

SECOND YEAR B.Sc. DEGREE EXAMINATION, APRIL/MAY 2005

Part III—Physics (Subsidiary)

Paper II—OPTICS, ELECTRICITY AND MAGNETISM, ELECTRONICS,
MODERN PHYSICS AND QUANTUM MECHANICS

(For Chemistry/Polymer chemistry/Home Science Main)

Time : Three Hours

Maximum : 50 Marks

Section A*Answer any two of the following questions.*

1. Explain with theory Bi prism experiment to determine wavelength of a monochromatic source.
2. What do you mean by optical activity ? Explain in detail, Fresnel's theory of optical rotation.
3. Describe the working of fullwave rectifier and derive expressions for average current, r.m.s. current, ripple factor and rectifier efficiency.
4. Derive Bragg's law and explain powder method of X-ray diffraction.

(2 × 7 = 14 marks)

Section B*Answer any twelve of the following questions.*

5. Write a short note on Ramsden's eye piece.
6. How is interference fringes formed in an air wedge ?
7. What is principle of Michelson's interferometer ?
8. Distinguish between Fresnel and Fraunhofer diffraction.
9. Write a note on Nicol prism.
10. Give some applications of optical fibres.
11. State Gauss's law for magnetism.
12. What are transient currents ?
13. Define an ideal diode.
14. Draw circuit diagram of Bridge rectifier.
15. What are properties of super conductors ?
16. Explain Barkhausen criterion for oscillations.
17. State Bohr's correspondence principle.
18. What are salient features of nuclear force ?
19. Explain radioactive equilibrium.

20. Write a note on rotational energy levels.
21. Distinguish between Absorption and Emission spectroscopy.
22. Write note on clipping and clamping circuits.
23. Draw symbol and write down truth table for NAND gate.
24. Write down time-independent-Schrödinger equation for a harmonic oscillator.

(12 × 2 = 24 marks)

Section C

Answer any four questions.

25. Two convex lenses of focal lengths 20 cm. and 25 cms. are separated by 10 cm. Find focal length of the combination.
26. In an air wedge of fringe spacing is 1 mm. for light of wavelength 600 nm, calculate angle of wedge in radians.
27. The first order maximum for light of wavelength 5890 Å occurs at angle of 20° when light is incident normally on the grating. Calculate number of lines per cm. of the grating.
28. NaCl has principal planes spaced at 2.85 Å. The first order Bragg's reflection is located at 10°. Calculate wavelength of X-rays used.
29. If half-life of a radioactive substance is 12 years what percentage of it will be decayed in 48 years ?
30. Find energy of first excited level of a simple harmonic oscillator with classical frequency equal to 20 MHz ($h = 6.62 \times 10^{-34}$ JS).
31. Glucose solution in a tube of length 12 cm. is seen to rotate the plane of polarisation of light by 2.5°. If specific rotation of glucose is 52°, calculate concentration of solution.

(4 × 3 = 12 marks)