STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2019 – 2020)

SUBJECT CODE:19PH/PE/CP15

M.Sc., DEGREE EXAMINATION NOVEMBER 2019
PHYSICS
FIRST SEMESTER

COURSE   :   ELECTIVE
PAPER   :   CRYSTAL PHYSICS
TIME   :   3 HOURS   MAX. MARKS : 100

SECTION - A
ANSWER ALL QUESTIONS: (10x3=30)

1. Why is the NaCl structure more stable than the CsCl structure?
2. Copper has FCC structure with lattice constant 0.36nm. Calculate the interplanar spacing for (1 1 1) and (3 2 1) plane.
3. What are Phase and Group velocities?
4. Explain Umklapp process.
5. Explain the phenomena of nucleation and its classification.
6. Distinguish between slow cooling and slow evaporation technique in crystal growth.
7. What is the difference between Vickers and Knoop hardness test?
8. What is difference between DSC and TGA?
9. List out the applications of Liquid Crystals.
10. What are liquid Crystal?

SECTION – B
ANSWER ANY FIVE QUESTIONS: (5x5=25)

11. Write a short note on Brillouin Zone.
12. Discuss, qualitatively, the concept of phonons for elastic vibration in a solid. Enumerate the properties of phonons.
13. Explain the process of crystallization by slow cooling method.
14. Write short note on thermal gravimetric analysis (TGA).
15. List out the Optical and Electrical properties of Liquid crystals.
16. Show that the zero point energy of a solid according to Debye model is 9/8 $R\Theta_D$.
17. Explain cohesive energy of ionic crystal.

SECTION – C
ANSWER ANY THREE QUESTIONS: (3x15=45)

18. With a neat sketch, explain in detail about the powder photograph method of x- ray diffraction.

19. Show that at very low temperatures, the internal energy of a vibrating lattice following Debye's theory is proportional to T^4.

20. Discuss the role of purity, pH, solution preparation and seed selection, morphology and agitation in influencing the growth of bulk size crystal and mention the merits of low temperature solution growth methods.

21. With necessary diagrams, discuss the instrumentation, operation and the determination of Vickers hardness number and work hardening coefficient of crystal.

22. Explain in detail about classification of liquid crystals.

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