



Icicles grow as water drips down them and then freezes, sticking to the ice that is already there. Freezing is an example of a change of state.

What happens when substances change state?

Ice, liquid water, and water vapor are different states of the same substance. As liquid water turns into ice or water vapor, the water molecules themselves do not change. What changes are the motion of the molecules and the amount of space between them.

The Motion of the Particles Changes

The particles of a substance, even a solid, are always in motion. As a solid is heated, its particles gain energy and vibrate faster. If the vibrations are fast enough, the particles break loose and slide past one another. The process in which a solid becomes a liquid is known as *melting*. As the temperature of a liquid is lowered, its particles lose energy. Eventually, the particles move slowly enough for the attractions between them to cause the liquid to become a solid. This process is called *freezing*. Because water freezes at 0°C , you may associate freezing with cold temperatures. But some substances are frozen at room temperature or above. For example, an aluminum can is an example of frozen aluminum. It will not melt until it reaches a temperature above 660°C ! The table below shows the most common types of state changes.

When substances lose or gain energy, one of two things can happen to the substance: its temperature can change or its state can change. But both do not happen at the same time. The energy that is added or removed during a change of state is used to break or form the attractions between particles. If you measure the temperature of boiling water, you will find that the temperature stays at 100°C until all of the liquid has become a gas.

11 Apply Complete the table below with examples of state changes.

State change	Result	Example
Melting	A solid becomes a liquid.	
Freezing	A liquid becomes a solid.	
Boiling	A liquid becomes a gas (throughout).	
Evaporation	A liquid becomes a gas (at the liquid's surface).	<i>A puddle dries out.</i>
Condensation	A gas becomes a liquid.	
Sublimation	A solid becomes a gas.	<i>Dry ice becomes a gas at room temperature.</i>
Deposition	A gas becomes a solid.	<i>Frost forms on a cold windowpane.</i>