WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 4th Semester Examination, 2024

CEMACOR10T-CHEMISTRY (CC10)

ORGANIC CHEMISTRY-IV

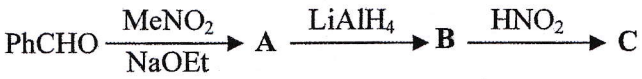
Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

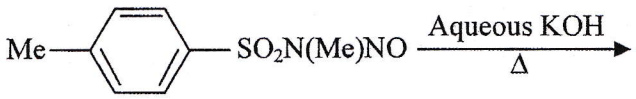
Answer any *four* questions taking *one* from each unit

Unit-I

1. (a) Identify the products **A**, **B** and **C** in the following sequence of transformations. Suggest a mechanism for the conversion of **B** to **C**. 3



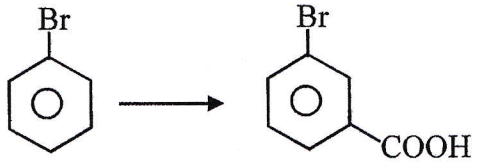
(b) Predict the product(s) of the following reaction with plausible mechanism. 1½



(c) State the action of $NaNO_2$ / HCl on (only the product): 1½

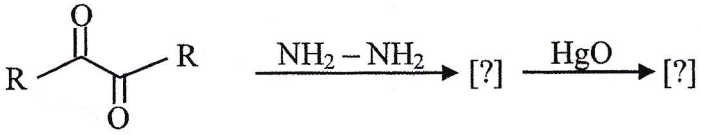
(i) *N*-methylaniline (ii) *N*, *N*-dimethylaniline and (iii) benzylamine

2. (a) Carry out the following conversion: 2



(b) Illustrate the use of diazomethane for the preparation of pyrazole and conversion of cyclopentanone to cyclohexanone. 2

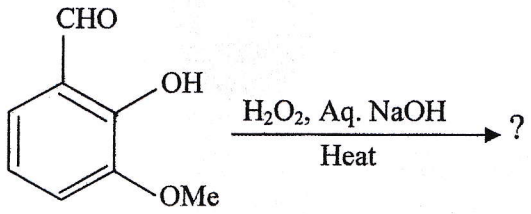
(c) Write down the product in the following scheme. 2



Unit-II

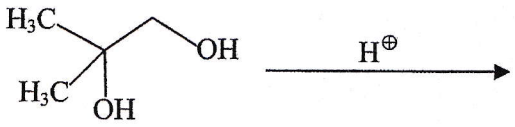
3. (a) "In the Arndt-Eistert synthesis two equivalent of diazomethane is used." — Explain the statement showing mechanism of the reaction. 2

(b) Predict the product of the following reaction: 3

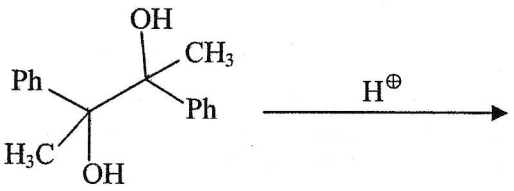


(c) Complete the following reactions and give reasons for your answer: $1\frac{1}{2} \times 2 = 3$

(i)

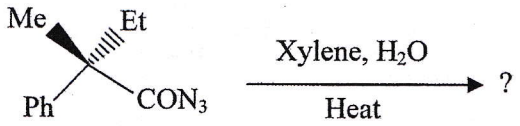


(ii)



4. (a) Two isomeric α-halo ketones A and B on treatment with NaOMe (separately) gave the same product $PhCH_2CH_2CO_2Me$. Identify A and B. 2

(b) Predict the product (with proper stereochemistry) in the following reaction with suitable mechanistic explanation. 3

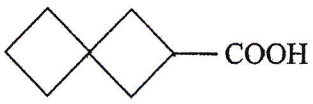


(c) Show that Hofmann, Curtius and Lossen reactions proceed through a common intermediate. Give proper evidence in favour of your answer. 3

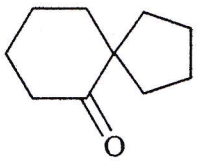
Unit-III

5. (a) Analyse the following molecules retro synthetically and suggest plausible synthetic route to them. (any *two*) $3 \times 2 = 6$

