Section 17.4 Instantaneous Reaction Rates and Reaction Mechanisms

In your textbook, read about instantaneous reaction rates.

Circle the letter of the choice that best completes the statement.

1. _____ is determined by finding the slope of the straight line tangent to the curve of a plot of the change in concentration of a reactant versus time.

a. Instantaneous rate
b. Change in temperature
c. Reaction mechanism
d. Reaction order

2. A(n) _____ consists of two or more elementary steps.

a. complex reaction
b. elementary step
c. reaction mechanism
d. reaction order

3. A(n)_____ is a substance produced in an elementary step and consumed in another elementary step.

a. instantaneous rate
b. intermediate
c. reaction mechanism
d. rate-determining step

4. A(n) _____ is the complete sequence of elementary reactions that make up a complex reaction.

a. instantaneous rate
b. elementary step
c. reaction mechanism
d. reaction order

5. The _____ is the slowest of the elementary steps in a complex reaction.

a. instantaneous rate
b. intermediate
c. rate-determining step
d. reaction order

6. The _____ can be used to determine the instantaneous rate for a chemical reaction.

a. rate-determining step
b. intermediates
c. products
d. rate law

7. An element or compound that reacts in one step of a complex reaction and reforms in a another step of the complex reaction is

a. an intermediate.
b. a catalyst.
c. not part of the reaction mechanism.
d. shown in the net chemical equation for the reaction.

Section 17.4 *continued*

In the space at the left, write *true* if the statement is true; if the statement is false, change the italicized word or phrase to make it true.

_____ **8.** To determine the *instantaneous rate*, you must know the specific rate constant, the concentrations of the reactants, and the reaction orders for the reaction.

_____ **9.** A reaction rate that is defined as k[A][B] and that has a specific rate constant of 1.0×10^1 L/(mol·s), [A] = 0.1*M*, and [B] = 0.1*M* would have an instantaneous rate of *0.01 mol/(L·s).*

In your textbook, read about reaction mechanisms.

Answer the following questions about the proposed reaction mechanism for the complex reaction below.

$$2NO(g) + 2H_2(g) \longrightarrow N_2(g) + 2H_2O(g)$$

Proposed Mechanism

$$2NO \longrightarrow N_2O_2 \quad \text{(fast)}$$

$$N_2O_2 + H_2 \longrightarrow N_2O + H_2O \quad \text{(slow)}$$

$$N_2O + H_2 \longrightarrow N_2 + H_2O \quad \text{(fast)}$$

10. How many elementary steps make up the complex reaction?

_____

11. What is the rate-determining step for this reaction?

_____

12. What are N_2O_2 and N_2O in the reaction?

_____

13. Is there a catalyst involved in the reaction? Explain your answer.

_____

_____

14. What can you conclude about the activation energy for the rate-determining step?

_____

15. If you wanted to increase the rate of the overall reaction, what would you do?

_____