

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

M.A./M.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2017

FIRST YEAR [BATCH 2017-19]

APPLIED CHEMISTRY

Date : 19/12/2017

Time : 11 am – 1 pm

Paper : II

Full Marks : 50

(Use a separate Answer Book for each Group)

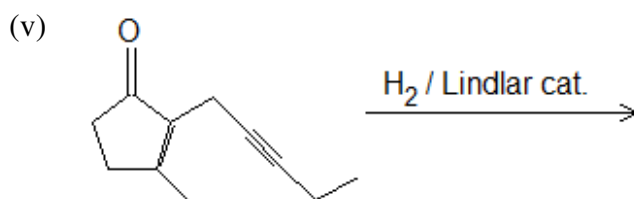
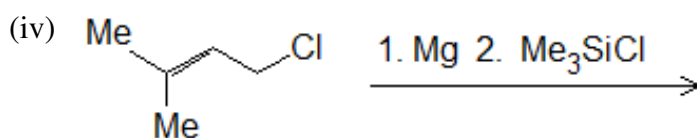
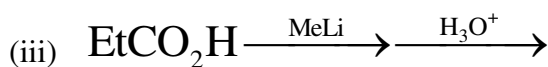
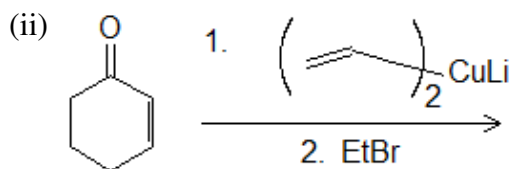
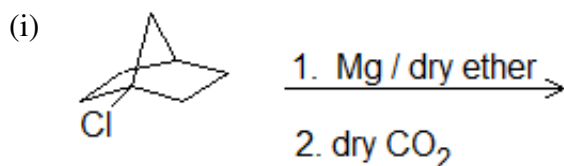
Group – A

Answer any one from Question Nos. 1 & 2:

1 X 20

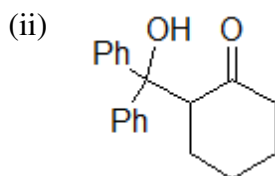
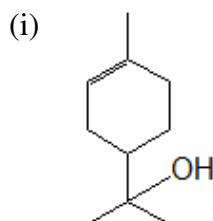
1. a) Predict the product in the following reactions and explain their formation.

2 X 5



b) Give retrosynthetic analysis and an efficient synthesis of the following compounds.

5

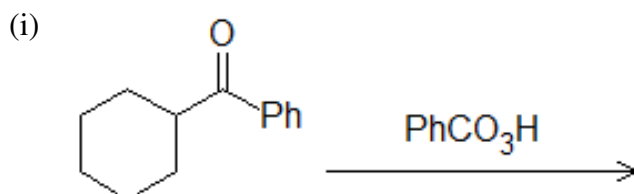


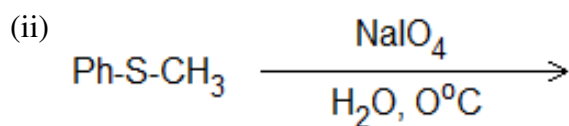
c) Outline the synthesis of papaverine.

3

d) Predict the product in the following reactions.

