A-1191

Total Pages : 4

Roll No. .....

PHY-551

M.Sc. Physics (MSCPHY)

Nuclear Physics and Analytical Techniques

Examination February, 2026

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

(Long Answer Type Questions) (2×19=38)

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. What is Gamow's theory of alpha decay ? Explain the main features of alpha particle emission process. Write down the limitations of this theory.

2. What are the elementary particles and how they are classified into different categories ? Explain various conservation laws obeyed by the particles.

3. What are the fundamental differences between the liquid drop model and the shell model of the nucleus ? Describe shell model and give the main assumptions of it.

4. Explain the Compound nucleus theory proposed by Neil's Bohr. Also obtain Breit-Wigner formula.

5. Explain how the neutrons can be classified as slow, fast and intermediate neutrons. Derive four factor formula and also discuss its importance.

Section–B

(Short Answer Type Questions) (4×8=32)

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Write down the postulates of Pauli's neutrino hypothesis.

2. Explain the term multipolarity in gamma transition.

3. Explain the principle and working of a scintillator detector.

4. Explain the concept of tensor force. Prove the statement that a tensor force is capable of explaining the deuteron quadrupole moment.

5. Discuss Yukawa's meson exchange theory of the nuclear force.

6. The binding energy of $_{10}Ne^{20}$ is 160.64 MeV. Find the atomic mass. (Given mass of proton = 1.007825u and mass of neutron = 1.008665u).

7. Explain the terms isospin and strangeness. Why they are important in the classification of the elementary particles ?

8. Define Q-value of a nuclear reaction. Obtain an expression for the Q-value in terms of the kinetic energies of incident and product particles and masses of various particles and nuclei.

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