

Properties of Solutions

Solubility

Solubility Trends

- The solubility of MOST solids increases with temperature.
- The rate at which solids dissolve increases with increasing surface area of the solid.
- The solubility of gases decreases with increases in temperature.
- The solubility of gases 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

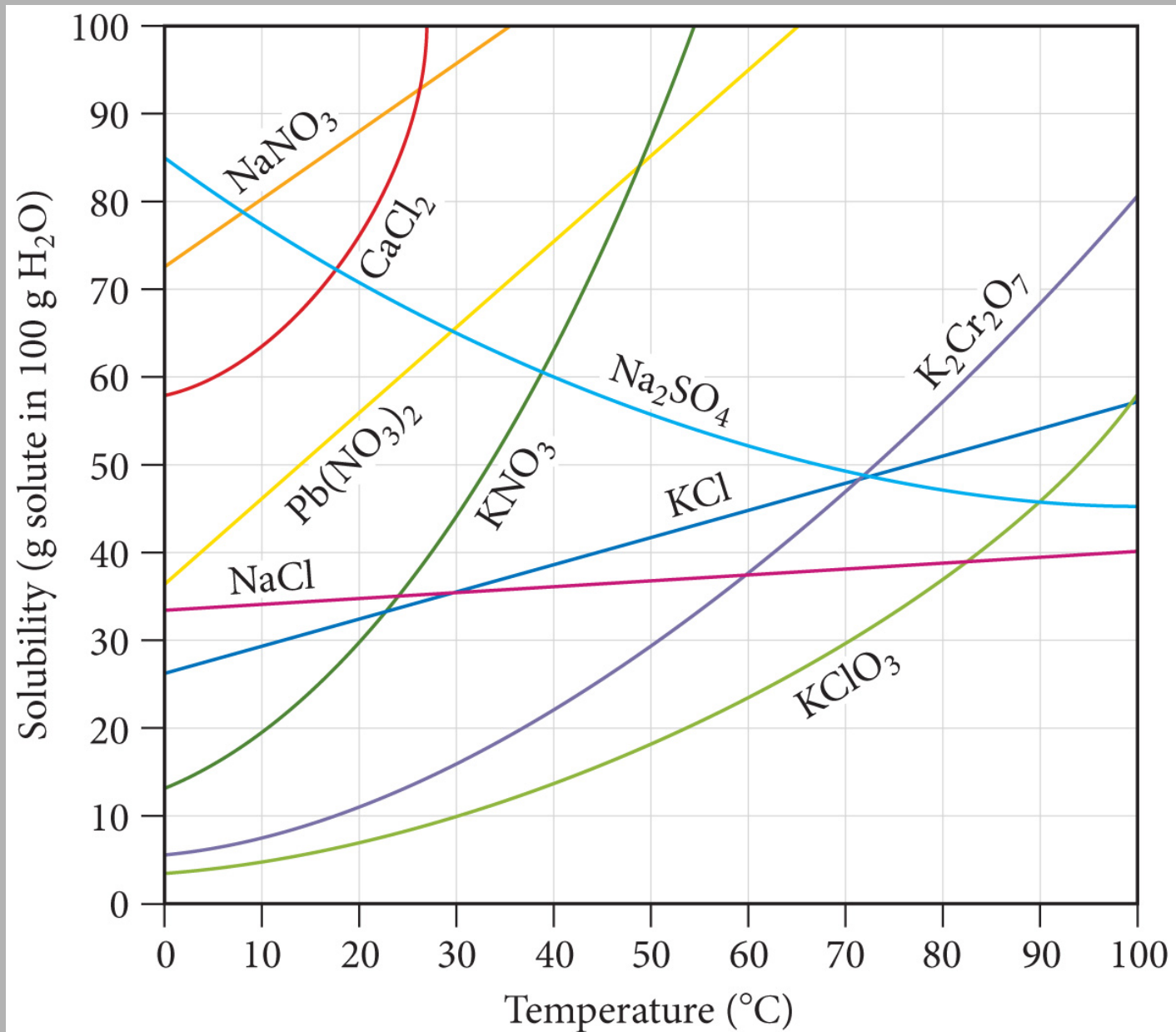
Solubility Limit

- A solution that has the solute and solvent in dynamic equilibrium is said to be **saturated**.
 - If you add more solute it will not dissolve.
 - The saturation concentration depends on the temperature and pressure of gases.
- A solution that has less solute than saturation is said to be **unsaturated**.
 - More solute will dissolve at this temperature.
- A solution that has more solute than saturation is said to be **supersaturated**.

Temperature Dependence of Solubility of Solids in Water

- Solubility is generally given in grams of solute that will dissolve in 100 g of water.
- 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 whether a solution with a particular amount of solute dissolved in water is saturated (on the line), unsaturated (below the line), or supersaturated (above the line).

