QP Code: D134300	Total Pages: 2	Name:
		Register No.

THIRD SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(CUFYUGP)

PHY3MN 205 - OPTICS AND SPECTROSCOPY

2024 Admission onwards

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

Section A

All Questions can be answered. Each Question carries 3 marks (Ceiling : 24 Marks)

1	What is meant by regular reflections? Draw a suitable diagram to represent it.
2	State laws of reflection with suitable diagram.
3	Give the names of radiations in the electromagnetic spectra with frequency greater than that of visible light.
4	State Brewster's law with suitable diagram.
5	What is meant by coherent superposition? Write the expression for its resultant intensity.
6	Give any two differences between the Ordinary ray and Extraordinary ray.
7	Differentiate Stokes and anti-Stokes line in Raman spectra.
8	Name any three types of spectroscopic methods to study a molecule.
9	Differentiate spontaneous and stimulated emission.
10	Give the expression for vibrational energy of a diatomic molecule and give its selection rule for the transition.

Section B

All Questions can be answered. Each Question carries 6 marks (Ceiling : 36 Marks)

11	Define photon and find the energy and momentum of X-ray photons with a wavelength 0.1 nm.
12	Explain the phenomena of reflection and refraction of light using neat diagram. A light ray is incident from air (n_1= 1.0) onto a glass surface (n_2=1.5) at an angle of incidence i=30^0. Find the angle of refraction.
13	State Malus's law. Unpolarized light of intensity Io=20 mW/cm^2 passes through two ideal polarizers. The transmission axis of the second polarizer is at an angle of 60^o with respect to the first polarizer. Calculate the intensity of light after the first polarizer and the second polarizer.
14	Define specific rotation. A solution is placed in a 10 cm long tube, its concentration is 0.1 kg/L. When plane-polarized light passes through, the solution rotates the light by 5°. Find the specific rotation of solution.
15	Derive an expression for the path difference in interference due to a wedge-shaped thin film. Hence obtain an expression for the fringe width in terms of the wedge angle and thickness of the spacer.
16	What is electronic spectroscopy? Briefly explain fluorescence using energy level diagram.
17	Define the Einstein coefficients and discuss their physical significance.
18	In carbon monoxide (CO) molecule, the masses of the C and O atoms are respectively 1.99 x 10^{-26} Kg and 2.66 x 10^{-26} Kg. The absorption line for the transition from J=0 to J=1 occurs at a frequency of 1.15 x 10^{11} Hz. Find the bond length of CO molecule.

Section C	
Answer any ONE .Each Question carries 10 marks (1x10=10 Marks)	
19	Briefly explain Young's double-slit experiment with a neat diagram. Derive the expressions for the positions of bright and dark fringes on the screen. Finally, obtain the expression for the fringe width.
20	What is meant by spectral line width? Briefly explain various factors affecting the spectral line width.