**Reaction Rates and Equilibrium**

**Directions:** Answer the following questions using complete sentences.

1. What is a catalyst?

2. What is an inhibitor?

3. What is the reaction rate for a chemical reaction?

4. What does Le Chatelier's principle state?

**Directions:** Decide if each reaction below involves a catalyst, an inhibitor, or neither. Write C for catalyst, I for inhibitor, or N for neither in the blank at the left.

5. Brushing the cut edges of fruits with lemon juice can prevent the darkening effect that contact with air can cause.
   
6. In the human body, proteins called enzymes help to speed up chemical processes. The proteins are not changed during these chemical processes.
   
7. Aluminum oxide, which forms on exposed aluminum, protects the aluminum from further reaction with the air.
   
8. Food preservatives called BHT and BHA slow down the spoilage of certain foods.
   
9. Nickel is used to increase the rate of methane formation from the addition of hydrogen and carbon monoxide. Nickel does not permanently change.

**Directions:** Complete each statement.

10. A reaction that can occur in both the forward and the reverse direction is called a(n) ____________.

11. ____________ is a state in which the forward and reverse reactions balance each other because they take place at equal rates.

12. At equilibrium, the concentrations of reactants and products are ____________, but that does not mean that the amounts or concentrations are ____________.
Section 3 - Chemical Reactions and Energy
Section 4 - Reaction Rates and Equilibrium

Directions: Read the following passage. Then answer the questions on the lines provided.

Carlos was camping and getting cold as the sun went down. He wanted to light a fire for warmth and light. However, he discovered that the nearby wood was wet, and would not light. He had to look under some leaves and debris to find dry wood. He piled the wood and surrounded it with a circle of stones to keep the fire contained. Then he put some dry leaves around the logs to help the fire get started. He lit the leaves. Soon the leaves had burned away, his fire was burning nicely, and Carlos was getting warmer.

1. Is the chemical reaction produced by Carlos's fire exergonic or endergonic? How do you know?

2. Is the reaction in Carlos's fire endothermic or exothermic? Explain.

3. Do you think the leaves were a catalyst for the fire? Why or why not?

Directions: Match the terms in Column II with the descriptions in Column I. Write the letter of the correct term in the blank at the left.

Column I

4. Substance that speeds up a chemical reaction without being a part of it
5. States that atoms, ions, and molecules must collide to react
6. Forward and reverse reactions proceed at equal rates
7. Food preservative is an example
8. Stress applied to the products shifts the reaction to the left
9. The rate at which reactants change into products

Column II

a. Le Chatelier's principle
b. equilibrium
c. catalyst
d. reaction rate
e. collision model
f. inhibitor
Chemical Reactions

Part A. Vocabulary Review
Directions: Complete the following sentences using the terms listed below.

- synthesis
- exothermic
- catalyst
- decomposition
- coefficients
- endothermic
- single-displacement
- inhibitor
- reactants
- precipitate
- chemical
- double-displacement
- products
- balanced

1. A change in which one or more substances are converted into a new substance is called a(n) ________ reaction.

2. If a precipitate, water, or a gas forms when two ionic compounds in solution are combined, the reaction is a(n) ________ reaction.

3. A substance that prevents certain chemical reactions is a(n) ________.

4. When two or more substances combine in a chemical reaction to form another substance, a(n) ________ reaction has taken place.

5. The breakdown of a substance into two or more simpler substances is a(n) ________ reaction.

6. In a chemical equation, the substances that react are called ________.

7. A substance that speeds up a chemical reaction without itself being permanently changed is a(n) ________.

8. A reaction that requires energy in the form of heat is a(n) ________ reaction.

9. When one element replaces another in a compound, a(n) ________ reaction has occurred.

10. If the energy released in a chemical reaction is primarily in the form of heat, that reaction is a(n) ________ reaction.

11. Numbers in front of the symbols and formulas in an equation are called ________.

12. If the number of atoms of each element on the left side of an equation is equal to the number of atoms of each element on the right side of the equation, the equation is ________.

13. In a chemical equation, the substances that are produced are called ________.

14. An insoluble solid that forms when two ionic compounds in solution are combined is a(n) ________.
Chemical Reactions

1. Testing Concepts

Directions: For each of the following, write the letter of the term or phrase that best completes the sentence or answers the question.

1. Substances that prevent certain chemical reactions are called ______.
   a. endothermics  
   b. catalysts  
   c. inhibitors  
   d. products.

2. When one element replaces another element in a compound, the reaction is a ______ reaction.
   a. synthesis  
   b. single-displacement  
   c. decomposition  
   d. double-displacement

3. Each substance to the right of the arrow in a chemical equation is a ______
   a. catalyst  
   b. precipitate  
   c. reactant  
   d. product.

4. A chemical reaction in which the energy released is primarily in the form of heat is ______
   a. flammable  
   b. exothermic  
   c. endothermic  
   d. endergonic.

5. A substance that speeds up a chemical reaction without undergoing a permanent change itself is a(n) ______
   a. inhibitor  
   b. coefficient  
   c. reactant  
   d. catalyst.

6. Numbers that precede symbols and formulas in a chemical equation are called ______
   a. subscripts  
   b. superscripts  
   c. fractions  
   d. coefficients.

7. A chemical reaction in which two or more substances combine to form another substance is a ______ reaction.
   a. synthesis  
   b. decomposition  
   c. reactant  
   d. product

8. The breaking down of a substance into two or more substances is ______
   a. displacement  
   b. synthesis  
   c. decomposition  
   d. endothermic.

9. Each substance on the left side of the arrow in a chemical equation is a ______
   a. reactant  
   b. product  
   c. coefficient  
   d. catalyst.

10. If energy in the form of heat is required for a chemical reaction to take place, the reaction is ______
    a. exothermic  
    b. reactant  
    c. balanced  
    d. endothermic.

11. In a chemical equation, the symbol that means "dissolved in water" is ______
    a. (s)  
    b. (l)  
    c. (aq)  
    d. (g).

12. An example of a balanced chemical equation is ______
    a. AgNO₃ + NaCl → AgCl + 2NaNO₃  
    b. 2AgNO₃ + 2NaCl → 3AgCl + 2NaNO₃  
    c. AgNO₃ + NaCl → AgCl + NaNO₃  
    d. AgNO₃ + 2NaCl → AgCl + AgCl + 3NaNO₃.