Chapter 11
Properties of Solutions: Their Concentrations and Colligative Properties
Learning Objectives

1.5.2021

To satisfy the minimum requirements for this course, you should be able to:

1. Discuss the concept of colligative properties and be able to
   - describe the effects of solute concentration on the osmotic pressure, vapor pressure, boiling point, and freezing point of a solution.
   - explain the magnitude of changes caused by electrolytes compared to those caused by non-electrolytes and be able to use the van't Hoff factor.
   - calculate the osmotic pressure, boiling point,and freezing point pressure of a solution containing a non-volatile solute in a volatile solvent.
   - determine the concentration and molar mass of a non-volatile non-electrolyte solute from the change in boiling point, freezing point or osmotic pressure of solution.

2. Explain how fractional distillation of crude oil separates hydrocarbons based on boiling point.

3. Define molality and be able to interconvert with other concentration units molarity and ppm.

4. Describe the solubility of gases in liquid solutions
   - how it is affected by temperature
   - calculate solubility using Henry's Law

5. NavApp: Water Treatment
   - identify reverse osmosis as the primary method used onboard ships and submarines to purify seawater
   - explain the following methods used by the Navy and Marines to purify water: distillation (including a solar still), ion exchange, reverse osmosis
   - define vapor pressure and describe its dependence on the strength of intermolecular forces and temperature