FPS – Reactions Chapter 7 - Unit 11 Review KEY

Name_____ Period_____

A. Definitions

1. Define and give the "formulaic" pattern for each type of reaction.
   a. Synthesis
      Reaction where two smaller substances combine to synthesize one product. Typically two elements, but could be compounds combining as well. Formula: A+B→AB
      Example: $S + F_2 \rightarrow SF_6$
   b. Decomposition
      Reaction involving one large compound as a reactant breaking down into multiple smaller substances are products. Formula: AB → A + B
      Example: $CaCO_3 \rightarrow CaO + CO_2$
   c. Single displacement
      Reaction involving one element (typically a metal) and one ionic compound as reactants and undergo a displacement, resulting in the cations switching. Formula: A + BC → AC + B
      Example: $Mg + CuCl_2 \rightarrow Cu + MgCl_2$
   d. Double displacement
      Reaction involving two compounds as reactants that undergo a displacement of ions, producing two compounds as products. Formula: AC + BD → AD + BC
   e. Combustion
      Reaction involving a carbon-based compound combusting in oxygen, producing BOTH carbon dioxide and water as products. Formula: $CH + O_2 \rightarrow CO_2 + H_2O$

2. Describe many observations that can be made when a chemical reaction is occurring.
   Observations that indicated a chemical reaction include: fizzing or bubbling (gas formation), heat change, production of light, solid formation, odor (also gas formation) BUT DOES NOT INCLUDE state/phase change (ex: melting or boiling)

3. What is a precipitate?
   solid formation which is a product of a reaction between two or more liquid or gas reactants
4. List AND define the parts of a chemical equation.
   reactants → original substances/particles that collide to react (left side of equation)
   products → resulting substances that have been formed (right side of equation)

5. Define the Law of conservation of mass.
   The law of conservation of mass states that mass (in a chemical reaction) cannot be created or destroyed, but the molecules can be rearranged to change form.

6. Why do we balance chemical equations?
   We balance equations with coefficients to satisfy the Law of Conservation of Mass; matter cannot be lost or gained during a chemical reaction.

7. Why can't you change the subscripts of a chemical equation when balancing?
   The subscripts of a chemical formula determine the identity of a substance example: H_2O is VERY DIFFERENT from H_2O_2

8. What is the rate of a reaction? What are the four factors that can affect the rate of a reaction?
   A rate of a reaction is the speed at which the reaction proceeds until completion. The four main factors are: temperature, concentration (or pressure for gases), surface area, and use of a catalyst.

9. What is activation energy?
   The activation energy of a reaction is the minimum energy required for a successful collision to result in a reaction—to reach the "threshold" of energy for the reaction to occur

10. Why doesn't a reaction last forever and constantly increase its rate?
    Typical reactions can't last forever because the concentration of the reactants decreases, and eventually there are only products remaining, causing the reaction to slow to a stop.

11. How and WHY does temperature affect the rate of reaction?
    Increased temperature INCREASES the rate of a reaction because a higher temperature causes the particles to have a higher velocity, therefore a high kinetic energy. With more energy, there are more collisions between particles and therefore higher rate.

12. How and WHY does increased surface area speed up the rate of reaction?
    Increased surface area INCREASES the rate of a reaction because when a large solid is broken down into smaller parts, more particles are available to collide. With more available collisions between particles, there is a higher rate of reaction.

13. How and WHY does increased concentration speed up the rate of reaction?
    Increased concentration INCREASES the rate of a reaction because more particles in the same volume increases the chance of successful collisions. The particles have nowhere else to go! With more collisions between particles there is a higher rate. ***KNOW HOW TO CONTRAST THIS FACTOR WITH SURFACE AREA. NOTICE THE DIFFERENCES.***

14. How and WHY does using a catalyst speed up the rate of reaction?
    A catalyst can be used in a reaction to increase the rate by lowering the activation energy or providing the energy to the reach the minimum. A catalyst itself is not chemically changed in a reaction and is not a PART of the reaction.

15. What three catalysts are commonly used in industry? Why are catalysts important?
    Platinum, iron, nickel are used in industry. Catalyst are very important—they allow industries to produce more products more quickly to increase profits

16. What is the difference between endothermic and exothermic reactions? How can we tell in the lab?
    Exothermic reactions release heat from the system of the reaction to the surroundings. In the lab, this reaction will feel warm or hot. Endothermic reactions take in heat from the surroundings. In the lab, this reaction will feel cold.

