December 8, 2017

7th Chemical Reactions Review

***Vocab***

* **Chemical reaction:** occurs when chemical reactants are converted into chemical products
* **Reactant:** a chemical compound that is consumed in a chemical reaction
* **Product:** a chemical compound that is produced in a chemical reaction
* **Formula:** a description of a chemical compound using the letter designations of the elements
* **Chemical equation:** Describes a chemical reaction by indicating the formulas of all reactants and products
* **Yield:** the amount of a product produced by a chemical reaction compared to the amount of reactant
* **Calorimeter:** an insulated container that prevents a chemical reaction from gaining heat from its surroundings or losing heat to its surroundings
* **Matter:** anything with mass and volume
* **Law of Conservation of Matter:** matter cannot be created nor destroyed
* **Atoms:** the smallest particle of matter that still retains the properties of an element
* **Chemical bonds:** the forces between atoms that hold those atoms together to form compounds
* **React:** when reactants interact to form products – It always requires the breaking and reforming of chemical bonds
* **Consumed:** when a reactant is converted to a product
* **Unreacted:** when a reactant is not converted to a product
* **Rate:** the amount of reactants consumed or the amount of products produced during a specific time period
  + We observed the rate of reaction in Inv. #3 by timing how long it took for iodine to be consumed, which occurred when the solution changed from reddish to clear
* **Wavelength:** the distance between two peaks of a wave
  + One of the characteristics of light is that it behaves like a wave
  + A typical human eye will respond to wavelengths from about 390 to 700 nm
    - This is the “visible light spectrum”
* **Nanometer:** a metric unit of length that equals 10-9 meters
  + 1,000,000,000 (one **b**illion) nanometers is equivalent to one meter
  + Wavelength is usually expressed in nanometers
* **Spectrophotometer:** an instrument used to measure the amount of light of a specific wavelength that is absorbed by a chemical compound
* **Absorbance:** the ability of a chemical compound to take in color of a specific wavelength
* **Catalyst:** a chemical that accelerates a chemical reaction without being consumed in the reaction
  + Usually written above the yield sign (🡪) in a chemical reaction

***Focus Questions***

*How does do reactants interact to form products in a chemical reaction?*

* The atoms in reactant molecules rearrange themselves to form product molecules.
  + Ex. NH4OH + HCl 🡪 H2O + NH4Cl is a chemical reaction because the atoms in the reactants were rearranged to form different products
  + Ex. NaCl + H2O 🡪 H2O + NaCl is **NOT** a chemical reaction because the atoms are not rearranged
* Reactants MUST come into contact with each other in order for these rearrangements to occur

*In a chemical reaction, what is the relationship between the amount of reactants and the amount of products?*

* As the amounts of the reactants increase, the amounts of the products produced also increase.

*In a chemical reaction, do the amounts of the reactants affect the amounts of products produced?*

* Reactants must be present in the reaction in equivalent amounts to produce the maximum amount of all products.
* If one reactant is present in greater amounts than another reactant, the amount of product produced will rely on the reactant present in *lower* quantities
  + After one reactant is used up, no more product can be produced!

*How does the Law of Conservation of Matter relate to chemical reactions?*

* No matter is lost from a chemical reaction even if the reactants are present in amounts that are not equivalent.
* You can see this in written chemical reactions – the amounts of atoms on each side of the yield symbol are **always** equal
  + Ex. 6CO2 + 6H2O 🡪 C6H12O6 + 6O2
    - 6 carbons on each side, 18 oxygens on each side, and 12 hydrogens on each side
  + Ex. NaCl + AgNO3 🡪 NaNO3 + AgCl
    - 1 sodium (Na) on each side, 1 chlorine (Cl), 1 silver (Ag), 1 nitrogen, and 3 oxygens

*In a chemical reaction, what is the relationship among the reactants, the products, and the time it takes to complete the reaction?*

* The more reactants added to a reaction, the more products that will be produced and the faster they will be produced.

*What are four ways in which we can* ***increase the rate*** *of chemical reactions?*

* Increase the concentration of the reactants
  + If the reactants are more “crowded”, they are more likely to bump into each other and react
* Stir the reactants
  + Increasing the kinetic energy of the reactants increases molecular motion
  + This increases the chances that reactants will bump into each other
* Increase the temperature
  + Increasing the temperature increases the kinetic energy of the reactants
  + This increases the molecular motion of the reactants, causing them to bump into each other
* Introduce a catalyst
  + Catalysts by definition increase the rate (speed) of chemical reactions

*What are three examples of evidence that a chemical reaction has occurred?*

* *­*Temperature change 🡪 we saw this in Investigation #1
* Gas formation (bubbles) 🡪 we saw this in Investigation #2
* Color change 🡪 we saw this in Investigation #3

*How do we perceive color?*

* Wavelengths of light **reflected** by objects are the colors we see
* Ex. A red apple absorbs all colors except for red, which the apple reflects back to our eyes
* Spectrophotometers measure absorbed light, but we *see* reflected light!

*Bonus:*

What is an exothermic reaction?

* A reaction that gives off heat