Answer on Question #76590 – Chemistry – Other

Task:

Chloroform ($CHCl_3$), an important solvent, is produced by a reaction between methane and chlorine.

$$CH_4(g) + 3Cl_2(g) = CHCl_3(g) + 3HCl(g)$$

How many grams of CH_4 is needed to produce 37.5 g $CHCl_3$?

Solution:

$$M(CH_4) = 16.04\,{}^{g}\!/_{mol};$$
$$M(CHCl_3) = 119.38\,{}^{g}\!/_{mol}.$$

The reaction equation:

$$CH_4(g) + 3Cl_2(g) = CHCl_3(g) + 3HCl(g)$$

By the equation of the chemical reaction: $n(CH_4)=n(CHCl_3)$.

$$n(CH_4) = \frac{m(CH_4)}{M(CH_4)}$$
$$n(CHCl_3) = \frac{m(CHCl_3)}{M(CHCl_3)}.$$

Then,

$$\frac{m(CH_4)}{M(CH_4)} = \frac{m(CHCl_3)}{M(CHCl_3)};$$
$$m(CH_4) = \frac{m(CHCl_3) * M(CH_4)}{M(CHCl_3)};$$
$$m(CH_4) = \frac{37.5 * 16.04}{119.38} = 5.038 \approx 5.04g$$

Answer: $m(CHCl_3) = 5.04$ g

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