Class Notes - Obj 7, 8, 9 2021

Objective 7: Balance a chemical equation using atom counts and coefficients. (Ch 7.1)  
Objective 8: Identify the types of common chemical reactions. (Ch 7.2)

Objective 9: Outline factors which will affect the rate of chemical reactions. (Ch 7.4)

**Obj 7 - Chapter 7.1**

**Key Terms:**

Chemical reaction: when a substance undergoes a chemical change

Reactants: the substances undergoing a change in a chemical reaction (left side of arrow)

Products: the substances formed as a result of the chemical change (right side of arrow)

Chemical equation: a representation of a chemical reaction in which the reactants and products are expressed as formulas (recipes) Zn + HCl **→** ZnCl2 + H2

Chemical formula: tells what elements and and the ratio of those elements are in a compound Ca3(PO4)2

Polyatomic ion: covalently bonded group of atoms that has a positive or negative charge and acts as a unit OH-1 (PO4)-3

**Counting Atoms**

1. The symbol of an element represents one atom of that element.   
  
 Ba = 1 atom

2. A **subscript** is a number written at the lower right corner behind the symbol of an element and indicates the number of atoms of the kind in the molecule.  
  
 Cl2 = 2 atoms

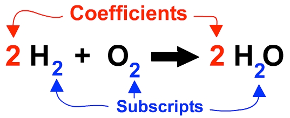
3. A **subscript outside a bracket** multiples all the elements inside the brackets.   
  
Ca3(PO4)2 Ca = 3 atoms P = 2 atoms O = 8 atoms

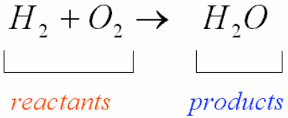
4. A **coefficient** is a number written in front of a chemical symbol and indicates the number of atoms of that element or number of molecules  
Note: a coefficient multiples the number of atoms of each element in the formula

3C 3 atoms  
 2NaSO4 2 molecules Na = 2 atoms S = 2 atoms O = 8 atoms   
 4 Pb(NO3)2 4 molecules Pb = 4 atoms N = 8 atoms O = 24 atoms

**Balancing Chemical Equations**Why → We balance chemical equations to satisfy the Law of Conservation of Matter (or mass), which says that matter is neither created nor destroyed in a chemical reaction. We must have the same number of atoms for each element on the reactant side and the product side.

How → You CAN add coefficients before a formula. You CANNOT add subscripts or break up a chemical formula to insert a coefficient.

Count the number of atoms of each element on the reactant side (left of yield sign) and on the product side (right of yield sign). Change one or more coefficients until the equation is balanced.



Steps:  
 1. Balance metals  
 2. Balance polyatomic ions  
 3. Balance nonmetals  
 4. Balance Hydrogen  
 5. Balance Oxygen  
  
 ~ In other words, balance everything but H & O. Balance H. Balance O. ~

**Obj 8 - Chapter 7.2**

Types of Reactions:  
1. Synthesis - 2 substances combine to form a different substance  
A + B → AB N2 + H2 **→** NH3

2. Decomposition - a substance breaks down into 2 or more substances  
AB → A + B 2H2O → 2H2 + O2

3. Single Displacement (replacement) - one element replaces another (could be metal or non)  
A + BC → B + AC Ca + 2KCl → 2K + Cacl2 Cl2 + 2KI → I2 + 2KCl

4. Double Displacement (replacement) - + ion of one compound replaces the + ion of another compound  
AB + CD → AD + CB AgNO3 + NaCl → AgCl + NaNO3

5. Combustion - hydrocarbon + O2 produces CO2 + H2O giving off energy (as heat and light)  
A + O2 → CO2 + H2O CH3OH + O2 → CO2 + H2O + heat

**Obj 9 - Chapter 7.4**

Reaction Rate: rate at which reactants change into products over time  
\*\*It all comes down to COLLISIONS!

1. Temperature - Increase Temp = Increase rate  
   Increasing temp → inc part speed → inc collisions → inc rate  
   EX: food in ref, different baking temps, slow cook BBQ
2. Surface area - think rubix cube! Increase SA = Increase rate  
   Smaller particle size means more SA → more exposure → inc rate  
   EX: cupcakes vs sheet cake, chicken tenders vs, chicken breast, log vs. sticks for fire
3. Concentration - Increase Conc = Increase rate  
   Inc conc → inc part in an area → inc collisions → inc rate  
   EX: tie dye, diluting reactants like the hydrogen peroxide
4. Catalysts: substance that increases the reaction rate without being used up in the reaction, lowers Activation Energy  
   EX: manganese dioxide from demo, enzymes help break down food or toxins in liver or unwind DNA for replication
5. Inhibitor: any substance that decreases the rate of a chemical reaction  
   EX: fruit fresh, cyanide poison prevents aerobic respiration so cells can’t produce ATP for energy, Penicillin binds to a bacterial enzyme that is used to make its cell wall

Catalyst: people throwing balls on one side of the room, people throwing cups on the other side of the room. A reaction only occurs if the ball lands in the cup. Catalyst would be someone in the middle catching the balls and cups and putting them together.

Inhibitors: cups filled with socks (competitive) OR a stick attached to the cup so the cup can’t catch the ball (non-competitive inhibitor)