

M.Sc. (Physics) (NEP Pattern) Semester-III
03MSCPH1 - Paper-I : Nuclear and Particle Physics

P. Pages : 2

Time : Three Hours



GUG/S/25/16023

Max. Marks : 80

Either:

1. a) Briefly discuss the term: Binding Energy of Nucleus. 8
Find the binding energy of a α – particle in Joules and MeV from the following data:
Mass of Helium nucleus : 4.002870 a.m.u.
Mass of Neutron : 1.008665 a.m.u.
1 a.m.u. : $14.92 \times 10^{-11} \text{ J}$
- b) Write the various terms in semi-empirical mass formula & explain it. 8

OR

- e) Describe how the spin-orbit potential generates the correct sub-shell separation and validate all the magic numbers. 8
- f) Explain the terms: 8
i) Magnetic Moment
ii) Electrical quadrupole moment of Nucleus

Either:

2. a) What are nuclear reactions? Give their conservation laws & mechanism of nuclear reaction. 8
- b) Discuss the elementary idea of alpha, beta and gamma decays. 8

OR

- e) Discuss multiple transition of nuclei in gamma decay. 8
- f) Explain forbidden and allowed states in α -decay process. 8

Either:

3. a) Explain with neat diagram the working scintillation detector. 8
- b) Discuss principle construction & working of Linear accelerator and derive an expression for length of n^{th} tube. 8

OR

- e) Discuss construction and working of Van-de-Graff generator. 8
- f) Explain the working principle of Betatron & obtain Betatron equation. 8

Either:

4. a) Discuss the classification scheme of Elementary particles. 8
- b) Discuss spin, parity, isospin and strangeness of elementary particles. 8

OR

- e) Explain the properties of Baryons, Mesons & Leptons. 8
- f) Explain in brief - Charm, beauty & truth quark. 8
5. Answer the followings-
- a) Discuss the stability of Nucleus. 4
- b) Explain nuclear reaction cross section. 4
- c) Explain Resolving time & paralysis time for GM counter. 4
- d) Explain Higg's Boson. 4
