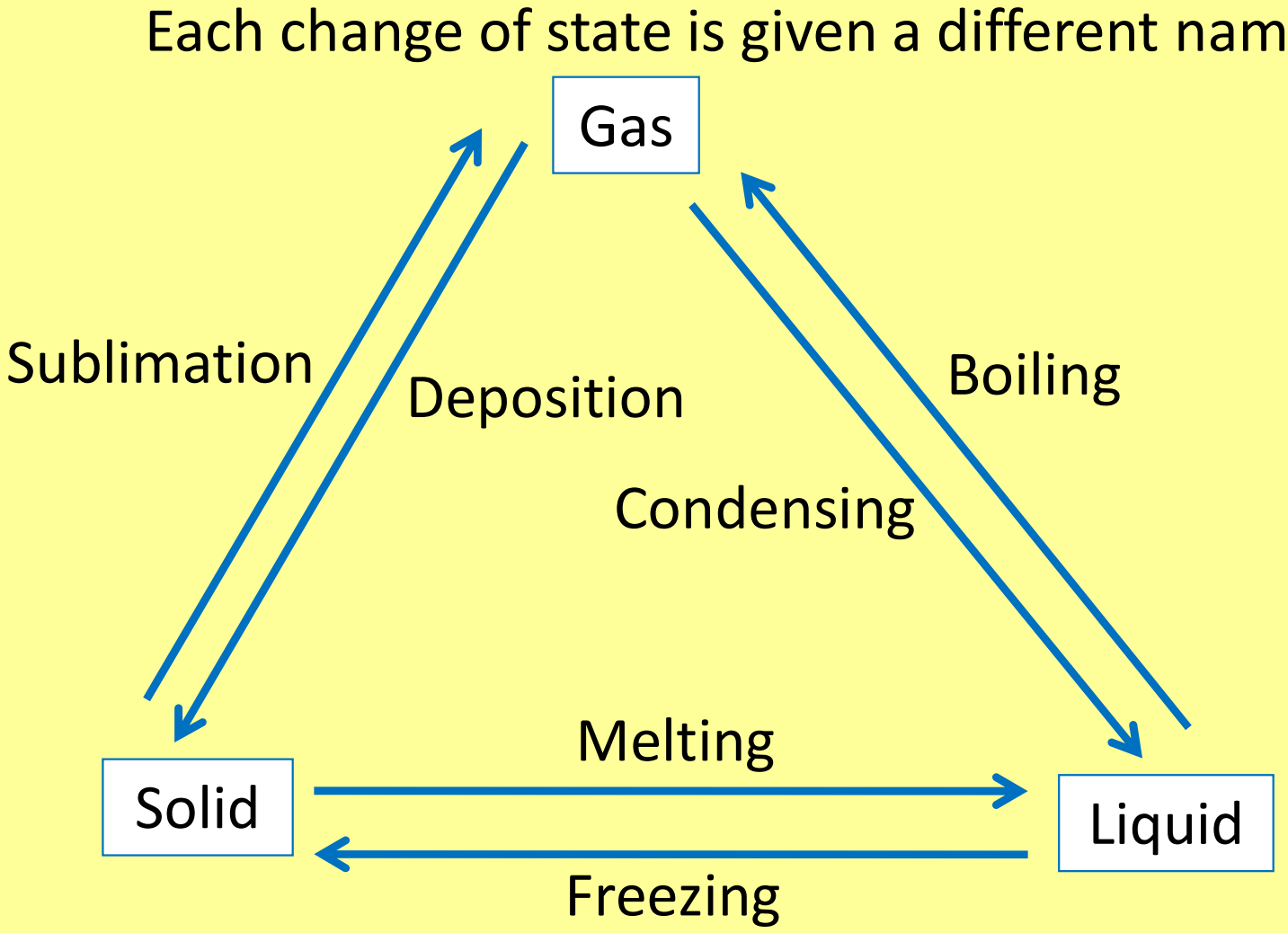
Retrieval; add arrows between the states and name the process



Topic: Chemistry

Wednesday, 24 June 2026

C3 States & separating/ purifying

What are we learning: Particle model for states of matter & experimental methods for filtration, crystallisation, chromatography & distillation

Why are we learning: To be able to suggest improvements in experimental methods to separate & purify substances

Success criteria:

Describe how to carry out experimental methods

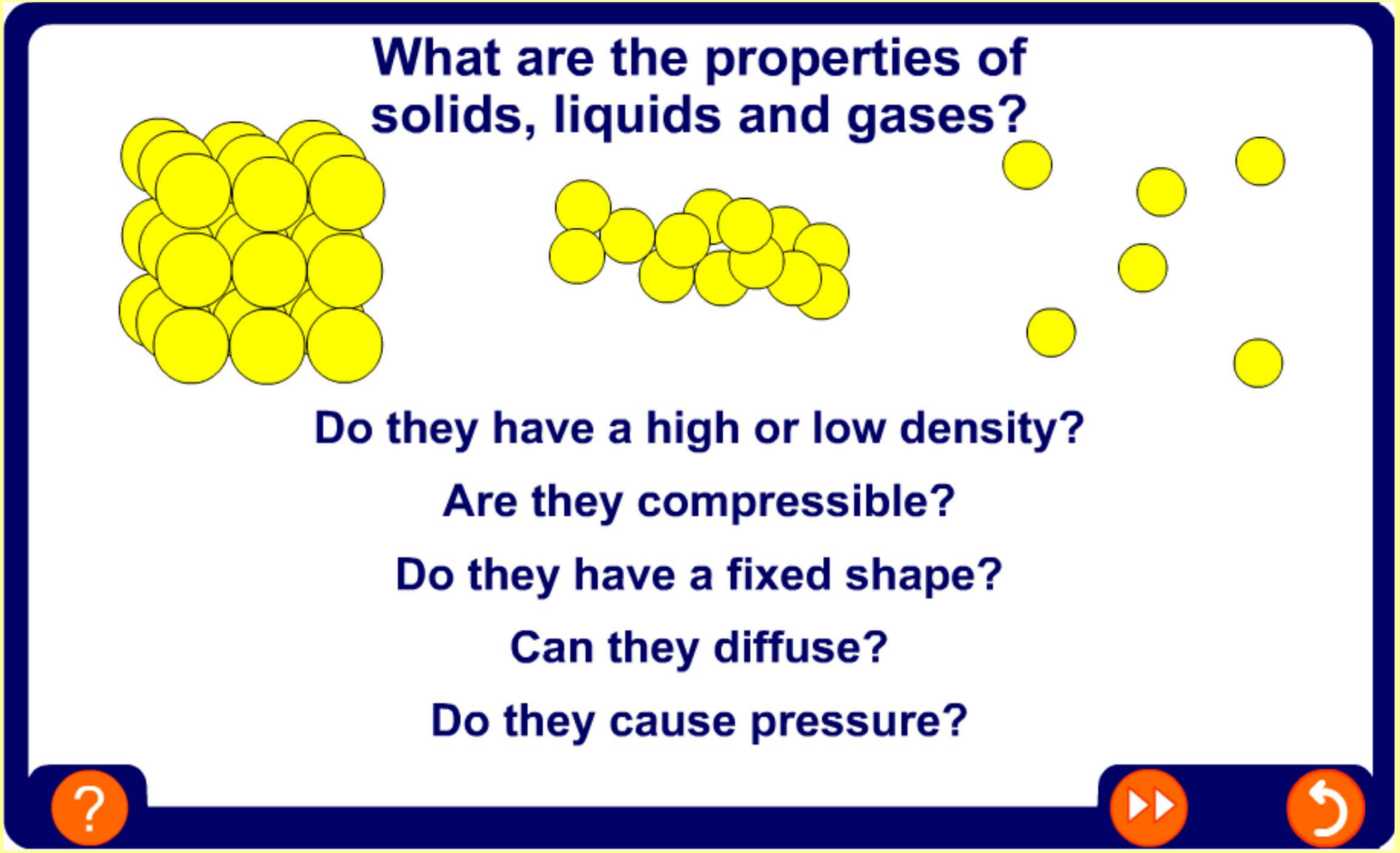
Evaluate methods used as suggestions for improvement

