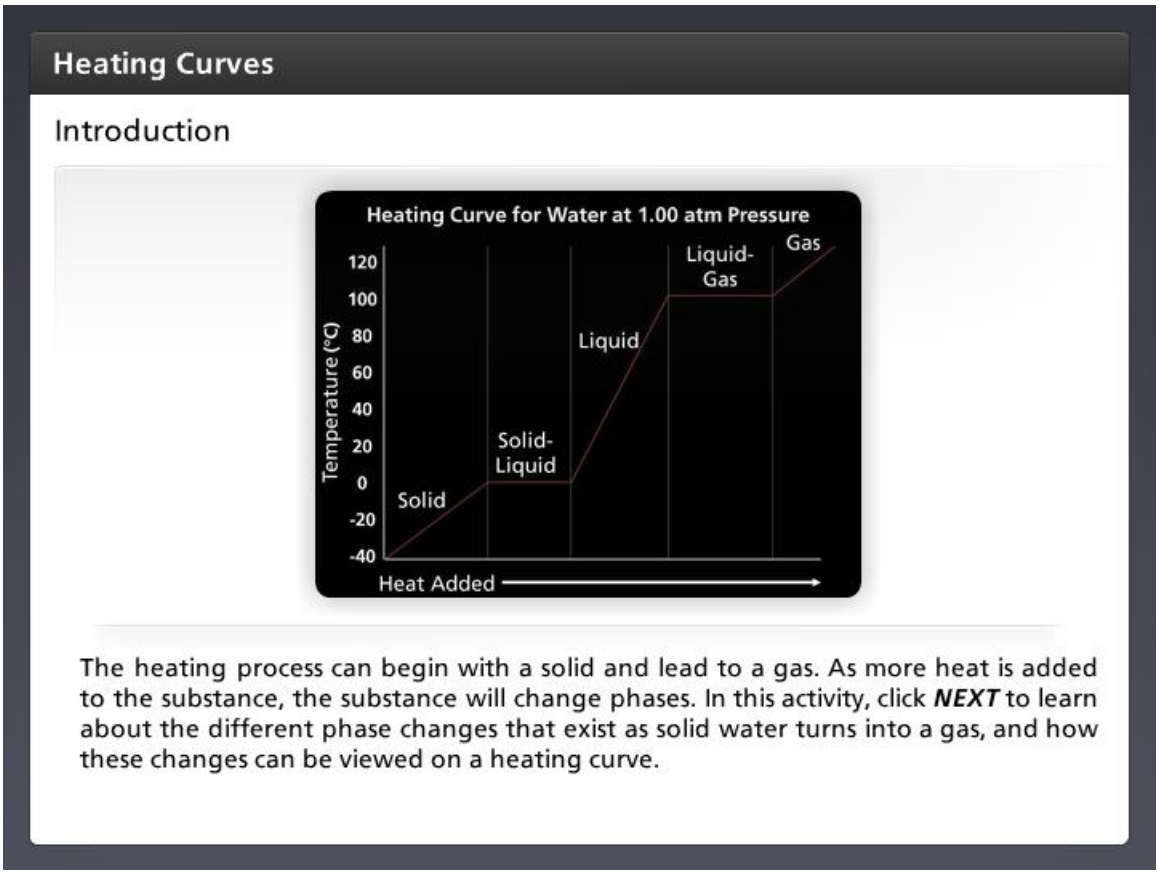
Module 8: Thermochemistry
Topic 5 Content: Heating Curves Notes

Introduction



The heating process can begin with a solid and lead to a gas. As more heat is added to the substance, the substance will change phases. In this activity, click ***NEXT*** to learn about the different phase changes that exist as solid water turns into a gas, and how these changes can be viewed on a heating curve.

