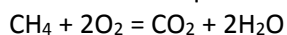


Task:

How many liters of water vapor can be produced if 8.9 liters of methane gas (CH₄) are combusted, if all measurements are taken at the same temperature and pressure?

Solution:

The chemical equation for the combustion reaction is



If the measurements are taken at STP (T=273 K, p = 1 atm), the number of moles of CH₄ is

$$n(\text{mol}) = V(\text{L}) / V_0(\text{L})$$

n- number of moles of methane

V – volume of CH₄, (L)

V₀ – molar volume of the gas at STP, (L)

$$n(\text{CH}_4) = V(\text{CH}_4) / V_0 = 8.9 / 22.4 = 0.397 \text{ mol}$$

According to the chemical equation the number of moles of water vapor is twice the number of moles of methane.

$$n(\text{H}_2\text{O}) = 2n(\text{CH}_4) = 2 \cdot 0.397 = 0.794 \text{ mol}$$

The volume of water vapor is

$$V(\text{H}_2\text{O}) = n(\text{mol}) \cdot V_0(\text{L}) = 0.794 \cdot 22.4 = 17.8 \text{ L}$$

Answer: V(H₂O) = 17.8 L