23106092

QP CODE: 23106092

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) IMPROVEMENT / REAPPEARANCE EXAMINATIONS, MARCH 2023

Fourth Semester

COMPLEMENTARY COURSE - PH4CMT02 - PHYSICS - OPTICS AND SOLID STATE PHYSICS

(Common for B.Sc Chemistry Model I, B.Sc Geology Model I)

2017 Admission Onwards

44A818CD

Time: 3 Hours

Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. Explain the principle of super position of waves.
2. What is a half period zone?
3. What is meant by polarization of light?
4. How can you show that both the ordinary and extraordinary rays are plane polarized with their planes of vibration mutually perpendicular ?
5. What is laevo rotatory substance?
6. What do you mean by active medium in laser?
7. Distinguish between monochromatic wave and coherent wave.
8. Differentiate between polar and non-polar molecules.
9. What you mean by electric displacement vector D?
10. How the terms susceptibility and permittivity are related?
11. Write down different features of the crystal.
12. Draw the planes for which the Miller indices are (120) and (221).

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. A light source emits light of two wavelengths 4300 Å and 5100 Å. The source is used in a double slit experiment. The distance between source and screen is 1.5 m and the distance between the slits is 0.025 mm. Calculate the separation between the 3rd order bright fringes due to these two wavelengths.

14. Light of wavelength 5500 Å from a narrow slit is incident on a double slit. The overall separation of 5 fringes on a screen 200 centimeter away is 1 centimeter. Calculate the slit separation and fringe width.

15. In a Newton's ring experiment the diameter of 15th dark ring was found to be 0.59 cm and that of the 5th ring was 0.336 cm. If the radius of curvature of the plano-convex lens is 100 cm, calculate the wavelength of light used.

16. What is the longest wavelength that can be observed in third order spectrum with a grating having 6000 lines per centimetre at normal incidence?

17. Obtain an expression for the resolving power of a grating.

18. What is laser? What are the main components in a laser source? Distinguish between spontaneous emission and stimulated emission.

19. Determine the value of electric field in a material for which the electric susceptibility is 4 and polarisation is 3×10^{-7} C/m2.

20. The ionic radii of Cs and Cl are 0.165 nm and 0.181 nm and their atomic weights are 133 and 35.5 respectively. The space lattice of CsCl is simple cubic. Calculate the density of CsCl.

21. In Bragg's diffraction of x-rays, diffraction is found at glancing angle 30° with lattice planes of spacing 1.87 Å. If this is second order diffraction, find the wavelength of x-rays.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Explain the interference phenomenon in thin films. What are the differences between interference and diffraction?

23. Describe the phenomenon of double refraction in uniaxial crystal. How this phenomena is explained using huygiene's theory.

24. With the help of geometry of optical fibre explain how light is propagated through and optical fibre. Derive the equation of numerical aperture of an optical fibre.

25. Discuss the close –packed and loose-packed structures in crystals with mention on hcp, fcc, bcc and simple cubic structures.

(2×10=20)