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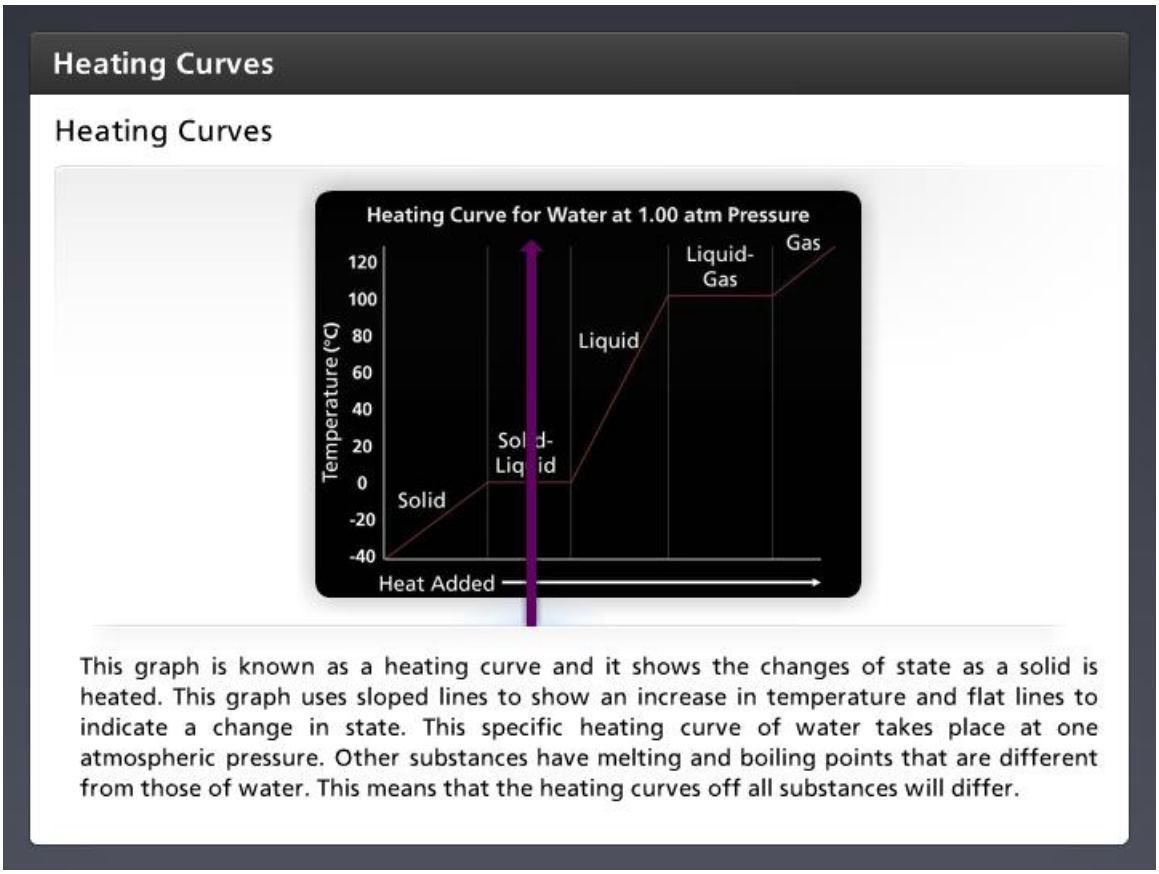
Heating Curves



This graph is known as a heating curve and it shows the changes of state as a solid is heated. This graph uses sloped lines to show an increase in temperature and flat lines to indicate a change in state. This specific heating curve of water takes place at one atmospheric pressure. Other substances have melting and boiling points that are different from those of water. This means that the heating curves off all substances will differ.

