

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

M.A./M.Sc. FIRST SEMESTER EXAMINATION, JANUARY 2015

FIRST YEAR

APPLIED CHEMISTRY

Date : 14/01/2015

Time : 11 am – 1 pm

Paper : II

Full Marks : 50

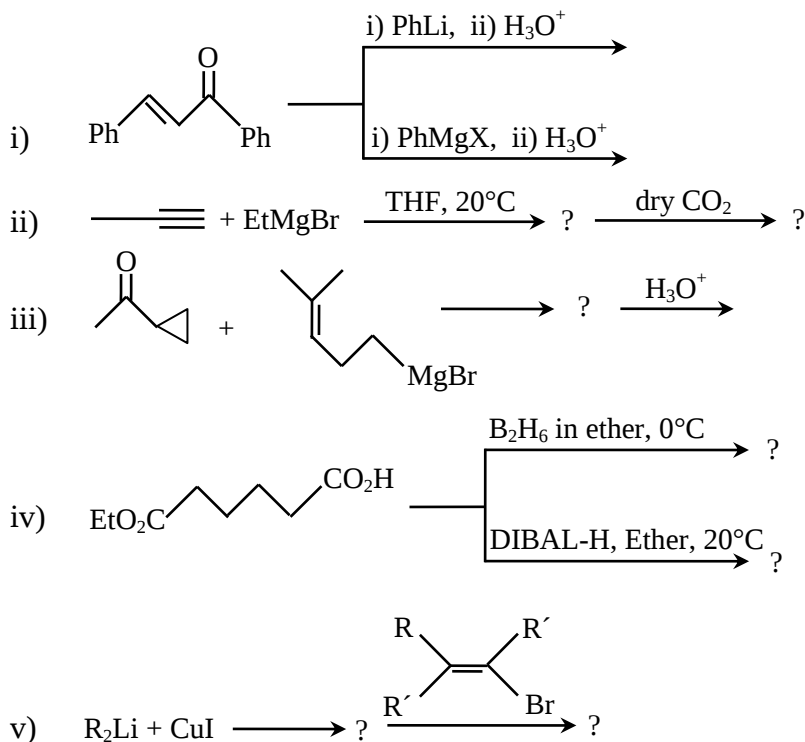
[Use a separate Answer Book for each Unit]

[Answer one question from each Unit]

Unit - I

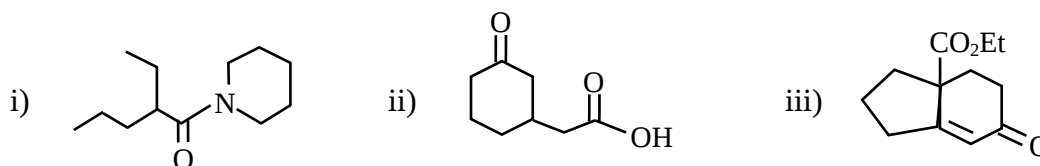
1. a) Predict the product in the following reactions and explain their formation.

[5×2]



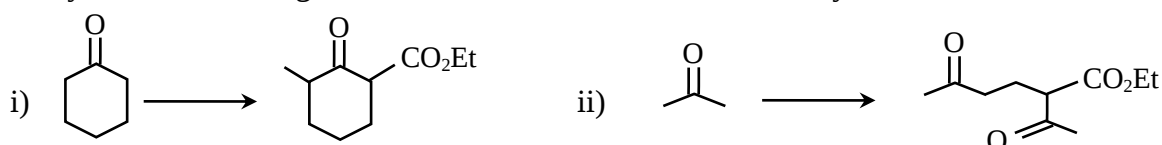
b) Give Retrosynthetic analysis and an efficient synthesis of the following compounds:

[3×2]



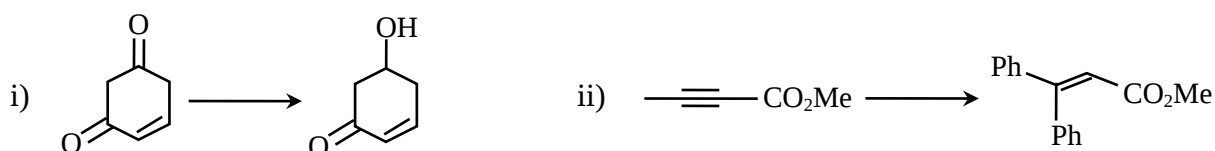
c) Carry out the following conversions. Mechanism is not necessary.

