

Problem-4

The three stable isotopes of neon: ${}_{10}\text{Ne}^{20}$, ${}_{10}\text{Ne}^{21}$ and ${}_{10}\text{Ne}^{22}$ have respective abundances of 90.51%, 0.27% and 9.22%. The atomic masses of the three isotopes are 19.99 u, 20.99 u and 21.99 u, respectively. Obtain the average atomic mass of neon.

Solution:

Let atomic mass of ${}_{10}\text{Ne}^{20}$ be $m_1 = 19.99 \text{ u}$

" " " ${}_{10}\text{Ne}^{21}$ be $m_2 = 20.99 \text{ u}$

" " " ${}_{10}\text{Ne}^{22}$ be $m_3 = 21.99 \text{ u}$

Respective abundances are

$$a_1 = 90.51\%$$

$$a_2 = 0.27\%$$

$$a_3 = 9.22\%$$

Let average atomic mass = m .

\therefore Average atomic mass

$$m = \frac{m_1 a_1 + m_2 a_2 + m_3 a_3}{a_1 + a_2 + a_3}$$

$$= \frac{(19.99 \times 90.51) + (20.99 \times 0.27) + (21.99 \times 9.22)}{(90.51 + 0.27 + 9.22)}$$

$$\therefore m = 20.177 \text{ u}$$

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