

# The particle model

## 1.1 The particle model

1. Use words and phrases from the box to complete the sentences below.

Use each word once, more than once, or not at all.

rock      particles      materials      sugar      silver      mixtures      substances

The different types of matter that things are made from are . . . All materials are made up of tiny . . . Most materials are . . . They have different types of particle. Some materials are made up of one type of particle only. They are . . . Examples of substances are . . . and . . .

2. The particle model explains properties. Draw one line from each factor to the one difference in properties that it explains.

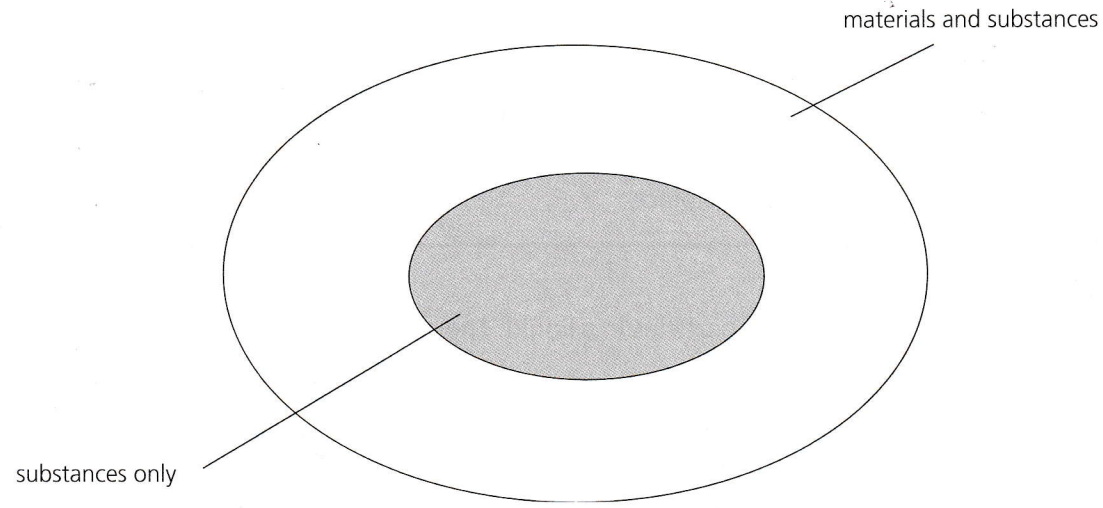
Factor
particle <u>separation</u>
particle <u>mass</u>
if and how the particles move
how <u>strongly</u> the particles hold together

Difference in properties that the factor explains
why a gold coin is <u>heavier</u> than a silver coin of the <u>same mass</u>
why liquid water flows but solid rock does not flow
why 1 g of ice takes up less <u>space</u> than 1 g of steam
why gold is easier to <u>scratch</u> than diamond

### Extension

Write the letter of each phrase below in the correct part of the diagram.

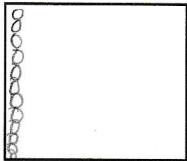
- a. Made up of particles
- b. Made up of identical particles
- c. Pure water, for example
- d. Most types of rock, for example
- e. Its properties describe what it is like and what it does



1. Highlight the correct **bold** words in the sentences below.

There are **two** / **three** / **ten** states of matter. A substance can flow in the liquid and **solid** / **gas** states. You can compress a substance a lot in the **solid** / **liquid** / **gas** state. A substance takes the shape of the bottom of its container in the **solid** / **liquid** / **gas** state. A substance takes the shape of its whole container in the **solid** / **liquid** / **gas** state.

2. a. In the box, draw the arrangement of particles in a substance in its solid state.

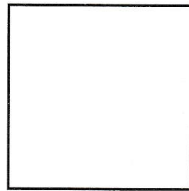
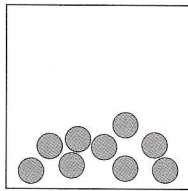


- b. Describe the movement of the particles in the solid.

*It vibrates*

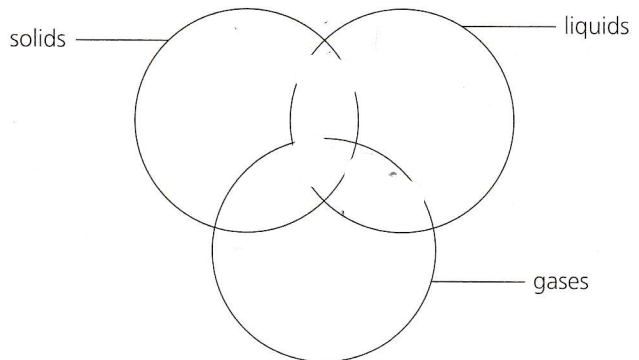
3. A student drew the diagram below to represent the particles in a liquid.

Explain what is wrong with the diagram, and draw a better one in the empty box.



4. Write the letter of each phrase below in the correct part of the diagram.

- A. Made up of particles
- B. Takes the shape of its whole container
- C. Particles move from place to place
- D. Particles touch each other
- E. Can be compressed only a tiny bit
- F. Particles are not in a pattern
- G. Flows
- H. Particles are in a regular pattern
- I. Particles do not move from place to place



### Extension

The statements below are about the particles in a liquid. They are all correct.

- P The particles hold together strongly.
- Q The particles touch each other.
- R The particles move around, sliding over each other.
- S The particles are not in a regular pattern.

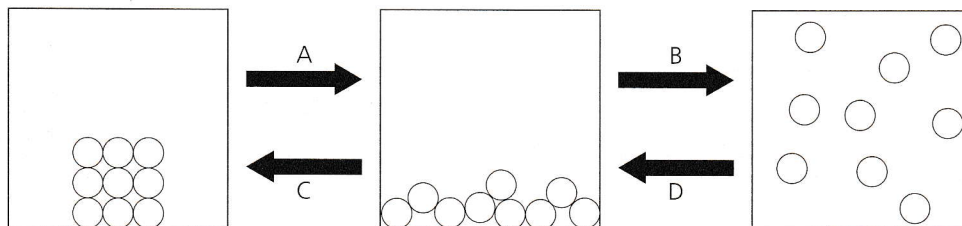
- a. Write the letter of the statement that best explains why you can pour a liquid. Explain your choice.
- b. Write the letter of the statement that best explains why the volume of a liquid does not change when you pour it into a bigger container. Give reasons for your choice.

- Write **T** next to the statements that are true. Write **F** next to the statements that are false. Then write corrected versions of the **two** statements that are false.
  - Condensing is the change of state from liquid to gas.
  - When a substance condenses, its particles get closer together.
  - When a substance changes state from liquid to gas, its particles get closer together.
  - The more strongly the particles of a substance hold together, the higher its boiling point

**Corrected versions of false statements:**

.....  
 .....

- Look at the diagrams.



- Give the letter of the arrow that shows condensation. ....
  - Give the letter of the arrow that shows boiling or evaporation. ....
- For each statement, write a tick (✓) in the correct box in the table.

	True of evaporation only	True of boiling only	True of both evaporation and boiling
This involves a change of state from a substance in its liquid state.			
Particles leave the surface of the liquid only.		✓	
Bubbles of the substance in its gas state form throughout the liquid.		✓	
This can happen at any temperature.			
During this change of state, the particles get further apart.			

### Extension

The table gives the boiling points of six substances.

Substance	Boiling point (°C)
ethane	-89
hexane	69
hexadecane	287
heptane	98
methane	-162

- Name the substance in the table that has the lowest boiling point.
- Name the substances in the table that are in the gas state at 20 °C.
- Name the substance in the table whose particles hold together most strongly.