

4 • Chemical Equations and Stoichiometry

CHEMICAL ANALYSIS

Do all of your work on another sheet of paper.

Answers to the numbered problems are located in the back of your textbook.

Chemical Analysis

32. A mixture of CuSO_4 and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ has a mass of 1.245 g, but, after heating to drive off all the water, the mass is only 0.832 g. What is the weight percent of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in the mixture?
34. A 1.25-g sample contains some of the very reactive compound $\text{Al}(\text{C}_6\text{H}_5)_3$. On treating the compound with aqueous HCl , 0.951 g of C_6H_6 is obtained.
- $$\text{Al}(\text{C}_6\text{H}_5)_3(\text{s}) + 3\text{HCl}(\text{aq}) \rightarrow \text{AlCl}_3(\text{aq}) + 3\text{C}_6\text{H}_6(\text{l})$$
- Assuming that $\text{Al}(\text{C}_6\text{H}_5)_3$ was converted completely to products, what is the weight percent of $\text{Al}(\text{C}_6\text{H}_5)_3$ in original 1.25-g sample?

Determination of Empirical Formulas

36. Styrene, the building block of polystyrene, is a hydrocarbon, a compound consisting only of C and H. If 0.438 g of styrene is burned in oxygen and produces 1.481 g of CO_2 and 0.303 g of H_2O , what is the empirical formula of styrene?
38. Menthol, from the *oil of mint*, has a characteristic cool taste. The compound contains only C, H, and O. If 95.6 mg of menthol burns completely in O_2 , and gives 269 mg of CO_2 and 110 mg of H_2O , what is the empirical formula of menthol?
40. Silicon and hydrogen form a series of compounds with the general formula Si_xH_y . to find the formula of one of them, a 6.22-g sample of the compound is burned in oxygen. On doing so, all of the Si is converted to 11.64 g of SiO_2 and all of the H to 6.980 g of H_2O . What is the empirical formula of the silicon compound?

AP Question

An organic compound was synthesized and found to contain only C, H, N, O, and Cl. It was observed that when a 0.150-g sample of the compound was burned, it produced 0.138 g of CO_2 and 0.0566 g of H_2O . All the nitrogen in a different 0.200-g sample of the compound was converted to NH_3 , which was found to have a mass of 0.0238 g. Finally, the chlorine in a 0.125-g sample of the compound was converted to AgCl . The AgCl , when dried, was found to weigh 0.251 g.

- Calculate the percent by mass of each element in the compound.
- Determine the empirical formula for the compound.