CIE Chemistry IGCSE

Topic 2 - Experimental Techniques

Flashcards

Suggest apparatus that is suitable for measuring time, temperature and mass

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Time - stopwatch

Temperature - thermometer / temperature probe

Mass - digital mass balance

Suggest suitable apparatus for measuring volume

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Measuring cylinder

Burette

Pipette with pipette filler

What is paper chromatography used for?

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Separating and identifying a mixture of substances.

How does separation occur in paper chromatography?

How does separation occur in paper chromatography?

There is a stationary phase (chromatography paper) and a mobile phase (solvent).

Substances have different solubilities in the mobile phase so will travel at different rates causing separation. More soluble substances travel further.

Describe how you could use paper chromatography to separate a mixture of food colourings

Describe how you could use paper chromatography to separate a mixture of food colourings

- Draw a pencil line 2 cm from the bottom of chromatography paper.
- Place one dot of 3 known food colourings and one dot of the unknown mixture along the line. Label each dot.
- Place the chromatography paper in a beaker containing 1 cm of water.
- Wait for the water to travel up most of the paper and then remove the paper from the beaker and mark the height reached by the solvent. Dry the paper.
- Observe the chromatogram and record results.

Why should pencil be used to draw the line along the bottom of the chromatography paper?

Why should pencil be used to draw the line along the bottom of the chromatography paper?

It is insoluble in the solvent so will not affect the experiment.

Why should the solvent in the beaker be no deeper than 1cm for paper chromatography?

Why should the solvent in the beaker be no deeper than 1cm for paper chromatography?

If it is deeper, it will wash away the substances on the chromatography paper.

In paper chromatography, what is the stationary phase?

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The chromatography paper

In paper chromatography, what is the mobile phase?

In paper chromatography, what is the mobile phase?

The solvent

e.g. water or ethanol

What two things affect how long the molecules spend in each phase in paper chromatography?

What two things affect how long the molecules spend in each phase in paper chromatography?

- Their solubility in the mobile phase.
- Their attraction to the chromatography paper.

What is an Rf value?
(extended only)

What is an Rf value? (extended only)

A Rf value is the ratio between the distance travelled by the dissolved substance (the solute) and the distance travelled by the solvent.

How do you calculate Rf values?
(extended only)

How do you calculate Rf values? (extended only)

Rf =

$$\frac{\text{Distance travelled by substance}}{\text{Distance travelled by solvent}}$$

In paper chromatography, what affects the Rf value of a substance?

(extended only)

In paper chromatography, what affects the Rf value of a substance? (extended only)

The solvent.

Repeating the experiment with a different solvent will change the Rf value.

When measuring the distance moved by a substance on the chromatography paper, where should you measure between?

When measuring the distance moved by a substance on the chromatography paper, where should you measure between?

From the pencil baseline to the middle of the spot of the substance.

How many spots will be observed on a chromatogram of a pure substance?

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One

How can you identify that two mixtures contain a substance which is the same using a chromatogram?

How can you identify that two mixtures contain a substance which is the same using a chromatogram?

Both mixtures will produce different chromatograms but the position of one spot will match exactly.

How does solubility affect the distance a substance travels in paper chromatography?

How does solubility affect the distance a substance travels in paper chromatography?

A substance that is more soluble in the mobile phase will travel further up the chromatography paper.

How can paper chromatography be used if a mixture contains colourless substances? (extended only)

How can paper chromatography be used if a mixture contains colourless substances? (extended only)

Using locating agents

After the chromatogram has been produced, it is treated with a locating agent to make the spots visible.

What is a mixture?

What is a mixture?

A combination of two or more elements or compounds that are not chemically joined together.

What is a pure substance?

What is a pure substance?

A single element or compound not mixed with any other substance.

How can a pure substance be identified using melting or boiling points?

How can a pure substance be identified using melting or boiling points?

Pure substances have a sharp, exact melting and boiling point whereas impure substances will melt/boil over a range of temperatures.

Why is the purity of substances important in everyday life?

Why is the purity of substances important in everyday life?

Impurities in drugs may cause dangerous side effects.

Impurities in food and drink may cause health problems if ingested.

What method can be used to separate an insoluble salt from a solution? Describe the process

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Filtration:

- Put a piece of filter paper into a funnel and place over a conical flask.
- Pour the mixture into the funnel so that the liquid collects in the beaker. The insoluble salt is left on the filter paper.
- Pour deionised water into the funnel to wash any of the solution from the salt.
- Leave the salt to dry on the filter paper.

How can a soluble salt be separated from a solution? Describe the process

How can a soluble salt be separated from a solution? Describe the process

Crystallisation:

- Place the solution in an evaporating basin.
- Warm the solution gently so that the solvent starts to evaporate and the concentration of the solution increases.
- Remove from the heat and allow the mixture to cool before all the solvent evaporates.
- Leave to evaporate without heating. Dry and collect the crystals.

When is simple distillation used as a separating technique?

When is simple distillation used as a separating technique?

To separate and purify a liquid from a mixture of liquids. It is suitable when the liquids have different boiling points.

Describe how to separate a mixture of water and ethanol using simple distillation

Describe how to separate a mixture of water and ethanol using simple distillation

- Pour the mixture into a round bottomed flask and connected to a condenser (water should flow in at the bottom and out at the top). Place a beaker at the outlet.
- Slowly heat the flask until the ethanol starts to vaporise. Since ethanol has a lower boiling point than water, the ethanol evaporates first then condenses in the condenser before being collected in the beaker.

What mixture is fractional distillation commonly used to separate?

What mixture is fractional distillation commonly used to separate?

Crude oil

Describe how fractional distillation separates crude oil

Describe how fractional distillation separates crude oil

- The crude oil is heated until it evaporates.
- The vapours enter a fractionating column. The column has a temperature gradient (hottest at the bottom).
- The vapours rise up the column and substances condense at different fractions depending on their boiling points.