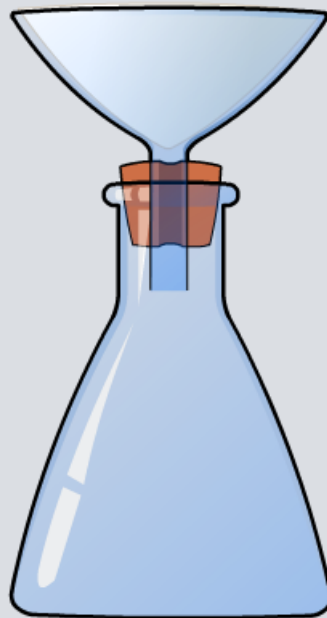


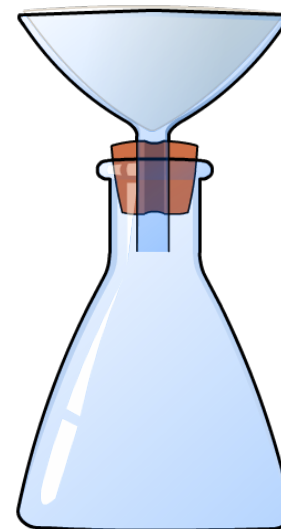
Separating Mixtures



How are solids separated out of mixtures?

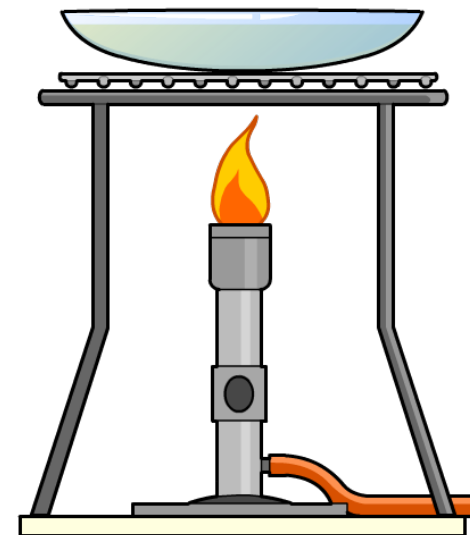
Separating an insoluble solid and a liquid:

- If a solid is insoluble (e.g. sand in water), then it is easy to separate it by **filtering** the mixture.
- The insoluble solid cannot pass through the filter paper, but the water can.

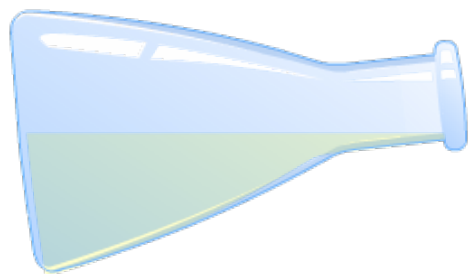


Separating a soluble solid and a liquid:

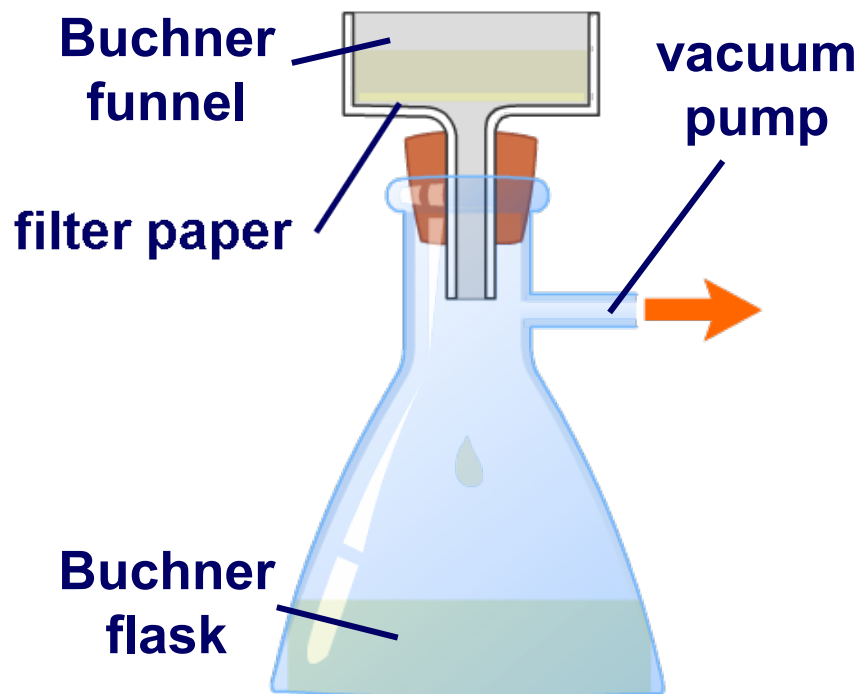
- To separate a soluble solid from a liquid (e.g. salt and water), **evaporation** can be used.
- The solution is heated so that the water evaporates and leaves the dissolved solid behind.



