

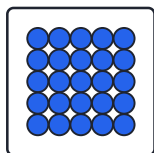


Properties of solids, liquids and gases

The particle model says that all matter is made of tiny particles. How close together they are, how they are arranged and how they move explains what each state of matter can and cannot do.

The particle model at a glance

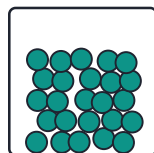
Solid



particles closely packed in fixed positions, vibrating on the spot; simple diagrams show a regular pattern

- keeps its own shape
- fixed volume
- very difficult to compress
- does not flow

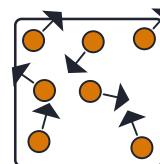
Liquid



particles touching, in a random arrangement, sliding past each other

- takes the shape of its container
- fixed volume
- very difficult to compress
- flows and can be poured

Gas



particles far apart, moving fast in all directions

- spreads out to fill its container
- no fixed volume
- easily squashed
- flows

Worked example

Explain why a gas can be squashed into a smaller space but a liquid cannot.

In a gas the particles are far apart, with empty space between them. Pushing on the gas moves the particles closer together, so it takes up less room.

In a liquid the particles are already touching. There is almost no empty space to push them into, so the volume barely changes.

The common mistake

"Heating makes the particles get bigger."

The particles stay exactly the same size. Heating gives them more energy, so they move faster. If the gas is free to expand, the particles spread further apart; in a sealed container they cannot, so the pressure rises instead. It is the gaps between particles that can grow, never the particles themselves.

Test yourself

- ☐ 1 Which state has a fixed volume but no fixed shape?
- ☐ 2 Why does a solid keep its shape?
- ☐ 3 What causes gas pressure?

Next topic

Changes of state: the particle model

thelearnden.com/year-9/science/changes-of-state-particle-model/

Answers: 1. A liquid. 2. Strong forces hold its particles in fixed positions; they can only vibrate. 3. Gas particles colliding with the walls of their container.