The Heys School

Science

The Earth's Structure

Ever wondered what the planet's like on the inside? Well you're in for a treat with this page then.

The Earth Has a Crust, a Mantle and a Core

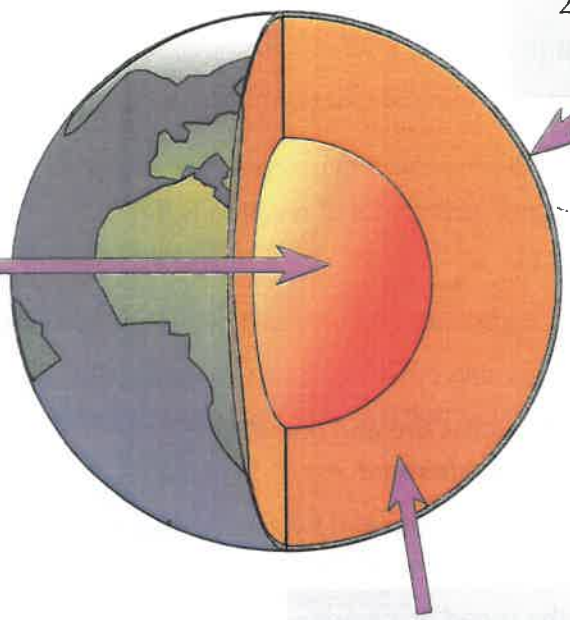
The Earth is almost a sphere and it has a layered structure. A bit like a scotch egg. Or a peach.

The CRUST

1) This is the part we live on.
2) It's a thin, outer layer of solid rock.

The CORE

1) This is the part at the centre.
2) We think it's made from iron and nickel.



The MANTLE

1) The mantle is mostly solid.
2) Deep down it can flow very slowly, like a thick liquid (think treacle).

The Earth's Surface is Broken Into Plates

1) The crust and the upper part of the mantle are cracked into a number of large plates.
2) These plates are a bit like big rafts that 'float' on the mantle. They're able to move around slowly.
3) Sometimes, the plates move very suddenly, causing an earthquake.

The part of Earth we live on is called the crust

You need to know the structure of Earth, i.e. what it would look like if you cut it open (which I wouldn't recommend) and what it's made of. That diagram above is your friend — learn it and learn it well. And, while we're on the subject, you'll need to learn all the words too. On the whole page.

Minerals and Rock Types

There's more than one sort of rock you know — they're all covered on these two pages.

The Crust Contains Minerals

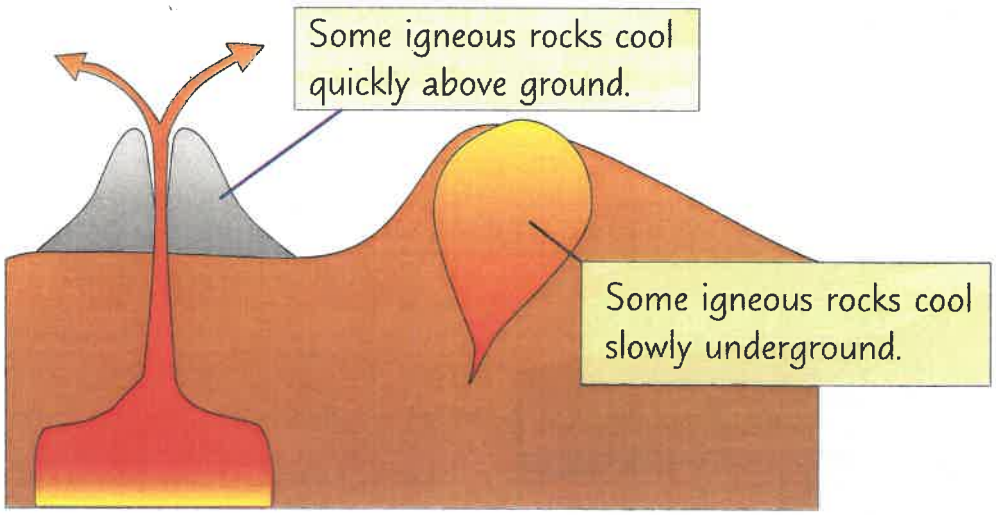
1) The Earth's crust is made up of rocks. These are made from different types of mineral.
2) Minerals are made of elements and compounds.

