

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017**Fourth Semester****Complementary Course—Physics****PHYSICAL OPTICS, LASER PHYSICS AND SUPERCONDUCTIVITY**

(For B.Sc. Chemistry Model I B.Sc. Geology and B.Sc. Chemistry-Environment and Water Management)

[2013 Admission onwards]

Time : Three Hours

Maximum Marks : 60

Part A (Very Short Answer Questions)

Answer all questions.

1 mark each.

1. State the principle of superposition.
2. What is diffraction ?
3. What do you understand by unpolarized and polarized ?
4. Differentiate negative and positive crystals.
5. What are the properties of laser beams ?
6. What is stimulated emission ?
7. What are the applications of superconductivity ?
8. What is the spin of Cooper pair ?

(8 × 1 = 8)

Part B (Brief Answer Questions)

Answer any six questions.

2 marks each.

9. Explain why different colours are produced by a thin film in white light ?
10. Define resolving power of a grating.
11. State and explain Malus law.
12. What is double refraction ?
13. Discuss about polarization by scattering.

Turn over

14. How half wave and quarter wave plates are formed ?
15. What is population inversion ? How is it achieved practically ?
16. What are the applications of laser beams ?
17. Explain Meissner effect.
18. Differentiate Type I and Type II superconductors.

(6 × 2 = 12)

Part C (Problems/Derivatives/Short Essays)

Answer any four questions.

4 marks each.

19. 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 cm away is 1 cm. Calculate the slit separation and the fringe width.
20. In Newton's rings experiment, diameters of the 4th and 12th dark rings are 0.4 cm and 0.7 cm respectively. Deduce the diameter of the 12th dark ring.
21. In a plane diffraction grating, the angle of diffraction for the second order maxima for wavelength 5×10^{-5} cm is 30°. Calculate the number of lines per cm of the grating surface.
22. Plane polarized light passes through a quartz plate with its optic axis parallel to the faces. Calculate the least thickness of the plate for which the emergent beam will be plane polarized. Given $\mu_E = 1.5533$, $\mu_O = 1.5442$ and $\lambda = 500$ nm.
23. A certain Ruby laser emits 1.0 J pulses of light whose wavelength is 694 nm. What is the minimum number of Cr^{3+} ions in the Ruby ?
24. Explain BCS theory.

(4 × 4 = 16)

Part D (Essay Questions)

Answer any two questions.

12 marks each.

25. Explain with theory the determination of wavelength of monochromatic light using Newton's rings.
26. Explain Fresnel's diffraction at a straight edge.
27. (a) What is the basic principle of laser ? Explain.
(b) Obtain Einstein's coefficients.
28. Explain Josephson effects in superconductors.

(2 × 12 = 24)