Chem 108, Long, Fall 2005        EXAM 4 Major Topics

FOR ALL CHAPTERS: Understand, describe, identify the “Have you learned this?” terms at the end of the chapter. Know how to do all the homework problems and lab exercises. There are more practice problems in the book, study guide, on the CD that came with your book, and on the web.

Chapter 10: Intermolecular Forces and the Phases of Matter
- Differences between solids, liquids, and gases on the molecular level
- Effect of intermolecular force strength on boiling point and melting point.
- Types of intermolecular forces (London dispersion forces, dipole-dipole forces, and hydrogen bonding).
  - Describe each.
  - Identify types possible for different compounds
  - Draw hydrogen bonds using dotted lines
- Relative strengths of types forces for different molecules
  - If molar mass is about the same
  - Major factors affecting each type
    London: number of electrons (molar mass)
    Dipole-dipole: strength of molecular dipole
    Hydrogen bond: strength of hydrogen bond
    Number of hydrogen bonds
- Predicting which compound would have a higher boiling point considering intermolecular forces.

Chapter 11 Gases (also lab demos and the Gas Stoichiometry lab.)
Memorize:

\[ K = ^\circ C + 273.15 \quad \text{STP} = \text{“standard temperature and pressure” (1 atm and 0}\degree \text{C)} \]
\[ \frac{760 \text{ mm Hg}}{1 \text{ atm}} \quad \frac{PV = nRT}{\text{and variations:} \quad \frac{PV = gRT}{MM}} \quad \frac{P_i V_i = P_f V_f}{T_i n_i \quad T_f n_f} \]
\[ R = 0.0821 \text{ L atm} \quad \frac{1}{\text{K mol}} \]
- Ideal gases and conditions favoring them
- The direction of variation of \( P, V, n, \text{or} T \) when two are held constant and the third is changed.
  Explaining this in terms of molecular motion and collisions with the container walls (kinetic molecular theory)
- Describing and explaining the behavior of gases in the lab demonstrations
- Converting between Celsius and Kelvin temperature scales.
- Converting between the pressure units of mm of Hg, and atmospheres (atm.).
- Know what temperature scale is used for all gas problem calculations and why.
- Problems involving gases:
  \( PV=nRT \) of one gas
  Initial-final conditions problems
  Using or finding molar mass or density in gas problems
  Stoichiometry problems with gases in reactions
Chapter 12: Solutions (and the Titration lab)
- Describe in terms of intermolecular forces what makes substances dissolve in each other.
- Meaning and use of “like dissolves like” to predict solubility
- Effect of temperature on the solubility of most solids. How does it affect the solubility of gases?
- Effect of the pressure of the gas above the liquid on the solubility of the gas
- Problems involving
  **Molarity**
  - Definition and writing molarity as a conversion factor
  - Calculating molarity from moles or grams and volume of solution
  - Using M as a conversion factor to calculate volume of solution, mass or moles of solute
    - Using this in a problem with a balanced chemical reaction
  - How to make M solutions
    - From mass of solute
    - From other M solutions

**Percent by mass, percent by volume, percent by mass/volume**
- Definition and writing percent as a conversion factor
- Calculating percent concentration from amounts of solute and solution
- Using percent as a conversion factor to calculate volume of solution or amount of solute
- How to make percent solutions
- Know how titrations are done (and of course the terminology associated with them)