

Total page: 1

PG CBCS
M.SC. Semester-III Examination, 2021
PHYSICS
 PAPER: PHS 303A (SPL PAPER)
 (SOLID STATE PHYSICS)

Full Marks: 40

Time: 2 Hours

Answer any **FOUR** questions of the following:

4X10=40

1. Find an expression of conductivity in an ionic crystal and hence find the Einstein diffusion relation. 10
2. Draw and explain the temperature dependent polarization and dielectric characteristics of ferroelectric solid BaTiO₃ considering all crystallographic transition. 5+5
3. Write Lennard Jones potential equation, with explaining each term. Draw and explain the corresponding potential and force curve for diatomic molecules. 4+6
4. Explain Frenkel defects in a crystal. Why lattice defects are inevitable in Solid? State the factors that influence diffusion process with explaining how they are influencing the diffusion process. 3+3+4
5. What is meant by effective mass and what negative effective mass correspond to? Explain what is meant by polaron. 6+4
6. What is F-center? How it is formed? What is polarisation catastrophe? 3+3+4
7. Show that effective number of electron is minimum where band is half filled? The conduction band structure and valence band structure of a solid is given by $E_{cb} = E_1 - E_2 \cos ka$ and $E_{vb} = E_2 - E_2 \sin^2 (ka/2)$. Find nature of the band gap, band gap value. band width of conduction band and valence band. 4+6
8. Explain what is meant by luminescence? Clearly distinguish luminescent and non- luminescent solid. What is meant by soft optical phonon mode? 3+3+4
9. Explain what is meant by De has Van Alphen Effect and find an expression of period of oscillation of mean energy of electrons near the ferini surface. 5+5
10. Explain what is meant by electrostatic screening and hence find an expression of Thomas Fermi Screening length for a metal. 3+7
