1. Which of the following symbols is used to designate that heat was added to catalyze the reaction.
   a) (s)  b) (aq)  c) \(\Delta\)  d) \\
2. Which of the following symbols is used to designate that a precipitate was produced in the reaction?
   a) (aq)  b) \(\Delta\)  c) (\(\ell\))  d) \\
3. Which of the following symbols is used to designate that a compound is dissolved in water?
   a) \(\Delta\)  b) (\(\ell\))  c) (aq)  d) \\
4. Which of the following symbols is used to designate that a gas was produced in the reaction?
   a) (s)  b) (aq)  c) \(\Delta\)  d) \\
5. KCl is ________ in water.
   a) soluble  b) insoluble
6. AgCl is ________ in water.
   a) soluble  b) insoluble
7. Cu(NO\(\text{3}\))\(_{2}\) is ________ in water.
   a) soluble  b) insoluble
8. Li will replace Ag in a single replacement reaction.
   a) TRUE  b) FALSE
9. Barium will replace Calcium in a single replacement reaction.
   a) TRUE  b) FALSE
10. In an exothermic reaction:
    a) energy is released  b) energy is absorbed.
11. How many CO\(_{2}\) molecules are contained in 5.0 g of carbon dioxide, CO\(_{2}\)?
    a) \(6.84 \times 10^{22}\)  b) \(3.01 \times 10^{24}\)
    c) \(5.30 \times 10^{23}\)  d) \(6.02 \times 10^{23}\)

\[
5.0 \text{ g CO}_2 \times \frac{1 \text{ mol}}{44.0 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ mol}^{-1}}{\text{mol}}
\]
Types of Chemical Reactions

12. Identify the type of reaction shown below:
   \[ \text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} \]
   a) single replacement  b) double replacement  c) combination (synthesis)  d) decomposition  e) combustion

13. Identify the type of reaction shown below:
   \[ 2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2 \]
   a) single replacement  b) double replacement  c) combination (synthesis)  d) decomposition  e) combustion

14. Identify the type of reaction shown below:
   \[ 2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 4\text{CO}_2 + 6\text{H}_2\text{O} \]
   a) single replacement  b) double replacement  c) combination (synthesis)  d) decomposition  e) combustion

15. Identify the type of reaction shown below:
   \[ 2\text{Al} + 6\text{HNO}_3(\text{aq}) \rightarrow 2\text{Al(NO}_3)_3 + 3\text{H}_2(\text{g}) \]
   a) single replacement  b) double replacement  c) combination (synthesis)  d) decomposition  e) combustion

16. Identify the type of reaction shown below:
   \[ 2\text{NaBr(}\text{aq}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{NaCl(}\text{aq}) + \text{Br}_2(\text{g}) \]
   a) single replacement  b) double replacement  c) combination (synthesis)  d) decomposition  e) combustion

17. Identify the type of reaction shown below:
   \[ 4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3 \]
   a) single replacement  b) double replacement  c) combination (synthesis)  d) decomposition  e) combustion

18. What type of reaction is shown?
   \[ \text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2 + \text{heat} \]
   a) exothermic  b) endothermic
19. Balance the following reaction:

\[ 2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO} \]

20. Balance the following reaction:

\[ \text{Mg(NO}_3\text{)}_2 + 2\text{KOH} \rightarrow \text{Mg(OH)}_2 + 2 \text{KNO}_3 \]

21. Write a complete balanced chemical equation for the following reaction:

Zinc reacts with hydrochloric acid.

\[ \text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2 \]

22. Write a complete balanced chemical equation for the following reaction:

Aluminum reacts with copper(II) sulfate.

\[ 2\text{Al} + 3\text{CuSO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + 3\text{Cu} \]

22. Given the reactant amounts specified in the chemical reaction below, determine the limiting reagent.

\[ 2\text{Fe(OH)}_3 + 3\text{H}_2\text{SO}_4 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + 6\text{H}_2\text{O} \]

The limiting reagent is \( \text{H}_2\text{SO}_4 \).

23. Determine the molar mass (molecular weight) of Barium Phosphate, \( \text{Ba}_3(\text{PO}_4)_2 \).

\[ \text{Ba} \quad 137.327 \times 3 = 411.981 \]
\[ \text{P} \quad 30.9738 \times 2 = 61.9476 \]
\[ \text{0} \quad 16.0 \times 8 = 128 \]

24. When 14.421 grams of Potassium bromide (KBr) is dissolved in 1.000 L of water, how many moles of ions are released into the solution?

\[ \text{KBr} \rightarrow \text{K}^+ + \text{Br}^- \]

\[ 14.421 \text{g} \text{KBr} \times \left( \frac{1 \text{mol}}{119.00 \text{g}} \right) \times \frac{2 \text{ions}}{1 \text{KBr}} = 0.242 \text{ mol ions} \]
25. How many moles of O₂ will be produced if 2 moles of CO₂ react with 3.5 moles KO₂ according to the balanced equation below?

