Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. The only sure evidence for a chemical reaction is
   a. the formation of a gas.
   b. changes in properties.
   c. the production of one or more new substances.

2. When a chemical reaction takes place in an open system,
   a. matter cannot move at all.
   b. matter can enter from or escape to the surroundings.
   c. matter is not allowed to enter from or escape to the surroundings.

3. Which of the following is a balanced chemical equation?
   a. \(2 \text{Fe}_2\text{O}_3 + 3 \text{C} \rightarrow 4 \text{Fe} + 3 \text{CO}_2\)
   b. \(\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2\)
   c. \(\text{SO}_2 + \text{O}_2 + 2 \text{H}_2\text{O} \rightarrow 4 \text{H}_2\text{SO}_4\)

4. What type of reaction is \(\text{FeS} + 2 \text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2\text{S}\)?
   a. a single replacement reaction
   b. a double replacement reaction
   c. a synthesis reaction

5. What is the best form of fire safety?
   a. fire prevention
   b. the fire department
   c. an extinguisher

6. Anything that has mass and takes up space is considered
   a. energy.
   b. chemistry.
   c. matter.

7. The best way to put out a small kitchen fire is to
   a. blow it out.
   b. turn off the appliances.
   c. cover it or use a home fire extinguisher.

8. A chemical reaction that absorbs energy in the form of heat is described as
   a. combustion.
   b. unbalanced.
   c. endothermic.
9. A chemical equation that shows the same number of each kind of atom on both sides of the equation is said to be
   a. an incomplete reaction.
   b. unbalanced.
   c. balanced.

10. Chemicals that act as biological catalysts by speeding up reactions in living things are
    a. reactants.
    b. fuels.
    c. enzymes.

11. Which is the correct chemical equation for the following statement? Sodium reacts with oxygen in a 2 to 1 ratio to produce sodium oxide.
    a. $2 \text{Na} + \text{O}_2 \rightarrow \text{Na}_2\text{O}$
    b. $\text{Na}_2\text{O} \rightarrow 2 \text{Na} + \text{O}_2$
    c. $\text{Na}_2 + \text{O}_2 \rightarrow 2 \text{NaO}$

12. In what way can a fire be brought under control?
    a. Add fuel.
    b. Add oxygen.
    c. Remove oxygen.

13. The minimum amount of energy that has to be added to start a reaction is the
    a. exothermic energy.
    b. activation energy.
    c. endothermic energy.

14. The number placed below an element’s symbol in a chemical formula is called a
    a. reactant.
    b. subscript.
    c. coefficient.

15. Every chemical reaction involves a change in
    a. state.
    b. energy.
    c. mass.

16. A shorter, easier way to show chemical reactions, using symbols instead of words, is called a
    a. subscript.
    b. symbol.
    c. chemical equation.
17. Which of the following does NOT increase the number of particles of a substance available to react in a chemical reaction?
   a. increasing the concentration
   b. increasing the mass
   c. adding a catalyst

18. In chemical reactions, what does the principle of conservation of mass mean?
   a. Matter is not created or destroyed.
   b. The total mass of the reactants is less than the total mass of the products.
   c. The total mass of the reactants is greater than the total mass of the products.

19. In a chemical equation, numbers often appear in front of a chemical formula. These numbers tell you the
   a. number of elements in the reaction.
   b. number of molecules or atoms of each substance in the reaction.
   c. number of molecules in each atom in the reaction.

20. What happens when chemical bonds break and new bonds form?
   a. surface area increases
   b. a chemical reaction
   c. a physical change

21. A rapid reaction between oxygen and a fuel is known as
   a. activation.
   b. heat.
   c. combustion.

22. Which two processes could be considered opposites?
   a. a synthesis reaction and a decomposition reaction
   b. a precipitate reaction and a synthesis reaction
   c. a decomposition reaction and a single replacement reaction

23. CaCO₃ represents a chemical
   a. formula.
   b. reaction.
   c. symbol.

24. The principle of conservation of mass is true
   a. only for reactions that take place in open systems.
   b. for reactions in both open and closed systems.
   c. for no reactions at all.
25. A material used to decrease the rate of a chemical reaction is a(n)
   a. catalyst.
   b. fuel.
   c. inhibitor.

26. The substances listed on the left side of a chemical equation are the
   a. products.
   b. coefficients.
   c. reactants.

27. Chemistry is
   a. the study of matter and how matter changes.
   b. anything that has mass and takes up space.
   c. a characteristic of a substance that can be observed without changing the substance into
      another substance.

28. Which of the following is an example of how to supply activation energy to begin a reaction?
   a. Heat the reaction flask on a hot plate.
   b. Add a catalyst.
   c. Cool the reaction flask in an ice bath.

Completion
Balance each equation by adding coefficients where needed. YOU MUST SHOW THE NUMBER OF
EACH ELEMENT ON BOTH SIDES OF THE EQUATION.

29. ______ Mg + ______ O₂ ™ ______ MgO

   Mg - ______
   O - ______

30. ______ N₂ + ______ H₂ ™ ______ NH₃

   N - ______
   H - ______

31. ______ H₂ + ______ Cl₂ ™ ______ HCl

   H - ______
   Cl - ______
Modified True/False

Indicate whether the statement is true or false. If false, change the identified word or phrase to make the statement true.

**Word Bank:**

<table>
<thead>
<tr>
<th>True</th>
<th>True</th>
<th>oxygen</th>
<th>endothermic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. The rate of a chemical reaction is ____________ of temperature.

2. Synthesis is the process of making a more complex compound from simpler substances.

3. The home fires that cause the most deaths start from carelessness with cigarettes.

4. Chemical reactions that absorb energy are said to be ________________.

5. A gas necessary for combustion to take place is carbon dioxide.

6. The materials present at the beginning of a chemical reaction are called the products.

7. The amount of matter in a chemical reaction changes.

8. In a chemical reaction, chemical bonds are formed or broken.

9. A change that produces a new substance is a chemical change.

10. A chemical reaction may be detected by observing changes in the properties of matter.
42. When the candle was lit, a pool of liquid wax formed in the area around the wick, and then spilled over the side and resolidified. Does this observation refer to a physical change or a chemical change? Explain.

43. Is the reaction that occurs in the diagram endothermic or exothermic? Explain.

44. If the candle is covered by a large glass beaker, the flame will go out. How does the beaker affect the conditions described by the fire triangle?
45. If the products formed from the burning candle are mostly carbon (C), carbon dioxide (CO₂), and water (H₂O), what elements were in the reactants? How do you know?

46. Is a burning candle an example of an open system or a closed system? Explain.

47. The flame from the candle gives off black smoke. Does this statement describe evidence for a physical change or a chemical change? Explain.