

# 12-2 Review and Reinforcement

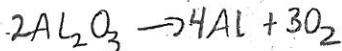
## Solving Stoichiometry Problems

If the statement is true, write "true." If it is false, change the underlined word or words to make it true. Write your answer on the line provided.

- true 1. The major types of stoichiometry problems are mass-mass, mass-volume, and volume-volume.
- relative 2. In a mass-mass problem, the coefficients in the balanced equation represent the actual numbers of moles of reactants and products.
- moles 3. In solving a mass-mass problem, it is necessary to convert the given mass to volume.
- 22.4 4. The molar volume of any gas at STP is 24.2 L.
- true 5. When the mass of a reactant is given, the number of moles can be found by dividing the mass by the reactant's molar mass.
- volume 6. The coefficients in a chemical equation also represent the ratio of the mass of gases involved in the reaction.

Write the balanced equations for each of the following problems. Then solve the problems as directed. Show all your work.

7. When 9.8 g of aluminum oxide ( $Al_2O_3$ ) decomposes, how many grams of aluminum metal are produced?



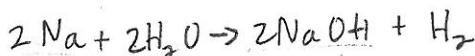
$$\frac{9.8g Al_2O_3}{1} \cdot \frac{1 mol Al_2O_3}{101.96g Al_2O_3} \cdot \frac{4 mol Al}{2 mol Al_2O_3} \cdot \frac{26.98g Al}{1 mol Al} = \boxed{5.2g Al}$$

8. How many grams of iodine are produced when 0.72 mol of fluorine react with potassium iodide (KI)?



$$\frac{0.72 mol F_2}{1} \cdot \frac{1 mol I_2}{1 mol F_2} \cdot \frac{253.8g I_2}{1 mol I_2} = 182.736 \rightarrow \boxed{180g I_2}$$

9. How many grams of sodium are required to react with water to produce 5.0 g of sodium hydroxide? How many grams of  $H_2$  are produced? What volume would be occupied by the resulting hydrogen at STP?



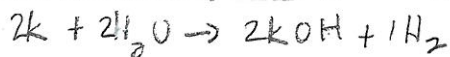
$$\frac{5.0g NaOH}{1} \cdot \frac{1 mol NaOH}{40.00g NaOH} \cdot \frac{2 mol Na}{2 mol NaOH} \cdot \frac{23.00g Na}{1 mol Na} = \boxed{2.9g Na}$$

$$\frac{5.0g NaOH}{1} \cdot \frac{1 mol NaOH}{40.00g NaOH} \cdot \frac{1 mol H_2}{2 mol NaOH} \cdot \frac{2.02g H_2}{1 mol H_2} = \boxed{0.13g H_2}$$

$$\frac{0.13g H_2}{1} \cdot \frac{1 mol H_2}{2.02g H_2} \cdot \frac{22.4L H_2}{1 mol H_2} = \boxed{1.4L H_2}$$

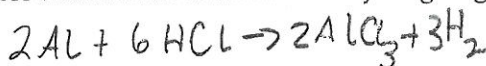
**12-2 Review and Reinforcement (continued)**

10. 20.0 g of potassium react with water to produce potassium hydroxide and hydrogen gas. How many liters would the hydrogen gas occupy at STP?



$$\frac{20.0\text{g K}}{1} \cdot \frac{1\text{mol K}}{39.10\text{g K}} \cdot \frac{1\text{mol H}_2}{2\text{mol K}} \cdot \frac{22.4\text{L H}_2}{1\text{mol H}_2} = \boxed{5.73\text{L H}_2}$$

11. If 30.2 g of aluminum react with HCl to produce aluminum chloride and hydrogen gas, how many liters of hydrogen are produced at STP?



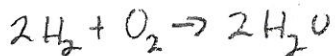
$$\frac{30.2\text{g Al}}{1} \cdot \frac{1\text{mol Al}}{26.98\text{g Al}} \cdot \frac{3\text{mol H}_2}{2\text{mol Al}} \cdot \frac{22.4\text{L H}_2}{1\text{mol H}_2} = \boxed{37.6\text{L H}_2}$$

12. How many liters of HCl are produced by the reaction of 5.7 L of hydrogen with an equal amount of chlorine?



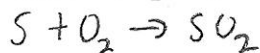
$$\frac{5.7\text{L H}_2}{1} \cdot \frac{2\text{L HCl}}{1\text{L H}_2} = 11.4 \rightarrow \boxed{11\text{L HCl}}$$

13. How many liters of hydrogen are required to react with 0.45 mol of oxygen to produce water?



$$\frac{.45\text{mol O}_2}{1} \cdot \frac{22.4\text{L O}_2}{1\text{mol O}_2} \cdot \frac{2\text{L H}_2}{1\text{L O}_2} = \boxed{20\text{L H}_2}$$

14. How many liters of SO<sub>2</sub> are produced from the reaction of sulfur with 26.9 L of oxygen?



$$\frac{26.9\text{L O}_2}{1} \cdot \frac{1\text{L SO}_2}{1\text{L O}_2} = \boxed{26.9\text{L SO}_2}$$

15. How many grams of zinc chloride will be produced if zinc is allowed to react with 16.8 L of chlorine at STP?



$$\frac{16.8\text{L Cl}_2}{1} \cdot \frac{1\text{mol Cl}_2}{22.4\text{L Cl}_2} \cdot \frac{1\text{mol ZnCl}_2}{1\text{mol Cl}_2} \cdot \frac{136.29\text{g ZnCl}_2}{1\text{mol ZnCl}_2} = \boxed{102\text{g ZnCl}_2}$$