Emperical Formula, Molecular Formula
and Percent Composition Calculations

1. Analysis of a compound of potassium, sulphur, and oxygen gave the following results:
    K 41.02 %
    S 33.69 %
    O 25.29 %
    What is the empirical formula of the compound?

2. A 3.000 g sample of a compound was analyzed and was found to consist of
    0.853 g Na
    0.962 g Cr
    l.185 g O
    Determine the empirical formula of the compound.

3. Caffeine is a stimulant found in coffee, tea, cola drinks, and chocolate. Analysis of caffeine shows that it consists of 49.48 % carbon, 5.197 % hydrogen, 28.85% nitrogen, and 16.48 % oxygen by mass. Determine the empirical formula of caffeine.

4. During the operation of a car battery, lead sulphate forms on the battery plates. Analysis of this compbund shows that it consists of 68.3 % lead, l0.6 % sulphur and 21.l % oxygen by mass. What is the empirical formula of lead sulphate?

5. Lactic acid is the substance responsible for the taste of sour milk. Analysis of a sample of lactic acid shows that its percentage composition by mass is 40.00 % carbon, 6.71 % hydrogen, and 53.29 % oxygen. lf the molar mass of lactic acid is found to be 90 g, determine the molecular formula of lactic acid.

6. A sample of a liquid used in dry-cleaning was found to consist of 10.06 % carbon (by mass), 89.l0 % chlorine, with the remainder being hydrogen. The molar mass of the compound was determined to be 119.6 g. What is the molecular formula of the compound?

7. Analysis of vanillin, the compound responsible for the vanilla favour, showed tha the compound consisted of 63.2 % carbon, 5.26 % hydrogen, and 31.6 % oxygen by mass. Determine the empirical formula of vanillin.

8. Analysis of a compound shows that it consisted of 49.0 % carbon, 2.72 % hydrogen and 48.3% chlorine by mass. ln a separate experiment, the molar mass of the compound was determined to be 147 g. What is the molecular formula of the compound?

9.   The formula of the artificial sweetener, saccharin, is $C_7H_5NO_3S$.
     Determine the percentage by mass of each element in the
     compound.

10. Lithium carbonate, Li_2CO_3, and lithium sulphate, Li_2SO_4, are
     drugs used in the treatment of manic-depression. lf the
     effectiveness of the medication depends on the percentage of
     lithium in the compound, show by calculation which compound is
     more effective for any given mass.

11. The formula of the antibiotic penicillin is $C_{16}H_{18}O_4N_2S$. Determine
     the percentage by mass of each element in the compound.