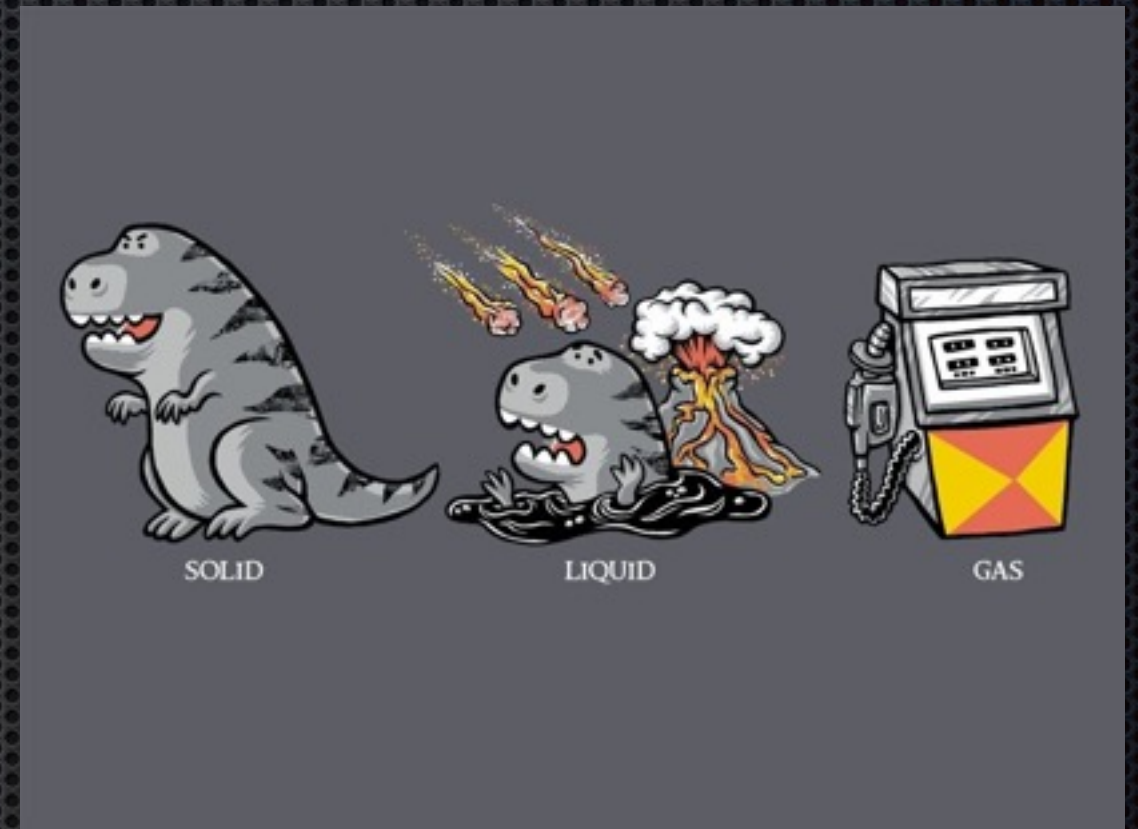


Kinetics and States of Matter

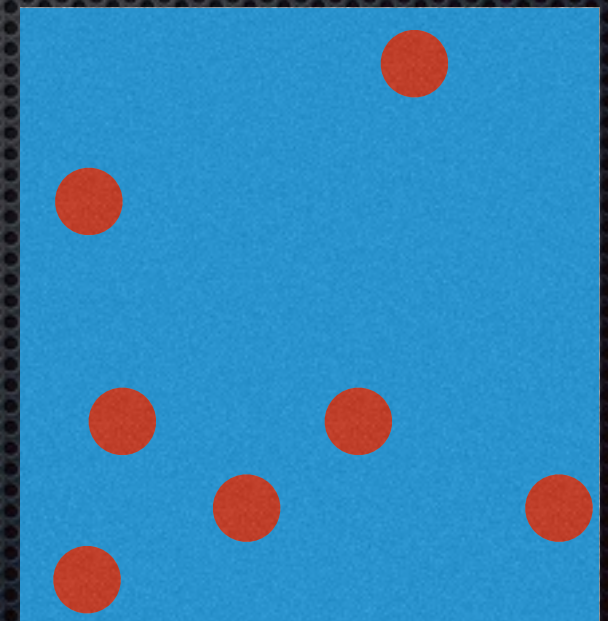
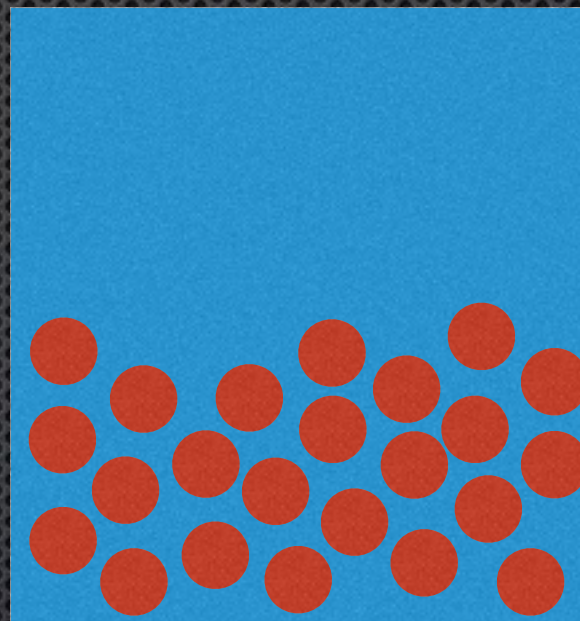
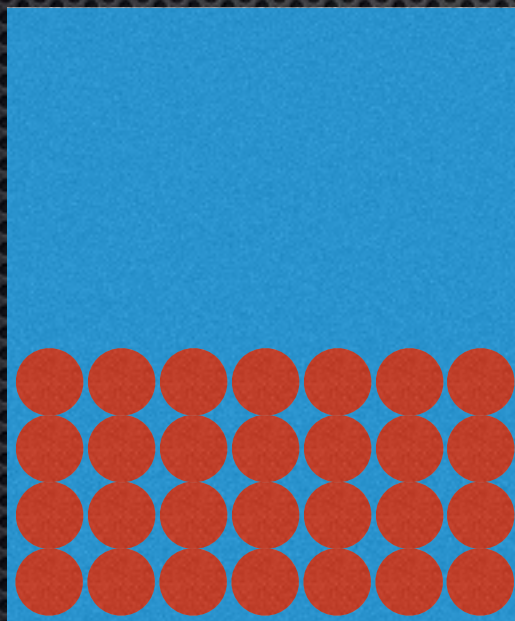