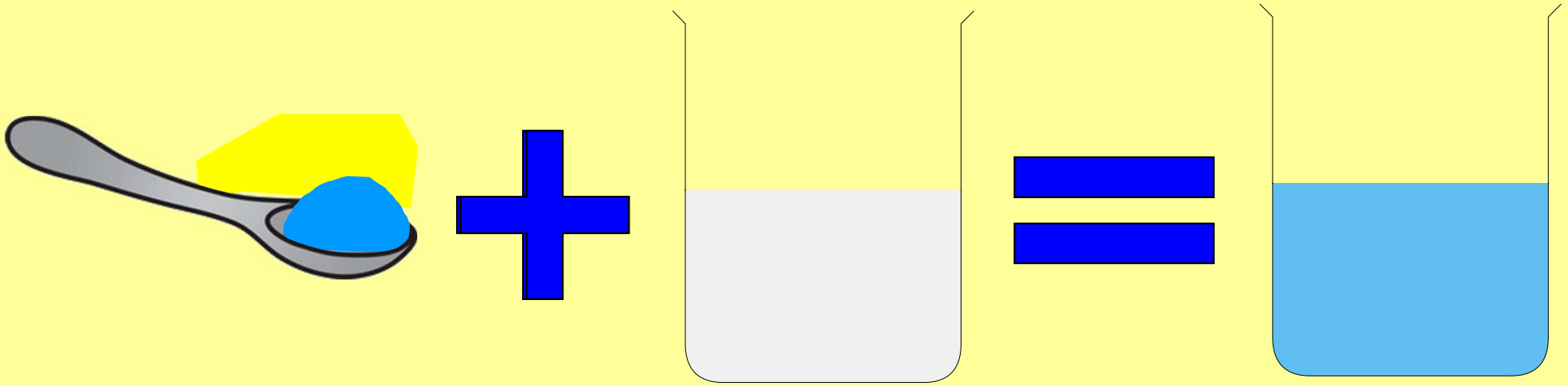
Explain why these methods are useful to separate & purify substances

Filtration	crystallization	Simple distillation
Fractional distillation	chromatography	electrolysis

Key ideas 10 mins

Properties of solids, liquids and gases





Solute Solvent Solution

Modelling ideas 25 mins

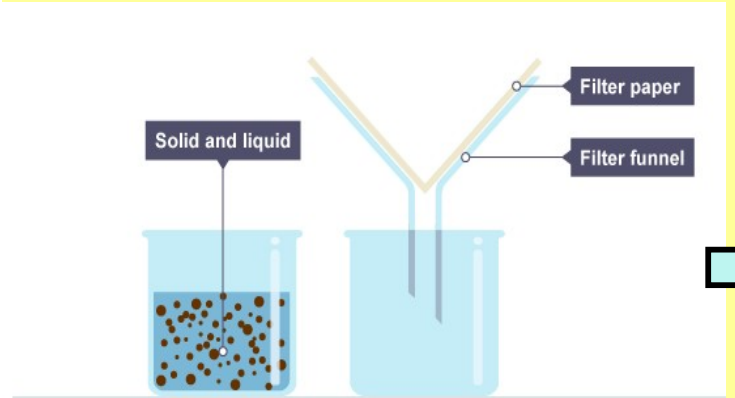
- States of matter
- Ways to separate materials

Filtration

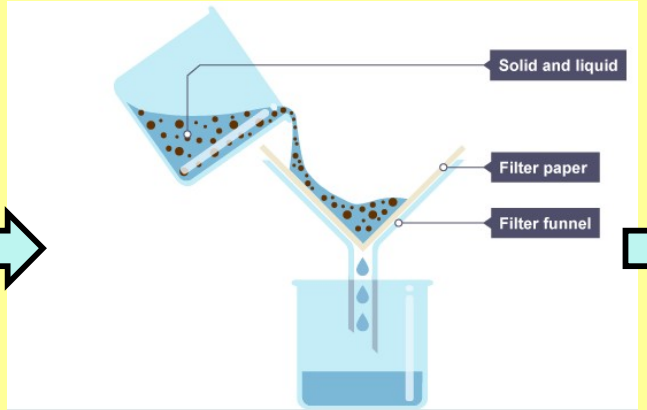
If a substance does not dissolve in a solvent, we say that it is insoluble. For example, sand does not dissolve in water, it is insoluble.

Filtration is a method for separating an insoluble solid from a liquids. When a mixture of sand and water is filtered:

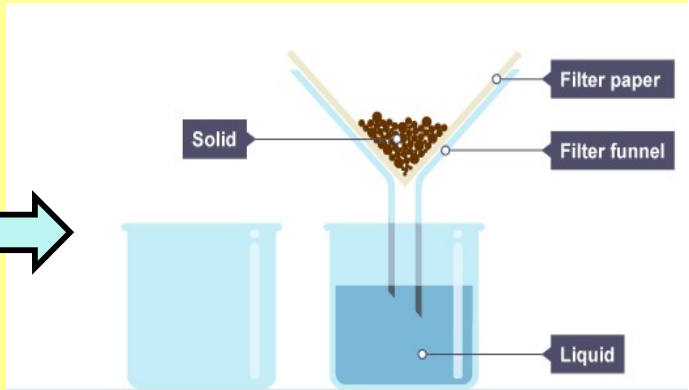
- The sand stays behind in the filter paper (to become the residue)
- The water passes through the filter paper (to become the filtrate)



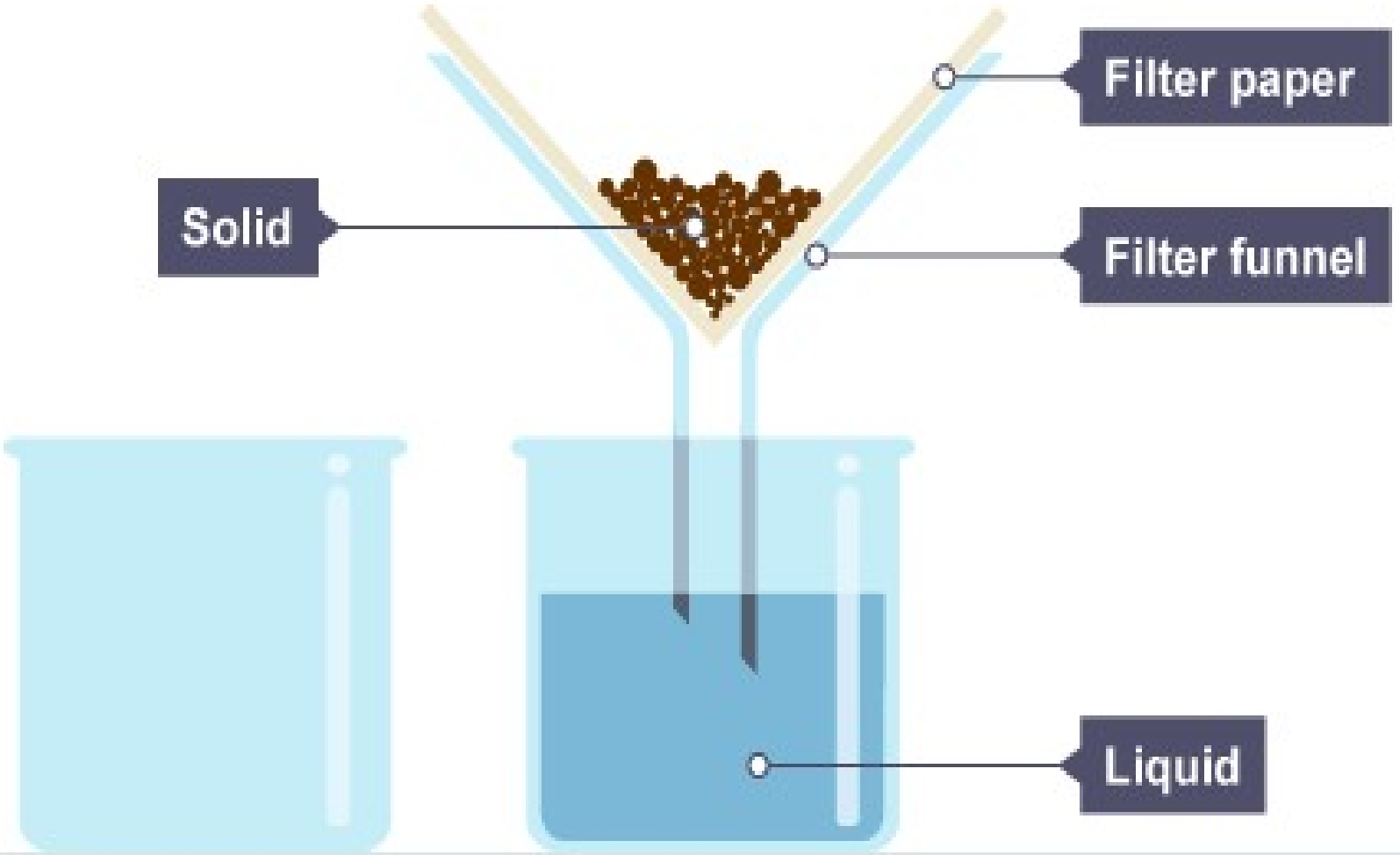
A beaker containing a mixture of insoluble solid and liquid. There is filter paper in a filter funnel above another beaker.



The mixture of insoluble solid and liquid is poured into the filter funnel.



The liquid particles are small enough to pass through the filter paper as a filtrate. The solid particles are too large to pass through the filter paper and stay behind as a residue.

