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**

(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 $_{13}Al^{27}$, $_{16}S^{33}$ and $_{18}Ar^{41}$. 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

(i) $_1H^2 + {}_5B^{10} \rightarrow {}_7C^{11} + ?_{-1}$

(ii) $_1H^2 + {}_3Li^6 \rightarrow {}_2He^4 + ?_2$

(iii) $_{11}Na^{23} + {}_2He^4 \rightarrow {}_{13}Al^{26} + ?$

(iv) $_4Be^9 + {}_1H^1 \rightarrow {}_4Be^8 + ?$

(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

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

(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