

Introduction to Solutions

Schweitzer

Saturated

- Solvent is holding the maximum amount of solute for a given temperature.



Cheerios

+



Sugar

=



Super Saturated

- **Solvent holding more solute than maximum at the current temperature.**
- **A student can carry 25 textbooks.**
 - Imagine the student holding 35 books. If bumped the books are dropped.

Solubility

- Ratio = Solute vs. Solvent
- Mass solute per volume of solvent
- g/mL

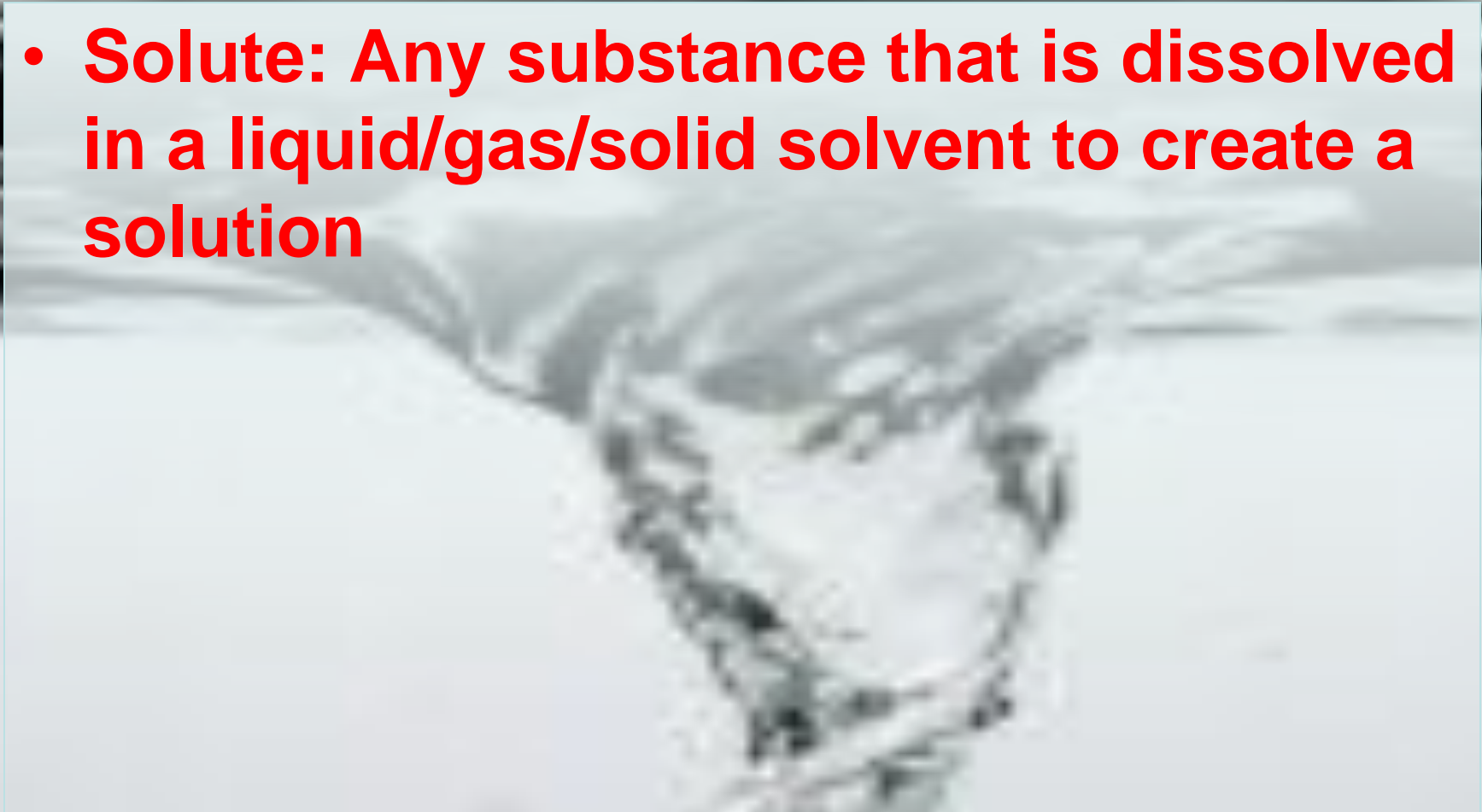
- Increasing temperature affects solubility
 - Solid \uparrow
 - Gas \downarrow (Henry's Law)

Solution = Solvent + Solute

- A **solvent** is a substance that dissolves another substance or substances to form a solution. The solvent is the component in the solution that is present in the largest amount. Solvents are usually, but not always, liquids. They can also be gases or solids.

