

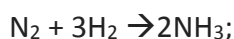
Answer on Question #55234 – Chemistry – General Chemistry

Question:

Under appropriate conditions, nitrogen and hydrogen undergo a combination reaction to yield ammonia: $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ If the reaction yield is 87.5%, how many moles of N_2 are needed to produce 3.00 mol of NH_3 ?

Solution:

v – The number of moles (mol);



$$v(\text{NH}_3) = 3.00 \text{ mol};$$

$$\mu = 87.5\%;$$

Calculate the theoretical yield of the reaction:

$$v(\text{NH}_3 \text{ theoretical}) = v(\text{NH}_3 - \text{obtained during the reaction}) / \mu;$$

$$v(\text{NH}_3 \text{ theoretical}) = \frac{v(\text{NH}_3)}{\mu}; \quad v(\text{NH}_3 \text{ theoretical}) = \frac{3}{0.875} = 3.423 \text{ mol};$$

$\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$; According to the equation: $v(\text{NH}_3 \text{ theoretical}) : v(\text{N}_2) = 2 : 1$;

$$v(\text{N}_2) = \frac{v(\text{NH}_3 \text{ theoretical})}{2} = \frac{3.423}{2} = 1.712 \text{ mol};$$

$$v(\text{N}_2) = 1.712 \text{ mol};$$

Answer: 1.712 mol.