

C152

Total Pages : 3

Roll No.

MPHY-601

Nuclear Analytical Technique

M.Sc. Physics (MSCPHY-20)

3rd Semester Examination, 2022 (June)

Time : 2 Hours]

Max. Marks : 40

Note : This paper is of Forty (40) 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 Ten (10) marks each. Learners are required to answer any Two (02) questions only.

(2×10=20)

1. Discuss the Gamow theory of α - decay and how it explains the main features of α -particle emission process. Write the limitations of the theory.

2. State and explain the Fermi theory of β -decay. Discuss how it explains the features of β -spectrum and also discuss the selection rules for β -emission.
3. Explain the following terms in reference with their importance in classification of elementary particles.
 - (a) Isospin.
 - (b) Strangeness.
 - (c) Hypercharge.
 - (d) Parity.
4. Discuss how the interaction of light charged particles is different from that of heavy charged particles. Explain the emission of 'Bremsstrahlung radiation'.
5. Explain the principle and working of a scintillation detector with a diagram. How can γ -ray energies be determined with its help ?

SECTION-B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Five (05) marks each. Learners are required to answer any Four (04) questions only. (4×5=20)

1. Discuss the postulates of Pauli's neutrino hypothesis.

2. Write a short note on 'radiative transitions' in nuclei.
 3. Check whether the following reactions are allowed or forbidden.
 - (a) $\pi^- + p^0 \rightarrow \lambda^0 + \pi^-$.
 - (b) $p^+ + p^0 \rightarrow 2\pi^+ + 2\pi^- + 2\pi^0$.
 4. Explain the Dirac's theory of Pair Production.
 5. Explain the numerical emulsion techniques to detect the charged particles.
 6. Write a short note on classification of elementary particles.
 7. Explain the fundamental interactions existing in nature?
 8. Define the term multipolarity in gamma transition and explain the selection rules.
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