Warm-Up

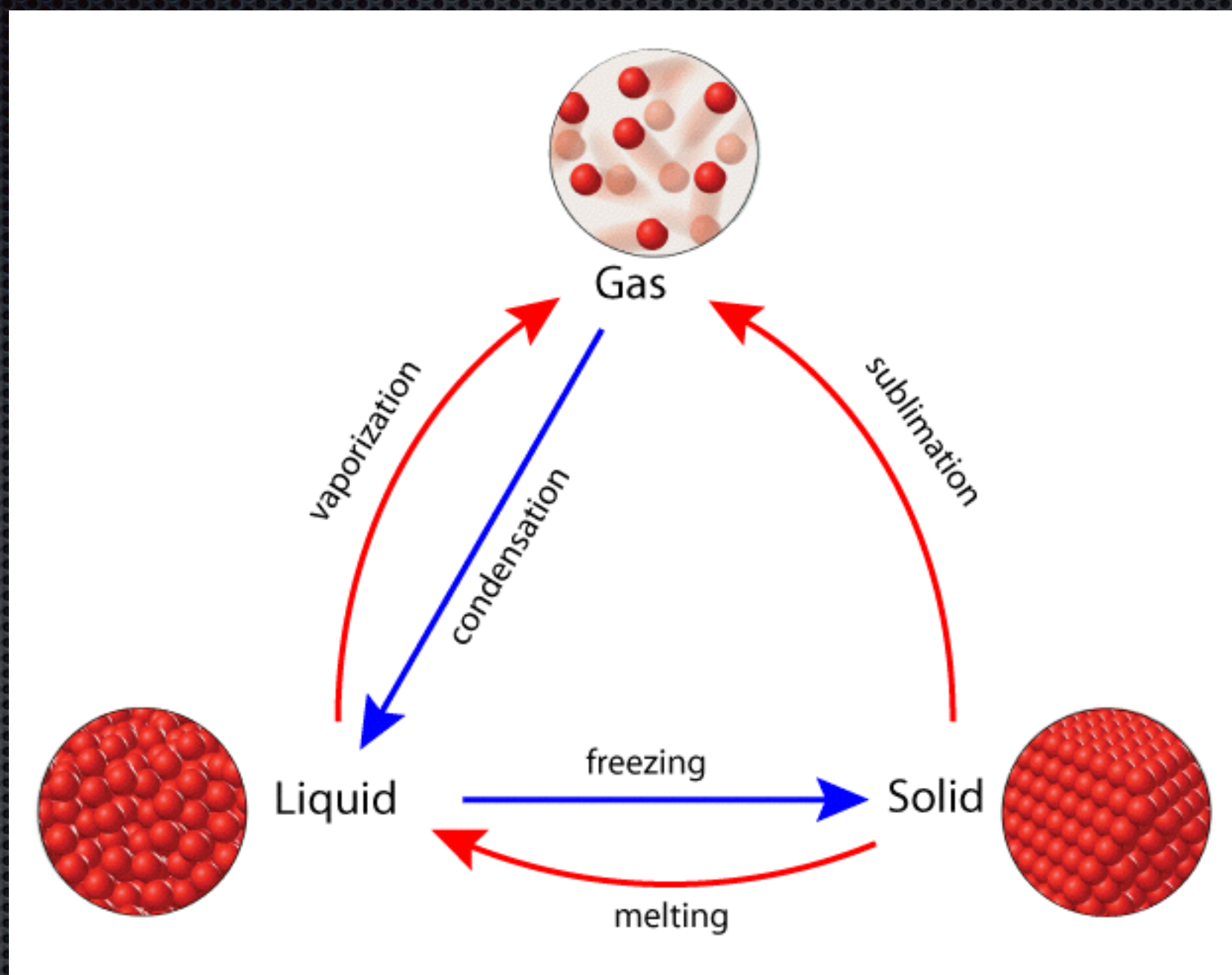
- Which state of matter (solid, liquid, gas) has the greatest amount of energy and explain using science words?



