

B.Sc. Semester - 5 (CBCS) Examination
Oct/Nov - 2022 (NEW COURSE)
Nuclear & Particle Physics (Core)

Time: 2:30 Hours**Marks: 70****Instructions:**

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

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- Q.1 (a) Answer the following questions (any two out of three) 10
1. Discuss the Rutherford Nuclear Atom model.
 2. Discuss Semi-Empirical mass formula and significance of various terms.
 3. Explain the Shell Model and provide the evidences of shell model.
- Q.1 (b) Answer the following questions (any one out of two) 04
1. Write a note on intrinsic properties of nucleus.
 2. Calculate the binding energy of ${}_{26}\text{Fe}^{56}$ using the semi-empirical mass formula. The constants of the formula are volume term (a_v) = 15.7, surface term (a_s) = 17.6, coulomb term (a_c) = 0.711, asymmetry term (a_{sym}) = 23.7 and pairing term (δ) = 11.18
- Q.2 (a) Answer the following questions (any two out of three) 10
1. Explain theory of beta decay and neutrino hypothesis.
 2. Explain half-life and mean life.
 3. Discuss the properties of beta particles.
- Q.2 (b) Answer the following questions (any one out of two) 04
1. Explain continuous beta ray spectrum.
 2. Derive the age of the earth.
- Q.3 (a) Answer the following questions (any two out of three) 10
1. Discuss interaction between energetic particle and matter.
 2. Write a note on Ionization chamber.
 3. Derive the Q value equation.
- Q.3 (b) Answer the following questions (any one out of two) 04
1. Write any four conservation laws for nuclear reaction.
 2. Explain Photomultiplier.
- Q.4 (a) Answer the following questions (any two out of three) 10
1. Write a note on discovery of nuclear fission.
 2. Discuss the main components of Nuclear reactors.
 3. Describe construction and working of electron synchrotron.
- Q.4 (b) Answer the following questions (any one out of two) 04
1. Write a note on Chain reaction.
 2. Explain the construction of Cyclotron.
- Q.5 (a) Answer the following questions (any two out of three) 10
1. Explain the proton-proton cycle and carbon-nitrogen cycle.
 2. Discuss the classification of elementary particles.
 3. Discuss in brief: The Fundamental Interactions.
- Q.5 (b) Answer the following questions (any one out of two) 04
1. Discuss gravitational plasma confinement and inertial plasma confinement.
 2. Write a note on antimatter.
