SCIENCE · CHEMISTRY & PHYSICS AGES 11–14

States of Matter

The same particles behave differently as a solid, a liquid and a gas. Heating and cooling move matter between the states.

Solid

Fixed shape and volume. Particles are tightly packed, often in a regular pattern, and vibrate about fixed positions. Cannot flow; very hard to squash.

Liquid

Fixed volume, takes the shape of its container. Particles are close together, in no pattern, and slide past each other. Flows; very hard to squash.

Gas

Fills any container. Particles are far apart and move quickly and randomly in all directions. Flows easily and is easy to squash.

Changes of state

Melting and freezing

Solid to liquid takes in energy; liquid to solid gives it out. Pure water melts and freezes at 0 °C (32 °F).

Evaporating, boiling and condensing

Liquid to gas takes in energy; gas to liquid gives it out. Pure water boils at 100 °C (212 °F) at sea level.

Sublimation and deposition

Solid straight to gas, or gas straight to solid, with no liquid stage. Dry ice (solid carbon dioxide) sublimes at room temperature.

Watch the thermometer

While a substance changes state, its temperature stays the same: the energy goes into changing how the particles are held together. The mass does not change either.

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