

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

1. Convert mass of CO₂ to **moles of carbon atoms**.
 - calculation yields moles of carbon in hydrocarbon sample.
2. Convert mass of H₂O 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 N₂ 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 = $\frac{1}{2} \times$ moles of O₂
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.