M.Sc. DEGREE EXAMINATION, NOVEMBER 2024
PHYSICS
FIRST SEMESTER

COURSE   **:** **MAJOR ELECTIVE**
PAPER   **:** **CRYSTAL PHYSICS**
SUBJECT CODE: 23PH /PE/CP15
TIME   **:** **3 HOURS**   **MAX. MARKS: 100**

Q. No.	SECTION A (10 x 3 = 30) **Answer ALL questions**	CO	KL
1	What is nucleation in crystal theory?	**CO1**	**K1**
2	Recall the important aspect of Becker and Doring concept?	**CO1**	**K1**
3	Write the expression for dispersion relations in lattice dynamics.	**CO1**	**K1**
4	List out the important parameters of anharmonic effect.	**CO2**	**K2**
5	How do we determine a crystallite size?	**CO2**	**K2**
6.	Mention the processes of single and double diffusion methods.	**CO2**	**K2**
7.	Give the significance of sublimation and condensation principle in vapour growth.	**CO2**	**K2**
8.	Write the principle of Differential Scanning Calorimetry (DSC).	**CO3**	**K3**
9.	What is cholestic phase in liquid crystals?	**CO3**	**K3**
10.	Write the electric and magnetic property of liquid crystals.	**CO3**	**K3**
Q. No.	SECTION B (2 x 5 = 10) PART A **(Answer any TWO out of three questions)**	CO	KL
11.	Estimate the hardness number and work hardening coefficient utilizing Vickers hardness testing	**CO3**	**K3**
12.	Explain the important significance of Einstein model of lattice heat capacity.	**CO3**	**K3**
13.	Explain the free energy formation of a spherical nucleus and cylindrical nucleus.	**CO3**	**K3**
Q. No.	SECTION B (4 x 5 = 20) PART B **(Answer any FOUR out of five questions)**	CO	KL
14.	Examine Umklapp process with appropriate diagram.	**CO4**	**K4**
15.	Discuss the different types of Symmetry operations in crystal with suitable examples.	**CO4**	**K4**
16.	Analyze the Physical Vapour Transport (PVT) technique.	**CO4**	**K4**
17.	Summarize the working of Differential Thermal Analysis (DTA).	**CO4**	**K4**

18.	Explain the applications of liquid crystals in different fields.	CO4	K4
19.	**SECTION C** **(2 x 20 = 40)** **(Answer ALL the questions)** a) Distinguish between homogenous and heterogeneous nucleation. b) Illustrate the Czochralski technique and controlling parameter in crystal pulling mechanism with suitable diagram.	**CO**	**KL** **K5**
	(OR)		
	c) Discuss the acoustic and optical modes in a one-dimensional atomic crystal. d) Explain in detail the Bridgman method of melt growth to grow single crystals with suitable diagram.	**CO5**	**K5**
20.	a) Interpret the principle, construction and working of X-Ray diffraction (XRD) in the field of crystallography with a neat diagram. b) Explain the different types of liquid crystals and its phase transition in liquid phases.	**CO5**	**K5**
	(OR)		
	c) Explain the Gibbs Thomson equations for vapour and solution. d) Discuss the Debye Model of heat capacity in lattice dynamics.	**CO5**	**K5**

****