QP CODE: D2BPH2402	(Pages: 2)	Reg. No : .....
		Name : .....

SECOND SEMESTER FYUGP EXAMINATION, APRIL 2025

MINOR COURSE

PHY2MN102 : MODERN PHYSICS AND NUCLEAR PHYSICS

(Credits: 4)

Time: 2 Hours **Maximum Marks: 70**

Section A

Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)

1.	What are de Broglie waves? Write an expression for the wavelength of de Broglie waves.	BL1	CO2
2.	Calculate the value of Compton wavelength. Also find the unit.	BL2	CO1
3.	A source operating at a frequency of 100 MHz radiates a power of 100 kW. Calculate the number of quanta of energy emitted per second.	BL3	CO1
4.	What is atomic spectra? Differentiate between emission line spectra and absorption line spectrum.	BL2	CO3
5.	The great majority of alpha particles pass through gases and thin metal foils with no deflections. To what conclusion about atomic structure does this observation lead?	BL2	CO3
6.	What are the merits of liquid drop model?	BL2	CO4
7.	Why $_{92}^{238}U$ is not suitable for nuclear fission?	BL2	CO6
8.	What do you mean by a compound nucleus? How are they formed?	BL2	CO6
9.	Give the fundamental laws of radioactivity.	BL1	CO5
10.	What is the mean life of a radioactive isotope?	BL1	CO5

Section B

Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)

11.	Calculate the minimum energy of radiation for pair production.	BL3	CO2

(PTO)

12.	Derive an equation to find the total energy of hydrogen atom.	BL2	CO3
13.	The longest wavelength in the Lyman series is 121.5 nm and the shortest wavelength in the Balmer series is 364.6 nm. Use the figures to find the longest wavelength of light that could ionize hydrogen.	BL3	CO3
14.	Explain Bohr model of atom.	BL2	CO3
15.	Deuteron is the nucleus of heavy hydrogen or deuterium ($_1{}^2H$). Its mass is 3.344×10^{-27} Kg. It has one proton and one neutron. The mass of proton is 1.673×10^{-27} Kg and that of neutron is 1.673×10^{-27} Kg. From these data, find out the mass defect, and binding energy per nucleon.	BL3	CO4
16.	Discuss the nuclear structure.	BL1	
17.	Establish that magic numbers evolve naturally from the shell model.	BL2	CO4
18.	A nucleus emits an α particle followed by two β particles. Show that the final nucleus is an isotope of the original one.	BL3	CO5
	Section C		
	Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)		
19.	State the laws of photoelectric effect. Explain how it is accounted on the basis of quantum theory of radiation and hence obtain Einstein's photoelectric equation.	BL2	CO1
20.	What are the differences and similarities between nuclear fission and nuclear fusion?	BL2	CO6
	CO : Course Outcome		
	BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)		