

## U.G. 4th Semester Examination - 2020

## CHEMISTRY

[HONOURS]

Course Code : CEMH-CC-T-10

Organic Chemistry

Full Marks : 40

Time : 2½ Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

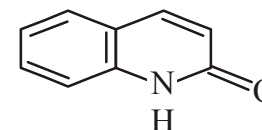
1. Answer any **five** questions: 2×5=10
- An organic compound in hexane exhibits  $\lambda_{\max} = 305\text{nm}$  and in ethanol shows  $\lambda_{\max} = 307\text{nm}$ . What should be the nature of transition and why?
  - What is finger print region in IR spectrum of an organic compound? State its importance.
  - Explain the term 'Shielding' and deshielding of protons in  $^1\text{H}$  NMR spectrum.
  - An organic compound of molecular formula  $\text{C}_3\text{H}_4$  shows sharp absorption peak at  $\sim 3300\text{cm}^{-1}$ . What will be the structure of the molecule?

[Turn Over]

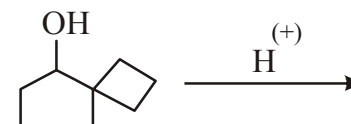
- What will be the synthetic equivalent of  $\text{CH}_2\text{NH}_2^-$  and  $\text{CH}_2\text{CH}_2\text{OH}^+$ .
- In most of the organic compounds, IR spectra exhibit peaks but UV spectra exhibit bands. Explain.
- Two methyl groups in dimethylformamide give two separate signals at room temperature. Explain.
- Mention the advantage and disadvantage of Curtins rearrangement over Hofmann rearrangement.

2. Answer any **two** questions: 5×2=10

- Work backward to identify the starting materials for the preparation of following compound:

out the synthesis of this compound. 3

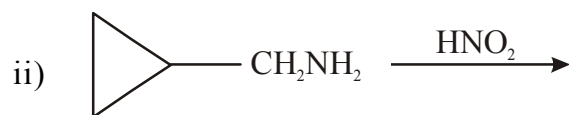
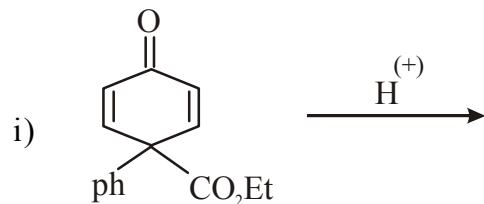
- Write down the product of the following reaction:

2

b) Suggest the structures for the compounds that meet the following descriptions in  $^1\text{H-NMR}$  spectroscopy.  $1 \times 5 = 5$

- $\text{C}_2\text{H}_6\text{O}$  ; one singlet
- $\text{C}_4\text{H}_8\text{O}_2$  ; one singlet, one triplet, one quartet
- $\text{C}_3\text{H}_7\text{Cl}$  ; one doublet and one septet
- $\text{C}_8\text{H}_{10}$  ;  $\delta 1.2(\text{t}, 3\text{H}), 2.6(\text{q}, 2\text{H}), 7.2(\text{s}, 5\text{H})$
- $\text{C}_{10}\text{H}_{14}$  ;  $\delta 1.3(\text{s}, 9\text{H}), 7.2(\text{s}, 5\text{H})$

c) Write down the product of the following reactions with proper mechanism:  $2 \frac{1}{2} \times 2 = 5$

