***Chemistry I Honors – Semester 1 Exam Study Guide Outline***

**Chapter 1 – Matter and Change:**

* Physical vs chemical properties
* Physical vs chemical changes
* Particle model of gas/liquid/solid states of matter
* Law of Conservation of Energy
* Mixture vs pure substance
* Element names and symbols
* Arrangement of periodic table
* Characteristics of metals, nonmetals, metalloids

**Chapter 2 – Measurements and Calculations**

* Scientific method – steps
* Qualitative vs quantitative observations
* Metric units for length, mass, time, volume, and density – also Metric unit conversions
* Density calculations
* Accuracy vs precision
* Significant figures – rules for math operations
* Scientific notation – be able to use it

**Chapter 3 – Atoms – Building Blocks of Matter**

* Dalton’s Atomic theory
* Laws of Conservation of Mass, Definite Proportions,

 Multiple Proportions

* Rutherford’s experiment
* Properties of protons, neutrons, electrons
* Isotopes
* Atomic number and mass number – how they are related
* Determine the number of protons, neutrons, and electrons in a nuclide given its symbol
* Define ‘mole’ , Avogadro’s number, molar mass
* Convert between mass, moles, and

 number of particles (atoms or molecules)

**Chapter 4 – Arrangement of Electrons in Atoms**

* Bohr model of the hydrogen atoms – basic ideas
* Electromagnetic spectrum – relationships between energy, frequency, and wavelength
* Quantum model of the atom
* Orbitals and quantum numbers
* Electron configurations of elements 1-36

**Chapter 5 – The Periodic Law**

* Describe how elements of a group are related
* Relationship between electron configuration and

 the structure of the Periodic table.

* Name 4 blocks of the periodic table
* Periodic trends in atomic radius, ionization energy,

 electron affinity, and electronegativity

* Define valence electrons and state the number present in atoms of each main group element

**Chapter 6 – Chemical Bonding**

* Distinguish ionic and covalent bonding
* Classify bond type by electronegativity differences
* Discuss the arrangement of ions in crystals

and the associated lattice energy

* Write Lewis electron dot structures
* Describe the electron-sea model of metallic bonding

and relate to properties of metals

* Predict shapes and polarities of molecules and ions using VSEPR theory
* Discuss the types of intermolecular forces and relate them to physical properties
* Bond Energy

**Chapter 7 – Chemical Formulas and Chemical Compounds**

* Write formulas for ionic compounds and name them
* Name binary molecular compounds using prefixes
* Write the formula of binary molecular compounds given the name
* Calculate molar mass for a given compound.
* Convert between mass, moles, and number of particles
* Define empirical formula and explain the relationship between the empirical formula and the molecular formula of a compound
* Oxidation numbers and Polyatomic ions

**Chapter 8 – Chemical Equations and Reactions**

* List observations that indicate a chemical reaction is occurring
* Balance formula equations by inspection
* List the five types of chemical reactions and classify a given reaction according to type
* Use an activity series and table of solubility rules to predict whether a given reaction will occur.
* Predicting Products

**Chapter 9 – Stoichiometry**

* Define stoichiometry
* Write a mole ratio relating two substances in a chemical equation
* Determine the number of moles of product formed from a given number of moles of reactant (including limiting reactants)
* Determine the number of grams of product formed from a given number of grams of reactant (including limiting reactants)
* Convert between liters of gas at STP and moles of the gas
* Distinguish between theoretical yield, actual yield, and percentage yield.

**Chapter 21 – Nuclear Chemistry**

* Explain why nuclear reactions occur and know how to balance a nuclear equation
* Define half-life and explain how it relates to the stability of the nucleus
* Define and relate the terms ‘radioactive decay’ and ‘nuclear radiation.’
* Describe nuclear fission and nuclear fusion, and compare them for their usefulness in generating energy