

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2025**(Regular/Improvement/Supplementary)****PHYSICS****GPHY6B11T: STATISTICAL PHYSICS, SOLID STATE PHYSICS, SPECTROSCOPY & PHOTONICS****Time: 2 Hours****Maximum Marks: 60****SECTION A: Answer the following questions. Each carries *two* marks.****(Ceiling 20 marks)**

1. What is meant by macroscopic property of a system?
2. Draw the following planes of a unit cubic crystal (110) and (111).
3. List the uses of X-Ray diffraction method.
4. Which are the three types of molecular vibrations?
5. Comment on Morse curve.
6. What is rotational constant?
7. What is symmetric top molecule? Give an example.
8. Draw unit cell corresponding to BCC and FCC.
9. What is atomic packing factor?
10. Write down Beer-Lamberts law and explain the symbols.
11. State Raman effect.
12. Draw rotational energy levels of a rigid diatomic molecule.

SECTION B: Answer the following questions. Each carries *five* marks.**(Ceiling 30 marks)**

13. Derive an expression for rms speed.
14. Obtain packing fraction in body centred cubic structure.
15. Briefly explain about NMR and ESR.
16. The rotational constant for HCl^{35} is found to be 10.5909 cm^{-1} . What is the rotational constant in HCl^{37} ?
17. Write an account on He-Ne Laser.
18. Describe the harmonic oscillator model vibrational energy levels of a diatomic molecule.
19. At what wavelength are the rates of spontaneous and stimulated emission equal at temperature 300K.

SECTION C: Answer any *one* question. The question carries *ten* marks.

20. Derive Planck's radiation law using Bose Einstein statistical distribution law. Also deduce Weins displacement law from it.
21. Deduce Bragg's law of X-Ray diffraction in crystals. Describe and explain rotating crystal method of crystal structure analysis.

(1 × 10 = 10 Marks)