



'সমানো মন্ত্র: সমিতি: সমানী'

UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 2nd Semester Examination, 2023

CC3-CHEMISTRY
ORGANIC CHEMISTRY
NEW AND OLD SYLLABUS

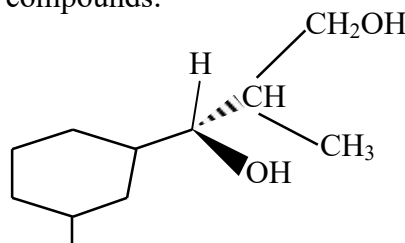
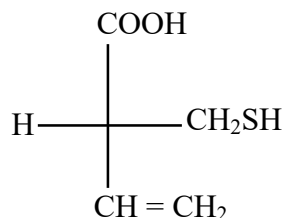
Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

GROUP-A

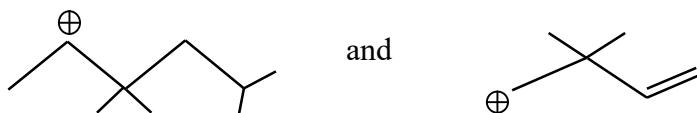
1. Answer any **five** questions from the following: 1×5 = 5
- (a) Cyclo-octatetraene readily forms potassium salt when it is reacted with potassium. Why?
- (b) Compare the stability of $(\text{NH}_2)_2\text{C}=\overset{\oplus}{\text{N}}\text{H}_2$ and $\text{H}_3\overset{\oplus}{\text{N}}-\underset{\text{NH}_3}{\text{C}}=\text{NH}$.
- (c) Draw the stereochemical structure of (2S, 3R)-Isomer of 3-bromo-2-butanol in sawhorse projection formula.
- (d) Acrylic acid is stronger than propanoic acid. Explain why.
- (e) Trimethyl amine is less basic than dimethyl amine in aqueous medium. Why?
- (f) Explain why HCN does not add to $\text{CH}_2=\text{CH}-\text{Me}$ but adds to $\text{CH}_2=\text{CH}-\text{COMe}$.
- (g) Despite being an alkane, cyclopropane often shows its reactive character. Why?
- (h) Assign R/S designation for following compounds:



GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) (i) pK_a values of maleic acid and fumaric acid vary differently. Suggest proper reasons for this variation. 3

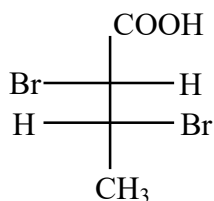
- (ii) Between the two carbocations, which is more stable and why? 2



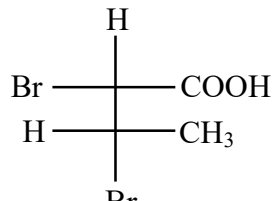
- (b) (i) In which compound C = O bond length is longer. Justify your answer. 2½
 CH_3CHO and CF_3CHO
- (ii) C–Cl heterolysis of $(\text{Me}_3\text{C})_3\text{CCl}$ is faster than that of Me_3CCl . Justify. 2½
- (c) (i) The direct reaction of an alcohol with NaBr does not give any alkyl bromide but the reaction proceeds well when few drops of conc. H_2SO_4 is added. Explain. 2½
- (ii) Justify that NH_2NH_2 is a stronger nucleophile than NH_3 but a weaker base. 2½
- (d) (i) When aniline is subjected to Friedel Crafts alkylation in presence of catalytic amount of AlCl_3 alkylation does not occur, but with large excess of AlCl_3 , a very small amount of *m*-product is obtained. Explain. 2½
- (ii) How would you establish that mechanism of ozonolysis, involves the formation of zwitter ion as intermediate? 2½
- (e) (i) What are singlet and triplet carbenes? Why triplet carbenes are more stable than singlet carbene? 2½
- (ii) Explain that unlike chlorination, iodination of methane is unsuccessful. 2½

