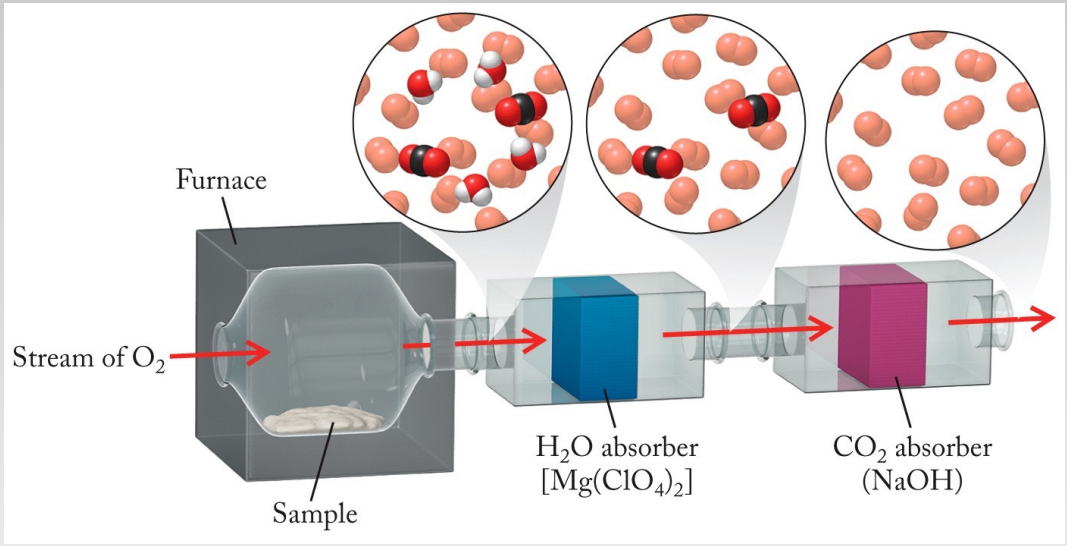
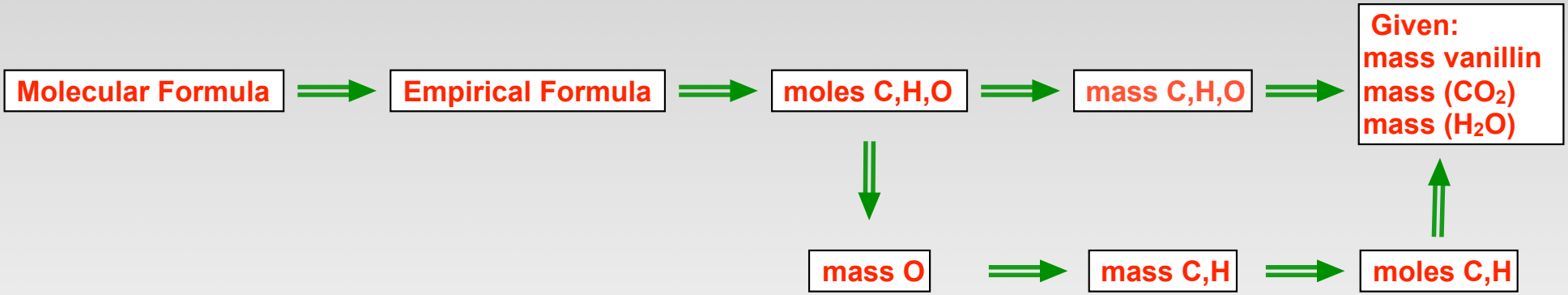
Combustion Analysis



The combustion analysis gives you the number of moles of carbon and hydrogen that are being produced during combustion.
It allows to calculate the number of moles for a third unknown like oxygen or nitrogen.

Combustion Analysis

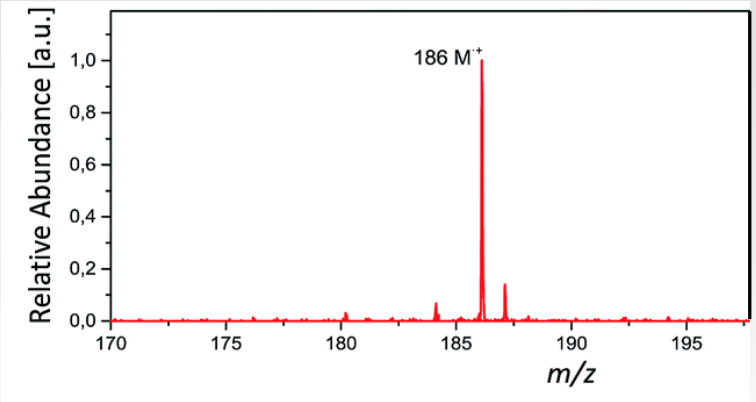
Example: Vanillin is a compound containing carbon, hydrogen and oxygen. The combustion of 30.4 mg of vanillin produces 70.4 mg CO_2 and 14.4 mg H_2O. The mass spectrum of vanillin shows a molecular-ion line at 152 amu. Use this information to determine the molecular formula of vanillin.



Homework (see worksheet)

The very first organometallic molecule discovered was an iron containing hydrocarbon called ferrocene. Combustion analysis and mass spectrometry were essential in ascertaining its structure. Ferrocene contains C, H and Fe

Question: You burn 21.21g of ferrocene and capture 50.41 of CO_2 and 10.32 g of H_2O. Determine the molecular formula with the help of the mass spectrum of ferrocene.



Reaction Stoichiometry

In photosynthesis, plants convert carbon dioxide and water into glucose according to the reaction

$$6CO_2(g) + 6H_2O(l) \xrightarrow{\text{Sunlight}} C_6H_{12}O_6(aq) + 6O_2(g)$$

Suppose you determine that a particular plant consumes 37.8g CO_2 in one week. Assuming that there is more than enough water present to react all the CO_2, what mass of glucose (in grams) can the plant synthesize from the CO_2?

Reaction Stoichiometry

Nitric acid, HNO_3, is a component of acid rain, which forms when NO_2 reacts with oxygen and water.

The generation of electricity used by a medium-sized home produces about 16 kg of NO_2 per year. Assuming that there is adequate O_2 and H_2O, what mass of HNO_3 (in kg) can form from this amount of NO_2 pollutant?