Elements	Compound	Mineral	Rock
Silicon & oxygen	Silicon dioxide	Quartz	Granite
			
very small	small	visible	rather large

There are Three Different Types of Rock

1) Igneous Rocks

1) These are formed from magma (melted underground rock).
2) Some magma gets pushed up to the surface of the crust — and often out through volcanoes.
3) It then cools and forms rocks above ground.
4) Sometimes it cools below ground.

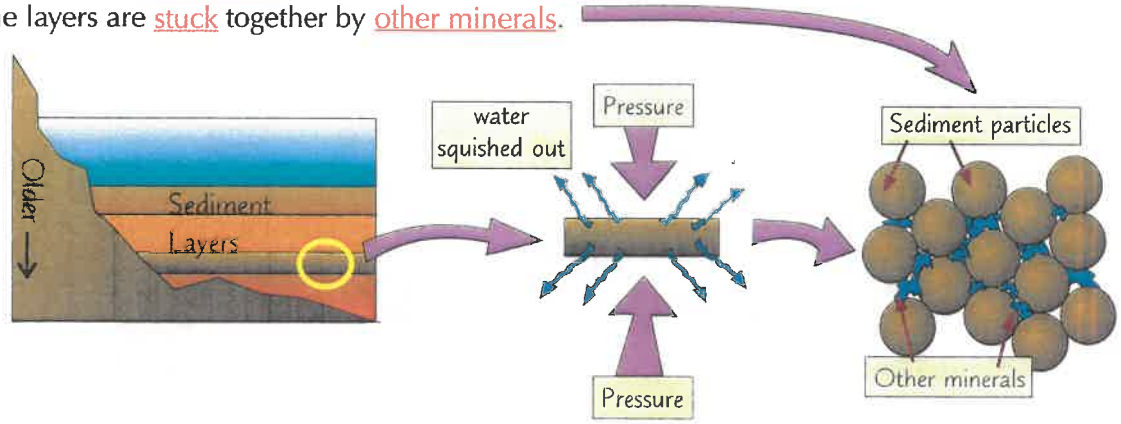


EXAMPLES: basalt (cooled above ground),
granite (cooled below ground)

More on Rock Types

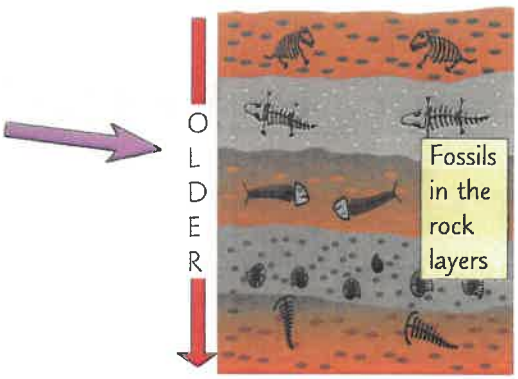
2) Sedimentary Rocks

1) These are formed from layers of sediment (tiny bits of rock).
2) The layers get laid down in lakes or seas over millions of years.
3) The layers are stuck together by other minerals.



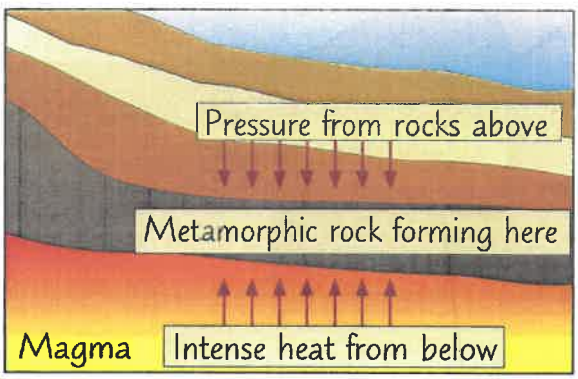
EXAMPLES: limestone, chalk.

4) Sedimentary rocks often have fossils. These are the long dead remains of plants and animals.



3) Metamorphic Rocks

1) These are formed when heat and pressure act on existing rocks for long periods of time.
2) The rocks get squished so hard that their structure changes.
3) Metamorphic rocks may have really tiny crystals. Some have layers.



EXAMPLES: marble, slate.

