Name:_____

Unit 8 Chemical Reaction- Guided Notes Part 1

Chemical Reactions

- A Chemical Reaction occurs when the _____ of a substance changes.
- Chemical Reaction: one or more substances are changed into one or more new substances by the _____of component _____.

How do Chemical Reactions Occur?

- The _____ describes the conditions for a reaction to occur
- The collision theory states that _____ (atoms or molecules) must _____for a chemical reaction to occur

Evidence of a Chemical Reaction

- _____ is produced
- A _____ (a solid) is formed
- Odor/gas is released
  - _____- bubbling from a gas being produced
- _____ and/or a _____ is produced
- Heat is _____
- _____ is produced
- _____ change along with another change
- The _____ of the products are different from the reactants

What Evidence of a Chemical Reaction do you see?

Chemical Equations

- _____: A representation of a chemical reaction using the formulas of the starting substances that react and the new substances that are formed
- _____: the starting substances that enter into a chemical reaction (_____ side of the reaction arrow)
- _____: the new substances formed during a chemical reaction (_____ side of the reaction arrow)
- _____: yields or a reaction arrow; separates reactants and products
  - X + Y → XY;
  - _____ are reactants
  - _____ is the product

Signs and Symbols

Symbol	**Meaning**
States of Matter	

- Coefficients: Number _____ of a substance; apply to _____ in compound/molecule
- Subscripts: number _____ an element; applies to _____ element
- (g), (l), (s): _____, _____, _____
- (aq): _____ (dissolved in water)

Law of Conservation of Mass

- _____ is neither created nor destroyed in a chemical reaction
- The starting mass of _____ = the final mass of _____
- Must be satisfied when describing a reaction (satisfied by _____)
- Atoms are rearranged
- Same _____ of each element on both sides of the reaction arrow
- _____: Show amount of each substance. In front of a compound. Apply to all elements in the compound.
    - _____ are used to balance
    - SUBSCRIPTS CAN NEVER BE CHANGED!!!
- H_2O: _____ Hydrogen atoms and _____ Oxygen atom
- 2 H_2O : _____ Hydrogens and _____ Oxygen atoms
- Coefficients show _____ of:
    - Formula units or molecules involved
    - Relative amounts expressed in moles

Balancing Chemical Reactions

- In order for an equation to reflect the Law of Conservation of Mass it must be _____.
- The # of _____ of each element on the reactants side must _____the # of _____ of each element on the products side.

- A balanced equation has the same number of atoms on _____sides of the equation.
- Tips to Remember:
    - NEVER CHANGE THE _____ when balancing an equation
    - Must use whole-number coefficients (no _____)
    - No coefficient means _____
    - If you get stuck, multiple coefficients by _____ and start over (combustion ONLY)

  1) Write **CORRECT** formulas for the reactant and product.
    - Remember the 7 diatomic gases (H_2, Br_2, O_2 N_2, Cl_2, I_2, F_2)

  2) Balance the number of atoms on both sides by adding coefficients. **DO NOT** change the subscripts!!!!
- Useful tips to try:
    - Make an _____ inventory
    - Rewrite water as _____
    - Balance _____ as a group if appear on both sides of the equation
    - Balance _____ and _____ last
- Ex. _____$MgCl_2$ + _____H_2O → _____$Mg(OH)_2$ + _____HCl
- Practice: Aluminum sulfate reacts with barium chloride to form aluminum chloride and barium sulfate.

- Nitrogen gas plus hydrogen gas under pressure and at high temperature turn into ammonia.

Unit 8 Notes Part 2

5 Types of Chemical Reactions:

- _____- occurs when_____ different compounds react to form _____ new compounds.
- _____- occurs when an _____ element replaces an element that is part of a compound.
- _____- occurs when _____ simple substances combine to form _____ more complex substance.
- _____- occurs when _____ complex substance breaks down into _____ simpler substances
- _____- a type of _____ displacement reaction where a compound is reacted/burned with _____ gas to produce _____, _____, and _____

Why are Reaction Types Important?

- Most reactions will fit into one of the five types. (There are _____.)
- Scientist use the types of reactions to _____.
- Being able to write a chemical equation does not necessarily mean that the reaction will actually take place.

#1 Double Displacement Reactions

- _____ different compounds react to form _____ new compounds
- Also called double _____
- General formula: AX + BY → AY + BX
- Double displacement reactions:
  - _____ of the products formed must be:
    - A _____ (a solid)
    - A _____ (water or will be indicated liquid)
    - A _____ (_____ or will be indicated gas)
- _____ reaction: a special type of _____ displacement reaction in which an _____ reacts with a _____ to produce a _____ and _____.
- Examples:
  - $Ca(OH)_2$ (aq) + 2HCl (aq) → $CaCl_2$ (aq) + $2H_2O$(l)
  - 2NaOH(aq) + $CuCl_2$(aq) → 2NaCl (aq) + $Cu(OH)_2$ (s)
  - In each of the reactions one of the products is a _____, _____, or a _____.
- Solubility:
  - S_____ solid- a solid that readily dissolves in water (aq)
  - _____ solid- a solid that dissolves to such a small degree that it is not detectable to the naked eye (s)
  - _____- An insoluble solid that forms during a chemical reaction (will look _____ or look like a _____) (s)

