

Series N° 03

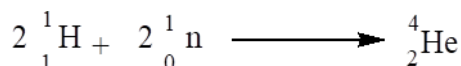
Exercise 1:

Complete the following reactions, giving the type of reaction in each case.

- 1) ${}_{53}^{131}I \longrightarrow {}_{52}^{131}Te + \dots\dots$
- 2) ${}_{53}^{124}I \longrightarrow \dots\dots + \beta^{-}$
- 3) ${}^3_1H + {}^2_1H \longrightarrow {}^1_0n + \dots\dots$
- 4) ${}^{14}_7N + {}^4_2He \longrightarrow {}^{16}_8O + \dots\dots$
- 5) ${}^{215}_{84}Po \longrightarrow {}^{211}_{82}Pb + \dots\dots$
- 6) ${}^1_0n + {}^{235}_{92}U \longrightarrow \dots\dots + {}^{139}_{53}I + 3 {}^1_0n$
- 7) ${}^9_4Be (\beta^{+}, \alpha)$

Exercise 2:

Consider the following nuclear reaction:

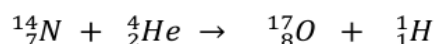


- 1) Calculate the loss of mass Δm .
- 2) Calculate the energy of cohesion of the nucleons in MeV.
- 3) Calculate the cohesion energy of one nucleon in joules and eV.
- 4) Calculate the cohesion energy of one mole of nucleons in joules and Kcal.

Given ${}^4_2He = 4.0026 \text{ uma}$, ${}^1_1H = 1.0073 \text{ uma}$, ${}^1_0n = 1.00866 \text{ uma}$

Exercise 3:

We have the following reaction:



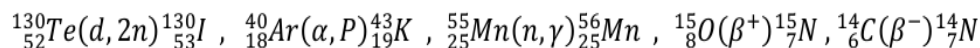
The reaction absorbs energy equal 0.8Mev.

-Calculate the mass of Helium atom in a.m.u

Given mass in a.m.u: ${}^{14}_7N = 14,00754$; ${}^1_1H = 1,007883$; ${}^{16}_8O = 17,0045$

Exercise 4:

A) Write the following nuclear reactions



B) Detail the nuclear reaction ${}^{55}_{25}\text{Mn}(\beta^-){}^{56}_{26}\text{Fe}$

1) It was found that in 7.5 hours, 1 mole of ${}^{56}\text{Mn}$ gives 49 g of ${}^{56}\text{Fe}$. Calculate the period T of manganese

2) Calculate the mass of a sample of manganese. Its activity is 2×10^6 Ci

3) Calculate the energy resulting from disintegration a nucleus of Mn, and then for 1 mole.

Given ${}^{56}\text{Mn} = 55,93948$ a.m.u, ${}^{56}\text{Fe} = 55,93493$ a.m.u

Exercise 5:

Thorium ${}^{232}_{90}\text{Th}$ disintegrates into lead nucleus ${}^{208}_{82}\text{Pb}$, after a series of successive reactions, Radioactive particles are released.

-Determine the number and nature of radiation transitions and the resulting miniscule particles in each case.

Exercise 6:

The bismuth nucleus ${}^{210}_{83}\text{Bi}$ disintegrates through β^- radioactivity.

1- Write the nuclear reaction equation that occurs and show how the electron accompanying the radiation is produced.

2- A sample of bismuth has a number of nuclei at moment t equal to $N(t)$, Express the number of disintegrated nuclei $N_d(t)$ as a function of time t , the initial number of nuclei N_0 , and the radioactive decay constant λ .

3- The curve was plotted where A is the radioactivity of the sample at moment t .

-Express $\ln A$ in terms of λ and A_0 .

-Deduce the value λ and A_0 from the curve.

- Calculate the number of primary nuclei N_0

-Calculate the time required to remain $\frac{1}{1000}$ from the number of primary nuclei.

