

# Science KS3 All matter in the universe is made of very small particles

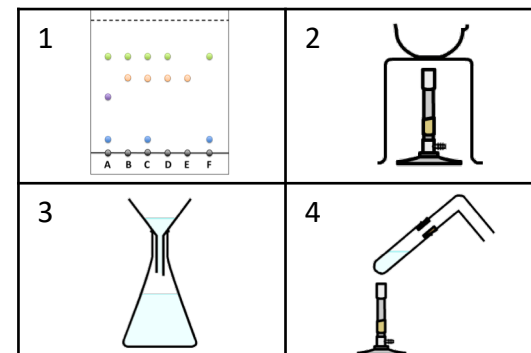


## Glossary:

- **Atom**  
Basic building blocks of all substances.
- **Chromatography**  
Separates mixtures of soluble substances.
- **Compound**  
Substances containing two or more types of atom.
- **Condensation**  
Change in state from gas to liquid.
- **Distillation**  
Separates a liquid from a mixture. Involves evaporation and condensation.
- **Element**  
Substances made of only one type of atom.
- **Evaporation**  
Change in state from liquid to gas.
- **Filtration**  
Separates insoluble substances from a solvent.
- **Freezing**  
Change in state from liquid to solid.
- **Insoluble**  
Describes a substance that will not dissolve in a solvent.
- **Melting**  
Change in state from solid to liquid.
- **Mixture**  
Different substances together which can be easily separated.
- **Soluble**  
Describes a substance that will dissolve in a solvent.
- **Solute**  
The substance that dissolves in a solvent to form a solution.
- **Solution**  
The mixture formed when a solute has dissolved in a solvent.
- **Solvent**  
The liquid in which a solute dissolves.

## Activities

- Explain how a solid melts in terms of **energy** and **forces between particles**.
- Explain why ice and iron have different melting points. Your answer should consider the forces of attraction between the particles.
- Rock salt contains sand and salt. A student mixed rock salt in warm water. Describe how the student would separate out the sand, salt and water from the mixture formed. You will need to consider the question carefully as the water needs to be collected too.
- Look at the diagrams in the table below. For each one answer the following questions:
  - a) Name the separating technique.
  - b) Name the pieces of equipment included in the diagram.
  - c) Describe how the equipment is used to separate mixtures. Make sure you include key scientific terms including changes in state if appropriate.



Explain the difference between an **atom**, an **element**, a **compound** and a **mixture** using the gases found in air as examples. Substances you could use in your answer include: oxygen, carbon dioxide and argon.

When a volcano erupts liquid rock (magma) is released along with hot gases. The magma cools and turns into solid rock.

- a) Describe the changes in the movement of the particles in the magma as it cools.
- b) Describe the arrangement of particles in the hot gases and explain how they are different to those in a liquid.

## QUICK QUESTIONS:

1. Draw diagrams representing the particles in a solid, liquid and gas.
2. Describe how the particles move in a solid, liquid and gas.
3. State the name of the process in each of the following changes:
  - a) Solid to liquid
  - b) Liquid to solid
  - c) Gas to liquid
  - d) Liquid to gas.

## 1. Particles

- If we could divide any substance down into smaller and smaller pieces we could see it is made of tiny **particles**.
- These particles are so small they could **not** be seen using a microscope.
- We can represent these particles in models using **spheres**.



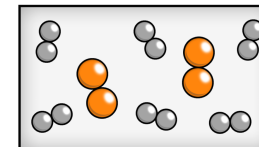
## 4. Changes in states of matter



- A solid melts when it is heated because the particles are **gaining energy**. This energy is used to break the **forces of attraction** between the molecules. The **more energy** a particle has the **faster** it can move.

## 6. Elements and mixtures

- This diagram shows a mixture of elements.
- **Mixtures** can be easily separated using techniques such as:
  - **Filtration**
  - **Distillation**
  - **Chromatography**



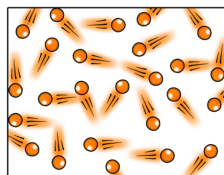
## 2. States of matter

- Three states of matter are **solid**, **liquid** and **gas**.

Solid	Liquid	Gas

## 3. Differences in states of matter

- In solids the particles are **closely spaced** and **vibrating**. In liquids there is **random motion** but the particles are in **contact**.
- In a gas there is **random motion** and the particles are **widely spaced**.
- Liquids and gases **flow** and completely **fill** their container. Gases can be **compressed**.

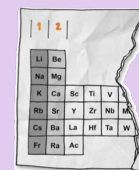


KS3 Spine

All matter in the universe  
is made of small particles

## 5. Atoms and elements

- Atoms are the **basic building blocks** of all living and non-living things anywhere in the universe.
- There are just over **100** different types of atom.
- Substances made of only **one kind** of atom are called **elements**.
- All the known elements are listed in the **periodic table** of elements.



## 8. Reactions and properties

- A chemical reaction involves the rearrangement of atoms to form new substances, while the total number of atoms **stays the same** (see image above).
- The **properties** of different materials can be explained in terms of the behaviour of the atoms and groups of atoms of which they are made.

