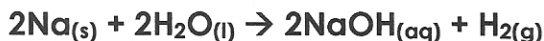


Stoichiometry Problems

Key

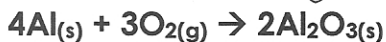


1. If 90.0 g of sodium are dropped into excess water, how many liters of hydrogen gas would be produced at standard pressure and 22°C assuming all of the sodium reacts?

$$2\text{Na} + 2\text{H}_2\text{O} \rightarrow \text{H}_2 + 2\text{NaOH}$$

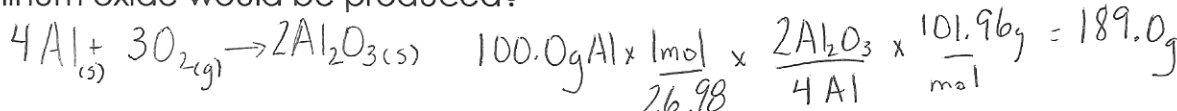
$$90.0\text{g} \times \frac{1\text{mol}}{22.99\text{g}} \times \frac{1\text{H}_2}{2\text{Na}} = 1.957\text{moles H}_2$$

$$\frac{RT}{P} = V = \frac{(1.957)(295)(0.0821)}{1.00\text{atm}}$$



$$V = 47.4\text{L H}_2(g)$$

2. If 100.0 g of aluminum is oxidized completely, how many grams of aluminum oxide would be produced?



$$189.0\text{g Al}_2\text{O}_{3(s)}$$

3. How many liters of carbon dioxide would be produced at standard pressure and 25°C for every 1.00 kg of tin produced?

$$1.00 \times 10^3\text{g Sn} \times \frac{1\text{mol}}{118.71} \times \frac{1\text{CO}_2}{1\text{Sn}} = 8.42\text{mol CO}_2$$

$$V = \frac{nRT}{P} = \frac{(8.42)(0.0821)(298)}{1.00} =$$



$$206\text{L CO}_2(g)$$

4. 5.00 grams of copper are placed into 300.0mL of a 0.20M solution of silver nitrate. How many grams of silver are produced? Does any unreacted copper remain?

$$5.00\text{g Cu} \times \frac{1\text{mol}}{63.55\text{g}} = 0.07868\text{mol} - 0.030 = 0.04868 \times 63.55\text{g} = 3.09\text{g Cu remain}$$

$$* 0.3000\text{L} \times 0.2\text{M} = 0.060\text{mol} \times \frac{2\text{Ag}}{2\text{AgNO}_3} \times \frac{107.87\text{g}}{\text{mol}} = 6.472\text{g Ag produced}$$



5. If a balloon is to be filled with 5.0 L of hydrogen at standard pressure and 20°C, how many mL of 0.3M sulfuric acid are needed and how many grams of iron are needed. (Assume the reaction has a 92% yield).

$$n_{\text{H}_2} = \frac{PV}{RT} = \frac{(1.00)(5.0)}{(0.0821)(293)} = 0.20785\text{H}_2 \times \frac{3\text{H}_2\text{SO}_4}{3\text{H}_2} = 0.20785\text{H}_2\text{SO}_4$$

$$0.20785\text{mol} \times \frac{1\text{L}}{0.3\text{M}} = 0.693\text{L} = 693\text{mL } 100\%$$



$$753\text{mL } (92\%) \text{ H}_2\text{SO}_4 \text{ required.}$$

6. If 10.0 grams of potassium chlorate are heated until no more oxygen is released, how many grams of potassium chloride will remain in the reaction vessel?

$$10.0\text{g} \times \frac{1\text{mol}}{122.55} \times \frac{2\text{KCl}}{2\text{KClO}_3} \times 74.55\text{g} = 6.08\text{g KCl}$$

$$\begin{array}{r} 48 \\ 39.10 \\ 35.45 \\ \hline 122.55 \end{array}$$