**KEY**

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Per:\_\_\_\_\_\_**

Unit 8 Outline- Advanced Applications of Chemical Reactions

**Study Guide**

1. According to the collision theory, what 3 things must happen in order for two molecules to react?

**- collide -collide with enough energy - with the correct alignment**

2. Using the collision theory, explain if the following would **increase/ decrease** the rate of reaction and **why**:

**2 HCl(aq) + Mg(s) 🡪 MgCl2(aq) + H2(g)**

a. Increase temp: **Increase reaction, molecules collide more often & more energy due to greater velocity**

b. Increase HCl: **Increase reaction, more collisions because more reactants to collide with**

c. Increase pressure: **Pressure only affects gases. This one is tough & more difficult than will be on your test. Pressure wouldn’t affect the reactants directly because none of them are gases. One of the products is a gas, so it might cause the gas particles to collide more with the reactants and could slow down the reaction.**

d. Remove MgCl2 : **Increase reaction, less products means less chance for them to interfere with collisions occurring between reactants**

e. Add H2 : **Decrease, more products mean they interfere more with reactants and the reactants would collide less.**

3. Identify the following on the graphs (with # or letter):

 a. Reactants- **1**  b. Products- **2**

c. Activation energy (number/letter & amount in Joules)-

**(300 Joules)**

d. Is this reaction exothermic or endothermic? **Endothermic**

e. What is the ΔH for this reaction?

**How much energy is absorbed or released. …C on graph (200 Joules)**

4. Explain how a **catalyst** affects the activation energy in a chemical reaction. (Also, show on the above graph what a catalyst might do). **Speeds it up by lowering the activation energy. (see line on graph)**

5. What is the importance of the **activation energy** in a chemical reaction?

**Amount of energy needed for a reaction to occur**.

6. Using your references, calculate the heat of reaction (ΔH = ) for the following reaction:

**H2 (g) + Cl2 (g) 🡪 2HCl (g)**

|  |  |
| --- | --- |
| **Reactants: (Bonds broken)** | **Products (Bonds formed)** |
| 1 H-H 435 kJ x 1 = 435 kJ  1 Cl-Cl 243 kJ x 1 = 243 kJ  Total = 678 kJ energy in | 2 H-Cl 439 kJ x 2 = 878 kJ  Total = 878 kJ energy out |
| **solve for ΔH = (Bonds broken- bonds formed)…**  **678 KJ- 878 KJ = -200 KJ**  **Write the heat Equation: H2 (g) + Cl2 (g) 🡪 2HCl (g) + 200 KJ**  **(write it on the product side because heat exits the reaction, is a product)** | |

a. Draw in the other side of the graph

b. Label on the graph where the bonds are breaking

c. Label on the graph where bonds are forming

d. Label the **ΔH on the graph**

e. Is this endothermic or exothermic? **EXO… More energy being released than used to break bonds.**

7. Use the Le Chatelier’s principle to predict how the system at equilibrium would **shift** and **why**:

**CO (g) + 3 H2 (g)🡨 🡪 CH4 (g) + H2O (l) + 113 J**

**Stresses:**

a. adding CO **Shifts 🡪 to use up extra** CO

b. Removing water **Shifts** **🡪 to make more H2O**

c. Adding pressure **Shifts 🡪 reduce pressure because only 1 gas particle is made going in the forward direction, while going in the reverse produces 4 gas particles.**

d. Adding heat **Shifts 🡨 use up heat**

8. Use the following **unbalanced** equation to answer the questions below:

**1 SiO2(s) + 4 HF(g) 🡪 1 SiF4(g) + 2 H2O(l)**

a. What is the mole ratio between: **SiO2 & H2O** ? **SiO2 & HF?**

**1 mole SiO2 1 moleSiO2**

**2 mole H2O 4 mole HF**

b Given 3 moles of HF, how many moles of H2O are produced?

|  |  |  |
| --- | --- | --- |
| 3 mol HF | 2 mol H2O | **1.5 mol H2O** |
|  | 4 mol HF |

c. Given 10 grams of silicon dioxide how many grams of HF are needed?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 10 g SiO2 | mol SiO2 | 4 mol HF | 20.01 g HF | **= 13 g HF** |
|  | 60.09 g SiO2 | 1 mol SiO2 | 1 mol HF |

9. **2CuS + 3O2 🡪 2CuO + 2SO2**

a. If **100 g of CuS** are available, how much sulfur dioxide (grams) can be produced?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 100 g CuS | 1 mol CuS | 2 mol SiO2 | 64 g | = **66.93 g SO2** |
|  | 95.62 g CuS | 2 mol CuS | 1 mol SO2 |

1. In a lab, you produced 60 grams of sulfur dioxide as described in the reaction above.
   1. What is the **theoretical yield** (from calculations above)? **66.93 g (stoich answer)**
   2. What is the **actual yield (aka experimental yield)** (given above)? **60 g (lab results)**
   3. Calculate the **percent yield** (equation on lab)? **60/ 66.93 = .896 x 100= 89.6%**