- Solubility Rules:
  - A set of rules/guidelines that indicate whether a substance will be _____ in water (___) or whether it will be _____ in water (____)
  - Located on the back of your periodic table
  - Soluble or Insoluble?
    - Sodium Sulfate
    - Calcium acetate
    - $Fe(OH)_2$
    - $AlPO_4$
    - LiOH
    - $PbSO_4$
- Double Displacement Practice: Write and balance the chemical equation for the following reactions. Indicating state of matter. If the reaction will not take place, write NR (for no reaction) after the reaction arrow.
  - Barium hydroxide reacts with hydrochloric acid to produce barium chloride and water.
  - Phosphoric acid reacts with ammonium hydroxide to produce ammonium phosphate and water.
  - Sodium chloride reacts with lithium bromide to form sodium bromide and lithium chloride.

#2 Single Displacement Reactions

- An _____ element or a _____ molecule replaces an element that is part of a compound
- Also called single replacement
- General formula: A + BX → AX + B
- _____will replace _____ and _____ will replace _____
  - What type of ions do metals form? _____
  - What type of ions do non-metals form? _____
- Requirements: follow the _____
- _____: Arrangement of elements organized in the order of ease with which they undergo certain chemical reactions
  - Used to predict products for <u>single displacement reactions only</u>
  - There are _____ different activity series
    - _____ activity series
    - _____ activity series
  - Elements can replace any element _____ it on the activity series, but NOT any element _____ it
  - Activity decreases as you move _____ the group
  - Metals _____ on the list will replace metals _____on the list.
  - A metal lower on the list will not replace a metal above it on the list; in this case we write _____for no reaction
  - The farther _____ 2 elements are on the series, the more likely the higher one will replace the lower one in a compound.

- Examples:
  - Copper metal reacts with silver nitrate to form silver and copper nitrate
    _____
  - Lithium metal reacts with water to form lithium hydroxide and hydrogen gas
    _____
- Practice: Reaction or No Reaction?
  - $Ag\ (s) + Cu(NO_3)_2\ (aq)$ →
  - $F_2(g) + 2NaBr(aq)$ →
  - $Mg(s) + Zn(NO_3)_2(aq)$ →
  - $2\ KBr(s) + I_2(g)$ →

#3 Synthesis Reactions

- Occurs when _____or more simple substances combine to form _____ substance that is more complex.
- Do not worry about states of matter
- General formula is A + B → AB
- Examples:
  - $2\ Fe + 3\ Cl_2$ → $2\ FeCl_3$
  - $2\ Na + Cl_2$ → $2\ NaCl$
- Practice: Write the complete balanced chemical equation for the following synthesis reactions:
  - Copper metal reacts with oxygen gas to form copper (II) oxide
    _____
  - Aluminum metal reacts with oxygen gas to form aluminum oxide
    _____
  - Calcium metal reacts with nitrogen gas to form calcium nitride
    _____
  - Solid sulfur (S_8) reacts with oxygen gas to form sulfur dioxide
    _____

#4 Decomposition Reactions

- A complex substance breaks down into _____ or more simpler substances
- General formula: AB → A + B
- Do not worry about states of matter
- Examples:
  - Ammonium nitrate decomposes to form dinitrogen monoxide and water

    NH_4NO_3 → $N_2O + 2H_2O$
  - Sodium nitride decomposes to form sodium metal and nitrogen gas

    $2NaN_3$ → $2\ Na + 3\ N_2$

- Practice: Write the complete balanced chemical equation (including states of matter) for the following synthesis reactions:
    - Water decomposes into hydrogen gas and oxygen gas
    - _____
    - Solid sodium chloride decomposes into sodium metal and chlorine gas
    - _____
    - Liquid ammonia decomposes into nitrogen gas and hydrogen gas
    - _____

#5 Combustion Reactions

- A type of _____ reaction in which hydrocarbons (substances made of _____, _____, and sometimes _____) are burned in _____ to produce _____ and _____
- All reactants and products are in the _____ state or _____ state
- General formula: $C_xH_{y\,(l)} + O_{2\,(g)} \rightarrow CO_{2\,(g)} + H_2O_{\,(l)}$
- Examples:
    - $CH_4(l) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$
    - $2C_2H_6(l) + 7O_2\,(g) \rightarrow 4CO_2\,(g) + 6H_2O(l)$
- Practice: Balance the following. Remember balance hydrogen and oxygen last, and if you get stuck, multiply the hydrocarbon by 2 and start over (combustion ONLY)
    - ____$CH_{4(g)}$ + ___ $O_{2(g)}$ ____ $H_2O_{(g)}$ + ____ $CO_{2(g)}$
    - ___$C_{12}H_{26(g)}$ + ___ $O_{2(g)}$ ___ $H_2O_{(g)}$ + ___ $CO_{2(g)}$
    - ___$C_3H_{8(g)}$ + ____ $O_{2(g)}$ ___ $H_2O_{(g)}$ + ___ $CO_{2(g)}$