

Answer on Question #51932-Physics-Field Theory

19 2 bulbs X and Y are filled with an ideal gas and connected by a capillary tube. The volume of bulb X is three times that of bulb Y. The number of gas molecules in X and Y are $2N$ and N respectively. If the temperature of the gas in Y is 300 K , what is the temperature of the gas in X

150 K

200 K

450 K

600 K

Solution

For equilibrium should be

$$P_X = P_Y,$$

where P_X is pressure of gas in bulb X, P_Y is pressure of gas in bulb Y.

The pressure is given by the formula

$$P = \frac{N}{V}kT.$$

Thus,

$$\frac{2N}{3V}kT_X = \frac{N}{V}kT_Y.$$

So, the temperature of the gas in X is

$$T_X = \frac{3}{2}T_Y = \frac{3}{2}300\text{ K} = 450\text{ K}.$$

Answer: 450 K.