Answer on Question #63303 – Chemistry – General Chemistry
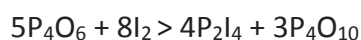
Task:

What is the maximum mass of P_2I_4 that can be prepared from 8.62 g of P_4O_6 and 10.18 g of iodine according to the reaction?

$$5P_4O_6 + 8I_2 > 4P_2I_4 + 3P_4O_{10}$$

Solution:

Equation for the reaction:

$$5P_4O_6 + 8I_2 > 4P_2I_4 + 3P_4O_{10}$$

We can use stoichiometry to calculate how much product is produced by each reactant.

$$8.62g\ P_4O_6 \times \frac{1\,mol\ P_4O_6}{220g\ P_4O_6} \times \frac{4\,mol\ P_2I_4}{5\,mol\ P_4O_6} \times \frac{570g\ P_2I_4}{1\,mol\ P_2I_4} = 17.867g\ P_2I_4;$$

$$10.18g\ I_2 \times \frac{1\,mol\ I_2}{254g\ I_2} \times \frac{4\,mol\ P_2I_4}{8\,mol\ I_2} \times \frac{570g\ P_2I_4}{1\,mol\ P_2I_4} = 11.422g\ P_2I_4;$$

The reactant that produces the lesser amount of product in this case is the iodine, which is this "limiting reactant."

Then, the maximum mass of P_2I_4 = 11.422g

Answer: 11.422 is the maximum mass of P_2I_4 that can be prepared.