Chemistry 2.1 **Worksheet 4** Name _____ MR/ YP

Question 1

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

$$C_2H_2O_4 + 2NaOH \rightarrow C_2O_4Na_2 + 2H_2O$$

oxalic acid + sodium hydroxide → sodium oxalate + water

Calculate the **maximum mass** of sodium oxalate, $C_2O_4Na_2$, which could be made from 17.0g of sodium hydroxide.

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

Molar mass for NaOH = 23 + 16 + 1 = 40 gmol^{-1}
amount of NaOH 17 g ÷ 40 gmol^{-1} = 0.425 mol
NaOH : $C_2O_4Na_2$ = 2 : 1
amount of $C_2O_4Na_2$ = 0.425 mol ÷ 2 = 0.2125 mol
Molar mass for $C_2O_4Na_2$ = 12 × 2 + 16 × 4 + 23 × 2 = 134 gmol^{-1}
0.2125 mol × 134 gmol^{-1} = 28.5 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?

$$C_2H_5OH + 3\ O_2 \rightarrow 2\ CO_2 + 3\ H_2O$$

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

Molar mass for ethanol = 12 × 2 + 1 × 6 + 16 = 46 gmol^{-1}
amount of ethanol = 34.5 g ÷ 46 gmol^{-1} = 0.75 mol
ethanol : CO_2 = 1 : 2
amount of CO_2 = 0.75 mol × 2 = 1.5 mol
Molar mass for CO_2 = 12 + 16 × 2 = 44 gmol^{-1}
1.5 mol × 44 gmol^{-1} = 66.0 g

The mass of CO_2 is produced is 66.0 g