Isolating the precipitate



The precipitate from a precipitation reaction can be separated from the reaction mixture by filtration.



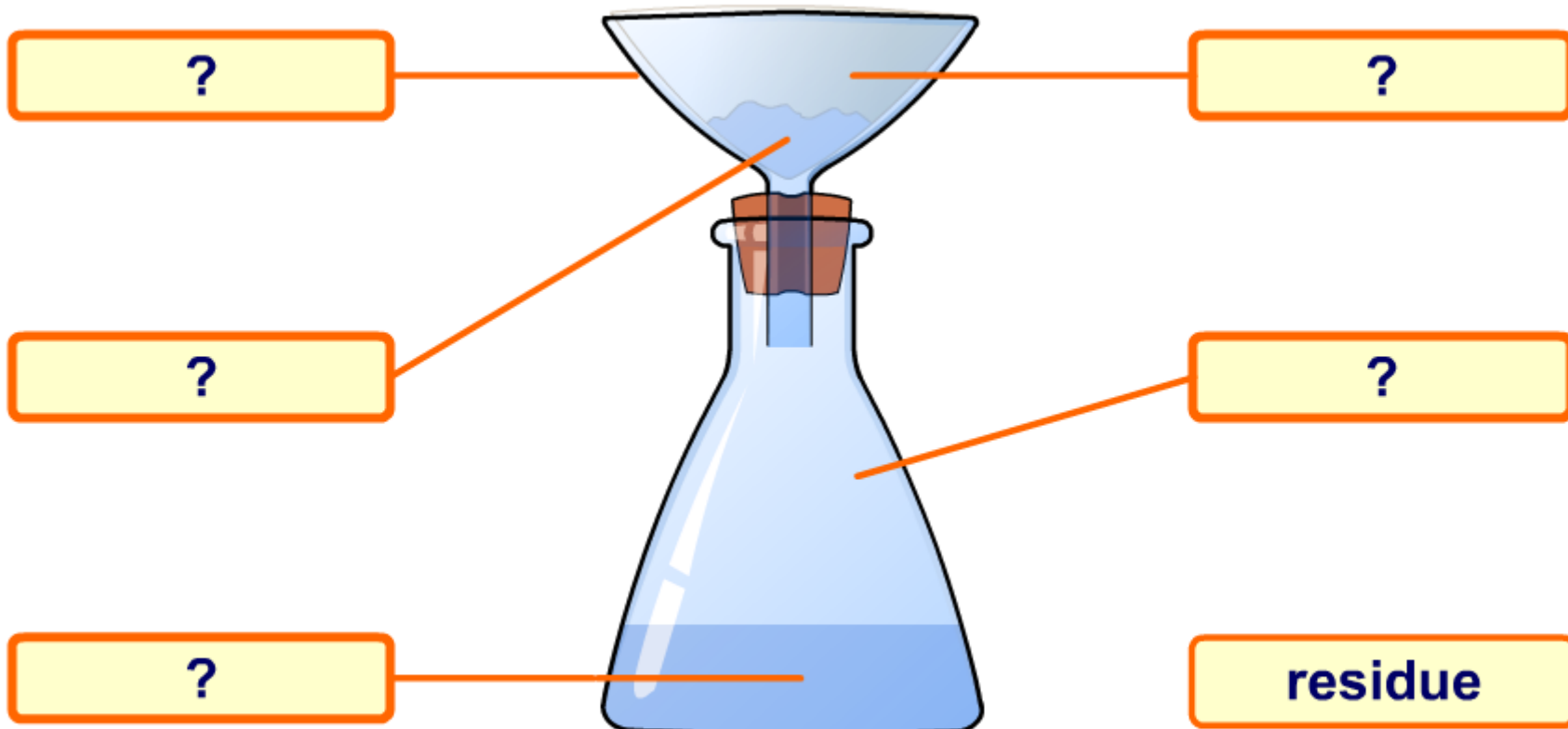
A **Buchner funnel** and flask can be used to accelerate the process.