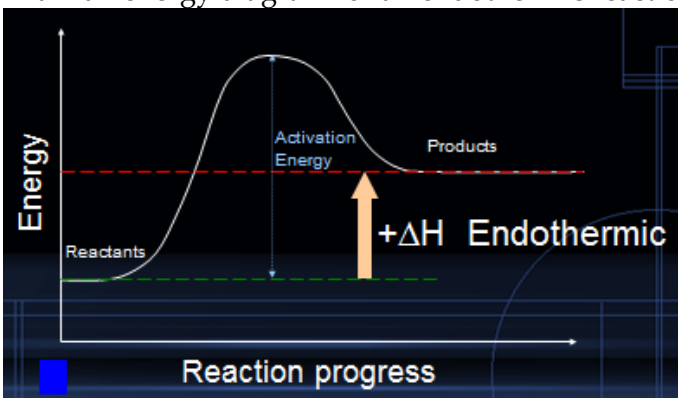
17. What is a molar mass?
    Molar mass is the weight of one mole of a substance. It is found by using the average atomic mass on the periodic table.

18. How do you calculate a molar mass? Explain using NaCl as an example.
    For compounds, we find the sum of the molar masses of all the atoms present. In NaCl, there is one atom of sodium and one atom of chlorine per unit of NaCl. Na = 23 g/mol (rounded) and Cl= 35 g/mol. 23 + 35 = 58 g/mol NaCl

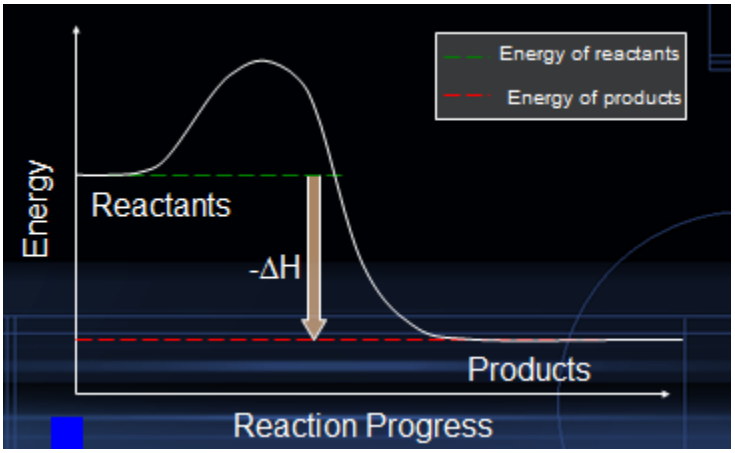
B. Application
Balance and write the type of reaction.

		Type of reaction:
19.	$4Na + O_2 \rightarrow 2Na_2O$	synthesis
20.	$SF_6 \rightarrow S + 3F_2$	decomposition
21.	$2Al + 3CuSO_4 \rightarrow 3Cu + Al_2(SO_4)_3$	single replacement
22.	$Pb(NO_3)_2 + 2NH_4Cl \rightarrow PbCl_2 + 2NH_4NO_3$	double replacement
23.	$Al_2O_3 + 3H_2O \rightarrow 2Al(OH)_3$	synthesis
24.	$2Fe_2O_3 \rightarrow 4Fe + 3O_2$	decomposition
25.	$Zn + SnCl_2 \rightarrow Sn + ZnCl_2$ ☺	single replacement
26.	$Cu(NO_3)_2 + Na_2S \rightarrow CuS + 2NaNO_3$	double replacement
27.	$2Al(OH)_3 + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 6H_2O$	double replacement
28.	$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$	combustion
29.	$2Ag + S \rightarrow Ag_2S$	synthesis
30.	$2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$	single replacement
31.	$2HgO \rightarrow 2Hg + O_2$	decomposition
32.	$KCl + AgNO_3 \rightarrow AgCl + KNO_3$ ☺	double replacement
33.	$Al_2(SO_4)_3 + 3Ca(OH)_2 \rightarrow 3CaSO_4 + 2Al(OH)_3$	double replacement
34.	$2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$	single replacement
35.	$4Al + 3O_2 \rightarrow 2Al_2O_3$	synthesis
36.	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$	combustion

37. Draw an energy diagram for an endothermic reaction.



38. Draw an energy diagram for an exothermic reaction.



39. Calculate the molar masses of the following chemicals:

1) Cl_2

35 + 35 = 70 g/mol

2) KOH

39 + 16+1= 56g/mol

3) $BeCl_2$

9+35+35=79 g/mol

4) $FeCl_3$

56+35+35+35=161g/mol

5) BF_3

11+19+19+19=68g/mol

6) CCl_2F_2

12+35+35+19+19=120 g/mol

7) $Mg(OH)_2$

24+16+16+1+1=58 g/mol

8) UF_6

238+19+19+19+19+19+19=352 g/mol

9) SO_2

32+16+16=64 g/mol

10) H_3PO_4

1+1+1+31+16+16+16+16=98 g/mol

11) $(NH_4)_2SO_4$

14+14+(8)+32+16+16+16+16=132 g/mol

12) CH_3COOH

12+12+4+16+16=60 g/mol

13) $Pb(NO_3)_2$

207+14+14+16+16+16+16+16+16=331 g/mol

14) $Ga_2(SO_3)_3$

70+70+(32x3)+(16x9)=380 g/mol