Answer on Question - #72649 - Chemistry / General Chemistry |

Question:
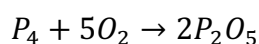How many grams of Diphosphorus Pentoxide result if 100.0 g of Phosphorus are combined with sufficient Oxygen?

A. 100.0 g P2O5
B. 114.5 g P2O5
C. 142.1 g P2O5
D. 228.9 g P2O5
E. None of the Above
use the following: Phosphorus (P4) burns in Oxygen (O2) to form Diphosphorus Pentoxide.

Solution:
Let's write the reaction equation:

$$P_4 + 5O_2 \rightarrow 2P_2O_5$$

According to this equation, the number of the moles of phosphorus and phosphorus oxide is related in the following way:

$$n(P_4) = \frac{n(P_2O_5)}{2}.$$

The number of the moles is related to the mass of the sample:

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

Thus, we can relate the masses of phosphorus and phosphorus oxide:

$$\frac{m(P_4)}{M(P_4)} = \frac{m(P_2O_5)}{2M(P_2O_5)}.$$

Consequently, from 100g of phosphorus we can get:

$$m(P_2O_5) = 2M(P_2O_5) \cdot \frac{m(P_4)}{M(P_4)} = 2 \cdot 283.886 \left(\frac{g}{mol}\right) \cdot \frac{100 \, (g)}{123.895 \left(\frac{g}{mol}\right)} = 458.3 \, (g).$$

Answer: 458.3 (g), None of the above

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