

U. G. 4th Semester Examination 2022

CHEMISTRY (Honours)

Paper Code : CEMH DC-10

(Organic Chemistry)

[CBCS]

Full Marks : 25

Time : Two Hours

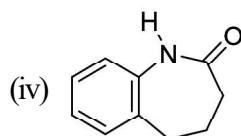
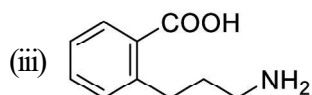
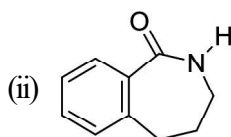
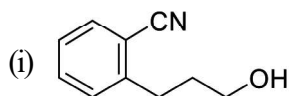
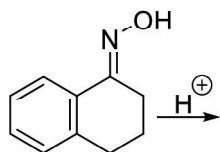
The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer any **five** questions from the following :

1×5=5

(a) The major product in the following reaction is



[P.T.O.]

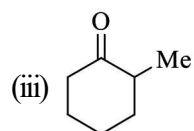
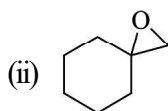
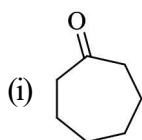
(b) The effect of hydrogen bonding on absorption maxima is :

- (i) Bathochromic shift
- (ii) Hypsochromic shift
- (iii) Hyperchromic shift
- (iv) Hypochromic shift

(c) Number of PMR signals displayed by *S*-2-bromobutane is

- (i) 5
- (ii) 2
- (iii) 3
- (iv) 4

(d) Treatment of cyclohexanone with diazomethane yields

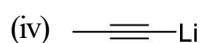
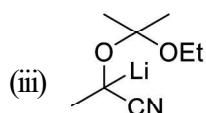
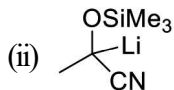
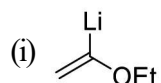


- (iv) Both (i) and (ii)

(e) 2-Nitro benzaldehyde can be converted into 2-amino benzaldehyde by

- (i) Lithium aluminum hydride
- (ii) Sodium in ethanol
- (iii) Stannous chloride in HCl
- (iv) Sodium borohydride

(f) Which of the following is not a synthetic equivalent of acetyl anion?



(g) Which of the following compounds needs Lewis acid catalysis for methylation by diazomethane?

(i) *p*-Cresol

(ii) Phenyl acetic acid

(iii) Benzyl alcohol

(iv) *p*-toluic acid

(h) Aldehydic C-H stretching appears as a doublet due to

(i) Fermi resonance

(ii) $n - \sigma^*$ interaction

(iii) $n - \pi^*$ interaction

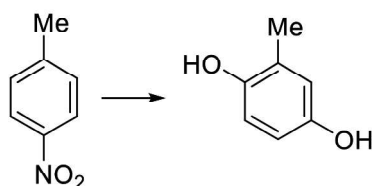
(iv) all of these

2. Answer any **four** questions:

2×4=8

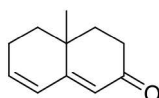
(a) Benzene diazonium chloride fails to couple with anisole but 2,4-dinitro benzene diazonium chloride couples with anisole. Explain.

(b) How can you accomplish the following transformation?

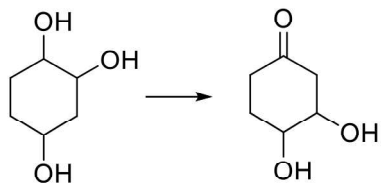


[P.T.O.]

- (c) How can you distinguish between anisole and *p*-cresol by UV spectroscopy?
- (d) Comment on the multiplicity of the PMR signals displayed by but-3-en-2-one.
- (e) How can you synthesize $\text{PhCH}_2\text{CH}_2\text{COCH}_2\text{COOEt}$ from ethyl acetoacetate?
- (f) Beckmann rearrangement of an oxime gives compound A hydrolysis of which furnishes acetic acid and benzyl amine. Identify compound A and the oxime with proper configuration and suggest a plausible mechanism for the formation of A.
- (g) Calculate λ_{max} for the following compound using Woodward Fieser rule.



- (h) How can you achieve the following transformation?



3. Answer any *two* questions:

2×6=12

- (a) (i) Compound A ($\text{C}_4\text{H}_8\text{O}_2$) displays the following spectroscopic data.

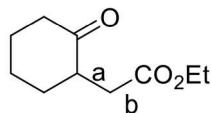
IR: 1735 cm^{-1}

$^1\text{H-NMR}$: δ (ppm): 1.1 (t, 3H, J 7 Hz), 2.06 (s, 3H), 3.9 (q, 2H J 7Hz)

Deduce structure for compound A and assign the spectroscopic data as far as possible.

- (ii) Use Felkin Anh model to explain the formation of major stereoisomeric product when *S*-3-phenyl-2-butanone is treated with ethyl magnesium bromide followed by acidification. 3+3

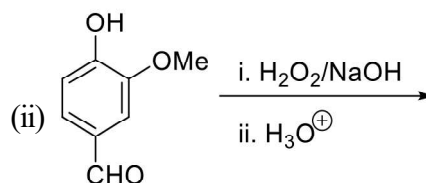
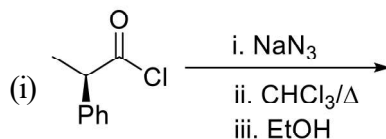
- (b) (i) Give synthons for disconnection at bonds 'a' and 'b' for the following molecule. Suggest a logical synthetic route based on any one of these disconnections.



- (ii) Mention a method for the preparation of Me_3CNH_2 from *tert*-butanol with plausible mechanism. 4+2

[P.T.O.]

- (c) (i) Predict the product(s) in the following reactions and suggest mechanism in each case.



2+2

- (ii) Explain with example consonant and dissonant polarities. 2

- (d) (i) How can you distinguish between methyl acrylate and vinyl acetate by IR spectroscopy?
- (ii) A compound $\text{C}_8\text{H}_{18}\text{O}_2$ with a strong, broad infrared absorption at 3293 cm^{-1} has the following proton NMR spectrum : δ 1.22(12H, s); δ 1.57(4H, s); δ 1.96(2H, s). The resonance at δ 1.96 disappears when the sample is shaken with D_2O . Predict the most probable structure of the compound consistent with the above spectral data. 2+4
