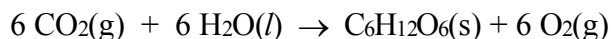


1. Which sample contains the same number of atoms as a gram of He?

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

2. 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) 32.0 L B) 192 L
C) **22.4 L** D) 264 L

3. The percent by mass of nitrogen in $\text{Mg}(\text{CN})_2$ is equal to

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

4. Given the balanced equation representing a reaction:
 $\text{C}_3\text{H}_8(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{g})$

What is the total number of moles of $\text{O}_2(\text{g})$ required for the complete combustion of 1.5 moles of $\text{C}_3\text{H}_8(\text{g})$?

- A) .30 mol B) 1.5 mol
C) 4.5 mol D) **7.5 mol**

5. What is the molecular formula of a compound that has a molecular mass of 54 and the empirical formula C_2H_3 ?

- A) C_8H_{12} B) C_2H_3
C) **C_4H_6** D) C_6H_9

6. 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) 72. %
C) **50. %** D) 8.0 %

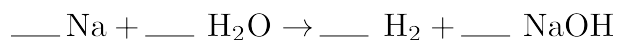
7. Given the reaction:



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

- A) **0.50 mole** B) 0.25 mole
C) 34 moles D) 17 moles

8. Given the unbalanced equation:



When the equation is correctly balanced using the smallest whole-number coefficients, the coefficient for H_2O is

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

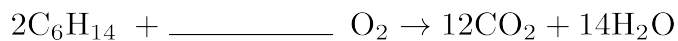
9. A compound was analyzed and found to contain 75% carbon and 25% hydrogen by mass. What is the compound's empirical formula?

- A) CH B) CH_2 C) CH_3 D) **CH₄**

10. What is the molecular mass of a gas whose density is 1.25 grams per liter at STP?

- A) **28.0** B) 14.0 C) 20.0 D) 17.9

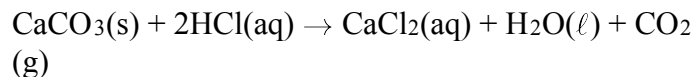
11. Given the incomplete equation representing a reaction:



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

12. Given the balanced equation:



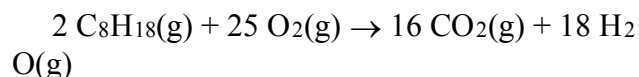
What is the total number of moles of CO_2 formed when 20. moles of HCl is completely consumed?

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

13. 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 H_2O attached to one unit of MgSO_4 .]

- A) 11** B) 7 C) 5 D) 4

14. 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**

15. What is the total mass in grams of 0.75 mole of SO_2 ?

- A) 16 g B) 24 g C) 32 g **D) 48 g**

16. What is the molecular formula of a compound with the empirical formula P_2O_5 and a gram-molecular mass of 284 grams?

- A) P_4O_{10}** B) P_2O_5
C) P_5O_2 D) P_{10}O_4

17. The percentage by mass of Br in the compound AlBr_3 is closest to

- A) 10.% **B) 90.%**
C) 75% D) 25%

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

- A) C_6H_6 and C_2H_2
B) C_2H_2 and CH_3CH_3
C) P_4O_{10} and P_2O_5
D) SO_2 and SO_3

19. 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) 98% C) 88% D) 2.5%

20. 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) $4\text{Al}(\text{s}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{Al}_2\text{O}_3(\text{s})$
C) $2\text{CO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g})$
D) $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g})$

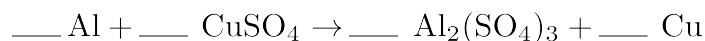
21. A compound has the empirical formula NO_2 . Its molecular formula could be

- A) N_4O_4 B) N_2O C) N_4O_2 **D) NO_2**

22. What is the formula mass of $\text{Al}_2(\text{SO}_4)_3$?

- A) 214 **B) 342** C) 150 D) 123

23. 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

24. In terms of potential energy, PE , which expression defines the heat of reaction for a chemical change?

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

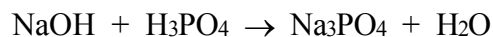
25. In a chemical reaction, the difference between the potential energy of the products and the potential energy of the reactants is equal to the

- A) activation energy B) rate of reaction
C) kinetic energy **D) heat of reaction**

26. The percent composition by mass of nitrogen in NH_4OH (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) $\frac{35}{4} \times 100$

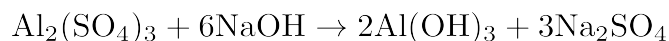
27. Given the unbalanced equation:



When the equation is correctly balanced, the coefficient of H_2O will be

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

28. Given the balanced equation representing a reaction:



The mole ratio of NaOH to $\text{Al}(\text{OH})_3$ is

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

29. A compound contains 53% Al and 47% O by mass. What is the empirical formula of this compound?

- A) AlO B) AlO_2
C) **Al_2O_3** D) Al_3O_2

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

- A) AgF** B) Ag_2F
C) AgF_2 D) Ag_2F_2

Answer Key
AAAFINAL-HONORS16Q1

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