

U.G. 6th Semester Examination - 2025

CHEMISTRY

[HONOURS]

Course Code : CHEM-H-CC-T-14

Full Marks : 40

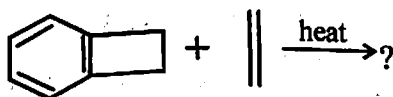
Time : 2½ Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any five of the following questions:

2×5=10

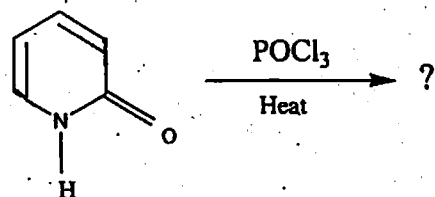
- a) Write down the product of the following reaction.



- b) Draw the π - molecular orbitals showing nodes.
- HOMO of butadiene.
 - LUMO for allyl cation.
- c) How would you obtain D-arabinose from D-glucose?

[Turn Over]

- d) In anhydrous methanol the equilibrium composition of D-glucose contains 50% of α -form whereas in water it is 38%. Explain.
- e) Furan and pyrrole react differently with maleic anhydride. Why?
- f) Identify the product with mechanism in the following reaction.



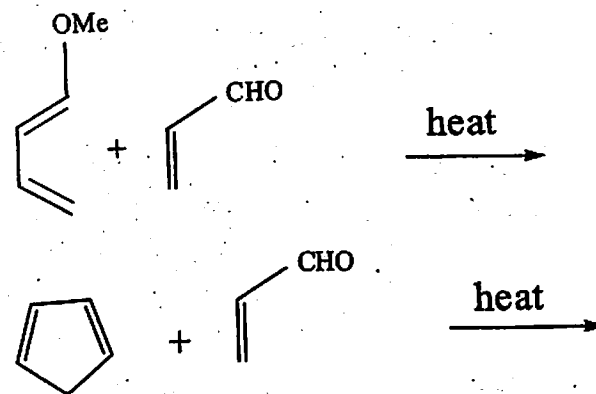
- g) Write down the stereostructure of the diastereomer of 4-hydroxycyclohexane carboxylic acid that undergoes facile lactonisation on brief heating. Give reasons.
- h) Write down the preferred conformation of 1-methyl-1-phenylcyclohexane. Give reason.

2. Answer any two of the following questions:

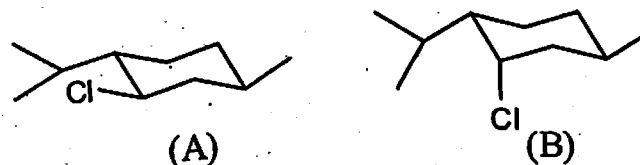
5×2=10

- a) Give the stereostructure of the major products of the following reactions and explain their stereochemistry.

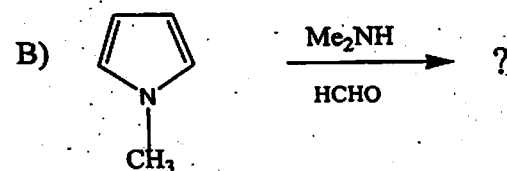
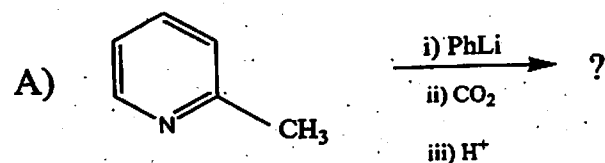
3+2=5



- b) i) Predict with reasons which of the following will undergo faster oxidation with chromic acid: (I) *Trans*-4-*t*-butylcyclohexanol, (II) *Cis*-4-*t*-butylcyclohexanol.
- ii) Menthyl chloride (A) on heating with NaOEt gives only one product whereas neomenthyl chloride (B), under the same condition gives a mixture of products. Explain the observations. 2+3=5



- c) Indicate the major product(s) of the following reactions with plausible mechanism: $2\frac{1}{2} \times 2 = 5$

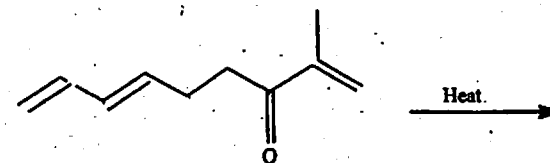


- d) i) Write down the structures of two different D-aldoheptoses which upon oxidation with HNO_3 yield the same aldic acid. Would they form the same osazone? Give reason.
- ii) Discuss the reaction of α -D-glucopyranose in the presence of acid catalyst and show how this intermediate can be used for selective methylation of glucose at C-3. $3+2=5$

