**Chemistry Mid-Term Exam Review Topics**

MATTER & CHANGES

* Chemical vs. physical properties, changes
* Signs of a chemical reaction
* Compounds vs. elements
* Location of metals, nonmetals, metalloids (properties of each also)
* Mixtures vs. pure substances

- ATOMS, ISOTOPES AND IONS

* Determining number, location, charge and relative mass of protons, neutrons, electrons in an atom
* Identify the mass number & atomic number
* Isotope definition and representation – C-14, or 146C, or 14C
* Calculate the number of protons, electrons, and neutrons in a neutral atom or in an ion
* Calculation of average atomic mass
* Dalton’s atomic theory and model of the atom
* Thomson’s experiments and model of the atom
* Rutherford’s gold foil experiment – conclusion is the atom has a small, dense, + charges nucleus. Most of the atoms is empty space
* Bohr model of the atom
* Modern (Quantum) Model of the atom – energy levels, sublevels, orbitals, electron spin

ELECTRONS

* Electromagnetic spectrum (wavelengths, frequencies, energies)
* Electron transitions in the Bohr atom
* Ground state vs. excited state (definitions, emission & absorption of energy)
* Use Bohr model and the Electromagnetic Spectrum to determine the wavelength, frequency, and/or energy of the emission spectrum lines
* Diagonal Rule – use to sequence from low to high electron energy levels
* Aufbau principle, Hund’s rule, Pauli Exclusion Principle. Use to sequence electron energy levels and sublevels
* Construct 1) an orbital filling diagram, 2) the electron configuration and 3) the Noble Gas configuration for any element
* s, p, d, f sublevels – shape, number of orbitals in the sublevel, number of electrons in the sublevel
* Dot diagrams, valence electrons
* Octet rule

– PERIODIC TABLE

* Periods & groups (definitions, names, locations)
* Location of metals, nonmetals, metalloids
* Location of s, p, d, and f sections
* Representative elements “A Groups” : know the valence e-, whether the atom will LOSE or GAIN electrons, size difference between atom & ion and the oxidation # (charge)
* Periodic law
* Periodic trends (atomic radius, ionization energy, electronegativity, metallic & nonmetallic character, reactivity)

BONDING

* Electronegativity differences that differentiate between IONIC and COVALENT
* Definitions of ionic, metallic and covalent bonding – types of elements involved – Metal/nonmetal, or nonmetal/nonmetal, or metal/metal
* Why atoms bond together - goal of 8 electrons, stable octet, low energy
* Electron transfer vs. electron sharing vs. delocalized electrons
* Lewis structure of ionic compounds and molecular compounds
* Use Lewis structure to predict the shape of the molecule and the polarity of the molecule
* Properties of ionic, metallic, covalent(polar and nonpolar) properties

NOMENCLATURE & MOLES

* Nomenclature – writing formulas and naming compounds for Binary ionic, Binary ionic with Roman Numerals, Ternary Ionic with Polyatomic Ions, and Covalent (also called Molecular) using prefixes : mono-, di-, tri-, etc
* Oxidation numbers of elements in a compound
* Calculation of molar mass of an element or compound using the Periodic Table
* Percent composition of element in a compound
* Grams  moles  atoms or molecules conversions using 1) molar mass g/mole or 2) Avogadro’s number = 6.02 x 1023 particles/mole
* Definition and calculation of empirical formula
* Definition and calculation of molecular formula