



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

FIFTH SEMESTER – NOVEMBER 2011

PH 5507/PH 5504/PH 5500 - ATOMIC & NUCLEAR PHYSICS

Date : 31-10-2011
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

PART – A

Answer ALL questions:

(10x2=20 Marks)

1. State Pauli's exclusion principle.
2. What is Stark effect?
3. Distinguish isobar and isotope with examples.
4. How many α and β particles are emitted when Uranium nucleus ${}_{92}\text{U}^{238}$ decays to lead ${}_{82}\text{Pb}^{206}$.
5. Discuss the spin and magnetic moment of the neutron.
6. Distinguish slow and fast neutrons.
7. What are cosmic ray showers?
8. What are Van Allen belts?
9. Name the four fundamental interactions.
10. What is Mossbauer spectroscopy?

PART – B

Answer any FOUR questions:

(4x7.5=30 Marks)

11. Explain the types of coupling schemes between the orbital and spin angular momenta. (4+3.5)
12. Explain i) mass defect, ii) binding energy and iii) packing fraction. (3x2.5)
13. Give the different sources of neutrons.
14. Explain the characteristics of nuclear force.
15. Discuss the basic ideas of Mossbauer spectroscopy.

PART – C

Answer any FOUR questions:

(4x12.5=50 Marks)

16. a) What are the differences between normal and anomalous Zeeman effects? (3+9.5)
b) Derive an expression for Lande's splitting factor and explain the anomalous Zeeman effect of sodium lines.
17. a) State Geiger - Nuttal law. (3+9.5)
b) Explain the theory of alpha decay.
18. Derive the four factor formula for the thermal nuclear reactor.
19. Discuss the semi-empirical mass formula for a nucleus and explain the different terms in it.
20. Explain the importance of chemical shift and how it is measured. (6+6.5)

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