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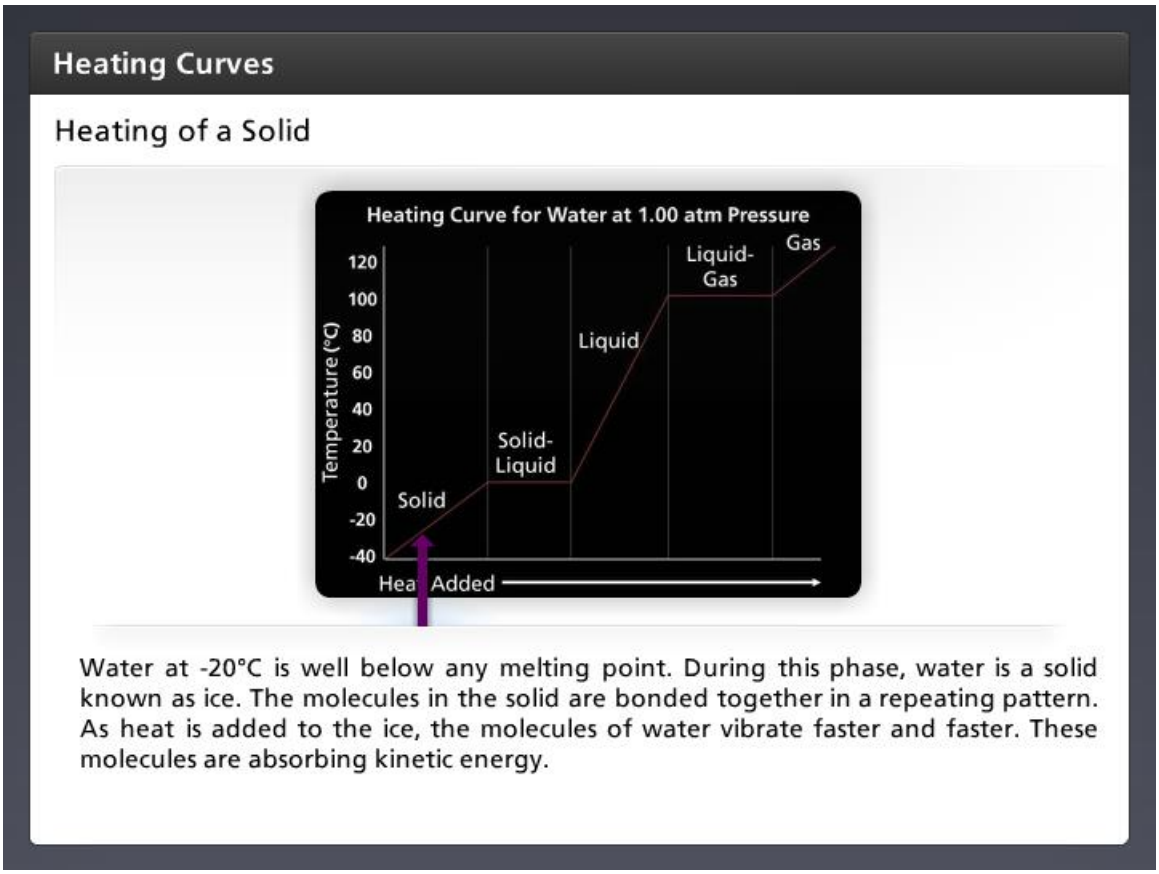
Heating of a Solid



Water at -20°C is well below any melting point. During this phase, water is a solid known as ice. The molecules in the solid are bonded together in a repeating pattern. As heat is added to the ice, the molecules of water vibrate faster and faster. These molecules are absorbing kinetic energy.

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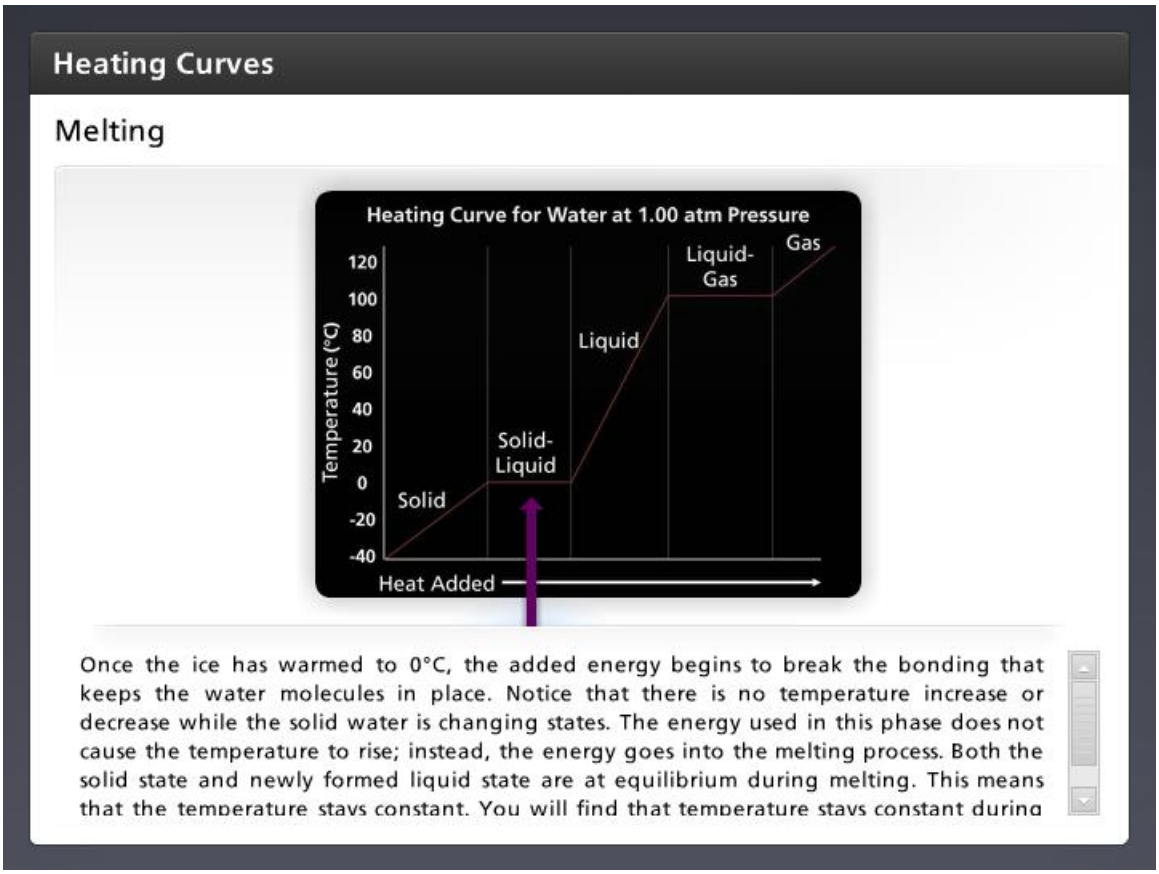
Melting