REVISION TASK

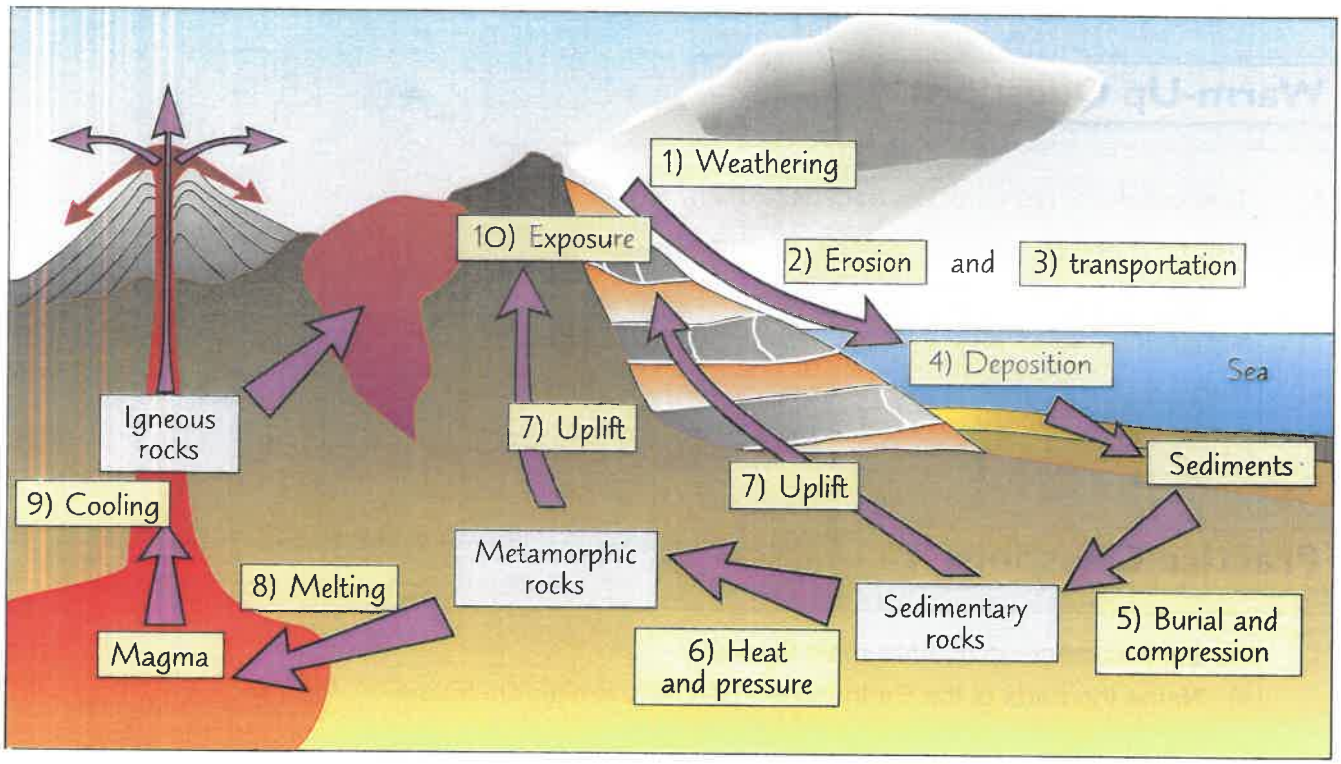
Some people think all rocks are the same, but they're wrong

Learn the headings, then cover the pages and scribble down what you know. Learn some examples of each type of rock while you're at it, and you'll soon be a geologist.

The Rock Cycle

The rock cycle involves changes to rocks both inside and outside the Earth.

The Rock Cycle Takes Millions of Years to Complete



The three types of rock are igneous, sedimentary and metamorphic (see page 87-88).
The rock cycle involves changing the three types of rock from one to another. This happens by:

1) WEATHERING: breaking down rocks into smaller bits.

2) EROSION: wearing down rocks, for example, by rain.

3) TRANSPORTATION: moving the eroded bits of rock round the world by wind and water (mostly).

4) DEPOSITION: laying down of sediment.

5) BURIAL and COMPRESSION: squeezing and compressing the layers — eventually they form SEDIMENTARY ROCKS.

6) HEAT and PRESSURE: further squashing and heating turns the rocks into METAMORPHIC ROCKS.

7) UPLIFT: rocks are pushed up to the surface.

