

Answer on Question #64281, Chemistry / General Chemistry

A gas has a volume of 246 L, a pressure of 4.0 atm, and a temperature of 390 K. If the temperature is reduced by 45 K and the volume is decreased by 78 L, what is the new pressure of the gas?

Answer

Assume that in the state 1 the gas has the following parameters:

$$V_1 = 246 \text{ L}$$

$$P_1 = 4.0 \text{ atm}$$

$$T_1 = 390 \text{ K}$$

Then, in the state 2 the gas has new parameters:

$$V_2 = V_1 - 78 \text{ L} = 246 \text{ L} - 78 \text{ L} = 168 \text{ L}$$

$$P_2 = ?$$

$$T_2 = T_1 - 45 \text{ K} = 390 \text{ K} - 45 \text{ K} = 345 \text{ K}$$

According to the combined gas law

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

Hence,

$$P_2 = \frac{P_1 V_1}{T_1} \times \frac{T_2}{V_2} = \frac{4.0 \text{ atm} \times 246 \text{ L} \times 345 \text{ K}}{390 \text{ K} \times 168 \text{ L}} = \mathbf{5.18 \text{ atm}}$$

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