Answer on Question #80442 – Chemistry – Other

Task:

How many grams of CO_2 are contained in 22.4 L of CO_2 gas at STP?

Solution:

Standard temperature at STP is zero degrees Celsius (273.15 K) and pressure of the gas at STP is 1 atmosphere (101 kPa).

R = 8.314 $J*K^{-1}*mol^{-1}$ = 0.0821 $L*atm*K^{-1}*mol^{-1}$.

So if the gas in question happens to be at STP then the calculation would be:

PV = nRT, where P is pressure, V is volume, T is temperature in Kelvin and R is the ideal gas constant.

n = m/M;

$M(CO_2)$ = Ar(C) + 2*Ar(O) = 12+2*16 = 44 g/mol

Then,

$$pV = \frac{m}{M}RT;$$

$$pVM = mRT;$$

$$m = \frac{pVM}{RT};$$

$$m = \frac{1*22.4*44}{0.0821*273.15} = 43.95\,g$$

Answer: 43.95 grams of CO_2.