

M.Sc.(Phy.) Semester - 3 (CBCS) Examination
Oct/Nov-2022 (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.

Q – 1: Answer in brief any seven**14**

1. How will you convert a figure of Nuclear Binding Energy from MeV/nucleon to kcal/kg?
2. Write down the equation of Binding Energy per Nucleon. Plot each term versus Mass Number A.
3. Why number of neutron N exceeds number of protons Z in stable nuclei?
4. Write two limitations of liquid drop model.
5. Give the significance of antineutrino in beta decay.
6. Give the classification of beta decay.
7. Draw a plot of variation in intensity of gamma ray with thickness of absorber.
8. If an atom of mass number 15 and atomic number 7 captures an alpha particle and then emits a proton, what will be the mass number and atomic number of resulting atom?
9. Draw a chart of classification of elementary particles.
10. How will you differentiate Baryons and Hyperons?

Q – 2: Answer the following questions: Any TWO out of THREE**14**

1. Write down the main assumptions of liquid drop model.
2. Mention the various facts in favor of Shell Model.
3. Discuss: Magic numbers on Shell Model.

Q – 3: Answer the following questions: ALL ARE COMPULSORY**14**

- (a) Discuss the basic properties of Nuclei.
- (b) Discuss: Binding Energy and Nuclear Stability.

OR

Q – 3: Answer the following questions: ALL ARE COMPULSORY

- (a) Discuss: Fermi's Theory of beta decay.
- (b) Derive the conditions for spontaneous emission of β^- decay and β^+ decay.

Q – 4: Answer the following questions: Any TWO out of THREE**14**

1. Discuss the phenomenon of pair production, when gamma photons interact with nucleus of the atom.
2. Derive an expression for Q-value of a nuclear reaction. Mention its special case.
3. Discuss a phenomenon of interaction of charge particle with matter.

Q – 5: Write any TWO short notes**14**

1. Resonance in particle physics.
2. Multiplet Number (M) and Isotopic Spin (I).
3. Nuclear reaction cross section.
4. Conservation of Strangeness.
