

Solution = Solute + Solvent

- **Solution** - homogeneous mixture

Solute - substance being dissolved

Solvent - present in greater amount



Solutions can be formed in any state of matter

Examples:

Solute	Solvent	Solution
Gaseous Solutions		
gas	gas	air (nitrogen, oxygen, argon gases)
liquid	gas	humid air (water vapor in air)
Liquid Solutions		
gas	liquid	carbonated drinks (CO ₂ in water)
liquid	liquid	vinegar (CH ₃ COOH in water)
solid	liquid	salt water (NaCl in water)
Solid Solutions		
liquid	solid	dental amalgam (Hg in Ag)
solid	solid	sterling silver (Cu in Ag)

Definitions


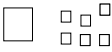

insoluble: "will NOT dissolve in"
e.g., sand and water

immiscible: refers to two gases or two liquids that will NOT form a solution
e.g., water and oil

suspension: appears uniform while being stirred, but settles over time

miscible: Fluids that mix or dissolve in each other in all proportions

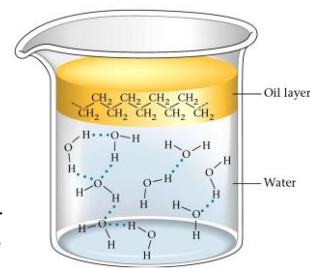
Factors Affecting the Rate of Dissolution

1. temperature  As T^o ↑, rate ↑
2. particle size  As size ↓, rate ↑
3. mixing  More mixing, rate ↑
4. nature of solvent or solute-like dissolves like

Oil and Water Don't Mix

- Oil is nonpolar
- Water is polar

"Like dissolves like" means that a polar solute will dissolve in a polar solvent and vice versa

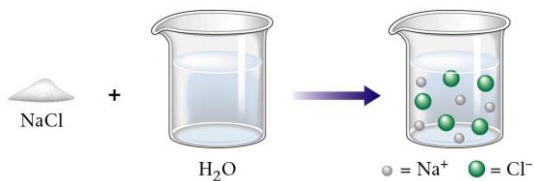


Making solutions



- In order to dissolve - the solvent molecules must come in contact with the solute.
- Stirring moves fresh solvent next to the solute.
- The solvent touches the surface of the solute.
- Smaller pieces increase the amount of surface of the solute.

Dissolving of solid NaCl



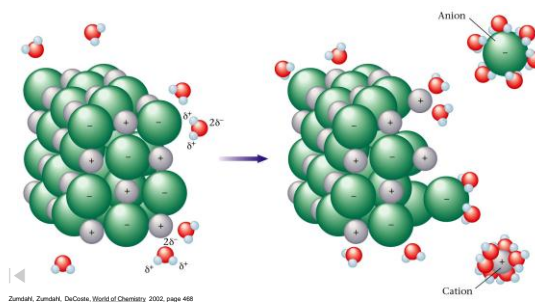
Solvation

- ◆ **Solvation** – the process of dissolving

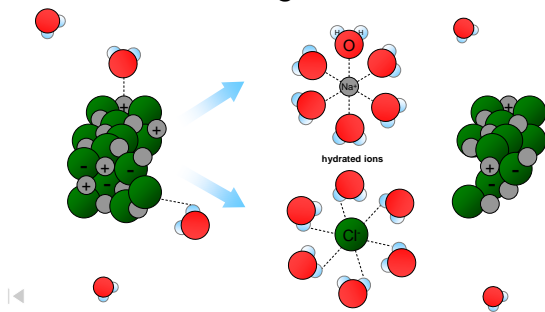
First... solute particles are surrounded by solvent particles

Then... solute particles are separated and pulled into solution

Polar water molecules interact with positive and negative ions [Animation](#)



Dissolving of NaCl

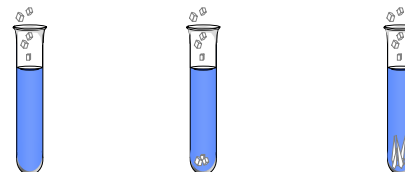


Solubility- the number of grams of solute that can be dissolved in 100mL solvent at 20°C

UNSATURATED SOLUTION
more solute dissolves

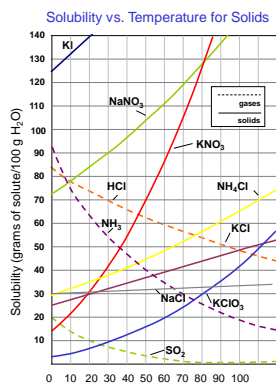
SATURATED SOLUTION
no more solute dissolves

SUPERSATURATED SOLUTION
becomes unstable, crystals form



Solubility Table

shows the dependence of solubility on temperature



LeMay, J., Beall, Robbins, Brower, Chemistry Connections to Our Changing World, 1996, page 517

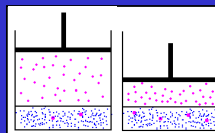
Solubility

◆ Solids are more soluble at...

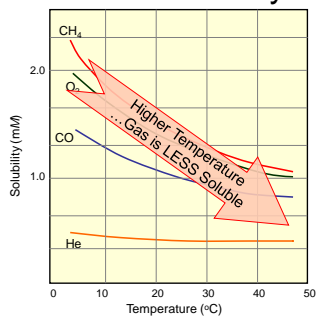
- high temperatures.

◆ Gases are more soluble at...

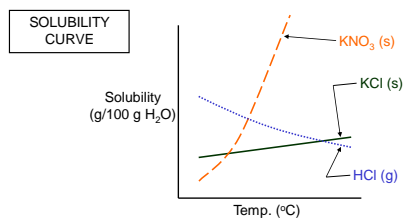
- low temperatures &
- high pressures
- EX: soda



Gas Solubility



Solubility → how much solute dissolves in a given amt. of solvent at a given temp.



unsaturated:
saturated:
supersaturated:
above the line

solution could hold more solute; **below** line solution has "just right" amt. of solute; **on** line solution has "too much" solute dissolved in it;