

2.4 Filtration

Learning objectives

After this topic you will be able to:

- explain how filtration works
- describe how to filter a mixture.

Link

You can learn more about separating a solution from an insoluble solid in C1 4.4 Making salts

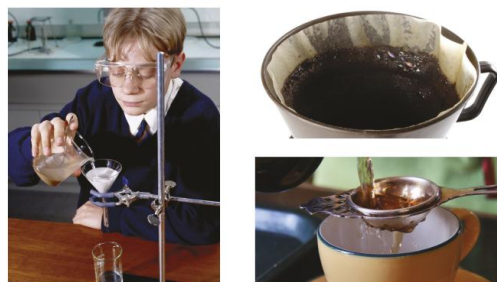


▲ An oil filter.

Solubility puzzle

Sandeep measures the solubility of zinc sulfate. Little by little, he adds zinc sulfate to water in a beaker. Eventually, no more dissolves. There is some solid at the bottom of the beaker. Discuss how Sandeep could use filtration, and measure masses, to find the solubility of zinc sulfate.

Look at the pictures. What do they have in common?



All the pictures show **filtration**. Filtration, or **filtering**, separates a liquid from an insoluble solid. Filtering also separates a solution from a solid that is mixed with it, but not dissolved.

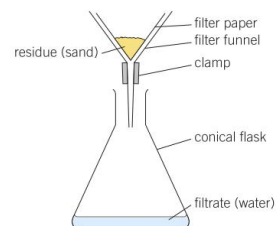
A State two types of mixture that can be separated by filtration.

How does filtering work?

You can separate sand from water by pouring the mixture into filter paper. Water passes through the filter paper. Sand does not.

Filter paper has tiny holes in it. Water particles are smaller than the tiny holes. In the liquid state, water passes through the holes. This is called the **filtrate**.

Grains of sand are bigger than the tiny holes, so they cannot pass through. The grains of sand stay in the filter paper. This is called the **residue**.



B Martha filters a mixture of glitter and water. Name the filtrate and the residue.

How is filtration useful?

Filtration has many uses:

- It separates coffee solution from ground-up coffee beans.
- Oil filters in cars contain materials such as cotton, or wood fibre. These materials trap solid bits of dirt. Liquid oil passes through gaps between the fibres. The dirt would damage the engine if it stayed in the oil.
- Sand filters help make water safe to drink. One type works like this:
 - River water passes slowly through sand and gravel.
 - As the water moves downwards, bits of dirt get stuck in the sand. Tiny creatures living in the sand remove bacteria. Water leaving the filter is nearly ready to drink.

C List three uses of filtration.



▲ Sand filtration helps make water safe to drink.

▲ This is a LifeStraw. It contains hollow fibres. The fibres filter the water, removing bacteria and parasites.

Separating a solution from an insoluble solid

If you have a mixture of sand and salt, you can separate the sand like this:

- Add water to the mixture.
- Stir. The salt dissolves. The sand does not.
- Pour the mixture into a filter paper funnel. Salt solution passes through the paper. The residue is sand.

Key Words

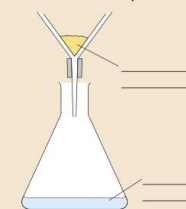
filtration, filtering, filtrate, residue

● C2 Chapter 2: Separation techniques

Summary Questions

1 Use the words below to finish labelling the diagram.

residue filtrate insoluble
solid liquid



(4 marks)

2 Naomi adds 100 g of different compounds to separate beakers of water, and stirs to dissolve. Each beaker contains 100 g of water. She filters each mixture, and measures the mass of solid that remains. Use the data to work out the most and least soluble substances. Show your working.

Name of substance	Mass of substance added to 100 g of water (g)	Mass of residue after filtering (g)
calcium chloride	100	25
calcium hydrogen carbonate	100	84
calcium bromide	100	0
calcium iodide	100	33

(4 marks)

3 Design a model you could make to explain filtering. Draw labelled diagrams to show your ideas. Identify the advantages and disadvantages of the model.

(6 marks)