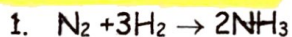


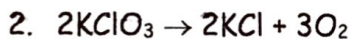
IDEAL STOICHIOMETRY PARTNER ACTIVITY: Work with a partner on solving these problems using Dimensional Analysis. You will be able to work together on the quiz next class as well. Honors

Mole-Mole Problems



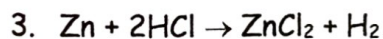
How many moles of hydrogen are needed to completely react with two moles of nitrogen?

$$\frac{2 \text{ mol } N_2}{1 \text{ mol } N_2} \times \frac{3 \text{ mol } H_2}{1 \text{ mol } N_2} = 6 \text{ mol } H_2$$



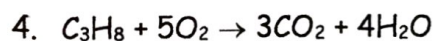
How many moles of oxygen are produced by the decomposition of six moles of potassium chlorate?

$$\frac{6 \text{ mol } KClO_3}{2 \text{ mol } KClO_3} \times \frac{3 \text{ mol } O_2}{1 \text{ mol } KClO_3} = 9 \text{ mol } O_2$$



How many moles of hydrogen are produced from the reaction of three moles of zinc with an excess of hydrochloric acid?

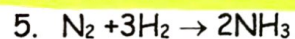
$$\frac{3 \text{ mol } Zn}{1 \text{ mol } Zn} \times \frac{1 \text{ mol } H_2}{1 \text{ mol } Zn} = 3 \text{ mol } H_2$$



How many moles of oxygen are necessary to react completely with four moles of propane (C_3H_8)?

$$\frac{4 \text{ mol } C_3H_8}{1 \text{ mol } C_3H_8} \times \frac{5 \text{ mol } O_2}{1 \text{ mol } C_3H_8} = 20 \text{ mol } O_2$$

Volume-Volume Problems

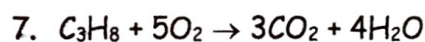


What volume of hydrogen is necessary to react with five liters of nitrogen to produce ammonia at STP?

$$\frac{5 \text{ L } N_2}{22.4 \text{ L } N_2} \times \frac{1 \text{ mol } N_2}{1 \text{ mol } N_2} \times \frac{3 \text{ mol } H_2}{1 \text{ mol } N_2} \times \frac{22.4 \text{ L } H_2}{1 \text{ mol } H_2} = 15 \text{ L } H_2$$

6. What volume of ammonia is produced in the reaction in problem 5?

$$\frac{5 \text{ L } N_2}{22.4 \text{ L } N_2} \times \frac{1 \text{ mol } N_2}{1 \text{ mol } N_2} \times \frac{2 \text{ mol } NH_3}{1 \text{ mol } N_2} \times \frac{22.4 \text{ L } NH_3}{1 \text{ mol } NH_3} = 10 \text{ L } NH_3$$



If 20 liters of oxygen are consumed in the above reaction, how many liters of carbon dioxide are produced?

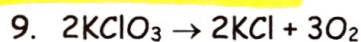
$$\frac{20 \text{ L } O_2}{22.4 \text{ L } O_2} \times \frac{1 \text{ mol } O_2}{5 \text{ mol } O_2} \times \frac{3 \text{ mol } CO_2}{1 \text{ mol } O_2} \times \frac{22.4 \text{ L } CO_2}{1 \text{ mol } CO_2} = 12 \text{ L } CO_2$$



How many liters of carbon dioxide are produced if 75 liters of carbon monoxide are burned in oxygen? How many liters of oxygen are necessary?

$$\frac{75\text{ L CO} \left| \frac{1\text{ mol CO}}{22.4\text{ L CO}} \right| \frac{2\text{ mol CO}_2}{2\text{ mol CO}} \left| \frac{22.4\text{ L CO}_2}{1\text{ mol CO}_2} \right|}{15\text{ L CO} \left| \frac{1\text{ mol CO}}{22.4\text{ L CO}} \right| \frac{1\text{ mol O}_2}{2\text{ mol CO}} \left| \frac{22.4\text{ L O}_2}{1\text{ mol O}_2} \right|} = 37.5\text{ L O}_2$$

Mass-Mass Problems



How many grams of potassium chloride are produced if 25 g of potassium chlorate decompose?

$$\frac{25\text{ g KClO}_3 \left| \frac{1\text{ mol KClO}_3}{122.55\text{ g KClO}_3} \right| \frac{2\text{ mol KCl}}{2\text{ mol KClO}_3} \left| \frac{74.55\text{ g KCl}}{1\text{ mol KCl}} \right|}{15.2\text{ g KCl}}$$

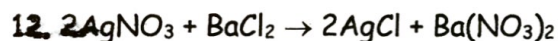


How many grams of hydrogen are necessary to react completely with 50.0 g of nitrogen in the above reaction?

$$\frac{50.0\text{ g N}_2 \left| \frac{1\text{ mol N}_2}{28.02\text{ g N}_2} \right| \frac{3\text{ mol H}_2}{1\text{ mol N}_2} \left| \frac{2.02\text{ g H}_2}{1\text{ mol H}_2} \right|}{10.8\text{ g H}_2}$$

11. How many grams of ammonia are produced in the reaction in problem 10?

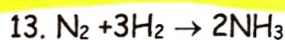
$$\frac{50.0\text{ g N}_2 \left| \frac{1\text{ mol N}_2}{28.02\text{ g N}_2} \right| \frac{2\text{ mol NH}_3}{1\text{ mol N}_2} \left| \frac{17.03\text{ g NH}_3}{1\text{ mol NH}_3} \right|}{60.8\text{ g NH}_3}$$



How many grams of silver chloride are produced from 5.0 g of silver nitrate reacting with an excess of barium chloride?

