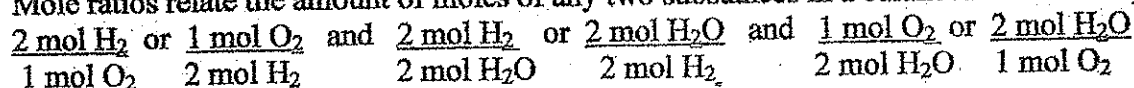


Stoichiometry Math notes

Using the equation: $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

Mole Ratios

Mole ratios relate the amount of moles of any two substances in a balanced chemical equation.



Mole \rightarrow Mole Conversion

How many moles O_2 are consumed with 3.0 mole H_2 ?

$$\begin{array}{l} \text{given} \\ 3.0 \text{ mol H}_2 \end{array} \times \frac{\text{mole ratio with desired on top, given on bottom}}{2 \text{ mol H}_2} = 1.5 \text{ mol O}_2$$

Gram \rightarrow Mole Conversion

How many moles O_2 are consumed with 4.0g H_2 ?

$$\begin{array}{l} \text{given} \\ 4.0\text{g H}_2 \end{array} \times \frac{\text{molar mass}}{2.0\text{g H}_2} \times \frac{\text{mole ratio}}{2 \text{ mol H}_2} = 1.0 \text{ mol O}_2$$

Mole \rightarrow Gram Conversion

How many grams O_2 are consumed with 2.0 mole H_2 ?

$$\begin{array}{l} \text{given} \\ 2.0 \text{ mol H}_2 \end{array} \times \frac{\text{mole ratio}}{2 \text{ mol H}_2} \times \frac{\text{molar mass}}{\text{mol O}_2} = 32\text{g O}_2$$

Gram \rightarrow Gram Conversion

How many grams O_2 are consumed with 1.0 g H_2 ?

$$\begin{array}{l} \text{given} \\ 1.0\text{g H}_2 \end{array} \times \frac{\text{molar mass}}{2.0\text{g H}_2} \times \frac{\text{mole ratio}}{2 \text{ mol H}_2} \times \frac{\text{molar mass}}{\text{mol O}_2} = 8.0\text{g O}_2$$

Percent Yield

What is the percent yield when 32.0g H_2O is formed from 2.00 mol H_2 ?

First, find theoretical yield.

$$2.00 \text{ mol H}_2 \times \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol H}_2} \times \frac{18\text{g H}_2\text{O}}{\text{mol H}_2\text{O}} = 36.0\text{g H}_2\text{O}$$

$$\% \text{ yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\% = \frac{32.0\text{g H}_2\text{O}}{36.0\text{g H}_2\text{O}} \times 100\% = 88.9\%$$

Limiting Reactant

Stoichiometrically determine how much of reactant B is required to fully react reactant A. If the given amount of reactant A is greater than the calculated amount, A is in excess. If given amount of reactant A is less than the calculated amount, A is the limiting reactant.

Given 9.0 mol H_2 and 8.0 mol O_2 , which is the limiting reactant?

$$9.0 \text{ mol H}_2 \times \frac{1 \text{ mol O}_2}{2 \text{ mol H}_2} = 4.5 \text{ mol O}_2 \quad \text{O}_2 \text{ is in excess; H}_2 \text{ is the limiting reactant.}$$