

**B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2024****SEMESTER 4 - COMPLEMENTARY PHYSICS FOR CHEMISTRY****COURSE : 19U4CPPHY08 - OPTICS AND SOLID STATE PHYSICS***(For Regular - 2022 Admission and Improvement / Supplementary - 2021/2020/2019 Admissions)*

Time : Three Hours

Max. Marks: 60

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

1. Explain Rayleigh's criterion for resolving power.
2. Define dielectric displacement vector'?
3. What are uniaxial and biaxial crystals?
4. Discuss applications of optical fibres.
5. State Gauss's law in dielectrics?
6. Explain plane of polarisation.
7. Whats the application of polaroid sunglasses?
8. Explain optical resonator in a laser device.
9. What are Bravias lattices?
10. What do you mean by packing fraction?

**(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. Illustrate the theory of thin film interference using examples.
13. Explain how population inversion can be achieved in a four-level laser system?
14. The density of sodium chloride is 2.18 g/cc. Determine the lattice constant. Given structure is fcc and molecular weight is 58.5.
15. In a crystal, lattice planes cut intercepts of length 2a, 3b and 4c along X, Y and Z axes. Find the Miller indices of the plane?
16. A step index fibre has a core of refractive 1.55 and cladding of refractive index 1.5. Calculate NA and acceptance angle of the fiber. Assume that the launch medium is air.
17. Explain plane, circularly and elliptically polarised light.
18. What angle is needed between the direction of polarized light and the axis of a polarizing filter to reduce its intensity by 90.0% ?

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

19. Explain Interference in thin films with the help of Cosines law.
20. (a) Derive an expression for the interplanar distance for a simple cubic structure crystal. (b) Also find the inter-planar spacing between the planes (101) of a cubic crystal, if lattice constant is 2.6 Å.?
21. Explain three level and four level laser systems with examples.
22. Discuss various sources of polarisation in dielectrics.

**(10 x 2 = 20)**