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This question paper contains 4 printed pages]

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

S. No. of Question Paper : **7687**

Unique Paper Code : **32177901** **J**

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

Name of the Course : **B.Sc. (Hons.)/B.Sc. (Prog.) : DSE-2/2A**

Semester : **V**

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

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

Attempt any *five* questions.

All questions carry equal marks.

1. (*a*) Compare the chemistry of alkali metal compounds of graphite and fullerides.

(*b*) Explain the difference between the top-down and bottom-up methods of fabrication of materials. Give *one* example each.

(*c*) What do you mean by Surface Plasmon Resonance (SPR) ? Explain taking example of Gold nanoparticles. 5,5,5

P.T.O.

2. (*a*) What is condensate ? How DNA condensation is carried out in-vitro ?

(*b*) What are the limitations of solid-state reactions ? What measures can be taken to overcome these ?

(*c*) What are the steps involved in the preparation of SiO_2 by sol-gel method ? 5,5,5

3. (*a*) Distinguish between static and dynamic self-assembly. Give an example of each type.

(*b*) Define biomimetics. Describe biomimetics with respect to how artificial fossilization is used to create titania paper.

(*c*) What are silver Nanoparticles ? Explain any *one* method of its synthesis. 5,5,5

4. (*a*) Describe framework electrolytes. Choose framework electrolytes from the following :

β-alumina, $Rb_4Ag_4I_5$, β"-alumina, NASICON, Li_4GeO_4, PbF_2.

(*b*) Discuss construction and working of Solid oxide fuel cells (SOFCs) in detail.

(*c*) Explain why Egyptian blue, $CaCuSi_4O_{10}$ is pale blue and the spinel $CuAl_2O_4$ is an intense blue-green in colour. 5,5,5

5. (*a*) Discuss the advantages and disadvantages of use of ion exchange resins.

(*b*) What is the difference between SWNT and MWNT ? What is the role of metal catalyst in the formation of SWNT ?

(*c*) What are conducting polymers ? Write down one method of synthesis of any polymer. What are the various applications of conducting polymers ? 5,5,5

6. (*a*) Discuss the effect of environment on various composite materials.

(*b*) What are the electrical, mechanical and other applications of ceramics ?

(*c*) Fill in the blanks :

(*i*) Quasi-particle used in condensed matter physics to understand the interactions between electrons and atoms in a solid are .....

(*ii*) The materials which are considered as synthetic metals of twenty first century .....

(*iii*) Zirconia is an example of ..... refractories.

(*iv*) Alumina, silica and ..... are the most important material in manufacturing of refractories.

(*v*) ..... is the first one-dimensional metal complex. 5,5,5

7. Write short notes on any *three* of the following : 5,5,5

(*a*) Bio-composites

(*b*) Inorganic phosphors

(*c*) Molecular magnets

(*d*) NASICON.