

Answer on Question #56152 - Chemistry - General Chemistry

Question:

When heated, KClO_3 solid forms solid KCl and O_2 gas. A sample of KClO_3 is heated and 365 mL of gas with a pressure of 790 mmHg is collected over water, at 26°C . At 26°C , the vapor pressure of water is 25 mmHg: $2(\text{KClO}_3)(\text{s}) \rightarrow 2(\text{KCl})(\text{s}) + 3(\text{O}_2)(\text{g})$
How many moles of O_2 were produced?

Solution:

$$p_{\text{O}_2} = p - p_{\text{steam}} = 790\text{mmHg} - 25\text{mmHg} = 765\text{mmHg} - \text{partial pressure of oxygen}$$

According to the Mendeleev-Clapeyron law $n(\text{O}_2)$ evolved during the reaction under the given conditions is:

$$n_{\text{O}_2} = \frac{p_{\text{O}_2} * V}{R * T} = \frac{765\text{mmHg} * 0,365\text{L}}{62,364 \frac{\text{mmHg} * \text{L}}{\text{mol} * \text{K}} * (26 + 273)\text{K}} = 0,015\text{mol}$$

where R - the individual gas constant $\frac{\text{mmHg} * \text{L}}{\text{mol} * \text{K}}$;

T - temperature in Kelvins;

P- pressure mmHg

Answer: 0,015 mol O_2