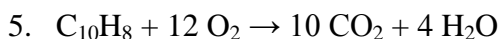


Please circle TRUE for true statements and FALSE for false statements. (2 points each)

1. TRUE or FALSE. The coefficients in a balanced equation tell you the relative numbers of moles of the substance in the reaction.
2. TRUE or FALSE. The coefficients in a balanced equation tell you the relative numbers of grams of the substance in the reaction.
3. TRUE or FALSE. It is always necessary to make sure you have a balanced equation before starting stoichiometry calculations.
4. TRUE or FALSE. Balanced equations are NOT necessary in performing stoichiometry calculations.

Please indicate the **mole ratios** from the following balanced equation. (6 points)



\_\_\_\_\_ moles of  $\text{O}_2$  = \_\_\_\_\_ moles of  $\text{H}_2\text{O}$

\_\_\_\_\_ moles of  $\text{O}_2$  = \_\_\_\_\_ moles of  $\text{CO}_2$

\_\_\_\_\_ moles of  $\text{O}_2$  = \_\_\_\_\_ moles of  $\text{C}_{10}\text{H}_8$

\_\_\_\_\_ moles of  $\text{C}_{10}\text{H}_8$  = \_\_\_\_\_ moles of  $\text{CO}_2$

\_\_\_\_\_ moles of  $\text{H}_2\text{O}$  = \_\_\_\_\_ moles of  $\text{CO}_2$

\_\_\_\_\_ moles of  $\text{O}_2$  = \_\_\_\_\_ moles of  $\text{C}_{10}\text{H}_8$

### Mole to Mole Conversions

6. Please determine the number of **moles** of water ( $\text{H}_2\text{O}$ ) produced if 3 **moles** of  $\text{C}_{10}\text{H}_8$  is reacted with an excess of oxygen according to the following balanced equation:  $\text{C}_{10}\text{H}_8 + 12 \text{O}_2 \rightarrow 10 \text{CO}_2 + 4 \text{H}_2\text{O}$ . (5 points)

7. Please determine the number of **moles** of water ( $\text{H}_2\text{O}$ ) produced if 1.8 **moles** of  $\text{CO}_2$  is produced according to the following balanced equation:  
 $\text{C}_{10}\text{H}_8 + 12 \text{O}_2 \rightarrow 10 \text{CO}_2 + 4 \text{H}_2\text{O}$ . (5 points)

Gram to Gram Conversions (3 step)

8. Please determine the number of grams of water ( $\text{H}_2\text{O}$ ) produced if 11.23 grams of  $\text{C}_6\text{H}_6$  is reacted with an excess of oxygen according to the following balanced equation:  $2 \text{C}_6\text{H}_6 + 15 \text{O}_2 \rightarrow 12 \text{CO}_2 + 6 \text{H}_2\text{O}$ . (8 points)
9. Please determine the number of grams of carbon dioxide ( $\text{CO}_2$ ) produced if 48.3 grams of oxygen is reacted according to the following balanced equation:  $2 \text{C}_6\text{H}_6 + 15 \text{O}_2 \rightarrow 12 \text{CO}_2 + 6 \text{H}_2\text{O}$ . (8 points)
10. Please determine the number of grams of aluminum produced if 16.9 grams of aluminum oxide ( $\text{Al}_2\text{O}_3$ ) is reacted with an excess of carbon monoxide ( $\text{CO}$ ) according to the following balanced equation:  $3\text{CO} + \text{Al}_2\text{O}_3 \rightarrow 3 \text{CO}_2 + 2 \text{Al}$ . (8 points)
11. Please determine the number of grams of carbon dioxide produced if 89.1 grams of aluminum oxide ( $\text{Al}_2\text{O}_3$ ) is reacted according to the following balanced equation:  $3\text{CO} + \text{Al}_2\text{O}_3 \rightarrow 3 \text{CO}_2 + 2 \text{Al}$ . (8 points)

