

### Question #80829

What is the maximum amount of ethanol that may be formed from 165 g carbon, 30.8 g hydrogen and 126 g of oxygen.

Answer:

The maximum amount of ethanol that may be formed from that quantities of carbon, hydrogen and oxygen, is equal to 235.98 g.

First of all, it is necessary to find out, which one element is the limited reactant:

$$\nu(C) = \frac{165}{12} = 13.75 \text{ moles}$$

$$\nu(H_2) = \frac{30.8}{2} = 15.4 \text{ moles}$$

$$\nu(O_2) = \frac{126}{32} = 3.9375 \text{ moles}$$

According to the chemical formula of ethanol ( $C_2H_5OH$ ) it is necessary 2 moles of carbon, 3 moles of hydrogen and 0.5 moles of oxygen to get 1 mole of alcohol. So, to find out, which one of that elements is the limited reactant, it is necessary to divide previous results on the number of moles per 1 mole of ethanol:

$$\nu(C) = \frac{13.75}{2} = 6.875 \text{ moles}$$

$$\nu(H_2) = \frac{15.4}{3} = 5.13 \text{ moles}$$

$$\nu(O_2) = \frac{7.875}{0.5} = 15.75 \text{ moles}$$

So, the limited reactant is hydrogen. The maximum amount of ethanol that may be formed from that quantities of carbon, hydrogen and oxygen, is equal to:

$$m(C_2H_5OH) = 5.13 * (2 * 12 + 6 * 1 + 1 * 16) = 235.98 \text{ g}$$

So, the maximum amount of ethanol that may be formed from that quantities of carbon, hydrogen and oxygen, is equal to 235.98 g.

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