Final Exam Review

- ☐ The **octet rule** states that atoms tend to form bonds so that each atom has eight electrons in its valence shell.
- ☐ **Electron dot structures (lewis structures)** show how many atoms share electrons to meet the octet rule.
    - Be able to draw the correct electron dot structures (lewis structures) for molecular substances **[pg.85]**
- ☐ Properties of Metals
    - **Ductility:** the ability to be drawn into wires
    - **Malleability:** the ability to be hammered or pressed into shapes
    - Have specific crystal structures
- ☐ Properties of Covalent Bonds
    - Bonds hold the atoms together in discrete molecules
    - Form when atoms of nonmetals get close enough for their orbitals to overlap
    - Can be single, double, or triple bonds
- ☐ How do intermolecular forces affect volatility?
    - **Volatility:** a measure of how easily a liquid evaporates.
    - The **stronger** the intermolecular force , the **lower** the volatility because the molecules are held together strongly
- ☐ Melting Point and Boiling Point
    - The **stronger** the intermolecular force, the **higher** the melting and boiling points because it takes more energy to separate the molecules.
- ☐ Formation of Ionic Bonds
    - The resulting cation has a stable octet in it valence shell
    - The resulting anion has a stable octet in its valence shell
    - The electrostatic attraction between the positive ion and the negative ion forms an ionic bond
- ☐ Particles of Matter
    - **Matter:** anything that has mass and occupies space.
    - **Atoms:** the fundamental building blocks of matter.
    - **Element:** the simplest form of matter that has a characteristic set of properties. (H, Cl, O)
    - **Molecules:** when two or more atoms combine, and are held together by chemical bonds. (NH_3, CO_2,CH_4)
- ☐ Types of Atoms
    - **Atomic Number:** the number of protons in the nucleus of an atom.
    - **Mass number:** the total number of protons plus neutrons in an atom.

☐ Ions

- **Cation:** an atom (metal) that loses one or more electrons to form an ion with a net positive charge.
- **Anion:** an atom (nonmetal) that gains one or more electrons to form an ion with a net negative charge.

☐ Isotopes

- Atoms that have the same number of protons but different number of neutrons.

☐ Periodic Trends

- **Atomic Radius:** increase down a group, and decreases across a period
- **Ion Size:** the radius of the cation is smaller → higher Zeff
- **Ion Size:** the radius of the anion is bigger → lower Zeff
- **Ionization Energy:** small atoms tend to have high ionization energies, and large atoms have low ionization energies
- **Ionization Energy:** increases from left to right across a period, and bottom to top within a group **[pg.59-60]**
- **Electron Affinity:** increases from left to right across a period, and bottom to top within a group

☐ Calculating Atomic Mass

- Multiply the mass of each isotope by its natural abundance, expressed as a decimal, and then add the product. **[pg.19]**

☐ Maximum number of electrons in an energy level

- The **maximum number** of electrons that an energy level can hold is given by the formula $\mathbf{2n^2}$, where **n** represents the number of the **energy level.**
- Example: the third energy level can hold 18 electrons → $2(3)^2 = 18$

☐ Electronegativity and Bond Polarity **[pg.87]**

- The ability of an atom to attract electrons toward itself in a chemical bond.
- **Ionic bonds** have an electronegativity difference **greater than 2.0**
- A **polar covalent bond** is a bond in which electrons are shared but not shared equally between the atoms. The electronegativity difference of polar covalent bonds is between **0.4 and 2.0**
- A **nonpolar covalent bond** is a bond in which the electrons are shared equally. Nonpolar covalent bonds have an electronegativity difference of **0.4 or less**

** Please study this very. There is a whole question worth 8 points on electronegativity and bond polarity on your exam **