**Fall Semester Exam Review 2016-2017**

**Unit 1 Material**

* Define Chemistry
* Identify laboratory safety hazards
* Differentiate between qualitative and quantitative observations
* Compare and contrast accuracy vs. precision
* Determine if a given set of data is accurate vs. precise
* Calculate % error from given data
* Convert between metric units
* Identify the number of significant digits in a given number
* Complete calculations using the appropriate number of significant digits
* Use a NFPA safety diamond to assess safety concerns
* Use a MSDS label to address hazardous situations
* Complete metric measurements with accuracy
* Write a standard number into scientific notation
* Convert a scientific notation number into standard notation
* Complete scientific notation calculations using the appropriate number of significant figures – multiple questions
* Set up dimensional analysis calculations
* Determine dependent and independent variables from a given experimental scenario
* Complete various density calculations

**Unit 2 Material**

* Define and apply the basic concepts of matter
* Compare and contrast the states of matter – solid, liquid, and gas (know shape and volume variables)
* Differentiate between elements, compounds, and mixtures
* Identify substances (elements and compounds)
* Compare and contrast homogeneous and heterogeneous mixtures (be able to identify examples)
* Demonstrate the law of conservation of mass using lab data
* Determine if properties are intensive or extensive
* Compare and contrast physical and chemical properties (be able to identify examples)
* Compare and contrast physical and chemical changes (be able to identify examples)
* List the indicators of a chemical change or reaction (gas, precipitate, light, heat)

**Unit 3 Material**

* Compare and contrast the scientists and experiments that contributed to the atomic theory
* Demonstrate understanding of the development of the atomic models
* Identify the subatomic parts of an atom
* Compare and contrast electrons, protons, and neutrons
* Differentiate between a neutral atom and an ion
* Define cation and anion
* Differentiate between an element and its isotopes
* Calculate average atomic mass for isotopes
* Demonstrate understanding of the periodic table layout (periods vs. groups/families)
* List the groups/families of the periodic table
* Identify elements in the same group or family having similar properties

**Unit 4 Material**

* Identify and apply the quantum numbers
* Principal quantum number – 7 main energy levels…
* Orbital quantum number – shape of area where electron travels
  + s – sphere
  + p – peanut
  + d – double peanut
  + f – flower
* Magnetic quantum number – gives orientation
  + s - 1 orbital, 2 electrons
  + p - 3 orbitals, 6 electrons
  + d - 5 orbitals, 10 electrons
  + f - 7 orbitals, 14 electrons
* Spin quantum number – clockwise and counterclockwise
* Main energy sublevels:
  + Energy level 1 – s
  + Energy level 2 – s and p
  + Energy level 3 – s, p, and d
  + Energy level 4-7 – s, p, d, f
* Aufbau principle – electrons enter lowest energy level first
* Pauli exclusion principle – no 2 electrons within an atom can have the same 4 quantum numbers; 2 electrons within an orbital must have opposite spin numbers
* Hund’s rule – electrons will fill each orbital singularly… and then fill the orbitals completely…
* Compare and contrast the quantum mechanical model to the Bohr and previous models
* Write and read ground state electron configurations
* Write and read shorthand electron configurations
* Determine the number of valence electrons from a given electron configuration
* Read and write proper orbital notations
* Differentiate between the types of electromagnetic radiation
* Demonstrate understanding of wave mechanics
* Explain the concept of light…how is it emitted???
* Complete calculations that involve wavelength, frequency, and the speed of light
* Complete calculations that involve energy, frequency, and Planck's constant
* Apply the concept of valence electrons to Lewis dot structures and orbital notation
* Differentiate between proper Lewis dot structures
* Define and apply the periodic trends:
  + Atomic radii
  + Electronegativity
  + Ionization energy
  + Metallic character

**Unit 5 Material**

* Name common monatomic ions from the periodic table
  + Positive monatomic ions contain the complete element’s name
  + Negative monatomic ions will end in “-ide”
* Name the polyatomic ions
* Write the formulas and charges of polyatomic ions
* Differentiate between cations and anions – know what they are and how they are formed
* Compare and contrast binary ionic vs. binary molecular compounds
* Name molecular compounds
* Write molecular formulas
  + Recall that molecular (or covalent) compounds will always begin with a non-metal *and* will only contain non-metals
  + Molecular formulas and names will utilize prefixes
* Name ionic compounds
* Write ionic formulas
  + Recall that ionic compounds will always begin with a cation and end with an anion
  + Usually metal and non-metal (NH4 is an exception as a polyatomic ion)
  + Ionic formulas must be balanced out (total charges must be neutral)
    - Criss-cross technique
  + Roman numerals must be used when the element has more than one possible oxidation number (transition metals)
* Diatomics
  + H2, N2, O2, F2, Cl2, Br2, I2
  + “Br2, I2, N2, Cl2, H2, O2, F2“
  + Single, double, triple bonds

**Unit 6 Material**

* The Mole Concept:
  + SI unit for the amount of a substance
  + 1 mole = molar mass (from periodic table)
  + 1 mole = 22.4 L @ STP
  + 1 mole = 6.022 x 1023 representative particles (Avogadro’s number)
  + Representative particles: atoms, molecules (molecular/covalent), formula units (ionic)
* Determine how many atoms are in a compound
* Define molar mass with respect to mole concept
* Determine molar mass of a compound (will be needed for many mole calculations)
* Complete mole calculations:
  + 1 step calculations:
    - moles to mass
    - mass to moles
    - moles to volume
    - volume to moles
    - moles to representative particles
    - representative particles to moles
  + 2 step calculations:
    - mass to volume
    - volume to mass
    - mass to representative particles
    - representative particles to mass
    - volume to representative particles
    - representative particles to volume
    - Determine the percent composition by mass for a given compound
  + (Part/Whole) x 100% = percent composition
  + Determine empirical formulas
  + Determine molecular formulas

**Unit 7 Material**

* Differentiate between various yield signs (heat, catalyst, equilibrium, etc…)
* Identify reactants and products in a given equation
* Differentiate between the five types of chemical reactions (synthesis, decomposition, single replacement, double replacement, combustion)
* Identify a replacement reaction as single vs. double and cationic vs. anionic
* Define the term “precipitate”
* Explain the law of conservation of mass and why we must balance equations
* Balance equations – multiple questions and multiple formats
  + Identify a specific coefficient
  + Identify all coefficients
  + Determine which equation is balanced correctly
* Write a skeleton equation from a given word equation
* Write a balanced equation from a given statement or word equation
* Predict the products of:
  + A synthesis reaction
  + A decomposition reaction
  + A combustion reaction
  + A single replacement reaction
  + A double replacement reaction
* Use solubility rules to assign states of matter for products of a chemical reaction
* Write a balanced equation from a given statement – you must be able to predict products and their corresponding states of matter