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Roll No.

Exam Code : D-23

Subject Code—60461

B. Sc. EXAMINATION

(Main/Reappear) (Batch 2019 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. All questions carry equal marks. Use of simple calculator is allowed.

(Compulsory Question)

1. (a) Which is more; atomic binding energy or nuclear binding energy ? Why ? 2
- (b) What is the ratio of BWh and MeV ? 2

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- (c) What are the assumptions of shell model ?
2
- (d) What do you mean by even and odd parity of a nucleus ?
2
- (e) What is Straggling ?
2
- (f) What is mass absorption coefficient ?
What is its unit ?
2
- (g) Distinguish between synchro-cyclotron and cyclotron.
2
- (h) What are the limitations of G.M. counter ?
2

Unit I

2. (a) What are the differences between gamma rays and X-rays ?
6
- (b) What is Radioactive series ? Define Thorium series and Neptunium series. 10
3. (a) What is relation between binding energy and mass defect ? Show how binding energy changes with mass number. 6

- (b) 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. 10

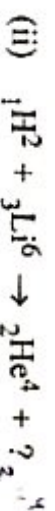
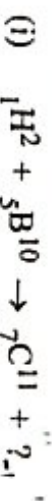
Unit II

4. What are magic numbers ? Give experimental evidence for their existence. What are the achievements of shell-model ?
16
5. (a) Why do we say that a nucleus behaves like a drop of liquid ? What are the essential features which are common to a drop of liquid and a nucleus ?
6
- (b) Using single particle shell model, predict the ground state spin and parity of ${}_{13}\text{Al}^{27}$, ${}_{16}\text{S}^{33}$ and ${}_{18}\text{Ar}^{41}$.
6
- (c) What are the properties of nuclear forces ?
4

Unit III

6. On what factors does stopping power of a charged particle depend ? Explain Bethe-Block formula. 16

7. (a) Complete the following reactions : 4



(b) What quantities are conserved in nuclear reactions ? 4

(c) What is photoelectric effect ? What is the effect of intensity, potential and frequency of incident radiations on photoelectric current ? Explain laws of photoelectric emission. 8

Unit IV

(b) Describe the principle, construction and working of ionization chamber. 12

9. (a) What are particle accelerators and how are they useful ? 4

(b) Describe necessary theory, construction and working of betatron. Where do you think it got its name ? 12

8. (a) How neutrons can be detected ? 4