

B.Sc. Semester - 6 (CBCS) Examination
March/April -2020
NUCLEAR AND PARTICLE PHYSICS (CORE)

Time: 2:00 Hours**Marks: 56****Instructions:**

1. Figures to the right indicate marks.
 2. There are five questions in the question paper.
 3. Answer any four of the following questions.
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1(a) Answer the following question. (Anyone) (7)

- (1) Discuss the main evidences to show the existences of shell structure within the nuclei.
- (2) Write the mathematical expression for Weizsacker's semi empirical mass formula and explain the importance of various terms.

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

- (1) Explain how the variation of binding energy with the mass number.
- (2) Discuss the resemblance between the nucleus of an atom and a liquid drop.

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

- (1) In Rutherford's alpha particle experiment, majority of the incident alpha particles were scattered. True/False
- (2) Isotopes are atom of the same elements having the same number of
- (3) Define: Binding energy
- (4) Nuclei have negative charges. True/False
- (5) What are mirror nuclei?

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

- (1) State few applications of radioisotopes.
- (2) Write the properties of alpha and beta particles.

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

- (1) Discuss the process of internal conversion.
- (2) Derive the equation of law of radioactive decay.

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

- (1) Define: Half life period
- (2) Gamma rays are more penetrating than beta rays.
- (3) The ionization power of alpha particles is.....times greater than beta rays.
- (4) If the number of atoms in radioactive substance disintegrates at 3.70×10^{10} disintegrates/sec rate, it is said to have a radioactivity of
- (5) The age of the earth is estimated from the relative abundance of the two isotopes

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

- (1) Write a short note on solid state detectors.
- (2) Discuss the various types of nuclear reactions.

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

- (1) Explain the plateau curve.
- (2) Explain the energy balance in nuclear reactions.

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

- (1) Write the principle of ionization chamber.
- (2) Write the principle of Geiger-Muller Counter.
- (3) A bombarding particle composed of more than one nucleon may lose one of them to the target. This reaction is called....
- (4) The spin character of a closed system changes. True/False
- (5) Write the equation of threshold energy.

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

- (1) Write a short note on Linac.
- (2) Explain the atom bomb and also explain the construction of nuclear reactors.

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

- (1) Explain breeder reactors.
- (2) Discuss the working of cosmotron.

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

- (1) Write the equation of Cyclotron frequency.
- (2) Electrons can be accelerated using.....
- (3) Write the mathematical expression for Betatron condition.
- (4) If the multiplication factor $k < 1$ then the energy generation increases. True /False
- (5) Bohr and Wheeler have given the theory for nuclear fusion. True/False

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

- (1) Write a note on sources of stellar energy.
- (2) Discuss the various fundamental interactions.

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

- (1) Explain the antimatter.
- (2) Discuss the thermonuclear reactions.

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

- (1) In massive stars the main part of energy production is due to proton-proton cycle. True/False
- (2) When two small nuclei are fused together then it forms a single heavy nucleus. This process is called
- (3) A baryon numberis assigned to baryons.
- (4) The top and bottom quarks associated with generation.
- (5) What is time reversal (T) operator?
