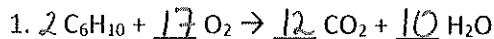


# Stoichiometry Test Practice

Key

## Practice Test 1



- a) If I do this reaction with 35 grams of  $\text{C}_6\text{H}_{10}$  and 45 grams of oxygen, how many grams of carbon dioxide will be formed?

$$\frac{35 \text{ g C}_6\text{H}_{10}}{1} \times \frac{1 \text{ mole C}_6\text{H}_{10}}{82.16 \text{ g C}_6\text{H}_{10}} \times \frac{12 \text{ moles CO}_2}{2 \text{ moles C}_6\text{H}_{10}} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mole CO}_2} = 112.49 \text{ g CO}_2$$

- ~~b) What is the limiting reagent for part (a)?~~

$$\frac{45 \text{ g O}_2}{1} \times \frac{1 \text{ mole O}_2}{32 \text{ g O}_2} \times \frac{12 \text{ moles CO}_2}{17 \text{ moles O}_2} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mole CO}_2} = 43.69 \text{ g CO}_2$$

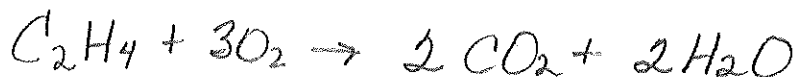
- b.) What is the limiting reagent for part (a)? Oxygen

- c) If 35 grams of carbon dioxide are actually formed from the reaction in part (a), what is the percent yield of this reaction?

$$\left( \frac{\text{actual yield}}{\text{theoretical yield}} \right) \times 100\% = \text{Percent Yield} \quad \left( \frac{35 \text{ g}}{43.69 \text{ g}} \right) \times 100\% = 80.11\%$$

2. Ethylene ( $\text{C}_2\text{H}_4$ ) burns in oxygen to form carbon dioxide and water vapor.

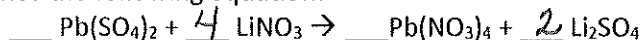
- a) Write the balanced chemical equation for this reaction below.



- b) How many liters of water can be formed if 1.25 liters of ethylene are consumed in this reaction?

$$\frac{1.25 \text{ L C}_2\text{H}_4}{1} \times \frac{1 \text{ mole C}_2\text{H}_4}{22.4 \text{ L C}_2\text{H}_4} \times \frac{2 \text{ moles H}_2\text{O}}{1 \text{ mole C}_2\text{H}_4} \times \frac{22.4 \text{ L H}_2\text{O}}{1 \text{ mole H}_2\text{O}} = 2.5 \text{ L H}_2\text{O}$$

3. a) Balance the following equation:



- b) How many moles of lithium nitrate will be needed to make 40 moles of lithium sulfate, assuming that you have an adequate amount of lead (IV) sulfate to do the reaction?

$$\frac{40 \text{ moles Li}_2\text{SO}_4}{1} \times \frac{4 \text{ moles LiNO}_3}{2 \text{ moles Li}_2\text{SO}_4} = 80 \text{ moles LiNO}_3$$

- c) How many moles of lead(IV) nitrate are produced if 25 moles of lithium sulfate are produced?

$$\frac{25 \text{ moles Li}_2\text{SO}_4}{1} \times \frac{1 \text{ mole Pb}(\text{NO}_3)_4}{2 \text{ moles Li}_2\text{SO}_4} = 12.5 \text{ moles Pb}(\text{NO}_3)_4$$

- d) How many moles of lithium nitrate are needed to react completely with 5.9 moles of lead(IV) sulfate?

$$\frac{5.9 \text{ moles Pb}(\text{SO}_4)_2}{1} \times \frac{4 \text{ moles LiNO}_3}{1 \text{ mole Pb}(\text{SO}_4)_2} = 23.6 \text{ moles LiNO}_3$$

Key

4. a) Write the balanced equation for the reaction of acetic acid with aluminum hydroxide to form water and aluminum acetate:



- b) Using the equation from part (a), determine the mass of aluminum acetate that can be made if I do this reaction with 125 grams of acetic acid and 275 grams of aluminum hydroxide.

