



WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 4th Semester Examination, 2023

CEMACOR10T-CHEMISTRY (CC10)

ORGANIC CHEMISTRY-IV

Time Allotted: 2 Hours

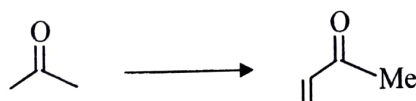
Full Marks: 40

*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.*

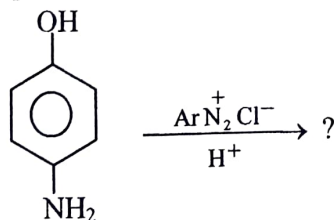
Answer any four questions taking one from each unit

Unit-I

1. (a) Although *N, N*-dimethylaniline couples with benzenediazonium chloride, its 2,6-dimethyl derivative does not. Explain. 2
- (b) Predict the product with suitable mechanistic course when *p*-bromonitrobenzene is treated with potassium cyanide in aqueous ethanol medium. 2
- (c) How can you chemically distinguish between *o*-phenylene diamine and *m*-phenylene diamine? 2
2. (a) How can you chemically distinguish between the isomers 4-nitro toluene and PhCH_2NO_2 ? 2
- (b) Carry out the following conversion using Mannich reaction in one of the steps: 2

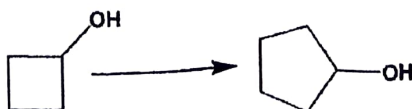


- (c) Predict the product in the following reaction 2



Unit-II

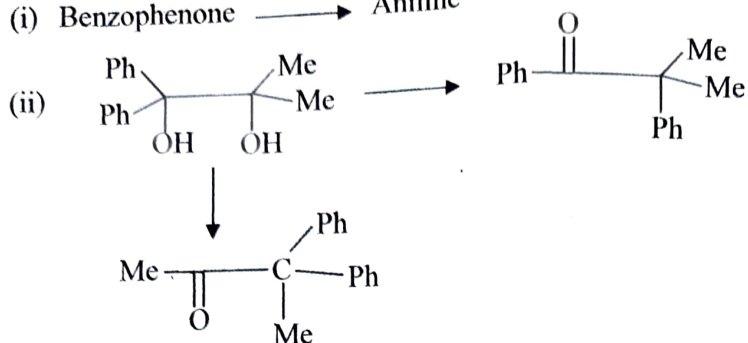
3. (a) Carry out the following conversion and suggest plausible mechanism of the ring expansion step: 2



(b) Two isomeric α -halo ketones A and B on treatment with NaOMe (separately) gave the same product $\text{PhCH}_2\text{CH}_2\text{CO}_2\text{Me}$. Identify A and B. 2

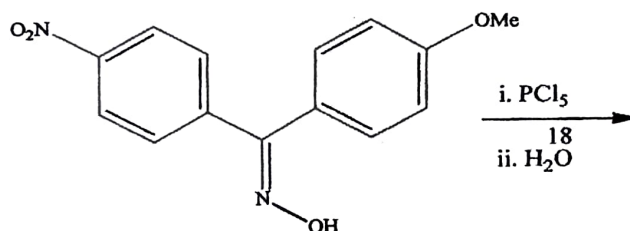
(c) Show how each of the following conversions could be accomplished by using a sequence of reactions involving a rearrangement reaction: 2+2

(i) Benzophenone $\longrightarrow$ Aniline

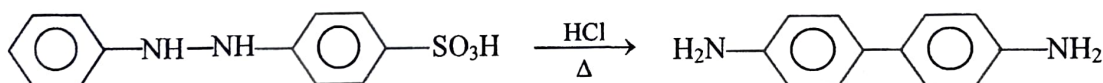


4. (a) In the Hofmann degradation of benzamide, small amounts of PhNHCONHPh and PhNHCONHCOPh are sometimes obtained along with aniline. Explain. 2

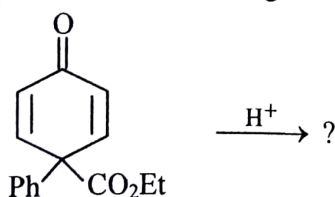
(b) Identify the product of the following reaction and suggest plausible mechanism for its formation. 2



(c) Suggest a mechanism of the following reaction 2



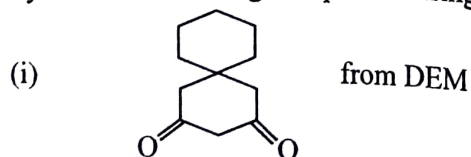
(d) Find out the product in the following reaction 2



Unit-III

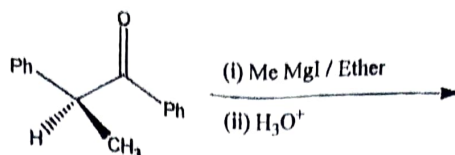
5. (a) Explain with suitable examples: (i) synthon ; (ii) illogical electrophile. 2+2

