General Chemistry with Dr. Mattson

Today Jan 13 Friday:
Sections 12.4 - 12.5

Monday 1/16: 12.6 - 12.9
Possible weather delays; make sure to watch

Tuesday 1/17: First Review session
Hitchcock 108 5-6:30 pm

Wednesday 1/18: catch up

Friday 1/20: 1st homework quiz

Lab stuff
Buy manuals
Monday 1/16 9-12 pm
Tuesday 1/17 1-4 pm

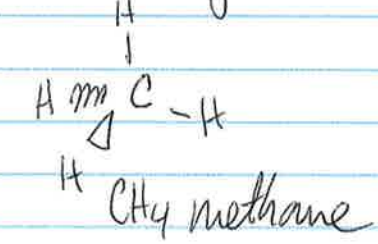
Review w/ Monika
HTC 108 5-6:30
Sunday's and Tuesday's

Elements

	Metal	Nonmetal
Examples	Fe Cu Pd	O_2 N_2 S_8 C(s)
forces	metallic; cations a sea of e^-	
state of matter at RT	solid	
vapor pressure	low	
soluble in water	no	
soluble in nonpolar solvent	no	

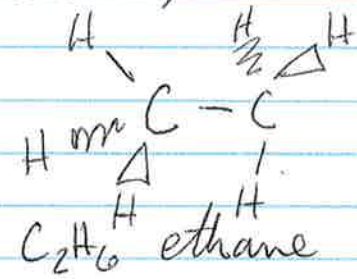
	Compounds Ionics	Covalent molecular	network covalent
Examples	$NaCl$ NH_4ClO_4	CO_2 H_2O CCl_4	SiO_2 (quartz) SiC
Forces	ionic, lattice energy. 	intramolecular: Cov bonds intermolecular: LDF dipole-dipole H-bonding	covalent bonds
state of matter at RT	solids	S intermolecular force strong l " " okay g " " weak	solid
vapor pressure	low	s: low l: higher	low
soluble in H_2O	solubility rules	like dissolves like	No
solubility in nonpolar solvent	no	like dissolves like	No

Mini Organic Chem section



CH_4 methane

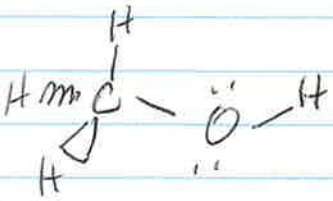
nonpolar
MM = 16 g/mol
bp = -164°C

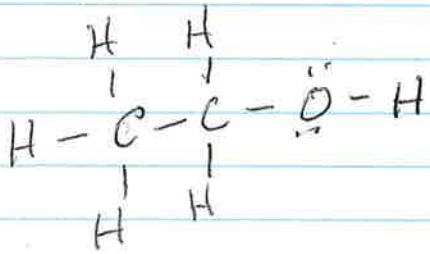


C_2H_6 ethane

nonpolar
MM = 30 g/mol
bp = -89°C

Alcohols

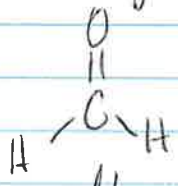


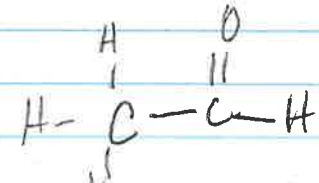


methanol
H-bonding
MM = 32 g/mol
bp = 65°C

ethanol
H bonding
MM = 46 g/mol
bp = 78°C

Aldehyde

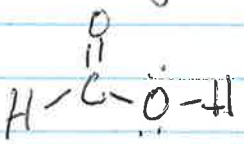


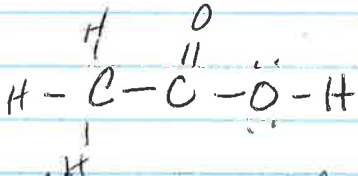


methanal
LDF + dipole-dipole
MM = 30 g/mol
bp = -19°C
(aka Formaldehyde)

ethanal
LDF + dipole-dipole
MM = 44
bp = 20°C

Carboxylic Acid





methanoic acid
H bonding
MM = 46 g/mol
bp = 101°C
(aka formic acid)

ethanoic acid
H-bonding
MM = 60
bp = 118°C
(aka acetic acid)

Example / Q 12.73

NaOCl (aq) 5.0% (mass) in soln. What is molality? mole fraction?

