

M.Sc.(Phy.) Semester - 3 (CBCS) Examination**OCT/NOV-2024****Nuclear and Particle Physics (Core (New))****Time: 2:30 Hours****Marks: 70****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate marks.

Que-1 Answer in brief any seven. (14)

- (1) Define: i) Average binding energy per nucleon ii) separation energy.
- (2) Define the term: Nucleon
- (3) Mention the number of features of the nucleus that need to be explained in terms of a nuclear model?
- (4) Why is particle physics called high energy physics?
- (5) Write the two different β decay processes.
- (6) Define linear attenuation coefficient. What is its unit ?
- (7) Show that (p, n) type of nuclear reaction is always endothermic.
- (8) Give the classification of nuclear reaction according to type of target.
- (9) Write the essential assumptions of Liquid Drop Model.
- (10) Define the terms : Endothermic reaction and exothermic reaction.

Que-2 Answer the following questions: Any TWO out of THREE (14)

- (1) Write down the basic nuclear properties of nuclei and discuss intrinsic angular momentum of nucleons.
- (2) Define the terms : Isotopes, Isobars and Isotones. Classify the following nuclides based on them : ^{11}C ^{12}C ^{13}C ^{13}N ^{14}N ^{15}N .
- (3) Discuss in detail: The merits of Liquid Drop Model.

Que-3 Answer the following questions: ALL ARE COMPULSORY

- (A) Discuss the spin orbit coupling based on Shell Model. (07)
- (B) Discuss in detail: Binding energy and nuclear stability (07)

OR**Que-3 Answer the following questions: ALL ARE COMPULSORY**

- (A) Which mechanisms take place when gamma radiation interacts with mater? Discuss Compton Effect. (07)
- (B) Derive the semi-empirical mass formula and discuss each term in detail. (07)

Que-4 Answer the following questions: Any TWO out of THREE (14)

- (1) Discuss in detail: Strange particles and strangeness quantum number
- (2) Derive nuclear reaction Q equation. Mention its special case.
- (3) In the phenomenon of interaction of charge particle with matter, derive an expression of total energy loss per unit path by the heavy particle.

Que-5 Write any TWO short notes. (14)

- (1) Elementary particle quantum numbers.
- (2) Internal conversion.
- (3) Neutrino hypothesis
- (4) Conservation of iso-spin and its component.