8) MELTING: lots of heat makes the rocks melt a little — that changes them to magma.

9) COOLING: The molten (melted) rock turns to solid IGNEOUS ROCK.

10) EXPOSURE: back to weathering and erosion again.

Rocks can change between different forms over time

Ten stages of the rock cycle to learn there — make sure you know what happens at each stage, and how each of the stages are linked. Why not try writing a summary in your own words?

Warm-Up and Practice Questions

You'll need to learn all the stuff in this section if you want to make it through Key Stage 3 Science. There were loads of difficult words over the previous few pages, so you might need to put in that extra bit of time to get them in your head. The best way to check you've learnt them all is to try answering a few questions. Might as well make a start now. It's not a lot of fun, but it's the only way to do it.

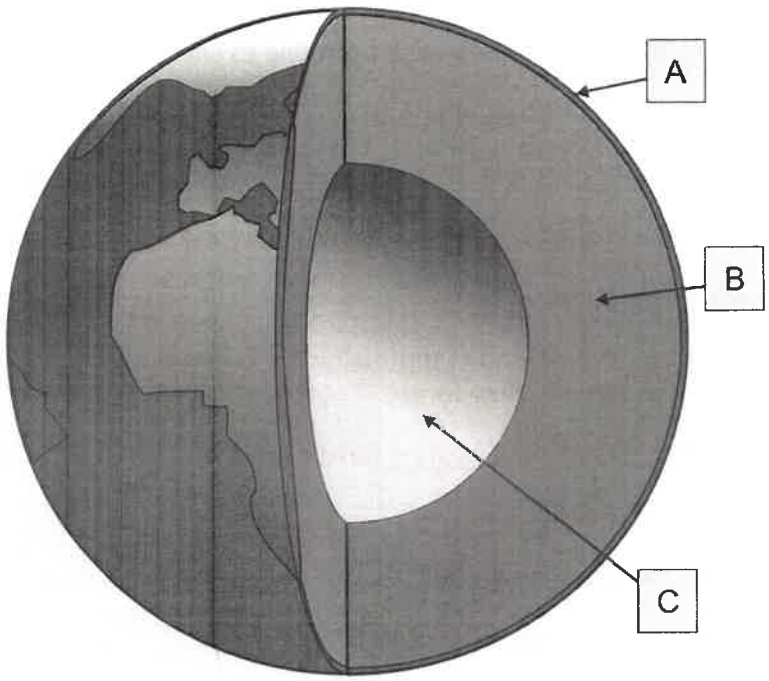
Warm-Up Questions

1) True or false? The Earth's surface is broken into plates.
2) List the following in order of size, starting with the smallest: mineral, compound, element, rock.
3) Is marble a metamorphic rock or a sedimentary rock?
4) Name a process that breaks rocks down into smaller pieces.

Practice Questions

1 The Earth is made up of three main layers.

(a) Name the parts of the Earth labelled A-C in the diagram below.



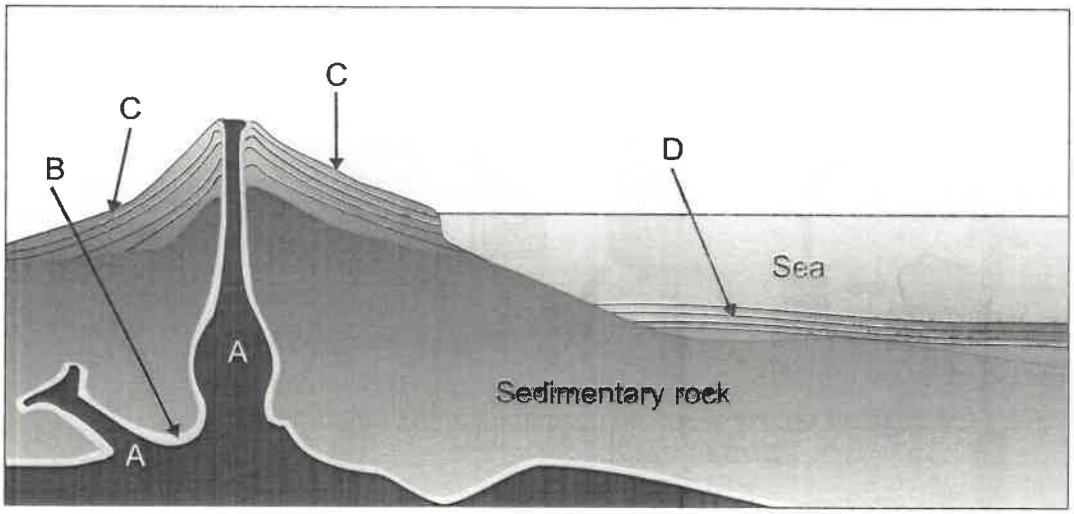
(3 marks)

(b) Which layer is thought to be made of iron and nickel?

