Announcements

To join clicker to class today (Clickers with LCD display join automatically):

- Turn on the Clicker (the red LED comes on).
- Push "Join" button followed by "20" followed by the "Send" button (switches to flashing green LED if successful).

- Discussion Quiz on Wednesday covers through Osmosis/Osmotic Pressure in today's lecture.

Review

- How we quantify what is dissolved in solution
  - Mass solute/mass sol'n
    - mg/kg = ppm (parts in 10^6) • also ppb and ppt
  - Molarity (M) = mol solute/L sol'n
- Calculating amount of solution necessary to get a particular amount of solute.
- Converting between mass/mass and molarity units.
  - 1) convert mass solute—> moles solute
  - 2) use density to convert mass sol'n to L sol'n.
- Electrolytes (dissociates into ions) vs. nonelectrolytes (molecular)

Effect of Osmosis on Blood Cells

Mathematics of Osmosis:

- $\pi = MRT$,
  - M = molarity of solute particles
  - R = gas constant = 0.08206 $L \cdot atm \cdot mol^{-1} \cdot K^{-1}$,
  - T = temperature in K.

- To account for dissociation of ions include the van't Hoff factor i= # of particles the species dissociates into: $\pi = iMRT$. (on exams assume 100% dissociation unless given i)

Chang Figure 13.10

Boiling Point Elevation

- Solute in a liquid lowers the rate at which molecules can enter the gas phase by sticking to solvent molecules or blocking access to surface, raising the boiling point.
- The observed effect is again proportional to the solute particle concentration: $\Delta T_b = i m K_b$.
  - i = the van't Hoff factor
  - *m* = molality = (moles solute/kg solvent)
  - K_b = the boiling point elevation constant which depends on the identity of the solvent.

Molality (*m*)

- Molality = (moles solute)/(kg of solvent) NOTE DENOMINATOR IS NOT kg of solution!
- Ex. 0.50 moles NaCl in 2.0 kg water. m = 0.50 moles NaCl/(2.0 kg solvent) = 0.25 m NaCl in water.
- Compare with molarity (M). What is the molality of 0.50 M NaCl in water ?
  - assume solution density =1.03 g/mL=>1.03 kg sol'n/L sol'n,
  - MM(NaCl) = 58.443 g/mole