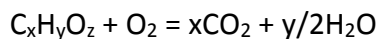


Question #63812, Chemistry / Other

A compound containing only carbon, hydrogen and oxygen was analyzed by combustion analysis. Combustion of a 10.68 g sample of the compound in excess oxygen gives 16.01 g CO₂ and 4.37 g H₂O. The molar mass of the compound is between 170 and 180 g/mol. What is the molecular formula of this compound?

Solution:



$$n(C) = n(CO_2) = \frac{16.01 \text{ g}}{44.04 \text{ g/mol}} = 0.364 \text{ mol}$$

$$n(H) = 2n(H_2O) = \frac{2 \times 4.37 \text{ g}}{18.00 \text{ g/mol}} = 0.486 \text{ mol}$$

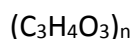
$$m(C) = 0.364 \text{ mol} \times 12.001 \frac{\text{g}}{\text{mol}} = 4.368 \text{ g}$$

$$m(H) = 0.486 \text{ mol} \times 1.002 \frac{\text{g}}{\text{mol}} = 0.486 \text{ g}$$

$$m(O) = 10.68 \text{ g} - 4.368 \text{ g} - 0.486 \text{ g} = 5.826 \text{ g}$$

$$n(O) = \frac{5.826 \text{ g}}{15.999 \text{ g/mol}} = 0.364 \text{ mol}$$

$$C : H : O = 0.364 : 0.486 : 0.364 = 1 : 1.33 : 1 = 3 : 4 : 3$$



$$M(C_3H_4O_3) = 12 \times 3 + 4 \times 1 + 3 \times 16 = 88 \text{ g/mol}$$

$$n = \frac{180 \text{ g/mol}}{88 \text{ g/mol}} = 2.045 \approx 2$$

Formula is (C₃H₄O₃)_n = **C₆H₈O₆**