Chem 1020 Spring 2012 Exam 3 Study Guide

This exam will cover chapters **9** (9.1-9.8), **10** (all sections), **18** (18.1-18.8, 18.11-12, 18.15), and **12** (12.1-12.2, 12.4-12.8 – Skip "Heat of vaporization" and "Heat of fusion" sections).

**Chapter 9** **(Electron configurations worksheet)**

- Electromagnetic radiation, significance of wavelength ($\lambda$)
- Electromagnetic spectrum: know the order, no need to memorize specific wavelengths
- Relationship of wavelength and energy
- Shells (principal quantum number *n*, energy levels)
- Atomic emission (line) spectra, relationship to electrons in shells
- Bohr model and Bohr diagrams for simple atoms
- Quantum mechanical orbitals and subshells
- Electron configurations (full or abbreviated) of any element by following the periodic table
- Valence electrons: relationship to periodic table and electron configurations
- Orbital diagrams (boxes with arrows)
- Electron configurations of ions, predict if a main-group ion is stable or unstable from an electron configuration (review ion formation from chapter 4)
- Shape of s and p orbitals, number of orbitals in a particular subshell
- Orbital explanation of atom and ion stability or instability

**Chapter 10** **(Lewis structures worksheet)**

- Ionic bonding: explanation using Lewis dot structures of valence electrons
- Calculate the total number of valence electrons from a molecule's formula, taking the charge into account for polyatomic ions
- Draw proper Lewis structures of neutral molecules and polyatomic ions
- When is the normal number of covalent bonds followed? When is it okay for an atom to not have the normal number of covalent bonds?
- Understand and draw the tetrahedral, trigonal planar, trigonal pyramidal, linear, and bent molecule shapes **(See optional questions at end of experiment 5 worksheet)**
- Electronegativity: definition, comparison of two elements using position on periodic table
- Identify ionic, polar-covalent, and nonpolar-covalent bonds – how do they differ on which elements they involve, charges.
- What makes one bond more polar than another bond? (e.g. the C-O bond is more polar than the C-N bond)
- Draw dipole arrow and partial charges on polar covalent bonds
- Use Lewis structures (with proper shape) and dipole arrows to draw molecule's net dipole moment and determine whether molecule is polar or nonpolar. **(Practice with the molecules in experiment 5 worksheet – key is posted)**
- Function and properties of soaps, micelles, emulsions (p. 343 and experiment 15)

**Chapter 18** **(Organic chemistry worksheet)**

- Hydrocarbon drawing styles, concentrate on condensed and line structures
- Alkanes: **memorize** names and be able to write formulas or structures for 1-10 carbon alkanes
- Draw line or condensed structures and write names of branched alkanes.
- Draw structures and write names of alkenes and alkynes. Identify if a hydrocarbon is an alkane, alkene, or alkyne from its formula.
- Draw structures and write names of alcohols.

- Reaction of carboxylic acids and alcohols to form esters **(Experiment 13)** - you will not be asked to name carboxylic acids or esters.

**Chapter 12**

- What molecular properties relate to general properties of solids, liquids, and gases (what is the molecular cause of compressibility, fluidity, rigidity, etc)
- Phase changes on the molecular level with relation to intermolecular forces and temperature (what causes phase changes to occur?) – is a particular phase change endothermic or exothermic? When are intermolecular forces broken? Are they partially or completely broken? When are covalent bonds broken?
- Heating curve of water – temperature changes while heating but not during a phase change
- Boiling point, freezing point/melting point concepts
- Dispersion forces; what causes them, which molecules have them, what influences their strength. Dispersion forces are one of the three types of intermolecular forces - please do not confuse dispersion forces with intermolecular forces in general.
- Dipole-dipole force: what causes them, which molecules have them, effect on miscibility (like dissolves like).
- Hydrogen bonding; what causes them, which molecules have them, their relative strength among the other intermolecular forces. Are they inside molecules or between molecules?
- Effect of intermolecular forces on boiling point or melting point of compounds. Which is stronger, IMFs or covalent bonds? IMFs or ionic bonds?
- Use intermolecular forces (or attractive forces in general) to rank boiling or melting points
- Properties of types of solids: molecular, ionic, metallic. Identify from types of atoms and relative melting point.