B.Sc. 5th Semester (Honours) Examination, 2019 (CBCS)

Subject : Chemistry

Paper : CC-12

Time: 2 Hours **Full Marks: 40**

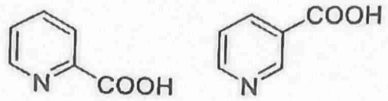
The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any five* questions from the following: 2×5=10

(a) What do you mean by complimentary base pairing in DNA? What factors does it depend upon?

(b) Which of the following picolinic acids would decarboxylate easily and why?

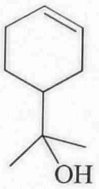


(c) Draw a structure of a reducing sugar in Howarth representation. Why is it called a reducing sugar?

(d) Draw the FMOs of the 1,3,5-hextriene system.

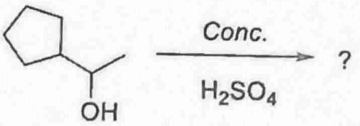
(e) The knowledge of the isoelectric point is significant for amino acid purification — justify.

(f) What is isoprene rule? Find out the isoprene units in the following compound.



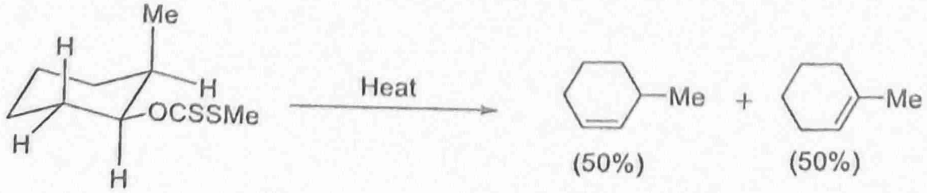
(g) Name two structural elements that are found in secondary structure of proteins.

(h) Predict the major product in the following reaction. What is the driving force behind the expected structural changes in the product?

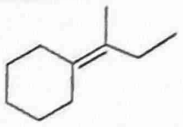


2. Answer *any two* questions: 5×2=10

(a) (i) Xanthate pyrolysis is believed to be essentially a *cis*-elimination. Account for the following pyrolysis of xanthate derivative where, both 1-methylcyclohexene and 2-methylcyclohexene are obtained in equal amounts.



(ii) Draw all possible starting haloalkanes that would form the following product under unimolecular elimination condition.



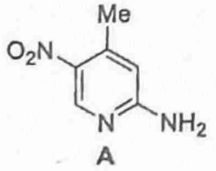
3+2=5

(b) (i) Why glycoside ether linkage is more acid labile than common ether linkage?

(ii) Outline the steps involved in Dansyl N-terminal analysis of proteins.

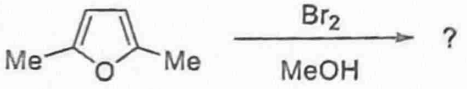
(iii) Why solution of sucrose does not undergo mutarotation but a solution of *D*-glucose does? 1+3+1=5

(c) (i) How can you convert the following compound A to 2-methoxy-4-methyl-5-nitropyridine? (mechanism not required)



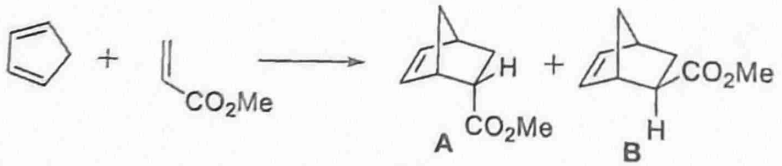
A

(ii) Predict the product of the following reaction and suggest a plausible mechanism.



2·5+2·5=5

(d) (i) In the following Diels-Alder cycloaddition reaction account for the enhanced stereoselectivity that is observed when the reaction carried out with $AlCl_3$ at low temperature.

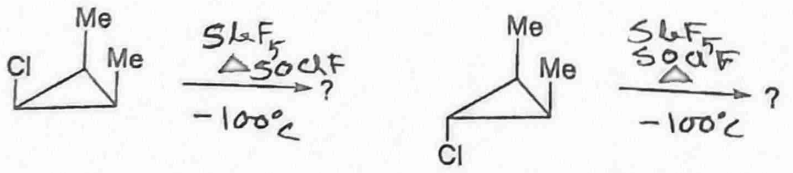


without $AlCl_3$ at 0^0C **A: B = 88 : 12**

with $AlCl_3$ at 0^0C **A: B = 96 : 04**

(ii) Predict the product with correct stereochemistry of the following electrocyclic ring opening reactions.