(1 mark)

Practice Questions

2 The diagram below shows part of a small volcanic island.



(a) Magma has cooled and formed rocks A and C.

(i) What type of rock are A and C?

(1 mark)

(ii) Over time, rock B can be turned into rock A.
Which of the following processes is involved in turning rock B into rock A?

- ☐ Deposition
- ☐ Melting
- ☐ Erosion

(1 mark)

(iii) Rock C can be changed by weathering. What is weathering?

(1 mark)

(b) D will eventually become a sedimentary rock.

(i) What is D?

(1 mark)

(ii) In order for D to become a sedimentary rock, the water must be removed.
Explain how this happens.

(2 marks)

(iii) There are often fossils in sedimentary rock.
What are fossils formed from?

(1 mark)

(c) Rock B is metamorphic. It was formed from a sedimentary rock.
Describe how a sedimentary rock can be turned into a metamorphic rock.

(1 mark)

Separating Mixtures

There are all sorts of ways you can separate mixtures. You've got to know four of them.

Mixtures Can be Separated Using Physical Methods

Here are the four separation methods you need to know:

1) FILTRATION
2) EVAPORATION
3) CHROMATOGRAPHY
4) DISTILLATION.

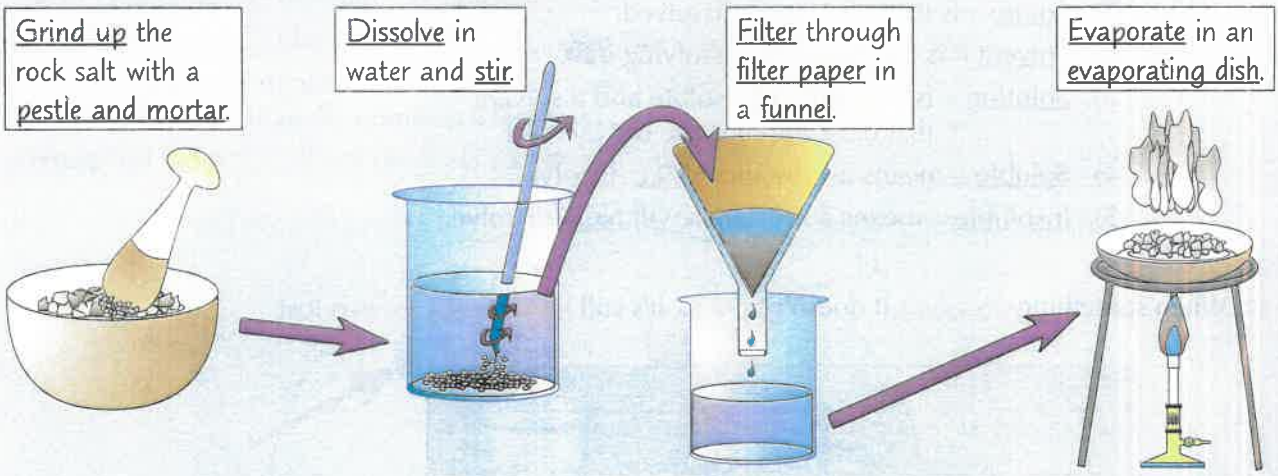
Physical methods involve physical changes (see p.109).

1) Filtration and 2) Evaporation — E.g. for the Separation of Rock Salt

1) Rock Salt is a mixture of salt and sand.
2) Salt and sand are both compounds — but salt dissolves in water and sand doesn't.
3) This difference allows us to separate them.

Learn the Four Steps Needed to Separate Rock Salt

1) Grinding
2) Dissolving
3) Filtering
4) Evaporating



You can evaporate off the water by boiling the mixture. The liquid water will turn into a gas and escape. This leaves behind salt crystals.

