S-482

MPHY-602

Nuclear Physics

M.Sc. Physics (MSCPHY)

3rd Semester Examination, 2022 (Dec.)

Time : 2 Hours]   **[Max. Marks : 35**

Note : This paper is of Thirty Five (35) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION–A
(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nine and Half (9½) marks each. Learners are required to answer any Two (02) questions only.

$$(2\times9½=19)$$

1. Discuss the assumptions of the Liquid drop model and on basis of these assumptions obtain an expression for the total binding energy of a nucleus based on this model.

2. Describe different properties of nucleus in detail and also explain the role of magnetic dipole moment and Electric quadruple Moment for nucleus.

3. Explain the nuclear reaction. Find out the solution of Q equation. Calculate the Q value of reaction O^{16} (d, n) F^{17}, Which are endothermic and exothermic.

4. Derive Fermi's four factor formula with significance of each term in the formula. Explain how the Fermi's four factor formula is used in designing a nuclear reactor.

5. Explain the salient features of nuclear forces and on its basis discuss meson theory of nuclear forces.

SECTION–B
(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Four (04) marks each. Learners are required to answer any Four (04) questions only.   (4×4=16)

1. Write the short notes on following :

(a) Bound and Spin states of two nuclear system.

(b) Nuclear cross section.

2. Differentiate between liquid drop model and shell model in terms of failure and limitations.

3. Explain nuclear fission and fusion on the basis of the binding energy curve.

4. Why is $^{3}P_{1}$ not a component of the ground state of the deuteron?

5. What do you mean by magic number? Calculate spin and parity of ground state of $^{15}N_{7}$ and $^{41}N_{20}$.

6. Explain the Bohr's hypothesis of compound nucleus.

7. How do the conservations laws play a role to develop nuclear reaction?

8. Derive an expression of cross section for the number of particles emerging out of a slab of finite thickness.

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