

B.Sc. Semester - 6 (CBCS) Examination
April/May-2022 (OLD COURSE)
NUCLEAR AND PARTICLE PHYSICS(CORE)

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

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

Q.1(a) Answer the following questions (any one) (07)

- 1) Explain in detail Weizsacker's semi empirical mass formula and its terms.
- 2) Explain the resemblance of the extrinsic properties between a nucleus and a liquid drop.

Q.1(b) Answer the following questions (any one) (04)

- 1) Explain Rutherford's alpha particle scattering experiment.
- 2) Describe the evidence of shell model.

Q.1(c) Answer the following questions (any three) (03)

- 1) Define: Binding energy
- 2) How many protons, neutrons and nucleons in ${}_{92}^{238}\text{U}$?
- 3) What is mirror nuclei?
- 4) The stability of mirror nuclei is high. True/False
- 5) Define isotone.

Q.2(a) Answer the following questions (any one) (07)

- 1) Discuss the properties of alpha particle.
- 2) Discuss law of radioactive decay.

Q.2(b) Answer the following questions (any one) (04)

- 1) The half-life of Radon is 3.80 days. After how many days only twentieth of a Radon sample remain behind?
- 2) Discuss continuous beta ray spectrum.

Q.2(c) Answer the following questions (any three) (03)

- 1) Define natural radioactivity.
- 2) 1 Curie =disintegration/sec.
- 3) Define half life time.
- 4) The thorium series starts from
- 5) Write the ionization power of alpha particle.

Q.3(a) Answer the following questions (any one) (07)

- 1) Define any five types of Nuclear reactions.
- 2) Discuss Threshold energy of endoergic reaction.

Q.3(b) Answer the following questions (any one) (04)

- 1) Write a note on Ionization chamber.
- 2) Discuss the principle of Scintillation counter.

Q.3(c) Answer the following questions (any three) (03)

- 1) What is the stopping power of a moving energetic particle?
- 2) Define elastic scattering.
- 3) If the energy balance Q is positive then the reaction is exothermic. True/False
- 4) Write the principle of ionization chamber.
- 5) The pair production can take place only when the energy of gamma rays is

Q.4(a) Answer the following questions (any one) (07)

- 1) Write a note on main components of nuclear reactors.
- 2) Discuss construction and working of synchrocyclotron.

Q.4(b) Answer the following questions (any one) (04)

- 1) Write a note on Bohr & Wheeler's theory of nuclear fission.
- 2) Discuss construction and working of Cyclotron.

Q.4(c) Answer the following questions (any three) (03)

- 1) Define Multiplication factor.
- 2) Betatron is a device to accelerate to very high energy.
- 3) What is breeder reaction?
- 4) The modified form of Cyclotron is called
- 5) The larger the size of body, the escape rate of neutron is small. True/False

Q.5(a) Answer the following questions (any two) (07)

- 1) Write a note on Proton-Proton cycle and Carbon-Nitrogen cycle.
- 2) Write a note on particles and antiparticles.

Q.5(b) Answer the following questions (any one) (04)

- 1) Discuss any five elementary particle quantum number.
- 2) Discuss the properties of three generation of quarks and leptons.

Q.5(c) Answer the following questions (any three) (03)

- 1) Define nuclear fusion.
- 2) What will be the baryon number of antiproton?
- 3) Neutrinos have charge.
- 4) Why fusion known as thermonuclear reaction?
- 5) Any fermions would have its intrinsic spin