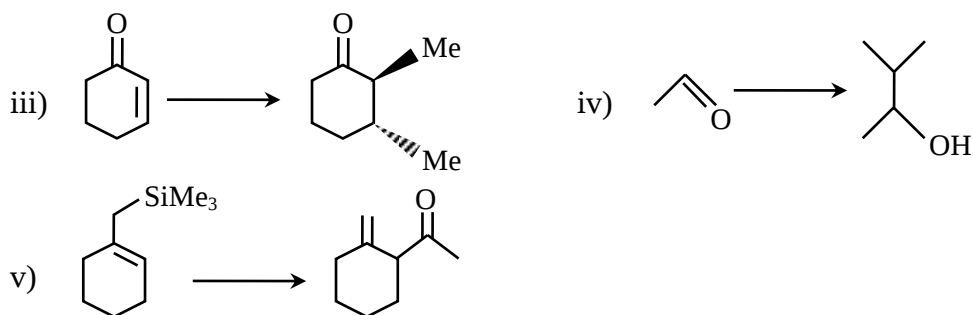
[2×2]



2. a) Carry out the following conversions:

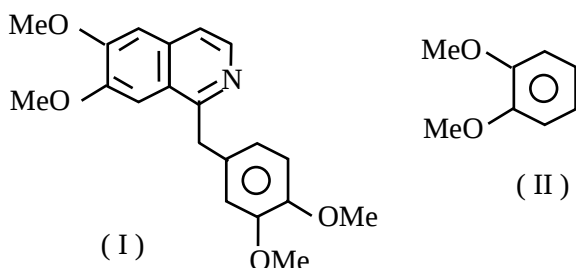
[5×2]





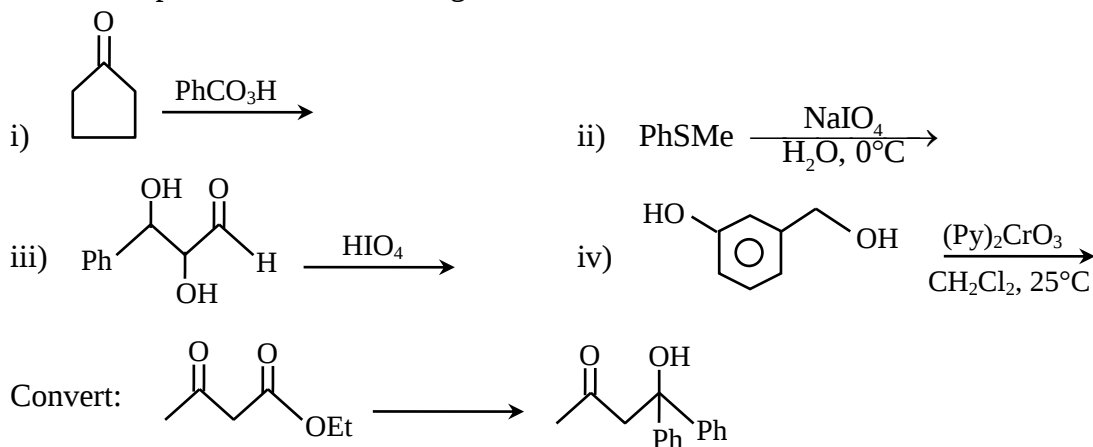
b) Outline the total synthesis of papaverine (I) starting from (II):

