Reg. No. : ....

Name : ....

VI Semester B.Sc. Degree (CBCSS – OBE – Regular) Examination, April 2022
(2019 Admission)
CORE COURSE IN PHYSICS
6B10PHY : Solid State Physics and Spectroscopy

Time : 3 Hours   Max. Marks : 40

SECTION – A (6 Marks)

(Short answer **six** questions. Answer **all** questions. **Each** question carries **1** mark.)

1. The nearest neighbor distance in the case of *bcc* structure is _____.

2. The wavelength of X-rays is of the order of _____ nm.

3. Minority carriers in a P-type semiconductor are _____.

4. The frequency range corresponds to X-ray spectrum is _____ Hz.

5. In a diatomic vibrating rotator, spectral line corresponds to $\Delta J = +1$ corresponds to _____.

6. The lines on the high frequency side of Raman spectra are called _____.

SECTION – B (12 Marks)

(Short answer **eight** questions. Answer **any six**. **Each** question carries **2** marks.)

7. What are Miller indices and write important features of Miller indices of crystal planes ?

8. What are intrinsic and extrinsic semiconductors ?

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9. Write a note on symmetric top molecules.

10. What are hot bands ?

11. Explain how X-rays are used for determining the crystal structure.

12. What is Zero point energy ?

13. How will you evaluate the bond length of a molecule from rotational constant ?

14. Explain Raman Effect.

SECTION – C (12 Marks)

(Problem **six** questions. Answer **any four. Each** question carries **3** marks.)

15. Derive the packing factor of face centered cubic structure.

16. A plane makes intercepts of 1, 2 and 0.5A° on the crystallographic axis of an orthorhombic crystal with $a : b : c = 3 : 2 : 1$. Determine the Miller indices of this plane.

17. Evaluate the moment of inertia of a diatomic molecule.

18. What is the change in rotational constant B when ^{12}C of carbon monoxide $(^{12}C\ ^{16}O)$ is replaced by ^{13}C. B of $^{12}C\ ^{16}O$ is $1.92118\ cm^{-1}$?

19. The fundamental and first overtone transitions of CO are centered at $2143.3\ cm^{-1}$ and $4260.0\ cm^{-1}$. Calculate the equilibrium oscillation frequency, anharmonicity constant and force constant of the molecule.

20. Show that the spacing of vibrational energy levels of a diatomic molecules as a harmonic oscillator are equally spaced.

SECTION – D (10 Marks)

(Long essay **four** questions. Answer **any two**. **Each** question carries **5** marks.)

21. What are Miller indices ? Draw neat diagrams to indicate Miller indices of the important plane systems in a simple cubic crystal. Obtain a relation between the interplanar spacing and cube edge.

22. Obtain an expression for the rotational energy levels of a diatomic molecule taking it as a rigid rotator.

23. Discuss the theory of rotation-vibration spectrum of a diatomic molecule.

24. What is Hall Effect and write about its applications ?

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