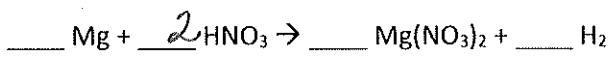
$$\frac{125 \text{ g } C_2H_3O_2H}{1} \times \frac{1 \text{ mole } C_2H_3O_2H}{60.06 \text{ g } C_2H_3O_2H} \times \frac{1 \text{ mole } Al(C_2H_3O_2)_3}{3 \text{ moles } C_2H_3O_2H} \times \frac{204.13 \text{ g } Al(C_2H_3O_2)_3}{1 \text{ mol } Al(C_2H_3O_2)_3} = 141.62 \text{ g } Al(C_2H_3O_2)_3$$

~~c) What is the limiting reagent in problem 4?~~

$$\frac{275 \text{ g } Al(OH)_3}{1} \times \frac{1 \text{ mole } Al(OH)_3}{78.01 \text{ g } Al(OH)_3} \times \frac{1 \text{ mole } Al(C_2H_3O_2)_3}{1 \text{ mole } Al(OH)_3} \times \frac{204.13 \text{ g } Al(C_2H_3O_2)_3}{1 \text{ mol } Al(C_2H_3O_2)_3} = 719.60 \text{ g } Al(C_2H_3O_2)_3$$

c) What is the limiting reagent in problem 4? acetic acid

5. a) Balance this equation and state which of the six types of reaction is taking place:



Type of reaction: single replacement

- b) If I start this reaction with 40 grams of magnesium and an excess of nitric acid, how many grams of hydrogen gas will I produce?

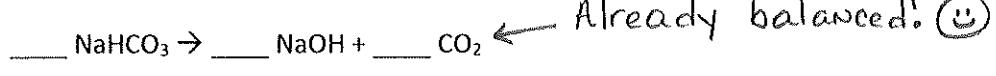
$$\frac{40 \text{ g } Mg}{1} \times \frac{1 \text{ mole } Mg}{24.31 \text{ g } Mg} \times \frac{1 \text{ mol } H_2}{1 \text{ mole } Mg} \times \frac{2.02 \text{ g } H_2}{1 \text{ mol } H_2} = 3.32 \text{ g } H_2$$

- c) If 1.7 grams of hydrogen is actually produced, what was my percent yield of hydrogen?

$$\left( \frac{\text{actual yield}}{\text{theoretical yield}} \right) \times 100\% = \text{Percent yield} \quad \left( \frac{1.7 \text{ g}}{3.32 \text{ g}} \right) \times 100\% = 51.20\%$$

**Practice Test 2**

6. a) Balance this equation and state what type of reaction is taking place:



Type of reaction: Decomposition

- b) If 25 grams of carbon dioxide gas is produced in this reaction, how many grams of sodium hydroxide should be produced?

$$\frac{25 \text{ g } CO_2}{1} \times \frac{1 \text{ mole } CO_2}{44.01 \text{ g } CO_2} \times \frac{1 \text{ mole } NaOH}{1 \text{ mole } CO_2} \times \frac{40 \text{ g } NaOH}{1 \text{ mole } NaOH} = 22.72 \text{ g } NaOH$$

- c) If 50 grams of sodium hydroxide are actually produced, what was my percent yield?

$$\left( \frac{\text{actual yield}}{\text{theoretical yield}} \right) \times 100\% = \text{Percent Yield} \quad \left( \frac{50 \text{ g}}{22.72 \text{ g}} \right) \times 100\% = 220.07\%$$

\* This is the answer; however, it is not reasonable. If you would ever get an answer like this, you would know something went very, very wrong.

7. Calcium carbonate decomposes at high temperatures to form carbon dioxide and calcium oxide:

- a) Write the balanced chemical equation for this reaction below.

