Q.P. Code : 35911

[Time: 2½ Hours] **[Marks: 60]**

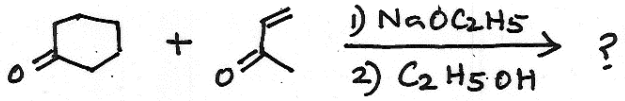
Please check whether you have got the right question paper.

N.B: 1. **All** questions are compulsory.
2. **Figures** to the **right** indicate **full** marks.

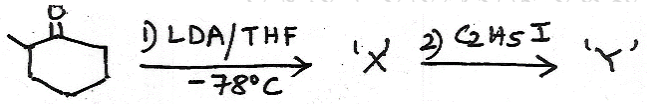
1. (A) Answer **any two** of the following:

(a) What is Mannich reaction? Using a suitable example, explain the mechanism of the reaction. **04**

(b) Complete the following reaction and give the mechanism: **04**



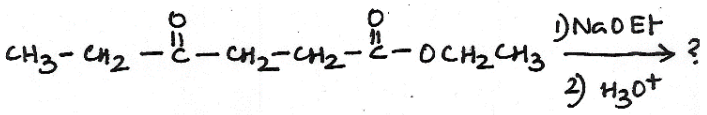
(c) Complete the following reaction and justify the formation of 'X' and 'Y': **04**



(d) What is Knoevenagel condensation? Explain the mechanism of the reaction using benzaldehyde and ethyl acetoacetate. **04**

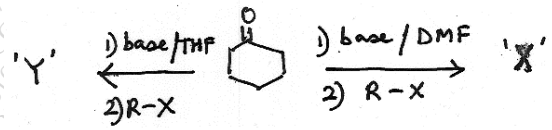
(B) Answer **any one** of the following:-

(a) Complete the following reaction and give the mechanism: **04**

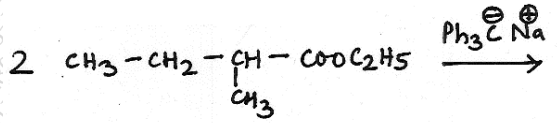


(b) Predict the products of the following reactions: **04**

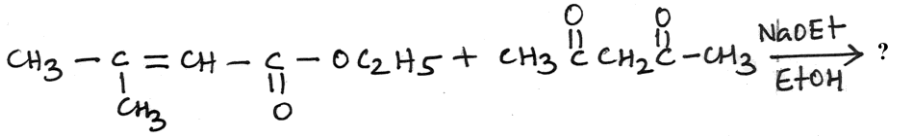
(i)



(ii)



(iii)



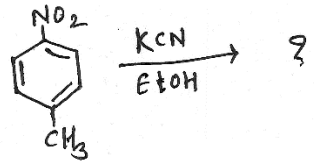
2. (A) Answer **any two** of the following:

(a) Explain the following rearrangement reactions with one example each: **04**

(i) Baylis Hilman (ii) Tiffeneau Demjanov

(b) What is McMurry coupling reaction? Explain its mechanism. **04**

(c) Complete the following reaction and give its mechanism: **04**

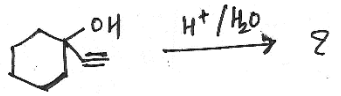


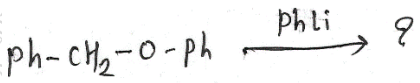
(d) Give the mechanism for the following conversions: **04**

(i) Diethyl sulfoxide to $\propto$ −acyloxydiethyl thioether
(ii) Acetophenone oxime to $\propto$ −aminoacetophenone

(B) Answer **any one** of the following

(a) Predict the products of the following reactions and name them: **04**

(i) 

(ii) 

(b) What is Passerini rearrangement? Give its mechanism. **04**

3. (A) Answer **any one** of the following:

(a) Show the interaction of allyl cation and allyl anion with their π − MO diagrams. Predict the product of the reaction. **04**

(b) Explain the following in IR spectroscopy: **04**

(i) Importance of finger print region
(ii) Structure determination of compounds containing a carbonyl group

