

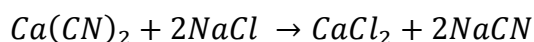
Answer on the question #64999, Chemistry / Physical Chemistry

Question:

What is the theoretical yield of NaCN if 174g of Ca(CN)₂ are reacted in the following reaction:
 $\text{Ca(CN)}_2 + \text{NaCl} \rightarrow \text{CaCl}_2 + \text{NaCN}$

Solution:

First, we write the balanced equation:



As one can notice, the number of the moles of calcium cyanide and sodium cyanide relate as 1/2:

$$n(\text{Ca(CN)}_2) = \frac{n(\text{NaCN})}{2}$$

Then, we can calculate the theoretical mass of sodium cyanide as a product of number of the moles and molar mass $n(\text{NaCN}) \cdot M(\text{NaCN})$:

$$m(\text{NaCN}) = n(\text{NaCN}) \cdot M(\text{NaCN}) = 2n(\text{Ca(CN)}_2) \cdot M(\text{NaCN})$$

As the number of the moles of calcium cyanide is the ratio of its mass to its molar mass:

$$n(\text{Ca(CN)}_2) = \frac{m(\text{Ca(CN)}_2)}{M(\text{Ca(CN)}_2)}$$

$$m(\text{NaCN}) = 2 \frac{m(\text{Ca(CN)}_2)}{M(\text{Ca(CN)}_2)} \cdot M(\text{NaCN})$$

The molar mass of NaCN is 49.0072 g/mol, the molar mass of calcium cyanide is 92.1128 g/mol.

$$m(\text{NaCN}) = 2 \frac{174(\text{g})}{92.1128(\text{g mol}^{-1})} \cdot 49.0072(\text{g mol}^{-1})$$
$$m(\text{NaCN}) = 185 \text{ g}$$

Answer: 185 (g)

Answer provided by <https://www.AssignmentExpert.com>