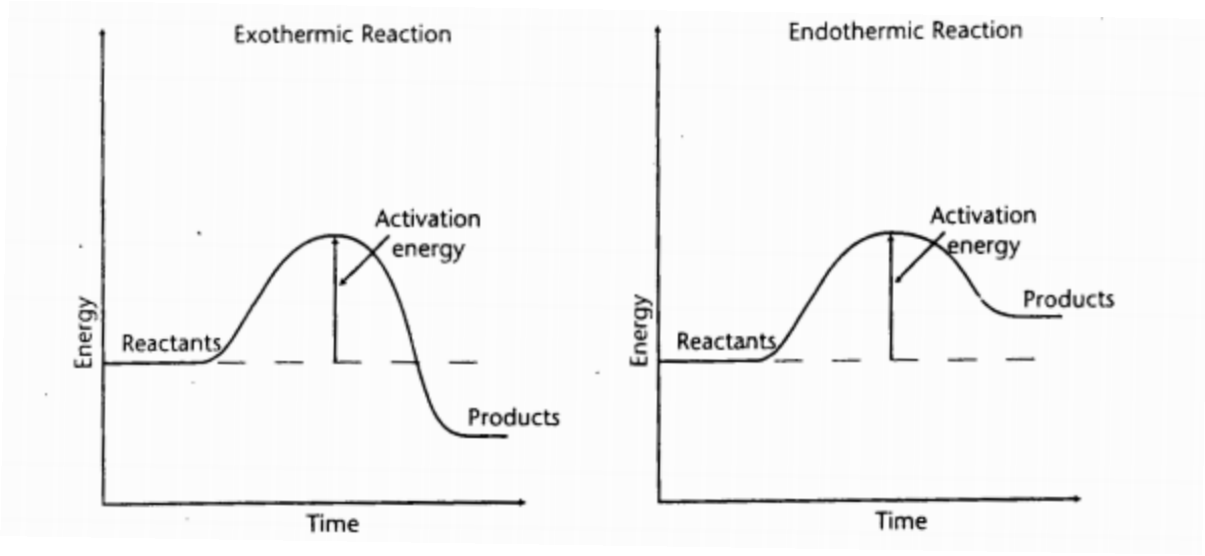
Controlling Chemical Reactions Name:_____ Date: _____Block:____

Use the graphs below to answer the following questions:



1. Define exothermic and endothermic chemical reactions:

   Exothermic reactions release energy while endothermic reactions absorb energy. In exothermic reactions, the products are at a lower energy level than the reactants due to the release of energy. In endothermic reactions, the products are at a higher energy level than the reactants, due to the absorption of energy.

2. Explain the differences in the graphs above using your knowledge of endothermic and exothermic reactions.

   In the graph of the exothermic reaction, the products are at a lower level of energy than the reactants. This is because an exothermic reaction releases energy. The products in the endothermic reaction are at a higher level of energy than the reactants. This is because an endothermic reaction absorbs energy

3. Why is the activation energy illustrated as a hill in the above graphs?

   Activation energy is the amount of energy that has to be added to start a reaction. With enough energy, reactants can get “over the hump” and form products.

   3. Other ways to increase the rate of a chemical reaction are increase the concentration of a reactant, increase the surface area of a solid reactant, or add a catalyst.
   4. The amount of substance in a given volume
   5. A biological catalyst
   6. A material used to decrease the rate of a reaction

4. Explain how increasing the temperature would change the rate of these chemical reactions:

Increasing the temperature of a reaction makes the reacting particles move faster, increasing the rate of the reaction.