Key Concepts

Matter is made up of particles in continual random motion. Kinetic energy is the measure of that motion and we measure it as temperature.





Vaporization: Evaporation

In an open container, molecules that evaporate can escape from the container.



Condensation

In a closed container, the gas molecules cannot escape. They collect as a vapor above the liquid.

Some gas molecules condense back into a liquid.



Pressure and Gas

**CO₂ at 0°C
3425-3629 kPa**

- ✦ Measure of force gas particles exert over an area.
- ✦ Vapor pressure is the force exerted above a liquid.
- ✦ As temperature increases vapor pressure increases

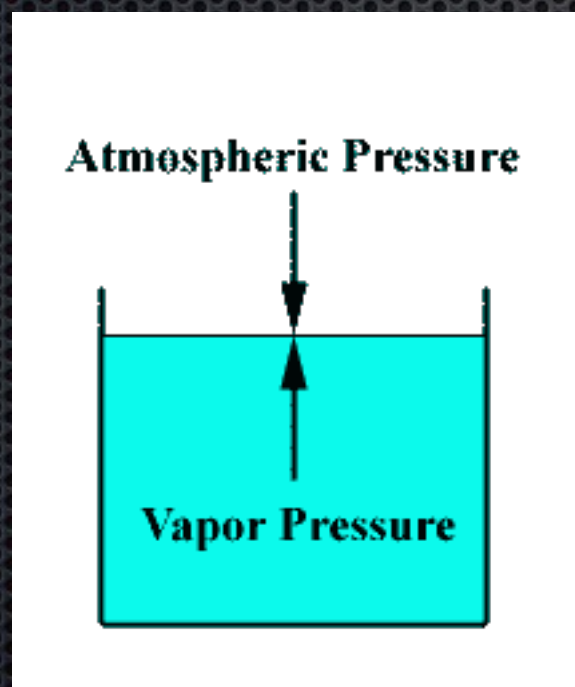