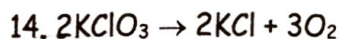
$$\frac{5.0\text{ g AgNO}_3 \left| \frac{1\text{ mol AgNO}_3}{169.87\text{ g AgNO}_3} \right| \frac{2\text{ mol AgCl}}{2\text{ mol AgNO}_3} \left| \frac{143.32\text{ g AgCl}}{1\text{ mol AgCl}} \right|}{4.22\text{ g AgCl}}$$

Mixed Problems



What volume of ammonia at STP is produced if 25.0 g of nitrogen gas is reacted with an excess of hydrogen gas?

$$\frac{25.0\text{ g N}_2 \left| \frac{1\text{ mol N}_2}{28.02\text{ g N}_2} \right| \frac{2\text{ mol NH}_3}{1\text{ mol N}_2} \left| \frac{22.4\text{ L NH}_3}{1\text{ mol NH}_3} \right|}{40.0\text{ L NH}_3}$$



If 5.0 g of potassium chlorate is decomposed, what volume of oxygen gas is produced at STP?

$$\frac{5.0\text{ g KClO}_3 \left| \frac{1\text{ mol KClO}_3}{122.55\text{ g KClO}_3} \right| \frac{3\text{ mol O}_2}{2\text{ mol KClO}_3} \left| \frac{22.4\text{ L O}_2}{1\text{ mol O}_2} \right|}{1.37\text{ L O}_2}$$

15. How many grams of potassium chloride are produced in problem 14?

$$\frac{5.0\text{ g KClO}_3 \left| \frac{1\text{ mol KClO}_3}{122.55\text{ g KClO}_3} \right| \frac{2\text{ mol KCl}}{2\text{ mol KClO}_3} \left| \frac{74.55\text{ g KCl}}{1\text{ mol KCl}} \right|}{3.04\text{ g KCl}}$$



If 10.0 g of aluminum chloride are decomposed, how many molecules of chlorine gas are produced?

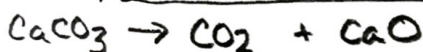
$$\frac{10.0 \text{ g AlCl}_3}{133.34 \text{ g AlCl}_3} \times \frac{1 \text{ mol AlCl}_3}{2 \text{ mol AlCl}_3} \times \frac{3 \text{ mol Cl}_2}{1 \text{ mol Cl}_2} \times \frac{6.02 \times 10^{23} \text{ molec.}}{1 \text{ mol Cl}_2} = 6.77 \times 10^{22} \text{ molec. Cl}_2$$

Stoichiometry with Aqueous Solutions and Gases

17. If I combined calcium hydroxide with 0.0750 L of 0.500 M HCl, how many grams of calcium chloride would be formed? Write the balanced equations: $\text{Ca(OH)}_2 + 2\text{HCl} \rightarrow \text{CaCl}_2 + 2\text{H}_2\text{O}$

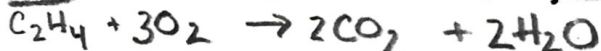
$$\frac{0.0750 \text{ L HCl}}{1 \text{ L HCl}} \times \frac{0.500 \text{ mol HCl}}{2 \text{ mol HCl}} \times \frac{1 \text{ mol CaCl}_2}{1 \text{ mol CaCl}_2} \times \frac{110.98 \text{ g CaCl}_2}{1 \text{ mol CaCl}_2} = 2.08 \text{ g CaCl}_2$$

18. Calcium carbonate decomposes at high temperatures to form carbon dioxide and calcium oxide. How many grams of calcium carbonate will I need to form 3.45 liters of carbon dioxide at STP?



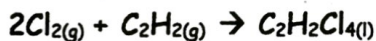
$$\frac{3.45 \text{ L CO}_2}{22.4 \text{ L CO}_2} \times \frac{1 \text{ mol CO}_2}{1 \text{ mol CO}_2} \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol CaCO}_3} \times \frac{100.09 \text{ g CaCO}_3}{1 \text{ mol CaCO}_3} = 15.4 \text{ g CaCO}_3$$

19. Ethylene (C_2H_4) burns in oxygen to form carbon dioxide and water vapor. How many liters of water can be formed if 1.25 liters of ethylene are consumed in this reaction at STP?



$$\frac{1.25 \text{ L C}_2\text{H}_4}{22.4 \text{ L C}_2\text{H}_4} \times \frac{1 \text{ mol C}_2\text{H}_4}{1 \text{ mol C}_2\text{H}_4} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol C}_2\text{H}_4} \times \frac{22.4 \text{ L H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 2.50 \text{ L H}_2\text{O}$$

20. When chlorine is added to acetylene, 1,1,2,2-tetrachloroethane is formed:



How many liters of chlorine will be needed to make 75.0 grams of $\text{C}_2\text{H}_2\text{Cl}_4$?

$$\frac{75.0 \text{ g C}_2\text{H}_2\text{Cl}_4}{167.84 \text{ g C}_2\text{H}_2\text{Cl}_4} \times \frac{1 \text{ mol C}_2\text{H}_2\text{Cl}_4}{1 \text{ mol C}_2\text{H}_2\text{Cl}_4} \times \frac{2 \text{ mol Cl}_2}{1 \text{ mol C}_2\text{H}_2\text{Cl}_4} \times \frac{22.4 \text{ L Cl}_2}{1 \text{ mol Cl}_2} = 20.0 \text{ L Cl}_2$$