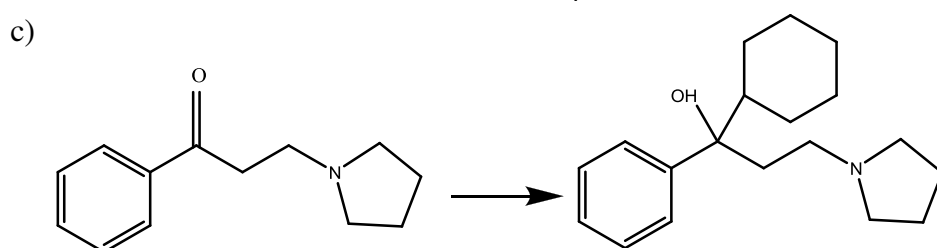
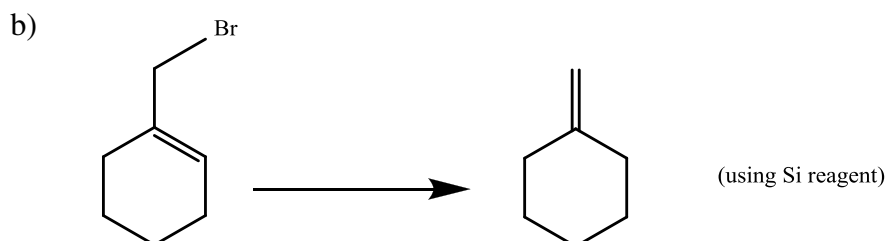
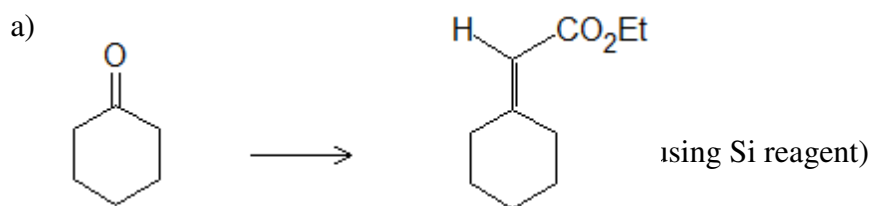
2





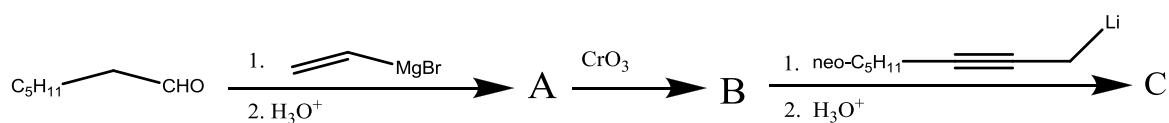
2. Carry out the following conversions:

2 X 3



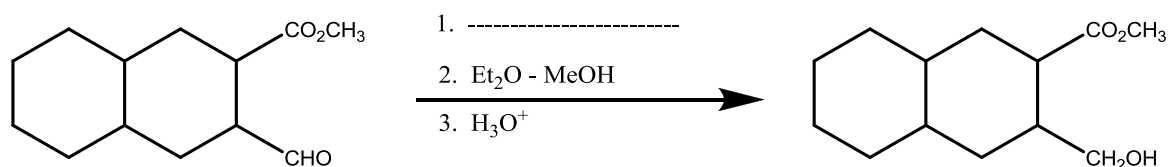
d) Write down the structures of A – C in the following reaction sequence:

3



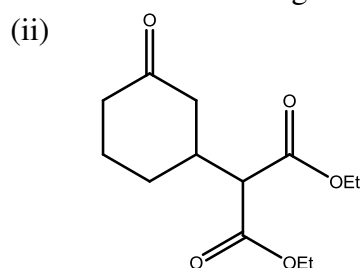
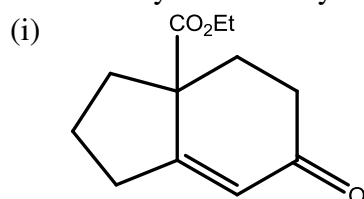
e) Fill up the blank:

1



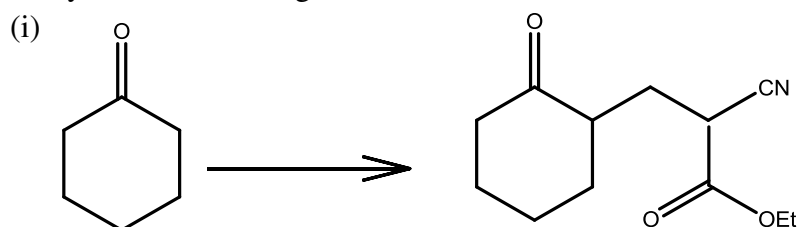
f) Give retrosynthetic analysis and an efficient synthesis of the following compounds:

