

B.Sc. (CBCS Pattern) Semester-VI
USDSEPHT13 - Physics Paper-I : Nuclear and Particle Physics

P. Pages : 2

Time : Three Hours



GUG/S/25/13365

Max. Marks : 50

- Notes :
1. All question are compulsory.
 2. Draw neat labelled diagram if necessary.
 3. Scientific calculator is allowed.

1. A) i) Define mass defect, binding energy and packing fraction. Draw the curve for binding energy per nucleon versus mass number and write its main features. 8

ii) Taking the mass of proton as 1.0072 amu and that of electron is 1.0086 amu. 2
Calculate the binding energy for ${}^8\text{O}^{16}$ having nuclear mass is 15.9905 amu.

OR

B) a) Discuss magnetic moment of an atom. 2½

b) Explain electric quadrupole moment of nucleus. 2½

c) Prove that nuclear density is same for all nucleus. 2½

d) Explain spin, orbital & total angular momentum of nucleons. 2½

2. A) i) Write Merits and limitations of liquid drop model. Explain nuclear fission on the basis of Liquid drop model. 6

ii) Explain Fermi gas model and discuss the concept of nuclear stability. 4

OR

B) a) State assumption of Shell model. 2½

b) Explain magic numbers. 2½

c) What is nuclear force? Write its properties. 2½

d) Explain the concept of two nucleon separation energy. 2½

3. A) i) What is nuclear reaction? Explain various types of nuclear reactions. 5

ii) Write the difference between Exo-ergic and Endo-ergic nuclear reaction. 2

iii) Explain various laws of conservation in nuclear reactions. 3

OR

B) a) Write short notes on Cerenkov Radiation. 2½

b) Explain Gamma ray interaction through matter. 2½

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| | c) | Describe methods of measurement of Gamma rays energies by pair production. | 2½ |
| | d) | Explain the interaction of neutron's with matter. | 2½ |
| 4. | A) | i) What is nuclear detector. Describe proportional counter and explain its Working. | 6 |
| | | ii) Describe construction and working of GM Counter. What is quenching in it? | 4 |
| | B) | a) Explain construction of linear accelerator. | 2½ |
| | | b) Describe the working of Van-De-Graft Generator. | 2½ |
| | | c) Describe the construction and working of cyclotron. | 2½ |
| | | d) Show that the length of cylindrical electrode in a linear accelerator is proportional to square root of the number of that electrode. | 2½ |
| 5. | | Solve any ten questions of the followings. | |
| | a) | Define charge density. | 1 |
| | b) | What is Bohr magnetron? | 1 |
| | c) | Write constituents of nucleus. | 1 |
| | d) | Write the condition for nuclear stability. | 1 |
| | e) | Give any two application of Fermi-gas model. | 1 |
| | f) | Write down semiempirical mass formula. | 1 |
| | g) | Define pair production. | 1 |
| | h) | What is Compton scattering? | 1 |
| | i) | What are photoelectron absorption? | 1 |
| | j) | Write down applications of Wilson cloud chamber. | 1 |
| | k) | What is synchro-cyclotrons? | 1 |
| | l) | What is dead time? | 1 |