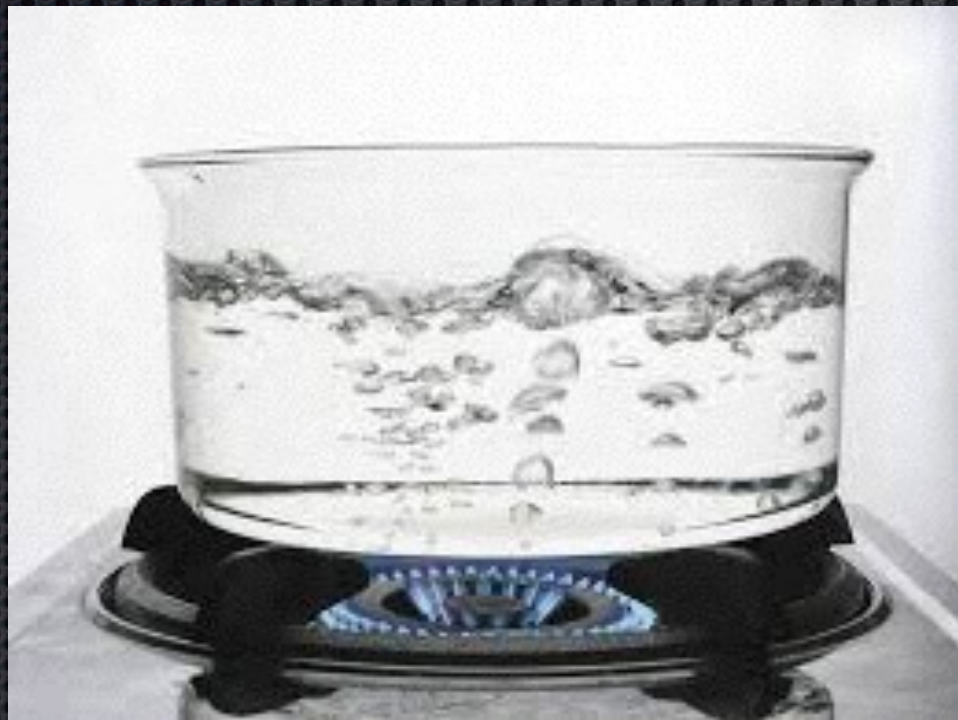
Table 13.1

**Vapor Pressure (in kPa) of Three Substances
at Different Temperatures**

	0°C	20°C	40°C	60°C	80°C	100°C
Water	0.61	2.33	7.37	19.92	47.34	101.33
Ethanol	1.63	5.85	18.04	47.02	108.34	225.75
Diethyl ether	24.70	58.96	122.80	230.65	399.11	647.87

Vaporization: Boiling

- ✦ **When a liquid is heated to a temperature at which particles throughout the liquid have enough kinetic energy to vaporize, the liquid begins to boil.**



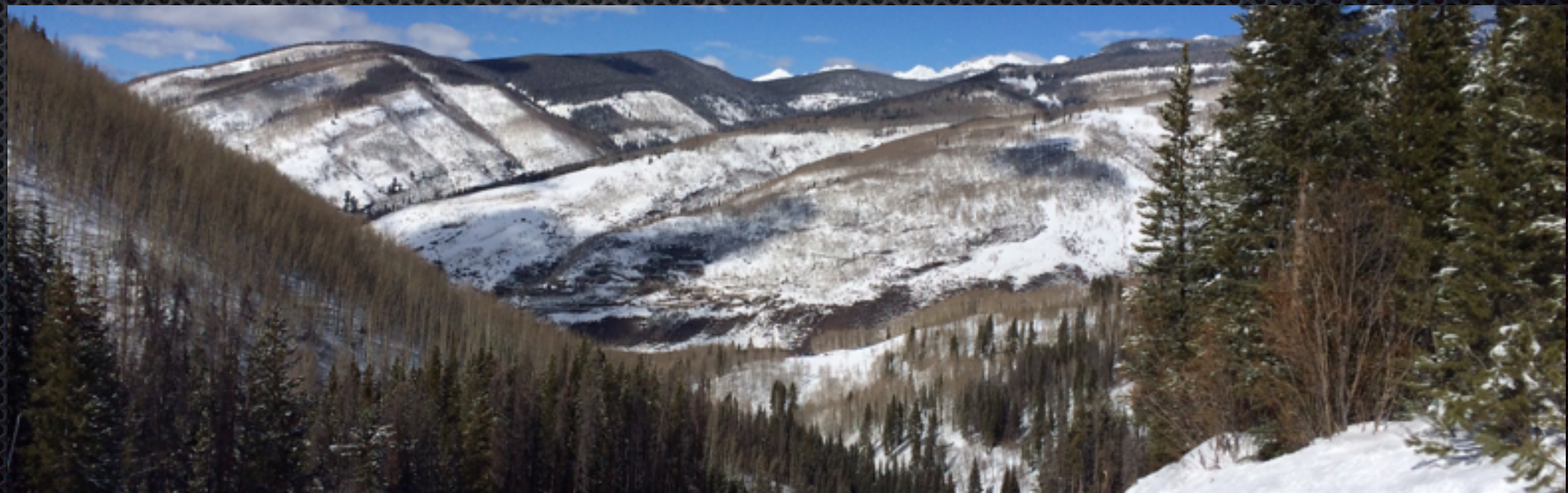
The temperature at which the vapor pressure of the liquid is just equal to the external pressure on the liquid is the **boiling point (bp)**.

