

Answer to the Question#47300-Chemistry, Other

Question:

Two samples of carbon tetrachloride were decomposed into their constituent elements. One sample produced 38.9g of carbon and 448 g of chlorine, and the other sample produced 14.8 g of carbon and 134 g of chlorine. Are these results consistent with the law of definite proportions? Show why or why not.

Solution:

The Law of definite proportions, sometimes called Proust's Law, states that a chemical compound always contains exactly the same proportion of elements by mass. We must remember that the Law of definite proportions is not universally true. According to Law of definite proportions all samples of carbon tetrachloride must have the same elemental composition by mass. Let's check this statement.

The mass ratio of chlorine and carbon in the first sample:

$$(\text{mass of chlorine})/(\text{mass of carbon})= 448/38.9= 11.5$$

The mass ratio of chlorine and carbon in the second sample:

$$(\text{mass of chlorine})/(\text{mass of carbon})= 134/14.8= 9.1$$

Since these ratios (11.5 and 9.1) are not equal, these data are inconsistent with the Law of definite proportions.

Answer: Results of given experiment are inconsistent with the Law of definite proportions.