Once the ice has warmed to 0°C, the added energy begins to break the bonding that keeps the water molecules in place. Notice that there is no temperature increase or decrease while the solid water is changing states. The energy used in this phase does not cause the temperature to rise; instead, the energy goes into the melting process. Both the solid state and newly formed liquid state are at equilibrium during melting. This means that the temperature stays constant. You will find that temperature stays constant during all phase changes.

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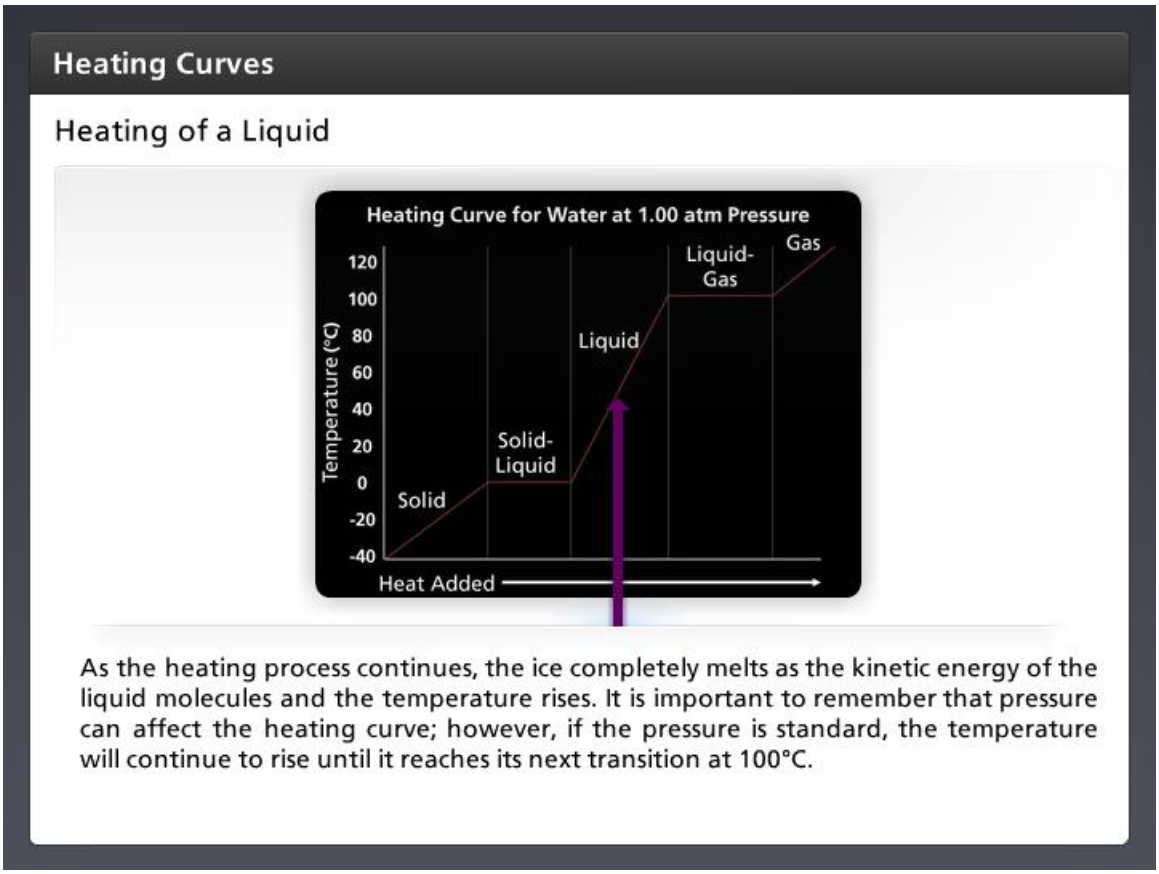
Heating of a Liquid