5

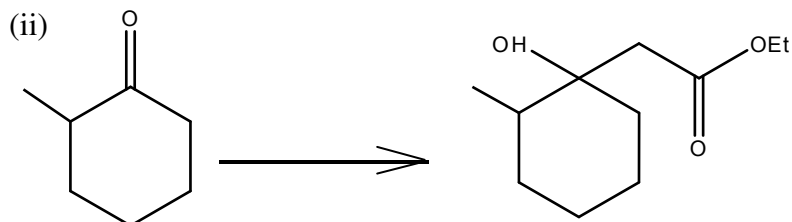


g) Carry out the following conversions:

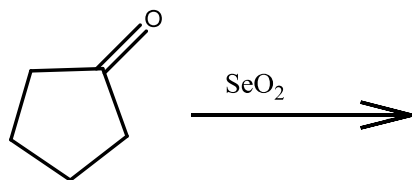
4



(2)



h) Predict the product in the following reaction:



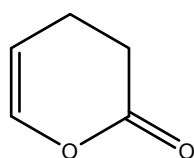
Group – B

Answer any one Question Nos. 3 & 4:

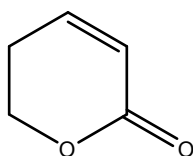
1 X 15

3. a) Arrange the following molecules in their increasing order of IR absorption frequency for Carbonyl bond with proper explanation:

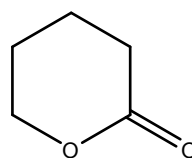
2



I



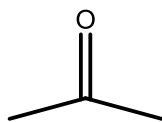
II



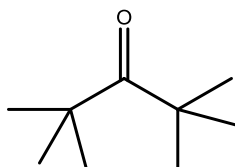
III

b) Give proper explanation why 'A' molecule has higher absorption frequency in IR than 'B' for Carbonyl bond.

1



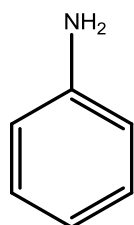
$\bar{\nu}_{CO} = 1720 \text{ cm}^{-1}$
A



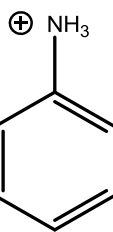
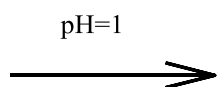
$\bar{\nu}_{CO} = 1697 \text{ cm}^{-1}$
B

c) Designate the following uv absorption bands for aniline and comment on the effect of low pH on the bands.

2



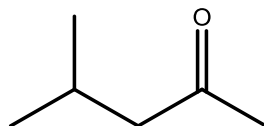
$\lambda_{\text{max}} 230 \text{ nm}$
($\epsilon = 6,600$)
 $\lambda_{\text{max}} 280 \text{ nm}$
($\epsilon = 430$)



