

A sample was decomposed in the laboratory and found to have 38.67g C, 16.22g H, and 45.11g N.

a) Find the molecular formula of this compound if the Formula mass is 62.12

g/mole.

b) Determine how many H atoms would be in a 3.50g sample of this compound.

Solution:

a) Find the number of atoms in the compound :

$$C:H:N = \frac{m(C)}{M(C)} : \frac{m(H)}{M(H)} : \frac{m(N)}{M(N)}$$

$$C:H:N = \frac{38.67g}{12g/mole} : \frac{16.22g}{1g/mole} : \frac{45.11}{14g/mole}$$

$$C:H:N = 3.22: 16.22: 3.22 = 1: 5: 1$$

Empirical formula: CH₅N

Find the molecular formula:

$$\frac{62.12g/mole}{12g/mole + 1g/mole + 14g/mole} = 2$$

So. the molecular formula = C₂H₁₀N₂

b) Find the amount of the substance of this compound:

$$n(C_2H_{10}N_2) = \frac{m(C_2H_{10}N_2)}{M(C_2H_{10}N_2)}$$

$$n(C_2H_{10}N_2) = \frac{3.50g}{62.12g/mole} = 0.056 \text{ mole}$$

1 mole of the compound contains 10 * 6.02 * 10²³ = 60.2 * 10²³ of H

0.056 mole of the compound contains 0.056mole * 60.2 * 10²³ = 3.37 * 10²³ of H