Why Substances Change Between Solids, Liquids and Gases

KS4 CHEMISTRY Ages 11-14 ⏰ 3 min read

The Three States of Matter

Everything around us is made of tiny invisible particles called **atoms** and **molecules**. These particles are always moving, and the way they move determines whether something is a **solid**, a **liquid**, or a **gas**. Water is the perfect example—it can be ice (solid), water (liquid), or steam (gas), but it's always made of the same **H_2O molecules**.

What's Different About Each State?

In a **solid**, particles are packed tightly together and vibrate in fixed positions. They're like children holding hands in a dance formation—everyone stays in their spot. In a **liquid**, particles are still close together but can move past each other, like a group of people gently pushing through a crowded hallway. In a **gas**, particles zoom around freely with lots of space between them, like birds flying in an open sky.

Think of it like a school: in a solid, students sit at desks in neat rows (fixed positions). In a liquid, they move around the classroom (close but moving freely). In a gas, they rush out into the playground with no boundaries (lots of space, moving fast).

Temperature Is the Key

The main reason substances change state is **temperature**. Heat is energy, and when you add heat to a substance, you give its particles more energy to move faster. When you remove heat, particles slow down.

When ice melts into water, you're adding heat energy. The particles vibrate so fast they break free from their fixed positions and can flow. This process is called **melting**. If you keep heating water, it eventually boils and turns into steam. This is called **evaporation**. The opposite happens too: if you cool steam down, it becomes water again in a process called **condensation**. Cool water enough, and it freezes back into ice in a process called **freezing**.

Think of it like students at school: when the bell rings, they're still (solid). When the lesson ends, they move around (liquid). When lunch starts, they run everywhere excitedly (gas).

Different Substances Change at Different Temperatures

Not all substances melt and boil at the same temperatures. Water freezes at **0°C** and boils at **100°C**, but other materials have different **melting points** and **boiling points**. Iron melts at over **1,500°C**! This is why we can melt an ice cube easily at home but can't melt iron without a very hot furnace.

Understanding state changes helps us in real life—from cooking food to running car engines to making medicines. It's one of the most important ideas in **chemistry**!