Name _____ Date _____ Class _____

CHAPTER 17 STUDY GUIDE FOR CONTENT MASTERY

Section 17.2 Factors Affecting Reaction Rates

In your textbook, read about the factors that affect reaction rates (reactivity, concentration, surface, area, temperature, and catalysts).

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

Increasing 1. *Decreasing* the concentration of reactants increases the collision frequency between reacting particles.

true 2. A *heterogeneous* catalyst exists in a different physical state than the reaction it catalyzes.

temperature 3. Increasing the *concentration* of a substance increases the kinetic energy of the particles that make up the substance.

lowering 4. Catalysts increase the rates of chemical reactions by *raising* the activation energy of the reactions.

true 5. *Increasing* the surface area of a reactant increases the rate of the reaction.

true 6. Raising the temperature of a reaction increases the rate of the reaction by increasing the *energy* of the collisions between reacting particles.

Answer the following questions.

7. A chemist heated a sample of steel wool in a burner flame exposed to oxygen in the air. He also heated a sample of steel wool in a container of nearly 100% oxygen. The steel-wool sample in the container reacted faster than the other sample. Explain why.
There was a greater concentration of oxygen in the container. Increasing the concentration of a reactant increases the rate of a reaction.

8. Would the chemist have observed the same results if he used a block of steel instead of steel wool? Explain your answer.
No; a block of steel would react more slowly because it has less surface area.

9. How would the reaction have differed if the steel wool was not heated?
Not heating the steel wool would decrease the rate of the reaction.

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CHAPTER 17 STUDY GUIDE FOR CONTENT MASTERY

Section 17.3 Reaction Rate Laws

In your textbook, read about reaction rate laws and determining reaction order.

Use each of the terms below to complete the statements.

chemical reaction	rate law	specific rate constant
reaction orders	concentration	time

Equation 1 $aA + bB \rightarrow cC + dD$

Equation 2 $-\frac{\Delta[A]}{\Delta t} = k[A]^m[B]^n$

1. Equation 1 describes a chemical reaction.
2. Equation 2 expresses the mathematical relationship between the rate of a chemical reaction and the concentrations of the reactants. This is known as the rate law.
3. The variable k in equation 2 is the specific rate constant, a numerical value that relates the reaction rate and the concentration at a given temperature.
4. The variables m and n are the reaction orders. These define how the rate is affected by the concentrations of the reactants.
5. The square brackets [ ] represent concentration.
6. The variable t represents time.

Answer the questions about the following rate law.

$$\text{Rate} = k[A]^1[B]^2$$

7. What is the reaction order with respect to A? the exponent to A, first order
8. What is the reaction order with respect to B? the exponent to B, second order
9. What is the overall reaction order for the rate law? the sum of 1 and 2, or third order
10. Doubling the concentration of A will cause the rate to double. What would happen if you doubled the concentration of B?
The rate would quadruple. The square of 2 is 4.
11. A reaction rate can be expressed as Rate = $k[A]^2$. What is the reaction order for this reaction?
This is a second-order reaction.