\[ 4 \text{KO}_2 + 2 \text{H}_2\text{O} + 4 \text{CO}_2 \rightarrow 4 \text{KHCO}_3 + 3 \text{O}_2 \]

\[ \frac{3.5}{2} \text{ mol CO}_2 \times \frac{3 \text{ mol O}_2}{4 \text{ mol CO}_2} = 1.5 \text{ mol O}_2 \text{ produced} \]

26. Kacie and Josh obtained an actual yield of silver chloride that weighed 0.345 g. According to their calculations, they should have theoretically obtained 0.527 g. What was their percent yield?

\[ \frac{0.345}{0.527} \times 100 = 65.5\% \]

26. Shalyn weighed out 19.285 grams of NaCl and dissolved it in water. Kimberly weighed out 13.254 grams of AgNO₃ and dissolved it in water. Ray came by and mixed both solutions together. A beautiful white precipitate was formed. The precipitate was dried and massed. The mass of the precipitate was found to be 2.284 grams. What is the percent yield of the reaction?

\[ \text{NaCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{NaNO}_3 \]

a) The limiting reagent is AgNO₃.

b) The theoretical yield is 11.182 g.

c) The percent yield is 20.43%.

SHOW YOUR WORK HERE!!

\[ \text{NaCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{NaNO}_3 \]

19.285 g NaCl × \( \frac{1 \text{ mol}}{58.44 \text{ g}} \) × \( \frac{1 \text{ mol AgCl}}{1 \text{ mol NaCl}} \) × \( \frac{143.32 \text{ g AgCl}}{1 \text{ mol AgCl}} \) = 47.295 g

13.254 g AgNO₃ × \( \frac{1 \text{ mol AgNO}_3}{169.87 \text{ g AgNO}_3} \) × \( \frac{1 \text{ mol AgCl}}{1 \text{ mol AgNO}_3} \) × \( \frac{143.32 \text{ g AgCl}}{1 \text{ mol AgCl}} \) = 11.182 g
1. Which of the following symbols is used to designate that heat was added to catalyze the reaction.
   a) (s)  
   b) (aq)  
   c) Ξ  
   d) ↓  
   e) Δ

2. Which of the following symbols is used to designate that a precipitate was produced in the reaction?
   a) (aq)  
   b) Δ  
   c) (s)  
   d) ↑  
   e) ↓

3. Which of the following symbols is used to designate that a compound is dissolved in water?
   a) Δ  
   b) (s)  
   c) ↓  
   d) ↑  
   e) (aq)

4. Which of the following symbols is used to designate that a gas was produced in the reaction?
   a) (g)  
   b) (aq)  
   c) Δ  
   d) ↓  
   e) ↑

5. KCl is ________________ in water.
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   b) insoluble

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   a) soluble  
   b) insoluble

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   a) TRUE  
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9. Barium will replace Calcium in a single replacement reaction.
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   b) FALSE

10. In an exothermic reaction:
    a) energy is released  
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11. How many CO₂ molecules are contained in 5.0 g of carbon dioxide, CO₂?
    a) 6.84 x 10²²  
    b) 3.01 x 10²⁴  
    c) 5.30 x 10²³  
    d) 6.02 x 10²³
Types of Chemical Reactions

12. Identify the type of reaction shown below:
   \[ \text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{HOH} \]
   a) single replacement
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   \[ 2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2 \]
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   \[ 2\text{Al} + 6\text{HNO}_3(aq) \rightarrow 2\text{Al(NO}_3)_3 + 3\text{H}_2(g) \]
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   b) double replacement
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16. Identify the type of reaction shown below:
   \[ 2\text{NaBr}(aq) + \text{Cl}_2(g) \rightarrow 2\text{NaCl}(aq) + \text{Br}_2(l) \]
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   c) combination (synthesis)
   d) decomposition
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17. Identify the type of reaction shown below:
   \[ 4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3 \]
   a) single replacement
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   a) exothermic
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SHORT ANSWER

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   \[ \text{Mg} + \text{O}_2 \rightarrow \text{MgO} \]

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    Aluminum reacts with copper(II) sulfate.

22. Given the reactant amounts specified in the chemical reaction below, determine the limiting reagent.
    \[ 2\text{Fe(OH)}_3 + 3\text{H}_2\text{SO}_4 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + 6\text{H}_2\text{O} \]
    5.0 mol \hspace{1cm} 6.0 mol
    The limiting reagent is _______________________.

23. Determine the molar mass (molecular weight) of Barium Phosphate, \( \text{Ba}_3(\text{PO}_4)_2 \).
    ________________

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\[ \text{NaCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{NaNO}_3 \]

a) The limiting reagent is ________________.

b) The theoretical yield is ________________.

c) The percent yield is ________________.

SHOW YOUR WORK HERE!!!

\[ \text{NaCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{NaNO}_3 \]