(b) Synthesize following compounds using retrosynthetic analysis: 2+2

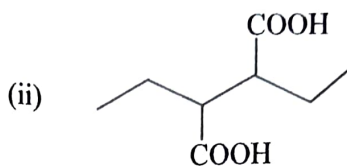
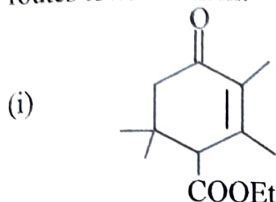


DEM = Diethyl malonate

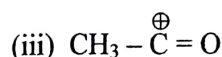
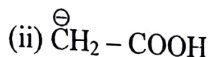
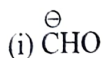
- (c) Use Felkin-Anh model to explain the formation of major product in the following reaction: 2



6. (a) Analyse the following molecules retrosynthetically and suggest plausible synthetic routes towards them: 2+2

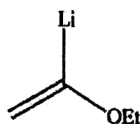


- (b) Write down the synthetic equivalents of the following: (any *two*) 2



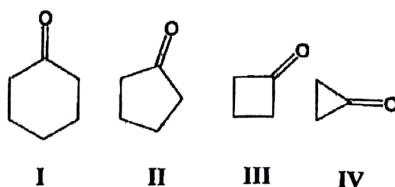
- (c) Synthesis of large rings is kinetically favourable but thermodynamically unfavourable — Justify or contradict with reasons. 2

- (d) Which synthon does the following compound represent when it reacts with benzaldehyde and the product is hydrolysed by acid? 2



Unit-IV

7. (a) Consider the following cyclic ketones. Suggest the correct increasing order of C = O stretching frequency with proper explanation. 3



- (b) The position of UV absorption maxima of aniline and benzene is different in aqueous medium but they give identical absorption maxima in acidic solution. Explain this observation. 2

- (c) A compound having molecular formula C₈H₁₀O shows the following spectroscopic data: 4

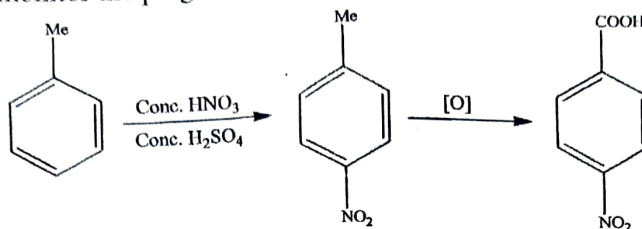
IR: 1170, 2950, 3080 cm⁻¹

¹H-NMR: δ 2.2 (3H, s), 3.5 (3H, s), 7.3 (2H, d, $J = 8$ Hz), 7.6 (2H, d, $J = 8$ Hz)

Find out the structure of the compound and explain the spectroscopic data as far as practicable.

- (d) How would you distinguish 1,1-dichloroethane and 1,2-dichloroethane using NMR spectroscopy? 2

- (e) How can you distinguish between the members in each of the following pairs of compounds by the spectroscopic technique mentioned within parenthesis? $1\frac{1}{2}+1\frac{1}{2}$
- p*-Cresol and anisole (by UV spectroscopy)
 - cis*-stilbene and *trans*-stilbene (by $^1\text{H-NMR}$ spectroscopy)
- (f) How can you monitor the progress of the following reaction using IR spectroscopy? 2



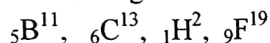
8. (a) A compound having molecular formula $\text{C}_{10}\text{H}_{12}\text{O}_2$ shows the following IR and $^1\text{H-NMR}$ data. 4

IR: 3050, 2950, 1730 cm^{-1}

$^1\text{H-NMR}$: δ 1.3 (6H, d), 5.2 (1H, septet), 7.2 (3H, m), 8.0 (2H, m)

Find out the structure of the compound and explain the spectroscopic data as far as practicable.

- (b) Which of the following nuclei are NMR active? 2



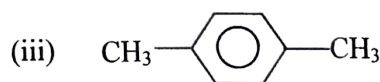
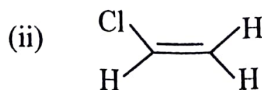
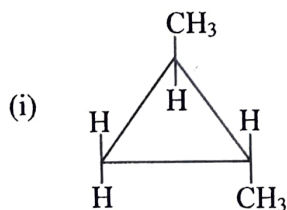
- (c) Distinguish the following pairs of compounds on the basis of IR spectroscopic data (any *two*): 2+2

- Acetone and hexamethyl acetone
- Salicylic acid and *p*-hydroxy benzoic acid
- Phenyl acetate and methyl benzoate

- (d) Define the following terms in connection with UV spectroscopy with suitable example (any *two*): 2+2

- Auxochrome
- Blue shift
- Chromophore.

- (e) Find out the number of signal(s) in NMR spectroscopy (any *two*): 1+1



—x—