

The molar mass of ammonia (NH₃) is 17g. What is the number of moles and volume in dm³ at standard temperature and pressure (s.t.p) occupied by 1.7g ammonia molecules?

Solution:

1) As we have mass and molar mass for ammonia, we can calculate its number of moles:

$$n(\text{NH}_3) = m(\text{NH}_3) / M(\text{NH}_3) = \frac{1.7 \text{ g}}{17 \text{ g/mol}} = \mathbf{0.1 \text{ mol}} ;$$

(Where m means mass of ammonia and M means molar mass of ammonia)

2) At standard temperature and pressure (according to IUPAC: T = 273.15 K; P=1 bar) each mole of any gas occupies volume equal to 22.71 dm³ per mole. Then, 0.1 mole of ammonia will occupy volume equal to:

$$V(\text{NH}_3) = n(\text{NH}_3) * V_m = 0.1 \text{ mole} * 22.71 \text{ dm}^3/\text{mole} = \mathbf{2.271 \text{ dm}^3} ;$$

Answer:

1.7 g of ammonia contains **0.1 moles** of ammonia and occupies volume equal to **2.271 dm³**.

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