

N34 - SOLUTIONS

Solubility Trends

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Target: I can describe how the solubility of a substance changes based on the phase of the substance.

Solubility Trends

Solids

- **Solubility of MOST solids increases with temperature.**
- **The rate at which solids dissolve increases with increasing surface area of the solid.**

Gases

- **Solubility decreases with temperature.**
- **Solubility increases with the pressure above the solution.**

Therefore...

Solids tend to dissolve best when:

- **Heated**
- **Stirred**
- **Ground into small particles**

Gases tend to dissolve best when:

- **The solution is cold**
- **Pressure is high**

Temperature Dependence of Solubility of Gases in Water

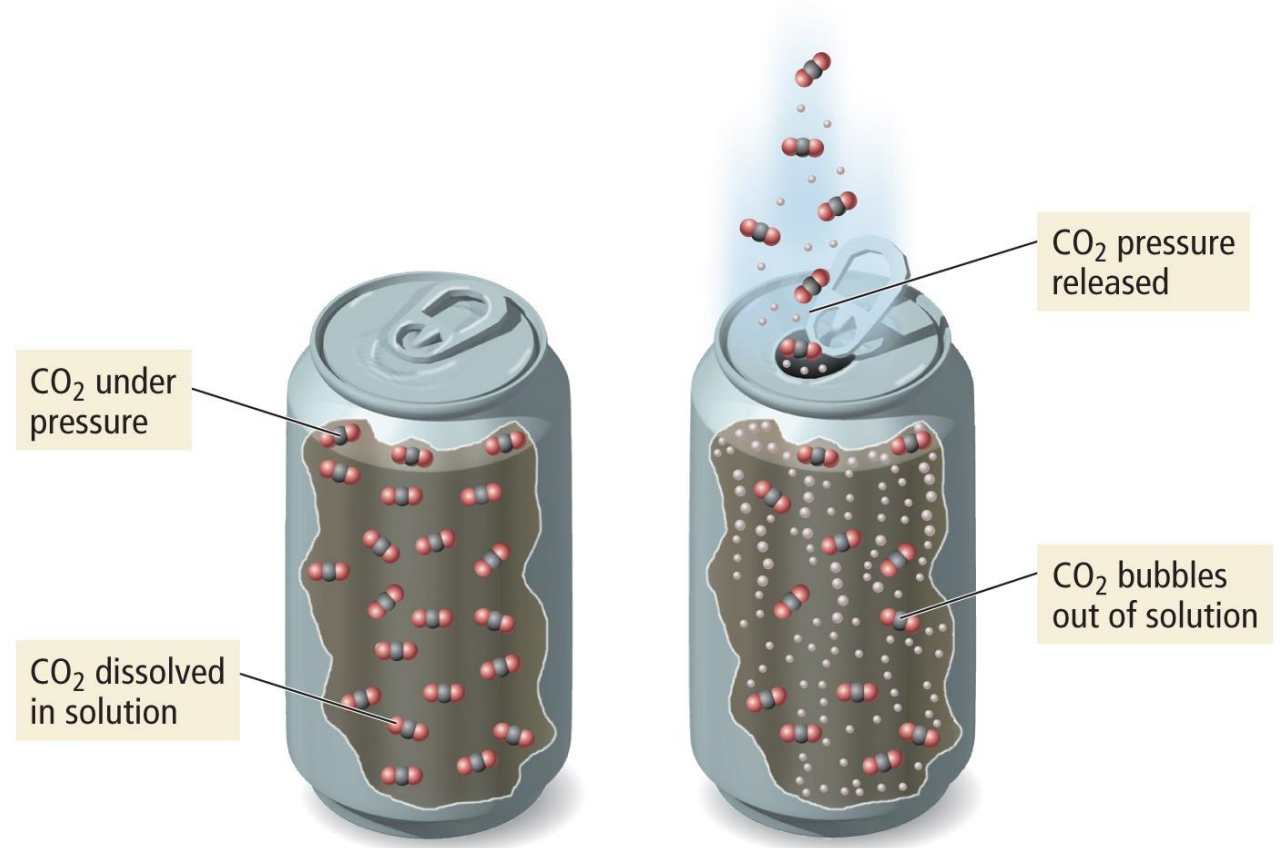


Cold soda pop

Warm soda pop

Pressure Dependence of Solubility of Gases in Water

The larger the partial pressure of a gas in contact with a liquid, the more soluble the gas is in the liquid.



Solubility Limit

Saturated - When the solute and solvent in dynamic equilibrium

- If you add more solute it will not dissolve.
- The saturation [] depends on the temperature and pressure of gases.

Unsaturated – When there is less solute than when saturated

- More solute will dissolve at this temperature.

Supersaturated – When there is more solute than when saturated

- Made by heating the solvent up, dissolving more solute than can be dissolved at the lower temperature, and then slowly cooling the solution down. Not a very stable situation, the extra solute will “crash out” if disturbed.

