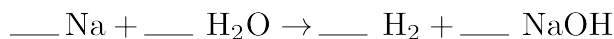
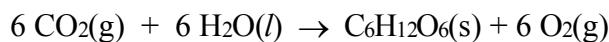


- A compound has the empirical formula  $\text{NO}_2$ . Its molecular formula could be  
A)  $\text{NO}_2$  B)  $\text{N}_4\text{O}_4$  C)  $\text{N}_4\text{O}_2$  D)  $\text{N}_2\text{O}$
- The percentage by mass of Br in the compound  $\text{AlBr}_3$  is closest to  
A) 10.% B) 75% C) 25% **D) 90.%**
- Given the unbalanced equation:



When the equation is correctly balanced using the smallest whole-number coefficients, the coefficient for  $\text{H}_2\text{O}$  is

- A) 1      **B) 2**      C) 3      D) 4
- Given the equation:



What is the minimum number of liters of  $\text{CO}_2(\text{g})$ , measured at STP, needed to produce 32.0 grams of oxygen?

- A) 192 L                      B) 32.0 L  
C) 264 L                      **D) 22.4 L**
- What is the formula mass of  $\text{Al}_2(\text{SO}_4)_3$ ?  
A) **342** B) 123 C) 150 D) 214
  - What is the total mass in grams of 0.75 mole of  $\text{SO}_2$ ?  
A) 16 g B) 24 g C) 32 g **D) 48 g**
  - Given the reaction:



What is the minimum amount of ammonium carbonate that reacts to produce 1.0 mole of ammonia?

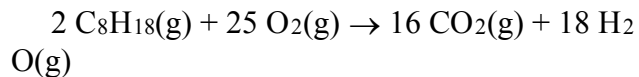
- A) 0.25 mole                      **B) 0.50 mole**  
C) 34 moles                      D) 17 moles
- The percent composition by mass of nitrogen in  $\text{NH}_4\text{OH}$  (gram-formula mass = 35 grams/mole) is equal to  
A)  $\frac{4}{35} \times 100$       **B)  $\frac{14}{35} \times 100$**       C)  $\frac{35}{14} \times 100$       D)  $\frac{35}{4} \times 100$

- What is the molecular mass of a gas whose density is 1.25 grams per liter at STP?  
A) 17.9      **B) 28.0**      C) 20.0      D) 14.0
- A compound was analyzed and found to contain 75% carbon and 25% hydrogen by mass. What is the compound's empirical formula?  
A) CH      B)  $\text{CH}_2$       C)  $\text{CH}_3$       **D)  $\text{CH}_4$**
- Which sample contains the same number of atoms as a gram of He?

- A) **4 g of O**                      B) 9 g of F  
C) 6 g of C                      D) 7 g of Li

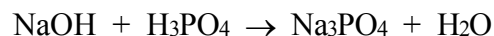
- In a chemical reaction, the difference between the potential energy of the products and the potential energy of the reactants is equal to the  
A) activation energy      **B) heat of reaction**  
C) kinetic energy      D) rate of reaction

- Given the reaction:



What volume of  $\text{C}_8\text{H}_{18}(\text{g})$  will completely react to produce exactly 36 liters of  $\text{H}_2\text{O}(\text{g})$ ?

- A) 27 L      B) 2.0 L      C) 36 L      **D) 4.0 L**
- Given the unbalanced equation:



When the equation is correctly balanced, the coefficient of  $\text{H}_2\text{O}$  will be

- A) 1      B) 2      **C) 3**      D) 4
- What is the molecular formula of a compound that has a molecular mass of 54 and the empirical formula  $\text{C}_2\text{H}_3$ ?  
A)  $\text{C}_6\text{H}_9$                       B)  $\text{C}_2\text{H}_3$   
**C)  $\text{C}_4\text{H}_6$**                       D)  $\text{C}_8\text{H}_{12}$

16. The percent by mass of nitrogen in  $Mg(CN)_2$  is equal to

- A)  $\frac{14}{76} \times 100$       B)  $\frac{28}{50} \times 100$   
C)  $\frac{28}{76} \times 100$       D)  $\frac{14}{50} \times 100$

17. A student obtained the following data to determine the percent by mass of water in a hydrate.

Mass of empty crucible + cover .....	11.70 g
Mass of crucible + cover + hydrated salt before heating .....	14.90 g
Mass of crucible + cover + anhydrous salt after thorough heating .....	14.53 g

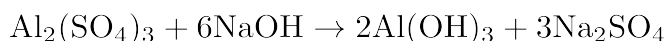
What is the approximate percent by mass of the water in the hydrated salt?