- The sand doesn't dissolve in the water (it's insoluble). It stays as big grains.
- These big grains won't fit through the tiny holes in the filter paper. So the sand collects on the filter paper.
- The salt does dissolve in the water, so it goes through the filter paper. The salt forms crystals in the evaporating dish when the water is evaporated.

Grind, dissolve, filter, evaporate

It's pretty easy to separate rock salt into rock (sand) and salt. Salt dissolves in water, but sand does not. So all you need to do is mash up the rock salt, dissolve the salt, and fish out the sand with a filter. Then you can get rid of the water by evaporating it off. Easy when you know how — make sure you do.

Separating Mixtures

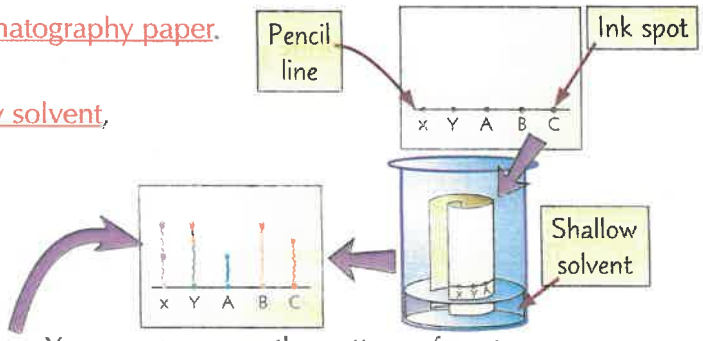
Two separation methods down, two more to go. Dive right in...

3) Chromatography is Ideal for Separating Dyes in Inks

Ink is a mixture of several different dyes (colourings).

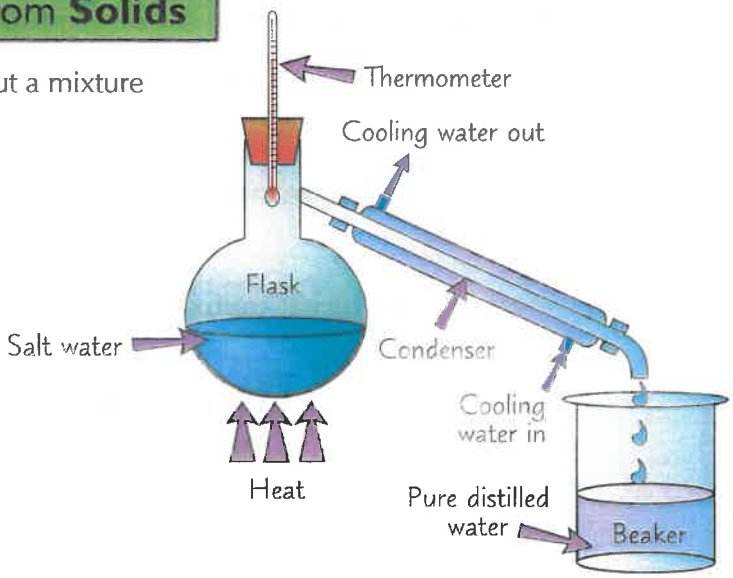
You can use chromatography to separate the dyes in ink. Here's how:

1) Draw a pencil line near the bottom of some chromatography paper.
2) Put spots of inks along the line.
3) Roll the paper up and put it in a beaker of shallow solvent, for example water.
4) The solvent seeps up the paper. The ink dyes are carried with it.
5) The dyes travel up the paper at different speeds. So each dye will form a spot in a different place.
6) You end up with a pattern of spots like the one here. You can compare the pattern of spots in an unknown ink to the pattern of spots in some known inks to see which it is.



4) Distillation Separates Liquids from Solids

1) Simple distillation can be used for separating out a mixture of a liquid and a solid. For example, salt water.
2) The mixture is heated in a flask and the water boils off to form a gas.
3) The gas is cooled and turns back to a liquid in a condenser.
4) The liquid water is collected in a beaker.
5) The salt is left behind in the flask.
6) Simple distillation can also be used to get pure water from dirty water.



Check Purity with Melting and Boiling Points

1) A pure chemical substance has fixed melting and boiling points.

For example, pure water boils at 100 °C and pure ice melts at 0 °C.

