

M.Sc.(Phy.) Semester - 3 (CBCS) Examination**Nov/Dec-2023 (NEW COURSE)****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.
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- Que.1 Answer in brief any seven. (14)
1. Define: Average binding energy per nucleon with equation and separation energy.
 2. Show that density of nucleus is independent of Mass Number A.
 3. Mention the number of features of the nucleus that need to be explained in terms of a nuclear model?
 4. Write two limitations of liquid drop model.
 5. Write down the reaction of inverse beta decay. What is its importance?
 6. Define half value thickness. Derive its relation with attenuation coefficient.
 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. Particle physics is known as high energy physics. Why?
 10. How will you classify Hadrons?
- 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. Write down the main assumptions of Liquid Drop Model.
 3. Discuss: The merits of Liquid Drop Model.
- Que.3 Answer the following questions: ALL ARE COMPULSORY (07)
- (A) Discuss the spin orbit coupling based on Shell Model. (07)
- (B) State the various evidences in favor of Shell Model. (07)
- OR
- Que.3 Answer the following questions: ALL ARE COMPULSORY (07)
- (A) Which mechanisms take place when gamma radiation interacts with matter? Discuss Compton Effect. (07)
- (B) Discuss the laws governing nuclear reactions. (07)
- Que.4 Answer the following questions: Any TWO out of THREE (14)
1. What do you mean by endothermic and exothermic nuclear reactions? How will you calculate the threshold energy of nuclear reaction?
 2. Name the fundamental interactions among elementary particles. Discuss gravitational and electromagnetic interactions and show that electromagnetic interaction between two protons is about 10^{37} times stronger than gravitational interaction.
 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. Binding energy and nuclear stability.
 2. Internal conversion.
 3. Resonance in particle physics.
 4. Conservation of iso-spin and its component.
