Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

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B.Sc.(CS) (2013 & onwards) (Sem.–6)

NUCLEAR PHYSICS

Subject Code : BCS-603

M.Code : 72783

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and a student has to attempt any FOUR questions.**

SECTION-A

1. Answer briefly :

(a) What do you understand by nuclear spin?

(b) Calculate the mass and radius of $_{13}A1^{27}$ nucleus.

(c) What is parity? What do you mean by even and odd parity?

(d) Why stable nuclei have more neutrons than protons?

(e) Which is more, atomic binding energy or nuclear binding energy?

(f) Describe the term 'internal conversion'.

(g) Calculate the half life time and mean life time of the radioactive substance whose decay constant is 4.28×10^{-4} per year.

(h) What is natural Radioactivity?

(i) What do you mean by a Q-value of a nuclear reaction?

(j) What do you mean by transmutation?

SECTION-B

2. Prove from wave mechanical, angular momentum, statistical and other considerations that electrons cannot exist in the nucleus.

3. Obtain the expression for the binding energy of a nucleus based on liquid drop model. State the semi-empirical formula. What are its achievements and limitations?

4. What are magic number nuclei? How does shell model explain the existence of magic numbers 2,8,20 and 28 only? Give the significance of magic numbers.

5. What is the cause of radioactivity? Give various types of radioactive decays and discuss the process involved in all the radioactive decays.

6. What is β-decay? Show that the law of conservation of energy and momentum are not obeyed in β-decay. Show that neutrino hypothesis explains this discrepancy.

7. Define and explain the term nuclear reaction cross-section. What are its units? If a beam of N_o particles is incident on a slab of thickness x of the material, how many particles will emerge out of the slab. Given that the slab contains n atoms per unit volume and σ is the cross section of the reaction.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.