

2021

## CHEMISTRY — HONOURS

Paper : CC-12

(Organic Chemistry)

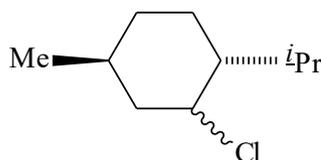
Full Marks : 50

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*Answer **question no. 1** (compulsory) and **any eight (08)** questions from the rest (**question no. 2 to 12**).1. Answer **any ten** questions :

1×10

- Why fructose remains in equilibrium with glucose in aqueous NaOH?
- How lysine ( $pI = 9.6$ ) can be separated from glycine ( $pI = 5.97$ ) by electrophoresis?
- Compare the reaction of pyrrole and pyridine with peroxybenzoic acid.
- Draw the boat conformation of cyclohexane in Newman projection.
- Explain why pyrrole undergoes protonation on carbon instead of nitrogen in presence of acid.
- 'Pyridine is completely soluble in water'. Justify the statement.
- Write down the names of two aldohexoses which produce same osazone.
- Calculate the value of angle strain in cyclopropane employing Baeyer strain theory.
- Explain why the compound aspartic acid shows three  $pK_a$  values.
- Draw the structure of a purine base mentioning its name.
- Why is the conrotatory ring closing of butadiene thermally allowed?
- How is the Boc group of an amino acid derivative removed?

2. (a) Two diastereoisomers of the following compound differ in the orientation of Cl atom. One isomer undergoes E2 dehydrohalogenation 200 times faster than the other. Draw the conformations of the two diastereoisomers and explain the observation.



- (b) Predict the product of the above said reaction with mechanism.

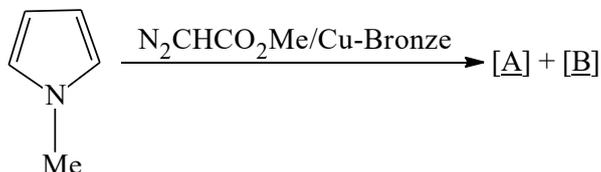
3+2

Please Turn Over

3. (a) Outline Hantzsch synthesis of diethyl – 2,6-dimethylpyridine – 3,5-dicarboxylate.

(b) Identify [A] and [B] in the following reaction and explain their formation.

3+2

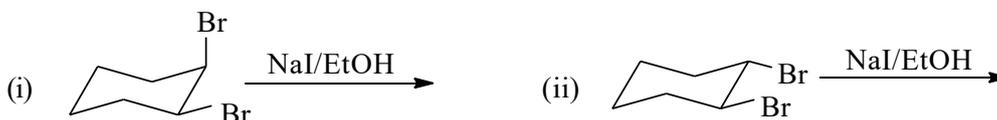


4. (a) How is phenanthrene synthesised using cyclohexanone and bromobenzene as starting materials? Mention all the steps.

(b) 'Naphthalene undergoes electrophilic substitution preferentially at 1-position.' Justify the statement.

3+2

5. (a) Predict the product(s) with suitable mechanism :



(b) Which one of the following is stronger acid and why?

*cis*-4-*tert* butyl-cyclohexanecarboxylic acid or

*trans*-4-*tert* butyl-cyclohexanecarboxylic acid.

3+2

6. (a) An aldopentose [C] is oxidised by nitric acid to an optically active aldaric acid [D]. On Ruff degradation of [C], an aldotetrose [E] is obtained which is oxidised to optically inactive aldaric acid [F]. Assuming the aldopentose [C] to be a D-sugar, write down the configurations of [C], [D], [E] and [F].

(b) Predict the product(s) and number of moles of  $\text{HIO}_4$  consumed when  $\text{HIO}_4$  reacts with methyl- $\alpha$ -D-fructofuranoside and methyl- $\alpha$ -D-glucopyranoside separately.

3+2

7. (a) Depict the FMO interactions for  $[\pi_S^4 + \pi_S^2]$  involving thermally allowed process. Explain why the reaction does not take place under photochemical conditions.

(b) Predict the product(s) with stereochemistry of the following reaction :



3+2

8. (a) How would you synthesise Phe-Gly-Ala applying Merrifield methodology using Boc as N-protecting group?

(b) What happens when alanine is heated with acetic anhydride in pyridine as solvent? Give the mechanism involved in the reaction.

3+2

9. (a) Explain the difference in behaviour when 1- and 3- methylisoquinoline are treated with *n*-Buli. Identify [G] in the following reaction.



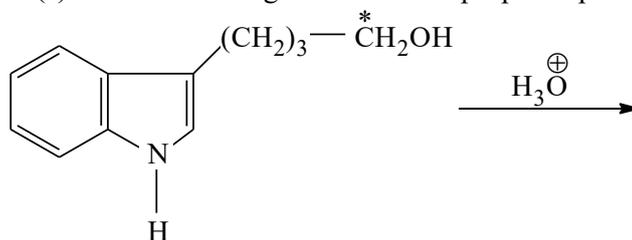
- (b) How 4-nitropyridine is prepared from pyridine? 3+2

10. (a) Show the steps of the following reaction along with plausible mechanism.



Why can't  $\text{CH}_2 = \text{CH} - \text{CHO}$  itself be used instead of  $\text{HOCH}_2 - \text{CH}(\text{OH}) - \text{CH}_2\text{OH}$ ?

- (b) Identify the product(s) of the following reaction with proper explanation : 3+2



11. (a) (*2E, 4E*)-Hexadiene is being separately cyclised by thermal and photochemical processes. Explain the formation of products showing FMO interaction.
- (b) Account for the fact that, in cycloaddition reaction of cyclopentadiene with maleic anhydride the less stable *endo* adduct predominates. 3+2
12. (a) How would you synthesise phenylalanine employing Erlenmeyer azlactone synthesis? Is the synthesis stereospecific in nature?
- (b) Identify [H], [I] and [J] in the following sequence of reactions : 3+2