[4]



c) Predict the product in the following reactions:

[4]



[2]

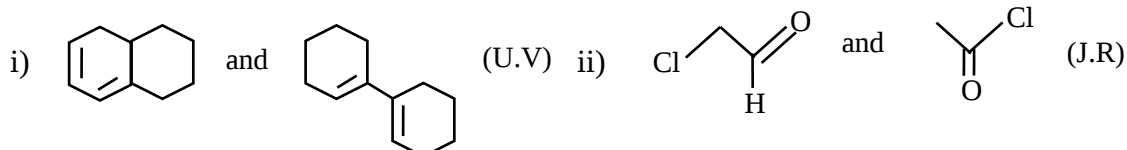
Unit - II

3. a) Show by orbital picture: $\pi \rightarrow \pi^*$ & $n \rightarrow n^*$ transitions.

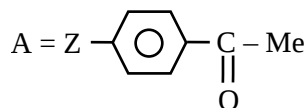
[2]

b) Distinguish between the given pair of compounds as directed:

[2]



c) Match the given carbonyl stretching frequencies with appropriate 'z' in (A), with reason:



$\bar{\nu}_{C=O}$ /

1677, 1687, 1691, 1700 cm^{-1}

Z/H, Me, NO_2 , NH_2 .

[3]

d) In connection with PMR spectrum, the olefinic protons are deshielded while acetylenic protons are shielded though degree of unsaturation in the later compound is more. —explain.

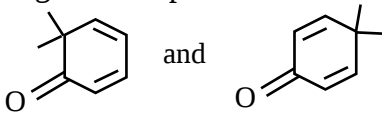
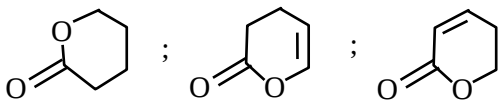
[3]

e) A compound of MF $\text{C}_9\text{H}_{10}\text{O}_2$ shows three PMR signals with integration ratios 18:7:11. How many protons given rise to each signal?

[2]

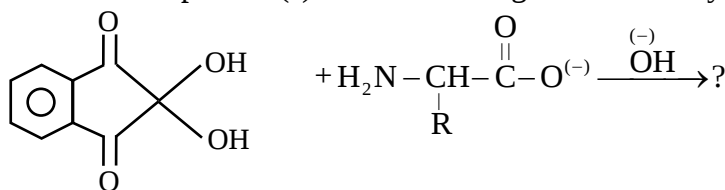
f) Describe the mass fragmentation pattern of 1-butanol. Indicate the fragment that constitutes base peak.

[3]

4. a) State with example: Hyperchromic effect, Auxochrome. [2]
 b) Calculate $\lambda_{\max}$ for the given compounds: [2]
- 
- c) Assign the given stretching frequencies (C=O) to the appropriate lactones, with reason.
 $\gamma_{C=O}$: 1760, 1720, 1740 cm^{-1}
- Lactones:  [3]
- d) Explain the following in respect of PMR spectroscopy:
 i) Chemically equivalent
 ii) Integration of a signal
 iii) Coupling Constant [3]
- e) State the following in respect of PMR spectra of nitrobenzene:
 i) no. of signals; (ii) relative positions; (iii) multiplicity [2·5]
- f) Describe the mass fragmentation of 3-hexanone indicating the fragment constituting base peak. [2·5]

Unit - III

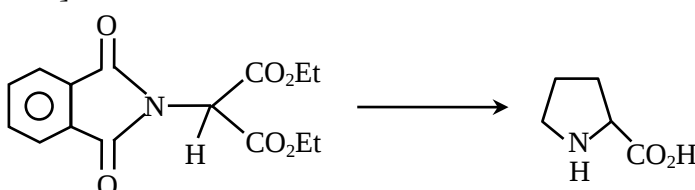
5. a) Write the name and one letter abbreviations of: [2]
 i) a basic amino acid
 ii) an amino acid with benzene ring
- b) Write down the product(s) of the following reaction? Why the product is coloured?



