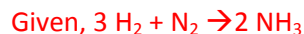


Question was:



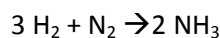
If 11.2 L of H_2 and 11.2 L of N_2 are mixed, what's the most NH_3 that can be produced? Which gas will be in excess, and how many liters will be in excess?

Solution:

Longer Method

11.2 L of an ideal gas is 0.500 moles at STP

So we have 0.500 moles of hydrogen and 0.500 moles of nitrogen.



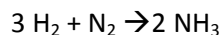
If you assume that 0.500 moles of N_2 react, then according to the ratio, you would need $3 \times 0.500 = 1.500$ moles of hydrogen. But we only have 0.500, so the N_2 can't all be reacting.

If we assume that all 0.500 moles of H_2 react, then only $0.500/3$ moles of N_2 react, which means that there will be $0.500 - 0.500/3$ leftover moles of $\text{N}_2 = 0.333\dots$ moles = 7.47 L leftover nitrogen.

Since all 0.500 moles of H_2 react, according to the ratio, $2/3(0.500)$ moles of NH_3 are produced = $0.333\dots$ moles = 7.47 L of NH_3 .

Shorter Method(L of ideal gases are proportional to moles at same T,P (avogadro's Hypothesis))

We have 11.2 L of hydrogen and 11.2 L of nitrogen.



If you assume that 11.2 L of nitrogen of N_2 react, then according to the ratio, you would need $3 \times 11.2 \text{ L} = 33.6 \text{ L}$ of hydrogen. But we only have 11.2 L, so the N_2 can't all be reacting.

If we assume that all 11.2 L of H_2 react, then only $11.2 \text{ L}/3$ moles of N_2 react, which means that there will be $11.2 - 11.2/3 = 7.47 \text{ L}$ leftover nitrogen.

Since all 11.2 L of H_2 react, according to the ratio, $2/3(11.2 \text{ L}) = 7.47 \text{ L}$ of NH_3 .