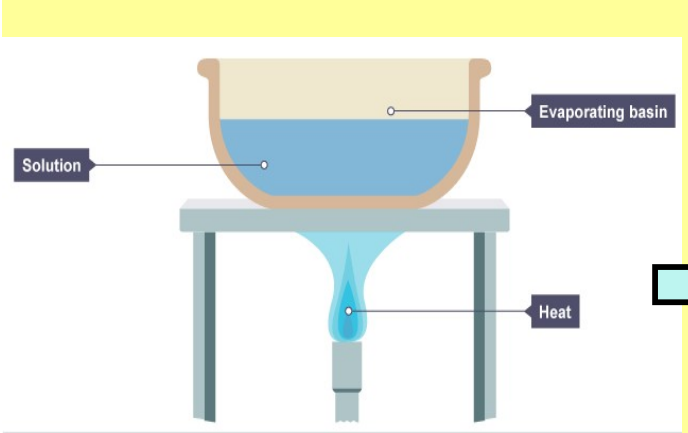


The liquid particles are small enough to pass through the filter paper as a filtrate. The solid particles are too large to pass through the filter paper and stay behind as a residue.

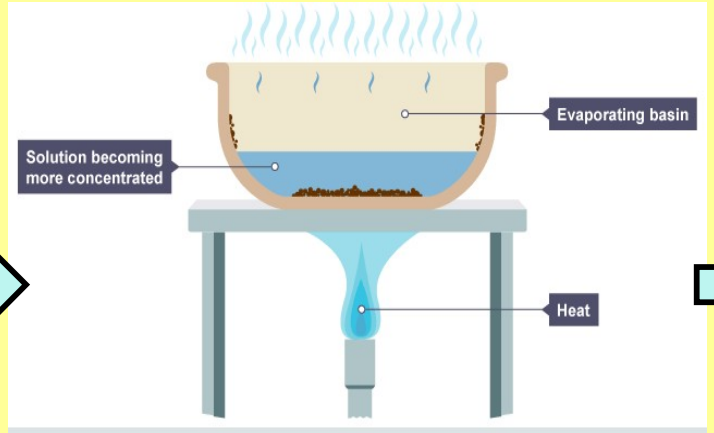
Crystallisation

Evaporation is used to separate a soluble solid from a liquid. For example, copper sulphate is soluble in water – its crystals dissolve in water to form copper sulphate solution.

During evaporation the water evaporates away, after a period of time all of the water will evaporate away leaving solid copper sulphate crystals behind.

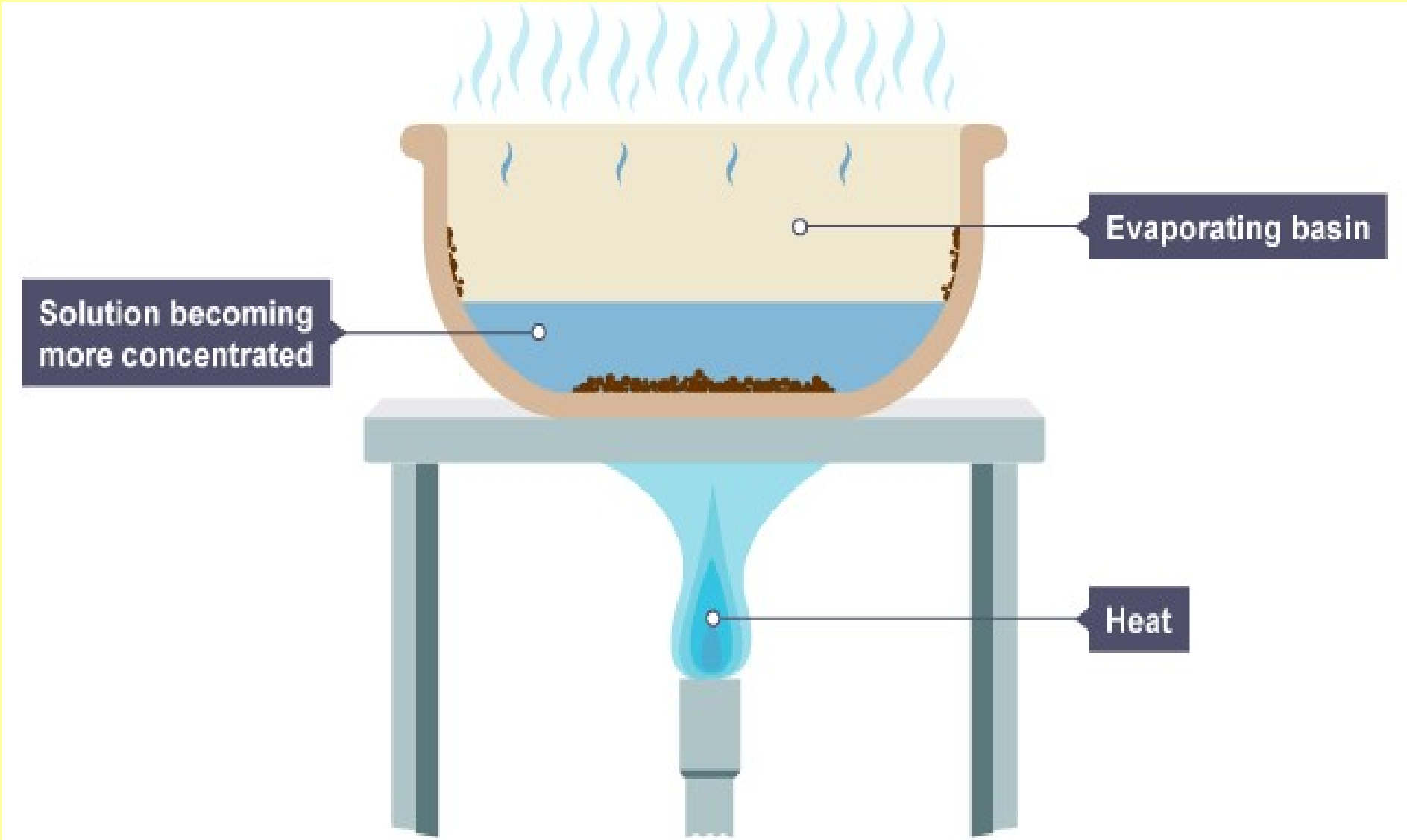


A solution is placed in an evaporating basin and heated with a Bunsen burner.



The volume of the solution has decreased because some of the water has evaporated. Solid particles begin to form in the basin.

All the water has evaporated, leaving solid crystals behind.

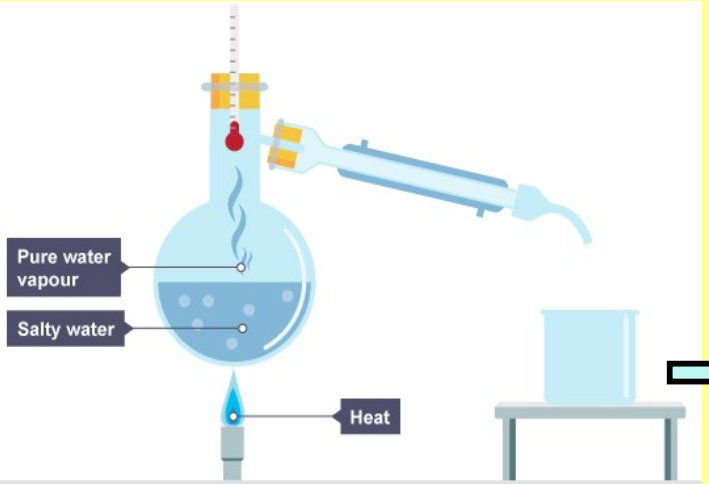


The volume of the solution has decreased because some of the water has evaporated. Solid particles begin to form in the basin.

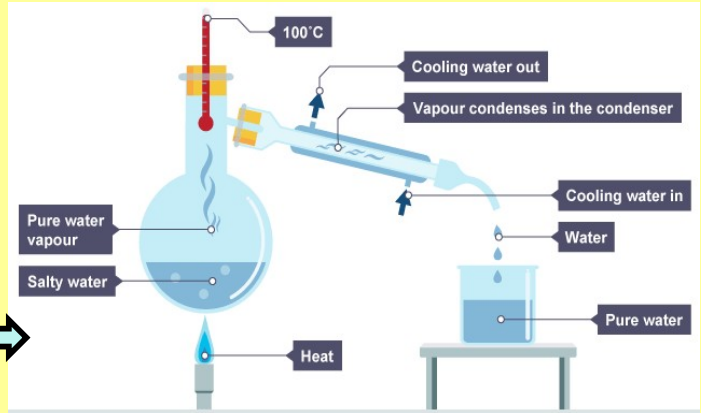
Simple distillation

Simple distillation is a method for separating the solvent from a solution. For example, water can be separated from salt solution by simple distillation. This method works because water has a much lower boiling point then salt.

