K25FY3598 Pages: 2 Reg No:.....
Name:.....

Third Semester FYUGP Degree (Reg) Examination November 2025

KU3DSCPHY211 - ELEMENTARY SOLID STATE PHYSICS AND SPECTROSCOPY

2024 Admission onwards

Time : 1.5 hours Maximum Marks : 50

Section A

Answer any 6 questions. Each carry 2 marks.

1. Give selection rule for harmonic and anharmonic vibrational transitions.
2. What is reduced mass? Write the expression for the reduced mass of a diatomic molecule consisting of two atoms with masses m_1 and m_2.
3. Define mobility of an electron. Give its unit.
4. What is conductivity?
5. What you mean by Coordination number of an atom in a crystal
6. Write the coordination number and nearest neighbor distance for a bcc unit cell.
7. State the condition for a molecule to exhibit rotational spectra.
8. What is the effect of isotopic substitution on the rotational spectrum of a diatomic molecule?

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Section B

Answer any 4 questions. Each carry 6 marks.

9. Name the seven crystal systems and the corresponding Bravais lattices.
10. Obtain the expression for density of a unit cell
11. Calculate the atomic packing fraction in a face centered unit cell.
12. Explain the classification of molecules in terms of principal moments of inertia (I_a, I_b and I_c) with examples.
13. Find the isotopic mass of ^{13} C, given that the first rotational line of^{12} C^{16} O is at 3.84236cm$^-$1 and ^{13} C^{16} O is at 3.7338 cm$^-$1.
14. First line in absorption rotation spectrum of CO is at 3.84235 cm^{-1}. Find Moment of Inertia and bond length. Given $m_C = 12$amu and $m_O = 16$amu.

Section C

Answer any 1 questions. Each carry 14 marks.

15. Derive the expression for total energy and transition between energy levels of a diatomic vibrating rotator?

16. a)Explain energy level splitting on the basis of band theory of solids.
b) Describe the formation of energy bands in a solid.

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