LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **PHYSICS**

FOURTH SEMESTER – **APRIL 2023**

PPH 4502 – NUCLEAR PHYSICS

Date: 03-05-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

	PART – A	**(10x 2 = 20 Marks)**
	Answer ALL questions	
1	Calculate the distance of closest approach between a deuteron of energy 3.5 MeV and a Uranium nucleus.	
2	Name the different types of central potentials available to solve the deuteron problem.	
3	How does the binding energy of the odd-odd differ from the even-even nuclei?	
4	What is the significance of atomic mass?	
5	State the condition for continuum in compound nucleus energy levels.	
6	If the radius of the $_{13}Al^{27}$ nucleus is estimated to be 3.6 fermi, then find the radius of $_{32}Te^{125}$ nucleus.	
7	Distinguish between *pick-up* and *stripping* nuclear reactions.	
8	What is the characteristic feature of the optical model?	
9	Distinguish between a neutrino and an anti-neutrino.	
10	What are hadrons? Give examples.	
	PART – B	**(4 x 7.5 = 30 Marks)**
	Answer any FOUR questions	
11	Provide an account of the various exchange forces in the nucleus.	
12	Enlist the analogies drawn out between the nucleus and a liquid drop.	
13	Derive the four factor formula for controlled chain reactions.	
14	Discuss the different types of beta decay with their corresponding equations.	
15	Explain the classification of elementary particles with a schematic diagram.	
16	Derive the Levy's formula for the determination of atomic masses.	
	PART – C	**(4 x 12.5 = 50 Marks)**
	Answer any FOUR questions	
17	Discuss in detail the two-nucleon potential analysis and hence obtain expressions for the range and depth of the potential.	
18	Obtain the Weizsacker's semi empirical mass formula and discuss it in detail.	
19	Derive the Breit-Wigner dispersion formula for nuclear cross section.	
20	Discuss the Fermi and Gamow Teller selection rules for beta transitions.	
21	State and elucidate with suitable examples the CPT invariance theorem.	
22	Discuss elaborately, the design and working of a nuclear reactor.	