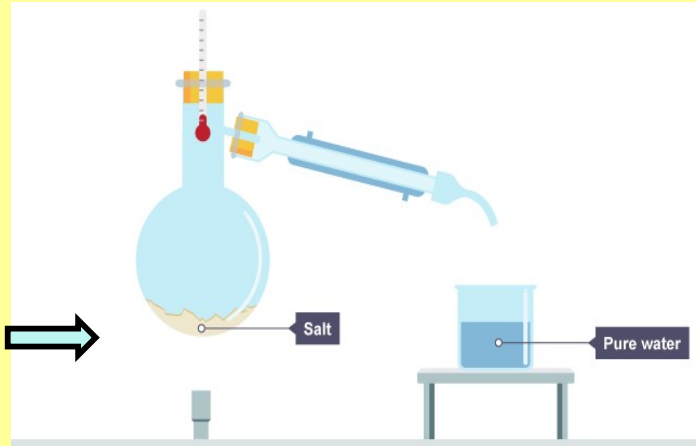
When the solution is heated, the water evaporates. It is then cooled and condensed into a separate container, the salt does not evaporate and stays behind.



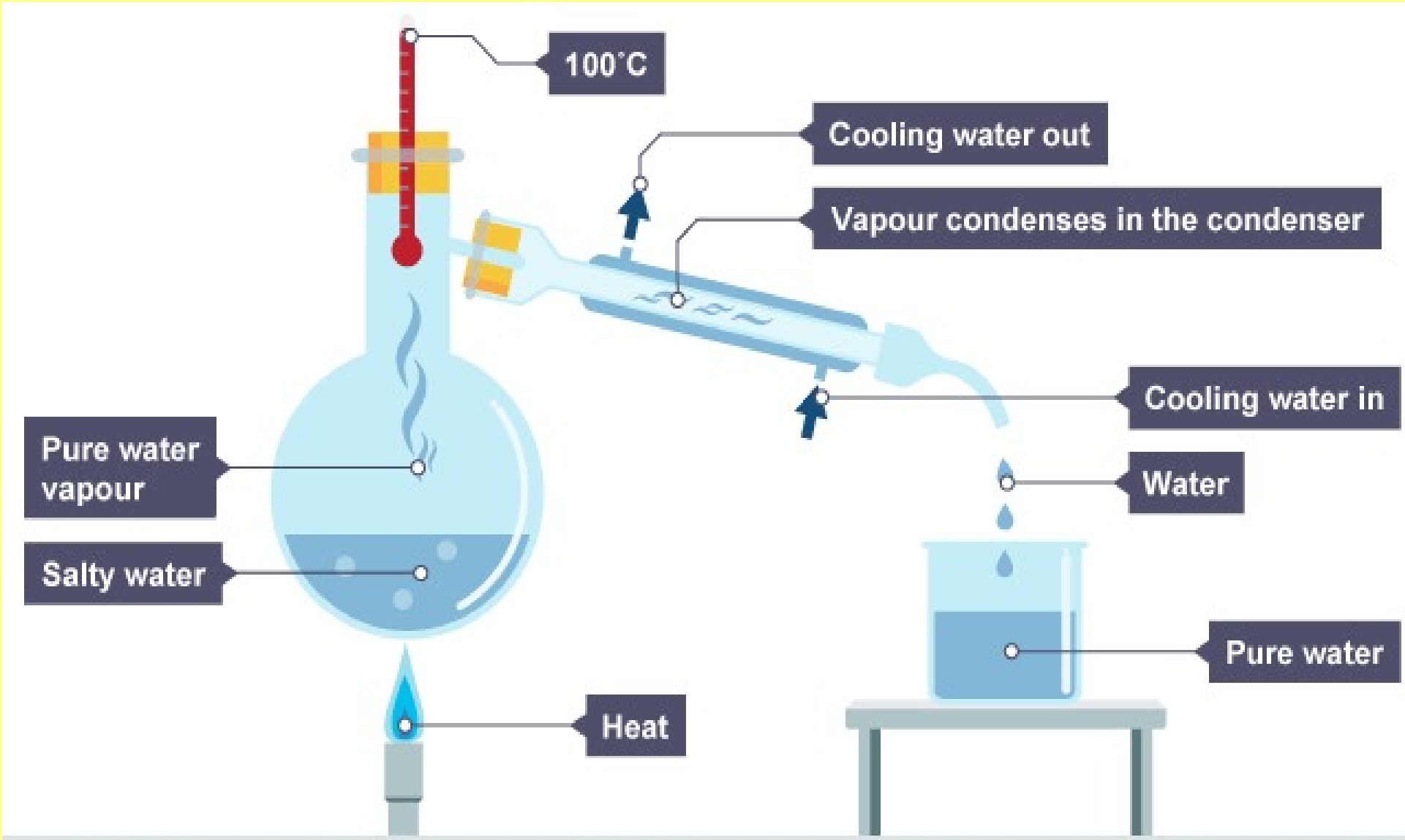
Salt solution is heated.



Water evaporates and its vapours rise. The water vapour passes into the condenser, where it cools and condenses. Liquid water drips into a beaker.



All the water has evaporated from the salt solution, leaving the salt behind

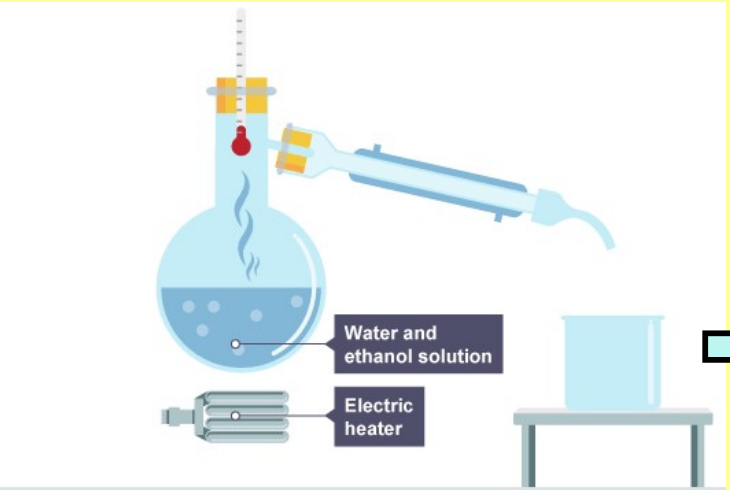


Water evaporates and its vapours rise. The water vapour passes into the condenser, where it cools and condenses. Liquid water drips into a beaker.

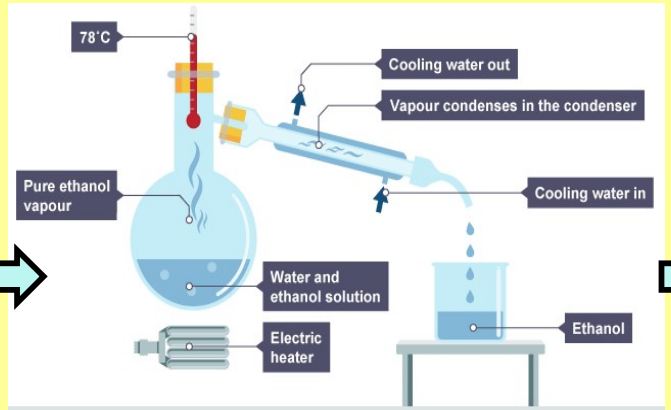
Fractional distillation

Fractional distillation is a method for separating a liquid from a mixture of two or more liquids. For example, liquid ethanol can be separated from a mixture of ethanol and water by fractional distillation.

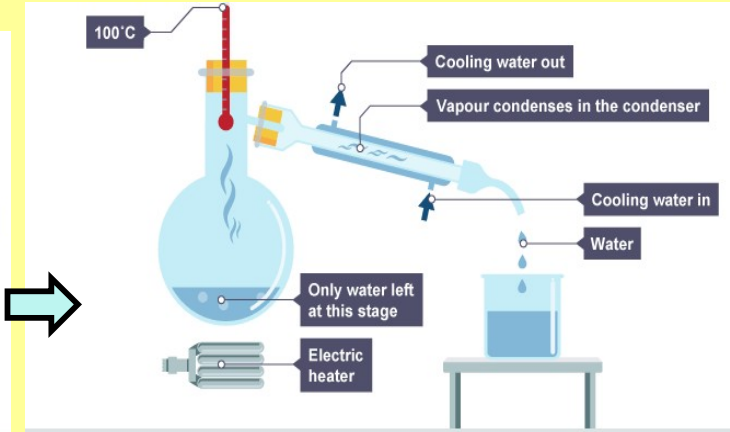
This method works because the liquids in the mixture have different boiling points. When the mixture is heated, one liquid evaporates and can therefore be collected before another.



A water and ethanol mixture is heated in a flask using an electric heater. Vapour forms in the air above the mixture in the flask.



The boiling point of ethanol is 78°C. Ethanol vapour passes into the condenser, where it is cooled and condensed. Liquid ethanol drips into a beaker.