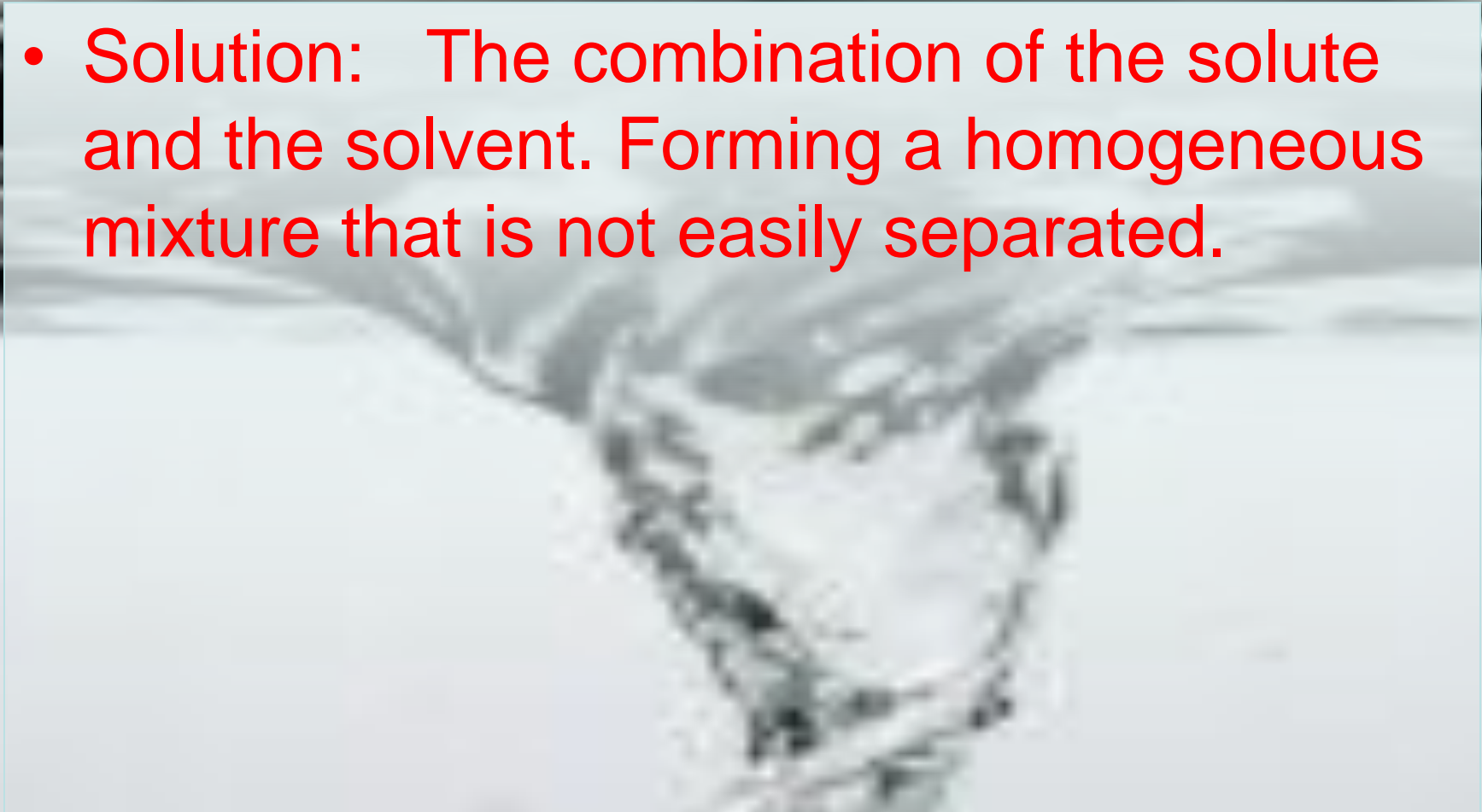
Solution = Solvent + Solute

- **Solute: Any substance that is dissolved in a liquid/gas/solid solvent to create a solution**



Solution = Solvent + Solute

- **Solution:** The combination of the solute and the solvent. Forming a homogeneous mixture that is not easily separated.



