

19U607

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Name:

Reg.No:

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2022

(CBCSS - UG)

CC19U PHY6 B11 - STATISTICAL PHYSICS, SOLID STATE PHYSICS, SPECTROSCOPY AND PHOTONICS

(Physics - Core Course)

(2019 Admission - Regular)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. Define the microstate of a system.
2. What is degeneracy?
3. Define: (i) a crystal (ii) lattice points and (iii) crystal lattice
4. What is (i) inversion symmetry (ii) reflection symmetry (ii) rotation symmetry?
5. How does hcp structure differ from bcc structure?
6. What is meant by Quantization of energy?
7. What are asymmetric top molecules? Give example.
8. Real molecules do not obey exactly the laws of simple harmonic motion. Why?
9. Write down the expression for energy eigen value of a diatomic molecule as an anharmonic oscillator.
10. Explain the Einstein coefficient for stimulated emission.
11. What is an active medium?
12. In helium - neon laser why is it necessary to use narrow tubes?

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer *all* questions. Each question carries 5 marks.

13. Derive Planck's radiation law by assuming Bose-Einstein distribution law and density of states. Arrive at Stefan's law using Bose-Einstein distribution law.

14. Derive an expression for average Fermi energy.
15. Derive the packing factor of simple cubic crystal?
16. If X-rays of wavelength 0.5\AA are diffracted at an angle of 5° in the first order, what is the spacing between the adjacent planes of the crystal? At what angle will second maximum occur?
17. Explain how collisions of atoms or molecules in liquids and gases leads to broadening of spectral lines.
18. What is meant by induced absorption? Explain with a two level diagram.
19. Explain the quantum theory of Raman effect.

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any *one* question. The question carries 10 marks.

20. Derive an expression for density of states of particles in a gas.
21. Discuss the theory of rotation-vibration spectrum of a diatomic molecule.

(1 × 10 = 10 Marks)
