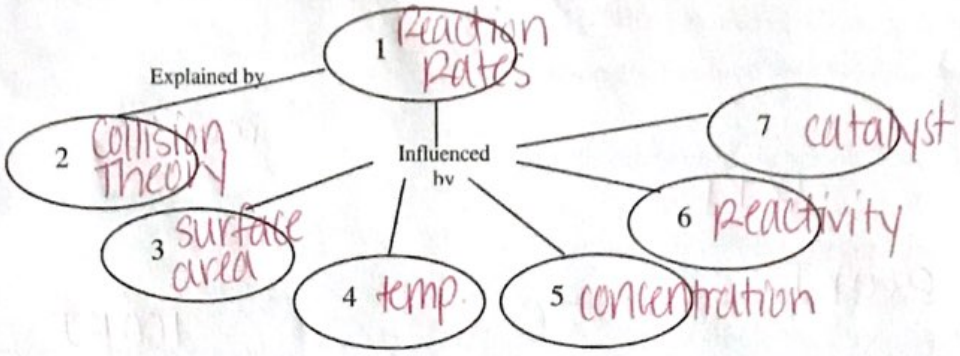
Kinetics (Reaction Rate) Practice

Name: KEY Pd: ____

1. Complete the following concept map using the following terms:

Surface area *Temperature* *Concentration* *Catalyst*
Collision theory *Reaction rates* *Reactivity*



2. Define reaction rate. What does the reaction rate indicate about a particular chemical reaction?
amount of time it takes for a reaction to occur

3. In addition to colliding, what else must happen in order for a reaction to occur?
correct orientation, enough energy

4. Use the collision theory to discuss how the following factors affect the rate of a chemical reaction:
   a. Temperature – ↑ temp, ↑ KE, ↑ # of collisions
   b. Concentration – ↑ concentration, ↑ # of collisions
   c. Surface area – ↑ surface area, ↑ likelihood of correct orientation

5. What role does the reactivity of the reactants play in determining the rate of a chemical reaction?
more reactive reactants, ↑ reaction rate

6. *Answer the following questions about catalysts:*
   a. What is the difference between a homogeneous and a heterogeneous catalyst?
homogeneous catalyst: in same phase as reactants
heterogeneous catalyst: in different phase as reactants
   b. How does a catalyst affect the activation energy for a chemical reaction?
lowers the Ea ~~homogeneous: catalyst in the same phase as reactants heterogeneous: catalyst in different phase as reactants~~
   c. What is the result of adding a catalyst to a reaction?
lowers the activation energy to speed up the reaction

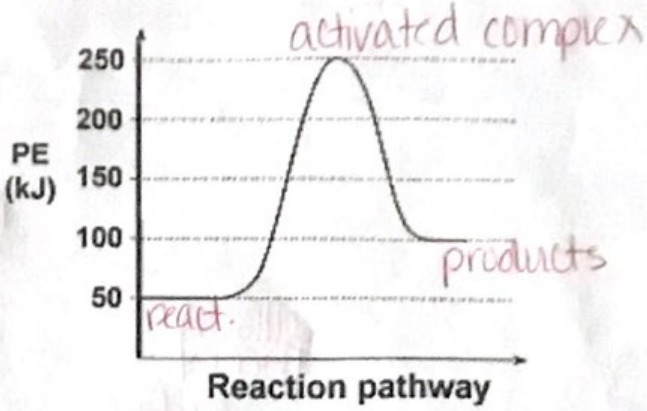
7. Would the changes listed below increase or decrease the rate of the following reaction:

$$I_2\,(s) + Cl_2\,(g) \rightarrow 2ICl\,(g)$$

   a. decreasing temperature: decrease
   b. Increasing $[Cl_2]$: increase
   c. crushing I_2: increase
   d. adding a catalyst: increase

Activation Energy Diagrams

Use the graph below to answer questions 1-7: Include labels on any numerical values.

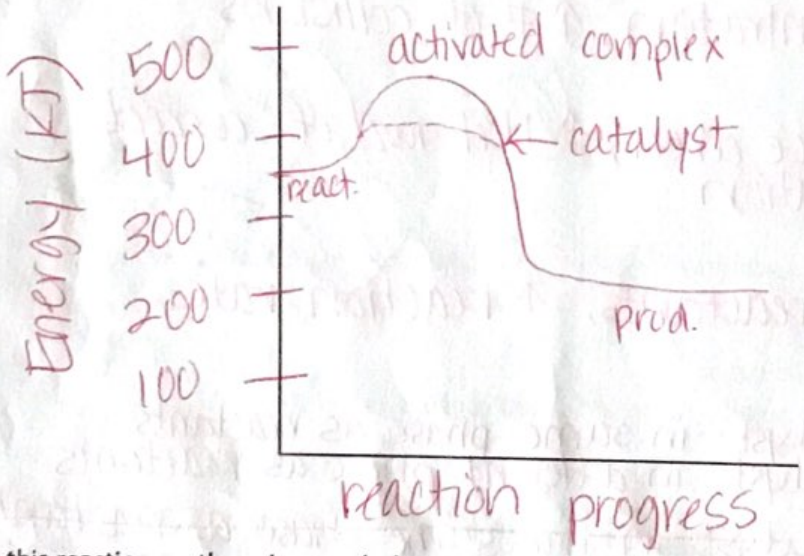


1. Label the position of the ***reactants*** on the graph.
2. Label the position of the ***products*** on the graph.
3. Lable the position of the ***activated complex*** on the graph.
4. How much energy do the reactants have at the start of the reaction? 50 KJ
5. What is the activation energy for this reaction? 200 KJ Label this on the graph.
6. How much energy do the products have at the end of the reaction? 100 KJ
7. Is this reaction exothermic or endothermic? Explain your answer using evidence from the graph.

endothermic, reaction gained energy
50KJ − 100 KJ

8. Draw an energy diagram on the axes below using the given information. Be sure to include labels and units on both the x-axis and y-axis.

   Potential energy of reactants = 350 kJ/mole
   Activation energy = 100 kJ/mole
   Potential energy of products = 250 kJ/mole



9. Is this reaction exothermic or endothermic? Explain your answer using evidence from the graph.

exothermic, products have less energy than the reactants

10. You add a catalyst to the reaction you graphed in question 8, which lowers the activation energy of the reaction from 100 kJ/mole to 50 kJ/mole. Draw the energy diagram of the catalyzed reaction on the same set of axes above (use a dashed line or a different color and label the reaction with the catalyst).