

Answer on Question#40043-Chemistry-Other

Question

A gas has a volume of 2.50 L. When the sample is cooled in ice water at $T = 0.00$ Celcius, the volume decreases to 2.45 L. What was the initial temperature of the gas?

Solution

According to the combined gas law or general gas equation:

$$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$$

It is given that $V_1 = 2.50$ L, $V_2 = 2.45$ L, $T_2 = 0.00$ °C = 273.15 K.

Since the other is not specified, we can assume $p_1 = p_2$ and thus:

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

Hence

$$T_1 = \frac{T_2 V_1}{V_2} = \frac{273.15 \cdot 2.50}{2.45} = 278.72 \text{ K}$$

Answer: 278.72 K