

Exam. Code : 103205

Subject Code : 1362

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

PHYSICS

Paper—B

(Nuclear Physics)

Time Allowed—3 Hours]

[Maximum Marks—35

Note :— Section A is compulsory. Attempt **ONE** question each from Sections B, C, D and E. All questions carry equal marks. Non programmable calculator/ log tables may be used.

SECTION—A

1. (a) What is relation between a.m.u. and electron volt ?
 - (b) What is difference between mass defect and packing fraction ?
 - (c) What do you understand by beta decay ?
 - (d) What is pair production ?
 - (e) What is nuclear transmutation ?
 - (f) What is threshold energy ?
 - (g) How the volume of a nucleus is related to mass number ?
- 1×7

SECTION—B

2. (a) What are nuclear forces ? Discuss the various properties of nuclear forces.
- (b) Calculate the binding energy and average binding energy per nucleon of ${}^4_2\text{He}$ nucleus, mass of ${}^4_2\text{He} = 4.002634$ a.m.u., $M_{\text{H}} = 1.007825$ a.m.u., $M_{\text{n}} = 1.008665$ a.m.u. 5,2
3. Explain why an electron cannot exist inside the nucleus. 7

SECTION—C

4. Show that radioactive element decays exponentially with time. Derive an expression for half life and average life for a radioactive material. 7
5. Explain radioactive dating and give two important methods used for it. 7

SECTION—D

6. What is Q-value of a nuclear reaction ? Derive an expression for the Q-value of a nuclear reaction in terms of masses and kinetic energies of incident particle, product particle and nuclei. 7
7. (a) What are various types of nuclear reactions ? Give at least one example for each case.
- (b) Write short notes on :
- (a) Compound Nucleus
- (b) Nuclear Cross Section. 3,4

SECTION—E

8. What are the various assumptions of liquid drop model of nucleus ? Discuss the semi-empirical mass formula of liquid drop model. Discuss the utility of this formula.

7

9. (a) What are magic numbers ? Discuss the evidences that they exist.

(b) Give the successes of shell model. 5,2