Today, Jan 18: Sections 12.3, 12.5, 12.6
Monday Jan 21: Rest of ch 12
Tuesday Jan 22: lab expt 1, problem club with Ali 6-7:30
Epply 107

Convert 4.73 molal KBr (MM = 119.0 g/mol) into mole fraction and mass %

	MM	m	n
KBr	119.0	562.87g	4.73mol
H_2O	18.01	1000g	55.5 mol

$$X_{KBr} = \frac{4.73\,mol}{4.73\,mol + 55.6\,mol} = \boxed{0.0784}$$

$$\text{mass \%} = 100\% \times \frac{562.87g}{1000g + 562.87g} = \boxed{36\%}$$

$$\text{mass \%} = 10^2 \times \frac{m_{solute}}{m_{solute} + m_{solvent}}$$

$$\text{Conc (ppm)} = 10^6 \times \frac{m_{solute}}{m_{solute} + m_{solvent}}$$

$$\text{Conc (ppb)} = 10^9 \times \frac{m_{solute}}{m_{solute} + m_{solvent}}$$

} for very dilute solutions

$m_{solute} + m_{solvent} \approx m_{solvent}$

- Calculate the conc in ppb for a solution that contains 24 μg Pb^{2+} per L. Given $d_{H_2O} = 1.00\ g/cm^3$

	m	n
Pb^{2+}	2.4×10^{-5} g	\
H_2O	1000 g	\

$$\text{Conc (ppb)} = 10^9 \times \frac{m_{Pb^{2+}}}{m_{Pb^{2+}} + m_{H_2O}}$$

$$\text{Conc (ppb)} = 10^9 \times \frac{2.4 \times 10^{-5}\ g}{2.4 \times 10^{-5}\ g + 1000\ g} = \boxed{24\ \text{ppb}}$$

- Suppose air in a room contains 35 ppm CO. What is the mass of CO in $1\ m^3$ air? Given $d_{air} = 1.3\ g/L$

35 g CO = 1×10^6 g air

$$m_{CO} = \frac{1\ m^3\ \text{air} \mid 1\ cm^3 \mid 1\ mL \mid 1\ L \mid 1.3\ g\ \text{air} \mid 35\ g\ CO}{1 \times 10^{-6}\ m^3 \mid 1\ cm^3 \mid 1 \times 10^3\ mL \mid L \mid 1 \times 10^6\ g\ \text{air}} = \boxed{0.0455\ g\ CO}$$

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molarity $\leftarrow \frac{m_{soln} = m_{solute} + m_{solvent}}{d_{soln} = \frac{m_{soln}}{V_{soln}}} \rightarrow$ X

- mass %
- conc (ppm)
- conc (ppb)
- molality

- What is the mole fraction of HCl in a 12.1 M solution with a density = 1.19 g/mL

	m	n	V
HCl	441.2 g	12.1 mol	
H_2O	748.8 g	41.6 mol	
soln	1190 g		1000 mL

$$\frac{1000\ mL \mid 1.19\ g}{mL} = 1190\ g$$

$$X_{HCl} = \frac{12.1\ mol}{41.6\ mol + 12.1\ mol} = \boxed{0.225}$$

· What is the molarity of KOH in a solution that is 45% KOH and has a density of 1.46 g/mL?

	m	n	vol
KOH	45 g	0.802 mol	
H_2O	55 g		
soln	100 g		68.5 mL

$$\text{molarity} = \frac{0.802\ \text{mol}}{0.0685\ \text{L}} = \boxed{11.7\ \text{M}}$$

vapor pressure: $P_{alcohol}$ units = mm Hg

$P_{external} = 760$ mm Hg

4 colligative properties (of solvents that depend only on amount of solute present)

1) vapor pressure lowered

2) freezing point lowering
3) boiling point elevation
4) osmotic pressure

we will learn on Monday

$$P_{soln} = X_{solvent} \times P_{solvent}$$

T	P_{H_2O}
20°C	17.3 mm Hg
21°C	18.8 mm Hg
22°C	19.5 mm Hg
23°C	21.0 mm Hg
24°C	22.5 mm Hg
25°C	24.0 mm Hg

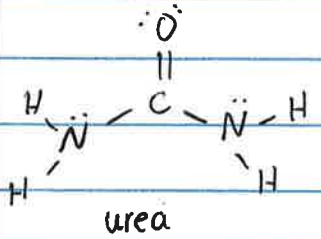
· What is the vapor pressure of a solution made by dissolving 57.4g urea (MM = 60.06 g/mol) in 100 mL H_2O at 23°C.

	m	n
urea	57.4g	0.956 mol
H_2O	100g	5.56 mol

$$X_{H_2O} = \frac{5.56}{0.956 + 5.56} = 0.85$$

$$P_{soln} = 0.853 \times 21.0 \text{ mm Hg}$$

$$\boxed{P_{soln} = 17.9 \text{ mm Hg}}$$



urea

- H-bonding with water both at the oxygen and NH groups
- very soluble in water