1. Which of the following is an example of a **synthesis reaction**?
   a) $H_2O \rightarrow H_2 + O_2$
   b) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
   c) $2Mg + O_2 \rightarrow 2MgO$
   d) $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O$

2. In a **decomposition reaction**, what happens to the reactants?
   a) They combine to form a single product
   b) A substance breaks down into simpler substances
   c) Two compounds exchange elements
   d) A hydrocarbon burns in oxygen

3. What type of reaction is represented by the equation below?
   $2HCl + Zn \rightarrow ZnCl_2 + H_2$
   a) Synthesis
   b) Decomposition
   c) Single displacement
   d) Double displacement

4. Which of the following is an example of a **double displacement reaction**?
   a) $H_2 + O_2 \rightarrow H_2O$
   b) $Pb(NO_3)_2 + KI \rightarrow PbI_2 + KNO_3$
   c) $Mg + HCl \rightarrow MgCl_2 + H_2$
   d) $CH_4 + O_2 \rightarrow CO_2 + H_2O$

5. In a combustion reaction, a hydrocarbon reacts with:
   a) Carbon dioxide
   b) Oxygen
   c) Hydrogen
   d) Nitrogen

6. Which of the following **balanced** chemical equations represents a combustion reaction?
   a) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
   b) $NaOH + HCl \rightarrow NaCl + H_2O$
   c) $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
   d) $CaCO_3 \rightarrow CaO + CO_2$

7. What is the **law of conservation of mass**?
   a) Energy cannot be created or destroyed
   b) The total number of atoms before and after a reaction must be the same

c) Mass can change during a chemical reaction
d) New atoms are created during chemical reactions

8. What type of reaction occurs when a metal reacts with an acid to produce a salt and hydrogen gas?
   a) Synthesis
   b) Decomposition
   c) Single displacement
   d) Double displacement

9. Which of the following is a **correctly balanced** equation?
   a) $Na + O_2 \rightarrow Na_2O$
   b) $N_2 + H_2 \rightarrow NH_3$
   c) $2H_2 + O_2 \rightarrow 2H_2O$
   d) $Mg + Cl_2 \rightarrow Mg_2Cl$

10. In a **neutralization reaction**, what are the two main products?
    a) Acid and base
    b) Salt and water
    c) Carbon dioxide and oxygen
    d) Metal and gas

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11. **Balance the following equation:**
    ___ Na + ___ $O_2 \rightarrow$ ___ Na_2O

12. **Identify the reaction type:**
    $CaCO_3 \rightarrow CaO + CO_2$

13. **Write the products** for the combustion of **C_6H_{12}** (hexane) in oxygen.

14. **Balance and classify the reaction:**
    $Al + Cl_2 \rightarrow AlCl_3$

15. **Explain why mass is conserved** in a chemical reaction.

16. **Predict the products** of the reaction:
    $Fe + CuSO_4 \rightarrow$?

17. **Write the balanced equation** for the reaction between sulfuric acid (H_2SO_4) and sodium hydroxide (NaOH).

18. **What type of reaction occurs** when silver nitrate ($AgNO_3$) reacts with sodium chloride (NaCl)? Write the balanced equation.
19. **Balance the equation and identify the reaction type:**
    $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$
20. **Explain the difference** between a single displacement and a double displacement reaction. Give an example for each.

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21. **A student writes the following unbalanced equation:**
    $Al + O_2 \rightarrow Al_2O_3$
    Balance the equation and determine the type of reaction.
22. **Identify the errors in the following equation and correct them:**
    $Mg + HCl \rightarrow MgCl + H_2$
23. **Write the balanced chemical equation** for the decomposition of hydrogen peroxide (H_2O_2) into oxygen and water.
24. **Explain why combustion reactions always require oxygen.**
25. **A chemical reaction occurs when a strip of zinc is placed in hydrochloric acid.**

- What type of reaction is this?
- Write the balanced equation.

26. **Determine the missing reactant** in the combustion reaction:
    $C_4H_{10} + \_\_\_ O_2 \rightarrow CO_2 + H_2O$
27. **Write a real-life example** of a single displacement reaction and explain its importance.
28. **Explain why some elements can replace others** in a single displacement reaction. Refer to the **reactivity series** in your answer.
29. **A scientist observes a reaction where a white solid forms after mixing two clear solutions.**

- What type of reaction is this?
- What is the solid formed called?

30. **A propane gas burner is used in a lab.**

- Write the balanced equation for the complete combustion of propane (C_3H_8).

- What are the dangers of an **incomplete combustion** reaction?