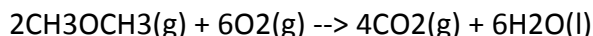


## Answer on Question #63967 - Chemistry - General Chemistry

Question:

How many liters of O<sub>2</sub>(g) measured at 295K and 763 Torr are consumed in the complete combustion of 2.55 L of dimethyl ether measured at 298K and 748 Torr.



Solution:

For this task we use the ideal gas law:

$PV=nRT$ , where

P is the pressure of the gas, Pa. Conversion of Torr to Pa: 1 Torr = 133.3 Pa.

V is the volume of the gas, m<sup>3</sup>; 1 L = 1\*10<sup>-3</sup> m<sup>3</sup>;

n is the number of moles of gas, mol;

R is the universal gas constant = 8.31 J mol<sup>-1</sup> K<sup>-1</sup>;

T is the absolute temperature of the gas, K.

First we find the number of moles of dimethyl ether that enters the reaction.

$$n = PV/RT$$

Do the calculation:

$$n = (748 * 133.3) \text{ Pa} * 2.55 * 10^{-3} \text{ m}^3 / 8.31 \text{ J mol}^{-1} \text{ K}^{-1} * 298 \text{ K} = 0.103 \text{ moles.}$$

The reaction equation tells us that 2 moles of ether react with 6 moles of oxygen.

Thus we can find how many moles of oxygen (n<sub>0</sub>) we need to burn our ether:

$$n_0 = 0.103 \text{ mol} * 6 \text{ mol} / 2 \text{ mol} = 0.309 \text{ moles}$$

Then using the gas law again we can find the volume of needed oxygen:

$$V_0 = n_0 RT_0 / P_0$$

Do the calculation:

$$V_0 = 0.309 \text{ mol} * 8.31 \text{ J mol}^{-1} \text{ K}^{-1} * 295 \text{ K} / (763 * 133.3) \text{ Pa} = 0.00745 \text{ m}^3 = 7.45 \text{ L}$$

**Answer:**

7.45 liters of oxygen.