LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **CHEMISTRY**

THIRD SEMESTER – **NOVEMBER 2022**

PCH 3301 – MATERIALS SCIENCE

Date: 30-11-2022 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART – A

Answer ALL questions. (10 x 2 = 20 Marks)

1. Define Wigner-seitz unit cell.
2. Define crystal structure.
3. Draw crystalline planes in a cubic unit cell having miller indices (1 1 0) and (1 0 0).
4. Give the matrix representation of symmetry operations, rotation and reflection at a point.
5. In a crystal, a plane cuts intercepts of 2a, 3b and 6c along the three crystallographic axes. Determine the Miller indices of the plane.
6. What is Meissner effect?
7. Calculate the number average molecular mass and the weight average molecular mass of a polymer that contains three types of molecules of molecular masses 150, 105 and 45 in the number ratio of 2:2:1.
8. List the tacticity of the polymer. Cite an example for each.
9. What are nanoparticles? Give an example.
10. What is agglomeration?

PART – B

Answer any EIGHT questions. (8 x 5 = 40 Marks)

11. Describe Bridgman Stockbarger method of crystal growth.
12. Describe the neutron diffraction method in crystal structure analysis.
13. Outline the principle involved in DTG/TGA analysis.
14. Explain the different types of polarization in dielectric materials.
15. Discuss steady state and non-steady diffusion in materials.
16. Explain the factors that influence diffusion.
17. List the applications of superconductors.
18. Explain the synthesis of polyethylene by using mono-metallic Ziegler-Natta catalyst.
19. Illustrate the mechanism of free radical polymerization.
20. What are conducting polymers? Explain with the mechanism of p-doping of polyacetylene.
21. How would you synthesize silica nanoparticles by sol-gel method?

22. Discuss the working principle of an inert gas condensation with neat diagram.

PART – C

Answer any FOUR questions. **(4 x 10 = 40 Marks)**

23. Explain the bravais lattices with suitable examples and diagrams.
24. Explain single crystal x-ray diffractometer.
25. Explain the construction and operation of SEM with a suitable diagram.
26. Describe the working principle of photovoltaic and Photo galvanic cells.
27. a. Illustrate the mechanism of rubber oxidation.
    b. How would you synthesize polyisobutylene by cationic addition polymerization? (5+5)
28. a. Explain the synthesis of gold nanoparticles by colloidal method.
    b. What are core-shell nanoparticles? Explain its properties. (5+5)

$$$$$$$