2.1 Mixtures

Learning objectives

After this topic you will be able to:

- describe particle arrangements in mixtures
- explain how to identify pure substances.

Have you cleaned your teeth today? Toothpaste is a mixture. A mixture is made up of several different substances. The substances are not chemically joined together. They are just mixed up.

A State what is meant by a mixture.

▲ A mixture of two elements, iron and sulfur.

▲ A compound, iron sulfide.

How are mixtures and compounds different?

The photo on the left shows a mixture of two elements, iron and sulfur. The elements are not joined together. You can see yellow sulfur powder and shiny grey iron. You can use a magnet to separate the mixture. The iron sticks to the magnet, leaving sulfur powder behind.

The photo below shows one dark-grey substance. The substance is a compound, iron sulfide. In the compound, atoms of iron and sulfur are strongly joined together. You could not separate them using a magnet. You would need a chemical reaction to separate them.

The table shows how mixtures and compounds are different.

	Mixture	Compound
Are its substances joined together?	No.	Yes – atoms of its elements are chemically joined together.
What are its properties?	The substances in the mixture keep their own properties.	A compound has different properties to those of its elements.
Is it easy to separate?	Yes.	You need to do chemical reactions to split a compound into its elements.
How much of each substance does it contain?	You can change the amounts of substances.	The relative amounts of each element cannot change.

B State two differences between mixtures and compounds.

How can you identify pure substances?

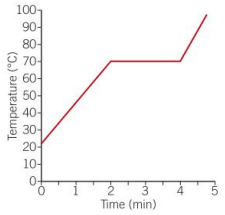
A pure substance has a sharp melting point. Shilpa has two samples of stearic acid, X and Y. One sample is **pure** – it has no other substances mixed with it. Shilpa's other sample is **impure**. Different substances are mixed with it.

Shilpa sets up the apparatus shown at the top of the next page to find out which sample is pure.

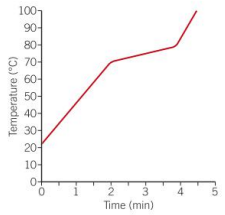
Link

You can learn more about compounds in C1 2.3 Compounds

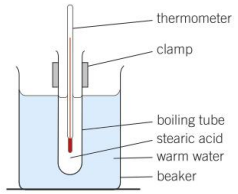
Shilpa heats Sample X. She records the temperature every minute. She plots a graph. She does the same for Sample Y.



▲ Sample X graph.



▲ Sample Y graph.



▲ Shilpa's apparatus.

Sample X has a sharp melting point. Its temperature stays at 70 °C until all the solid has melted. This shows that Sample X is pure. Sample Y melts between 70 °C and 80 °C. It does not have a sharp melting point. It is impure.

C Describe how to find out if a sample of a substance is pure.

Are there other mixtures?

Most materials are mixtures. Some exist naturally:

- Most rocks are mixtures of compounds.
- Seawater is a mixture of water, sodium chloride, and other salts.

Chemists make mixtures that are suitable for their purpose. They work out the best amounts of each substance to add to the mixture. For example, toothpaste may include a chemical called hydrated silica to remove plaque, sodium fluoride to prevent cavities, sodium lauryl sulfate to make foam, carrageenan to thicken the toothpaste, and titanium oxide to make it white.

Toothpaste tales

Write the text for a new toothpaste box. Include the ingredients and write down a reason why each one is included. Make sure the reasons are easy for people who use the toothpaste to understand.

Key Words

mixture, pure, impure

Summary Questions

1 Copy the sentences that are true. Write corrected versions of the sentences that are false.

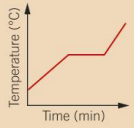
a A mixture is made up of different substances that are chemically joined together.

b You cannot change the amounts of substances in a mixture.

c A pure substance has no other substances mixed with it.

(3 marks)

2 Tim heats a sample. He plots the temperature every minute. Use the graph to decide whether the sample is a pure substance or a mixture of substances. Explain your decision.



(2 marks)

3 Write a paragraph to compare mixtures and compounds.

(6 marks)