<http://www.youtube.com/watch?v=0wifFbGDv4I>

Temperature Dependence of Solubility of Solids in Water

Units - Solubility is often in grams of solute that will dissolve in 100 g of water. Be sure to check though!

For most solids, the solubility of the solid increases as the temperature increases.

– When $\Delta H_{\text{solution}}$ is endothermic

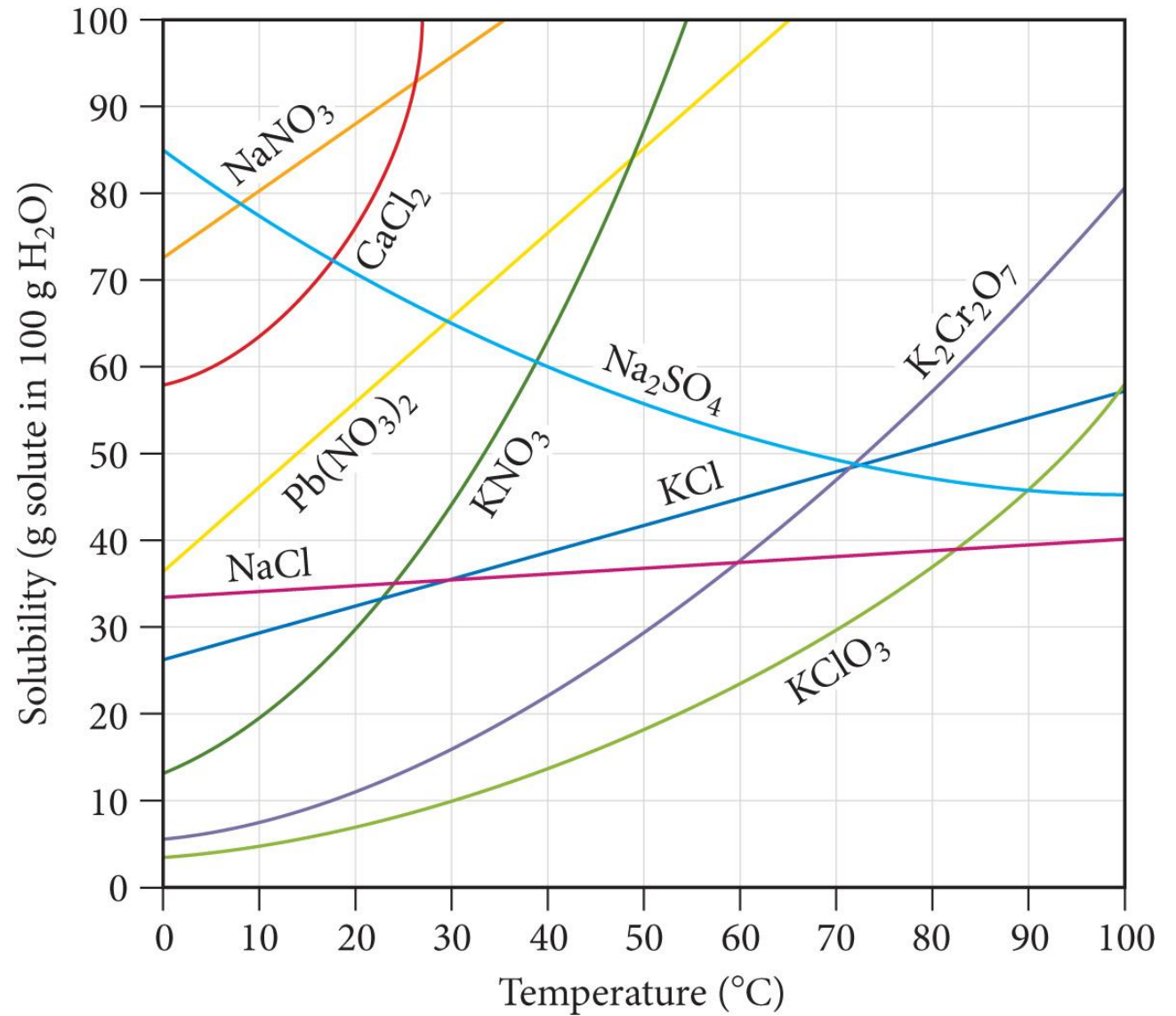
Solubility Curves

Can be used to predict solubility of a solute.

