LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

FIFTH SEMESTER – **NOVEMBER 2017**

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

Date: 04-11-2017 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART – A

Answer ALL questions: (10x2=20 marks)

1. What is stark effect?
2. Electrons move at right angles to the magnetic field of 1.5×10^{-2} tesla with a velocity of 6×10^{6} m/s. Find the radius of the circular path. ($e/m=1.7 \times 10^{11}$ c/kg)
3. Define mass defect and packing fraction.
4. State Geiger-Nuttal law.
5. Why neutrons are moderated in nuclear reactors?
6. Write a note on magnetic moment of a neutron.
7. What are magic numbers?
8. Name the four fundamental interactions.
9. What is the frequency of NMR radiation between two equally populated levels of spin ½ system?
10. What is Mossbauer spectroscopy?

PART – B

Answer any FOUR questions: (4X7.5=30 marks)

11. Explain the coupling schemes between orbital and spin angular momenta . (4+3.5)
12. Mention any seven properties of gamma rays.
13. Discuss electric quadrapole moment of a nucleus.
14. Discuss the similarities of a liquid drop and of a nucleus.
15. a) Explain Yukawa's meson theory of nuclear forces.

    b) How does the intensity of cosmic ray varies with altitude? (4+3.5)

16. Discuss the population of energy levels in the context of NMR spectroscopy.

PART – C

Answer any FOUR questions: (4X12.5=50 marks)

17. Describe Thompson's parabola method to find e/m of a positive ion.

18. i) Derive an expression for the change in wavelength of a photon in Compton Scattering.

    ii) Photon of energy 1.02 MeV undergoes Compton scattering through 180^0. Calculate the wavelength of scattered photon. **(10+2.5)**

19. i) Explain the energetics of a Beta ray spectrum. Hence explain Pauli's hypothesis of neutrino theory.

    ii)) What is the minimum energy required to break a Helium nucleus? The masses of a hydrogen, a neutron and a helium atom in a.m.u are 1.007825, 1.008665 and 4.002603 respectively. **(2+6.5+4)**

20 i) define nuclear chain reaction

    ii) Derive the four factor formula for a thermal nuclear reactor.

21. Obtain an expression for binding energy of nucleus based on semi-empirical mass formula.

22. Give a brief note on chemical shift and its measurement in NMR spectroscopy **(6+6.5)**

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