

Answer on Question #57335 - Chemistry - Other

Question:

How many grams of ethane gas (C₂H₆) are in a 12.7 liter sample at 1.6 atmospheres and 24°C? Show all work used to solve this problem.

Answer:

Using Mendeleev-Clapeyron equation we can find the mass of given gas:

$$PV = \frac{m}{M} \times RT,$$

where P – the pressure, V - the volume, T – the absolute temperature [T(K) = 273 + T(°C)], m – the mass and M – the molecular weight, R – universal gas constant (R = 0.082057338(47) L atm/(K mol)).

According to this, the mass of ethane is defined:

$$m = \frac{M}{RT} \times PV, \text{ where}$$

$$M(\text{ethane}) = 12 + 12 + 6 = 30 \text{ g/mol}$$

$$T = 273 + 24 = 297 \text{ K}$$

$$P = 1.6 \text{ atm}$$

$$V = 12.7 \text{ L}$$

Hence, the mass of ethane is:

$$m = \frac{30}{0.08206 \times 297} \times 1.6 \times 12.7 = 25.013 \text{ g}$$