Answer on the question #41591, Chemistry, Inorganic Chemistry

Question:

20. Ammonia is manufactured by the reaction of N2 and H2. An equilibrium mixture contains 5.0 g of
each N2, H2 and NH3. Calculate mass of N2 and H2 present initially.

Solution:

$$N_2 + 3H_2 = 2NH_3$$

According to the reaction equation, the amounts of nitrogen, hydrogen and ammonia relate as:

$$\mathrm{n}(\mathrm{N_2}) = \frac{\mathrm{n}(\mathrm{H_2})}{3} = \frac{\mathrm{n}(\mathrm{NH_3})}{2}$$

Initial mass of nitrogen and hydrogen can be calculated as the sum of equilibrium mass and mass , that reacted with ammonia formation:

$$\mathrm{m(initial)} = [\mathrm{m}] + \frac{\mathrm{n}(\mathrm{NH_3})}{\mathrm{i}} * M$$

where *i* – coefficient, that encounters stechiometric relations, *M* – molar mass of the substance.

$$\mathrm{m}(\mathrm{N_2})_{ini} = [\mathrm{N_2}] + \frac{\mathrm{n}(\mathrm{NH_3})}{2} * \mathrm{M}(\mathrm{N_2}) = [\mathrm{N_2}] + \frac{\mathrm{m}(\mathrm{NH_3})}{2 * \mathrm{M}(\mathrm{NH_3})} * \mathrm{M}(\mathrm{N_2}) = 5 + \frac{5}{2 * 17} * 28$$
$$= 9.12\ \mathrm{g}$$

$$\mathrm{m}(\mathrm{H_2})_{ini} = [\mathrm{H_2}] + \mathrm{m}(\mathrm{NH_3}) - \mathrm{n}(\mathrm{NH_3})/2 * \mathrm{M}(\mathrm{N_2}) = 5 + 5 - 4.12 = 5.88\ \mathrm{g}$$

Answer: 9.12 and 5.88 g