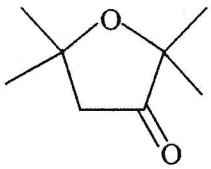
(i)



(ii)



(iii)



(b) Explain the terms "functional group interconversion" and 'illogical nucleophile' with suitable examples. 2+2

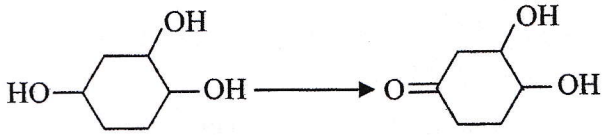
6. (a) Write down the synthetic equivalents of the following synthons. 3

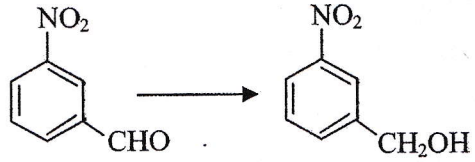
(i) $\bar{C}O_2H$ (ii) $\overset{+}{C}HCH_2OH$ (iii) $Ph-\bar{C}=O$

(b) Predict the major diastereomeric product when *S*-3-bromo-2-butanone is treated with sodium borohydride. 3

(c) Illustrate the use of acyloin condensation for the synthesis of large rings. Does the method require the high dilution technique? 2

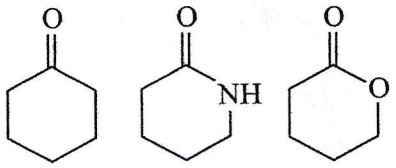
(d) Give the reagents for the following transformations. 2

(i) 

(ii) 

Unit-IV

7. (a) Consider the following carbonyl compounds. Suggest the correct increasing order of C = O stretching frequency. 3



I II III

(b) Distinguish the following pair of compounds on the basis of their IR spectroscopic data: 2+2+2

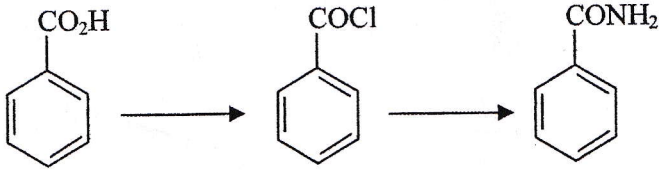
(i) Acetone and benzophenone

(ii) Salicylic acid and *o*-chloro benzoic acid

(iii) Phenyl acetate and methyl benzoate.

(c) What will be the change in ^{1}H-NMR spectrum of pure ethanol by the addition of D_2O? 2

(d) How do you study the progress of the following transformations using IR spectroscopy? 2



(e) Comment on the effect of polarity of solvent on $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transitions in UV spectroscopy. 2

(f) Mention one solvent, other than $CDCl_3$, that acts as NMR solvent. 1

8. (a) An organic compound with molecular formula $C_6H_{12}O$ gives positive iodoform test. Its UV, IR and ^{1}H-NMR data are given below: 3+1

UV: λ_{max} 282 nm , ε_{max} 22

IR: ν_{max} 1710 cm^{-1}

^{1}H NMR: δ 2.1 (3H, s) and 1.1 (9H, s)

Deduce the structure of the compound with proper explanation.

Explain the spectroscopic data.

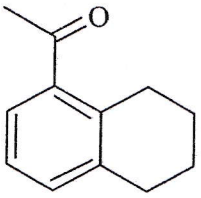
(b) Write down the structure of the compound $C_5H_{11}Cl$ which shows two singlets in its ^{1}H NMR spectrum. Predict the chemical shift. 2

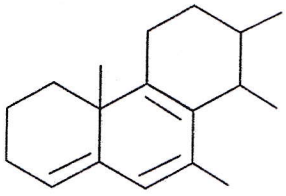
(c) Toluene is oxidized to benzaldehyde. What changes would you expect in PMR spectral feature for the product with respect to that of the starting material? 2

(d) "The nature of H-bonding present in a molecule can be identified by IR spectroscopy." — Explain with examples. 2

(e) The stretching absorption maxima for C–H and C–D are approximately 2900 cm^{-1} and 2200 cm^{-1} respectively. — Explain why. 2

(f) Calculate λ_{max} values for the following compounds using Woodward Fieser rule. 2+2

(i) 

(ii) 

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