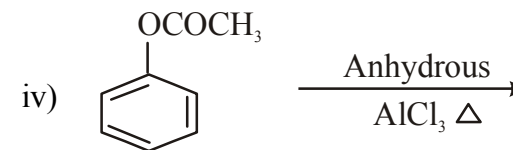
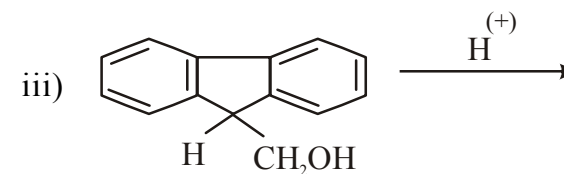
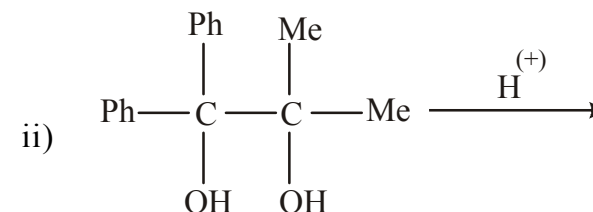
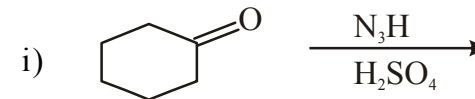


- d) i) State and explain High dilution Principle.  
 ii) Distortion of chromophore may lead to red or blue shift in the UV spectrum of organic compounds. Explain.  
 iii) What is end absorption in UV spectroscopy?  $2+2+1$

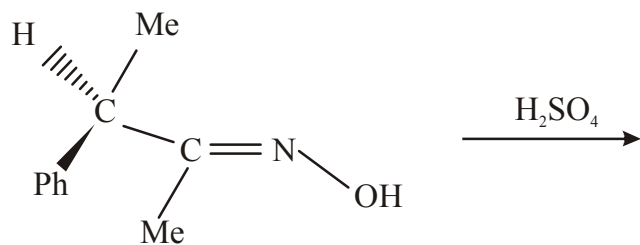
3. Answer any **two** questions:  $10 \times 2 = 20$

a) Write down the product(s) with mechanism:

$2 \frac{1}{2} \times 4 = 10$

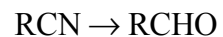


- b) i) Explain stereospecific and stereoselective reaction with proper example.  
 ii) How will you establish that Benzidine rearrangement is intramolecular.  
 iii) Write down the product with proper stereochemistry:

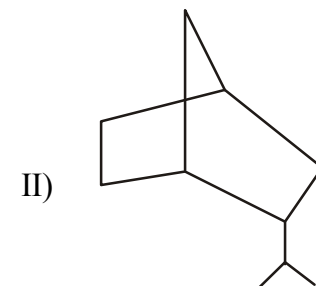
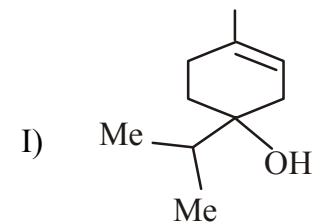


- iv) When (R)-2-methylbutanamide is allowed to react with bromine in a strong aqueous solution of NaOH, the product is an optically active amine. Predict the structure of the expected product and use your knowledge of the reaction mechanism to predict the stereochemistry.  $2\frac{1}{2}+2\frac{1}{2}+2\frac{1}{2}+2\frac{1}{2}$

c) i) How will you convert—



- ii) Give one example each of functional group addition and functional group inter conversion.
- iii) Give retrosynthetic analysis of the following compounds and outline the corresponding synthetic route:



2+2+(3×2)

- d) i) Ethylene absorbs at 164 nm in the UV, whereas 1,3-butadiene absorbs at 217 nm. Explain.
- ii) The C=C stretching vibration of isobutylene appears at  $1640\text{cm}^{-1}$  whereas no peak appears in that region in 2,3-dimethyl-2-butene. Explain.
- iii) A compound with molecular formula  $\text{C}_2\text{H}_2\text{BrCl}$  exhibits two doublets ( $J=16\text{Hz}$ ) in its PMR spectrum. Suggest the structure.

- iv) Sometimes the conversion of an alkylamide into the amide may be effected by means of alkaline hydrogen peroxide. Explain.
- v) Esters of O-chlorobenzoic acid exhibit two C=O stretching frequencies. Explain.

2+2+2+2+2

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