

Matter and Motion Fall 2015 Midterm Review

We have covered chapters R, 1, 2, 3, 4, & 5 in *Chemistry: An Atoms First Approach* by Zumdahl and Zumdahl. Constants, nonmetric conversion factors, a periodic table, and electronegativity chart will be provided on the exam. You will need to know formulas for density, molar mass, and molarity. Plan to bring a calculator and something to write with.

Learning Objectives Weeks 1 – 4

Determine significant figures from calculations and their origin in measurements

Know the metric system and how to convert between different scales, eg. nano- to kilo-, etc...

Be able to create conversion factors and use them to convert between different units

Know the general process in the scientific method and explain why the parts are important

Translate between scientific notation and standard notation

Use the density equation to calculate mass, volume, or density

Be able to characterize electromagnetic radiation in terms of wavelength, frequency, and energy.

Understand how the emission spectrum of hydrogen demonstrates the quantized nature of the energy of its electron and be able to calculate photon energies from atomic transitions.

Be able to describe the quantum numbers n , l , m_l , and m_s and use them to write electron configurations for elements using the Aufbau principle, Hund's rule, and the Pauli exclusion principle.

Understand how the structure of the periodic table originates from electron configurations and how it can be used to identify core and valence electrons.

Describe the origin of general trends in ionization energy, electron affinity, and atomic radius in the periodic table and use these trends to predict reactivity.

Understand the mole as a unit of measure in chemistry and use it with molar mass to convert between moles, mass, and number of particles.

Learn to use the periodic table to predict the formulas of ionic compounds.

Learn the system for naming ionic and simple covalent compounds.

Use the concept of electronegativity to explain the formation of ionic, covalent, and polar-covalent bonds.

Use the concept of bond polarity to predict molecular polarity/Understand the relationship between bond polarity and molecular polarity.

Use the localized electron bonding model, the octet rule, and the concept of formal charge to draw Lewis structures of compounds and polyatomic ions.

Apply Valence Shell Electron Pair Repulsion (VSEPR) theory to predict the shape and polarity of molecules.

State the deficiencies of the localized electron bonding model and the need for a more sophisticated model.

Use Molecular Orbital diagrams for diatomic molecules.

Apply Molecular Orbital theory and bond order calculations to predict bond length and bond strength.