John Dalton (1803) stated, "'When two elements combine with each other to form two or more compounds, the ratios of the masses of one element that combines with the fixed mass of the other are simple whole numbers'.

**Example**

- Carbon monoxide (\((CO)\)): 12 parts by mass of carbon combines with 16 parts by mass of oxygen.
- Carbon dioxide (\((CO_2)\)): 12 parts by mass of carbon combines with 32 parts by mass of oxygen.

Ratio of the masses of oxygen that combines with a fixed mass of carbon (12 parts): 16:32 or 1:2

Hydrogen and oxygen are known to form 2 compounds. The hydrogen content in one is 5.93%, and that of the other is 11.2%. Show that this data illustrates the law of multiple proportions.

**Solution**

In the first compound: hydrogen = 5.93%

Oxygen = \((100 - 5.93) = 94.07\%\)

In the first compound the number of parts of oxygen that combine with one part by mass of hydrogen

\(\frac{94.07}{5.93}=15.86\) parts

In the second compound: hydrogen = 11.2%

Oxygen = \((100 - 11.2) = 88.88\%\)

In the second compound the number of parts by mass of oxygen that combine with one part by mass of hydrogen

\(\frac{88.8}{11.2}=7.9\) parts

Ratio of the masses of oxygen that combine with fixed mass of hydrogen: 15.86:7.9 or 2:1. This is consistent with the law of multiple proportions.