Problem Club with Kendall:
Sunday
&
Thursday
6:30 - 8:00 pm
Eppley 211

(sections 13.1-13.4)

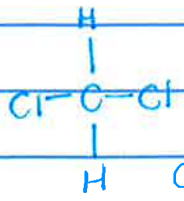
January 20th

Thursday Lab Jan 16
* bring laptop
* read prelab presentation
* optional: buy lab manual $15 (cash)
* Be on time: 8 AM
* Pick lab partner & station
* FRIDAY: sections 13.5-13.7

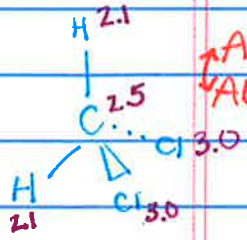
Solutions = solvent + solute
↳ usually a liquid

covalent molecular (s, l, g)

polar (includes H-bonding) → H_2O

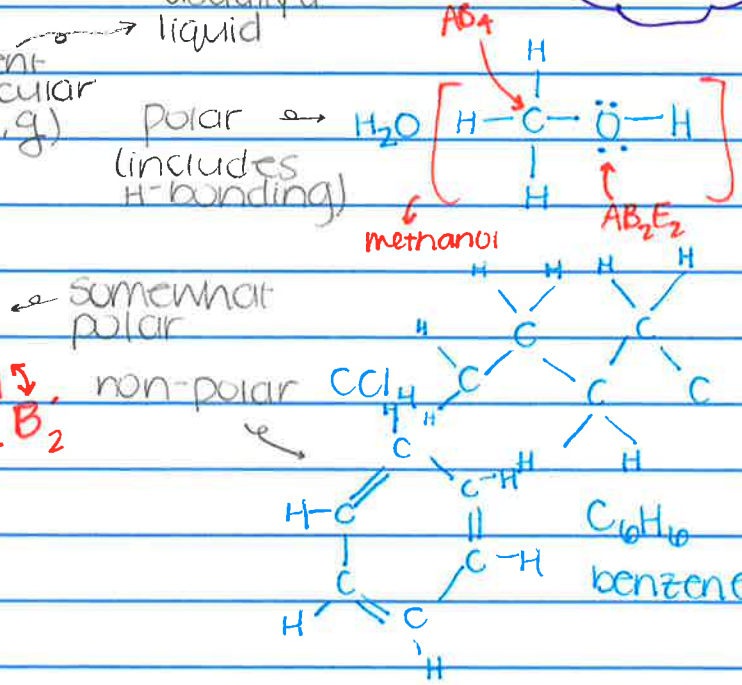


CH_2Cl_2 ← somewhat polar



AB_4 ↓
AB_2B_2

non-polar



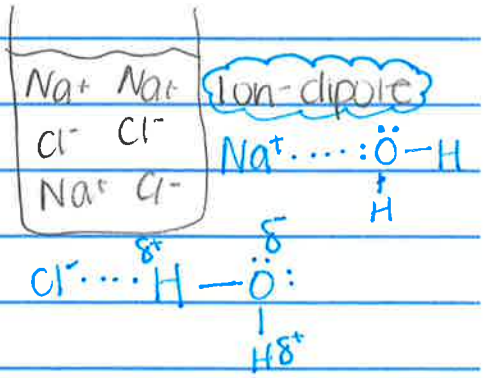
Polar solvents

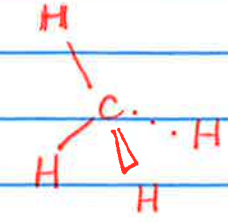
H_2O in particular
↳ dissolve polar solutes esp. those with H-bonding

$C_{12}H_{22}O_{11}$

Ionics Dissolve*
*check solubility rules

$NaCl_{(aq)}$

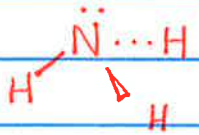




"ABE" notation

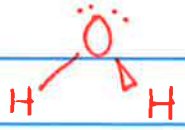
AB_4

① Lewis Dot
↳
② ABE → solubility
↳ geometry
↳ polar or not

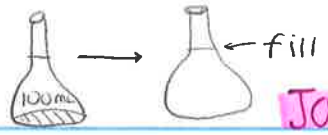


AB_3E

* If E group, it's polar!



AB_2E_2



January 20th

concentration units

$$\text{Molarity} = \frac{n_{solute}}{V_{solution}}$$

Suppose 37.2 g NaCl were dissolved in water to make 100.00 mL of solution. What is its molarity?

$$[NaCl] = \frac{37.2\text{ g NaCl}}{} \left| \frac{1\text{ mol NaCl}}{58.44\text{ g}} \right| \frac{}{0.100\text{ L}} = 6.37\text{ mol NaCl/L}$$

↳ 6.37 M NaCl

[NaCl] = the molarity of NaCl

$[Na^+] = 6.37\text{ M } Na^+$

$[Cl^-] = 6.37\text{ M } Cl^-$

What are the ion molarities in 2.5M $CaCl_2$?

$[CaCl_2] = 2.5\text{M}$ $[ions] = 7.5\text{ M}$

$[Ca^{2+}] = 2.5\text{M}$

$[Cl^-] = 5.0\text{M}$

$$\text{Mole Fraction, } X = \frac{n_{solute}}{n_{solute} + n_{solvent}}$$

$$\text{Mass \%} = 100 * \frac{m_{solute}}{m_{solute} + m_{solvent}}$$

* Suppose we dissolved 25.0 g urea CON_2H_4 in 40.0 g H_2O. Calculate Mole fraction, mass % & molality

$$\text{Molality} = \frac{n\text{ solute}}{m_{solvent}\text{(kg)}}$$

urea = 60 g/mol

water = 18 g/mol

	m	n
solute	25.0 g	0.417 mol
solvent	40.0 g	2.22 mol
solution	65.0 g	2.637 mol

$$\text{Mass \%} = 100 * \frac{25.0\text{ g}}{65.0\text{ g}} = 41.7\text{ \%}$$

$$\text{Mole fraction, } X = \frac{0.417\text{ mol}}{2.637\text{ mol}} = 0.158$$

$$\text{Molality} = \frac{0.417\text{ mol}}{0.04\text{ kg}} = 10.43\text{ mol urea/kg } H_2O$$

* Mole Fraction, max %, molality are easily interchanged (using the table)

↳ convert 0.684 molal NH_4NO_3 into mass % & mol fraction

		m	n
80 g/mol	NH_4NO_3	54.7 g	0.684 mol
18 g/mol	H_2O	1000 g	55.5 mol

$$\text{mass \%} = \frac{m_{NH_4NO_3}}{m_{NH_4NO_3} + m_{H_2O}} * 100$$

↳ 5.19 %

January 20th

Molality ↔ Must use density of soln ↔ molarity

Mass %

Mole Fraction

	m	n	V
solute		11.7 mol	
solvent			
solution	1460 g		1000 mL

$d = \frac{m}{V}$ $V = \frac{m}{d}$ $m = V * d$

11.7 M KOH has a density of 1.46 g/mL, what is its molality, mass %, mole fraction?