Reg. No…….. Name…… **18U428**

B. Sc. DEGREE END SEMESTER EXAMINATION MARCH 2018

SEMESTER **– 4: PHYSICS (COMPLEMENTARY FOR CHEMISTRY)**

COURSE: **15U4CPPHY8: PHYSICAL OPTICS, LASER PHYSICS AND SUPERCONDUCTIVITY**

Common for Regular (2016 Admission) & Supplementary (2015 & 2014 Admissions)

Time: Three Hours Max. Marks: 60

PART A

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

1. Define coherence.
2. What happens to the energy lost during destructive interference, taking into account conservation of energy?
3. Why can't we polarise longitudinal waves? Explain briefly.
4. What do you mean by polaroids?
5. Write down the significance of metastable state of atoms in lasing action?
6. List out four applications of lasers.
7. Write two differences between Type I and Type II superconductors. Give one example for each type.
8. State Josephson Effect in superconductors. (1 × 8 = 8)

PART B

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

9. Differentiate between interference and diffraction. Give one example for each from your daily life.
10. Define diffraction of light. What is the use of a diffraction grating?
11. State and prove Brewster's law. Write an application of Brewster's law.
12. Define double refraction. Differentiate between ordinary and extra ordinary rays.
13. Briefly explain different types of pumping mechanisms in lasers.
14. Discuss on the different quantum processes involved in the working of a laser.
15. Explain Meissner effect with necessary diagram.
16. What is meant by a half wave plate? Explain its use. (2 × 6 = 12)

PART C

Answer ***any four*** questions. Each question carries 4 marks

17. A shift of 100 circular fringes is observed when the movable mirror of the Michelson's interferometer is shifted by 0.0295 mm. Calculate the wavelength of light.

18. Light of wavelength 565 nm falls normally on a grating 20 mm wide. The first order is 18^o from the normal. What is the total number of lines on the grating?
19. A glass plate is to be used as a polarizer. Find the angle of polarisation and angle of refraction. Refractive index of the glass is 1.54.
20. Plane polarised light passes through a quartz plate with its optic axis parallel to the faces. Calculate least thickness for the plate for which the emergent beam will be plane polarized. Given, $\mu_\varepsilon = 1.553$, $\mu_o = 1.544$ and $\lambda = 5.5 \times 10^{-5}$ cm.
21. A He-Ne laser emits light at a wavelength of 632.8 nm and has an output power of 2.3 mW. How many photons are emitted in each minute by this laser when operating?
22. A superconducting material has a critical temperature of 3.7 K in zero magnetic field and a critical field of 0.0306 Tesla at 0K. Find the critical field at 2K. (4 × 4 = 16)

PART D

Answer ***any two*** questions. Each question carries ***12*** marks

23. Explain how circular Newton's rings are formed by reflected light. With necessary theory, explain an experiment to determine the wavelength of a monochromatic source of light by the Newton's rings method.
24. Give the theory of plane transmission grating and describe how it is used to determine the wavelength of light, by normal incidence method.
25. Define polarization of light. Explain four methods of producing polarized light.
26. What is superconductivity? Briefly outline the BCS theory. What are the possible applications of superconductivity?

(12 × 2 = 24)

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