

D 100635

(Pages : 2)

Name.....

Reg. No.....

SIXTH SEMESTER U.G. (CBCSS-UG) DEGREE EXAMINATION, MARCH 2024

Physics/Applied Physics

PHY6B11/APH 6B 11—STATISTICAL PHYSICS, SOLID STATE PHYSICS,
SPECTROSCOPY AND PHOTONICS

(2019 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. Explain the term distribution function.
2. What are Bosons ? Give two examples.
3. Differentiate between classical and quantum statistics.
4. What are Bravais lattices ? Give an example.
5. Define crystallographic axis.
6. What is meant by resolving power of an optical instrument ?
7. Give the selection rules for rotational spectroscopy.
8. What is an asymmetric top molecule ? Give an example.
9. What are hot bands ?
10. What is pumping ? Give two examples of pumping mechanisms.
11. What are Stokes' lines and anti-Stokes' lines ?
12. Which are the essential components of a laser ?

(Ceiling 20 marks)

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. Comment on the applications of Bose-Einstein statistics.
14. On a simple cubic lattice of spacing = 1, draw the [100], [010], [110], and [111] directions.

Turn over

15. How does the Rayleigh - Jeans law fail to explain the black body spectrum ?
16. Explain the quantization of energy and the regions of the electromagnetic spectrum.
17. Explain the an harmonic vibration spectrum of a diatomic molecule.
18. Find the energy in cm^{-1} of the photon absorbed when an NO molecule undergoes transition $v = 0, J'' = 0$ state to $v = 1, J' = 1$ state where v is the vibrational quantum number and J is the rotational quantum number. Assume that B is the same in both states. Given $v_e = 1.904 \text{ cm}^{-1}$ and $\chi_e = 0.00733$, $r_{\text{NO}} = 0.1151 \text{ nm}$, rotational constant of NO = 1.672 cm^{-1} .
19. Discuss the quantum theory of Raman scattering.

(Ceiling 30 marks)

Section C - Essay type

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

20. Obtain the Maxwell Boltzmann distribution law.
21. Explain, with necessary diagrams, the construction and working of a He- Ne Laser.

(1 × 10 = 10 marks)