Chemistry **Mr. Thaler**

Unit-II Exam Outline

I. Atomic structure
- A. History and different atomic theories and models
  1. Dalton; 2. Thomson; 3. Millikan; 4. Rutherford;
  5. Bohr; and 6. Schrödinger & quantum mechanical
- B. Subatomic particles
  1. Protons, neutrons, and electrons in an atom or ion
  2. Respective charges and relative masses
- C. Belt of stability
- D. Nuclear equations: alpha and beta emissions
- E. Four basic forces in nature

II. Electrons
- A. Radiant energy and quantum theory
  1. Electromagnetic spectrum
  2. Relationships between wavelength, frequency, and radiant energy
  3. How this all relates to atomic structure and electrons—think photons
  4. Calculating radiant energy, wavelength, and/or frequency using the speed of light and Planck's constant
- B. Orbital shapes (*s*, *p*, and *d*)—per Schrödinger equation
- C. Orbital diagrams and electron configurations
  1. Principal energy levels, sublevels, and orbitals
  2. Aufbau principle, Pauli exclusion principle, and Hund's rule
  3. Identifying elements from e-configurations, and *vice versa*
  4. Determining unpaired electrons and valence electrons

III. Periodic table
- A. Classification of elements
  1. Metals, nonmetals, and metalloids (semimetals)
  2. *s*, *p*, *d*, and *f* blocks
  3. Groups (families): numbers and names
  4. Representative elements
- B. Periodic trends
  1. Atomic and ionic radii, ionization energy, electron affinity, and electronegativity, and why
  2. Interpreting graphs of periodic trends
  3. Relative reactivity of elements and ions

IV. Ionic and molecular (or covalent) compounds
- A. Lewis dot diagrams
  1. Number of valence electrons can determine the charge of an ion.
  2. Drawing and/or interpreting Lewis structures
- B. Distinguishing ionic from molecular compounds
- C. Interpreting molecular formulas (subscripts)
- D. Ionic compounds vs. metallic bonding
- E. Naming ionic and molecular compounds
  1. Naming ionic compounds (cation then anion).
  2. Naming molecular compounds (using prefixes: mono, di, tri, etc.).
- F. Writing the formulas of compounds from the names
  1. Identifying and/or writing common monatomic and polyatomic ions
  2. Crisscross method recommended for ionic compounds

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V. Covalent bonding and molecules

A. Determining the number of unpaired electrons (those available for bonding—use *HONC* rule)

B. Using Lewis dot diagrams to represent covalent bonding (two electrons [dots], or "shared pair," equal a single bond).

C. Determining whether a bond is nonpolar, polar, or ionic from differences in electronegativity.

D. Five molecular geometries discussed in class.

E. Predicting shape of molecules from their formulas (use *HONC* rule to predict central atom)

F. Interpreting various molecular schematic representations (ex, ball-and stick models, and others)

VI. Molecular geometry and polarity

A. Predicting polarity of molecules from (1) polarity of bonds, and (2) shape of molecule

B. Predicting what solutes will dissolve in what solvents ("Like dissolves like.")

C. Predicting the bond angles within given molecules based on hybridization (using water, ammonia, and others as rules helps)

VII. Intermolecular forces of attraction

A. Ion-dipole

B. Dipole-dipole

C. Dispersion forces

D. Hydrogen bonding

VIII. Laboratory

A. Isotopes of pennium

B. 1s electron

C. Flame tests

D. ~~Trends in a group~~

E. ~~Solubility and bond type~~

F. Models of molecules