

Stoichiometry: Mass-Mass, Volume-Volume, Mass-Volume Problems

Mass-Mass Problems (Give answers to 3 significant figures)

1. What is the mass in grams of 4.00 moles of potassium chlorate, KClO_3 ?
2. If 4.00 moles of KClO_3 decomposes according to the equation:
 $2\text{KClO}_3 (s) \rightarrow 2\text{KCl} (s) + 3\text{O}_2 (g)$ how many moles of oxygen, O_2 , will be formed?
3. What is the mass in grams of O_2 formed when 4.00 moles of KClO_3 decompose according to the equation in Question 2?
4. How many grams of O_2 are produced when 61.5 g KClO_3 decompose according to the equation in Question 2?
5. How many grams of H_2SO_4 are needed to neutralize 120. grams of NaOH according to the equation: $\text{H}_2\text{SO}_4 (aq) + 2\text{NaOH} (aq) \rightarrow \text{Na}_2\text{SO}_4 (aq) + 2\text{H}_2\text{O} (l)$?
6. How many grams $\text{Ca}(\text{NO}_3)_2$ are produced when HNO_3 reacts with 20.0 grams of CaCO_3 according to the equation:
 $2\text{HNO}_3 (aq) + \text{CaCO}_3 (s) \rightarrow \text{Ca}(\text{NO}_3)_2 (aq) + \text{H}_2\text{O} (l) + \text{CO}_2 (g)$?
7. How many grams of nitrogen must react with excess hydrogen to produce 3.40 g of ammonia, NH_3 , according to the equation: $\text{N}_2 (g) + 3\text{H}_2 (g) \rightarrow 2\text{NH}_3 (g)$?
8. How many grams of aluminum sulfate will react with 148 grams of calcium hydroxide in the reaction in which aluminum hydroxide and calcium sulfate are the products? Start this problem by writing the balanced equation for the reaction.

Volume-Volume Problems

9. According to the equation: $\text{CH}_4 (\text{g}) + 2 \text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g}) + 2 \text{H}_2\text{O} (\text{g})$
how many liters of O_2 are needed to burn completely 44.8 liters of CH_4 , assuming that both volumes are measured at the same temperature and pressure?
10. According to the equation: $2 \text{C}_8\text{H}_{18} (\text{g}) + 25 \text{O}_2 (\text{g}) \rightarrow 16 \text{CO}_2 (\text{g}) + 18 \text{H}_2\text{O} (\text{l})$, how many liters of CO_2 are produced when 5.00 liters of O_2 react with excess C_8H_{18} assuming both volumes are measured at STP?
11. According to the equation: $\text{N}_2 (\text{g}) + 3 \text{H}_2 (\text{g}) \rightarrow 2 \text{NH}_3 (\text{g})$
what volume of H_2 is needed to produce 100. liters of NH_3 assuming that both volumes are measured at the same temperature and pressure?
12. What volume of O_2 will react with excess CS_2 to produce 10.0 liters of SO_2 , if the temperature and pressure remain constant throughout?
 $\text{CS}_2 (\text{l}) + 3 \text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g}) + 2 \text{SO}_2 (\text{g})$
13. According to the equation: $4 \text{NH}_3 (\text{g}) + 5 \text{O}_2 (\text{g}) \rightarrow 4 \text{NO} (\text{g}) + 6 \text{H}_2\text{O} (\text{g})$
if 8.00 liters NH_3 are mixed with 2.00 liters O_2 , what is the maximum number of liters of NO that can be produced, assuming all volumes are at the same temperature and pressure?

Mass-Volume Problems

14. According to the equation: $2 \text{H}_2\text{O} (\text{g}) \rightarrow 2 \text{H}_2 (\text{g}) + \text{O}_2 (\text{g})$
how many liters of oxygen will be produced at STP if 180 grams of water decompose?
15. According to the equation: $2 \text{HCl} (\text{aq}) + \text{Zn} (\text{s}) \rightarrow \text{H}_2 (\text{g}) + \text{ZnCl}_2 (\text{aq})$
how many grams of zinc must react with excess HCl to produce 11.2 liters of hydrogen at STP?
16. According to the equation: $3 \text{O}_2 (\text{g}) + 4 \text{Al} (\text{s}) \rightarrow 2 \text{Al}_2\text{O}_3 (\text{s})$
how many liters of oxygen at STP must react with excess aluminum to form 408 grams Al_2O_3 ?
17. According to the equation: $\text{Cl}_2 (\text{g}) + \text{CaI}_2 (\text{aq}) \rightarrow \text{CaCl}_2 (\text{aq}) + \text{I}_2 (\text{g})$
what volume of Cl_2 at STP must react to produce 222 grams of CaCl_2 ?