

B.Sc. Semester - 6 (CBCS) Examination

March/April -2019

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) Write any one in detail [7]

- 1) Derive semi empirical mass formula.
- 2) Show the nature of the graph of average binding energy per nucleon against atomic mass number and explain its notable points.

Q 1(b) Answer Any One [4]

- 1) Write the observations of alpha scattering experiment and give Rutherford's explanation of alpha scattering experiment.
- 2) Write note on liquid drop model.

Q 1(c) Answer any three questions – one mark each [3]

- 1) In alpha particle scattering experiment _____ is a source of alpha particle.
- 2) Nucleus is positively charged. (True/ False)
- 3) What is impact parameter for backward scattering?
- 4) Define isotope nuclei.
- 5) Write formula of nuclear radius.

Q 2(a) Write any one in detail [7]

- 1) Write the difficulties in explain beta decay and Explain Pauli's neutrino hypothesis for beta decay.
- 2) Explain how we can determine the age of earth using radio isotopes and explain carbon dating

Q 2(b) Answer Any One [4]

- 1) Obtain the exponential law of radioactive disintegration.
- 2) Explain internal conversion.

Q 2(c) Answer any three question – one mark each [3]

- 1) During the life time of a radioactive element as time passes the number of its nuclei _____
- 2) Internal conversion process is like photo electric effect. (True/ False)
- 3) Half life of a radioactive element is 5 min. at the end of 20 min. its ____% quantity will remain undisintegrated.
- 4) Give unit of decay constant.
- 5) Find Decay constant of radon, $\tau_{1/2}$ of radon = 3.83 days

Q 3(a) Write any one in detail [7]

- 1) Describe the principle, construction and working of ionization chamber.
- 2) Drive the Q value equation for nuclear reaction.

Q 3(b) Answer Any One [4]

- 1) Explain Char. Curve of G.M. tube in detail.
- 2) Describe the Rutherford's experiment of artificial transmutation.

Q 3(c) Answer each question – one mark each**[3]**

- 1) The pair production can take place only when the energy of γ – rays is more than _____ MeV
- 2) Define Stopping Power for Nuclear radiation.
- 3) Complete the following nuclear reaction ${}_5\text{B}^{10} + \text{---} \rightarrow {}_3\text{Li}^7 + {}_2\text{He}^4$
- 4) ${}_1\text{H}^2 + \gamma \rightarrow {}_1\text{H}^1 + {}_0\text{n}^1$, this nuclear reaction is _____
- 5) Write the principle of Scintillation counter.

Q 4(a) Write any one in detail**[7]**

- 1) Explain principle and working of Betatron.
- 2) What is nuclear reactor? Explain it in detail.

Q 4(b) Answer Any One**[4]**

- 1) Explain principle and working of Proton synchrotron
- 2) Find energy released by 1kg. of U^{235} in kilo watt hour in fission process. 200 Mev energy released in each fission. Avogadro number = 6.023×10^{23}

Q 4(c) Answer any three question – one mark each**[3]**

- 1) If multiplication factor, $K = 1$, then reactor is in _____ state.
- 2) Betatron is a device to accelerate _____ to very high energy.
- 3) The larger the size of the body, the escape rate of neutron is small. (True/False)
- 4) A particle Accelerator is a device for increasing _____ of charged particle.
- 5) Write principle of linear accelerator.

Q 5(a) Write any one in detail**[7]**

- 1) Write note on quark model.
- 2) Explain plasma confinement in detail.

Q 5(b) Answer Any One**[4]**

- 1) Explain proton-proton cycle.
- 2) Give properties of quarks.

Q 5(c) Answer each question – one mark each**[3]**

- 1) Neutrinos have _____ charge.
- 2) Any fermion would have its intrinsic spin _____.
- 3) Define fusion.
- 4) Write principle of H bomb.
- 5) Write Conservation law of linear momentum for elementary particle.
