

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc
BRANCH: CHEMISTRY

SEMESTER : VI
SESSION : SP/2023

SUBJECT: CH314 ORGANIC CHEMISTRY-V, SPECTROSCOPY

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
- Nothing

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|---|-----|----|----|
| Q.1(a) Explain the fundamental principle of ¹ H-NMR. Arrange and explain the following H nuclei (bold) in the decreasing order of their relative chemical shifts in ¹ H NMR: | [5] | 1 | 1 |
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> $\text{a) } \text{---} \text{C}(=\text{O})\text{---O-}\mathbf{H}$ </div> <div style="text-align: center;"> $\text{b) } \text{---} \text{C}(=\text{O})\text{---}\mathbf{H}$ </div> <div style="text-align: center;"> $\text{c) } \text{---}\mathbf{CH_3}$ </div> <div style="text-align: center;"> $\text{d) } \text{---} \text{C}(\text{NH}_2)\text{---}\mathbf{H}$ </div> </div> | | | |
| Explain the schematic ¹ H-NMR spectrum of ethyl acetate with the approximate chemical shift and splitting. | | | |
| Q.1(b) Draw a schematic energy diagram to demonstrate the energy gap order for electronic transitions in UV-Vis spectroscopy. Why does trans-stilbene, which is more stable, shows higher λ _{max} than cis-stilbene | [5] | 1 | 3 |
| Q.2(a) Identify the absolute configuration (R/S) for the chiral centre (1 & 2 as marked) in the following carbohydrate structure. Write the compound's name and the stereoisomeric relation between A & B. | [5] | 2 | 2 |
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> $\begin{array}{c} \text{CHO} \\ \\ \text{H} \text{---} \text{C}^2 \text{---} \text{OH} \\ \\ \text{H} \text{---} \text{C}^1 \text{---} \text{OH} \\ \\ \text{CH}_2\text{OH} \\ \text{A} \end{array}$ </div> <div style="text-align: center;"> $\begin{array}{c} \text{CHO} \\ \\ \text{HO} \text{---} \text{C}^2 \text{---} \text{H} \\ \\ \text{H} \text{---} \text{C}^1 \text{---} \text{OH} \\ \\ \text{CH}_2\text{OH} \\ \text{B} \end{array}$ </div> </div> | | | |
| Q.2(b) Write a short note on Ruff's Degradation. Convert L-Glucose to pyranose Haworth Form and Distinguish the α and β-form. | [5] | 2 | 3 |
| Q.3(a) Malachite green is deeper in color than that of crystal violet - explain from their resonance structures. Chemically establish the structure of alizarin. | [5] | 3 | 2 |
| Q.3(b) Draw the isomeric structure of indigotin and comment on their stability. Describe the industrial preparation of indigotin from Aniline. How does the process make cheap with better product yield? | [5] | 3 | 4 |
| Q.4(a) Show the different carboncation formed during cationic polymerization of 4-methyl-1-pentene. Explain the termination in anionic polymerization of methyl methacrylate through side reaction. | [5] | 3 | 4 |
| Q.4(b) What are the advantages of metallocene catalyst over Ziegler-Natta catalyst? Describe the possible mechanism for termination of co-ordination polymerization. | [5] | 4 | 3 |
| Q.5(a) Write short note on conducting polymer and biodegradable polymer. | [5] | 4 | 1 |
| Q.5(b) Explain the working principle of liquid crystalline polymer as optical material. Describe the vulcanization of rubber including mechanism. | [5] | 4 | 3 |

:25/04/2023:M