Combustion Analysis Worksheet

Combustion Analysis Process

Given:

Mass of hydrocarbon (unnecessary) Mass of O₂ Mass of CO₂ Mass of H₂O Mass of N₂ (possibly)

Find:

Empirical formula of hydrocarbon

- Convert mass of CO₂ to moles of carbon atoms.
 calculation yields moles of carbon in hydrocarbon sample.
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- 2. Convert mass of H_2O to moles of hydrogen atoms.
 - because there are two moles of hydrogen to one mole of water, multiply result by 2 to yield moles of hydrogen in hydrocarbon sample.
- 3. Convert mass of N_2 to moles of nitrogen atoms.
 - because there are two moles of nitrogen atoms in one mole of nitrogen molecules, multiply result by 2 to yield moles of nitrogen in hydrocarbon sample.
- 4. Calculate moles of oxygen atoms used from molecular oxygen. - moles of oxygen = $\frac{1}{2} \times \text{moles of } O_2$
- 4. Calculate **moles of oxygen in products**. - moles of oxygen = $2 \times$ moles of CO₂ + moles of H₂O
- 5. Calculate moles of oxygen in hydrocarbon

 moles of hydrocarbon oxygen = moles of oxygen in products moles of oxygen used
- 6. Divide molar amounts by smallest of the values to find molar ratios in terms of whole numbers.

Combustion Analysis Problems

- 1. A hydrocarbon fuel is fully combusted with 18.214 g of oxygen to yield 23.118 g of carbon dioxide and 4.729 g of water. Find the empirical formula for the hydrocarbon.
- 2. After combustion with excess oxygen, a 12.501 g of a petroleum compound produced 38.196 g of carbon dioxide and 18.752 of water. A previous analysis determined that the compound does not contain oxygen. Establish the empirical formula of the compound.
- 3. In the course of the combustion analysis of an unknown compound, 12.923 g of carbon dioxide, 6.608 g of water and 2.057 g of nitrogen was measured. The complete combustion of 11.014 g of the compound needed 10.573 g of oxygen. What the compound's empirical formula?
- 4 12.915 g of a biochemical substance was burned in an atmosphere of 50.123 g of oxygen. Subsequent analysis of the gaseous result yielded 18.942 g carbon dioxide, 7.749 g of water and 36.347 g of oxygen. Determine the empirical formula of the substance.
- 5. 33.658 g of oxygen was used to completely react with a sample of a hydrocarbon in a combustion reaction. The reaction products were 33.057 g of carbon dioxide and 10.816 g of water. Ascertain the empirical formula of the compound.