Saturated
On the line

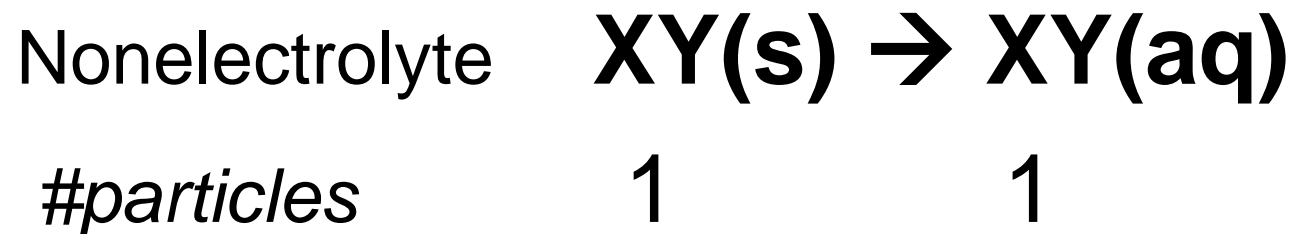
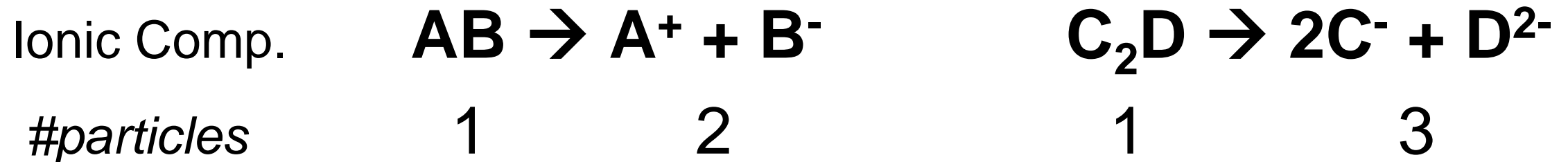
Unsaturated
Below the line

Supersaturated
Above the line



Ionic Solutes

Ionic compounds lower the vapor pressure 2-3+ times more than nonelectrolyte solutes. When the ionic compounds dissociate it results in more particles.



VP lowering depends on the number of particles, not the identities of the particles.

Electrolytes vs. Non-electrolytes

Electrolyte

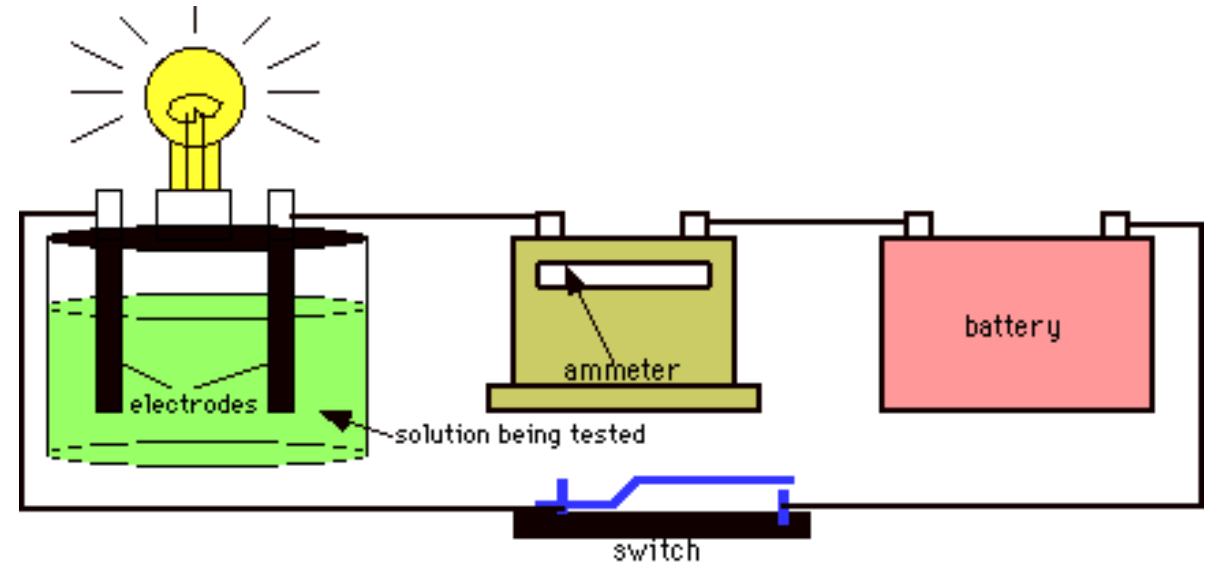
A substance whose aqueous solution conducts an electric current.

Nonelectrolyte

A substance whose aqueous solution does not conduct an electric current.

Electrolytes vs. Non-electrolytes

The **ammeter** measures the flow of electrons (current) through the circuit.



- If the ammeter measures a current, and the bulb glows, then the sol'n conducts.
- If the ammeter fails to measure a current, and the bulb does not glow, the solution is non-conducting.

Electrolytes or Non-electrolytes?

- 1) Pure water
- 2) Tap water
- 3) Sugar solution
- 4) Sodium chloride solution
- 5) Hydrochloric acid solution
- 6) Lactic acid solution
- 7) Ethyl alcohol solution
- 8) Pure sodium chloride

Answers

ELECTROLYTES:

- Tap water (weak)
- NaCl solution
- HCl solution
- Lactic acid solution (weak)

NONELECTROLYTES:

- Pure water
- Sugar solution
- Ethanol solution
- Pure NaCl (*unless molten!*)

YouTube Link to Presentation

<https://youtu.be/S6VuAo-LIYw>