As the heating process continues, the ice completely melts as the kinetic energy of the liquid molecules and the temperature rises. It is important to remember that pressure can affect the heating curve; however, if the pressure is standard, the temperature will continue to rise until it reaches its next transition at 100°C.

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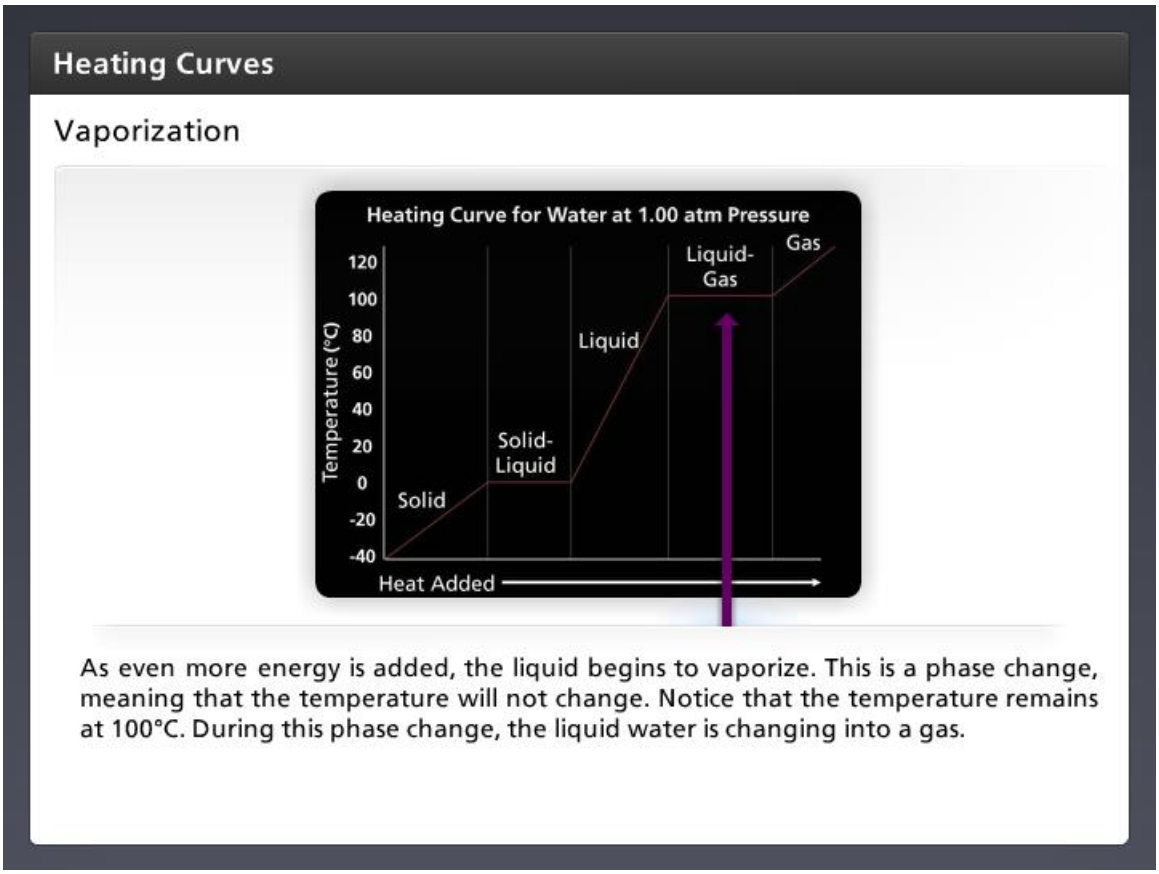
Vaporization