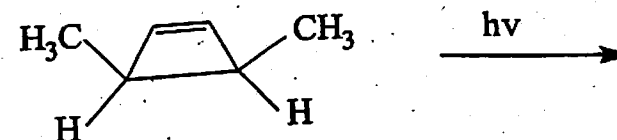
3. Answer any two of the following questions:

$10 \times 2 = 20$

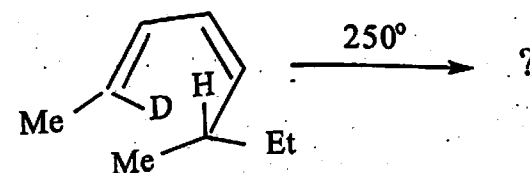
- a) i) Identify the product with mechanism in the following reaction:



- ii) Predict the product(s) of the following reaction explaining the stereochemistry:

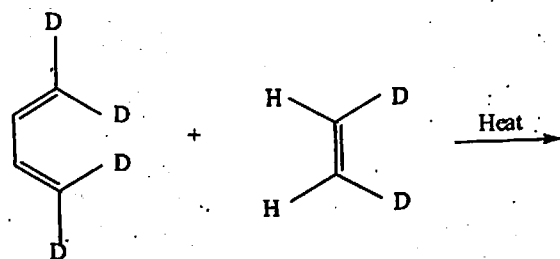


- iii) Discuss the stereochemistry of suprafacial [1, 5] migration of hydrogen in the following acyclic 1,3-diene.



- iv) Write down the product of the following reaction. Explain mechanistically the

stereostructure of the product.

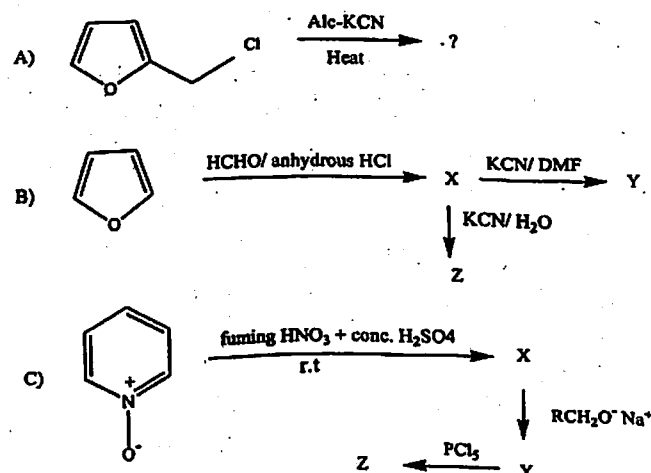


2+3+3+2

- b) i) β -D-Glucopyranose undergoes bromine-water oxidation two hundred and fifty times faster than α -D-glucopyranose. Explain.
- ii) The -OH group at C-1 in glucose preferentially reacts with MeOH/ HCl in glycoside formation. Explain.
- iii) *Trans*-2-aminocyclohexanol on treatment with aqueous NaNO_2 and dilute HCl gives cyclopentane carboxaldehyde while its *cis*-isomer gives mixture of products. Explain.
- iv) Write the structure of the product of the low temperature reaction of anthracene with Br_2/CCl_4 and propose a mechanism for its formation. What type of addition

has occurred? Identify the product formed at a higher temperature and rationalize its formation. 2+2+2+(2+1+1)

- c) i) What is Merrifield resin? Outline the steps for the synthesis of the dipeptide Phe-Ala in the solid phase using this resin.
- ii) How is dansyl chloride used to identify the N-terminal amino acid of a peptide?
- iii) How does cyanogen bromide (CNBr) selectively cleave peptides?
- iv) Explain what is meant by replication of DNA. (1+3)+2+2+2
- d) i) Identify the major product(s) with mechanism for the following reactions (any two):



- ii) The monobromination of thiophene-3-carboxylic acid gives only one product. What is its structure and Why is it the only one product formed?
- iii) Anthracene is very reactive at 9, 10-positions. Explain. $(3 \times 2) + 3 + 1$
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