LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – **APRIL 2023**

PH 5504 – ATOMIC AND NUCLEAR PHYSICS

Date: 29-04-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

	PART – A	**(10 x 2 = 20 Marks)**
Q. No.	**Answer ALL questions**	
1	State Pauli's exclusion principle.	
2	What is Stark effect?	
3	What are isotopes and isobars? Give an example.	
4	Draw the binding energy fraction versus mass number curve.	
5	Mention any two sources of neutrons.	
6	Distinguish between fast and slow neutrons.	
7	What are magic numbers?	
8	List out the four fundamental interactions of force in nature.	
9	What is Larmor precession?	
10	Mention any two applications of NMR spectroscopy.	
	PART – B	**(4 x 7.5 = 30 Marks)**
	Answer any FOUR questions	
11	With suitable diagram describe Dunnington method to determine the charge of the electron.	
12	Discuss in detail the L-S and j-j couplings.	
13	Draw a neat diagram of a nuclear reactor and explain its working.	
14	Describe in detail the properties of alpha, beta and gamma particles.	
15	What are cosmic rays? Write a note on cosmic ray showers.	
16	Explain the salient features of nuclear shell model.	
	PART – C	**(4 x 12.5 = 50 Marks)**
	Answer any FOUR questions	
17	With a neat experimental set up, explain the normal Zeeman Effect and obtain the expression of Zeeman shift.	
18	a) Write a note on mass defect, binding energy and packing fraction. b) Explain Rabi method to determine the nuclear magnetic moment.	(6.5+6)

19	Describe the Bohr-Wheeler's theory of nuclear fission and hence explain the nuclear chain reaction.
20	Obtain an expression for binding energy of a nucleus based on the semi-empirical mass formula.
21	With examples describe the various conservation laws in elementary particle physics.
22	Describe Thomson's parabola method to determine the specific charge of positive rays and give its limitations.

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