January 28, 2002

- **Problem Set Solutions:**
  - Chapters 9 and 11 now online
  - Chapter 15 coming soon!
- **Weekly Problem Session:**
  - Monday (today!), 3-4 pm, A531 Cook
  - *Email me with suggested problems*
- **Quiz *post mortem***

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Gas Solubility: Henry's Law

It can be shown that:

$$P_A = K[A(aq)]$$

- P_A: partial pressure of gas A above solution
- K: Henry's Law Constant
- $[A(aq)]$: concentration of gas A dissolved in solution

Example: P_{CO2} (air) $\approx 3 \times 10^{-4}$ atm - v. little dissolved CO_2

P_{CO2} (soda bottle) ≈ 5 atm - ~0.16 *M* CO_2

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Henry's Law Example

"The Bends"

- Pressure 90 ft underwater: ***~3.7 atm***
- *Henry's Law says:*
  3.7x as much N_2 and O_2 dissolved in blood
- ***Problem:*** surfacing too quickly
- ***Solutions:***
  1. Surface *slowly*
  2. Breathe O_2/He mixture

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Effects of *Temperature* on Solubility

For gases:

Solubililty ***decreases*** with **increasing** temperature

Example: **Thermal Pollution**

•Hot water dumped into lake kills fish

•***Why?***

•Decreased dissolved O_2 in hot water

•Layer of less dense hot water on top hinders O_2 dissolution

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What about Boiler Scale?!

- CO_2 in water can form bicarbonate:

CO_3^{2-} (aq) + CO_2 (aq) + H_2O (l) ⇆ $2HCO_3^-$ (aq)

- If there's Ca^{2+} in the water:

$Ca(HCO_3)_2$ or $CaCO_3$ will form
(soluble) (insoluble)

- In *hot water*, CO_2 is *less soluble*:

$HCO_3^- \rightarrow CO_3^{2-}$
$+ Ca^{2+} \rightarrow CaCO_3$ (s)

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Temperature Effects on Solubility of *Solids*

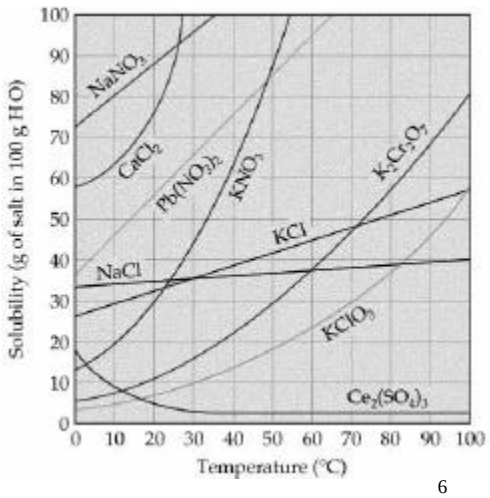
Usually:

Solubility **increases** with increasing temperature

Why?

$\Delta H_{soln} > 0$: adding heat facilitates *endothermic* process.

$\Delta H_{soln} < 0$: adding heat *hinders* exothermic process



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Effects of Solute on Physical Properties of Solvent

- Presence of dissolved solute can change the solvent's:
  1. Vapor Pressure
  2. Boiling Point
  3. Freezing Point
  4. Osmotic Pressure
- Collectively known as:

Colligative Properties

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