

CHAPTER 11

SOLUTIONS AND THEIR PROPERTIES

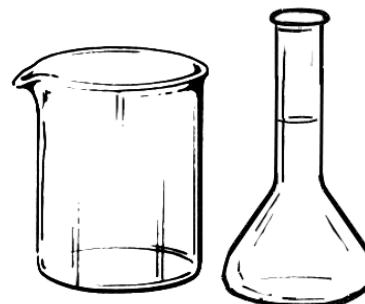
We will spend four lecture days on this chapter.

- ❖ Day 1. Sections 1 – 3: Solutions, energy changes and the solution process, and units of concentration and inter-converting units of concentration.
- ❖ Day 2. Sections 3 and 4: Units of concentration and inter-converting units of concentration; factors affecting solubility
- ❖ Day 3. Sections 5 – 9: Colligative properties and some uses of colligative properties
- ❖ Day 4. Catch up
- ❖ Skip Section 11.10.

Section 11.1 Classify homogeneous mixtures as solutions or colloids.
 Identify the solvent and the solute in a solution.

Section 11.2 Explain the rule of thumb, “like dissolves like” by analyzing the solution process in terms of forces overcome in the solute and solvent and forces formed between solute and solvent particles.
 Predict which solute is more soluble in a given solvent by correlating solubility with chemical structure.
 Do Problem 1, 2, 38, 40, 42, and 44.

Section 11.3 Define solution density, molarity, mole fraction, mass percent, parts per million, parts per billion, and molality, and perform calculations using these quantities. Know which of these two pieces of glassware shown at right is needed to make these solutions.
 Do Problems 3 –10, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, and 66.



Section 11.4 Predict the effect of changing pressure and temperature on the solubility of a given solute.
 Perform calculations using Henry’s law.
 Do Problems 11 and 12 and 68, 70, 72, 74.

Section 11.5 Define and give examples of colligative properties.

Section 11.6 Use Raoult’s law to calculate the vapor pressure over a solution containing a nonvolatile solute and a solution containing two volatile liquids.
 Interpret vapor pressure curves.
 Do Problems 13 – 17.

Section 11.7 Perform calculations involving freezing–point depression and boiling–point elevation, and determine the molality of a solution and the molar mass of the solute.
 Do Problems 18 – 22.

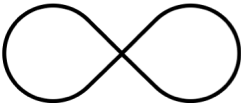
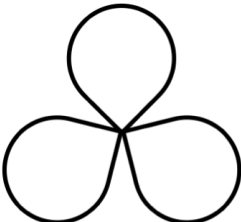
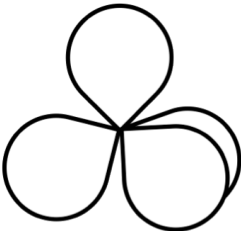
Section 11.8 Perform calculations involving the osmotic pressure equation, and determine the molarity of a solution.
 Do Problems 23 and 24, 76, 80, 82, 84, 86, 88, 92, 94, 96, and 98.

Section 11.9 Use osmotic pressure to calculate the molecular mass of a solute.
 Do Problems 25 and 26 (Note: For Problem 26, you need the density to do this problem; use $d_{\text{sol'n}} = 1.00 \text{ g/mL}$), and Problems 100, 102, 104, and 106.



“I see you brought the pie charts.”

Table of Geometries

Number of regions of electron density	Hybridization of central atom & bond angle	Arrangement of regions for maximum separation	Number of regions used in bonding	Geometry of molecule	ABE format
2	sp	Linear	2	linear	AB ₂
	180°		1	two atoms make a line	ABE
3	sp ²	trigonal plane	3	trigonal plane	AB ₃
	120°		2	angular	AB ₂ E
			1	two atoms make a line	ABE ₂
4	sp ³	Tetrahedron	4	Tetrahedron	AB ₄
	109.5°		3	Triangular pyramid	AB ₃ E
			2	angular	AB ₂ E ₂
			1	two atoms make a line	ABE ₃

Advice from a former student:

To be successful in your course, I suggest ALWAYS doing the homework and making sure you understand it all. Don't wait 'til right before the test to start trying to figure it out. Also, do both the practice tests that are handed out before the test and the ones online from previous years. That's what helps me!