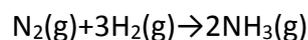


Answer on the question #55657 - Chemistry - General chemistry

Question:

Nitrogen gas reacts with hydrogen gas to produce ammonia.



If you have 3.68 g of H_2 , how many grams of NH_3 can be produced?

Express your answer with the appropriate units.

Solution:

As it can be seen from the reaction equation, the number of the moles for the NH_3 and H_2 relate as:

$$\frac{n(\text{NH}_3)}{2} = \frac{n(\text{H}_2)}{3}$$
$$n(\text{NH}_3) = \frac{2 \cdot n(\text{H}_2)}{3}$$

Then we can find the relation for masses, using the molar masses of hydrogen and ammonia:

$$\frac{m(\text{NH}_3)}{M(\text{NH}_3)} = \frac{2 \cdot m(\text{H}_2)}{3 \cdot M(\text{H}_2)}$$
$$m(\text{NH}_3) = \frac{2 \cdot m(\text{H}_2)}{3 \cdot M(\text{H}_2)} \cdot M(\text{NH}_3) = \frac{2 \cdot 3.68}{3 \cdot 2} \cdot 17 = 20.85 \text{ g}$$

One should note, that this value is calculated using several assumptions. Firstly, the amount of nitrogen for the reaction is sufficient. Secondly, the reaction is not reversible. Thirdly, the yield of the reaction is 100%. That means that all the hydrogen reacts with formation of ammonia. If these assumptions are not valid, the calculated amount of ammonia will be bigger than the experimentally measured one.

To take some of these corrections into account, the additional information is needed, namely the equilibrium constant for the reversible reaction or estimated reaction yield.

Answer: 20.85 g