	MM	M	n
NaOCl	74.5 g/mol	5.0 g	6.71×10^{-2} mol
H_2O	18.0 g/mol	95 g	5.28 mol
soln	X	100 g	

Molality: $\frac{n_{solute}}{m_{solvent}\ (kg)}$

$m_{solvent} = 95\ g = .095\ kg$

$n_{solute} = \frac{5.0\ g}{74.5\ g/mol} = 6.71 \times 10^{-2}\ mol$

$\frac{6.71 \times 10^{-2}\ mol\ NaOCl}{.095\ kg\ H_2O} = 0.706\ \frac{mol\ NaOCl}{kg\ H_2O} = 0.706\ molal\ NaOCl$

$= 0.706\ molal$

$= 0.706\ m$

Mole fraction

$X_{NaOCl} = \frac{n_{NaOCl}}{n_{NaOCl} + n_{H_2O}} = \frac{6.71 \times 10^{-2}}{6.71 \times 10^{-2} + 5.28} = 0.012_5$

Molarity $\xleftrightarrow{m_{soln} = mass\ solute + mass\ solvent}$ molality

density of soln

molality $\times$ mass %

12.75 Ethylene glycol is used as antifreeze
40% ethylene glycol sol'n
$d = 1.0514$ g/mL calc molarity

Ethylene glycol	MM	m	n
	62.1 g/mol	40 g	0.644 mol

H_2O	60 g
sol'n	100 g

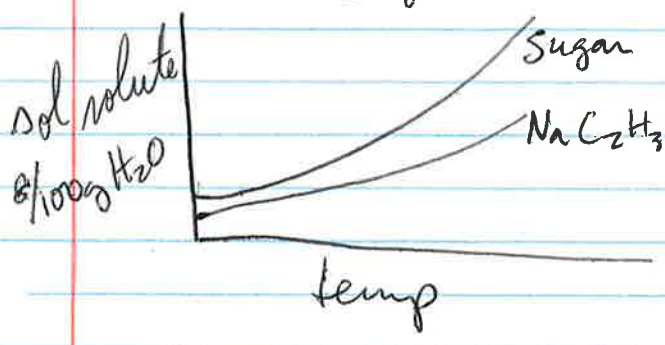
$$\text{molarity} = \frac{\text{mol solute}}{\text{volume sol'n (L)}}$$

$$\frac{100 \text{ g sol'n}}{1.0514 \text{ g/mL sol'n}} = 95.11 \text{ mL sol'n} = 0.0951 \text{ L sol'n}$$

$$\text{molarity} = \frac{0.644 \text{ mol ethylene glycol}}{0.0951 \text{ L sol'n}} = 6.77 \frac{\text{mol Eg}}{\text{L}}$$

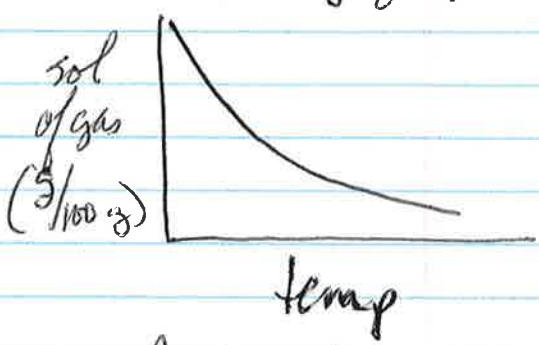
$$= 6.77 \text{ M Eg}$$

Solubility of solids in water



(there are a few that go down)

Solubility of Gases



All Gases decrease solubility as Temp increase

Solubility of a gas at constant temp is dependent on pressure

Henry's Law

$$\text{Solubility}_{gas} = k\, P_{gas}$$

Ex/ $\text{Solubility}_{H_2S} = k\, P_{H_2S}$

$$0.195\,M = k\ 760\ mm\,Hg$$

$$k = 2.57 \times 10^{-4}\ \frac{M}{mm\,Hg}$$

Solubility of H_2S @ 250 mm Hg

$$Sol_{H_2S} = 2.57 \times 10^{-4}\ \frac{M}{mm\,Hg} \times 250.0\ mm\,Hg$$