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Roll No. | | | | | | | | | | |

S. No. of Question Paper : 7642

Unique Paper Code : 32177901 J

Name of the Paper : **Novel Inorganic Solids**

Name of the Course : **B.Sc. (Hons.)/B.Sc. (Prog.) :DSE-1/1A**

Semester : **V**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

1. (*a*) Fill in the blanks with appropriate answer :

I. Refractories are ..... materials used in lining.

II. Slurry processing in ceramics uses ..... to improve dispersion and dispersion stability.

III. The example of first reported conducting polymer, which did not find practical application is ..... .

IV. An example of mixed ionic conductor that has attracted attention for use in solid oxide fuel cells is ..... .

V. ..... is a distortion in one dimension, due to which atomic position oscillates and the perfect order of the crystal is broken.

P.T.O.

(*b*) Discuss the structure and function of YSZ (Yttrium stabilized Zirconia) as solid electrolyte.

(*c*) Why do inorganic solids show color ? 5,5,5

2. (*a*) What is a topotactic reaction ? Why intercalation is considered topotactic ?

(*b*) What are the different steps involved in Sol-Gel method and how this method finds application in the synthesis of Zeolites ?

(*c*) Discuss Hydrothermal method used for the synthesis of solids. Give schematic representation of Hydrothermal bomb used for Crystal growth. How a single crystal of quartz synthesized by this method ? 5,5,5

3. (*a*) What are Conducting polymers ? The unique electrical properties of conducting polymers depends upon the chemical structure of their polymer backbone, explain.

(*b*) Write down any *one* method of synthesis of polypyrrole. What are the various applications of conducting polymers ?

(*c*) State the various types of inorganic pigments with examples. What are the attributes related to the suitability of pigments ? 5,5,5

4. (*a*) What are fast ionic conductors ? How superionic conductors classified according to the type of mobile ions, the dimensionality of the conduction pathways or the structure type of non-mobile portion of the crystal structure ?

(*b*) What are refractories ? How are the refractories classified on the basis of their composition ?

(*c*) Define inorganic liquid crystals. Describe the various applications of inorganic liquid crystals with suitable examples. 5,5,5

5. (*a*) Define morphosynthesis. Give an example of how this approach can be used to control nanoarchitecture.

(*b*) Describe why mechanical properties are a key metric of the quality of artificial bone materials. Explain how chemistry plays a major role in enhancing the mechanical properties of bio-nanocomposite bone material.

(*c*) Explain Brust-Schiffrin method of synthesis of Gold nanoparticles in detail. 5,5,5

6. (*a*) What are Quantum dots (QD) ? Give example. Compare and contrast the band energies for a quantum dot nanocrystal and a bulk semiconductor.

(*b*) What are composite materials and explain the role of matrix and reinforcement in composite materials.

(*c*) Define ceramics with examples. Explain the difference between traditional and advanced ceramics with suitable examples. 5,5,5

7. Write short notes on any *three* of the following :

(*a*) Surface Plasmon Resonance

(*b*) One-Dimensional Metals

(*c*) Biomimetics

(*d*) Metal Matrix Composites. 5,5,5