Dissolving?

- **Dissolving-** Is the process by which a solute is chemically bound to the solvent.
- **Gravity--**Let to stand, a truly dissolved solute will never separate.
- **Filtration?**
- **Centrifuge?**

Suspension

- **Material is floating in solvent**
 - Given time material will settle to bottom.
 - Easily filtered
- **Lake Winnebago**
 - Winter vs. Summer
 - The form *Winnebago* is from the Menominee *Winnibégo*, which expresses the meaning "Dirty Water People."

Colloid

- A solution where a substance is hanging in solution but can be easily removed.
- Gravity: Will not settle out by gravity.
- Centrifuge: Easily separates.
- **Example**: Milk, lotion, toothpaste

Electrolyte / Non-electrolyte

- Electrolytes: Solution that conducts electricity.
- Ionic compounds conduct electricity
 - Example: $\text{NaCl} \rightarrow \text{Na}^+ + \text{Cl}^-$
- Sport/energy drinks claim to be high in electrolytes.



Photo: @BeverNET.com



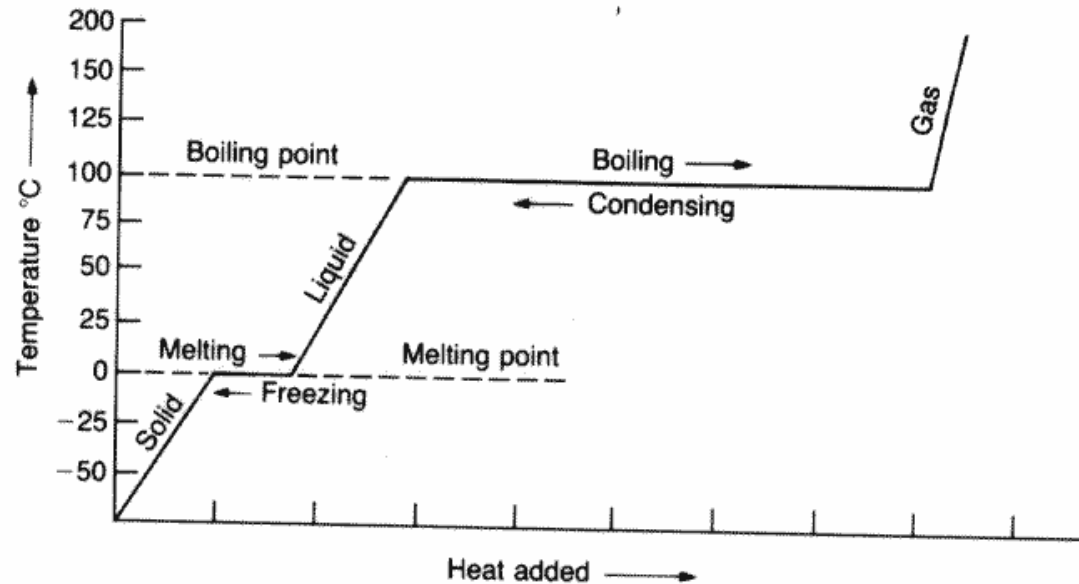
MONSTER
ENERGY

Solutions



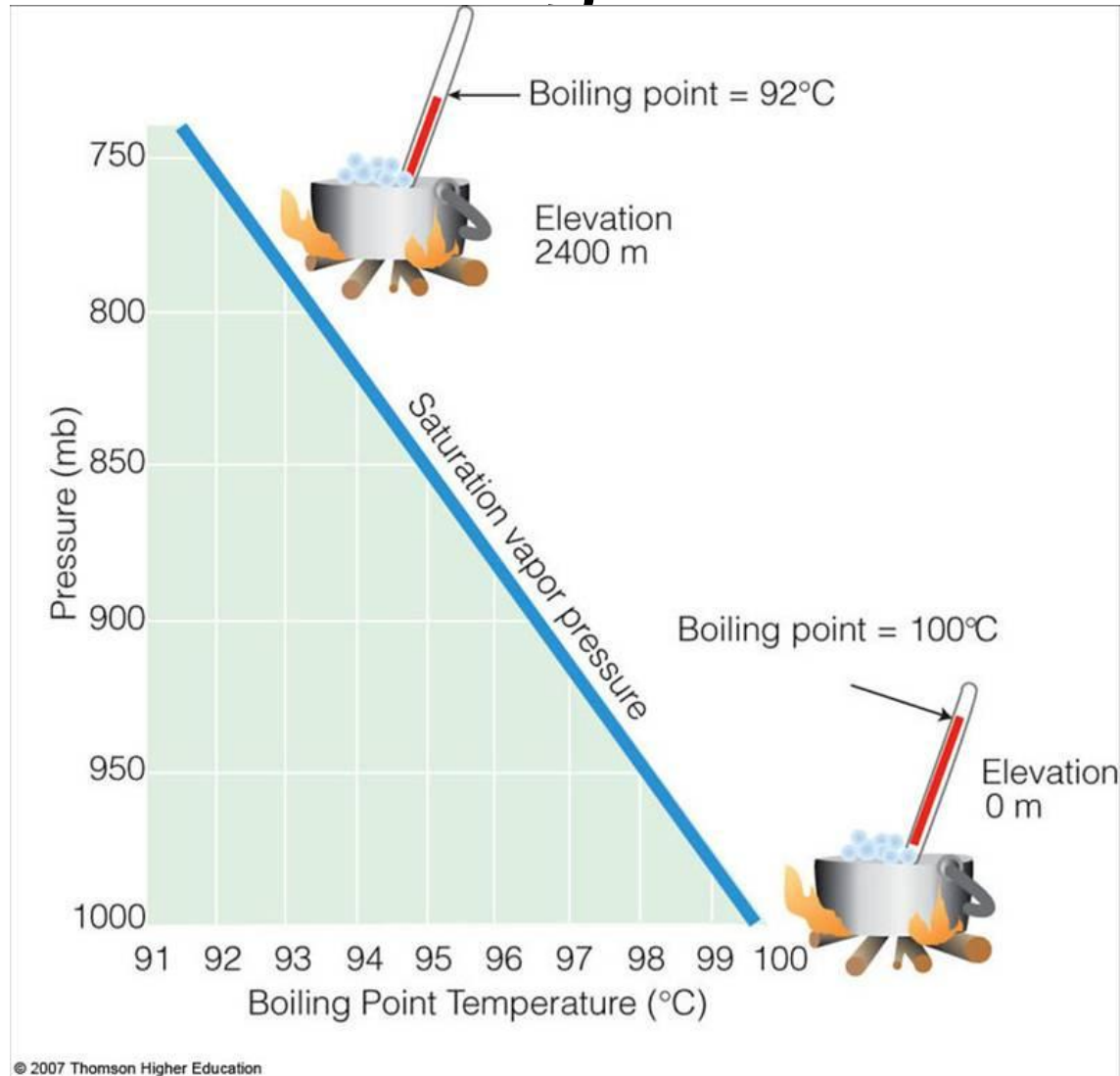
States of matter

- Solid
- Liquid
- Gas



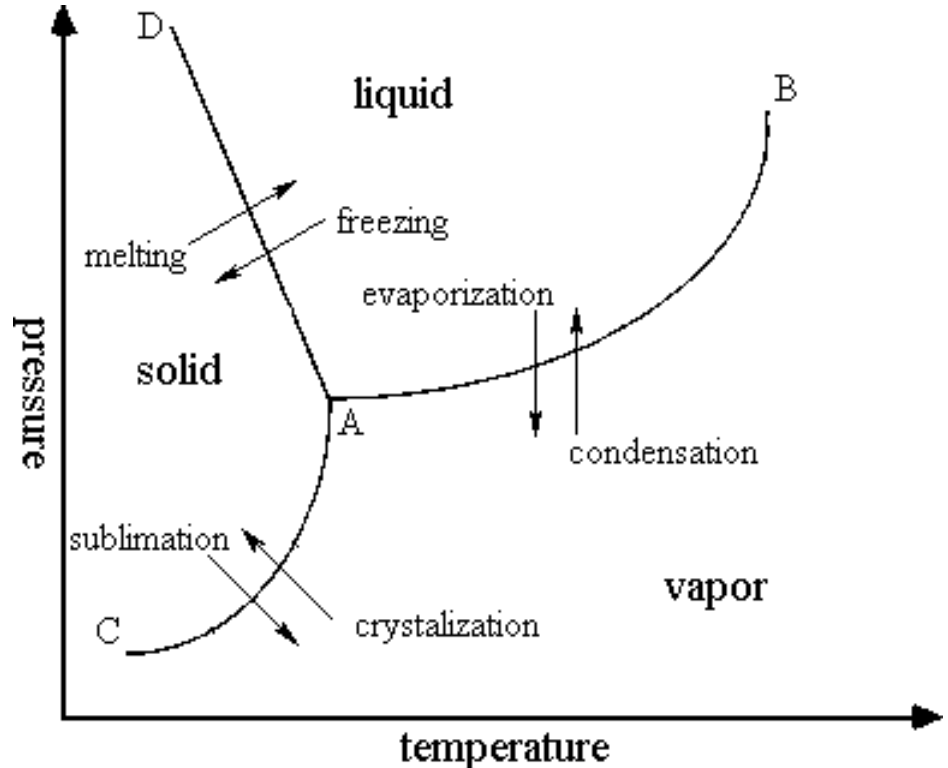
What factors affect phase change?

Q: Why does water boil at lower temperatures at higher altitudes?



What would a graph look like the tracked temperature vs. pressure?

- Increasing temperature pushes a substance toward being a gas.
- Increasing the atmospheric pressure pushes or compresses the substance more toward being a solid.

