

## UG 5th Semester Examination 2021

### CHEMISTRY (Honours)

Paper: DC-12

(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)

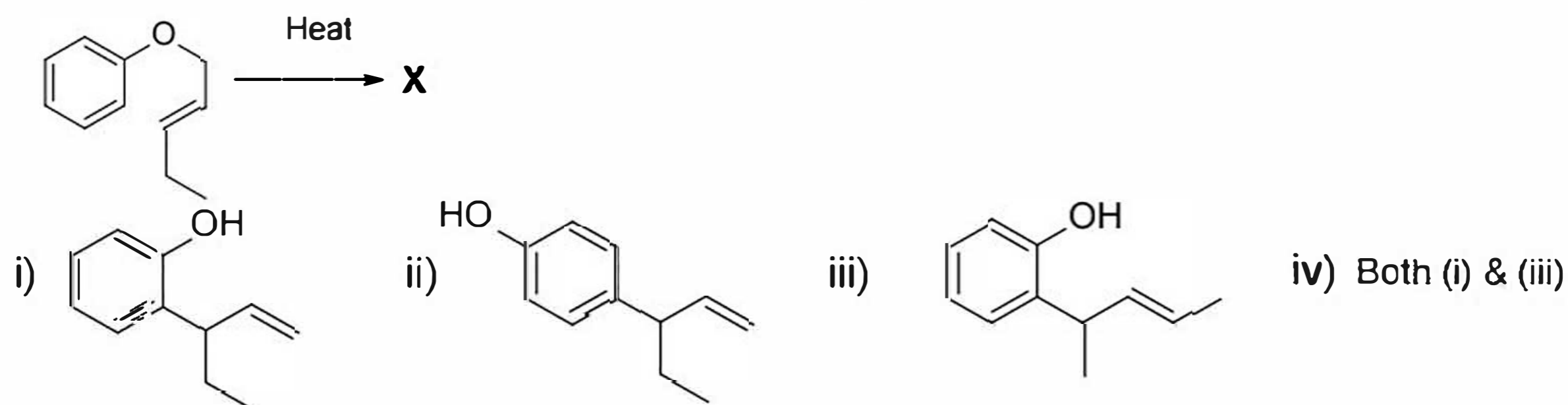
(a) (2E,4E)-Hexa-2,4-diene is produced from

- i) *trans*-3,4-dimethylcyclobut-1-ene by thermal process
- ii) *trans*-3,4-dimethylcyclobut-1-ene by photochemical process
- iii) *cis*-3,4-dimethylcyclobut-1-ene by thermal process
- iv) *cis*-3,4-dimethylcyclobut-1-ene by photochemical process

(b) Which of the following statement is not correct?

- i) D-Talose is the C-2 epimer of D-Galactose as well as C-4 Epimer of D-Mannose
- ii) D-Glucose is the C-2 epimer of D-Mannose as well as C-3 Epimer of D-Allose
- iii) D-Gulose is the C-2 epimer of D-Allose as well as C-3 Epimer of D-Galactose
- iv) D-Mannose is the C-2 epimer of D-Glucose as well as C-3 Epimer of D-Altrose

(c) What is correct structure of "X" in the following reaction?

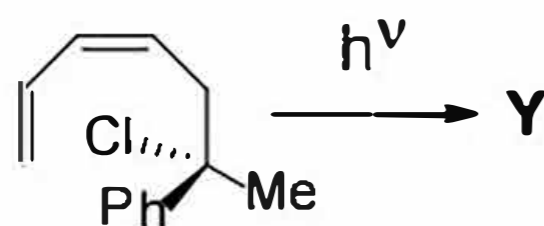


(d) Which of the following statement is correct?

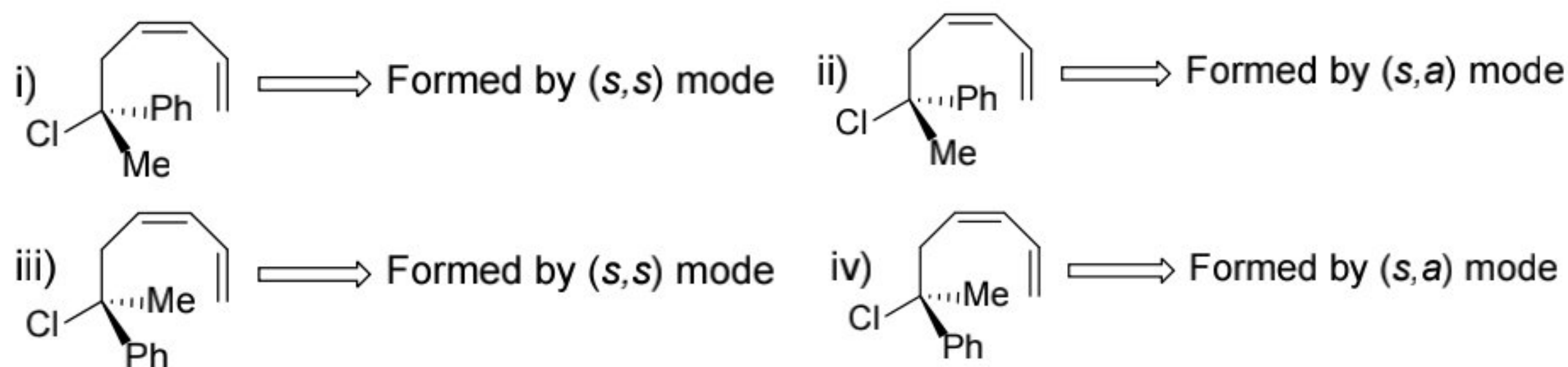
Cycloheptenyl anion is produced from pentadienyl anion and ethylene by

