19/05/2022

B.Tech 1st year (Unit: Nuclear and particle physics)
H.W. Questions(Radioactivity)

1. How long does it take for 60.0 percent of a sample of radon to decay? (*Half life of Rn: 3.82days*) **(Ans: 5.05 d)**
2. A sample of ^{14}C whose halflife is 5730 years has a decay rate of 14 disintegrations per min per gm of natural Carbon. A fossil is found to have radioactivity of 4 disintegrations per min per gm of its present Carbon. How old is the fossil? **(Ans: 10,350 Years)**
3. Find the activity of 1.00 mg of radon, ^{222}Rn, whose atomic mass is 222 u. **(Ans:155 Ci)**
4. What will the activity of the above radon sample be exactly one week later?**(Ans:43 Ci)**
5. The atomic ratio between the uranium isotopes ^{238}U and ^{234}U in a mineral sample is found to be 1.8×10^4 . The half-life of ^{234}U is $T_{1/2}(234) = 2.5 \times 10^5$ y. Find the half-life of ^{238}U. **(Ans: 4.5×10^9 y)**
6. The polonium isotope $^{210}_{84}Po$ is unstable and emits a 5.30-MeV alpha particle. The atomic mass of $^{210}_{84}Po$ is 209.9829 u and that of $^{4}_{2}He$ is 4.0026 u. Identify the daughter nuclide and find its atomic mass.**(Ans: daughter nuclide is $^{206}_{82}Pb$; atomic mass:205.9745 u)**

Assignment

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Discuss following questions in detail with proof:

1. The helium isotope $^{6}_{2}He$ is unstable. What kind of decay would you expect it to undergo?
2. What is the Earth's age and how one can determine? What is the most reliable way to determine the age of the Earth?