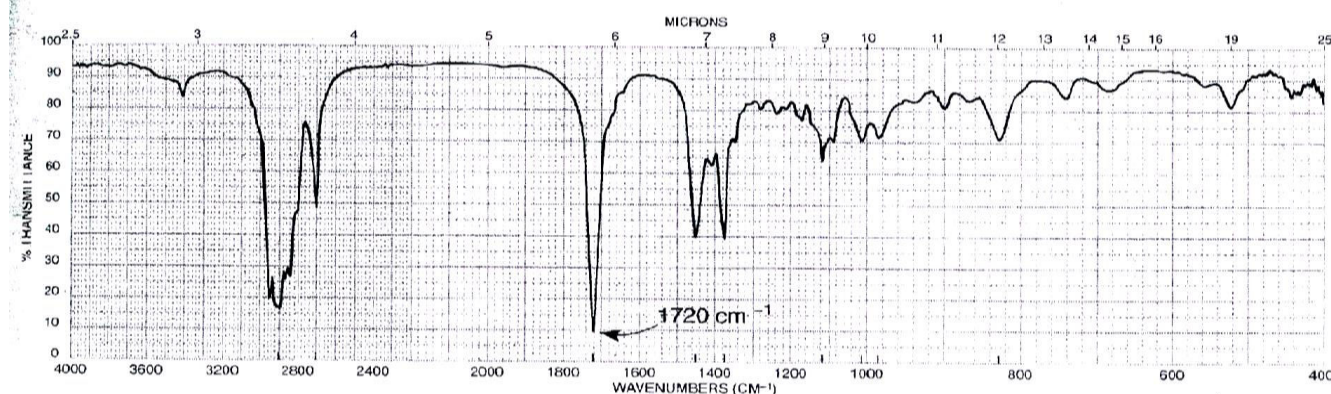
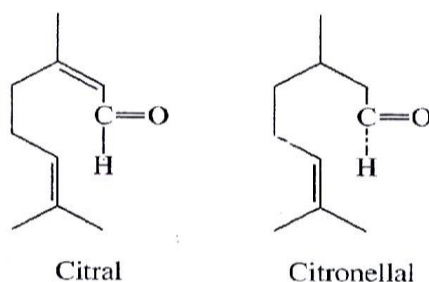
$\lambda_{\text{max}} 203 \text{ nm}$
($\epsilon = 7,400$)
 $\lambda_{\text{max}} 254 \text{ nm}$
($\epsilon = 200$)

d) i) "Alkyne proton shows higher chemical shifts than alkene proton in ^1H NMR spectra" – Justify with proper reason whether the statement is true or false.
ii) Why Tetramethylsilane is used as a NMR standard?

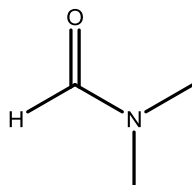
- iii) How will you identify the position of O–H and N–H Signals in proton NMR spectra by isotope labelling?
- iv) Predict the approximate chemical shifts and splitting pattern of the following compound in ^1H NMR. 3+2+2+3



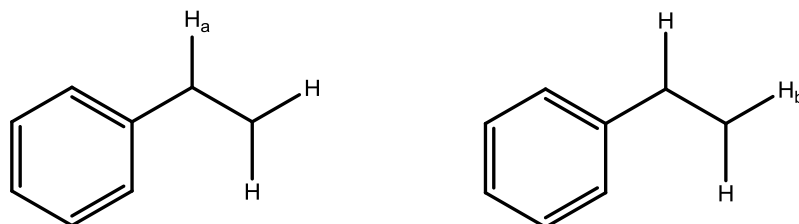
4. a) What are bathochromic shift and hypsochromic shift? 2
- b) Ants emit tiny amounts of chemicals called alarm pheromones to warn other ants (of the same species) of the presence of an enemy. Several of the components of the pheromone in one species have been identified and two of their structures follow. Which compound has the infrared spectrum shown? 1



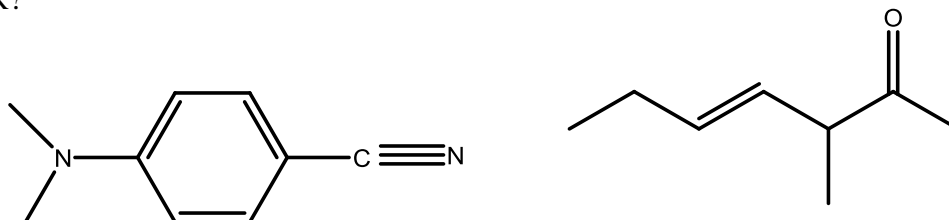
- c) How can you differentiate *cis*-cinnamic acid and *trans*-cinnamic acid by uv–vis spectroscopy? 2
- d) i) DMF shows two distinct peaks for the methyl protons as low temperature but only one at relatively high temperature in proton NMR – Why? DMF has the following structure:



- ii) How will you distinguish the following two hydrogens (H_a and H_b) in proton NMR?



iii) How many different types of carbons are present in the following two compounds in ^{13}C NMR?