- i) Thermal  $[\pi^6s+\pi^2s]$
- ii) Photochemical  $[\pi^6s+\pi^2a]$
- iii) Thermal  $[\pi^6s+\pi^2a]$
- iv) Photochemical  $[\pi^6s+\pi^2s]$

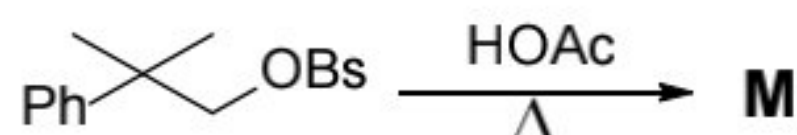
(e) Consider the following reaction



Choose the correct statement for the formation of "Y"

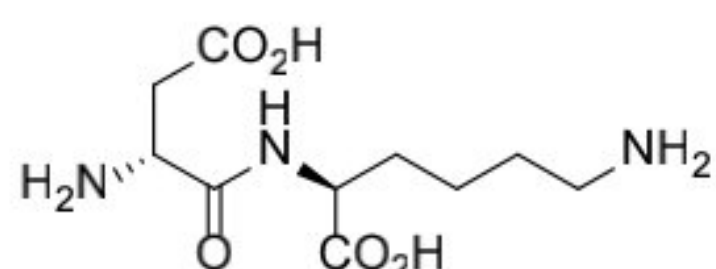


(f) The structure of “M” in the following reaction



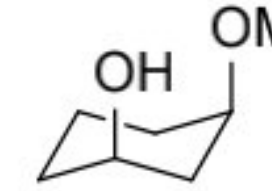
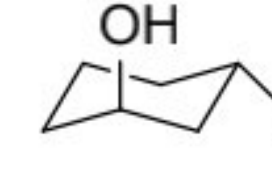
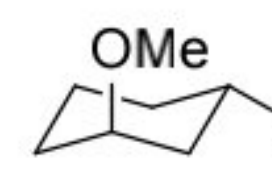
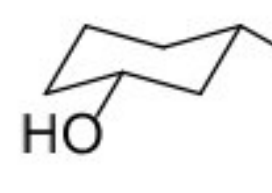
- i)  ii)  iii)  iv) All of them

(g) The constituent amino acids present in the following dipeptide, respectively are



- i) (R)-aspartic acid and (S)-lysine  
 ii) (S)-aspartic acid and (R)-lysine  
 iii) (R)-glutamic acid and (S)-arginine  
 iv) (S)-glutamic acid and (S)-arginine

(h) Which one is the most stable among the following isomers?

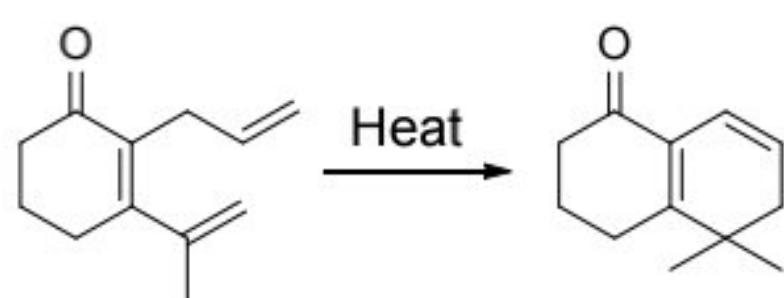
- i) 
- ii) 
- iii) 
- iv) 

2. Answer any four questions:

(2×4=8)

(a) Suggest a suitable mechanism for the following reaction

[2]

