

PHYSICS Paper-C

(Nuclear & Particle Physics-I)

Time Allowed : Three Hours

Maximum Marks : 44

Note : Paper consists seven questions comprising of three Sections. First two Section comprise of three questions from each of unit I and II. Sections three comprising of one compulsory question of ten short answer parts. Student attempt any eight parts. Student will attempt two questions from each of the first two Sections. The use of non-programmable calculator is allowed.

SECTION - I

- (a) Discuss the failure of proton-electron hypothesis of nuclear constitution. 6

(b) Show that nuclear density is independent of the mass number. 3
2. Explain the postulates of the liquid drop model. Give derivation of semi-empirical mass formula. 9
- (a) What are the magic numbers ? Discuss the evidences that they exist. 3

(b) What do you mean by L-S coupling and J-J coupling ? 6

SECTION - II

- (a) Discuss the theory of successive decay at radioactive substance and obtain the conditions for transient and secular equilibrium. 6

(b) Calculate the activity of 10 mg of Ra^{226} which has a half-life of 1620 years.

5. (a) Discuss Geiger Nuttal law. 3
 (b) What is process of electron capture, electron emission and positron emission? 6
6. (a) What do you mean by Value of reaction? Derive an expression for it in terms of kinetic energies of product and incident particles and their masses. 6
 (b) Find the age of death of an organism from the following data :
 Half-life of ${}^{14}_6\text{C} = 5600$ years
 Rate of amt. of ${}^{14}_6\text{C}$ at the death and present time is 10^5 . 3

SECTION – III

(Compulsory Questions)

7. Do any eight parts :
- (i) What is Nuclear spin?
 - (ii) What do you understand by nuclear quadrupole moment?
 - (iii) Name the four radioactive series.
 - (iv) What is concept of compound nuclears?
 - (v) What are the unit of nuclear-cross-section?
 - (vi) What do you mean by tunnel effect in α -decay?
 - (vii) What do you mean by energy classification of neutrons?
 - (viii) Define the two units of intensity of radioactivity.
 - (ix) What are main difference between fission and nuclear fusion?
 - (x) What is the function of carbon rods in the nuclear reactor? $1 \times 8 = 8$