

Related Problem with Solution :

Find (a) the total number and (b) the total mass of neutrons in 7 mg of ^{14}C . (Assume that mass of a neutron = $1.675 \times 10^{-27}\text{kg}$).

Ans :

Step I. Calculation of total number of carbon atoms

Gram atomic mass of carbon (C-14) = 14 g = 14×10^3 mg

14×10^3 mg of carbon (C-14) have atoms = 6.022×10^{23}

$$7 \text{ mg of carbon (C-14) have atoms} = \frac{6.022 \times 10^{23}}{(14 \times 10^3 \text{ mg})} \times (7 \text{ mg}) = 3.011 \times 10^{20} \text{ atoms.}$$

Step II. Calculation of total number and total mass of neutrons

No. of neutrons present in one atom (C-14) of carbon = $14 - 6 = 8$

No. of neutrons present in 3.011×10^{20} atoms (C-14) of carbon = $3.011 \times 10^{20} \times 8$

= 2.408×10^{21} neutrons

Mass of one neutron = 1.675×10^{-27} kg

Mass of 2.408×10^{21} neutrons = $(1.675 \times 10^{-27} \text{ kg}) \times 2.408 \times 10^{21}$

= 4.033×10^{-6} kg.