



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

CEMACOR10T-CHEMISTRY (CC10)

ORGANIC CHEMISTRY-IV

Time Allotted: 2 Hours

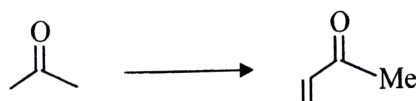
Full Marks: 40

*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.*

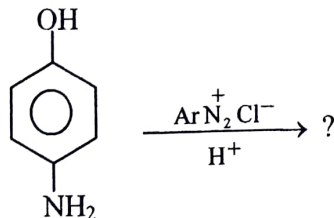
Answer any four questions taking one from each unit

Unit-I

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

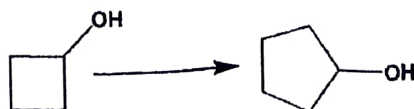


- Predict the product in the following reaction 2



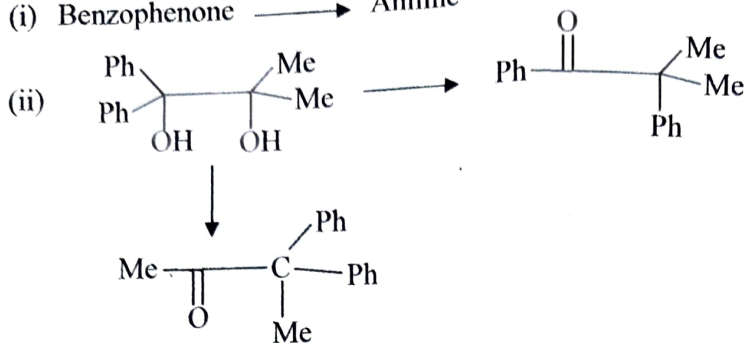
Unit-II

- Carry out the following conversion and suggest plausible mechanism of the ring expansion step: 2

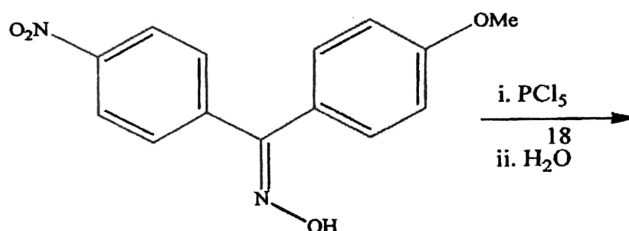


- (b) Two isomeric α -halo ketones A and B on treatment with NaOMe (separately) gave the same product $\text{PhCH}_2\text{CH}_2\text{CO}_2\text{Me}$. Identify A and B. 2
- (c) Show how each of the following conversions could be accomplished by using a sequence of reactions involving a rearrangement reaction: 2+2

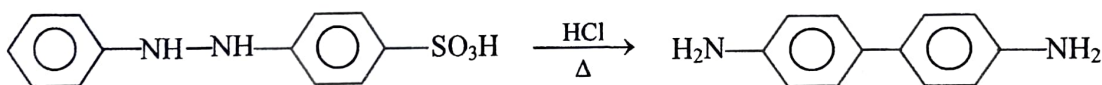
(i) Benzophenone \longrightarrow Aniline



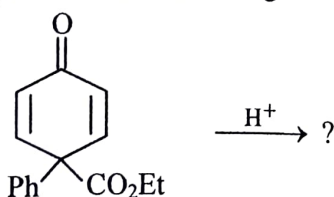
4. (a) In the Hofmann degradation of benzamide, small amounts of PhNHCONHPh and PhNHCONHCOPh are sometimes obtained along with aniline. Explain. 2
- (b) Identify the product of the following reaction and suggest plausible mechanism for its formation. 2



