

B.Sc. Semester - 6 (CBCS) Examination
March/April -2020
NUCLEAR AND 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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1(a) Answer the following question. (Anyone) (7)

- (1) Write the mathematical expression for Weizsacker's semi empirical mass formula and explain the importance of various terms.
- (2) Discuss the variation of binding energy with mass number and also explain the resemblance of the extrinsic properties between a nucleus and a liquid drop.

1(b) Answer the following questions. (Anyone) (4)

- (1) Explain Rutherford's alpha particle scattering experiment.
- (2) State any four evidences of nuclear shell model.

1(c) Answer the following questions. (Any three) (3)

- (1) What are mirror nuclei?
- (2) Define: Binding energy
- (3) The stability of nuclei.....with the binding energy.
- (4) What is mass defect for the case of nuclei?
- (5) The stability of magic nuclei is low. True/False

2(a) Answer the following question. (Anyone) (7)

- (1) Discuss the theory of alpha decay.
- (2) Explain the applications of radioisotopes.

2(b) Answer the following question. (Anyone) (4)

- (1) State few properties of beta rays.
- (2) Derive the mathematical expression for the law of radioactive decay.

2(c) Answer the following question. (Any three) (3)

- (1) Define: Half life time
- (2) 1 Curie =disintegrations /sec
- (3) The ionization power of alpha particle is less than that of gamma rays. True/False
- (4) The thorium series starts from.....isotope.
- (5) Write the general rule of alpha decay.

3(a) Answer the following question. (Anyone) (7)

- (1) Explain the Geiger-Muller counter with principle, working, construction and counter characteristic.
- (2) Derive the Q – value equation for a nuclear reaction and also explain the threshold energy for a nuclear reaction.

3(b) Answer the following question. (Anyone) (4)

- (1) Explain the construction of solid state detector.
- (2) Based on the product nuclei, state any five types of nuclear reactions.

3(c) Answer the following question. (Any three) (3)

- (1) Write the law of conservation of parity.
- (2) If the energy balance Q is negative then the reaction is exothermic. True/False
- (3) Write the principle of ionization chamber.
- (4) What is stopping power for a moving energetic particle ?
- (5) Write the transmutation reaction that was first observed by Rutherford.

4(a) Answer the following question. (Anyone)

(7)

- (1) Explain Cyclotron with its construction, working and limitations. Also derive the equation for cyclotron frequency and energy of an ion to be accelerated.
- (2) Discuss the Bohr and Wheeler's theory of nuclear fission. Explain the chain reaction with its classes.

4(b) Answer the following question. (Anyone)

(4)

- (1) Explain how to determine the k – value for a nuclear fission reaction.
- (2) Derive the mathematical expression for the betatron condition.

4(c) Answer the following question. (Any three)

(3)

- (1) The modified form of Cyclotron is called.....
- (2) Bevatron can be used to accelerate.....
- (3) Define: Multiplication factor (k)
- (4)uses the heat generated in a nuclear reactor to produce power.
- (5) An atom bomb consists of two portions of fissionable material having size greater than the critical size.
True/False

5(a) Answer the following question. (Anyone)

(7)

- (1) Write a note on various mechanisms which can be implemented to confine plasma.
- (2) Explain the various classes of fundamental interactions.

5(b) Answer the following question. (Anyone)

(4)

- (1) Explain Carbon - Nitrogen cycle as a source of stellar energy.
- (2) Write a note on particles and antiparticles.

5(c) Answer the following question. (Any three)

(3)

- (1) Define: Nuclear Fusion
- (2) The energy obtained from a hydrogen bomb is.....than it is obtained from a nuclear fusion bomb.
- (3) Tauon can be put in a class of Hadrons. True/False
- (4) The strange and charm quarks are associated with.....generation.
- (5) What will be the baryon number for antiproton?