STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086
(For candidates admitted from the academic year 2023 – 2024)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023
BRANCH III - PHYSICS
FIRST SEMESTER

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

Q. No.	SECTION A Answer ALL the questions: (10 x 3 = 30 marks)	CO	KL
1.	Distinguish between homogeneous and heterogeneous nucleation	CO1	K1
2.	Illustrate four types of symmetry operations.	CO1	K1
3.	Define thermal conductivity.	CO1	K1
4.	State Umklapp process.	CO2	K2
5.	What is growth technique?	CO2	K2
6.	What are the advantage of vapour growth technique?	CO2	K2
7.	What are the limitations of DTA?	CO2	K2
8.	How X-rays are produced?	CO3	K3
9.	What does LCD stands for? List the types of LCD.	CO3	K3
10.	Define mesogenic state.	CO3	K3
Q. No.	**SECTION B** **(30 marks)**	**CO**	**KL**
	PART A **Answer any TWO questions:** **(2 x 5 = 10 marks)**		
11.	Obtain the dispersion relation for the lattice vibrations of linear mono atomic lattice.	CO3	K3
12.	Describe the Bridgman technique to grow a single crystal.	CO3	K3
13.	Describe the properties of liquid crystal.	CO3	K3
	PART B **Answer any FOUR questions:** **(4 x 5 = 20 marks)**	**CO**	**KL**
14.	Explain the nucleation theory.	CO4	K4
15.	Examine theoretically, the differences between Einstein's model and Debye model of vibrations in solids.	CO4	K4
16.	Explain the chemical vapour transport with its principle.	CO4	K4
17.	Explain Vickers micro hardness testing with applications.	CO4	K4
18.	Briefly explain any five application of liquid crystal.	CO4	K4

Q. No.	SECTION C	CO	KL
	Answer the following: (2 x 20 = 40 marks)		
19.	(a) Explain and derive Gibb's Thomson equation of nucleation. **(b)** Explain the Becker and Doring concepts on nucleation rate.	CO5	K5
	OR		
	Discuss in detail about the following techniques of growing single crystals with a diagram. (c) Czochralski technique (d) Physical Vapour transport	CO5	K5
(a)	Discuss the instrumentation and working of (a) Differential scanning calorimeter. (b) Single crystal X-ray diffractometer	CO5	K5
	OR		
	c) Discuss the association of an harmonicty with thermal expansion of solids and deduce the Gruneisen formula. (d) Derive Boltzmann transport equation for phonons in the relaxation-time approximation	CO5	K5

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