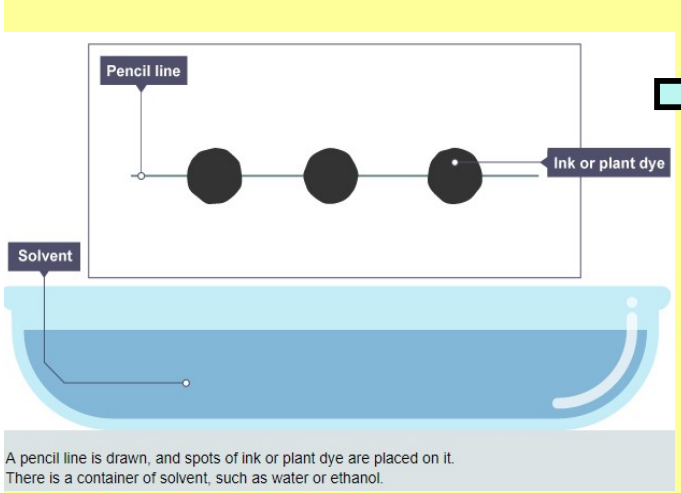


When most of the ethanol has left, water vapour at 100°C passes into the condenser, where it is cooled and condensed. Liquid water now drips into the beaker.

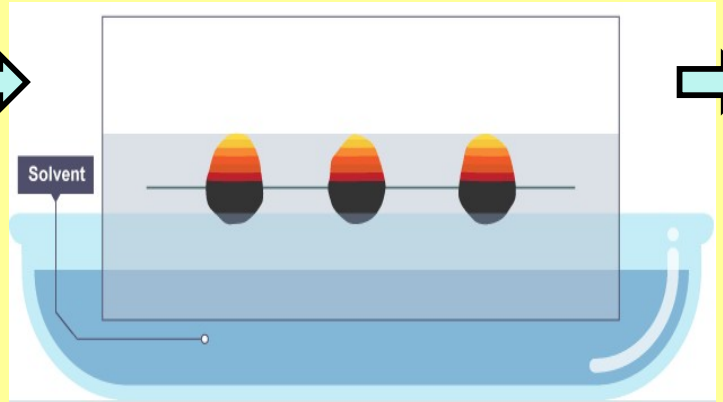
Chromatography

Paper chromatography is a method for separating dissolved substances from one another. It is often used when the dissolved substances are coloured, such as inks, food colourings and plant dyes.

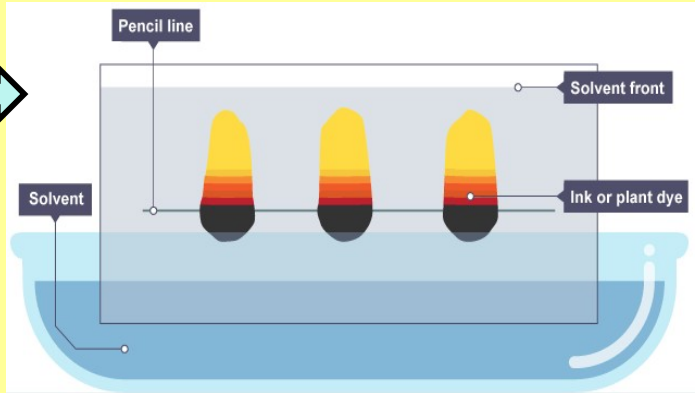
It works because some of the coloured substances dissolve in the solvent used much better than others, and so they travel further up the paper.



A pencil line is drawn, and spots of ink or plant dye are placed on it.
There is a container of solvent, such as water or ethanol.



The paper is lowered into the solvent. The solvent travels up through the paper, taking some of the coloured substances with it.

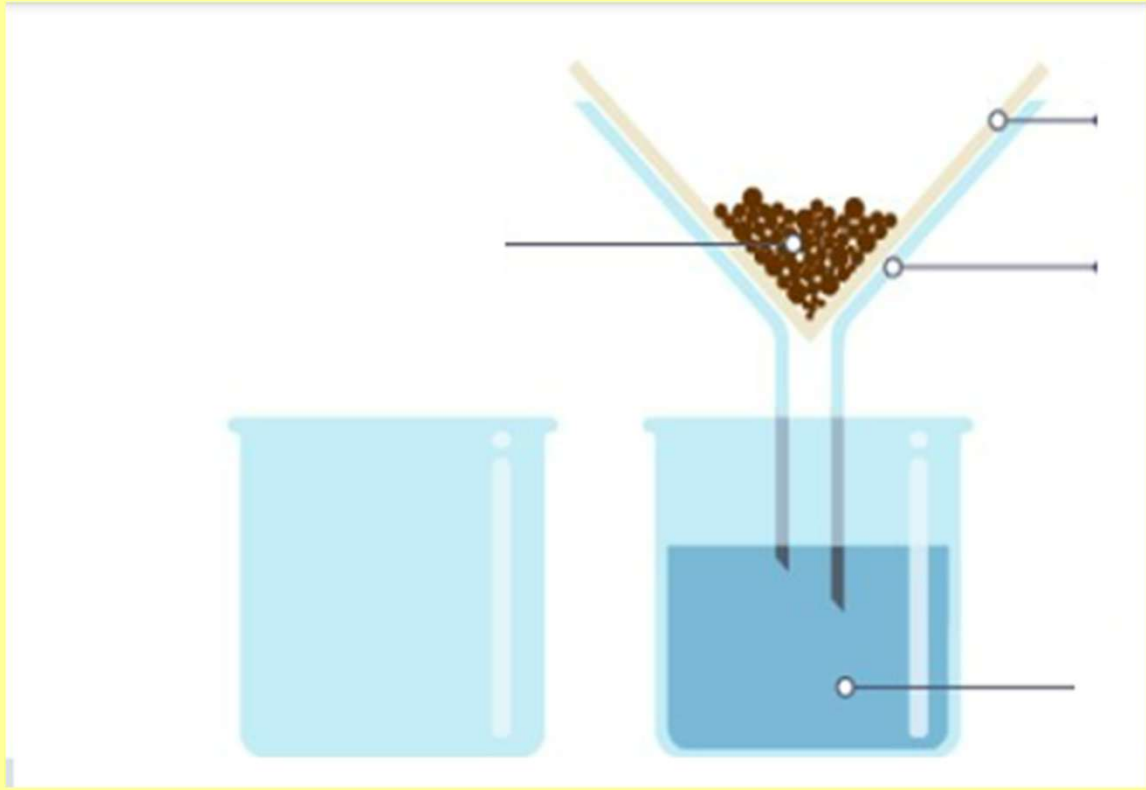


As the solvent continues to travel up the paper, the different coloured substances spread apart. In this example, the colours separated substances are yellow, red and black.

Filtration

Type of solution involved:

What happens:

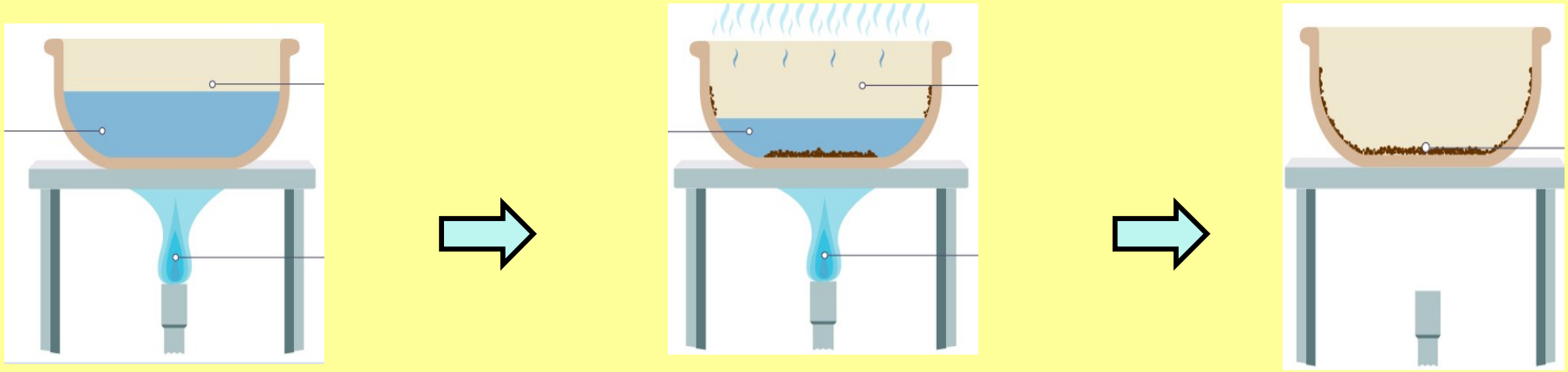


Crystallisation

Main process involved:

Type of solution involved:

What happens:



