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Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, NOVEMBER 2022

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—2016 Admissions)

Time : Three Hours Maximum Marks : 60

Part A

Answer **all** *questions briefly.*
Each question carries 1 *mark.*

1. Can interference be observed with two independent sources of light ?
2. How grating element is different from grating ?
3. State Brewster's law.
4. What is meant by birefringence ?
5. State any two applications of lasers.
6. What is optical pumping ?
7. What is meant by coherence length for electrons in superconductors ?
8. What are Cooper pairs ?

(8 × 1 = 8)

Part B

Answer any **six** *questions.*
Each question carries 2 *marks.*

9. State and explain the principle of superposition for interference.
10. Briefly explain destructive interference.
11. Obtain the expression for β.

Turn over

12. Write down the theory of plane transmission grating.

13. How diffraction is different from interference ?

14. Briefly explain polarizations by refraction.

15. Explain the principle of quarter wave plate.

16. Sketch the energy level diagram for Nd-YAG laser.

17. What is chemical pumping ?

18. Explain why good conductors cannot be superconductors ?

(6 × 2 = 12)

Part C

Answer any **four** *questions.*

Each question carries 4 *marks.*

19. A two slit interference pattern at appoint we observe 10th order maximum for 700nm. What order will be visible here if the source of light is replaced by light of wavelength 500nm ?

20. In a Newton's ring experiment, the radii of the nth and $(n + 5)$th dark rings were found to be 6mm and 8mm respectively. Calculate the wavelength of the light used, if the radius of curvature of the curved surface is 10m.

21. Calculate the angle between the lamp filament and its first diffracted image produced by a fabric with 160 threads per cm. λ = 600 nm.

22. A ray of light is incident on the surface of a glass plate with refractive index 1.33 at the polarizing angle. Calculate the angle of refraction.

23. Calculate the ratio of spontaneous to stimulated emission by an incandescent lamp at 2000K.

24. The critical angle for certain wavelength of light in the case of a piece of glass is 40°. Find the polarising angle for glass.

(4 × 4 = 16)

Part D

Answer any **two** *questions.*

Each question carries 12 *marks.*

25. Give the theory of Newton's rings. How rings can be used to find the wavelength of light ?

26. Describe any three methods for the production of plane polarized light.

27. Discuss the terms stimulated emission, population inversion, electrical pumping, meta-stable states and spontaneous emission.

28. Give an account of the applications of superconductors.

(2 × 12 = 24)