This apparatus uses a vacuum pump to draw the mixture through the filter.

The filtrate is finally washed and dried.



What apparatus is used for filtering substances?



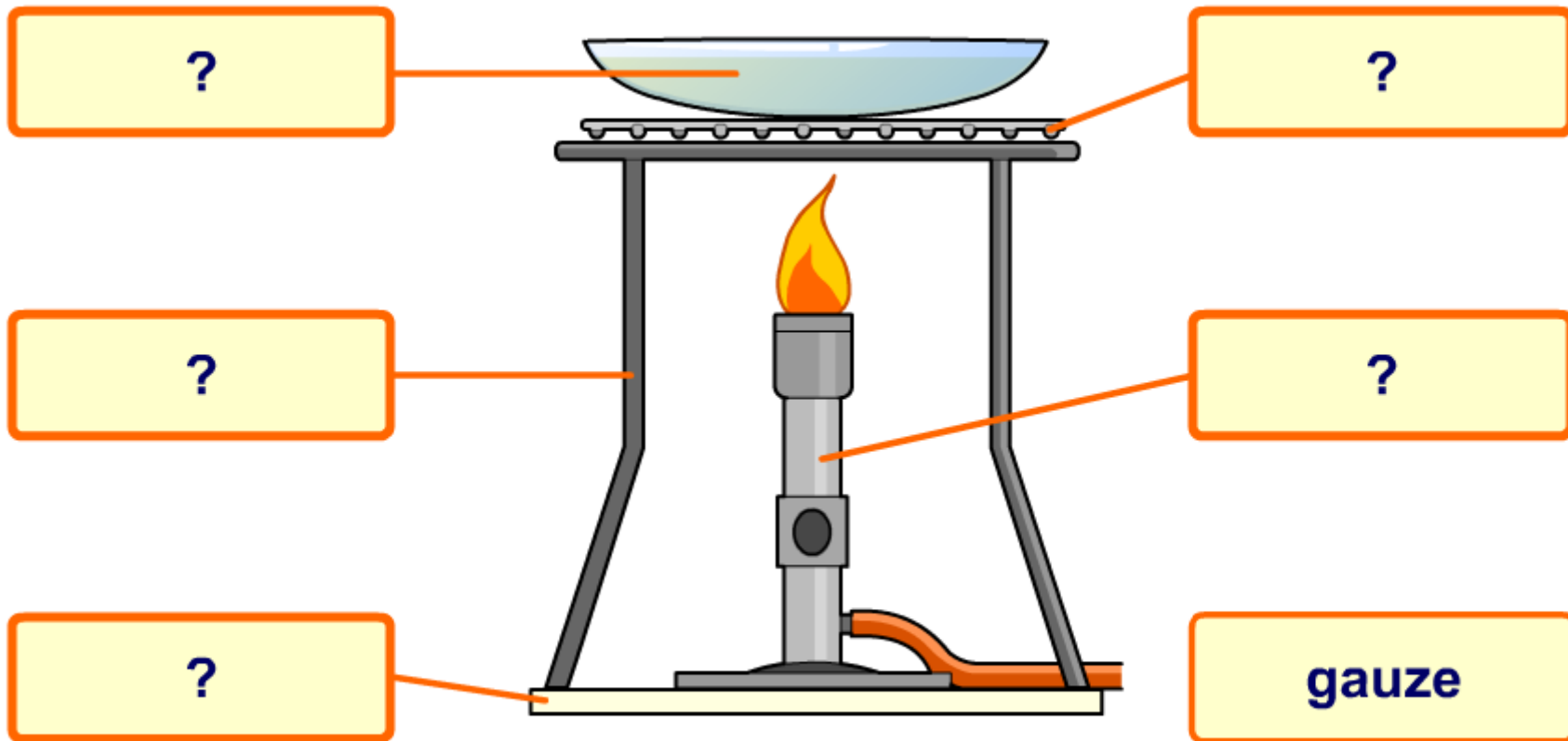
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C

solve

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What apparatus is used for evaporating substances?



solve



Evaporation can be used to separate and collect the solute in a solution. How can the solvent be collected?