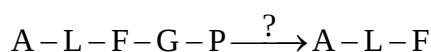
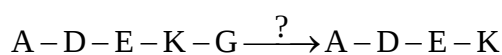
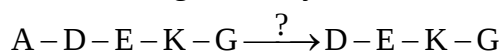
Write the mechanism of the reaction.

[1+2]

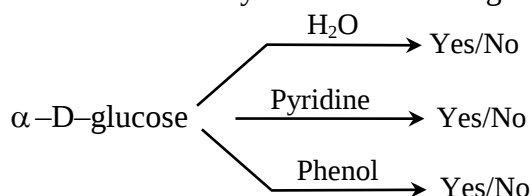
- c) Why amino acids are not soluble in non-polar solvent. What is the pI (iso-electric point) of lysine?
 [Hint: $p^{ka_1} = 2.18$, $p^{ka_2} = 8.95$, $p^{ka_3} = 10.79$] [2]

- d) Carryout the following transformations:  [2]

- e) Write the reagents/ enzymes for the following peptide cleavages? [2]



- f) Convert D-Glucose $\rightarrow$ D-Arabinose. [2]
 g) Write the structures (in Fischer Plane projection) of C2 and C4 epimers of D-glucose. [1]
 h) In what condition you observe a change in optical rotation with time. Write Yes/No. [1]



6. a) Write the name and one letter abbreviations of:

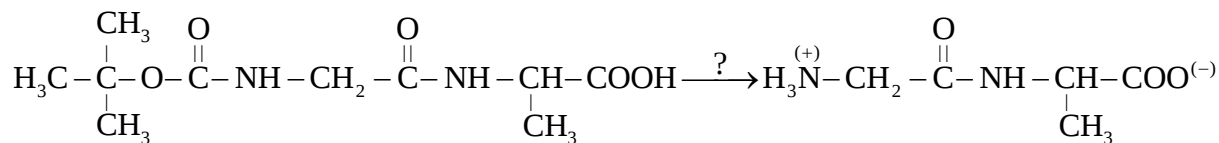
i) an acidic amino acid

ii) an amino acid with indole ring.

[2]

b) Write down the reagent(s) and mechanism of following conversion:

[2]

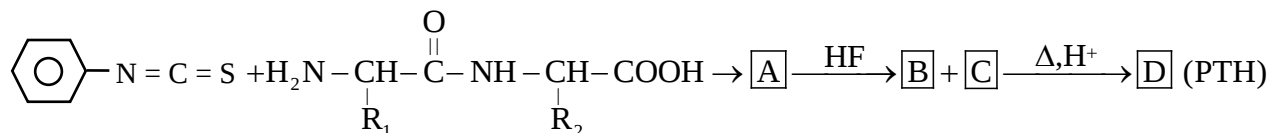


c) Synthesize methionine from 2-propenal using strecker synthesis.

[2]

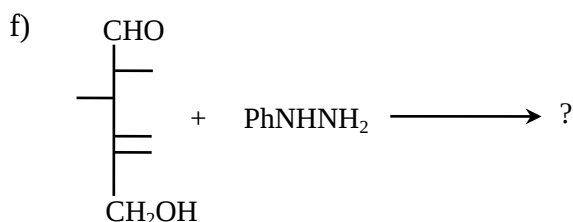
d) Write down the structures of A,B,C,D. [Hint: D is PTH]

[2]



e) Convert D-Arabinose $\rightarrow$ D-Glucose

[2]



Write down the product of osazone reaction. What is the structure of osazone from D-Mannose?

[2]

g) Why won't CNBr cleave at cysteine residues? Suggest a mechanism.

[2]

h) What are the interactions present in 3°-(tertiary) structure of proteins?

[1]

_____ × _____