(c) Suggest a mechanism of the following reaction 2

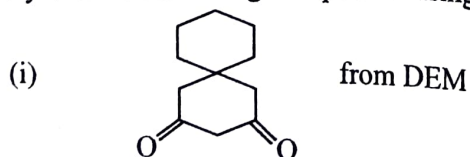


(d) Find out the product in the following reaction 2



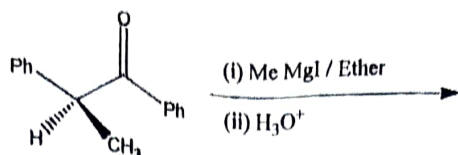
Unit-III

5. (a) Explain with suitable examples: (i) synthon ; (ii) illogical electrophile. 2+2
- (b) Synthesize following compounds using retrosynthetic analysis: 2+2

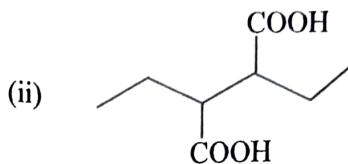
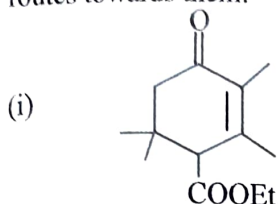


DEM = Diethyl malonate

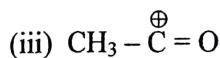
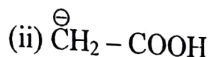
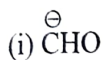
- (c) Use Felkin-Anh model to explain the formation of major product in the following reaction: 2



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

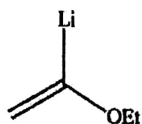


- (b) Write down the synthetic equivalents of the following: (any *two*) 2



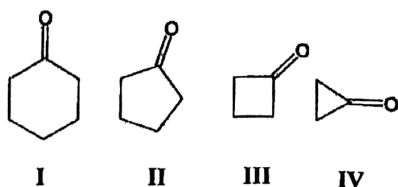
- (c) Synthesis of large rings is kinetically favourable but thermodynamically unfavourable — Justify or contradict with reasons. 2

- (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 $\text{C}_8\text{H}_{10}\text{O}$ shows the following spectroscopic data: 4

IR: 1170, 2950, 3080 cm^{-1}

$^1\text{H-NMR}$: 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.

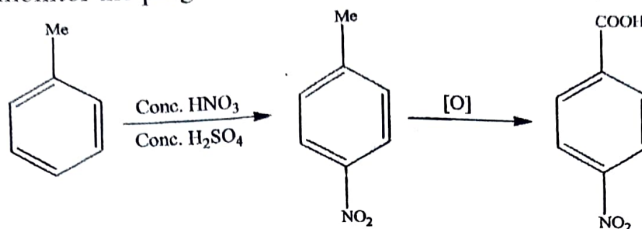
- (d) How would you distinguish 1,1-dichloroethane and 1,2-dichloroethane using NMR spectroscopy? 2

(e) How can you distinguish between the members in each of the following pairs of $1\frac{1}{2}+1\frac{1}{2}$ compounds by the spectroscopic technique mentioned within parenthesis?

(i) *p*-Cresol and anisole (by UV spectroscopy)

(ii) *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



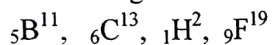
8. (a) A compound having molecular formula $\text{C}_{10}\text{H}_{12}\text{O}_2$ shows the following IR and $^1\text{H-NMR}$ data. 4

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

$^1\text{H-NMR}$: 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

(i) Acetone and hexamethyl acetone

(ii) Salicylic acid and *p*-hydroxy benzoic acid

(iii) Phenyl acetate and methyl benzoate

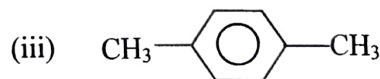
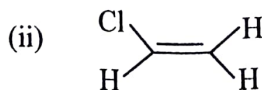
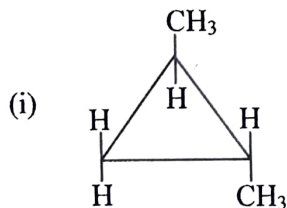
(d) Define the following terms in connection with UV spectroscopy with suitable example (any two): 2+2

(i) Auxochrome

(ii) Blue shift

(iii) Chromophore.

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



—x—