CHEMISTRY CONTENT FACTS

The following is a list of facts related to the course of Chemistry. A deep foundation of factual knowledge is important; however, students need to understand facts and ideas in the context of the conceptual framework. This list is not intended to provide a comprehensive review for State and National Assessments. Its purpose is to provide a highlight of the factual material covered in Chemistry. This list is not all inclusive, be sure to check Nevada State Standards and your district syllabi.

Bonding

- When a bond is formed energy is released (exothermic); when a bond is broken energy is absorbed (endothermic)
- Atoms bond together to form **OCTETS** (this is lower in energy than unbonded atoms)
- Metals tend to form positive ions by loss of electrons
  (these cations are smaller than the neutral atoms: Ionic radii < than atomic radii)
- Nonmetals tend to form negative ions by gaining electrons (anions formed are larger than the neutral atoms: Ionic radii > atomic radii)
- **A chemical bond** - results from the simultaneous attraction of electrons by two nuclei
- **Ionic bonds** - formed between metal and nonmetal; created by a transfer of electrons; electronegativity difference ≥ 1.7
- **Covalent bond** - formed by the sharing of electrons; electronegativity difference < 1.7
- **Electronegativity** - the affinity for electrons in a covalent bond. Highest: ***Fluorine 4.0***
- Diatomic molecules are considered to have **NONPOLAR** covalent bonding
- *Helium & Hydrogen* need only 2 electrons to fill outer shell. The first energy level can contain a maximum of two electrons
- **Coordinate covalent bonds** - a covalent bond where both of the shared electrons are donated by one of the atoms. Usually found in polyatomic ions
- **Ions**: K^+ and Cl^- have the same # of electron (18) since formation of ions are caused by the loss or gaining of ELECTRONS
- **Ionization energy**: the amount of energy required to remove the outermost electron from an atom
- **Ionic solids**: high melting & boiling point; hard; do not conduct electricity UNLESS dissolved in water and/or in molten form
- **Metallic solids**: mobile electrons, conductors in solids phase, malleable, ductile, only metal that is a liquid at room temperature is Hg (mercury)
- **Molecular solids**: molecules held together by van der Waals forces; low melting & boiling points; poor conductors; are soft. ex. Sugar $C_6H_{12}O_6$

- **Network solids**: held together by a network of covalent bonds; high melting & boiling points. Extremely poor conductors of heat & electricity. i.e. SiO_2, diamond - tetrahedral bonding (C_n), graphite (C_n) - hexagonal bonding
- Van deer Waals forces - attractive forces that exist between ALL particles. They increase when particles
    - Increase in size
    - Get closer together
- **Hydrogen bonds** - attractive for between molecules that contain hydrogen and atoms of small atomic radius and **HIGH ELECTRONEGATIVITIES**. i.e. H_2O and HF. These bonds result in some compounds having higher boiling points than expected
- **Polar molecules** - molecules in which there is a localization of charge that causes part of the molecule to be slightly positively charged [δ^+] and part of the molecule to be negatively charged [δ^-]. Bonded electrons are shared unequally (polar bonds) and these polar bonds are asymmetrically arranged
- **Nonpolar molecule** - there may still be localization of charge but there is no NET dipole of electrons in any particular direction**.**