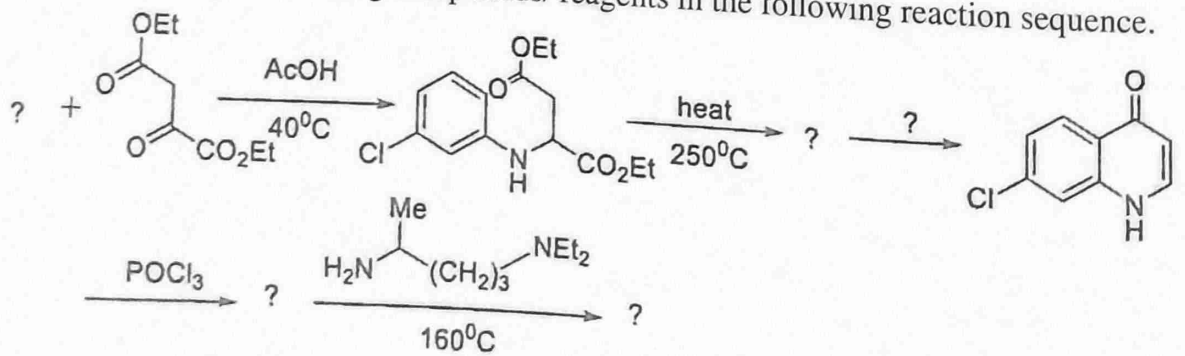
3+2=5



3. Answer *any two* of the following:

10×2=20

(a) (i) Identify the missing compounds/ reagents in the following reaction sequence.



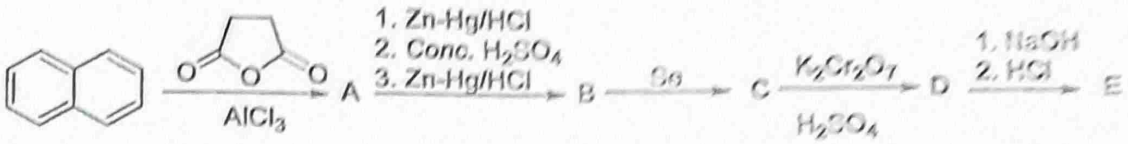
(ii) Which diastereomer of 4-^{t}Butyl cyclohexanol will react at a faster rate when subjected to CrO_3 oxidation and why? — Explain with detailed mechanism.

(iii) Given a suitable example of NGP of a σ-bond in nucleophilic substitution of a substrate of your choice. Draw the structure of the intermediate/ transition state that may be involved. 5+3+(1+1)=10

(b) (i) How can you chemically prove that naphthalene contains two benzene rings?

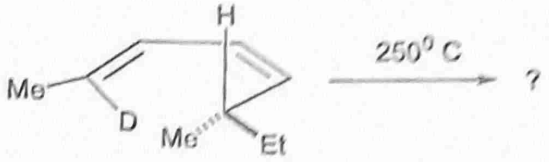
(ii) Convert β-naphthol to β-naphthylamine and explain the mechanism involved.

(iii) Identify the compounds A—E in the following reaction sequence:

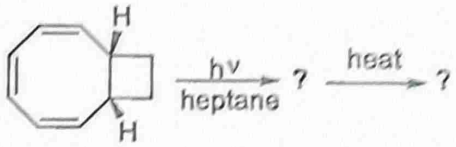


2+(1·5+1·5)+5=10

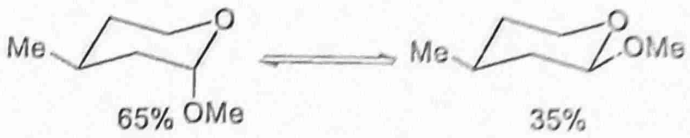
(c) (i) Predict the product with correct stereochemistry of the following pericyclic process. Also draw the FMO of the corresponding transition state.



(ii) Identify the missing compounds in appropriate stereochemical forms in the following reaction sequence.



(iii) In the following equilibrium the methoxy group preferentially stays in the axial position — Explain.



(iv) Identify the compounds A-C in the following reaction sequence:

(+) Glucose $\xrightarrow[\text{Dry HCl}]{\text{MeOH}}$ A + B $\xrightarrow{2\ NaIO_4}$ C (a dialdehyde)

3+2+2+3=10

(d) (i) Write down the steps involved in the production of the tripeptide **Gly-Ala-Val** via Merrifield's automated solid phase synthesis.

(ii) Briefly outline the steps involved in the synthesis of the amino Phenylalanine by Bücherer-Bergs hydantoin method.

(iii) Design a synthesis of 2,3,4,6-tetra-*O*-methyl glucose.

(iv) Write the structures of the two hexoses that give same aldaric acid upon nitric acid oxidation. 4+3+2+1=10