Lecture Notes: More Stoichiometric Calculations

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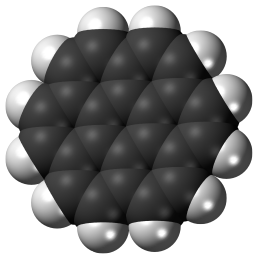
Review From Problem Set

Coronene is a compound that contains **ONLY** carbon and hydrogen. The space-filling model for this compound is shown below. Combustion analysis of a 1.3g sample of coronene produces 4.58 g of CO_2 and 0.45 g of H_2O. The molar mass of coronene is 300.35 g/mol.



a) Using this information, determine the empirical and molecular formulas of coronene.

b) Another compound with yields the exact same combustion data as coronene, however, has a mass of 100.12 g/mol. Propose a molecular formula for this compound.

Stoichiometric Calculations

Problem 1: Mass of Reactants Needed to Produce Product

Over the years, the thermite reaction has been used for welding railroad rails, in incendiary bombs, and to ignite solid-fuel rocket motors. The reaction is

$$Fe_2O_3(s) + 2\,Al(s) \longrightarrow 2\,Fe(l) + Al_2O_3(s)$$

What masses of Fe_2O_3 and aluminum must be used to produce 15.0 g iron? What is the maximum mass of aluminum oxide that could be produced?

Problem 2: From Volume to Mass Produced

a) Write the balanced equation for the combustion of isooctane (C_8H_{18}) to produce water vapor and carbon dioxide.

b) Assuming that gasoline is made up of 100% isooctane, with a density of 0.692 g/mL, what mass of carbon dioxide is produced by the combustion of 1.2×10^{10} gal of gasoline (the approximate annual consumption of gasoline in the United States)?