Exam. Code : 103205
Subject Code : 1339

B.A./B.Sc. 5th Semester

PHYSICS

Paper—B (Nuclear Physics)

Time Allowed—3 Hours] [Maximum Marks—35

Note :—Candidates are required to attempt **FIVE** questions, selecting at least **ONE** question from each section. The fifth question may be attempted from any section. All questions carry equal marks.

SECTION—A

1. Explain the terms Mass Defect, Packing Fraction and Nuclear Binding Energy. Give salient features of binding energy per nucleon versus mass number curve. How nuclear fission and nuclear fusion can be explained on the basis of this curve ? 7

2. (a) What are Nuclear Forces ? Explain briefly the properties of nuclear forces.

   (b) The mass of deuteron ${}_1H^2$ nucleus is 2.014103 a.m.u. if the masses of proton and neutron are 1.007825 a.m.u. and 1.008665 a.m.u. respectively, calculate mass defect and binding energy of the deuteron ${}_1H^2$ nucleus. 5,2

SECTION—B

3. Explain the Gamow's Theory of α-decay. How Geiger Nuttal's law is obtained from it ? 7

4. (a) What are radioactive decay laws ? Define half life and mean life. Derive the expression for half life and mean life.

   (b) Calculate disintegration constant λ of a sample of radium whose half life is 1590 years. 5,2

SECTION—C

5. Describe Kinematics of Nuclear Reaction and obtain expression for its Q-value. 7

6. Explain the terms nuclear reaction cross-section and what are its units ? Derive an expression for nuclear reaction cross section. Also define and explain the term differential cross-section. 7

SECTION—D

7. What are basic assumptions of liquid drop model ? Derive semi-empirical mass formula of liquid drop model. 7

8. (a) What are magic numbers ? Discuss briefly the experimental evidences for the existence of magic numbers.

   (b) Give the successes of shell model. 4,3