WKS
Collision Theory

Name ________________________________
Period ______

Section 17.1 A Model for Reaction Rates

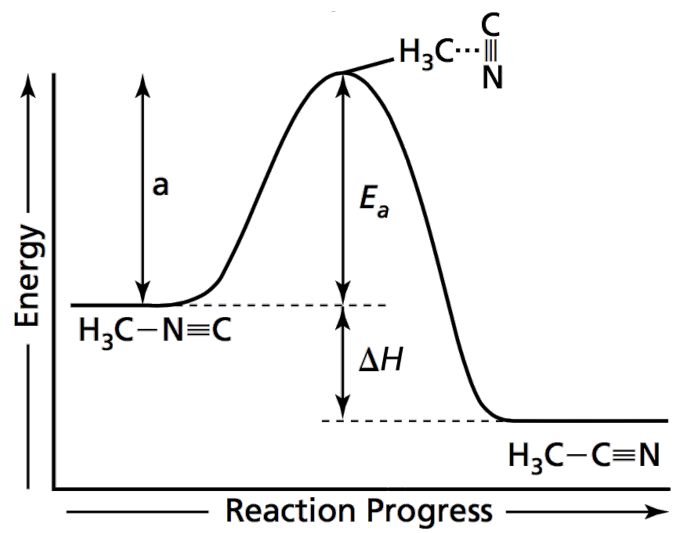
In your textbook, read about expressing reaction rates and explaining reactions and their rates.

Use each of the terms below just once to complete the passage.

activation energy	reaction rate	M/s
collision theory	activated complex	transition state

According to (1) ____________________, atoms, ions, and molecules must collide in order to react. Once formed, the (2) ____________________ is a temporary, unstable arrangement of atoms that may then form products or may break apart to reform the reactants. This physical arrangement is known as the (3) ____________________. Every chemical reaction requires energy, and the minimum amount of energy that reacting particles must have to form the activated complex is the (4) ____________________. In a chemical reaction, the (5) ____________________ is the change in concentration of a reactant or product per unit time. It may be expressed using the units of (6) ____________________.

Use the energy diagram at right for the rearrangement reaction of methyl isonitrile (CH_3NC) to acetonitrile (CH_3CN) to answer the following questions:



7. What kind of reaction is represented by this diagram: endothermic or exothermic?
8. What is the chemical structure at the top of the curve on the diagram called?

9. What does the symbol E_a represent?

10. What does the symbol ΔH represent?

11. What does the reaction rate indicate about a particular chemical reaction?

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

13. How is the speed of a chemical reaction related to the spontaneity of the reaction?

14. Interpreting Scientific Illustrations Based on your analysis of Figures 17-4 and 17-5 (below), how does E_a for the reaction $CO + NO_2 \leftarrow CO_2 + NO$ (the reverse reaction, at right) compare with that of the reaction $CO + NO_2 \rightarrow CO_2 + NO$ (the forward reaction at left)?

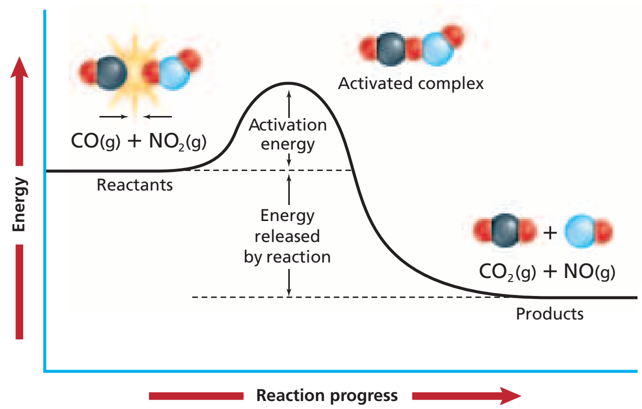


Figure 17-4 In an exothermic reaction, molecules collide with enough energy to overcome the activation energy barrier, form an activated complex, then release energy and form products at a lower energy level.

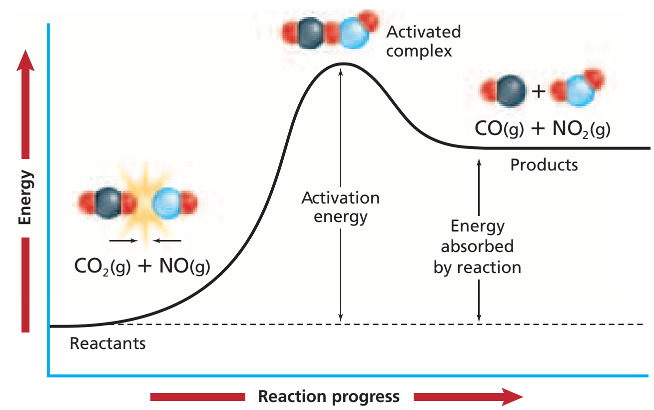


Figure 17-5 In the reverse endothermic reaction, the reactant molecules lying at a low energy level must absorb energy to overcome the activation energy barrier and form high-energy products.