

B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2025**SEMESTER 4 : PHYSICS (COMPLEMENTARY FOR CHEMISTRY)****COURSE : 19U4CPPHY08 : OPTICS AND SOLID STATE PHYSICS***(For Regular 2023 Admission and Improvement/Supplementary 2022/2021/2020/2019 Admissions)*

Time : Three Hours

Max. Marks: 60

PART A**Answer any 8 (2 marks each)**

1. Enlist the various contributions to total polarisability.
2. Discuss applications of optical fibres.
3. Calculate the packing fraction of body centered cubic structure?
4. What is single mode step index fiber?
5. Mention the applications of polarised light.
6. Discuss the crystal structure of NaCl.
7. Define dielectric displacement vector'?
8. What are incoherent sources of light?
9. Describe the action of a half wave plate.
10. Can a sound wave in air be polarized? Explain.

(2 x 8 = 16)**PART B****Answer any 6 (4 marks each)**

11. The dielectric constant of water is 84. What is the electric permittivity?
12. Explain plane, circularly and elliptically polarised light.
13. In a tetragonal lattice $a=b=(1/2)$ nm and $c=(1/3)$ nm. Determine the lattice spacing between (111) planes?
14. Illustrate the theory of thin film interference using examples.
15. Determine the relationships between the lattice parameter a and the atomic radius r for monoatomic sc, bcc and fcc structures.
16. In a double slit experiment, the distance between the slits is 3.5 mm and the slits are 1 m away from the screen. Determine the fringe width of the obtained interference pattern due to the light of wave length 600nm.
17. Explain step-index and graded index fibres with refractive index profile.
18. A glass fiber is made with core of refractive index 1.55 and cladding is doped to give of a fractional difference of 0.005. Find (a) the refractive index of cladding (b) critical internal reflection angle (c) external critical acceptance angle (d) Numerical Aperture.

(4 x 6 = 24)**PART C****Answer any 2 (10 marks each)**

19. Derive Gauss's law in dielectrics?
20. Explain determination of wavelength of sodium light using Newton's rings.

21. Discuss the propagation of light in optical fiber and Briefly explain the terms Numerical Aperture and Acceptance angle of and optical fiber.
22. (a) Why X-rays are used in Crystal structure studies? Derive Bragg's law of X-ray diffraction in crystals? (b) Find the smallest glancing angle at which K-alpha radiation of copper of wavelength 3 \AA will be reflected from Calcium crystal of spacing 6.072 \AA . At what angle will the third order reflection take place?

(10 x 2 = 20)