

M.Sc. (Physics) (CBCS Pattern) Semester-III
PSCPHYT10 - Core Paper-X : Solid State Physics and Spectroscopy

P. Pages : 2

Time : Three Hours



GUG/S/25/11296

Max. Marks : 80

Either:

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|----|----|---|---|
| 1. | a) | Explain point groups and space groups for 2D and 3D lattices in details. | 8 |
| | b) | State the properties of reciprocal lattice. Prove that FCC lattice is the reciprocal & BCC lattice. | 8 |

OR

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| | e) | What are Liquid Crystals? Explain their types in details. | 8 |
| | f) | Write a note on Miller and Bravais indices. | 8 |

Either:

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| 2. | a) | Discuss point defects, line defects and stacking faults. | 8 |
| | b) | Derive Clausius-Mossotti equation. | 8 |

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| | e) | What is dislocation? Discuss Burger's vector and Burger circuit. | 8 |
| | f) | Explain Piezo, Pyro and ferroelectricity in details. | 8 |

Either:

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| 3. | a) | Explain the term LS and JJ coupling for two electrons system. | 8 |
| | b) | Write a note on X-Rays and Auger transitions in X-Rays. | 8 |

OR

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| | e) | State and explain Franck-Condon principle. | 8 |
| | f) | Discuss the relativistic corrections to the energy levels of hydrogen atom. | 8 |

Either:

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| 4. | a) | Explain Raman effect. Outline the theory of Raman effect with the help of experimental set-up. | 8 |
| | b) | Discuss ESR and NMR Spectroscopy in brief. | 8 |

OR

- e) Explain electronic spectra of diatomic molecules. **8**
- f) What is Morse Potential Energy Curve? Discuss Vibrational Spectra & Diatomic Molecules. **8**

5. Answer all the followings:

- a) Determine Miller Indices of a plane which cuts intercepts in the ratio: (i) $1a : 3b : 2c$ and (ii) $2a : -4b : 6c$ along the three axes. **4**
- b) Explain Polarization Mechanism. **4**
- c) Write a short note on 'Quantum States' of an electron in an atom. **4**
- d) What is 'Chemical Shift'? **4**
