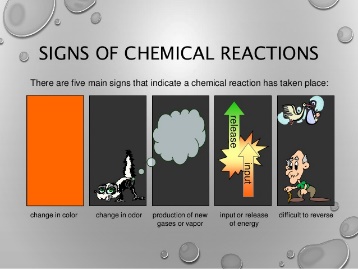
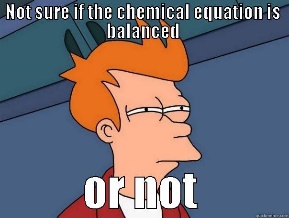
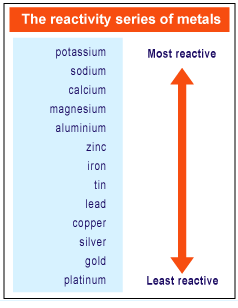
1. Signs of a Chemical Reaction
   1. Change in color
   2. Change in odor
   3. Production of new gases or vapor
   4. Input or release of energy
   5. Difficult to reverse
2. Chemical Equations
   1. Depict the kind of reactant and products and their relative amounts in a reaction.
   2. The letters in () stand for the physical state the atoms/compounds are in.
      1. (s) – solid
      2. (l) – liquid
      3. (g) – gas
      4. (aq) aqueous solution
   3. The numbers in the front are called stoichiometric coefficients.
      1. A stoichiometric coefficient indicates how many:
         1. Atoms/compounds of each reactant/product
            1. (4 Al atoms + 3 O2 molecules yield 2 compounds of Al2O3)
         2. How many moles of each reactant/product
         3. IT DOES NOT DIRECTLY TELL HOW MANY GRAMS THERE ARE
   4. Chemical Equations must obey the Law of Conservation of Matter
      1. Because the same atoms are present in a reaction at the beginning (reactants) and at the end (products), the amount of matter in a system does not change.
      2. Therefore, we must balance equations.
   5. Why do we care about balancing equations?
      1. Provides qualitative information about the identities and physical states of the reactants and products
      2. Provides quantitative information because it tells the relative amounts of reactants and products consumed or produced in the reaction.
   6. Characteristics of Chemical Equations
      1. The equation must represent known facts.
      2. The equation must contain the correct formulas for the reactants and products.
      3. The law of conservation of mass must be satisfied.
      4. Reactants go on the left side and they are substances that exist before a reaction takes place.
      5. Products go on the right side and they are the new substances that are formed due to the reaction.
      6. An arrow is drawn between reactants and products to represent the reaction taking place (yields).
   7. Method for balancing chemical equations
      1. Identify the most complex substance.
      2. Beginning with that substance, choose an element that appears in only one reactant and one product.
      3. Adjust the coefficients to obtain the same number of atoms of this element on both sides.
      4. Balance the polyatomic ions (if present) as a unit.
      5. Balance the remaining atoms, usually ending with the least-complex substance
      6. Count the number of atoms of each kind on both sides of the equations to be sure that the chemical equation is balanced.
   8. When doing reaction word problems, keep the following in mind:
   9. make sure that chemical formulas are accurate in equation
      1. Note: Diatomic Molecules - elements that exist in nature in pairs - H2, N2, O2, F2, Cl2, Br2, I2
   10. Example: Write a balanced equation for the reaction between chlorine and sodium bromide to produce bromine and sodium chloride.
   11. Example: Write the balanced equation for the reaction between aluminum sulfate and calcium chloride to form a white precipitate of calcium sulfate.
3. Types of Chemical Reactions (5 types)
   1. Synthesis - A direct combination of two reactants.
      1. 2 reactants = 1 product
      2. General Form: A + B --> AB
   2. Decomposition Reaction - when a more complex reactant becomes two or more products.
      1. 1 reactant --> 2+ products
      2. General Form: AB --> A + B
   3. Single Replacement - when an element reacts with a compound and a new compound is formed and the compound releases one of the elements.
      1. 2 reactants --> 2 products
      2. General Form: A + BC --> AC + B
      3. Activity Series - predicts the outcome of single replacement reactions
         1. Any element will reduce compounds of the elements below it in the series.
   4. Double Replacement - when two compounds switch their cations to form two or more new compounds.
      1. these include acid-base reactions
      2. 2 reactants --> 2+ products
      3. General Form: AB + CD --> AD + BC
   5. Combustion - when a compound burns in the presence of oxygen, producing energy in the form of heat and light.
      1. The combustion of organic compounds produces carbon dioxide and water.
      2. 2 reactants --> 2 products
      3. General Form: organic + O2 --> CO2 + H2O
4. Construct Classifying Reactions Flow Chart Here: