

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**



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

**SIXTH SEMESTER – APRIL 2016**

**PH 6611 – ATOMICS AND NUCLEAR PHYSICS**

Date: 15-04-2016

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

**PART – A**

**Answer ALL questions**

**(10x2=20 marks)**

1. What are the limitations of Thomson's parabola method?
2. State Pauli's exclusion principle.
3. What is Stark effect?
4. Write down the types of excitation giving rise to molecular spectra.
5. Define isobar and isotope.
6. State Geiger-Nuttall law.
7. Write a note on magnetic moment of a neutron.
8. Define chain reaction.
9. What are cosmic ray showers?
10. Explain dark matter with examples.

**PART – B**

**Answer any FOUR questions**

**(4x7.5=30 marks)**

11. Describe the Dunnington's method of finding  $e/m$  of an electron.
12. Explain the coupling schemes between orbital and spin angular momenta. (4+3.5)
13. Give the elementary theory of the origin of pure rotational spectrum of a molecule.
14. a) Explain (i) mass defect (ii) binding energy. (4+3.5)  
b) Explain the variation of binding energy with mass number and discuss its salient features.
15. a) Explain Bohr and Wheeler's theory of nuclear fission. (4+3.5)
16. Discuss the future of universe based on Hubble's law.

**PART – C**

**Answer any FOUR questions**

**(4x12.5=50 marks)**

17. a) Describe Thompson's parabola method to find  $e/m$  of positive rays.  
b) Discuss few applications. (10+2.5)
18. a) What is normal and anomalous Zeeman effect? (3+9.5)  
b) Explain the sodium doublet lines  $D_1$  and  $D_2$  by deriving Lande's 'g' factor.
19. a) Discuss electric quadrupole moment of a nucleus. (6+6.5)  
b) Give the origin of line and continuous spectrum of  $\beta$  rays.
20. Write a note on discovery and sources of neutrons.
21. Discuss (i) particles and antiparticles and (ii) fundamental interactions between elementary particles. (6+6.5)
22. a) Explain the principle and experimental arrangement of Stern-Gerlach in support of spatial quantisation. (10+2.5)  
b) Why it is necessary to use a beam of neutral atoms and not ions in this experiment.

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