GSQ/D-21   **1070**

PHYSICS

(Nuclear Physics)

Paper–X

Time : Three Hours]   [Maximum Marks : 40

Note : Attempt *five* questions in all. Q. No. 1 is compulsory. Select *one* question from each unit.

Compulsory Question

1. (a) Define parity, even and odd parity.   2

   (b) What is β-decay ?   2

   (c) Why electron cannot be accelerated using cyclotron ?

                                                                   2

   (d) Why heavy water is preferred over ordinary water for use as a moderator ?   2

UNIT–I

2. (a) What is binding energy ? Explain the significance of binding energy per nucleon curve.   5

   (b) Write short note on nuclear dipole and quadrupole moments.   3

3. (a) What is Moseley's law ? Discuss how charge of nucleus is determined it ? 5

(b) Find the energy equivalent to 1 amu. 3

UNIT–II

4. (a) How a light charged particle loses its energy while traversing through a medium ? 5

(b) What is Geiger-Nuttal law ? 3

5. What is α-decay ? Discuss energetics of α-decay to explain the energy carried by α-particle and daughter nucleus. 8

UNIT–III

6. Give principle, construction and working of a linear accelerator. Give its advantages and disadvantages. 8

7. (a) Describe the working and construction of GM counter with special reference of the following : (i) Quenching (ii) Dead and recovery time. 6

(b) If a photomultiplier tube has 10 dynodes and secondary emission factor of these dynodes = 4, then find out total multiplication factor. 2

UNIT–IV

8. (a) What is a nuclear reaction ? Explain various types of nuclear reactions and conservation laws. 6

(b) Which quantities are not conserved in nuclear reactions ? 2

9. (a) Discuss general aspects of a design of a nuclear reactor.

6

(b) Calculate the excitation energy of the $_{92}U^{236}$ nucleus when a thermal neutron ($E_n \approx 0.25$ eV) is absorbing by a $_{92}U^{235}$ nucleus. Mass of neutron = 1.0087 u, mass of $_{92}U^{235}$ = 235.0435 u and mass of $_{92}U^{236}$ = 236.0457 u.

2

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