

Name: Key

Stoichiometry Practice Problems #1

Complete each of the following stoichiometry problems. Pay attention to what each problem is asking you to determine. **Show all your work!**

1. Given the equation below, show what the following molar ratios should be.



a. $\text{C}_4\text{H}_{10} / \text{O}_2$ $\frac{2 \text{ mol C}_4\text{H}_{10}}{13 \text{ mol O}_2}$

d. $\text{C}_4\text{H}_{10} / \text{CO}_2$ $\frac{2 \text{ mol C}_4\text{H}_{10}}{8 \text{ mol CO}_2}$

b. O_2 / CO_2 $\frac{13 \text{ mol O}_2}{8 \text{ mol CO}_2}$

e. $\text{C}_4\text{H}_{10} / \text{H}_2\text{O}$ $\frac{2 \text{ mol C}_4\text{H}_{10}}{10 \text{ mol H}_2\text{O}}$

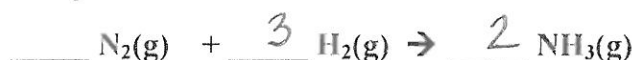
c. $\text{O}_2 / \text{H}_2\text{O}$ $\frac{13 \text{ mol O}_2}{10 \text{ mol H}_2\text{O}}$

2. Given the equation below, how many moles of O_2 can be produced by letting 12.00 moles of KClO_3 react?



$$12.00 \text{ mol KClO}_3 \times \frac{3 \text{ mol O}_2}{2 \text{ mol KClO}_3} = 18.00 \text{ mol O}_2$$

3. Answer the questions below for the production of ammonia from nitrogen gas and hydrogen gas (which, when completed on an industrial scale, is called the Haber process).
- a. Balance the chemical equation.



- b. If 12.6 moles of N_2 react, how many moles of NH_3 are produced?

$$12.6 \text{ mol N}_2 \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} = 25.2 \text{ mol NH}_3$$

- c. If 14 grams of N_2 react, how many moles of NH_3 are produced?

$$14.00 \text{ g N}_2 \times \frac{1 \text{ mol N}_2}{28.02 \text{ g N}_2} \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} = 0.9993 \text{ mol NH}_3$$

4. A somewhat antiquated method for preparing chlorine gas involves heating hydrochloric acid with pyrolusite (manganese dioxide), a common manganese ore. How many kilograms of HCl react with 5.69 kilograms of manganese dioxide?

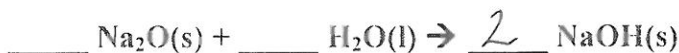


$$\begin{array}{r} 54.94 \\ + 32.00 \\ \hline 86.94 \end{array}$$

$$5.69 \text{ kg MnO}_2 \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ mol MnO}_2}{86.94 \text{ g MnO}_2} \times \frac{4 \text{ mol HCl}}{1 \text{ mol MnO}_2} \times \frac{36.46 \text{ g HCl}}{1 \text{ mol HCl}} \times \frac{1 \text{ kg}}{1000 \text{ g}}$$

9.54 kg HCl

5. How many grams of sodium hydroxide are produced from 112 grams of sodium oxide?



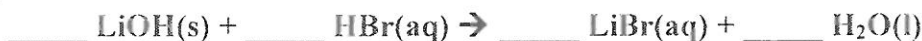
$$112 \text{ g Na}_2\text{O} \times \frac{1 \text{ mol Na}_2\text{O}}{61.98 \text{ g Na}_2\text{O}} \times \frac{2 \text{ mol NaOH}}{1 \text{ mol Na}_2\text{O}} \times \frac{40.00 \text{ g NaOH}}{1 \text{ mol NaOH}} =$$

$$22.99 \times 2 = 45.98$$

$$\frac{45.98}{61.98}$$

145 g NaOH

6. If you start with ten grams of lithium hydroxide. how many grams of lithium bromide will be produced?



$$10 \text{ g LiOH} \times \frac{1 \text{ mol LiOH}}{23.95 \text{ g LiOH}} \times \frac{1 \text{ mol LiBr}}{1 \text{ mol LiOH}} \times \frac{86.84 \text{ g LiBr}}{1 \text{ mol LiBr}} = 36.26$$

$$\frac{6.94}{16} = 1.01$$

$$\frac{23.95}{23.95}$$

$$\frac{6.94}{79.90} = 86.84$$

40 g LiBr

7. If you start with 45 grams of ethylene (C₂H₄), how many grams of carbon dioxide will be produced?

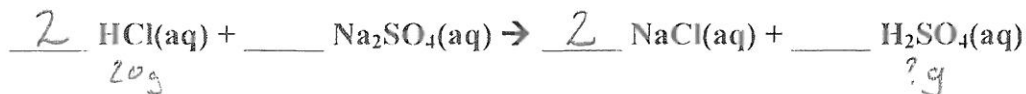


$$45 \text{ g C}_2\text{H}_4 \times \frac{1 \text{ mol C}_2\text{H}_4}{26.04 \text{ g C}_2\text{H}_4} \times \frac{2 \text{ mol CO}_2}{1 \text{ mol C}_2\text{H}_4} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mol CO}_2} = 152.108$$

$$\frac{24.02}{2.02}$$

150 g CO₂

8. If you start with 20 grams of hydrochloric acid. how many grams of sulfuric acid will be produced?



$$20 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36.46 \text{ g HCl}} \times \frac{1 \text{ mol H}_2\text{SO}_4}{2 \text{ mol HCl}} \times \frac{98.09 \text{ g}}{1 \text{ mol H}_2\text{SO}_4} = 26.9$$

30 g H₂SO₄

$$\frac{2.02}{32.07} = 64$$

$$\frac{98.09}{98.09}$$