The technique used to obtain a solvent from its solution is called **distillation**.

Distillation has three steps:

- evaporating
- condensing
- collecting.

The solution is heated so that the solvent (a liquid) evaporates and is turned into a gas. The solute is left behind.

The gas cools in the condenser and turns back into a liquid. This liquid is collected and is pure solvent.



What apparatus is used for distillation?

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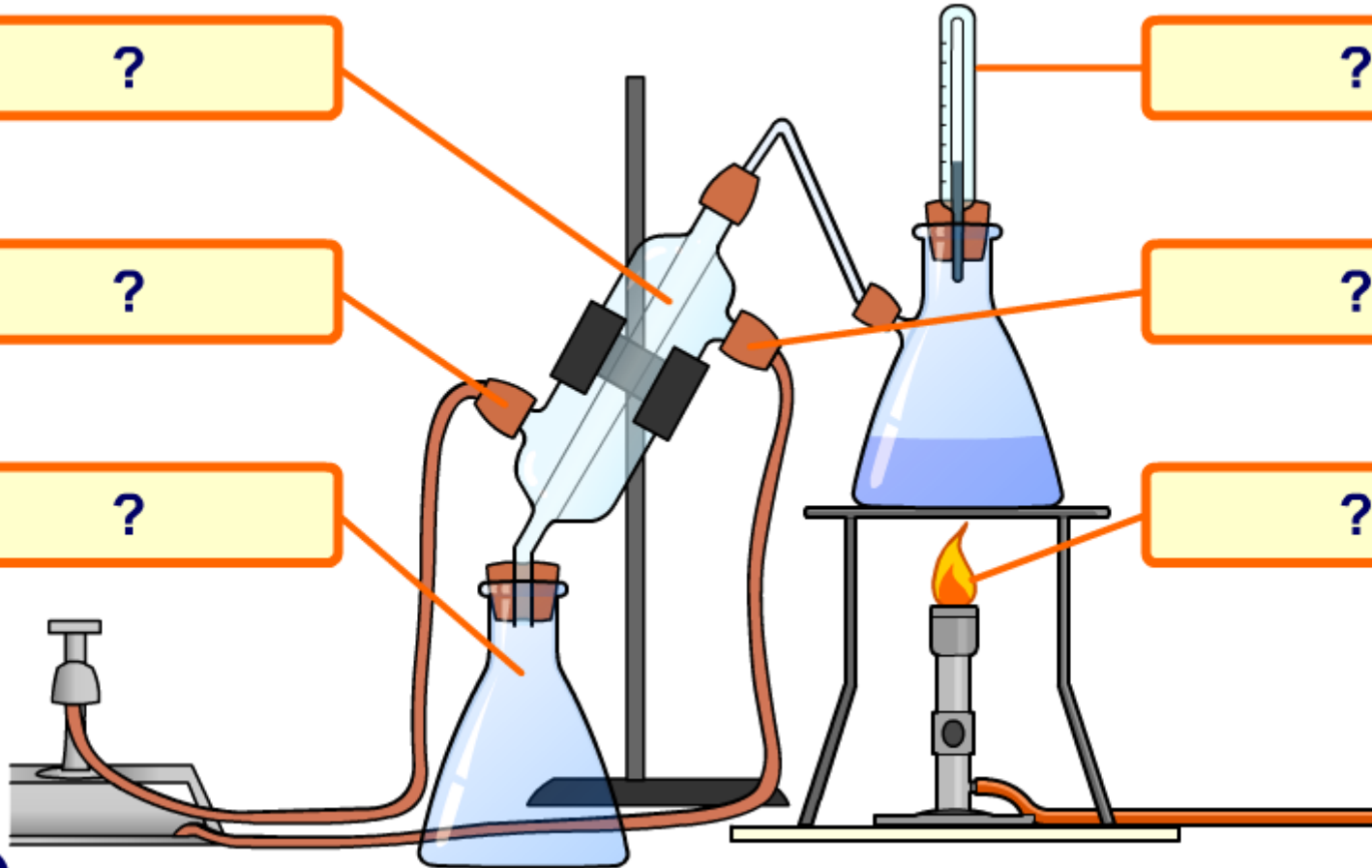
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Paper chromatography

Paper chromatography is used to separate mixtures, especially dyes or pigments.

