Related Problem with Solution :

Find (a) the total number and (b) the total mass of protons in 34 mg of NH_3 at STP.

Ans :

Step I. Calculation of total number ofNH_3 molecules
Gram molecular mass of ammonia (NH_3) = 17 g = 17×10^3 mg
17×10^3 mg of NH_3 have molecules = 6.022×10^{23}

$$34 \text{ mg of } NH_3 \text{ have molecules} = \frac{6{\cdot}022 \times 10^{23}}{(17 \times 10^3 \text{ mg})} \times (34 \text{ mg})$$

$$= \mathbf{1{\cdot}2044 \times 10^{20} \text{ molecules.}}$$

Step II. Calculation of total number and mass of protons
No. of protons present in one molecule of NH_3 = 7 + 3 = 10 .
No. of protons present in 12.044×10^{20} molecules of NH_3 = $12.044 \times 10^{20} \times 10$
= 1.2044×10^{22} protons
Mass of one proton = 1.67×10^{-27} kg
Mass of 1.2044×10^{22} protons = $(1.67 \times 10^{-27}$ kg) $\times 1.2044 \times 10^{22}$
= 2.01×10^{-5} kg.
No, the answer will not change upon changing the temperature and pressure because only the number of protons and mass of protons are involved.