

1957

- (c) What are bionanocomposites ? Explain their composition and important characteristics. 5
7. (a) Explain the role of the Michelson interferometer in FTIR spectroscopy and how FTIR helps in identifying metal-oxygen (M-O) bonds in inorganic solids. 5
- (b) Discuss the intercalation process in inorganic solids and explain its effect on properties using hydrogen-intercalated WO_3 as an example. 5
- (c) Egyptian blue ($\text{CaCuSi}_4\text{O}_{10}$), is pale blue, and the spinel CuAl_2O_4 is an intense blue-green, Explain the difference. 5
8. (a) Explain any one method used for the synthesis of inorganic solids, highlighting the steps and recons involved. 5
- (b) Write a short note on Inorganic phosphors. 5
- (c) What are Solid Oxide Fuel Cells (SOFCs) ? Explain their working principle. 5

[This question paper contains 4 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : 1957

Unique Paper Code : 2173012013

Name of the Course : **B.Sc. (H)**

Name of the Paper : Discipline Specific :
Elective : Novel Inorganic Solids

Semester : IV/VI

Time : 3 Hours **Maximum Marks : 90**

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt **SIX** questions in **all. All** questions carry equal marks.
1. (a) Explain the sol-gel process used for the synthesis of inorganic solids from alkoxides, emphasizing the chemical reactions involved at each stage. 5
- (b) Explain why titanium dioxide (TiO_2) is preferred over other materials as a white pigment, giving suitable reasons. 5

- (c) Define refractory materials and discuss their importance and industrial applications with suitable examples. 5
- 2.** (a) What are topotactic & Epitactic reactions ? Explain the formation of MgAl_2O_4 spinel on the surfaces of MgO and Al_2O_3 with reactions. 5
- (b) What are liquid crystals ? Explain its different types with suitable examples. 5
- (c) What are matrix materials ? Explain their role in composite materials. 5
- 3.** (a) Differentiate between pigments and dyes, and explain the essential characteristics required for an ideal inorganic pigment. 5
- (b) What are single-molecule magnets (SMMs) ? Provide suitable examples, and explain the origin of their magnetic properties. 5
- (c) What are ion-exchange ? Discuss their types and explain how ion exchange occurs. 5
- 4.** (a) Discuss the conduction mechanism of conducting polymer : polyaniline or polypyrrole. 5

- (b) What are solid electrolytes ? Explain how mixed solid electrolytes differ in behavior from purely cationic or anionic systems. 5
- (c) Explain the concept of Peierls distortion and its effect on the stability of one-dimensional metals. 5
- 5.** (a) What are Polymer blends and copolymers ? Give their classification with examples. 5
- (b) Compare Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) in terms of their principles and applications in the characterization of inorganic solids. 5
- (c) What is the full form NASICON ? Explain how the crystal structure of zirconia (ZrO_2) contributes to its behavior as a solid electrolyte. 5
- 6.** (a) What is the co-precipitation method ? Describe its principle and the steps involved in the synthesis of inorganic materials. 5
- (b) Discuss the different types of electronic transitions that can give rise to multiple peaks in the visible region of an inorganic solid. 5