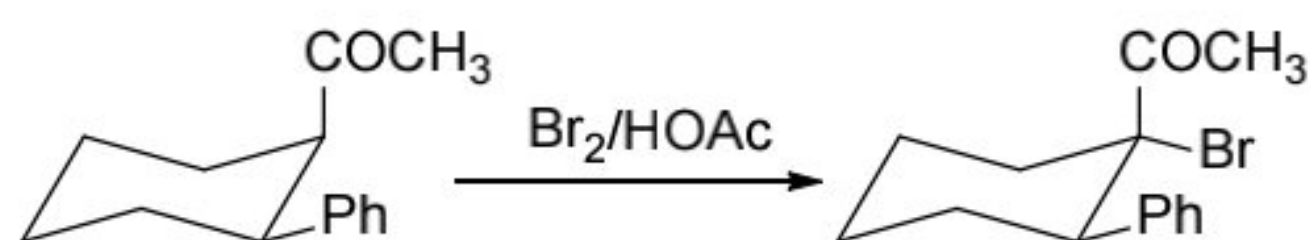


(b) The rate of oxidation of β-D-glucopyranose by Br<sub>2</sub>-H<sub>2</sub>O is 250 times as fast as that of α-D-glucopyranose. Explain.

[2]



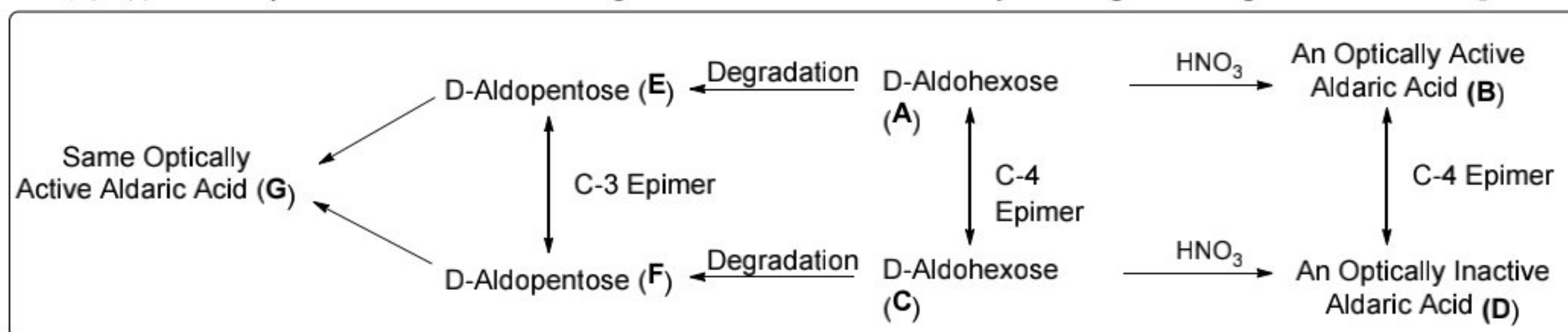
- (c) Outline a plausible mechanism to rationalize the stereochemical aspects of the following reaction: [2]



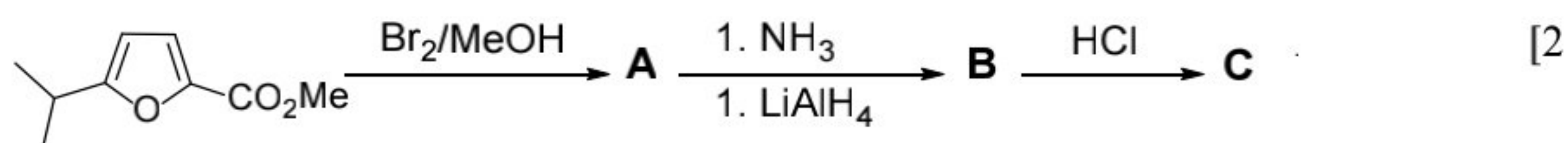
- (d) Furan behaves as an enol ether. Justify your answer. [2]  
 (e) What is Merrifield resin? Write the steps for the synthesis of the dipeptide Gly-Ala in the solid phase with the help of the resin. [2]  
 (f) Synthesize quinoline following Skraup synthesis mentioning the role of different reagents used in the synthesis. [2]  
 (g) Write down all the possible dipolar structures of arginine and point out the actual one. [2]  
 (h) Draw the stereo-chemical disposition of peptide linkage group and predict its features. Show how this group can exist as a particular geometric isomer. [2]

3. Answer any two questions: (6×2=12)

- (a) (i) Identify **A-G** in the following reaction scheme. Give your logic of explanation. [3]

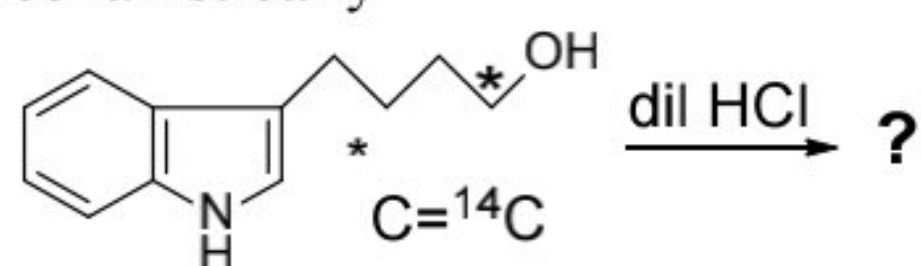


- (ii) Identify the products **A-C** in the following reaction.

