M.Sc.(Physics) (CBCS Pattern) Semester - III

PSCPHYT10 - Core Paper-X : Solid State Physics and Spectroscopy

P. Pages : 2 **GUG/S/23/11296**

Time : Three Hours * 1 4 6 5 * Max. Marks : 80

Either :-

1. a) What are liquid crystals? Explain their types in details. **8**

b) Explain Miller indices with example. Draw following planes. (121), (101), (001) in cubic systems. **8**

OR

e) State the properties of a reciprocal lattice. Prove that FCC lattice is reciprocal to bcc lattice. **10**

f) Explain 2D and 3D lattices in details. **6**

Either :-

2. a) Prove that $\frac{\in -1}{\in +2} = \frac{4\pi}{3} N\alpha_a$ by using Clausius – Mossotti relation. **8**

b) Write short note on polarization mechanism. **8**

OR

e) Write short note on piezo, pyro and ferroelectricity. **8**

f) What is dislocation. Discuss Burger's vector and Burger's circuit. **8**

Either :-

3. a) Explain width of spectral line and discuss mechanism of homogeneous and inhomogeneous broadening of spectral line. **10**

b) Write a note on Auger transitions. **6**

OR

e) State and explain Franck – Condon principle. **8**

f) Explain the relativistic corrections for energy level of hydrogen atom. **8**

Either :-

4. a) Explain the concept of ESR spectroscopy. **8**

b) What is Morse potential energy curve? Explain vibration spectrum of diatomic molecules. **8**

OR

e) Explain Raman effect. Describe the experimental set-up to study it. Outline the theory of Raman Effect. **8**

f) Discuss N.M.R Spectroscopy in detail. **8**

5. Answer **all** the followings.

a) Determine Miller indices of a plane which cats intercepts in the ratio. **4**

i) 1a : 3b : - 2c

ii) 4a : 6b : 3c

along the three axes.

b) What is defect? Explain their types. **4**

c) Explain the hyperfine structure. **4**

d) Explain electronic spectra of diatomic molecules. **4**

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