

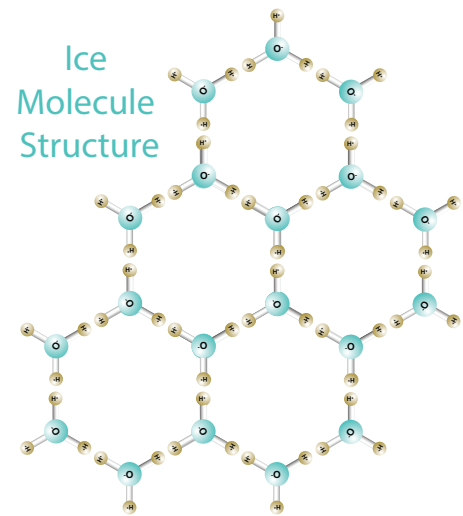
# Physical Properties of Water

Vocabulary	
specific heat	coolant
kinetic energy	

Water is the only natural substance that is found in all three states: solid (ice), liquid, and gas (steam). It **boils** at 212°F or 100°C and **freezes** at 32°F or 0°C. Water has a high **specific heat** index. Specific heat is the amount of energy required to change the temperature of a substance. Water can absorb a lot of heat before it begins to get hot, which is why the sand at the beach always feels hotter than the ocean water. Land absorbs heat faster than water.

Water's high specific heat index makes it valuable, especially to manufacturing companies. It is used as a **coolant** because it can absorb a lot of heat before it begins to get hot. Water can move over heated elements in a factory, absorbing the heat from machines. In a car, water is a coolant in the radiator that absorbs heat put out by the engine.

When water molecules make a change in phase or state, their molecules rearrange themselves into different patterns. In the liquid phase, water molecules are closer together with no regular arrangement. The particles of a liquid vibrate, move about, and slide past each other. A solid has tightly packed particles that are usually in a regular pattern. There is very little vibration or movement of the particles of a solid. In the gaseous phase, water molecules are widely spaced apart and very active with no regular arrangement. Generally, as the temperature rises, matter moves to a more active state. This movement of molecules is called **kinetic energy**.



Most substances are the densest in their solid form. However, water is different. Solid water, or ice, floats on top of liquid water. Why is this? In order to float on water, a substance must be less dense than water. When ice is formed, the water molecules are tightly packed together, preventing them from changing shape. Ice has a regular pattern with the molecules held rigidly apart by their bonds. This causes ice to form a crystalline lattice structure. These crystals have many open spaces throughout their structure, making ice less dense than liquid water.



	Gas	Liquid	Solid
<b>particle arrangement</b>	well separated — no regular arrangement	close together — no regular arrangement	tightly packed — a regular pattern
<b>shape</b>	assumes the shape of its container - no shape	assumes the shape of its container - no shape	retains a fixed volume and shape
<b>kinetic energy — movement</b>	very active	slide past each other	rigid
<b>fluid</b>	fluid — flows easily	fluid — flows easily	not a fluid — does not flow easily
<b>volume</b>	volume of container	fixed volume	fixed volume

## Questions

1. Why does water's high specific heat make it a good coolant for car radiators?

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2. Which state of matter has the most kinetic energy? the least kinetic energy?

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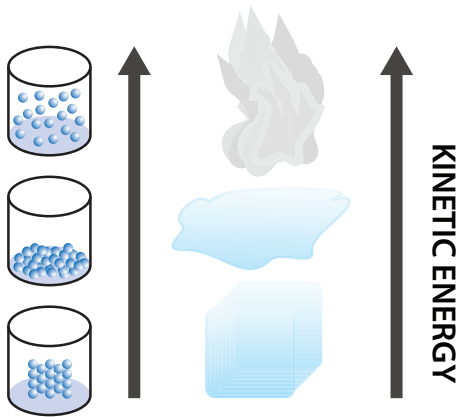
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3. How does heat affect water and its state of matter?

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4. What is the picture below showing? Please explain.



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5. Fill in the definitions of the vocabulary words.

Vocabulary	
specific heat	
kinetic energy	
coolant	