# Phase Transitions

## Vaporization and Condensation

**Condensation** is the phase transition from gas to liquid. When ther rate of condensation is equal to the rate of **vaporization**(liqiud to gas), the sytem reaches a **Dynamic equilibrium** in which the amount of liquid and gas does not change, but the molecules are continuously exchanged between phases. **Vapor pressure** is the pressure exerted on the liquid by the vapor above.

## Boiling Points

The temperature at which the vapor pressure increases enough to match the atmospheric pressure is the **Boiling Point**.

## Clausius-Clapeyron Equation

$$P = Ae^{-\Delta H_{vap}/RT}$$

The CCE can be linearized in the following form.

$$ln(P) = \frac{-\Delta H_{vap}}{RT} + ln(A)$$

For a change of temperature, we can combine the 2 linear Clausius equations at each temperature, setting each equal to ln(A), and then setting each expression equal to each other, such that;

$$ln(\frac{P1}{P2}) = \frac{\Delta H_{vap}}{R}(\frac{1}{T1} - \frac{1}{T2})$$

## Enthalpy of Vaporization

Vaporization is an endothermic process. Condensation is exothermic, it is the negative of vaporization

## Melting and Freezing

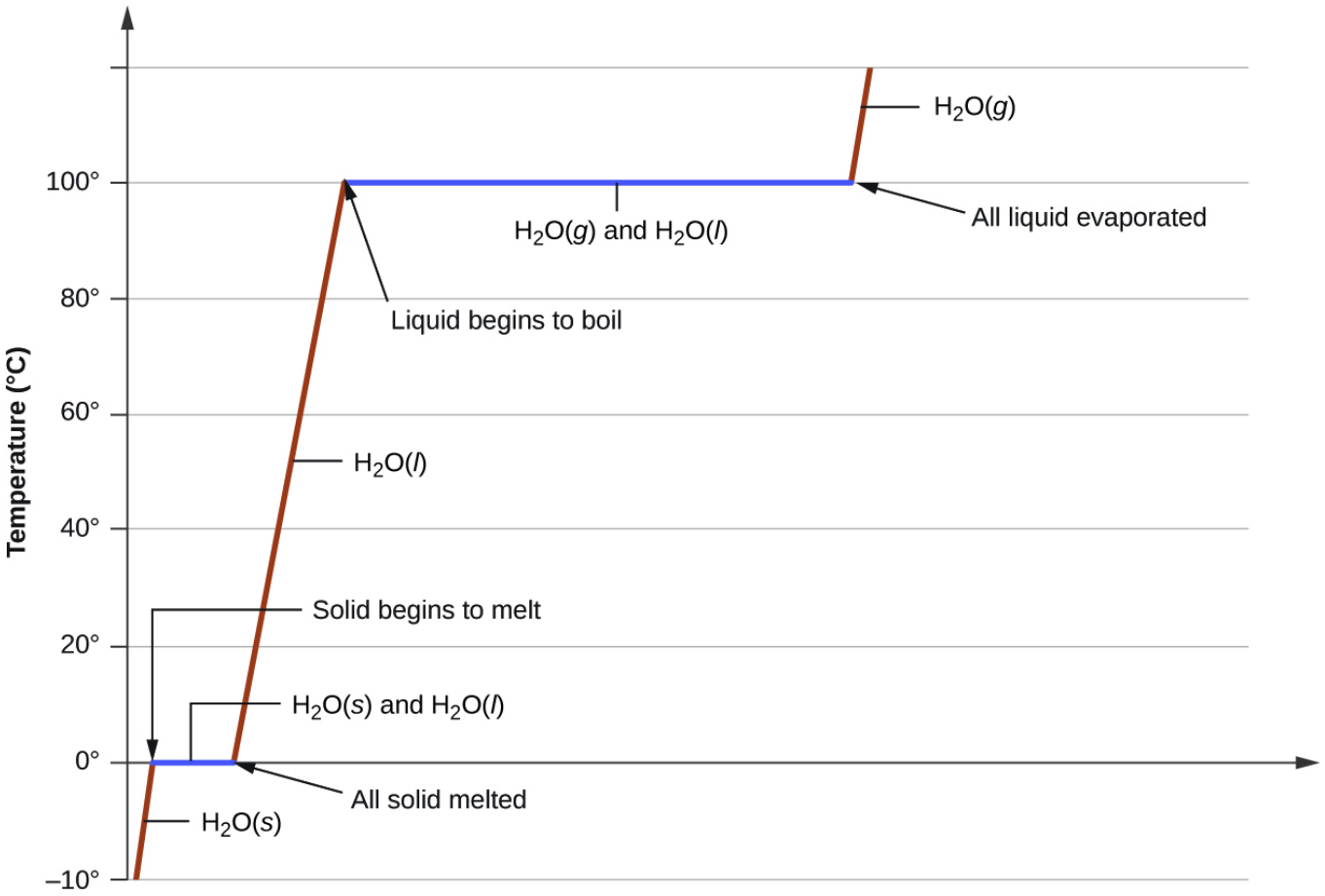
**Melting** is the phase transition from solid to liquid, and **Freezing** is the opposite. The enthalpy of **fusion** is that of melting.

## Sublimation and Deposition

**Sublimation** is the phase transition from solid to gas. **Deposition** is the opposite.

## Heating and Cooling Curves

Recall $q = mc\Delta T$


Temperature (°C)
100°
80°
60°
40°
20°
0°
–10°
$H_2O(g)$
All liquid evaporated
$H_2O(g)$ and $H_2O(l)$
Liquid begins to boil
$H_2O(l)$
Solid begins to melt
$H_2O(s)$ and $H_2O(l)$
All solid melted
$H_2O(s)$