- A) **12%**   B) 88%   C) 2.5%   D) 98%
18. A hydrate is a compound with water molecules incorporated into its crystal structure. In an experiment to find the percent by mass of water in a hydrated compound, the following data were recorded:

Mass of crucible + hydrated crystals before heating	7.50 grams
Mass of crucible	6.90 grams
Mass of crucible + anhydrous crystals after heating	7.20 grams

What is the percent by mass of water in the hydrate?

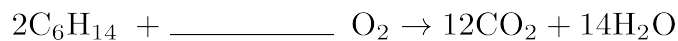
- A) 96. %      B) **50. %**  
C) 72. %      D) 8.0 %
19. Given the balanced equation representing a reaction:



The mole ratio of  $NaOH$  to  $Al(OH)_3$  is

- A) 3:7   B) 1:3   C) 1:1   D) **3:1**

20. Given the incomplete equation representing a reaction:



What is the coefficient of  $O_2$  when the equation is completely balanced using the smallest whole-number coefficients?

- A) 13   B) 14   C) **19**   D) 26
21. Given the balanced equation representing a reaction:
- $$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$$

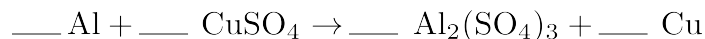
What is the total number of moles of  $O_2(g)$  required for the complete combustion of 1.5 moles of  $C_3H_8(g)$ ?

- A) .30 mol      B) 1.5 mol  
C) 4.5 mol      D) **7.5 mol**
22. A compound contains 53% Al and 47% O by mass. What is the empirical formula of this compound?
- A)  **$Al_2O_3$**       B)  $Al_3O_2$   
C)  $AlO$       D)  $AlO_2$
23. In terms of potential energy,  $PE$ , which expression defines the heat of reaction for a chemical change?

- A)  $\frac{PE_{reactants}}{PE_{products}}$   
B)  $\frac{PE_{products}}{PE_{reactants}}$   
C)  $PE_{products} - PE_{reactants}$   
D)  $PE_{reactants} - PE_{products}$

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24. Given the unbalanced equation:



When the equation is balanced using the *smallest* whole-number coefficients, what is the coefficient of Al?

- A) 1                      **B) 2**                      C) 3                      D) 4
- 

25. What is the molecular formula of a compound with the empirical formula  $\text{P}_2\text{O}_5$  and a gram-molecular mass of 284 grams?

- A)  $\text{P}_5\text{O}_2$                       B)  $\text{P}_{10}\text{O}_4$   
C)  **$\text{P}_4\text{O}_{10}$**                       D)  $\text{P}_2\text{O}_5$

26. Which reaction releases the greatest amount of energy per 2 moles of product?

- A)  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$   
B)  $2\text{CO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g})$   
C)  $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g})$   
**D)  $4\text{Al}(\text{s}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{Al}_2\text{O}_3(\text{s})$**

27. Which pair consists of a molecular formula and its corresponding empirical formula?

- A)  $\text{C}_2\text{H}_2$  and  $\text{CH}_3\text{CH}_3$   
B)  $\text{C}_6\text{H}_6$  and  $\text{C}_2\text{H}_2$   
C)  **$\text{P}_4\text{O}_{10}$  and  $\text{P}_2\text{O}_5$**   
D)  $\text{SO}_2$  and  $\text{SO}_3$

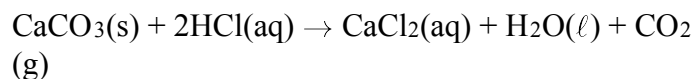
28. What is the total number of oxygen atoms in the formula  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ? [The  $\cdot$  represents seven units of  $\text{H}_2\text{O}$  attached to one unit of  $\text{MgSO}_4$ .]

- A) **11**    B) 7    C) 5    D) 4

29. What is the empirical formula of a compound that contains 85% Ag and 15% F by mass?

- A)  $\text{AgF}_2$                       **B) AgF**  
C)  $\text{Ag}_2\text{F}_2$                       D)  $\text{Ag}_2\text{F}$

30. Given the balanced equation:



What is the total number of moles of  $\text{CO}_2$  formed when 20. moles of  $\text{HCl}$  is completely consumed?

- A) 40. mol                      B) 20. mol  
C) 5.0 mol                      **D) 10. mol**
-

**Answer Key**  
**AAAFINAL-HONORS16Q1**

1. **A**
2. **D**
3. **B**
4. **D**
5. **A**
6. **D**
7. **B**
8. **B**
9. **B**
10. **D**
11. **A**
12. **B**
13. **D**
14. **C**
15. **C**
16. **C**
17. **A**
18. **B**
19. **D**
20. **C**
21. **D**
22. **A**
23. **C**
24. **B**
25. **C**
26. **D**
27. **C**
28. **A**
29. **B**
30. **D**