AP CHEMISTRY INTRODUCTION TO REACTION RATES

PART 1: COLLISION THEORY

Follow the links below to complete the assignment. Some animations may take a while to load so be patient!

A. Watch: Ted ED "How to get a Date"

http://ed.ted.com/lessons/how-to-speed-up-chemical-reactions-and-get-a-date

- While watching, take 10 bullet points of notes on how to speed up chemical reactions.
- Click "Think" tab and take the quiz. Write the answers here in complete sentences (yes, I mean it this time).

B. **Visit: The Collision Theory of Reaction Rates –**
(http://www.chemguide.co.uk/physical/basicrates/introduction.html)

- Read the information describing the collision theory. Answer the questions that follow.

1. It is pretty obvious that if you have a situation involving two reactants they can only react together if they come into contact with each other. They first have to collide, and then they ***may*** react. Why is the term "***may*** react" used?

2. What is activation energy?

3. Describe the significance of the Maxwell – Boltzmann Distribution Curve.

C. **Watch: Orientation of Collisions – see link below**
(http://www.mhhe.com/physsci/chemistry/essentialchemistry/flash/collis11.swf

Explain, in your own words, what "Orientation of Collisions" means.

D. **Watch: ActivationEnergy**
(http://www.mhhe.com/physsci/chemistry/essentialchemistry/flash/activa2.swf)

Sketch a potential energy diagram of the two following reaction coordinates (endothermic and exothermic). Label all parts and briefly describe what is happening at each part of the reaction coordinate curve (A, B, C, and D)

An Endothermic reaction

An Exothermic Reaction

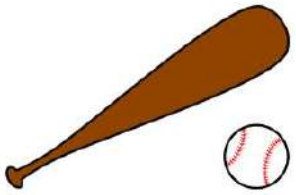
E. How does a Catalyst work?

Complete the fill in the blanks at this site: Write the answers only on this paper.
http://www.sciencegeek.net/Chemistry/taters/energydiagram.htm

F. Read the information and four scenarios below. Answer the questions that follow.

In the picture below, the **baseball bat** will represent Reactant A and the **baseball** will represent Reactant B. A reaction will only be successful if the batter hits a homerun. If the batter does not hit a homerun, the reaction will be considered a failure. Now, read the four scenarios below and answer the key questions that follow.

Scenario 1: The pitcher throws a fastball down the middle of the plate. The batter takes a mighty swing and totally misses the ball. The umpire yells, "Strike one!"



Scenario 2: The pitcher throws an off-speed pitch and the batter checks his swing. The batter just barely makes contact with the ball and it dribbles down in front of the batter's feet into foul territory. The umpire yells, "Foul ball; strike two!"

Scenario 3: The pitcher throws a curve ball that looks like it might catch the outside corner of the plate. The batter swings with all his strength, but the bat grazes the underside of the ball and the ball skews off to the right into the crowd. The umpire yells, "Foul ball, still two strikes!"

Scenario 4: The pitcher throws another fastball down the middle of the plate. The batter swings and wallops the ball high into the air and the ball clears the center field wall that reads 410 feet. The ump yells, "Homerun!"

Questions:

1. Did a reaction take place between Reactant A and Reactant B in Scenario 1? Why or why not? Explain your reasoning in terms of the nature of the collision.

2. Did a reaction take place between Reactant A and Reactant B in Scenario 2? Why or why not? Explain your reasoning in terms of the nature of the collision.

3. Did a reaction take place between Reactant A and Reactant B in Scenario 3? Why or why not? Explain your reasoning in terms of the nature of the collision.

4. Did a reaction take place between Reactant A and Reactant B in Scenario 4? Why or why not? Explain your reasoning in terms of the nature of the collision.

G. Write down these notes:

Factors that affect reaction rates (change COLLISIONS per second) – KNOW THESE!!

1. Temperature

** increases KE of particles so possible to meet required Ea (more FORCEFUL collisions)!

** increases velocity so increase FREQUENCY at which they collide

2. Concentration of the Reactants

** more "stuff" = more collisions

3. Surface Area

** more exposure to collide (smaller particles have MORE surface area)

** increase area for orientation to be 'effective'

4. Catalyst

** provide a meeting site / ALTERNATE PATHWAY!

** lower the Ea so more collisions meet sufficient energy required = MORE effective collisions **{remember catalysts are NOT CONSUMED OR USED UP IN RXN!!!}**

5. Nature of the Reactants

**refers to their complexity and the number of bonds that must be broken and reformed in the course of reaction.

H. Visit: Ozone Lesson Watch the animation, which demonstrates how ozone is destroyed by chlorofluorocarbons (CFC's). (Note: You can control the speed of the animation by clicking on the buttons to the right of the animation.) Also, please read the information that follows on the webpage. Then, answer the questions that follow.

Questions:

1. What is ozone?

2. What is the importance of the ozone layer?

3. How is ozone destroyed?

4. In reaction $CFCl_3$ + UV Light -> $CFCl_2$ + Cl, there is only one reactant ($CFCl_3$) and no collision. So, why did a reaction take place?

Answer the two questions below regarding two chemical reactions.

1. For the reaction H_2 (g) + Br_2 (g) -> HBr (g), list the type(s)/number of bonds that must be broken and the type(s)/number of bonds that must form for the chemical reaction to take place. (You must first balance the reaction.)

1. For the reaction N_2 (g) + H_2 (g) -> NH_3 (g), list the type(s)/number of bonds that must be broken and the type(s)/number of bonds that must form for the chemical reaction to take place. (You must first balance the reaction.)

Extra Resources – if you need extra help!
https://prezi.com/x-6ofuuic3fv/copy-of-chemical-reactions-and-collision-theory/