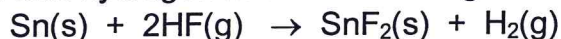


Stoichiometry Practice

1. Tin(II) fluoride, stannous fluoride, is used in some home dental treatment products. It is made by reacting tin with hydrogen fluoride according to the equation below.

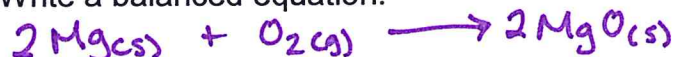


If 126 g of tin are used, how many moles of tin(II) fluoride, SnF_2 , can be produced?

$$126 \text{ g Sn} \times \frac{1 \text{ mol Sn}}{118.7 \text{ g Sn}} \times \frac{1 \text{ mol SnF}_2}{1 \text{ mol Sn}} = 1.06 \text{ mol SnF}_2$$

2. Magnesium burns in oxygen to produce magnesium oxide.

- a. Write a balanced equation.



- b. How many moles of oxygen gas are needed to burn 2.5 grams of magnesium?

$$2.5 \text{ g Mg} \times \frac{1 \text{ mol Mg}}{24.3 \text{ g Mg}} \times \frac{1 \text{ mol O}_2}{2 \text{ mol Mg}} = 0.051 \text{ mol O}_2$$

3. Laughing gas (nitrous oxide, N_2O) is sometimes used as an anesthetic in dental work. It is produced when ammonium nitrate is decomposed. Another product is water.

- a. Write a balanced equation.



- b. How many grams of ammonium nitrate is required to produce 33.0 g of nitrous oxide?

$$33.0 \text{ g N}_2\text{O} \times \frac{1 \text{ mol N}_2\text{O}}{44.02 \text{ g N}_2\text{O}} \times \frac{1 \text{ mol NH}_4\text{NO}_3}{1 \text{ mol N}_2\text{O}} \times \frac{80.06 \text{ g NH}_4\text{NO}_3}{1 \text{ mol NH}_4\text{NO}_3} = 60.0 \text{ g NH}_4\text{NO}_3$$

- c. How many grams of water are produced in this reaction?

$$33.0 \text{ g N}_2\text{O} \times \frac{1 \text{ mol N}_2\text{O}}{44.02 \text{ g N}_2\text{O}} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol N}_2\text{O}} \times \frac{18.01 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 27.0 \text{ g H}_2\text{O}$$

4. When sodium reacts with water, hydrogen gas and sodium hydroxide are produced.

- a. Write a balanced equation.



- b. Determine the mass of sodium hydroxide when 0.25 g of sodium reacts with water:

$$0.25 \text{ g Na} \times \frac{1 \text{ mol Na}}{22.9 \text{ g Na}} \times \frac{2 \text{ mol NaOH}}{2 \text{ mol Na}} \times \frac{39.9 \text{ g NaOH}}{1 \text{ mol NaOH}} = 0.44 \text{ g NaOH}$$

- c. Calculate the number of water molecules required to produce 10.0 L of hydrogen gas at STP.

$$10.0 \text{ L H}_2 \times \frac{1 \text{ mol H}_2}{22.4 \text{ L H}_2} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol H}_2} \times \frac{6.02 \times 10^{23} \text{ molecules H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 5.38 \times 10^{23} \text{ molecules of H}_2\text{O}$$

- d. Determine the mass of the water molecules produced from 3.27 $\times 10^{24}$ atoms of sodium.

$$3.27 \times 10^{24} \text{ atoms Na} \times \frac{1 \text{ mol Na}}{6.02 \times 10^{23} \text{ atoms Na}} \times \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol Na}} \times \frac{18.01 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 97.8 \text{ g H}_2\text{O}$$