D 140215 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER (CBCSS—U.G.) DEGREE EXAMINATION
APRIL 2026

Physics/Applied Physics

PHY 6B 11/APH 6B 11—STATISTICAL PHYSICS, SOLID STATE PHYSICS, SPECTROSCOPY AND PHOTONICS

(2020 Admission onwards)

Time : Two Hours Maximum : 60 Marks

The symbols used in this question paper have their usual meanings.

Section A (Short Answer Type)

*Answer **all** questions in two* or *three sentences, each correct answer carries a maximum of* 2 *marks.*

1. What are the key assumptions of Bose-Einstein statistics ?
2. Define crystal symmetry and give an example.
3. What is a unit cell, and how does it differ from a primitive cell ?
4. What is the importance of Miller indices in crystallography ?
5. Define resolving power of a spectrometer.
6. What do you mean by intensity of spectral transitions ?
7. What is meant by a diatomic vibrating rotator ?
8. Explain the concept of hot bands in IR spectroscopy.
9. What is light amplification ?
10. What is pumping ? Give two examples of pumping mechanisms.
11. What are the applications of lasers in modern technology ?
12. Explain the quantum theory of the Raman effect.

(Ceiling 20)

Turn over

Section B (Paragraph/Problem Type)

Answer **all** *questions in a paragraph of about* **half a page** *to* **one page**, *each correct answer carries a maximum of* 5 *marks.*

13. Discuss the role of blackbody radiation in understanding quantum statistics.
14. Find the lattice spacing of a cubic crystal with lattice parameter 4.2 Å for (1, 1, 1) planes.
15. Explain how Bragg's X-ray spectrometer works and its application.
16. The rotational constant of CO is 1.93 cm^{-1}. Find its bond length.
17. Discuss the effect of anharmonicity on vibrational spectra.
18. A He-Ne laser emits radiation at 632.8 nm. Calculate its energy.
19. Explain the working principle of a semiconductor laser.

(Ceiling 30)

Section C (Essay Type)

Essays - Answer in about **two page***s, any* **one** *question. Answer carries* 10 *marks.*

20. Compare classical and quantum statistics and discuss their significance in physics.
21. Explain the construction and working of a Nd:YAG laser and its applications.

(1 × 10 = 10 marks)