

# Solutions & Solubility

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### The Solution Process

Dissolution of  
NaCl in Water

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### The Solution Process

- Solutions contain two components
  - Solvent
    - The dissolver
  - Solute
    - The dissolvee
- For our purpose, we will study liquid solvents and all three phases of solutes.

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### The Solution Process

- Important terms:
  - Solvation
    - The clustering of solvent particles around a solute particle
  - Hydration
    - Solvation that involves water as the solvent
  - Saturated Solution
    - Additional solute will not enter solution, but remains as a solid
  - Solubility
    - The amount of solute needed to form a saturated solution at a given temperature
    - g/100 mL
  - Miscible
    - Liquids that form solutions in all proportions
      - Alcohol in water
  - Immiscible
    - Liquids that don't dissolve significantly in one another
      - Gasoline in water

## Solutions & Solubility

### Factors Affecting Solubility

*“Like Dissolves Like”*

		Solute	
		Polar (NaCl)	Non-Polar (Oil)
S o l v e n t	Polar (H <sub>2</sub> O)		
	Non-Polar (Gasoline)		

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### Practical Applications

- The Big Question
  - Forces With In:
    - Boiling Point
    - Melting Point
    - Vapor Pressure
    - Volatility
  - Forces In Between:
    - Solubility

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### Practical Applications

- What IMF's exist in liquid water?
- What IMF's exist in cooking oil?
- Why is water more volatile than cooking oil?
  
- Cyclohexane is a liquid at room temperature while p-dichlorobenzene is a solid
- p-dichlorobenzene dissolves in water while cyclohexane does not
  
- $\text{SO}_3$  boils at a higher temperature than  $\text{SO}_2$
- $\text{SO}_2$  dissolves in water while  $\text{SO}_3$  does not

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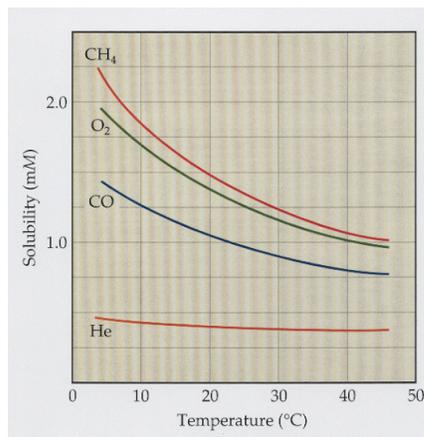
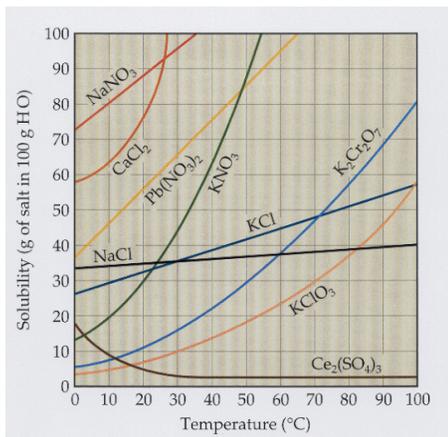
### Factors Affecting Solubility

- Pressure
  - The solubilities of liquids and solids in liquids are not significantly affected by pressure
  - The solubility of a gas in a liquid solvent is increased as the pressure of the gas increases
  - Henry's Law
  - Application
    - Why does pop respond as it does when you unscrew the cap from a bottle of Coke?

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### Factors Affecting Solubility

- Temperature
  - In liquid solvents
    - The solubility of solid solutes increases with increased temperature.
    - The solubility of gas solutes decreases with increased temperature.



## Solutions & Solubility

### Homework

- 13.2 / 13.3 / 13.5 / 13.7 / 13.14 / 13.15 / 13.17 / 13.23 / 13.25 / 13.27 / 13.29 / 13.35