Limiting Reactant Problems

12. Please determine the **amount of water (in Grams)** if 191 **grams** of  $O_2$  is reacted with 191 **grams** of  $C_4H_{10}$  according to the following balanced equation:  
 $2 C_4H_{10} + 13 O_2 \rightarrow 8 CO_2 + 10 H_2O$ . **Only indicate ONE answer** (15 points)

13. What is the limiting reactant in Question #12? (5 points)

14. Please determine the amount in **grams** of the non-limiting reactant that will be leftover after the reaction in Question #12 has taken place. (8 points)

Limiting Reactant Problems

15. Please determine the **amount of aluminum(in Grams)** if 100 **grams** of CO is reacted with 115 **grams** of  $\text{Al}_2\text{O}_3$  according to the following balanced equation:  
 $3\text{CO} + \text{Al}_2\text{O}_3 \rightarrow 3\text{CO}_2 + 2\text{Al}$ . **Only indicate ONE answer** (15 points)

16. What is the limiting reactant in Question #15? (5 points)

17. Please determine the amount in **grams** of the non-limiting reactant that will be leftover after the reaction in Question #15 has taken place. (8 points)

Percent Yield Calculations

18. If a reaction was predicted to produce 85 grams of  $\text{NH}_3$ , but when the reaction is carried out in the lab only 52 grams are produced, what is the percent yield of the reaction in the lab? (5 points)
19. If a reaction produced 115 grams of  $\text{NH}_3$  in the lab, and the student calculated using stoichiometry that the reaction would produce 128 grams, what is the percent yield of the reaction in the lab? (5 points)
20. Using your answer from Question # 12, determine the percent yield of the reaction if when carried out in the lab 75.0 grams of water was produced by the reaction. (6 points)
21. Using your answer from Question # 15, determine the percent yield of the reaction if when carried out in the lab 55.0 grams of aluminum was produced by the reaction. (6 points)

Gas Stoichiometry

22. What volume of water vapor is produced by the complete reaction of 3 liters of butane ( $\text{C}_4\text{H}_{10}$ ) according to the following balanced chemical reaction at  $29^\circ\text{C}$  and 2.5 atm of pressure:  $2 \text{C}_4\text{H}_{10} (\text{g}) + 13 \text{O}_2 (\text{g}) \rightarrow 8\text{CO}_2 (\text{g}) + 10 \text{H}_2\text{O} (\text{g})$ ? (10 points)

23. What volume of carbon dioxide is produced by the complete reaction of 13 liters of naphthalene ( $\text{C}_{10}\text{H}_8$ ) according to the following balanced chemical reaction at  $24^\circ\text{C}$  and 0.9 atm of pressure:  $\text{C}_{10}\text{H}_8 (\text{g}) + 12 \text{O}_2 (\text{g}) \rightarrow 10 \text{CO}_2 (\text{g}) + 4 \text{H}_2\text{O} (\text{g})$  ? (10 points)

The following are worth 4 points each.

24. What is Stoichiometry?

25. What is the molar volume of a gas?

26. What does a limiting reactant do in a reaction?

27. How is a balanced equation different from an unbalanced equation?

28. What are the conditions of STP?

Practice TEST

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Atomic and Molar Masses

(Note: Masses are given for all substances on the test, regardless if they are needed or not!)

Al = 26.98 grams / 1 mole

Al<sub>2</sub>O<sub>3</sub> = 101.96 grams / 1 mole

C<sub>4</sub>H<sub>10</sub> = 58.12 grams / 1 mole

C<sub>6</sub>H<sub>6</sub> = 78.11 grams / 1 mole

C<sub>10</sub>H<sub>8</sub> = 128.16 grams / 1 mole

CO = 28.01 grams / 1 mole

CO<sub>2</sub> = 44.01 grams / 1 mole

H<sub>2</sub>O = 18.02 grams / 1 mole

NH<sub>3</sub> = 17.03 grams / 1 mole

O<sub>2</sub> = 32.00 grams / 1 mole

Kelvin = °C + 273