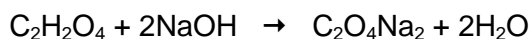


Question 1

Oxalic acid reacts with sodium hydroxide. The equation for the reaction is:



oxalic acid + sodium hydroxide \rightarrow sodium oxalate + water

Calculate the **maximum mass** of sodium oxalate, $\text{C}_2\text{O}_4\text{Na}_2$, which could be made from 17.0g of sodium hydroxide.

$$M(\text{C}) = 12.0 \text{ g mol}^{-1} \quad M(\text{H}) = 1.00 \text{ g mol}^{-1} \quad M(\text{O}) = 16.0 \text{ g mol}^{-1} \quad M(\text{Na}) = 23.0 \text{ g mol}^{-1}$$

$$\text{Molar mass for NaOH} = 23 + 16 + 1 = 40 \text{ g mol}^{-1}$$

$$\text{amount of NaOH} = 17 \text{ g} \div 40 \text{ g mol}^{-1} = 0.425 \text{ mol}$$

$$\text{NaOH} : \text{C}_2\text{O}_4\text{Na}_2 = 2 : 1$$

$$\text{amount of C}_2\text{O}_4\text{Na}_2 = 0.425 \text{ mol} \div 2 = 0.2125 \text{ mol}$$

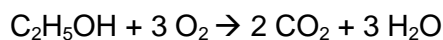
$$\text{Molar mass for C}_2\text{O}_4\text{Na}_2 = 12 \times 2 + 16 \times 4 + 23 \times 2 = 134 \text{ g mol}^{-1}$$

$$0.2125 \text{ mol} \times 134 \text{ g mol}^{-1} = 28.5 \text{ g}$$

The maximum mass of sodium oxalate formed is 28.5 g

Question 2

What mass of CO_2 is produced in the complete combustion of 34.5 g of ethanol according to the equation?



$$M(\text{C}) = 12.0 \text{ g mol}^{-1} \quad M(\text{H}) = 1.00 \text{ g mol}^{-1} \quad M(\text{O}) = 16.0 \text{ g mol}^{-1}$$

$$\text{Molar mass for ethanol} = 12 \times 2 + 1 \times 6 + 16 = 46 \text{ g mol}^{-1}$$

$$\text{amount of ethanol} = 34.5 \text{ g} \div 46 \text{ g mol}^{-1} = 0.75 \text{ mol}$$

$$\text{ethanol} : \text{CO}_2 = 1 : 2$$

$$\text{amount of CO}_2 = 0.75 \text{ mol} \times 2 = 1.5 \text{ mol}$$

$$\text{Molar mass for CO}_2 = 12 + 16 \times 2 = 44 \text{ g mol}^{-1}$$

$$1.5 \text{ mol} \times 44 \text{ g mol}^{-1} = 66.0 \text{ g}$$

The mass of CO_2 is produced is 66.0 g