Question #77229 - Chemistry - General Chemistry

What volume is occupied by 0.707 mol of CO_2 at 289.6 K and 911 mmhg?

Solution

First we will know the volume of CO_2 at STP:

$V_m = 22.4$ L

$V_0 = V_m \times n(CO_2) = 22.4 \times 0.707 = 15.8368$ L

Now we need to convert mm hg to the kPa:

991 mm hg = 121.46 kPa

Using the combined gas law, we give the volume of CO2 to the specified conditions:

$P_0 \times V_0 / T_0 = P \times V / T$

$V = T \times P_0 \times V_0 / P \times T_0$

$P_0 = 101.3$ kPa

$T_0 = 273$ K

$V = 289.6 \times 121.46 \times 15.8368 / 101.3 \times 273 = 14$ L

Answer

Volume is occupied by 0.707 mol of CO_2 at 289.6 K and 911 mmhg is 14 L.