(c) Draw the π − MO diagram to show the relative energies of the MOs of formaldehyde and ethene. Explain their reactivity with nucleophiles on the basis of their FMOs. **04**

(d) Ethene absorbs at ~ 165 nm while butadiene absorbs at ~ 214 nm in UV spectroscopy. Explain, using MO diagrams of ethene and butadiene. **04**

(B) Answer **any one** of the following:

(a) Explain the effect of solvent polarity on $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transitions in UV spectroscopy with suitable examples. **04**

(b) How are the following compounds distinguished using IR spectroscopy: **04**

(i) $(C_6H_5CO)_2O$, C_6H_5-COOH and $C_6H_5COCH_3$

(ii) ortho- and para-hydroxyacetophenones

4. (A) Answer **any two** of the following:

(a) On the basis of NMR spectroscopy how will you distinguish between: **04**

(i) cis –and trans-alkenes

(ii) axial and equatorial protons in cyclohexane

(b) What is deshielding effect in NMR spectroscopy? Illustrate the effect of the same on chemical shift with suitable examples. **04**

(c) How will you differentiate between the two isomeric alcohols, 3–pentanol and 2–methyl–2–butanol on the basis of their ^{13}C NMR spectra. **04**

(d) An organic compound $C_{10}H_{12}O_2$ gave the following spectral data. Deduce the structure of the compound. **04**

Ms : m/z 73, 91, 149, 164

IR : ν_{max} cm^{-1} 1730

^1H NMR : δ ppm 2.0 (s, 3H), 2.93 (t, 2H, J = 7Hz), 4.30 (t, 2H, J = 7Hz), 7.30 (s, 5H)

(B) Answer **any one** of the following:

(a) Write notes on the following w.r.t. mass spectrometry: **04**

(i) McLafferty Rearrangement

(ii) Retro Diels-Alder Reaction

(b) Deduce the structure of the compound from the spectral data given below: **04**

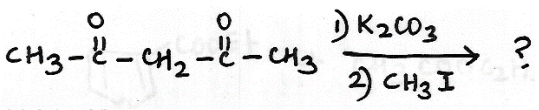
Molecular Formula: $C_8H_8O_2$

IR cm^{-1} : 1710 (s), 3000-2500 (br)

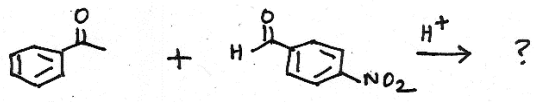
^1H NMR: (δ ppm) = 7.2 (5H, s), 3.5 (2H, s) 11.6 (1H, s) (D_2O exchangeable)

5. Answer **any four** of the following: **12**

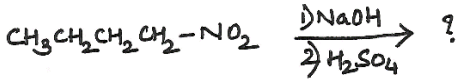
(A) Complete the following reaction and give the mechanism:

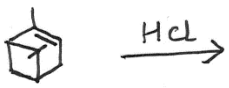


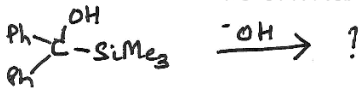
(B) Complete the following reaction and name the reaction:



(C) Complete the following reactions:

(i) 

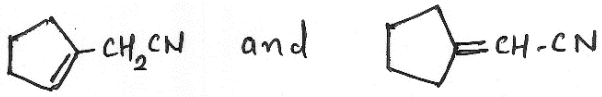
(ii) 

(iii) 

(D) Explain the mechanism of Boulton-Katritzky rearrangement with a suitable example.

(E) 'Dimerization of ethane takes place via photochemical pathway'. Explain on the basis of HOMO-LUMO interaction using a $\pi -$ MO diagram.

(F) Can UV spectroscopy be used to distinguish between the following isomers? If yes, Explain.

(i) 

(ii) 

(G) Define the following terms in mass spectrometry:

(i) Base peak
(ii) Isotopic abundance
(iii) Molecular Ion

(H) Give the fragmentation pattern of salicylic acid in mass spectrometry.