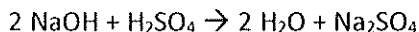


- b) How many grams of calcium carbonate will I need to form 3.45 liters of carbon dioxide?

$$\frac{3.45 \text{ L } CO_2}{1} \times \frac{1 \text{ mol } CO_2}{22.4 \text{ L } CO_2} \times \frac{1 \text{ mol } CaCO_3}{1 \text{ mol } CO_2} \times \frac{100.09 \text{ g } CaCO_3}{1 \text{ mol } CaCO_3} = 15.42 \text{ g } CaCO_3$$

Key

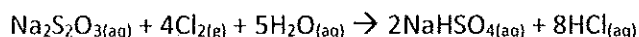
8. Using the following equation:



How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide and you have an excess of sulfuric acid?

$$\frac{200 \text{ g NaOH}}{1} \times \frac{1 \text{ mol NaOH}}{40 \text{ g NaOH}} \times \frac{1 \text{ mol Na}_2\text{SO}_4}{2 \text{ mol NaOH}} \times \frac{142.04 \text{ g Na}_2\text{SO}_4}{1 \text{ mol Na}_2\text{SO}_4} = 355.10 \text{ g Na}_2\text{SO}_4$$

9. Chlorine is used by textile manufacturers to bleach cloth. Excess chlorine is destroyed by its reaction with sodium thiosulfate,  $\text{Na}_2\text{S}_2\text{O}_3$ :



a. How many moles of  $\text{Na}_2\text{S}_2\text{O}_3$  are needed to react with 0.12 mol of  $\text{Cl}_2$ ?

$$\frac{0.12 \text{ mols Cl}_2}{1} \times \frac{1 \text{ mol Na}_2\text{S}_2\text{O}_3}{4 \text{ mols Cl}_2} = 0.030 \text{ mols Na}_2\text{S}_2\text{O}_3$$

b. How many moles of HCl can form from 0.12 mol of  $\text{Cl}_2$ ?

$$\frac{0.12 \text{ mols Cl}_2}{1} \times \frac{8 \text{ mols HCl}}{4 \text{ mols Cl}_2} = 0.24 \text{ mols HCl}$$

c. How many moles of  $\text{H}_2\text{O}$  are required for the reaction of 0.12 mol of  $\text{Cl}_2$ ?

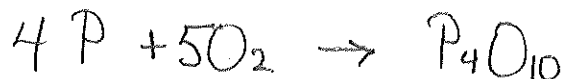
$$\frac{0.12 \text{ mols Cl}_2}{1} \times \frac{5 \text{ mols H}_2\text{O}}{4 \text{ mols Cl}_2} = 0.15 \text{ mols H}_2\text{O}$$

d. How many moles of  $\text{H}_2\text{O}$  react if 0.24 mol HCl is formed?

$$\frac{0.24 \text{ mols HCl}}{1} \times \frac{5 \text{ mols H}_2\text{O}}{8 \text{ mols HCl}} = 0.15 \text{ mols H}_2\text{O}$$

10. The incandescent white of a fireworks display is caused by the reaction of phosphorous with  $\text{O}_2$  to give  $\text{P}_4\text{O}_{10}$ .

a. Write the balanced chemical equation for the reaction.



b. How many grams of  $\text{O}_2$  are needed to combine with 6.85g of P?

$$\frac{6.85 \text{ g P}}{1} \times \frac{1 \text{ mole P}}{30.97 \text{ g P}} \times \frac{5 \text{ mols O}_2}{4 \text{ mols P}} \times \frac{32 \text{ g O}_2}{1 \text{ mol O}_2} = 8.85 \text{ g O}_2$$

c. How many grams of  $\text{P}_4\text{O}_{10}$  can be made from 8.00g of  $\text{O}_2$ ?

$$\frac{8.00 \text{ g O}_2}{1} \times \frac{1 \text{ mole O}_2}{32 \text{ g O}_2} \times \frac{1 \text{ mole P}_4\text{O}_{10}}{5 \text{ mols O}_2} \times \frac{283.88 \text{ g P}_4\text{O}_{10}}{1 \text{ mole P}_4\text{O}_{10}} = 14.19 \text{ g P}_4\text{O}_{10}$$

d. How many grams of P are needed to make 7.46g  $\text{P}_4\text{O}_{10}$ ?

$$\frac{7.46 \text{ g P}_4\text{O}_{10}}{1} \times \frac{1 \text{ mole P}_4\text{O}_{10}}{283.88 \text{ g P}_4\text{O}_{10}} \times \frac{4 \text{ mols P}}{1 \text{ mole P}_4\text{O}_{10}} \times \frac{30.97 \text{ g P}}{1 \text{ mole P}} = 3.26 \text{ g P}$$