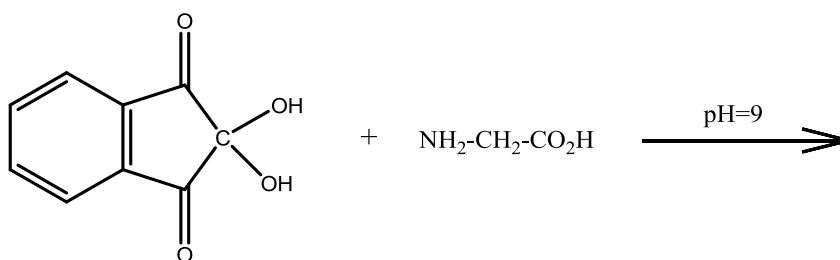
iv) At what frequency would the chemical shift of chloroform occurs relative to TMS on a spectrum recorded on a 300 MHz spectrometer? Justify your answer. 2+2+4+2

Group – C

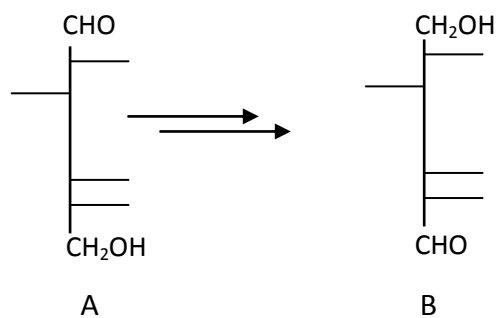
Answer any one Question Nos. 5 & 6:

1 X 15

- | | | |
|-------|---|---|
| 5. a) | Diisopropylidene derivatives of D-Glucose but not that of D-Galactose can be alkylated at C-3 positions – Give reason. | 2 |
| b) | Write a short note on “Glycosylation Reaction”. | 2 |
| c) | Write the structure of D-glucose in $^1\text{C}_4$ conformation. | 1 |
| d) | Give an example of naturally occurring disaccharide. | 1 |
| e) | D-glucose on oxidation with dil. HNO_3 gives aldaric acid. Write down the structure of the final product and also comment on its optical activity. | 2 |
| f) | pK_1 and pK_2 of glycine have been found to be 2.4 and 9.6. Find the isoelectric pH for glycine. | 1 |
| g) | Write down the products formed when D-Glucose reacts with acetone and benzaldehyde separately. | 2 |
| h) | Synthesis ‘gly-ala’ dipeptide using solid phase peptide synthesis method. | 2 |
| i) | Write the name of the amino acids with: | 2 |
| | a) aromatic side chain | |
| | b) basic side chain | |
| 6. a) | Write the structure of D-glucose in $^4\text{C}_1$ conformation. | 1 |
| b) | Which of the following sugar is laevorotatory predominantly? | 1 |
| | i) Sucrose | |
| | ii) Fructose | |
| | iii) Glucose | |
| | iv) Galactose | |
| c) | Write a short note on ‘Anomeric effect’. | 2 |
| d) | Define isoelectric point of Glycine. | 1 |
| e) | Write the name of amino acids with: | 2 |
| | a) acidic side chain | |
| | b) thio group in the side chain | |
| f) | Write down the products of the following reaction with proper mechanism: | 2 |



- g) Write down the chemistry of DCC for the synthesis of peptide bond with proper mechanism. 2
- h) During determination of relative structure of D-glucose, the following molecule (A) was converted (B). Write down proper reagents and reactions for the conversion (no mechanism need). 2



- i) Glucose and Fructose give same osazone – explain. 2

_____ × _____