QP CODE: D4BPH2403	**(Pages: 2)**	**Reg. No**	**:**	**...............................**
		Name	**:**	**...............................**

FOURTH SEMESTER FYUGP EXAMINATION, APRIL 2026

Discipline Specific Core (DSC) Courses - Major

PHY4CJ205 : MODERN PHYSICS

(Credits: 4)

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

Section A

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

1.	Define rest mass and explain why the concept of relativistic mass is avoided in modern physics.	BL2	CO1
2.	Define the "relativity of simultaneity"	BL2	CO1
3.	Derive the Galilean velocity transformation equations and explain why they predict different light speeds for different observers.	BL2	CO1
4.	State the concept of an electromagnetic wave.	BL1	CO2
5.	Mention the equation representing pair production.	BL2	CO2
6.	Explain the photoelectric effect and describe the term photoelectrons.	BL2	CO2
7.	Explain how the Davisson–Germer experiment provides evidence for the de Broglie hypothesis.	BL2	CO3
8.	Differentiate between phase velocity and group velocity of de Broglie waves.	BL2	CO3
9.	List the spectral series observed in the hydrogen atom.	BL1	CO4
10.	List the limitations of Bohr’s atomic model.	BL1	CO4

Section B

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

11.	Find the speed of the space ship of every day spent on it may correspond to 2 days on the earth surface.	BL3	CO1
12.	Give examples of mass-energy equivalence.	BL3	CO1

(PTO)

13.	X-rays of wavelength 0.140 nm are scattered from a block of carbon. What will be the wavelength of the X-rays scattered at a given angle (30 and 60 degree)?	BL3	CO2
14.	Distinguish between photon emission and photon absorption	BL2	CO2
15.	The uncertainty in the velocity of an electron is equal to half of its velocity. Using the relation $\Delta x \Delta p = h$ (Planck's constant), show that the uncertainty in its position is twice its de Broglie wavelength.	BL3	CO3
16.	The lifetime of an excited atomic state is 1×10^{-9}s. Estimate the uncertainty in the frequency of the emitted radiation.	BL2	CO3
17.	Explain how the results of the Franck–Hertz experiment provide evidence in support of Bohr’s atomic model.	BL3	CO4
18.	An electron in a hydrogen atom is in the n=5 energy level. Identify the possible transitions the electron can make and calculate the energies of the emitted radiations.	BL3	CO4
	Section C		
	Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)		
19.	Derive the formula giving the variation of mass with velocity.	BL2	CO1
20.	A beam of alpha particles with known kinetic energy is incident on a thin gold foil. (a) Derive the expression for the distance of closest approach. (b) Explain the physical significance of the impact parameter for scattering at a given angle.	BL3	CO4
	CO : Course Outcome		
	BL : Bloom’s Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)		