# General Chemistry 205 w/ Doc M

Chem 205 → Lecture
Chem 206 → Lab
Make sure to buy a notebook!
stockroom hours
1/12 Thursday 2-4 pm
1/16 Monday 9am-12 pm
1/17 Tuesday 1-4 pm

Bring Laptop to lab next class.
Download Logger Pro from Mattson's website

Examples of solns

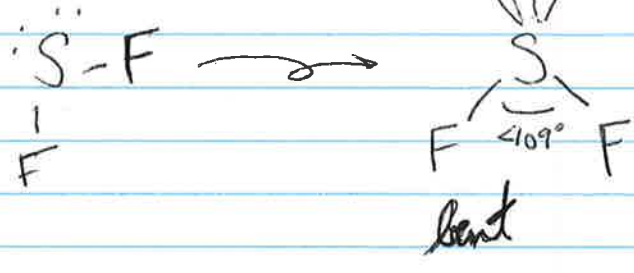
| | | |
|---|---|---|
| NaCl (aq) | bleach | gatorade |
| HCl (aq) | urine | air |
| Dr Pepper | vinegar | steel |
| IV fluid | gasoline | |
| acid rain | ~~gatorade~~ | |

solute
+ solvent
solution

Like dissolves like → based on intermolecular forces (IMF)

Examples of IMF

* dipole-dipole

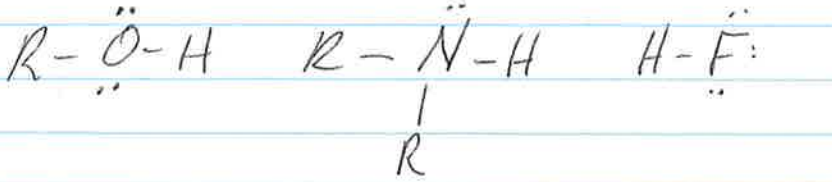


dipole special case:

★ H bonding

Super strong dipole-dipole

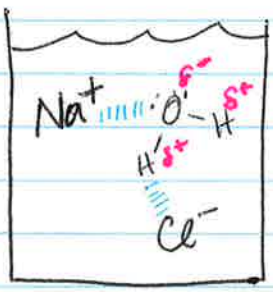
10-40 kJ/mol



★ London dispersion forces (LDF) ∝ Molar Mass (MM)

The larger the molecule, the larger the LDF

★ ion-dipole

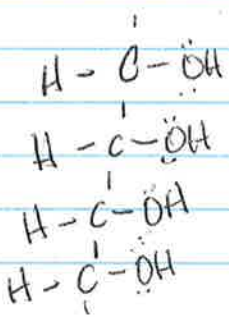



all ionics that dissolve dissociate 100% into ions in water

Dr. Pepper Example

sugar + water

↳ $C_{12}H_{22}O_{11}$



Gasoline

mixture of non polar materials

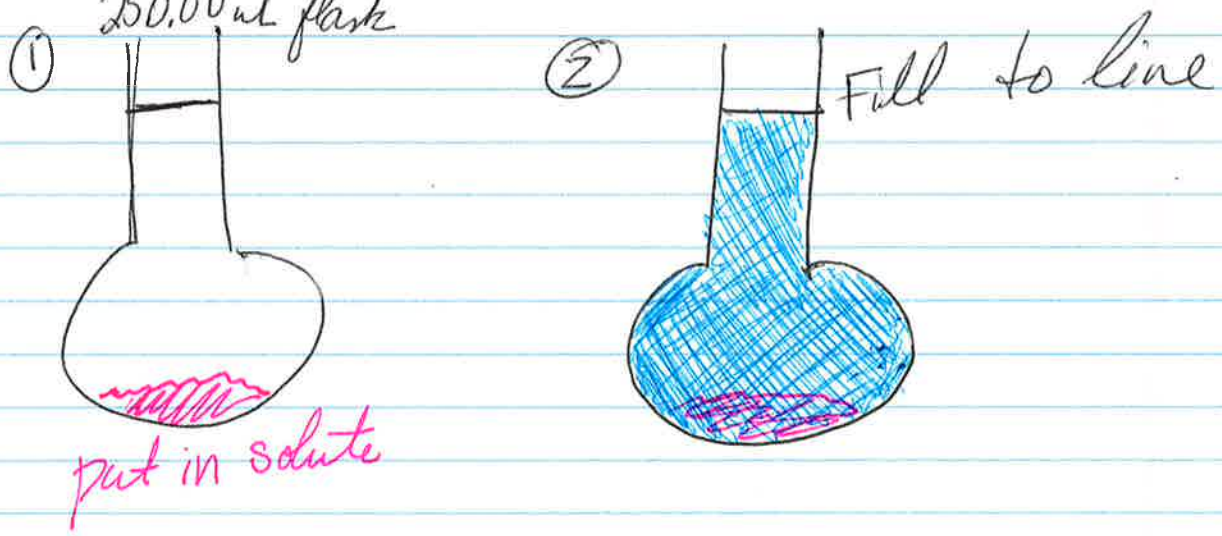
$C_8H_{18}$

$C_9H_{20}$

$C_{10}H_{22}$

## Concentration Units

$$\text{Molarity} = \frac{n_{solute}}{V_{sol'n}\ (L)} = \frac{mol}{L} \quad \underline{\underline{M}}$$




$$\text{mole fraction} = \frac{n_{solute}}{n_{solute} + n_{solvent}}$$

Example

Seawater contains ~35 g NaCl in 100 g $H_2O$

| | MM | Mass | n |
|---|---|---|---|
| NaCl | 58.4 g/mol | 35 g | 0.60 mol |
| $H_2O$ | 18.0 g/mol | 100 g | 5.50 mol |
| Soln | X | 135 g | X |

$$\chi_{NaCl} = \frac{0.60 \text{ mol}}{0.60 \text{ mol} + 5.56 \text{ mol}} = 0.097$$

$$\chi_{H_2O} = 1 - \chi_{NaCl} = 1 - .097 = .903$$

$$\text{Mass \%} = 10^2 \times \frac{m_{NaCl}}{m_{NaCl} + m_{H_2O}}$$

from example $10^2 \times \frac{35 \text{ g}}{35 + 100 \text{ g}} = 25.9\% \text{ NaCl}$

$$\text{Conc (ppm)} = 10^6 * \frac{m_{NaCl}}{m_{NaCl} + m_{H_2O}}$$

$$\text{molality } (m) = \frac{n_{solute}}{m_{solvent}\,(kg)}$$

$$\frac{0.60 \text{ mol}}{1 \text{ kg}} = 6.0 \text{ mol NaCl/kg } H_2O$$

$$= 6.0 \text{ molal}$$

$$= 6.0\ m$$

Convert 0.42 molal NaCl sol'n (aqueous) to $X_{NaCl}$ and mass% NaCl

| | MM | m | n |
|---|---|---|---|
| NaCl | 58.4 g/mol | 24.5 g | 0.42 mol |
| $H_2O$ | 18.0 g/mol | 1 kg (1000 g) | 55.6 mol |
| sol'n | X | | |

$$0.42 \text{ molal NaCl} = \frac{0.42 \text{ mol NaCl}}{1 \text{ kg } H_2O} = \frac{0.42 \text{ mol NaCl}}{1000 \text{ g } H_2O}$$

$$\chi_{NaCl} = \frac{.42 \text{ mol}}{.42 + 55.6} = 0.0075$$

$$\text{mass\% NaCl} = \frac{24.5 \text{ g}}{24.5 \text{ g} + 1000 \text{ g}} \times 100 = 2.4\%$$