

Oxygen occupies 400 Liters at 28 degree celsius at a pressure of 70 cm Hg. What will be the new volume if the new temperature and pressure at 50 degree celsius and 75 cm Hg respectively?

Solution:

To find solution of this problem we need use the Combined Gas Law. This law we can represent in the following way:

$$P_1 \cdot V_1 / T_1 = P_2 \cdot V_2 / T_2$$

where

P_1 is the initial pressure of Oxygen;

V_1 is the initial volume of Oxygen;

T_1 is the initial temperature measured (in kelvin) of Oxygen;

P_2 is the final pressure of Oxygen;

V_2 is the final volume of Oxygen;

T_2 is the final temperature measured (in kelvin) of Oxygen;

And $P_1 = 70$ cm Hg; $V_1 = 400$ L; $T_1 = 28$ C°; $P_2 = 75$ cm Hg; $T_2 = 50$ C°;

$$T_1 = 28 \text{ C}^\circ + 273 = 301 \text{ K};$$

$$T_2 = 50 \text{ C}^\circ + 273 = 323 \text{ K};$$

Then

$$V_2 = P_1 \cdot V_1 \cdot T_2 / (T_1 \cdot P_2)$$

$$V_2 = 70 \cdot 400 \cdot 323 / (301 \cdot 75) = 401 \text{ L}$$

The answer is $V_2 = 401$ L.