

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

CLASS: BTECH / IMSC

BRANCH: BT/CHEMICAL/CIVIL/MECH/PIE/FT/PHYSICS

TIME: 3 HOURS

SEMESTER : II
SESSION : SP/2024

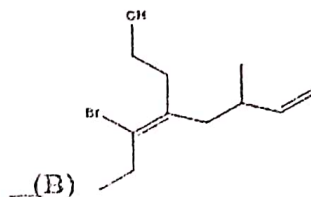
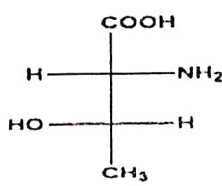
SUBJECT: CH101R1 CHEMISTRY

FULL MARKS: 50

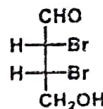
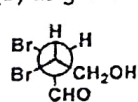
INSTRUCTIONS:

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.

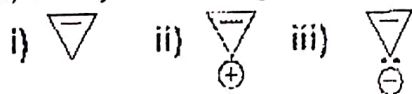
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|---|-------|----|----------|
| Q.1(a) Draw the shapes of various d orbital and explain how they split into two parts e_g and t_{2g} in Octahedral complexes. [5] | 1 | | Evaluate |
| Q1.(b) What are 'spin forbidden' and 'spin allowed' transitions? Why is $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ colourless while MnO^{4-} intensely coloured. | | | |
| Q2.(a) (i) Why normally the <i>cis</i> isomers have higher boiling point but lower melting point than the <i>trans</i> isomers? Explain with example.
(ii) Assign RS configurations of both the chiral centres to (A) and EZ configuration to (B). | [3+2] | 2 | Analyze |



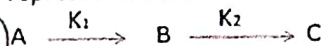
- Q2.(b) (i) Give the correct Fisher projection formula for (A) and sawhorse projection for (B) as given below: [2+3] 2 Analyze



- (ii) Classify the following molecules based on the aromaticity with explanation.



- Q3(a) Derive the kinetics of consecutive reaction and show the graphical representation of variation of concentration of A, B, C. [5] 3 Evaluate



- Q.3(b) Write the different reaction condition of catalytic industrial process. (a) Haber's Process (b) Ostwald Process (c) Bosch Process (d) Bergius Process (e) contact Process [5] 3 Evaluate

- Q4(a) (i) $n \rightarrow \pi^*$ Transition in acetone is red shifted on changing the solvent from water to hexane. Explain [3+2] 4 Understand

(ii) What do you mean by 'fingerprint region' of IR absorption spectrum of an organic molecule? What is functional groups region?

- Q4(b) Why Tetramethyl silane is used as a standard in NMR? Give the no. of proton NMR signals for $\text{C}_2\text{H}_5\text{OH}$, C_3H_8 and $\text{C}_3\text{H}_7\text{Cl}$. [5]

- Q5(a) Calculate the number of components in the following systems: [2+3] 5 Evaluate
i) Thermal decomposition of CaCO_3 in a closed vessel
ii) Dissociation of NH_4Cl in a closed vessel along with NH_3 or HCl
Draw a neat phase diagram of water system and discuss the behavior of various equilibrium involved in the system with varying pressure and temperature. How does the melting point of ice change with the pressure and why?
- Q5(b) How is a fuel cell different than a battery? Describe the working of $\text{H}_2\text{-O}_2$ fuel cell and write down the anodic, cathodic and overall reactions [2+3] Remember Understand

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