

# Midterm Study Guide

**Be able to:**

## **Math and Scientific Method**

1. Determine the number of significant figures
2. Calculations with answers to the correct number of sigfigs
3. Conversions of metric units using dimensional analysis
4. Use the reference packet to compare compounds based on boiling point, melting point, and density
5. Identify graphs of direct and indirect (inverse) relationships
6. Explain direct and indirect (inverse) relationships

## **Matter and Changes**

1. Determine physical and chemical changes
2. Determine physical and chemical properties
3. Calculations with density to determine density, mass, or volume

## **Atomic Theory**

1. Identify the subatomic particles and list their mass, charge, and location in the atom
2. Define isotope and identify isotopes
3. Determine the number of protons, neutrons, electrons in atom
4. Determine the atomic number and mass number of an atom
5. List the history of the atom from Democritus through Chadwick including discoveries, experiments, and models of the atom
6. Explain the law of conservation of mass

## **Quantum**

1. Using the Bohr model to determine wavelengths, colors, type of radiation
2. Write electron configurations for atoms and ions
3. Write orbital notations for atoms
4. Explain the Bohr model of the atom
5. Define Hund's rule, Aufbau principle, and Pauli Exclusion Principle
6. Use the electromagnetic spectrum to compare frequencies, wavelengths, and energies of different types of electromagnetic radiation
7. Explain the difference between the Bohr model of the atom and the modern/quantum model of the atom
8. Construct Lewis electron dot diagrams for atoms
9. Determine the number of valence electrons of an atom
10. Explain what the first and second quantum number indicate
11. Use and identify the 4 quantum numbers, shapes and orbital location.
12. Calculate wavelength, frequency, and energy of a wave.

## Periodic Table

1. Determine groups and periods on the periodic table
2. Apply periodic table trends to questions and indicate direction of increasing/decreasing trend on the periodic table
3. Determine s,p,d,f blocks and name families/groups on the periodic table
4. List properties of metals, nonmetals, and metalloids
5. List the most reactive metals and nonmetals (group and individual atom)
6. Determine the number of energy levels of an atom based on position in the periodic table
7. Explain how properties of the atoms are determined
8. Compare the ion atomic radii to the atomic radii of neutral atoms

## Bonding

1. Determine VSEPR molecular geometries of compounds
2. Determine polarity of compounds
3. Determine electronegativity differences of atoms and bond type
4. Define ionic and covalent bonds and what is bonded in each
5. List the properties of ionic compounds and molecular compounds and metallic atoms
6. Define each of the four types of intermolecular forces and explain how they affect the properties of compounds such as boiling point, melting point, and density
7. Define delocalized electrons and what bond type they are involved in
8. Determine which element can make single, double, and triple bonds with itself
9. Define polyatomic ion

## Nomenclature

1. Name ionic compounds from formulas
2. Write formulas from names for ionic compounds
3. Name and write formulas for binary and ternary acids
4. Name and write formulas for covalent (molecular) compounds
5. Name and write formulas for hydrates

## Chemical Reactions and Equations

1. List indicators of a chemical change
2. Define precipitate, reactant, product, exothermic, and endothermic
3. Balance chemical reactions
4. Identify the five types of reactions
5. Identify and label parts of a phase diagram

## Stoichiometry

1. % comp.
2. Molecular and empirical formula
3. Mole conversions
4. Molar mass