B.Sc. 5th Semester (Honours) Examination, 2020-2021

CHEMISTRY

Course ID: 51412   **Course Code: UG/CHEM/502/C-12**

Course Title: Organic Chemistry V

**Time: 1 Hour 15 Minutes**   **Full Marks: 25**

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: $1 \times 5 = 5$

    a) Give the structure of Diels-Alder adduct formed by anthracene and maleic anhydride.

    b) 'Pyrrole is protonated at 3-position' — Comment.

    c) Write the structure of the product formed in the reaction of lysine with two equivalents of benzyloxycarbonyl chloride.

    d) Write the most stable conformation 1-methyl-1-phenylcyclohexane.

    e) What happens when the following compound is heated?
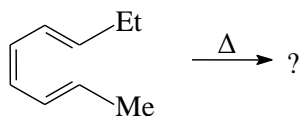

    f) Write the equilibrium between two anomeric forms of D-Mannose. Which one is more stable?

    g) Arrange the aminoacids in order of increasing isoelectric points: neutral aminoacids, acidic aminoacids and basic aminoacids.

    h)   What is meant by specific base pairing with respect to DNA and RNA?

2. Answer *any two* questions: $5 \times 2 = 10$

    a) i) How can you synthesize 2,4,6-trimethyl pyridine starting from a suitable substrate?

    ii) Compare the basicity of 2-methyl indole and 3-methyl indole. $3+2 = 5$

    b) i) Outline the reaction pathway to convert: D-arabinose to D-mannose.

    ii) Compare the rate of bromine water oxidation of α-(D)-glucose and β-(D)-glucose.

iii) Predict the products of the following reaction indicating the mechanism:

$$\alpha\text{-(D)-Glucose} \xrightarrow[\Delta]{\text{aq. NaOH}} \text{?}$$
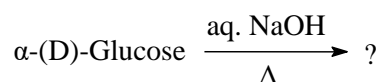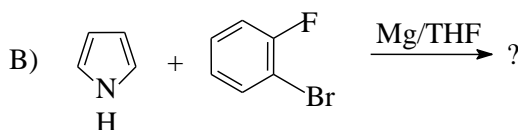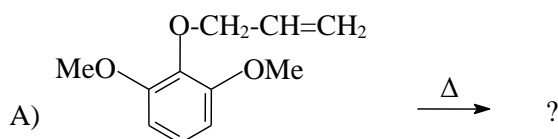
$1\frac{1}{2}+1\frac{1}{2}+2 = 5$

c) i) Trace the route for synthesis of $Ph\text{-}CH(NH_2)CO_2H$ from phthalimide.

ii) How is N-terminal aminoacid determined by Edman method? Why is it more advantageous than Sanger's method? $2+3 = 5$

d) i) Arrange the following dienes in order of increasing reactivity in Diels-Alder cycloaddition with tetracyanoethylene. Give suitable explanation in favor of your choice.
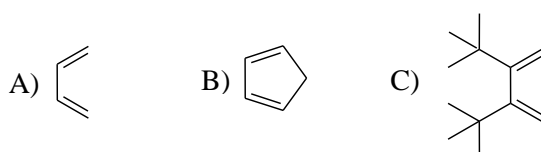
ii) Predict the products of the following reactions and give the mechanism.

$2+1\frac{1}{2}+1\frac{1}{2} = 5$
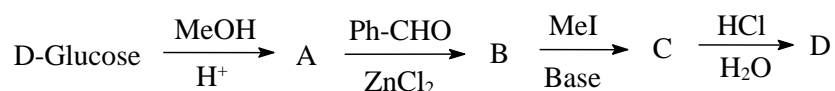
3. Answer *any one* question: $10\times1 = 10$

a) i) Using 2,5-diketopiperazine, how would you synthesize tyrosine?

ii) How will you synthesize the tripeptide Phe-Gly-Ala, applying Merrifield methodology and using *t*-butyloxycarbonyl group as N-protecting group?
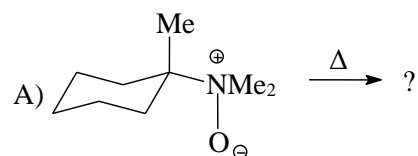
iii) Discuss the mechanism of osazone formation. Why osazone formation does not proceed beyond the first two carbon atoms?

iv) Write the structures of the products— A, B, C, D with rationalization.
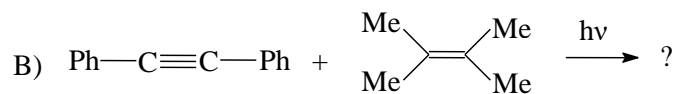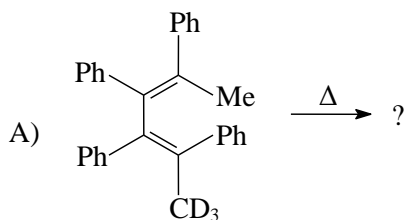
$$\text{D-Glucose} \xrightarrow[H^+]{\text{MeOH}} \text{A} \xrightarrow[\text{ZnCl}_2]{\text{Ph-CHO}} \text{B} \xrightarrow[\text{Base}]{\text{MeI}} \text{C} \xrightarrow[H_2O]{\text{HCl}} \text{D}$$

$3+2+3+2 = 10$

b) i) Predict the Product(s) with mechanism:

A)

$$\text{A)} \quad \overset{\text{Me}}{\underset{\text{O}^{\ominus}}{\overset{|}{\text{C}}}}\overset{\oplus}{\text{NMe}_2} \quad \xrightarrow{\Delta} \quad ?$$

B) Me_2N ~~~ OTs $\xrightarrow[\text{ii) } H^+/H_2O \text{ (mild)}]{\text{i) Et}_3\text{N/EtOH, } \Delta}$?

ii) *Trans*-4-*tert*-butylcyclohexane-ethylcarboxylate undergoes saponification at a much faster rate than the *cis*-isomer. Explain.

iii) Predict the product(s) of the following reactions:

A)

$\xrightarrow{\Delta}$?

B) $Ph-C\equiv C-Ph$ +

$\xrightarrow{h\nu}$?

iv) Point out the salient features of the double helix structure of DNA.

3+2+3+2 = 10