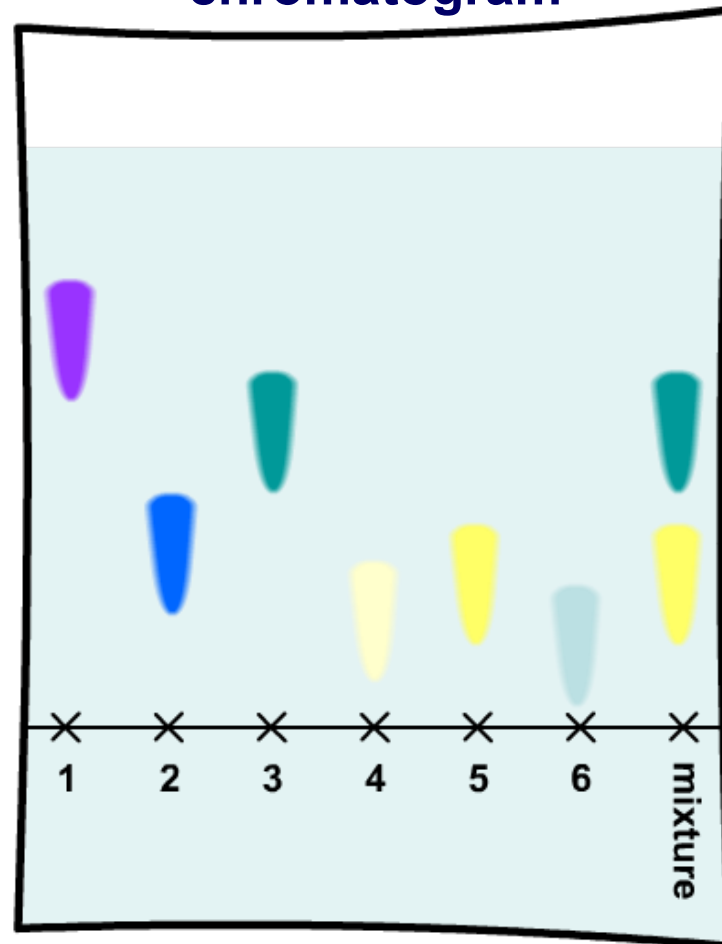
Dots of single dyes are placed alongside a dot of the unknown mixture.

The solvent is drawn up the paper by capillary action.

As the solvent moves up the paper, the pattern of the single dyes can be compared to that of the mixture.

Which dyes does the mixture contain?

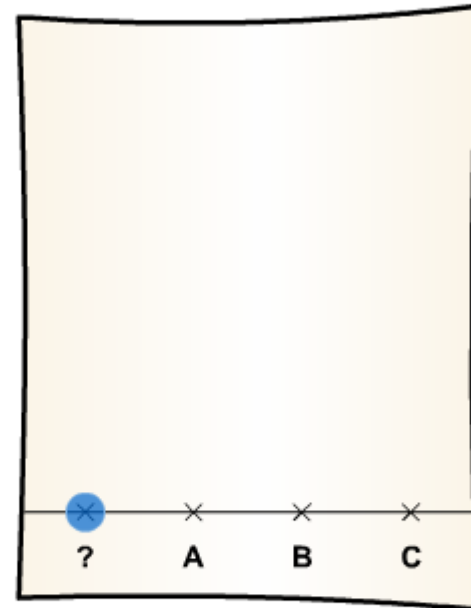
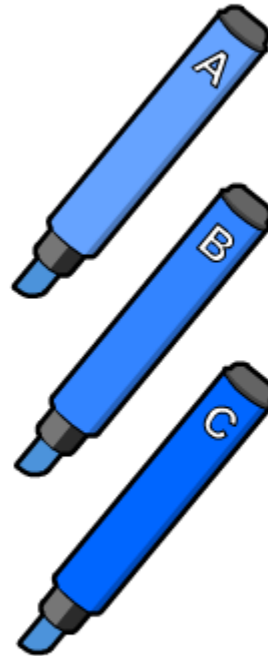
chromatogram



Using chromatography to identify a mixture

Has pen **A**, **B** or **C**
been used to make
the mystery mark?

