Dr. Lesher   Chem 111   Chapters 9& 10 Exercise   **Name:_____**

1. Define the following terms:

- Solution:

  A liquid consisting of a solute dissolved in a solvent.

- Solvent:

  A liquid that dissolves solutes

- Solute:

  A substance that dissolves in a solvent

- Electrolyte:

  Dissolved ions that can conduct electricity

  i. Strong versus Weak

  Strong electrolytes dissociate completely. Weak ones do not.

- Non-electrolyte:

  dissolved substance that does not conduct electricity

- Dissolve:

  When the attractive forces between the solute and solvent are strong enough to produce a solution.

- Dissociate:

  When an ionic compound breaks apart into its constituent ions

- Precipitation:

  When a substance comes out of a solution as a solid

- Hydration:

  When a substance combines with water

- Metathesis or Double Displacement Reaction

  A reaction in which two ions switch places

- Molecular equation

  A balanced equation showing all molecules involved in a reaction.

- Ionic equation

  A balanced equation showing the dissociated ions in an aqueous reaction.

- Net ionic equation

  An equation showing only the ions directly involved in a reaction.

2. What are the solubility rules pertaining to the following ion groups:

-Alkali metal cations and NH_4^+

      Always soluable

-nitrate, acetate and chlorate ions

    Always soluable

-chloride, bromide and iodide ions

    soluble except for Ag+, Pb2+, Cu+, Hg2 2+

-sulfate ion

    soluable except for Ca2+, Sr2+, Ba2+, Ag+, Pb2+

-carbonate, phosphate, chromate and sulfide ions:

    insoluable except for with group 1A, 2A, and NH4

-hydroxide ion:

    insoluable except with group 1A, 2A

Define the following terms:
- Arrhenius acid
  Species that increases amount of H+ ions
- Arrhenius base
  Species that increases amount of OH- ions
- Bronsted acid
  Donates proton
- Bronsted base
  accepts proton
- Acid-base neutralization reaction
  A reaction that results in an ionic salt and water
- Hydronium ion
  H3O+
- Titration
  A process used to find the concentration of an analyte
- Endpoint
  The point in a titration where the indicator changes color
- Equivalence point
  The point where the all of the acid and base is neutralized.

3. What are the rules for determining oxidation number of an atom in a compound?

    #1   Oxidation number of atoms in an uncombined element is zero.
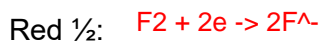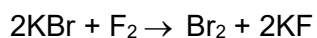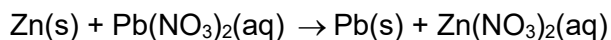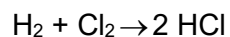
    #2   Sum of all oxidation numbers in a compound is equal to zero.

    #3   The sum of oxi numbers in an ion is equal to the charge.

4. What are the oxidation numbers of the elements in bold in each of the following compounds:

- $H_2\mathbf{O}$ -2

- $H_2\mathbf{O}_2$ -1

- $H_2\mathbf{S}O_4$ +6

- $H_2\mathbf{C}O_3$ +4

- $\mathbf{N}_2O_5$ +5

- $\mathbf{Cu}Cl_2$ +2

- $\mathbf{N}H_3$ -3

5. Write the half-reactions for the following redox reactions:

    $H_2 + Cl_2 \rightarrow 2\ HCl$

        Ox ½: H2 -> 2H^+ + 2e

        Red ½: 2e + Cl2 -> 2Cl^-

    $Zn(s) + Pb(NO_3)_2(aq) \rightarrow Pb(s) + Zn(NO_3)_2(aq)$

        Ox ½: Zn -> Zn^2+ + 2e

        Red ½: Pb^2+ + 2e -> Pb

    $2KBr + F_2 \rightarrow Br_2 + 2KF$

        Ox ½: 2Br^- -> Br2 + 2e

        Red ½: F2 + 2e -> 2F^-

6. Define the following:
- Kinetic energy

  Energy possesed due to being in motion
- Thermal energy

  energy produced by a rise in temperature
- Potential energy

  energy possessed due to relative position/electric charge
- Chemical energy

  energy stored in chemical bonds
- Electrostatic energy

  electric potential energy caused by Coulomb forces.
- Law of conservation of energy

  Energy cannot be created or destroyed
- Exothermic reaction

  A rxn that releases heat
- Endothermic reaction

  a rxn that absorbs energy
- State function

  a mathematical function relating several state variables
- Specific heat

  amount of energy required to raise temp of 1 unit of mass 1 degree C
- Heat capacity

  number of heat units needed to raise temp of body by 1 degree
- Standard enthalpy of formation

  change in enthalpy when one mole of a substance in a standard state is formed
- Bond enthalpy

  measure of the strength of a bond
- Lattice Energy

  the energy change required to form a crystalline ionic compound from the gas state.

7. Write down the 3 rules for manipulating thermochemical equations and adding them together using Hess's Law, give an example of each.