

Roll No.

Exam Code : J-22

Subject Code—55616

B. Sc. EXAMINATION

(Main/Reappear) (Batch 2018 Onwards)

(Fifth Semester)

PHYSICS

CPL-502

Paper-II

Nuclear Physics

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. Use of simple calculator is allowed.

1. (a) Neutron is neutral particle but still have magnetic dipole moment. Explain. 2
- (b) Why an electron cannot exist inside the nucleus ? 2

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P.T.O.

- (c) Define Parity. 2
- (d) What is binding energy? 2
- (e) Define linear absorption coefficient. What are its units? 2
- (f) What is nuclear cross-section? 2
- (g) Why cyclotron cannot be used to accelerate electrons? 2
- (h) What is dead time and recovery time of a G.M. counter? 2

Unit I

- 2. (a) Define packing fraction in a nucleus. Give its variation with A. 12
- (b) Calculate the energy in joule required to break one gram mole of helium into its constituent particle. 4
- 3. (a) What are β -rays? Give the important features of β -ray spectra. What led Pauli to postulate the existence of neutrino? Mention the properties of neutrino. 12

- (b) Determine the radii of Pb^{208} nucleus.
Given $R_0 = 1.4 \text{ fm}$. 4

Unit II

4. Mention the main postulate of liquid drop model. Give the contribution of various term to the binding energy of nucleon. Draw these on a graph. Where does it fail ? 16
5. (a) Describe the nuclear shell model and obtained the so called "magic numbers." 12
- (b) Predict the characteristics of the ground state of ${}_8\text{O}^{17}$ and ${}_{29}\text{Cu}^{62}$. 4

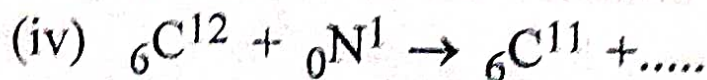
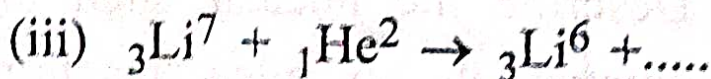
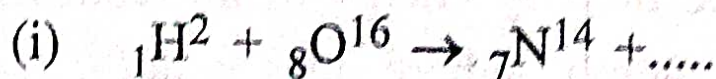
Unit III

6. (a) What is stopping power, impact parameter and range of charged particle ? Give an expression for stopping cross-section. 12
- (b) For given metal surface, the limiting wavelength for photo-electric emission is $5800\text{\AA}$, Deduce the kinetic energy of electrons ejected by light of $4500\text{\AA}$. 4

7. (a) Define Q-value of a nuclear reaction. Derive an expression for the Q-value of nuclear reaction in terms of mass, K.E. of incident particle and product particle.

12

- (b) Complete the following reactions : 4



Unit IV

8. (a) Name various detectors of nuclear radiation. Discuss in detail, principle working and uses of G.M. counter. 12

- (b) Calculate frequency of applied potential to the cyclotron dees in which deuterons are accelerated, given flux density $B = 3.0 \text{ weber/m}^2$, $e = 1.6 \times 10^{-27} \text{ kg}$.

4

9. (a) What is a synchrotron ? Give a detailed account of construction and working of (i) electrons synchrotron (ii) proton synchrotron. 14
- (b) What do the abbreviations "MeV" and "BeV" stand for ? 2