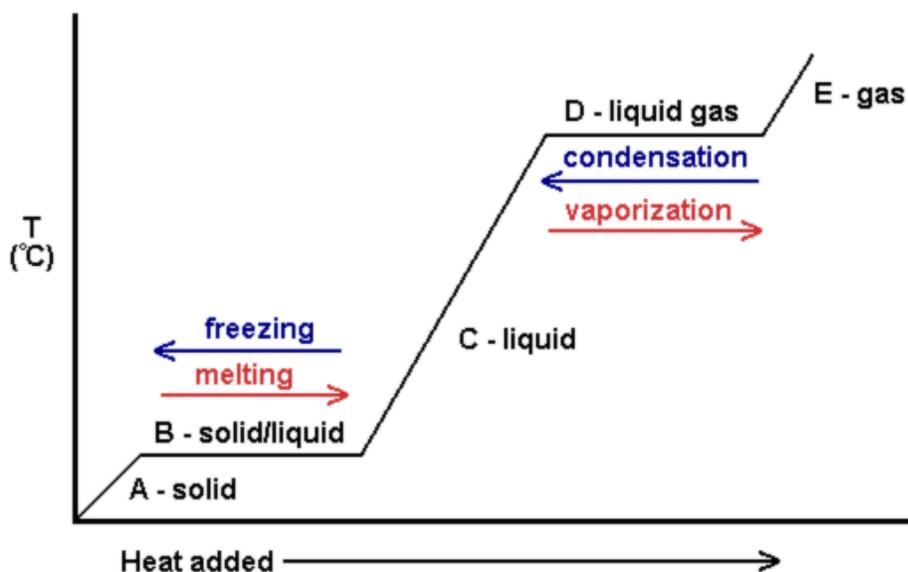


Triple Point Graphs and Phase Change diagrams

When a substance undergoes a phase change, the temperature (KE) stops changing. This plateau occurs when it melts/freezes or boils/condenses. So while there may not be a change in KE there is a change in the PE of the molecules.

Heat of fusion: PE needed to change 1 gram of ice to 1 gram of water at 0 degrees C
Waters heat of fusion is 80 cal/gram

Heat of vaporization: PE needed to change 1 gram of water to 1 gram of steam at 100 degrees C
Waters heat of vaporization is 540 cal/gram

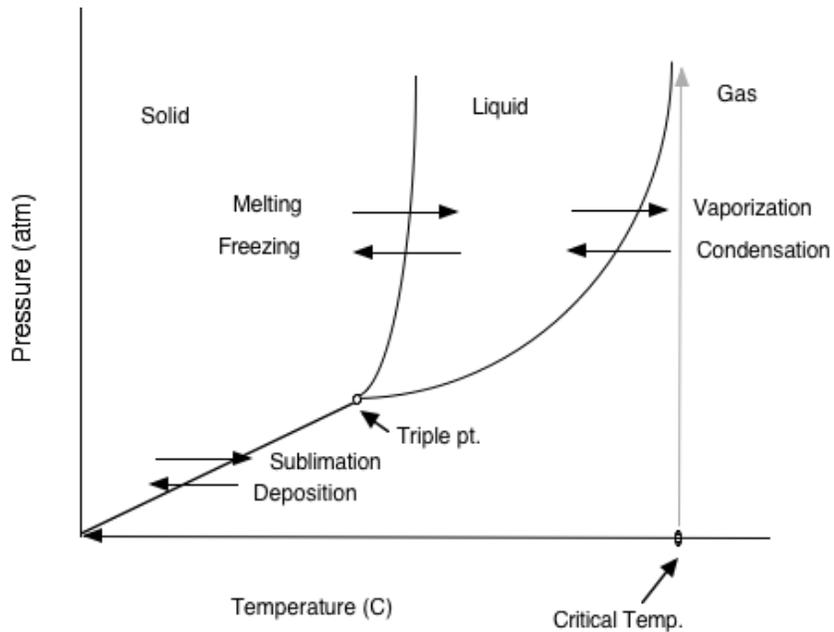


When we say that water boils at 100 C, we are assuming that it is at standard pressure (1 atmosphere or 760 mm Hg or 101.3 Kilopascals) . That is its “normal boiling pt”. Change the pressure above the liquid and the boiling pt will change. (direct relationship)

The vapor pressure of a liquid must be equal to or slightly greater than that of the surrounding atmosphere in order for the liquid to be able to change to a gas. If the pressure above the surface of a liquid increases, the harder it will be for the molecules to escape into the vapor phase and the more KE they will need. So increasing the pressure above a liquid will cause the boiling temperature to rise. Pressure changes have a large influence on the boiling points of most liquids. On the other hand pressure has only a small effect on the freezing/melting points of most substance

Graphs can be used to show this relationship between pressure and boiling and freezing temperatures.

Triple Point Graphs and Phase Change diagrams



Freezing temperatures are also affected by pressure but not as greatly. For most substances, increasing the pressure causes the freezing temperature to rise slightly.

The exception to this rule is water. When increasing the pressure above the surface of solid ice, you actually lower the freezing temperature, and in doing this you “melt” the ice.

The reason for this is that water is one of a few substances that expands upon freezing due to the structure of water and the strong Hydrogen bonds it possesses. When adding pressure, the system can relieve the stress by liquifying. Here is a comparison of how a Triple pt graph for water differs from all other substances.

Water

All other substances

