LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

FIFTH SEMESTER – November 2009

PH 5500 - ATOMIC & NUCLEAR PHYSICS

Date & Time: 3/11/2009 / 9:00 - 12:00 Dept. No. Max. : 100 Marks

PART – A

Answer ALL questions: **(10x2=20 Marks)**

1. Mention the limitations of Aston's mass spectrograph.
2. Write a note on spectral notation.
3. An X-ray tube operates at 25 kV. Find the short wavelength limit of the continuous X-rays.
4. Define the terms work function and threshold frequency of a photo metal.
5. State Geiger-Nuttal law.
6. Write a note on packing fraction.
7. Classify slow and fast neutrons.
8. What is Nuclear fusion?
9. What are cosmic ray showers?
10. Give the quark model of proton and neutron.

PART – B

Answer any FOUR questions: **(4x7.5=30 Marks)**

11. Explain L-S and J-J coupling schemes. (4+3.5)
12. Give an account of properties of X-rays.
13. a)Explain mass defect and binding energy. (3)
    b)Discuss the binding energy variation with mass number (4.5)
14. a)What are the sources of neutron? (5.5)
    b)Complete the following nuclear reactions:
    (i) $_{17}Cl^{35} + ? \rightarrow {}_{16}S^{32} + {}_{2}He^{4}$ and (ii) $_{5}B^{10} + ? \rightarrow {}_{3}Li^{7} + {}_{2}He^{4}$ (2)
15. Write a note on nuclear shell Model.

PART – C

Answer any FOUR questions: **(4x12.5=50 Marks)**

16. a) What are normal and anomalous zeeman effect. (2.5)
    b) Derive an expression for Lande's factor and explain the doublet of sodium lines. (10)
17. a) Explain how Millikan calculated the value of Planck's constant. (9)
    b) X-rays of wavelength 1Å are scattered at such an angle that the recoil electron has the maximum kinetic energy. Calculate the wavelength of scattered wave. (3.5)
18. a) Discuss the nuclear (i) size, (ii) magnetic dipole moment and (iii) electric quadrupole moment. (3+3+4)
    b) Calculate the binding energy per nucleon in $_{6}C^{12}$. Masses of proton, neutron and electron are 1.007276, 1.008665 and 0.00055 amu respectively. (2.5)
19. Describe the construction and working of a nuclear reactor.
20. Obtain an expression for binding energy of a nucleus based on semi-empirical mass formula.

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