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B.Sc.-M.Sc Integrated Program in Chemistry /Semester V

Odd Semester End-term Examination 2023

Paper Name: Novel Inorganic Solids

Time: 3 hours

Paper Code: BCH- DSE03TH

Maximum Marks: 75

Note: This paper has 3 sections A, B, and C, Attempt all three sections

Section A: Answer *all* the questions; **Section B:** Answer *any 2* out of 4; **Section C:** Answer *all* the questions, each question has an *internal choice*

Abbreviations Used

CLO- Course Learning Outcome, PLO- Program learning Outcome, BTL- Bloom Taxonomy Level: BT level 1-Remember; BT level 2- Understand; BT level 3-Apply; BT level 4-Analyse; BT level 5-Evaluate, BT level 6-Create

Q.No		BTL	CLO	PLO
<u>SECTION A</u>				
Attempt <i>all</i> questions		(1.5*10= 15 Marks)		
A 1.	What functions do reinforcement and matrix serve in composite materials?	3	1	1
A 2.	What is the basic idea behind surface plasmon resonance?	4	1	2
A 3.	What are Inter-band and Intra-band transitions?	5	2	3
A 4.	State the law that relates the angles for the coherent scattering of waves from a crystalline solid.	1	5	2
A 5.	Titanium dioxide is used almost universally as a white pigment. Explain.	1	5	3
A 6.	How do we classify ceramics?	4	5	2
A 7.	Differentiate between epitaxy and topotaxy.	6	1	1
A 8.	What is Peierl's distortion?	2	4	1
A 9.	What are nematic liquid crystals?	2	3	2
A 10.	For what reason are solid anionic electrolytes less frequent than cationic electrolytes?	3	1	1
<u>SECTION B</u>				
Attempt <i>any two</i> out of four		(10*2=20 Marks)		
B 1.	What are polarons? Discuss the conduction mechanism of conducting polypyrrole. Also, give its applications.	2	1	1
B 2.	What is the Reinforcement or Reinforcing phase? Give its significance. Discuss different types of Reinforcements used in Composites.	4	5	3
B 3.	Discuss the steps involved in the sol-gel method of synthesis of inorganic solids utilizing alkoxides as precursors. What are the advantages and disadvantages associated with this method?	4	1	2
B 4.	What are the two approaches for the synthesis of nanoparticles? Give a detailed explanation of any one method used to synthesize gold nanoparticles.	5	3	3

SECTION C

Attempt *all* questions, each question has an Internal choice

(8*5=40 Marks)

- C 1. What are the criteria for good refractory? Give the classification of Refractories based on chemical composition and with suitable examples 1 1 1
- OR
- What are the properties of an ideal inorganic pigment? How will you distinguish dyes and pigments? 1 1 1
- C 2. Distinguish between static and dynamic self-assembly. What role does self-assembly play in the synthesis of nanomaterials? 5 4 2
- OR
- How does the structure of Zirconia, ZrO_2 support it to function as a solid electrolyte? Discuss in detail. 5 4 2
- C 3. How do ion exchange resins work? Discuss the advantages and disadvantages of ion-exchange resins. 3 2 2
- OR
- What are one-dimensional solids? Give examples and explain its electronic properties. 3 2 2
- C 4. Discuss the working of Solid Oxide Fuel Cells (SOFCs). What are its benefits and drawbacks? 4 1 2
- OR
- What is band theory? Describe how conductors, semi-conductors and insulators are different in this context. 3 1 2
- C 5. What are Single Molecular Magnets (SMMs)? Describe the slow relaxation process of molecular magnets. 3 1 1
- OR
- Discuss the citrate method of synthesis for Gold and silver nanoparticles 5 1 1
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