5. Explain how increasing the surface area would change the rate of these chemical reactions:

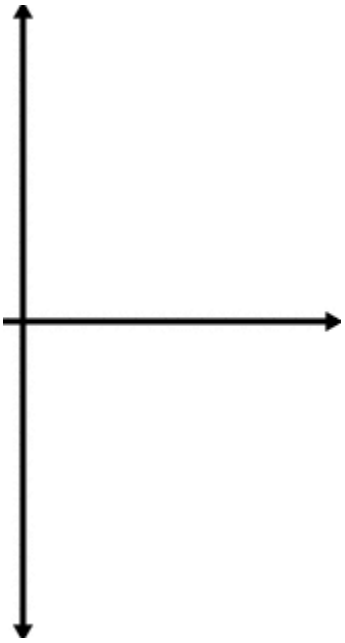
Only the surfaces of solids are usually available to react with other substances. Increasing the surface area makes more surface available for collisions, and therefore reactions, to occur.

6. Explain how adding a catalyst

Another way to control the rate of a reaction is to change the activation energy needed. If you decrease the activation energy, the reaction happens faster. A catalyst is a material that increases the rate of a reaction by lowering the activation energy. Catalysts affect the reaction rate, but they are not considered reactants.

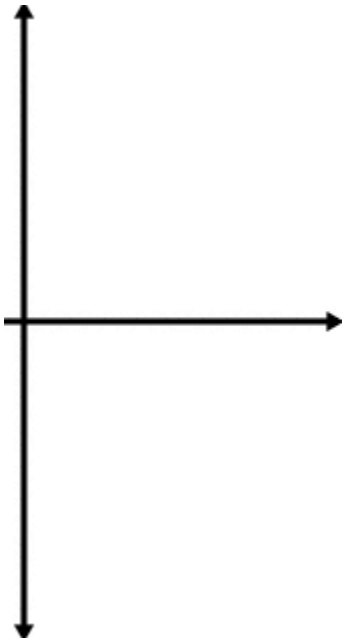
Illustrate on the graphs below the differences in activation energy of catalyzed versus un-catalyzed reactions:

Uncatalyzed Reaction ***see key posted in class**



Time

Catalyzed Reaction



Time

7. What is an enzyme and how does it function?
   The cells in your body contain biological catalysts, called **enzymes**. Enzymes increase the reaction rates of chemical reactions necessary for life.

8. Explain how changing the p
9. Explain the function of an inhibitor in relation to catalysts and/or enzymes?
   Sometimes a reaction is more useful when it can be slowed down rather than speeded up. A material used to decrease the rate of a reaction is called an **inhibitor**. Most inhibitors work by preventing reactants from coming together.

10. How would a change in concentration affect the rate of a chemical reaction?

    A third way to increase the rate of a reaction is to increase the concentration of the reactants. The **concentration** is the amount of a substance in a given volume. Increasing the concentration of reactants makes more particles available to react.

Controlling Chemical Reactions – Practice problems 2

a. Increase in surface area
b. Increase in temperature

c. Increase in concentration
d. Use of a catalyst
1. activation energy
2. True
3. The activation energy can be a spark.
4. Exothermic reaction
5. Endothermic reaction
6. For the reaction to start, a tiny amount of activation energy is needed. Once a few molecules react, the rest will quickly follow because the first few reactions provide activation energy for more molecules to react.
7. The energy of the products is greater than the energy of the reactants.
8. Endothermic
9. The peak of the curve
10. Temperature, surface area, catalysts, inhibitors, concentration
11. More surface is available for collisions to occur and therefore for reactions to occur.
12. Temperature is the average thermal energy of a sample, and this is related to the kinetic energy of the particles. Particles at higher temperature, and therefore higher energy, will move more vigorously/rapidly/energetically and therefore more collisions may occur, and of those that occur, more may be successful collisions that bring about a reaction.
13. A and C would increase the reaction rate.
14. concentration
15. Higher concentration results in more particles/molecules per unit volume than lower concentration. Essentially, the particles are more "crowded" and there will therefore be more collisions and more reactions.
16. True
17. A catalyst lowers the activation energy for a reaction and therefore increases the reaction rate.
18. False
19.Enzyme
20. Biological catalysts increase the rates of reactions in cells, and each has a specific substrate (substance that it acts on).