Click "**play**" to find
out.

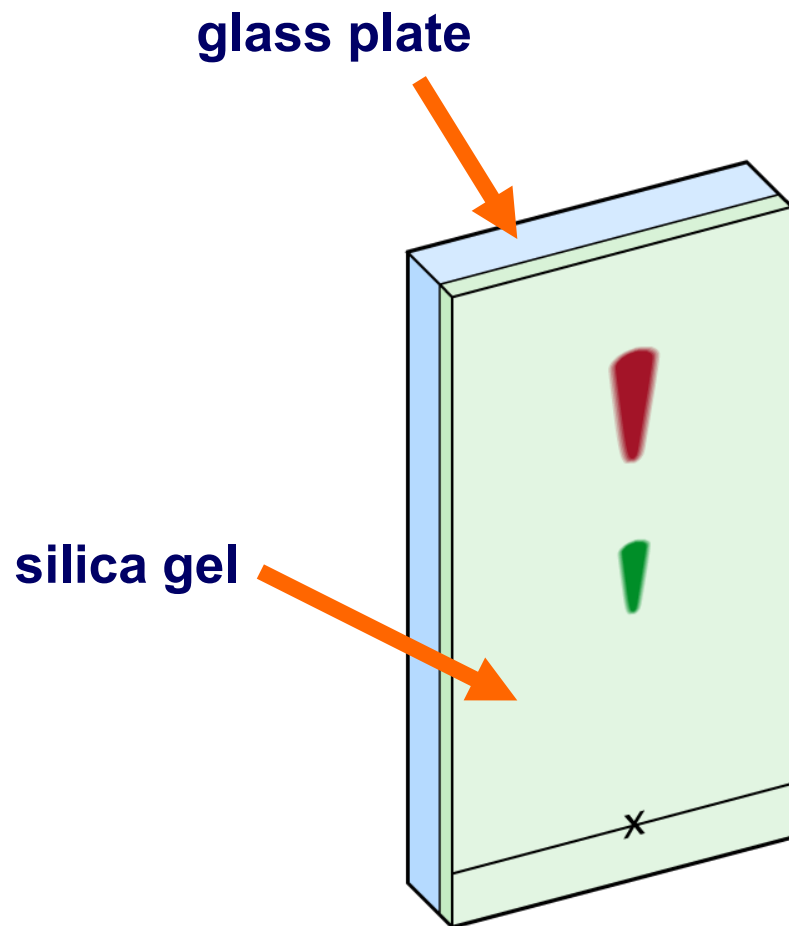


All chromatography involves a **stationary phase** and a **mobile phase**.

In **thin layer chromatography (TLC)** the stationary phase is a layer of silica gel fixed onto a glass plate.

The mobile phase is a solvent that travels up the plate, carrying the substances.

In paper chromatography, what are the stationary and mobile phases?



How does TLC work?

TLC uses the same principals as paper chromatography.

Capillary action still draws the solvent up the matrix; however, while the molecules in paper chromatography are separated based on mass, in TLC, separation often depends on solubility or charge, due to the interaction of solute and matrix.

A dry sample is placed in the silica gel matrix. As the solvent front moves up the gel, it dissolves the sample and carries it up the matrix with it.

Some of the particles in the sample stick more strongly to the silica gel than others, so they lag behind the solvent.

Eventually the different substances in the sample separate out, with similar molecules traveling a similar distance.



Which separation technique?

Match each technique to the substances it is used to separate

sieving

separating a mixture of dyes

filtering

separating solids of different sizes

distillation

separating a soluble solid from a liquid

evaporation

separating an insoluble solid from a liquid

chromatography

separating a solvent from its solution



solve

