Answer on Question #81931 – Chemistry – General Chemistry

Question

A sample of oxygen has a volume of $384.83mL$ at STP. What is the volume of this gas at $18.0°C$?

Solution

STP means standard temperature and pressure – $273.15K$ and 10^5Pa. $18.0°C$ equals $(273.15 + 18.0)K$, or $291.15K$. For comparing the sample under two different conditions, the combined gas law can be used:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}.$$

The pressure does not change ($P_1 = P_2$), therefore it can be reduced:

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}\ (Charles's\ law).$$

Then,

$$V_2 = \frac{V_1T_2}{T_1} = \frac{384.83mL \times 291.15K}{273.15K} \approx 410.19mL.$$

Answer: $410.19mL$ is the volume of this sample at $18.0°C$.