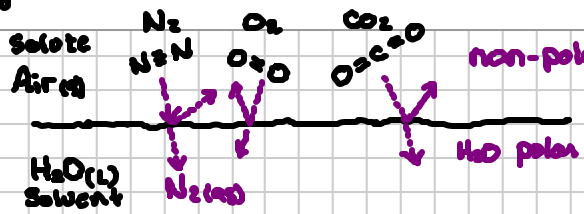
Note Title

# Lecture 2.3 Henry's Law

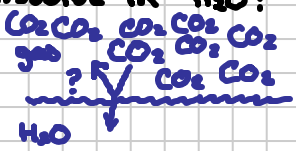
- at the surface




Like dissolves like!

Few $N_2$, $O_2$, $CO_2$ molecules accumulate.

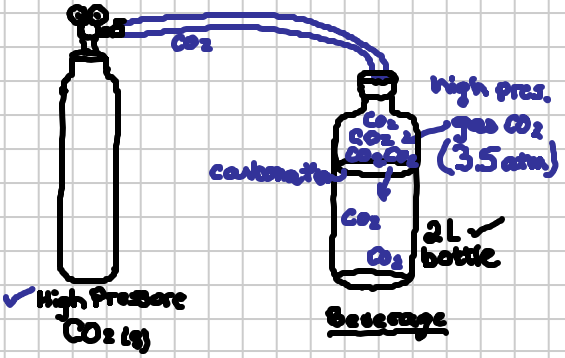
- How can we get more gas to dissolve in $H_2O$?




$PV = nRT$

incr. incr.

$\uparrow P_{CO_2} \ldots \uparrow n_{CO_2} \ldots \uparrow *CO_2$ in $H_2O$




**Henry's Law.** Solubility of a gas in liquid solvent is proportional to the pressure of the gas.

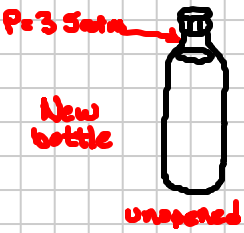
$S_{CO_2} \propto P_{CO_2}$ (solution ∝ gas; ∝ proportional)

$S_{CO_2} = k P_{CO_2}$ (k: Henry's law gas constant (Tables))

$CO_2$: $k_{CO_2} = 3.4 \times 10^{-2}$ M/atm

**Example:** An unopened 2.0 L bottle of soda is pressurized with $CO_{2(g)}$ to 3.5 atm (That's why the bottles are so stiff when you buy them)

What is the molar concentration of $CO_2$ dissolved in the beverage before opening and hours after opening?





$P_{atm} = 1.00$ atm.

Partial Pressure $_{CO_2} = 0.000385$ atm.

$S_{CO_2} = k_{H_{CO_2}} P_{CO_2} = (3.4 \times 10^{-2}\ M/atm)(3.5\ atm)$

$S_{CO_2} = 0.119\ M$ (conc. $CO_2$ in beverage)

$S_{CO_2} = k P_{CO_2} = (3.4 \times 10^{-2}\ M/atm)(0.000385\ atm)$

$S_{CO_2} = 0.0000131\ M$ (~10,000 times)

How does pop go "flat"?

1) open bottle
↓ $P_{CO_2}$
↓ Solubility$_{CO_2}$

Excess $CO_2$ released to the surrounding.

2) Solubility$_{CO_2}$ ∝ Temp.

Low Temp ⇒ high S

high S ⇒ a lot of $CO_2$ dissolved $H_2O$.