

Answer on Question #63282 - Chemistry - General Chemistry

Question

A 100.0 L tank of He gas at -15.00°C and 5.00 atm of pressure will contain how many moles of He?

A 62.0 L tank of CO gas at -5.38°C and 2.00 atm of pressure will contain how many moles of CO?

0.0416 mol of F_2 gas inside a 45 L cylinder at 0.0°C will have what pressure in atm?

3.77 mol of N_2 gas at 39.0°C and 1.08 atm of pressure will occupy what volume in L?

Solution and answer:

The ideal gas law: $PV = \vartheta RT$

Where P – pressure in Pa

V – volume in m^3

ϑ - Amount of substance in mol

R - The gas constant $R = 8.314 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$

T – temperature in K

- $\vartheta(\text{He}) = \frac{PV}{RT} = \frac{5 \cdot 101325 \cdot 0.100}{8.314 \cdot 258.15} = 23.6 \text{ (mol)}$
- $\vartheta(\text{CO}) = \frac{PV}{RT} = \frac{2 \cdot 101325 \cdot 0.062}{8.314 \cdot 267.77} = 5.64 \text{ (mol)}$
- $P = \frac{\vartheta RT}{V} = \frac{0.0416 \cdot 8.314 \cdot 273.15}{0.045} = 2099 \text{ (Pa)} = 0.02 \text{ (atm)}$
- $V = \frac{\vartheta RT}{P} = \frac{3.77 \cdot 8.314 \cdot 312.15}{1.08 \cdot 101325} = 0.0894 \text{ (m}^3\text{)} = 89.4 \text{ (L)}$