Chemical Reactions and Energy

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

1. What is an exothermic reaction?

2. What is an endothermic reaction?

3. What is an exergonic reaction?

4. What is an endergonic reaction?

**Directions:** Decide if each reaction below is endergonic or exergonic. In the blank at the left, write EN for endergonic or EX for exergonic.

5. When a lit match is placed in alcohol, the alcohol ignites producing heat and light.
   
   6. Energy in the form of electricity can be added to water to break apart the water molecules into hydrogen gas and oxygen gas.

7. A piece of coal placed in a furnace gives off heat and light before turning to ash.

8. When ammonium chloride mixes with water, the solution formed feels cold.
Overview
Chemical Reactions

Directions: Complete the concept map using the terms in the list below.

- two or more substances
- decomposition
- single displacement
- element
- compounds
- combine

Types of chemical reactions include:

1. synthesis
   - in which substances
   - to form a new substance

2. double displacement
   - in which two substances
   - to form positive ions
   - replace each other to form two new compounds

3. in which substances
   - to form a new substance

4. in which one substance
   - replaces another in a compound

5. break apart
   - to form

Directions: Write the letter of the term or phrase that best completes the sentence.

7. Which of the following does not speed up the rate of a chemical reaction?
   a. higher temperature  
   b. more surface area  
   c. lower air pressure  
   d. catalyst

8. In the equation \( \text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons \text{H}_2\text{O}(\text{l}) \), the symbol \( \rightleftharpoons \) represents:
   a. equilibrium  
   b. precipitation  
   c. Le Chatelier  
   d. displacement
Chemical Reactions

1. Testing Concepts

Directions: In the blank at the left, write the letter of the term that best completes each statement.

1. A(n) _____ reaction is a change in which one or more substances are converted into new substances.
   a. chemical  b. physical  c. state  d. electrical

2. The substances that react are called _____.
   a. nuclear reactors  b. elements  c. compounds  d. reactants

3. The new substances produced in a reaction are called _____.
   a. elements  b. compounds  c. products  d. reactants

4. _____ established that the total mass of the products is always equal to the total mass of the reactants.

5. Numbers to the left of formulas for reactants are called _____.
   a. superscripts  b. coefficients  c. elements  d. formulas

6. A(n) _____ chemical equation has the same number of atoms of each element on both sides.
   a. false  b. balanced  c. imbalanced  d. physical

Directions: Identify each statement as true or false. If the statement is false, change the underlined word(s) to make it true.

7. A combustion reaction occurs when a substance reacts with carbon to produce energy.

8. A synthesis reaction occurs when one substance breaks down into two or more substances.

9. In a decomposition reaction, two or more substances combine to form another substance.

10. When one element replaces another in a compound, it is called a double-displacement reaction.

11. In a single-displacement reaction, the positive ion of one compound replaces the positive ion of the other to form two new compounds.
Skill: Hypothesizing

Directions: Answer the following questions in the lines provided.

3. When heated, mercury (II) oxide produces oxygen plus mercury. What would be the combined mass of oxygen and mercury if 20 g of mercury (II) oxide were heated?

4. How much oxygen would be produced by heating 20 g of mercury (II) oxide if 18.6 g of mercury is produced?

Skill: Concept Mapping

Complete the concept map using the terms endergonic and exergonic.

III: Applying Concepts

Directions: Study the following diagram. Then identify each model of a chemical reaction by filling in each blank below.

1. 
2. 
3. 
4. 

1. \( \text{-} + \text{-} \rightarrow \text{-} + \text{-} \)
2. \( \text{-} + \text{-} \rightarrow \text{-} + \text{-} \)
3. \( \text{-} \rightarrow \text{-} + \text{-} \)
4. \( \text{-} + \text{-} \rightarrow \text{-} + \text{-} \)