

Answer on Question #63852 - Chemistry - General Chemistry

Question:

5. Given a fixed quantity of gas at a constant temperature, calculate the new volume of the gas would occupy if the pressure changed from 5.00 atm to 2.00 atm and the volume was 3.00 L initially.

Solution:

Write the ideal gas law:

$PV=nRT$, where

P is the pressure of the gas,

V is the volume of the gas,

n is the number of moles of gas,

R is the universal gas constant,

T is the absolute temperature of the gas.

In our case temperature and number of moles is constant, so $P_0V_0 = P_1V_1$, where index 0 relates to the initial and index 1 – to the final state of the system.

So $V_1 = P_0V_0 / P_1$. The pressure is expressed in Pa, but we can notice that atm and Pa – are proportional units, so ratio of atm can be used instead of ratio of Pa.

Do the calculation:

$$V_1 = 5.00 \text{ atm} * 3.00 \text{ L} / 2.00 \text{ atm} = 7.50 \text{ L}.$$

Answer:

The new volume of the gas is 7.50 L.