Answer on Question #55192 – Chemistry – Physical Chemistry

Question:

If 13.9g N_2_ and 1.89g H_2_ react to produce 1.45g NH_3_, what is the percent yield of the reaction?

N_2_ + 3H_2_ -->2NH_3_

Solution:

ν – The number of moles (mol); m – mass (g); M – molar mass ($g*mol^{-1}$);

$\nu = \frac{m}{M}$;

M(N2) = 28 $g*mol^{-1}$; m(N2) = 13.9 g;

ν(N2) = 0.5 mol;

M(H2) = 2 $g*mol^{-1}$; m(H2) = 1.89 g;

ν(H2) = 0.945 mol;

According to the equation: N2 + 3H2 → 2NH3; ν(N2) : ν(H2) = 1 : 3;

In our case: ν(N2) : ν(H2) = 0.5 : 0.945 = 1 : 2;

Therefore, we get an excess of N2. The limited reagent is H2.

Calculate the theoretical yield of the reaction:

ν(H2) : ν(NH3) = 3 : 2;

$\nu(NH3) = \frac{2\nu(H2)}{3} = \frac{2*0.945}{3}$ = 0.63 mol;

M(NH3) = 17 $g*mol^{-1}$;

m(NH3 theoretical) = 10.71 g;

μ - the percent yield of the reaction (%);

μ = m(NH3)/m(NH3 theoretical);

μ = 13.5%

Answer: 13.5%