As even more energy is added, the liquid begins to vaporize. This is a phase change, meaning that the temperature will not change. Notice that the temperature remains at 100°C. During this phase change, the liquid water is changing into a gas.

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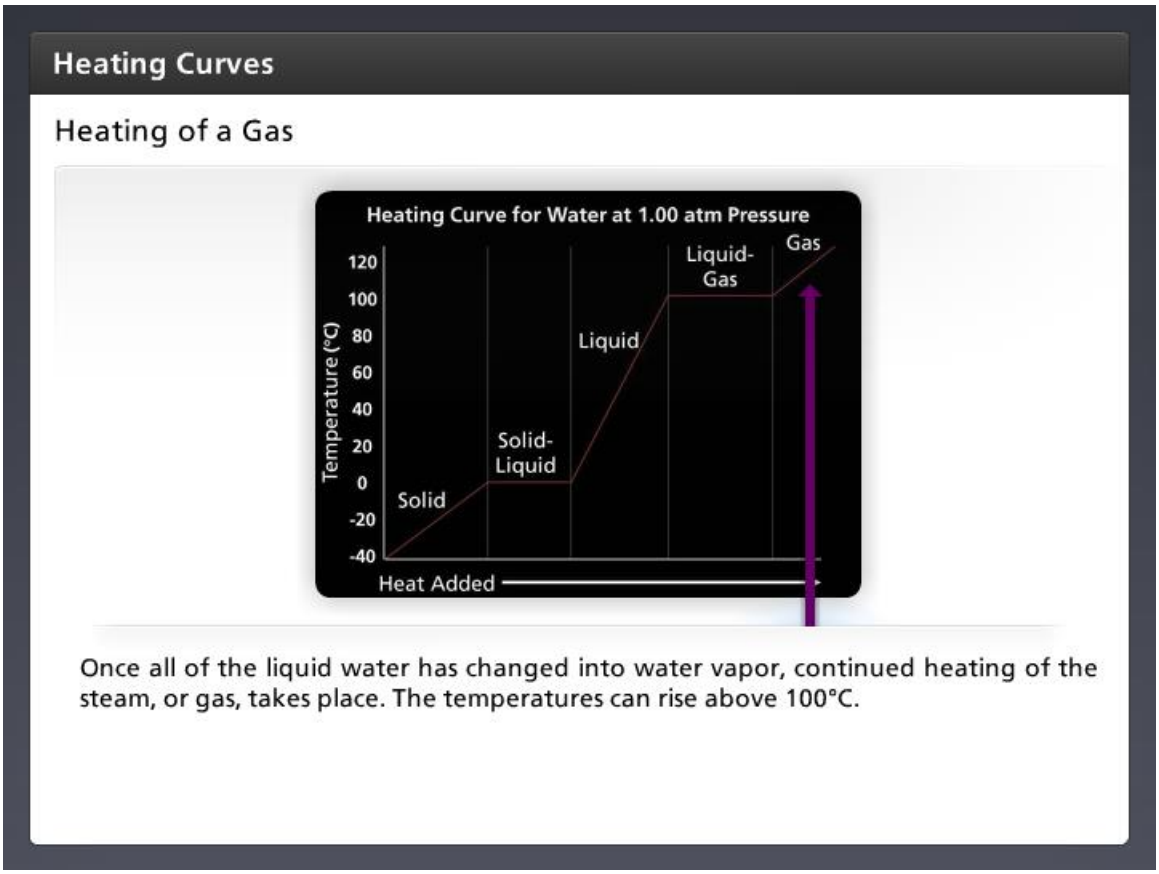
Heating of a Gas



Once all of the liquid water has changed into water vapor, continued heating of the steam, or gas, takes place. The temperatures can rise above 100°C.