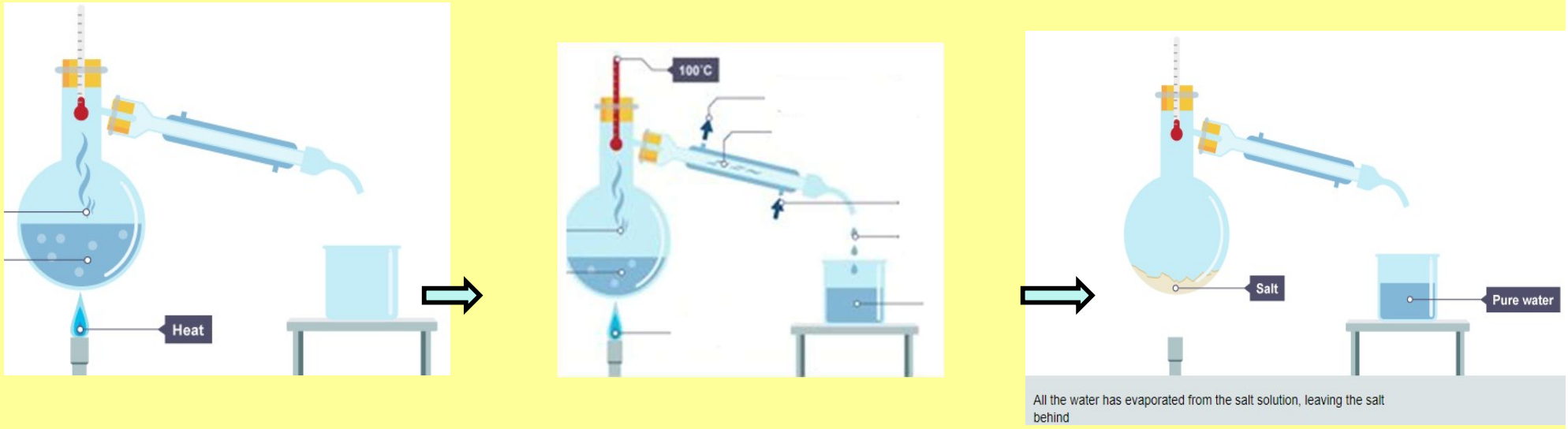
Simple distillation

Main process involved:

Type of solution involved:

What happens:

Why does this work with these types of solutions?



Fractional distillation

Main process involved:

Type of solution involved:

What happens:

Why does this work with these types of solutions?

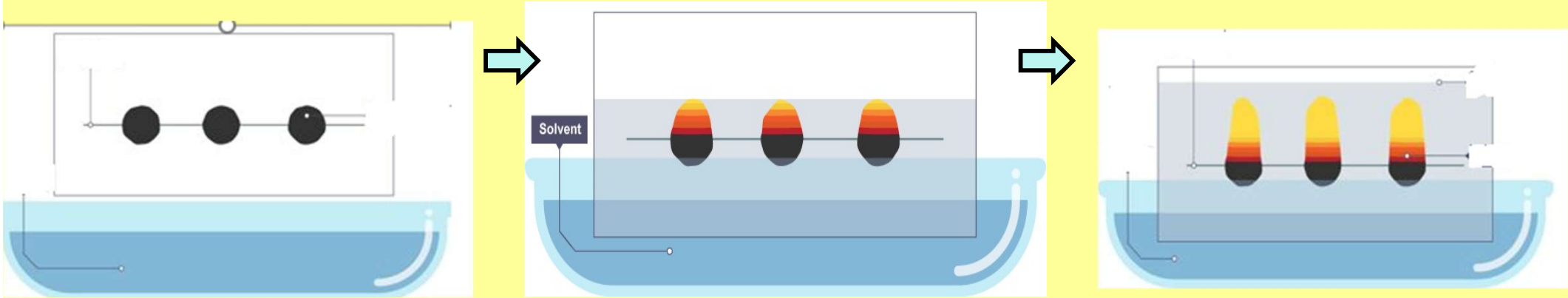
Chromatography

Main process involved:

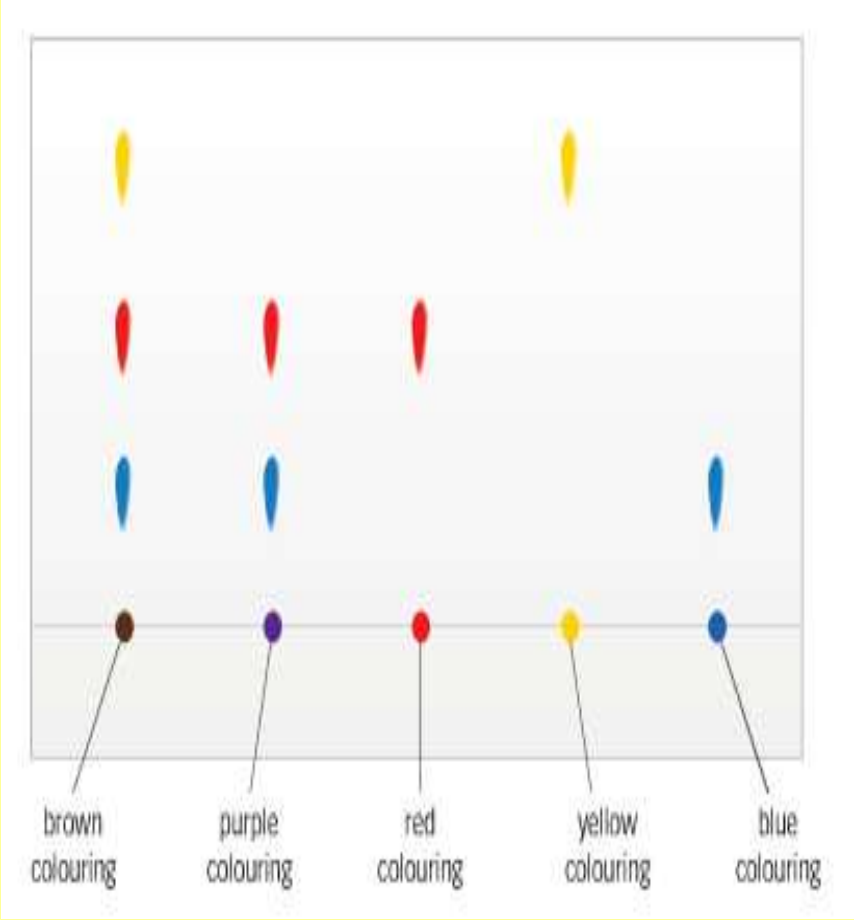
Type of solution involved:

What happens:

Why does this work with these types of solutions?



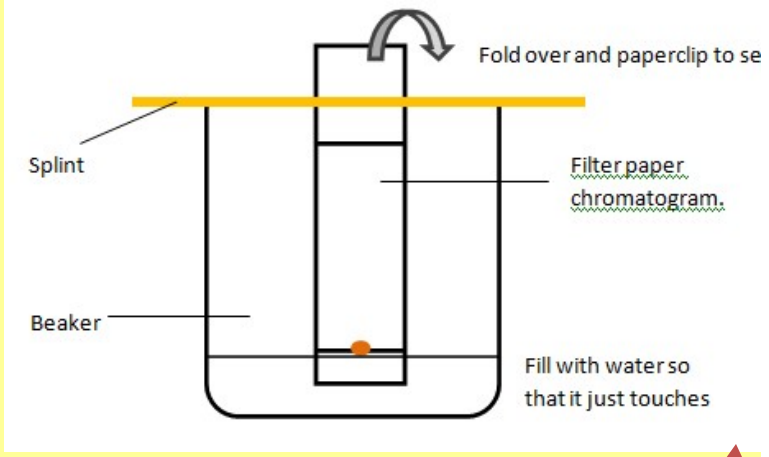
Paper Chromatography



- Water/ solvent (mobile phase) carries these compounds across the paper
- Paper (stationary phase) is stained with the food dye as the mobile phase travels along

https://www.youtube.com/watch?v=PvHvx7k7UPU

Core practical; use instructions on your sheet



1. Get paper strip and mark a
1cm line from the bottom using pencil
2. Press a pen nib onto your line
3. Let this dry slightly, then reapply to ensure enough ink is present
4. Continue to do this with the other pen inks
5. Put a small amount of water in a small beaker
6. Place your paper sample so that the end touches the water but not up to the sample line
7. Leave this to form your chromatogram
8. Take the paper out to dry, compare your results