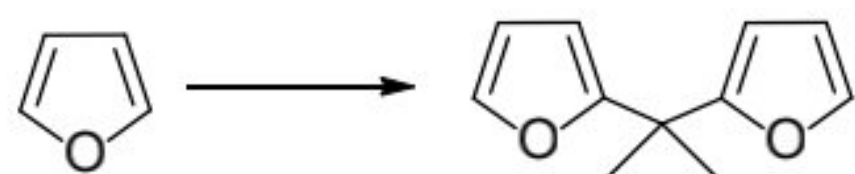


- (iii) If the  $pK_a$  values of lysine are  $pK_{a1} = 2.18$ ,  $pK_{a2} = 8.95$  and  $pK_{a3} = 10.53$ . what is the isoelectric point of lysine? [1]

- (b) (i) Explain the formation of major product(s) from the following reaction mechanistically [2]

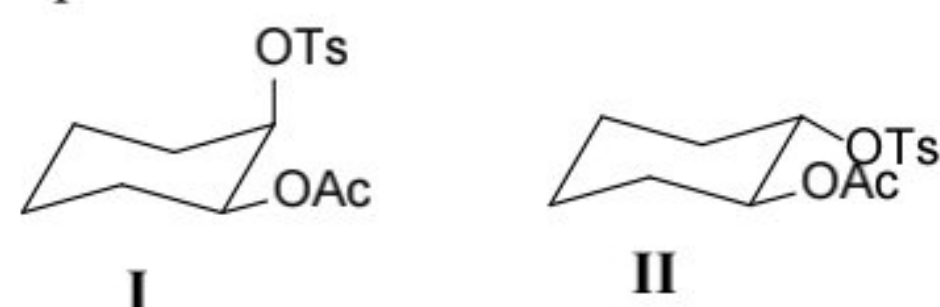


- (ii) How would you carry out the following transformation? Give mechanism of the reaction involved. [2]

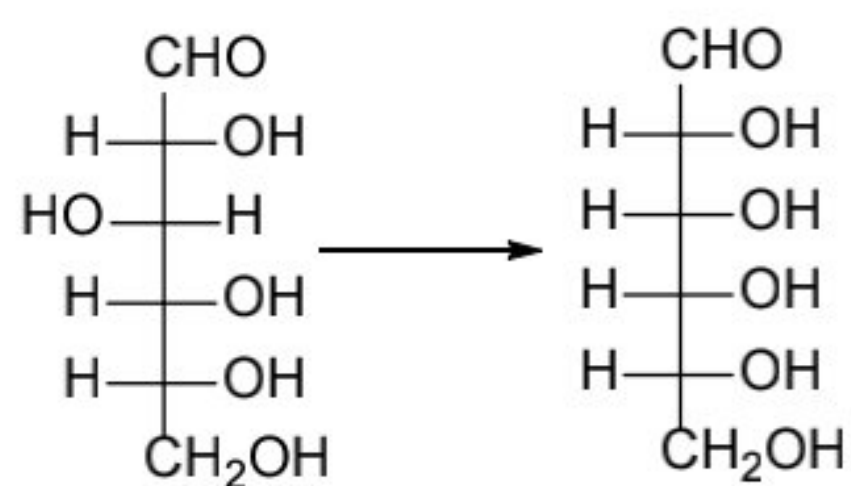


- (iii) How would you synthesise the dipeptide Phe-Gly applying protection and deprotection Methodology? [2]

- (c) (i) Using Woodward Hoffman generalized rule for pericyclic reactions show the allowed stereochemical mode of thermal and photochemical [1.5]-sigmatropic shift of H atom. [2]
- (ii) How would you use Hofmann rearrangement and HVZ reaction as the key steps to prepare proline from adipic acid. [2]
- (iii) How DCC helps in direct synthesis of Dipeptide? Explain with mechanism. [2]
- (d) (i) Acetolysis of both *cis*- and *trans*-tosylates, shown below, give the same *trans*-diacetate. Explain. [2]



- (ii) How will you carry out the following transformation? [2]



- (iii) Name the product(s) when pyridine reacts with (a) Br<sub>2</sub> at 300°C, (b) KNO<sub>3</sub> in H<sub>2</sub>SO<sub>4</sub>. [2]

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