2) We know the melting and boiling points of a huge range of substances.
3) This helps us to identify substances if we're not sure what they are. For example, a liquid that boils at exactly 100 °C is likely to be pure water.
4) Impurities (other chemicals) change melting and boiling points. For example, impurities in water cause it to boil above 100 °C.
5) This means you can test the purity of a substance you've separated from a mixture. So if you want to test the purity of some water, boil it and check the temperature it boils at.

Warm-Up and Practice Questions

Phew, that's enough stuff on mixtures to last a lifetime. Time to test whether it all went in though. Have a go at these Warm-Ups. Once you're happy with them, move on to the Practice Questions.

Warm-Up Questions

1) What is an element?
2) True or false? Periods go down the periodic table.
3) How many hydrogen atoms are there in a molecule of methane, CH_4?
4) 10 g of salt is dissolved in 200 g of water. What will the mass of the solution be?
   A: less than 210 g B: 210 g C: more than 210 g
5) True or false? Chromatography can be used to separate a mixture of dyes in an ink.

Practice Questions

1 Rock salt is a mixture of salt and sand. Amanda grinds up some rock salt. She then adds water to the rock salt and stirs.

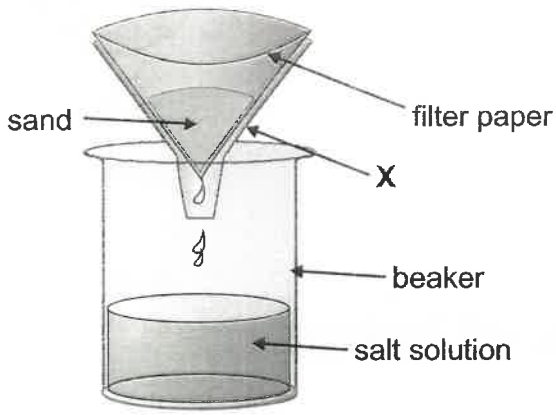
(a) Circle the correct words in the brackets to complete the following sentences.

Salt will dissolve in the water because it is (**soluble** / **insoluble**).

Sand will not dissolve in the water because it is (**soluble** / **insoluble**).

(2 marks)

Amanda separates the salt from the sand using the apparatus shown below:



(b) What is the piece of equipment labelled **X** on the diagram above? Tick **one** box.

☐ condenser ☐ evaporating dish ☐ funnel

(1 mark)

(c) What is this separation technique called?

(1 mark)

(d) Describe how Amanda could get salt crystals from the salt solution.

(1 mark)

Practice Questions

2 When Sally adds salt to water and stirs it, the salt dissolves in the water.

(a) Draw lines to match up the scientific words on the left to the substances on the right:

solvent	salt water
solution	water
solute	salt

(3 marks)

(b) Sally uses simple distillation to purify the salt water.

(i) The steps in the process of simple distillation are given below. Put the steps into the correct order. The first two statements have been done for you.

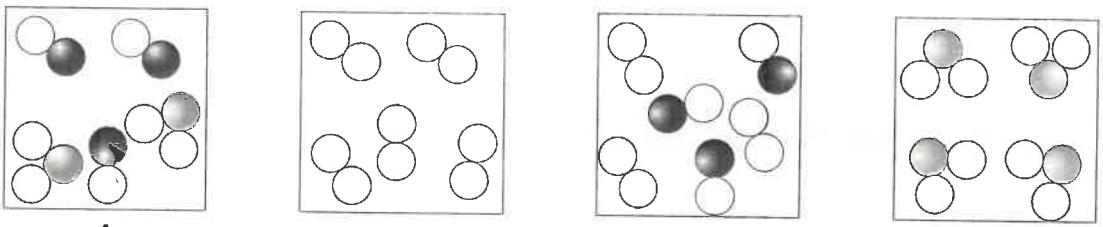
A The mixture is heated in a flask. — **Step 1**
B The water boils to form steam. — **Step 2**
C The water drips into a beaker.
D A condenser is used to cool the steam.
E The steam turns into water.

(2 marks)

(ii) How could Sally check that the distilled water is pure?

(1 mark)

3 The diagrams below represent the arrangement of atoms and molecules in four different substances, A, B, C and D.



A B C D

(a) Which substance is a pure element?

(1 mark)

(b) Which substance is a mixture of two compounds?

(1 mark)

(c) Which substance would you expect to find in the periodic table?

(1 mark)

(d) Which substance is most likely to be pure water, H_2O?

(1 mark)