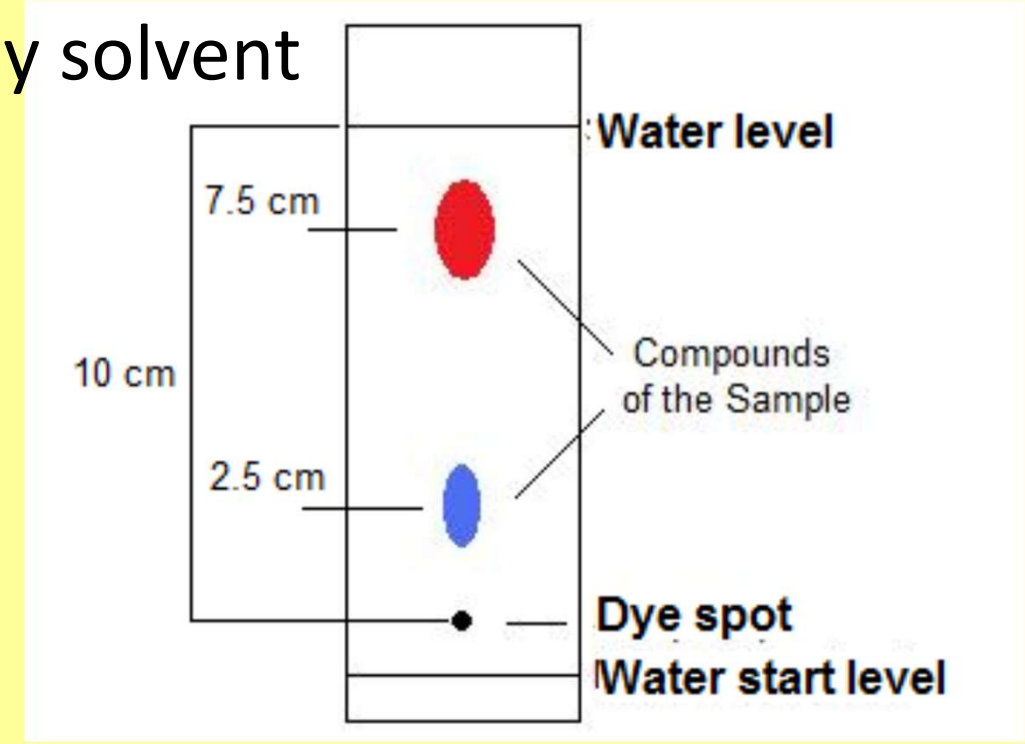
Conclusions to Chromatography

- Calculate the R_f value for each pen ink from your chromatogram. Draw table of answers in your lab book
- Rf = $\frac{\text{distance travelled by spot}}{\text{distance travelled by solvent}}$

Red sample =

Blue sample =

Answer always less than 1



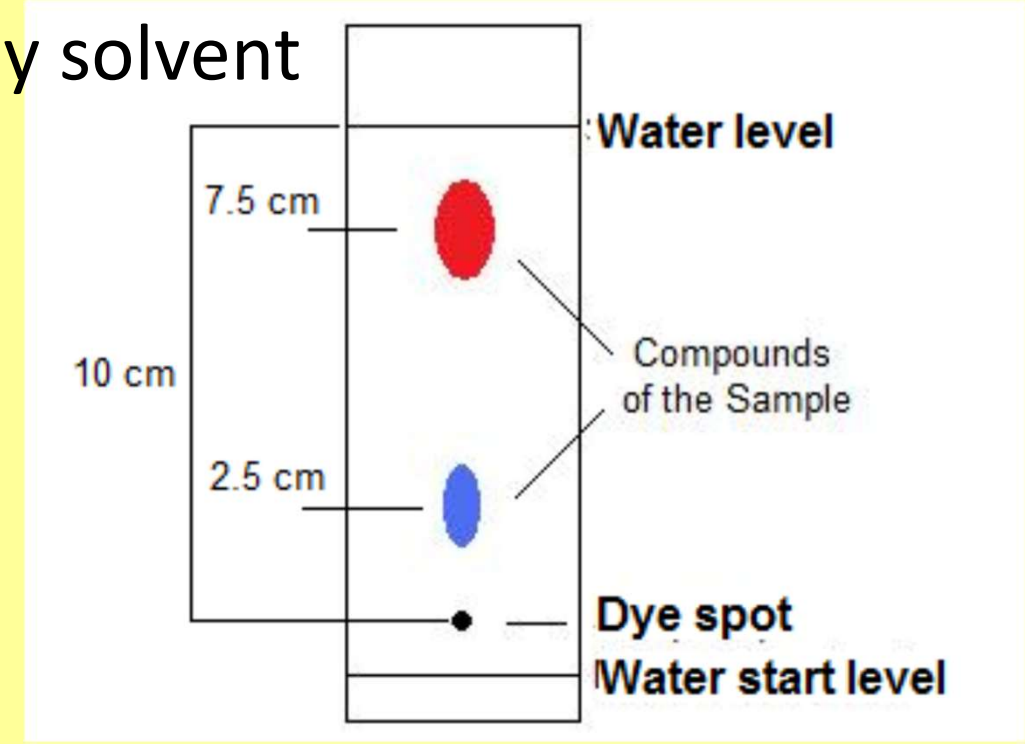
Conclusions to Chromatography

- Calculate the R_f value for each pen ink from your chromatogram. Draw table of answers in your lab book
- Rf = $\frac{\text{distance travelled by spot}}{\text{distance travelled by solvent}}$

