Combustion Analysis

Technique used to determine the amount of carbon and hydrogen in combustible compounds.

- All the carbon in the sample is converted into _____.
- All the hydrogen in the sample is converted into _____.
- How do we use this knowledge?
  - Determine the # moles of CO_2 and H_2O
  - Determine the # moles of C and H
  - Determine the mole ratio of C to H→empirical formula
- What if there is another element in the compound?
  - After determining the # moles of C and H, find out how many grams of each this corresponds to
  - Total mass of compound - (g of C + g of H) = mass of other element

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Example #1:

3.47g of a compound containing C, H, and F was burned. 7.51g CO_2 and 3.08g H_2O were recovered. What is the empirical formula of the compound?

Molar masses: CO_2=44.01g/mol H_2O=18.016g/mol
C=12.011g/mol H=1.01g/mol O=16.00g/mol

Empirical Formula= $C_xH_yF_z$ What are *x*, *y*, and *z*?

Try this one!

A 1.00-gram sample if vitamin C (which contains only C, H, and O) was subjected to combustion analysis; 1.50 grams of CO_2 and 0.41 grams of H_2O were produced. The molecular weight of vitamin C is 176.12. Determine the molecular formula of vitamin C.

Molar masses: CO_2=44.01g/mol H_2O=18.016g/mol
C=12.011g/mol H=1.01g/mol O=16.00g/mol

Moles of CO_2 produced

Moles of C in original sample

Mass of C in original sample

Moles of H_2O produced

Moles of H in original sample

Mass of H in original sample

Mass of oxygen (obtained by difference):

Moles of oxygen in original sample

Mole ratios (divide each by the smallest):

Carbon:

Hydrogen:

Oxygen:

Empirical Formula= C H O