

Answer on Question #44032 - Chemistry - Inorganic Chemistry

Question:

Rubidium ignites spontaneously when exposed to oxygen to form rubidium oxide. Rb_2O . Rubidium exists as two isotopes (84.91u) and (86.91u). If the average atomic mass of rubidium is (84.91u), determine the percentage abundance of ^{85}Rb .

Note: If the average atomic mass of rubidium is (84.91u), how it is written in the task, then
The abundance of isotope #1 (84.91u) = 100%

The abundance of isotope #2 (86.91u) = 0%

But maybe it's a mistake. That's why we will calculate the abundance for average atomic mass of rubidium = 85 (in the task ^{85}Rb).

Solution:

average atomic weight of the element = (exact weight of isotope #1)·(abundance of isotope #1) + (exact weight of isotope #2)·(abundance of isotope #2)

We have to remember that abundance of isotope #1 + abundance of isotope #2 = 1

Then

abundance of isotope #1 = x

abundance of isotope #2 = 1 - x

Let's put all the meanings in our equation:

average atomic weight of the element = (exact weight of isotope #1)·(abundance of isotope #1) + (exact weight of isotope #2)·(abundance of isotope #2)

$$85 = 84.91 \cdot x + 86.91 \cdot (1-x)$$

$$85 = 84.91x + 86.91 - 86.91x$$

$$2x = 1.91$$

$$x = 0.955$$

The abundance of isotope #1 (84.91u) = 95.5%

The abundance of isotope #2 (86.91u) = 100% - 95.5% = 4.5%

Answer: The abundance of isotope #1 (84.91u) = **95.5%**

The abundance of isotope #2 (86.91u) = **4.5%**