Solubility Curves



Temperature Dependence of Solubility of Gases in Water

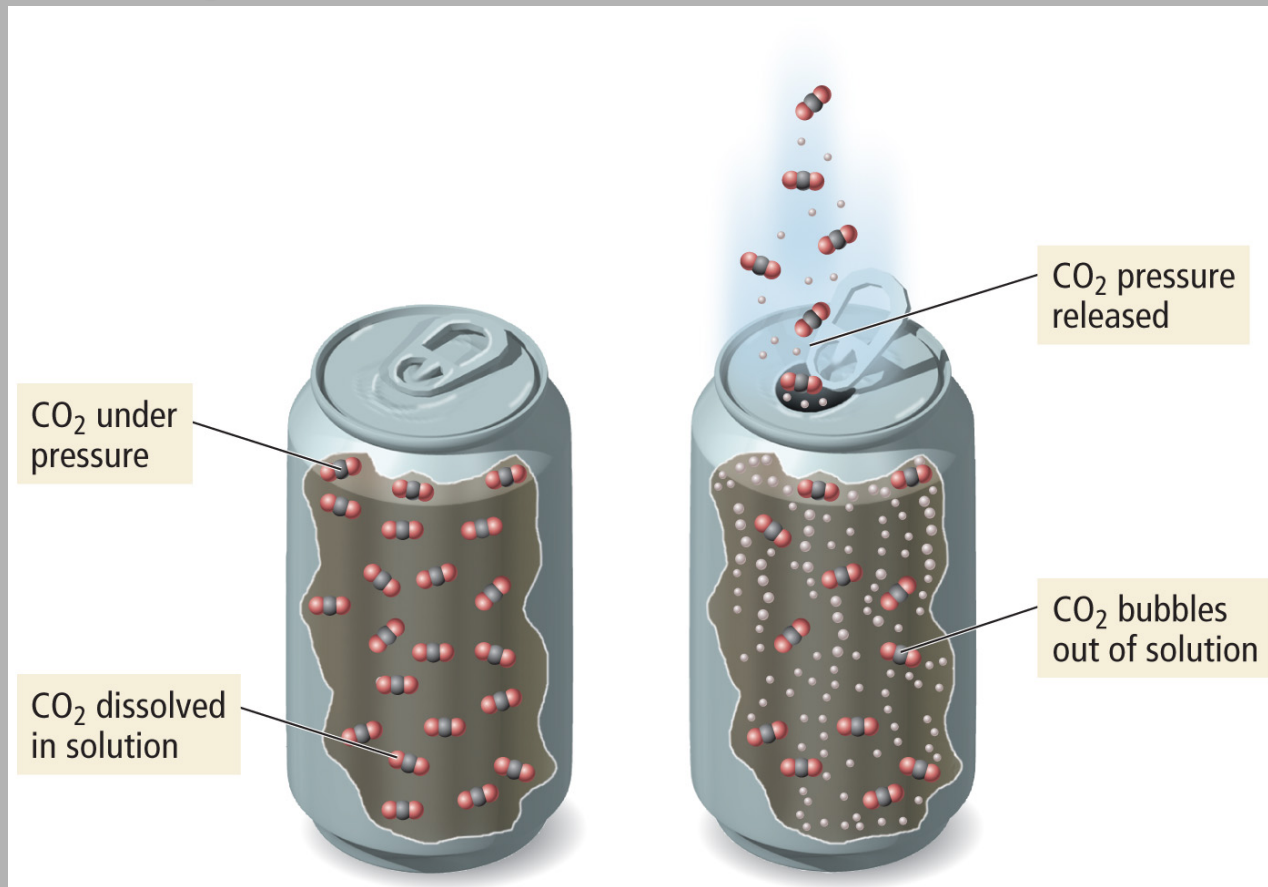


Cold soda pop

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.



Ionic Solutes

- Dissociation of ionic compounds has nearly two, three or more times the vapor pressure lowering of nonionic (nonelectrolyte) solutes

Definition of Electrolytes and Nonelectrolytes

An electrolyte is:

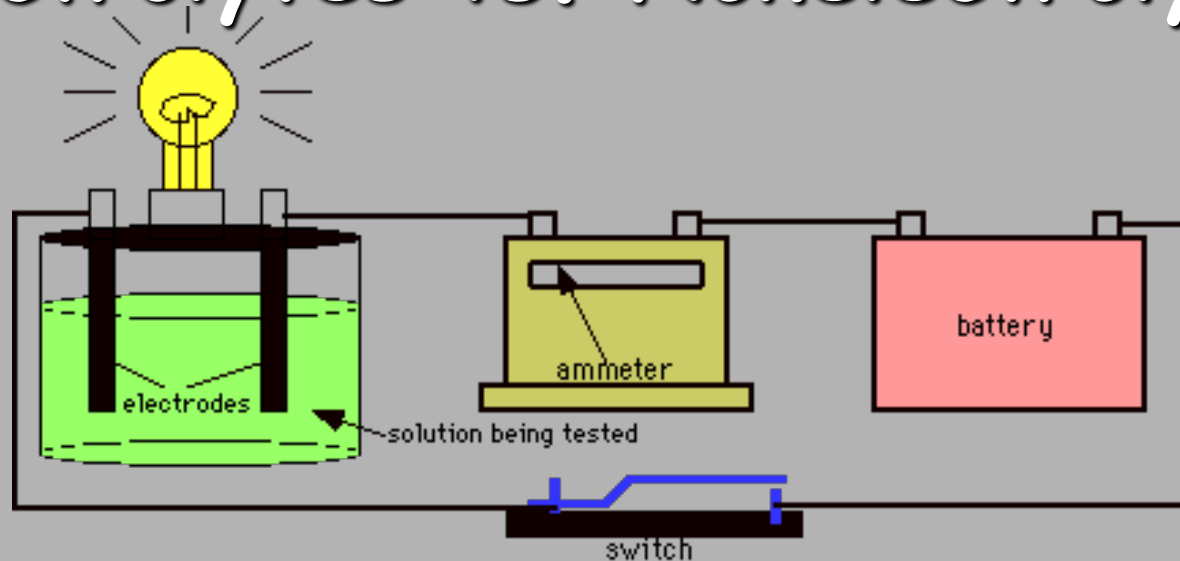
- A substance whose aqueous solution conducts an electric current.

A nonelectrolyte is:

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

Try to classify the following substances as electrolytes or nonelectrolytes...

Electrolytes vs. Nonelectrolytes



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

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

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 to Electrolytes

ELECTROLYTES:

- Tap water (weak)
- NaCl solution
- HCl solution
- Lactate solution (weak)

NONELECTROLYTES:

- Pure water
- Sugar solution
- Ethanol solution
- Pure NaCl