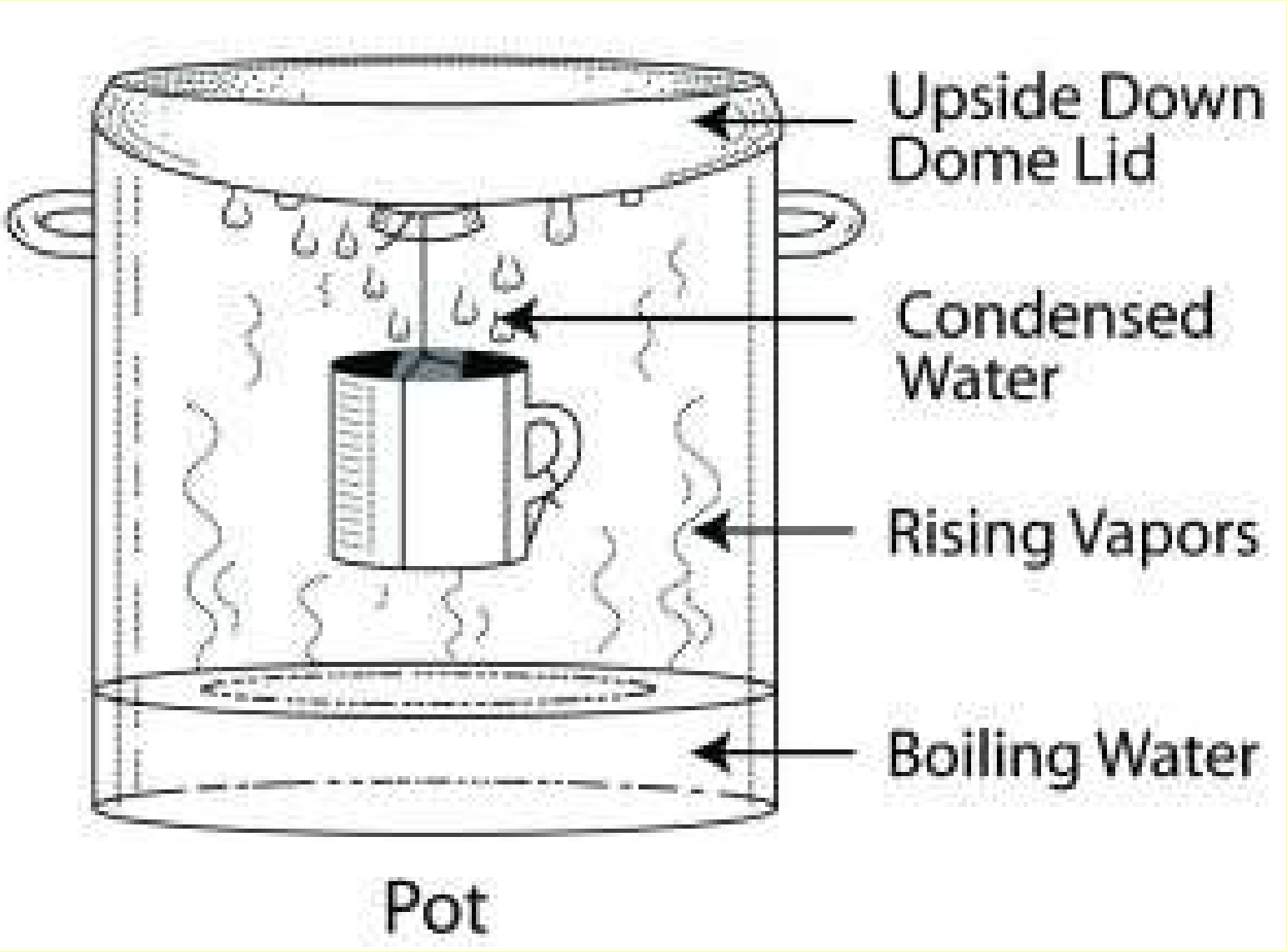
Red sample = 7.5 / 10 = 0.75

Blue sample = 2.5 / 10 = 0.25

Answer always less than 1



Purifying sea water; desalination

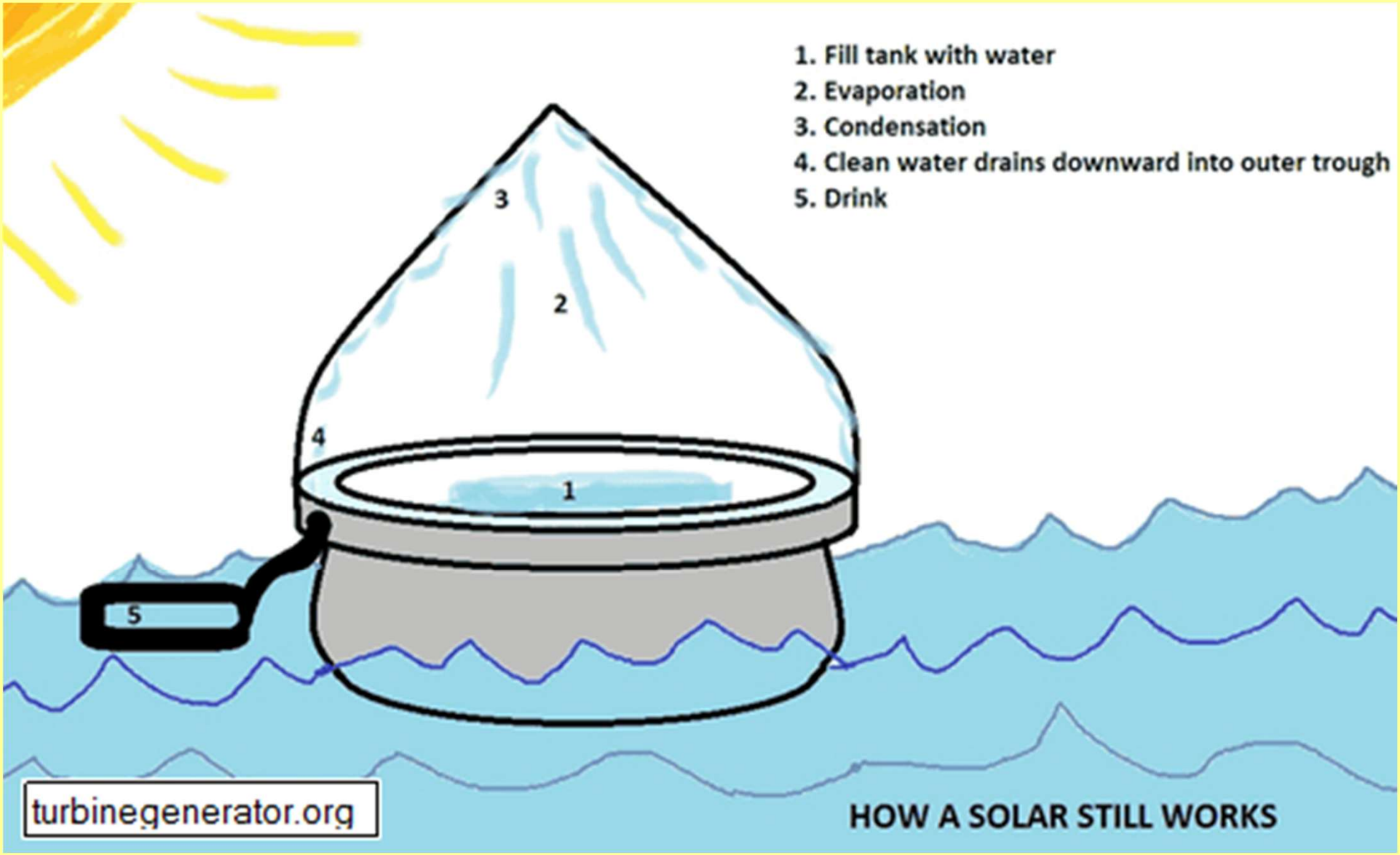


+ve simple distillation

+ve little equipment used

-ves?

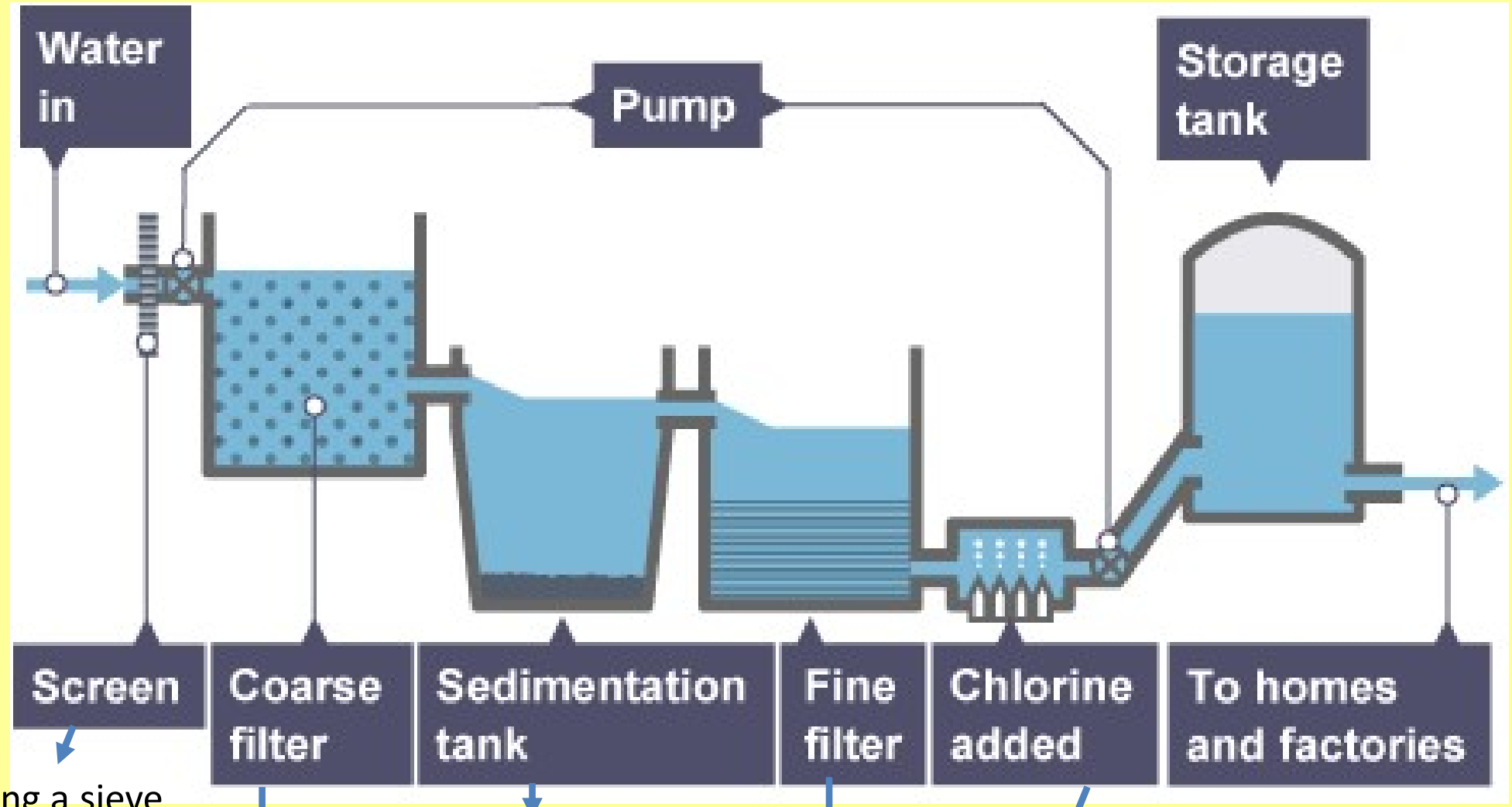
Bad taste
Expensive to heat
No good salts
High salt returned to sea


1. Fill tank with water
2. Evaporation
3. Condensation
4. Clean water drains downward into outer trough
5. Drink
3
2
4
1
5
turbinegenerator.org
HOW A SOLAR STILL WORKS

Drinking water

From rivers, lakes or aquifers (underground rocks with groundwater)

Contains; leaves, grit + silt (insoluble), salts+ pesticides + fertilisers (soluble), bacteria + microorganisms



Using a sieve

Filtration

Small particles settle

Filtration

Kill microorganisms

- Water is filtered to remove dirt, grit, leaves
- Treat the water with Chlorine to kill microorganism (bacteria)
- Desalination = remove salt from water

Exam questions 15 mins

Topic: Chemistry

Wednesday, 24 June 2026

C3 States & separating/ purifying; plenary

What are we learning: Particle model for states of matter & experimental methods for filtration, crystallisation, chromatography & distillation

Why are we learning: To be able to suggest improvements in experimental methods to separate & purify substances

Success criteria:

Describe how to carry out experimental methods

Evaluate methods used as suggestions for improvement

Explain why these methods are useful to separate & purify substances

Highlight key facts from today's lesson

Rank ☺ :/ ☹ confidence

SENECA topics: 2.1, 2.2