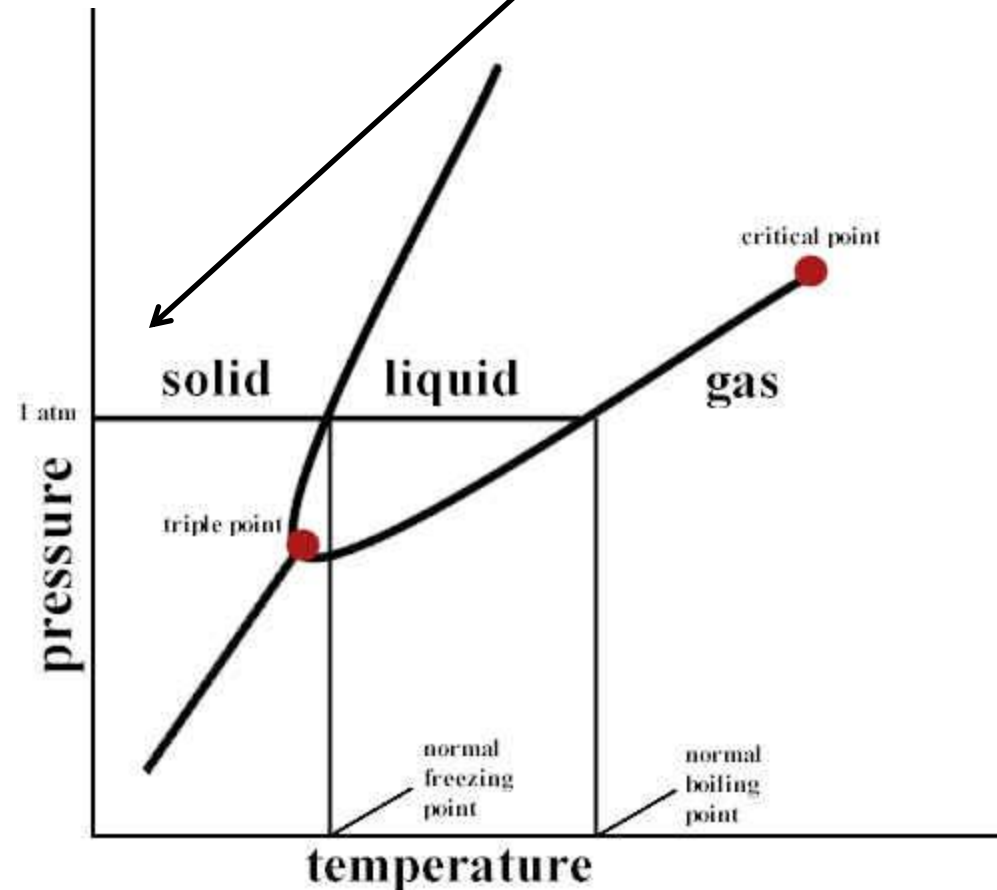


Triple phase Diagram?

Considered
normal
pressure

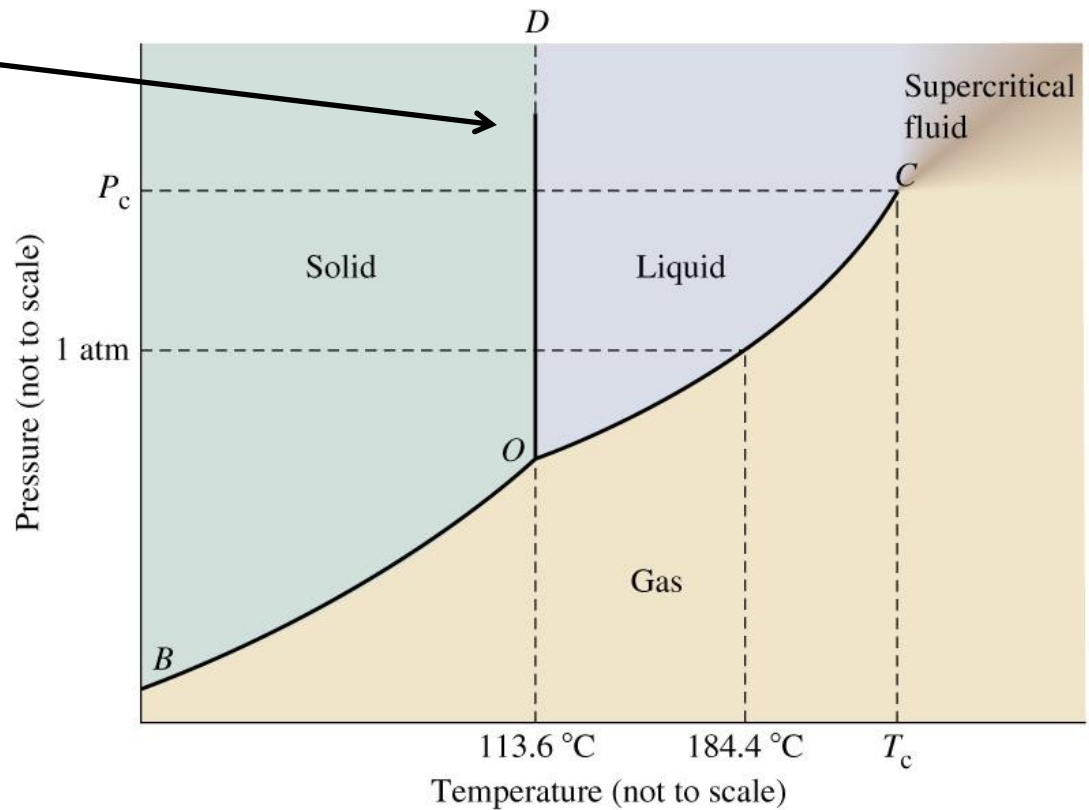
- New Terms

- Triple point: point to where all 3 phases are present.
- Critical point: temperature is so high liquid can no longer be sustained.



Triple phase diagrams

- If line leans to the left its solid will float in its own liquid
- If it leans to the right its solid will sink in its own liquid.



Factors affecting Vaporization

There are two ways to boil water.

1. Raise the water's Vapor pressure above the atmospheres pressure. (Vapor pressure > Atmospheric pressure.)
2. Find a way to lower the atmospheric pressure