JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2024

MSc (Physics)

COURSE CODE(CREDITS): 3 MAX. MARKS: 15

COURSE NAME: Nuclear Physics

COURSE INSTRUCTORS: Haresh Raval MAX. TIME: 1 Hour

Note: (a) *All questions are compulsory.*

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

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Q1. Define atomic mass unit. Express it in terms of MeV. [2]

Q2. Two radioactive sources each have activities of 1 μCi at t=0. Their half lives are, respectively, 1.0 s and 1.0 hr. (a) How many radioactive nuclei are present at t=0 in each sources? (b) How many nuclei of each source decay between t=0 to t=1 s? (c) How many nuclei decay between t=0 and t= 1 hr? (1 Ci = 3.7×10^{10}) [4]

Q3. The radioactive decay of ^{232}Th leads eventually to stable ^{208}Pb. A rock is found to contain 3.65 g of ^{232}Th and 0.75 g of ^{208}Pb. What is the age of the rock, as deduced from the Th/Pb ratio? (Th $t_{1/2} = 1.41 \times 10^{10}$ years). [2]

Q4. Derive the expression for the Volume, Surface and coulomb terms in the semi-empirical formula for the binding energy. [3]

Q5. Derive the Gieger-Nuttal relation using quantum mechanics. [4]