

Answer on Question #75911 – Chemistry – General Chemistry

Task:

Calculate the grams of oxygen gas present in a 2.50 L sample kept at 1.66 atm and a temperature of 10.0°C.

Solution:

We use the Ideal Gas equation: $PV=nRT$,

and the appropriate gas constant $R=0.0821 \text{ L}\cdot\text{atm}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$.

$$T = 10.0^\circ\text{C} + 273.15 = 283.15 \text{ K.}$$

$$n(\text{O}_2) = m(\text{O}_2) / M(\text{O}_2).$$

$$M(\text{O}_2) = 2 \cdot \text{Ar}(\text{O}) = 2 \cdot 16 = 32 \text{ g/mol.}$$

Then,

$$PV = nRT;$$

$$PV = \frac{m}{M} RT; \Rightarrow PVM = mRT;$$

$$m(\text{O}_2) = \frac{PVM(\text{O}_2)}{RT} = \frac{1.66 \text{ atm} \cdot 2.50 \text{ L} \cdot 32 \text{ g} \cdot \text{mol}^{-1}}{0.0821 \text{ L} \cdot \text{atm} \cdot \text{K}^{-1} \cdot \text{mol}^{-1} \cdot 283.15 \text{ K}} = 5.71 \text{ g}$$

$$m(\text{O}_2) = 5.71 \text{ g}$$

Answer: 5.71 g of oxygen gas present.