



**Avinashilingam Institute for Home Science and Higher Education for Women
Coimbatore - 641 043**

Continuous Internal Assessment II - OCTOBER 2025

VI Semester

Class: III B.Sc.,
Major: Physics

Duration: 2 Hours
Max. Marks: 60

23BPHC11 Nuclear and Particle Physics

Course Outcomes:

1. Learn the ground state properties of a nucleus such as radius and the mass number, average density, range of force, saturation property, stability curve, the concepts of packing fraction and binding energy per nucleon vs mass number graph, explanation of fusion and fission from the nature of the binding energy graph.
2. Know about the nucleus and their role in explaining the ground state properties of the nucleus.
3. Learn about the process of radioactivity, the radioactive decay law, the emission and properties of the nucleus.
4. Learn the basic aspects of nuclear reactions, the Q-Value of such reaction and its derivation from conservation laws.
5. Learn some basic aspects of interaction of nuclear radiation with matter and to learn about the detectors of nuclear radiations-the Geiger –Muller counter, the scintillation Counter, the photomultiplier tube, the solid state and semiconductor detectors.

PART A

(6×1=6 marks)

Choose the correct answer

1. The primary force that holds the nucleus together is (CO1K1)
a. Gravitational force b. electromagnetic force c. strong nuclear force d. weak nuclear force
2. The charge on a proton is _____ (CO1K3)
a. $1.6 \times 10^{-9}C$ b. $1.6 \times 10^{-19}C$ c. $1.6 \times 10^{19}C$ d. 1.6×10^8C
3. For a nucleus possess quadrapole moment _____ (CO2K1)
a. $I = 0$ b. $I = 1/2$ c. $I > 1/2$ d. Spherical shape of nucleus
4. Which one of the following is a fermion? (CO2K1)
a. α - particle b. Hydrogen atom c. ${}^7_4\text{Be}$ nucleus d. deuteron
5. Scintillation detector is a large flat crystal of which of the following materials. (CO4K1)
a. Sodium chloride b. sodium iodide c. Sodium carbonate d. Sodium sulphate
6. The crystal used for gamma ray detection in scintillation counter _____. (CO4K2)
a. NaS b. Cel c. ZnS d. NaI

PART-B

(3×6=18 marks)

Answer the following

7. a. Explain β – decay with an example. (CO3K2)
(Or)
7. b. Discuss about the law of successive disintegration. (CO3K3)
8. a. Discuss the working of an ionization chamber. (CO4K3)
(Or)
8. b. State and explain the different types of nuclear reactions. (CO4K2)
9. a. Calculate the energy released during the fission Reaction uranium 235. (CO4K3)
(Or)
9. b. Explain the working principle of particle detection (CO4K2)

PART-C
Answer the following

(3×12= 36 marks)

10. a. Explain the working of a) PMT and b) GM Counter. (CO4K3)
(Or)
10. b. Describe the Gamow's theory of α -decay. How far does this explain the Geiger Nuttall law? (CO1K2)
11. a. Describe the Q-value of nuclear reactions and obtain an expression for it. (CO3K4)
(Or)
11. b. Describe Gamow's theory of α - decay. Hence deduce Geiger – Nuttall law. (CO3K4)
12. a. Discuss briefly about the various conservation laws in nuclear reactions. (CO4K3)
(Or)
12. b. Explain the different types of radioactive decay processes with examples. (CO4K3)

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