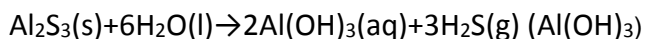


Answer on Question#55666 – Chemistry – General Chemistry

Question:

For each of the following reactions, calculate the grams of indicated product when 16.9 g of the first reactant and 10.4 g of the second reactant is used:



Solution:

$$m(\text{Al}_2\text{S}_3) = 16.9 \text{ g};$$

$$m(\text{H}_2\text{O}) = 10.4 \text{ g};$$

$$m(\text{Al}(\text{OH})_3) = ?$$

$$M(\text{Al}_2\text{S}_3) = 150 \text{ g/mol};$$

$$M(\text{H}_2\text{O}) = 18 \text{ g/mol};$$

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

n – the amount of substance (mol);

m – the mass (g);

M – the molar mass ($\text{g} \cdot \text{mol}^{-1}$);

According to the equation $n(\text{Al}_2\text{S}_3) : n(\text{H}_2\text{O}) = 1:6$;

$$n(\text{Al}_2\text{S}_3) = 0.113 \text{ mol};$$

$$n(\text{H}_2\text{O}) = 0.578 \text{ mol};$$

$$n(\text{Al}_2\text{S}_3) : n(\text{H}_2\text{O}) = 1 : 5.1;$$

In this case, we have an excess of Al_2S_3 . We need 12.168 g of H_2O to react with 16.9 g of Al_2S_3 . In this reaction, H_2O is a limiting reactant.

According to the equation: $n(\text{H}_2\text{O}) : n(\text{Al}(\text{OH})_3) = 6:2 = 3:1$;

$$n(\text{Al}(\text{OH})_3) = 0.193 \text{ mol};$$

$$M(\text{Al}(\text{OH})_3) = 78 \text{ g/mol};$$

$$m = nM;$$

$$m(\text{Al}(\text{OH})_3) = 15.022 \text{ g};$$

Answer: 15.022 g.