

Subject Code—52603

B. Sc. EXAMINATION

(Batch 2018) (Main)

(Fift Semester)

PHYSICS

CPL-502 (Paper II)

Nuclear Physics

*Time : 3 Hours**Maximum Marks : 80*

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory. All questions carry equal marks. Use of simple calculator is allowed.

1. (a) What is auger electron ? 2
- (b) Why does gamma-decay takes place ? 2
- (c) What is magic number ? Which out of these are magic numbers :

2, 4, 5, 6, 8, 10, 16, 18 2

- (d) What do you mean by even and odd parity of a nucleus ? 2
- (e) What is stopping power ? 2
- (f) Give an example of conversion of matter into energy ? 2
- (g) What is cyclotron resonance frequency ? 2
- (h) What do you understand by sensitivity of G.M. tube ? 2

Unit I

2. (a) Define binding energy per nucleon. What are the conclusion drawn from the graph between binding energy/nucleon and mass number A ? 8
- (b) What are the cause of failure of proton-electron hypothesis of nuclear constitution ? 8
3. (a) Explain Geiger-Nuttal law and show that $R \propto E^{1/2}$, where E is the kinetic energy of α -particles. 12
- (b) Find the nuclear density of U^{235} , if $R_0 = 1.1 \times 10^{-15}$ m. 4

Unit II

4. (a) What is semi-empirical formula ? Explain significance of various terms. 8
- (b) What are nuclear forces ? Discuss their properties. 8
5. (a) Explain/Drive the experimental evidence for nuclear magic numbers. 12
- (b) Using single particle shell model, predict the ground state spin and parity of ${}_{13}\text{Al}^{37}$, ${}_{16}\text{S}^{33}$ and ${}_{18}\text{Ar}^{41}$. 4

Unit III

6. (a) What is Compton effect ? Derive an expression for the Compton shift. 12
- (b) An X-ray of wavelength $0.1 \text{ \AA}$ is scattered by an electron. What are the maximum and the minimum wavelength of the scattered photon ? Calculate the angle corresponding to the scattered photon of $11 \text{ \AA}$. 4
7. Discuss nuclear cross-section in detail. 16

Unit IV

8. (a) Describe the principle, construction and working of ionization chamber. 12
- (b) Can electron accelerate with the help of cyclotron ? Explain. 4
9. (a) Draw the block diagram of a scintillation counter. What are its main features ? Drive the relation for the height of output pulse generate in it. What are its distinct advantages over other particle detectors ? 12
- (b) A G.M. counter collect 10^8 electrons/discharge when the counting rate is 500 counts/min. What will be the average current in the circuit ? 4