GROUP-C

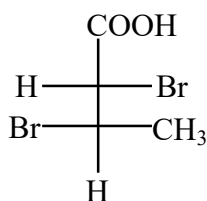
3. Answer any *two* questions from the following: 10×2 = 20
- (a) (i) Optically active $\text{CH}_3\text{CH}(\text{Br})\text{CH}(\text{Br})\text{CH}_3$ has positive dipole moment while the meso form has zero dipole moment. Explain. 3
- (ii) Why are the racemic modifications optically inactive? Discuss with suitable example. 2
- (iii) Dissociation of *t*-BuCl in water requires only 20 kcal.mol⁻¹ of energy but in absence of water it requires 150 kcal.mol⁻¹. Justify the statement. 2
- (iv) Find the stereochemical relationships of the following structures (A to D): 3



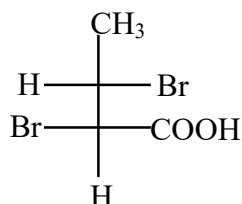
‘A’



‘B’



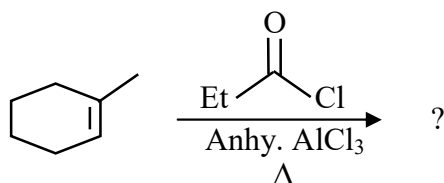
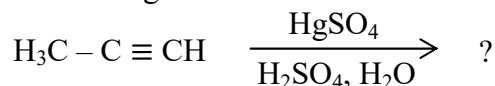
‘C’



‘D’

[Hints: Consider all possible pairs AB, AC, AD, BC, BD and CD]

- (b) (i) Complete the following reactions: 2+2



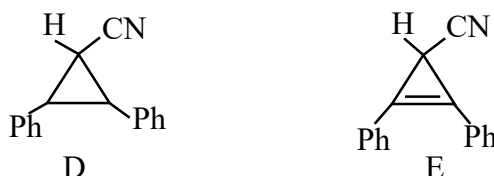
- (ii) 2

How do you classify the two hydrogens marked as H_A and H_B ? Are they prochiral or not? 2×2 = 4

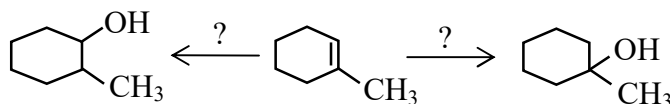
- (iii) Write short notes on:

Electrophilic substitution reaction on aromatic hydrocarbon and Hydroboration-oxidation process in an alkene.

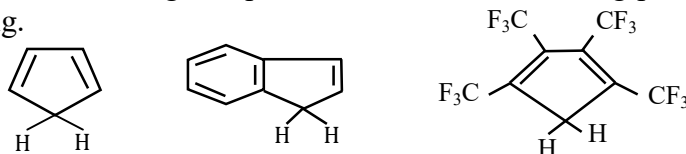
- (c) (i) The cyclopropane D loses its proton in hydrogen exchange reactions 10000 times faster than cyclopropane E. Explain. 2



- (ii) Carry out the following transformation with suitable mechanisms: 4

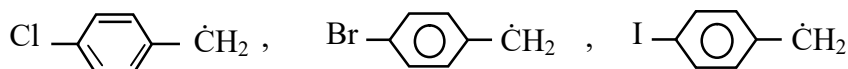
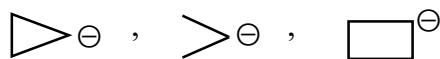


- (iii) Arrange the following compounds in order of increasing pK_a values with reasoning. 3

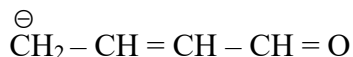


- (iv) Distinguish between 1-butyne and 2-butyne by a chemical test. 1

- (d) (i) Compare the stability of the following: 2×2 = 4



- (ii) Draw the resonating structures of the following and indicate the most stable structure: 1 1/2



- (iii) The difference in pK_1 and pK_2 values for dicarboxylic acids of the type $\text{HOOC}(\text{CH}_2)_n\text{COOH}$ decreases as 'n' increases. Explain. 1 1/2

- (iv) Compare the rate of bromination of nitrobenzene with that of bromobenzene. Also explain the orientation effect in these reactions. 3

—x—