Answer on Question #42379 - Chemistry - Other

Question:

A quantity of chlorine gas occupies a volume of 50L at 27c and 721kPa. How many gram of chlorine gas are present?

Answer:

The ideal gas law is:

$$PV = nRT$$

where P is the absolute pressure of the gas, V is the volume of the gas, n is the amount of substance of gas (measured in moles), R is the ideal, or universal, gas constant, and T is the absolute temperature of the gas.

Absolute pressure of chlorine gas equals:

$$P = 721\ kPa = 721000\ Pa$$

Volume of chlorine gas equals:

$$V = 50\ L = 5 \cdot 10^{-2} m^3$$

Absolute temperature of chlorine gas is:

$$T = 27\ ℃ = 300\ K$$

That's why the number of moles of chlorine gas is:

$$n = \frac{PV}{RT} = \frac{721000 \cdot 5 \cdot 10^{-2}}{8.314 \cdot 300} = 14.45\ mol$$

Mass of chlorine gas equals:

$$m = n \cdot M$$

where M is the molar mass of chlorine gas, M = 71 g/mol.

So the mass of 14.45 mol of chlorine gas equals:

$$m = 14.45 \cdot 71 = 1025.95\ g$$

Answer: m(Cl_2) = 1025.95 g.