

S-481

Total Pages : 3

Roll No.

MPHY-601

Nuclear Analytical Techniques

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 ($9\frac{1}{2}$) marks each. Learners are required to answer any Two (02) questions only.

($2 \times 9\frac{1}{2} = 19$)

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. Explain the violation of parity conservation during beta decay process. How has this been experimentally verified?
3. Discuss the nuclear gamma decay and its semi classical treatment. Compute and explain the decay rates for the associated electric and magnetic dipole transitions.
4. Give the classification of fundamental interactions, elementary particle and conservation laws.
5. Write down a short note on linear accelerator. Give an introduction on particle accelerators in India.

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. A radio-active nuclide emits an α -particle of Energy E_{α} . Calculate the corresponding disintegration energy and the barrier height of α -particle within nucleus.
2. Discuss the properties of the Pauli's neutrino hypothesis.
3. State and explain the selection rules of β -emission.

4. Explain the terms internal conversion and K-capture.
 5. Describe weak interactions of particles. Also give examples of this interaction.
 6. Show that whether the following interactions obey conservation of charge, baryon number, lepton number, isospin, third component of isospin and strangeness and mark them as allowed or forbidden accordingly :
 - (a) $\pi^- + p \rightarrow \Lambda^0 + n$
 - (b) $k^- + p \rightarrow \Omega^- + k^+ + k^0$.
 7. Explain the construction and working of diffused junction detector.
 8. Explain the emission of 'bremsstrahlung radiation'.
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