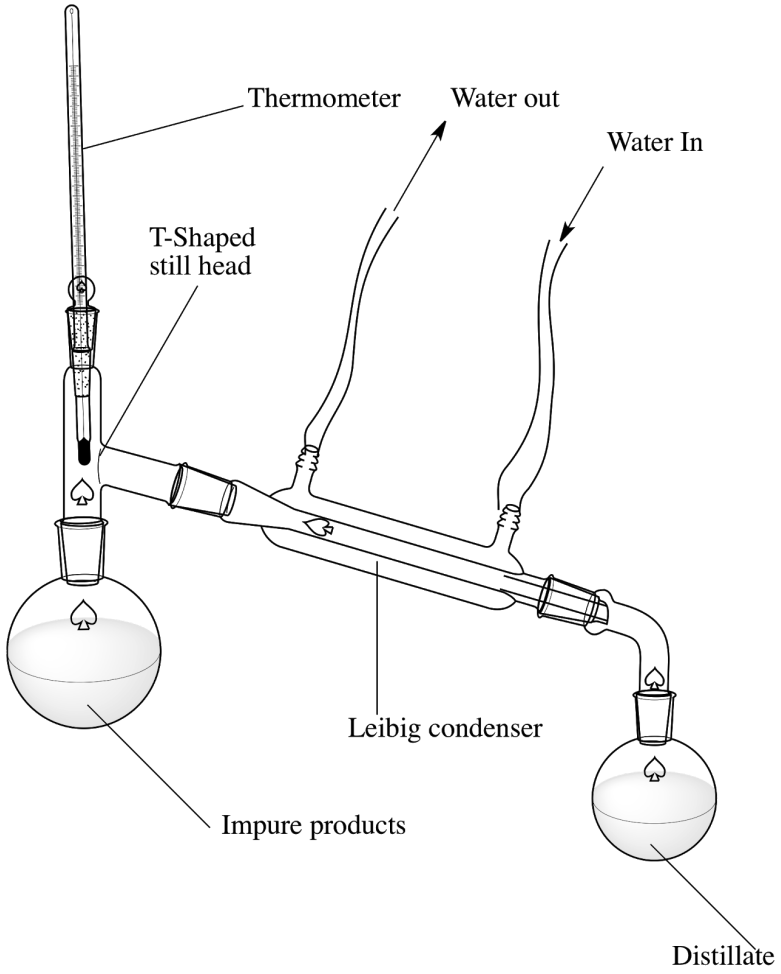
Equipment list

- Water-cooled (Liebig) condenser and connection tubing
- Quickfit apparatus
- Thermometer
- Stand, boss and clamp
- Bunsen burner
- Tripod and gauze
- Heat resistant mat
- Beaker (100 cm^3)
- Anti-bumping granules
- 1.0M copper(II) sulphate solution

Method

1. Set up the distillation apparatus (see diagram).
2. Place 30 cm^3 copper(II) sulfate solution and a few anti-bumping granules in the flask.
3. Turn on the water-cooled condenser with a slow flow of water.
4. Heat the solution until it boils gently.
5. Collect the distilled water from the condenser in the beaker.

Diagram



Safety Precautions

- Copper sulphate solution is harmful and dangerous for the environment.
- Make sure hair is tied back.
- Take care with the glass Quickfit apparatus as it can be fragile and smash.
- When the Bunsen burner is not in use, turn it off or leave it on the orange safety flame.

2. Paper Chromatography

Methods taken from the AQA Practical handbook

Aim

Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values.

Equipment List

- A 250 cm^3 beaker
- A wooden spill or pencil to support the chromatography paper
- Paper clip
- A ruler
- A pencil
- Distilled water
- Four known food colourings labelled A–D
- Unknown food colouring labelled U
- Rectangle of chromatography paper
- Five glass capillary melting point tubes

Method

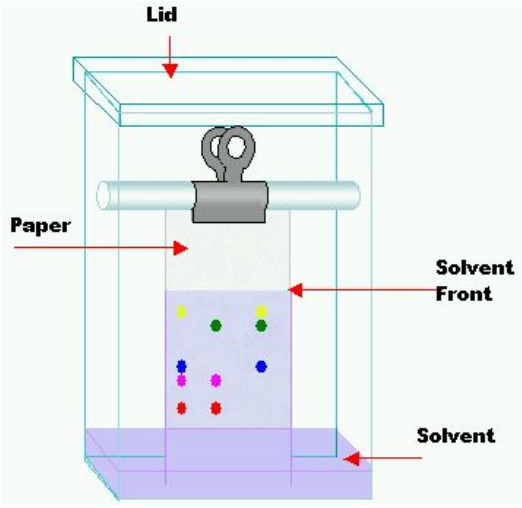
1. Draw a horizontal pencil line 2 cm from the short edge of the chromatography paper. Mark pencil spots at equal intervals across the line but not too close to the end of the paper.
2. Use a glass capillary tube to put a small spot of each colouring on the pencil spots. A small spot ensures that the colouring separates clearly. Label each spot in pencil.
3. Pour about 1 cm^3 of water into the beaker.
4. Suspend the paper in the beaker so that the bottom edge of the paper dips into the water.
5. Wait for the water solvent to travel at least three quarters of the way up the paper. Remove the paper and draw another pencil line at on the dry part of the paper right next to the wet edge. This is the solvent front, the distance travelled by the solvent.
6. Hang the paper up to dry thoroughly.
7. Calculate the R_f values for each spot. Rf value is calculated by distance travelled by substance/ solvent front.

Important Notes

- Make sure the pencil line is above the water surface, otherwise the colouring spots will dissolve into the water rather than rise up the paper

- Also make sure that the sides of the paper do not touch the beaker wall

Diagram



Analysis of Results

To identify substances in the food colouring compare Rf values to know Rf values in data books.

Safety Precautions

- Don't put food colouring in eyes, it may cause irritation.