A-0557

Total Pages : 3 **Roll No. .....**

MSCCH–601

M.Sc. CHEMISTRY (MSCCH)

(Solid State and Materials Chemistry)

3rd Semester Examination, Session December 2024

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Answer the following questions :

   (a) What are Miller indices ?

   (b) Calculate the miller indices of the plane, whose intercepts along the axes are (a, $2a$, $3c$).

   (c) Calculate the miller indices of the diagonal plane of a cube.

   (d) Draw the trace of all the [121] planes intersecting a block $2 \times 2 \times 2$ blocks of orthorhombic ($a \neq b \neq c$, $\alpha = \beta = \gamma = 90°$) unit cell.

2. What are different types of defects ? Explain Non-Stoichiometric defect in detail.

3. Explain the following :

   (a) Magnetism in organic materials

   (b) Doped fullerenes as superconductor

   (c) Molecular switches

4. Define liquid crystal and classify them ? Give molecular rearrangement in Smectic A and Smectic C phases.

5. What are surfactants and what are their main types ? Describe how surfactants function at the molecular level to reduce surface tension and facilitate processes like cleaning, emulsification, and foam formation.

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Describe the extent to which the liquid crystal sample is ordered.
2. Discuss the process of reversed micelle.
3. Write short note on the Critical Micelle Concentration (CMC).
4. What are molecular rectifiers and transistors. Discuss their theories with suitable examples.
5. Write note on the following :
   (a) Bragg's law
   (b) Organic charge transfer complexes
6. Why it is important to vary angle or wavelength of X-rays when investigating diffraction peaks.
7. What is artificial photosynthesis. Discuss in detail.
8. Write about Schottky and Frenkel defects.

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