Boiling Point and Pressure Changes

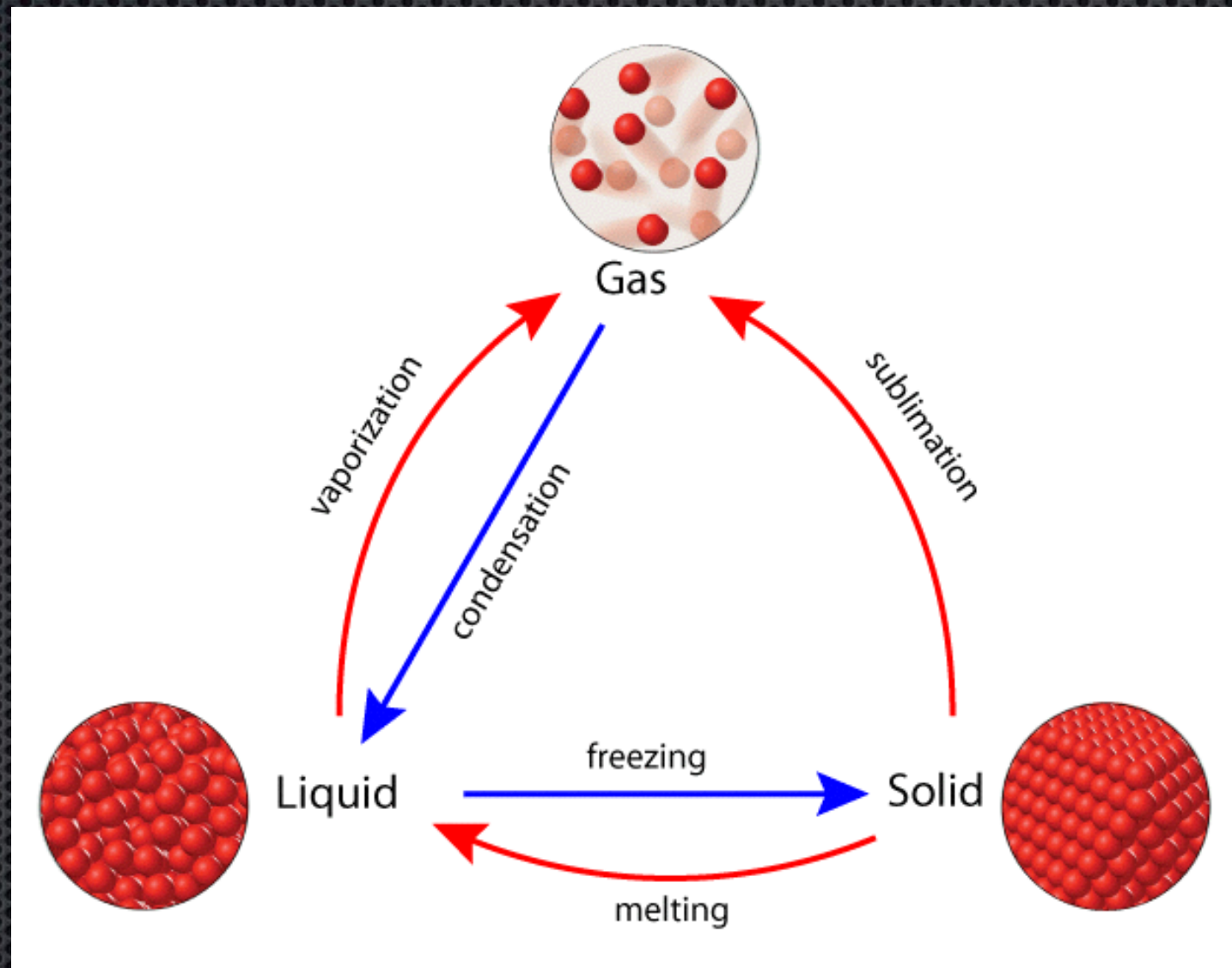
Because a liquid boils when its vapor pressure is equal to the external pressure, liquids don't always boil at the same temperature.

- At a lower external pressure, the boiling point decreases.**
- At a higher external pressure, the boiling point increases**

Because a liquid can have various boiling points depending on pressure, the normal boiling point is defined as the boiling point of a liquid at a pressure of 101.3 kPa.



Sublimation occurs when there is high vapor pressure and cold temperatures



Let's play with some dry ice

