

## **Gas Law Stoichiometry**

### **Background**

- **Oxygen gas (O<sub>2</sub>) will be generated by the enzyme catalyzed decomposition of H<sub>2</sub>O<sub>2</sub>.**
- **Using the Dalton's Law, the Partial Pressure of O<sub>2</sub> is calculated.**

**The pressure, volume, and temperature of O<sub>2</sub> generated will be measured and used to calculate the moles of O<sub>2</sub> from PV = nRT**

- **Using the stoichiometric ratio (mole-mole ratio from the balanced equation), convert moles of O<sub>2</sub> to moles of H<sub>2</sub>O<sub>2</sub>.**



- **To obtain the Molarity H<sub>2</sub>O<sub>2</sub>, the moles of H<sub>2</sub>O<sub>2</sub> is divided by the volume of H<sub>2</sub>O<sub>2</sub> soln.**
- **We want to know % H<sub>2</sub>O<sub>2</sub> (by mass), OR (mass of H<sub>2</sub>O<sub>2</sub> / mass of soln ) x 100%**
- **Multiply the M H<sub>2</sub>O<sub>2</sub> by the Molar mass of H<sub>2</sub>O<sub>2</sub> and divide by the density of the solution.**

## Calculations:

- $P_{\text{total}} = P_{\text{barometric}} = P_{\text{O}_2} + P_{\text{H}_2\text{O}}$   
 $P_{\text{O}_2} = P - P_{\text{H}_2\text{O}}$
- Solve for n in  $PV = nRT$  (R = gas constant)  
 $\text{mol O}_2 = n = \frac{PV}{RT}$   
(convert units to atm, L, & K)
- $\text{mol}_{\text{H}_2\text{O}_2} = \text{mol O}_2 \times \left( \frac{2 \text{ mol H}_2\text{O}_2}{1 \text{ mol O}_2} \right)$
- $M_{\text{H}_2\text{O}_2} = \text{mol}_{\text{H}_2\text{O}_2} / L_{\text{H}_2\text{O}_2 \text{ soln}}$
- $\% \text{H}_2\text{O}_2 \text{ (by mass)} = \left( \frac{\text{mass H}_2\text{O}_2}{\text{mass soln}} \right) \times 100\%$

to get % H<sub>2</sub>O<sub>2</sub> (by mass):

$$M_{\text{H}_2\text{O}_2} \times MW_{\text{H}_2\text{O}_2} \times (1/\text{density}_{\text{H}_2\text{O}_2 \text{ soln}}) =$$
$$\left( \frac{\text{mol}_{\text{H}_2\text{O}_2}}{L_{\text{soln}}} \right) \times \left( \frac{34.02 \text{ g}_{\text{H}_2\text{O}_2}}{1 \text{ mol H}_2\text{O}_2} \right) \times \left( \frac{1 \text{ mL}_{\text{soln}}}{1 \text{ g}_{\text{soln}}} \right) \times \left( \frac{1 \text{ L}}{1000 \text{ mL}} \right)$$

- Is this sample of H<sub>2</sub>O<sub>2</sub> the 30% or 3% (by mass) concentration?