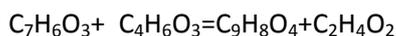
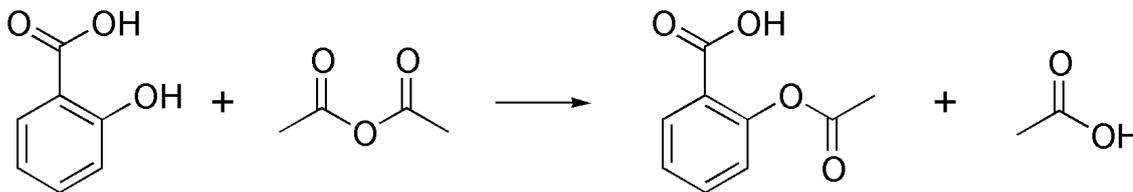


If 10.0 g of salicylic acid reacts with 25.0g of acetic anhydride, what is the theoretical yield of aspirin?

Solution:



Firstly, we determine the molar mass of reactants and products:

the molar mass of salicylic acid $M(\text{C}_7\text{H}_6\text{O}_3) = 138.12 \text{ g/mol}$;

the molar mass of acetic anhydride $M(\text{C}_4\text{H}_6\text{O}_3) = 102.09 \text{ g/mol}$;

the molar mass of aspirin $M(\text{C}_9\text{H}_8\text{O}_4) = 180.16 \text{ g/mol}$.

After that we calculate a limit quantity of reactants:

a quantity of salicylic acid $\frac{10.0}{138.12} = 0.07 \text{ mole}$,

a quantity of acetic anhydride $\frac{25.0}{102.09} = 0.24 \text{ mole}$.

So, the quantity of salicylic acid is limited.

We calculate the theoretical yield of aspirin for the quantity moles of salicylic acid. From the equation of reaction one mole of salicylic acid produce one mole of aspirin. So, the theoretical yield of aspirin is: $0.07 \cdot 180.16 = 12.61 \text{ g}$.

Answer:

The theoretical yield of aspirin is 12.61 g.