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# 18.1 RATES OF REACTION

## Section Review

### Objectives

- Describe how to express the rate of a chemical reaction
- Identify four factors that influence the rate of a chemical reaction

### Vocabulary

- rate
- collision theory
- activation energy
- activated complex
- transition state
- inhibitor

### Part A Completion

*Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.*

__1__ measure the speed of any change that occurs within a time interval. Collision theory states that particles __2__ when they collide, provided that they have enough __3__.

The rate at which a chemical reaction occurs is determined by an __4__ energy barrier. The activation energy is the __5__ energy that reactants must have to be converted to __6__. The higher the activation energy barrier, the __7__ the reaction. Chemists help reactants overcome the activation barrier in a number of ways. Two effective methods are to increase the __8__ at which the reaction is done or use a __9__. Rates of reaction can also be increased by __10__ the concentration of reactants.

1. Rates
2. react
3. kinetic energy
4. activation
5. minimum
6. products
7. slower
8. temperature
9. catalyst
10. increasing

### Part B True-False

*Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.*

ST **11.** An increase in temperature will increase the rate of a reaction.

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NT **12.** A catalyst is considered as a reactant in a chemical reaction.

AT **13.** The speed of a reaction can be increased by increasing reactant concentration or decreasing particle size.

AT **14.** An enzyme is a biological catalyst.

## Part C Matching

*Match each description in Column B to the correct term in Column A.*

| Column A | Column B |
|---|---|
| b **15.** rate | **a.** synonym for an activated complex |
| d **16.** collision theory | **b.** speed of a change that occurs over time |
| f **17.** activation energy | **c.** substance that interferes with the action of a catalyst |
| e a **18.** transition state | **d.** Particles can react to form products when they collide, provided they have enough kinetic energy. |
| a e **19.** activated complex | **e.** an unstable arrangement of atoms that forms momentarily at the peak of the activation energy barrier |
| c **20.** inhibitor | **f.** minimum energy that particles must have in order to react |

## Part D Questions and Problems

*Answer the following question and solve the following problem in the space provided.*

**21.** An ice machine can produce 120 kg of ice in 24 hours. Express the rate of ice production in kg/h.

$$\frac{120\ \text{kg}}{24\ \text{h}} = 5.0\ \text{kg/h}$$

**22.** Which of the following will increase the rate of a reaction?

**a.** increase particle size

(**b.**) increase temperature

**c.** decrease concentration

(**d.**) add a catalyst