

M.Sc. CHEMISTRY
THIRD SEMESTER
ORGANIC CHEMISTRY-III
MSC-301

(Use separate answer scripts for Objective & Descriptive)

Duration : 3 hrs.

Full Marks : 70

(PART-A : Objective)

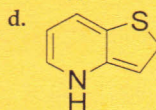
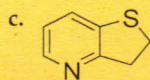
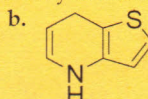
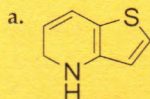
Time : 20 min.

Marks : 20

Choose the correct answer from the following:

1x20=20

1. The correct structure of the compound 4,7-dihydrothieno[3,2-b]pyridine is:



2. The nitration of pyridinium-N-oxide occurs regio-specifically at:

a. α -carbon

b. β -carbon

c. γ -carbon

d. Non-regio-specific

3. Compound having maximum pKaH value in aqueous medium is:

a. Pyridine

b. Isoquinoline

c. Quinoline

d. 3-methylpyridine

4. Regio-selective nitration of indole at β -carbon can be obtained by using:

a. Conc. HNO_3 & Ac_2O

b. PhCOONO_2

c. Conc. HNO_3

d. Mixture of Conc. HNO_3 & Conc. H_2SO_4

5. Chichibabin reaction of quinoline gives the product of:

a. α -C-alkylation

b. γ -C-alkylation

c. α -C-amination

d. γ -C-amination

6. Porphyrin ring present in the hemoglobin is called:

a. Uroporphyrin III

b. Mesoporphyrin III

c. Hematoporphyrin III

d. Protoporphyrin III (IX)

7. The chemical formulae of Phthalocyanine is:

a. $\text{C}_{32}\text{H}_{18}\text{N}_8$

b. $\text{C}_{32}\text{H}_{16}\text{N}_8$

c. $\text{C}_{32}\text{H}_{14}\text{N}_8$

d. $\text{C}_{32}\text{H}_{18}\text{N}_6$

8. Which of the following statement is not correct?

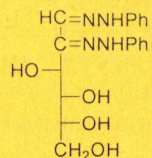
a. Starch is a mixture of two polymers.

b. Cellulose is a polymer of glucose linked by α -1-4 glycosidic linkage.

c. Chitin is a polymer of N-acetyl glucosamine.

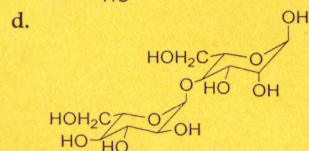
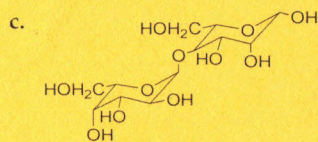
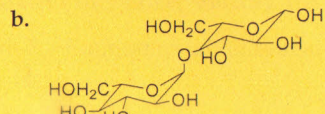
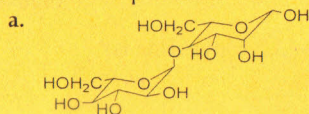
d. Glycogen is an animal sugar structurally similar to amylopectin.

9. A given monosaccharide form the following osazone on treatment with excess of phenyl hydrazine.



- , the monosaccharide is:
 a. Mannose
 b. Mannose
 c. Galactose
 d. Both Glucose and Mannose

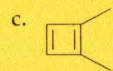
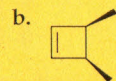
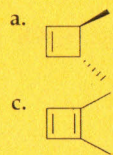
10. Structure of β -maltose is:



11. Oxidation of α -methyl D-glucopyranoside with HIO_4 will have the following result:

- a. Consume 1 HIO_4 and produce 1 HCOOH
 b. Consume 2 HIO_4 and produce 1 HCOOH
 c. Consume 1 HIO_4 and produce 2 HCOOH
 d. Consume 2 HIO_4 and produce 2 HCOOH

12. The product of the following electrocyclic ring closing reaction



- d. None of these

13. Which of the following statement is not correct?

- a. [2+2] cyclo-additions are photochemically allowed.
 b. Thermal [1,3] sigmatropic shift is supra-antara.
 c. Thermal [4+2] cycloaddition is supra-antara.
 d. Pericyclic reactions involve a cyclic transition state.

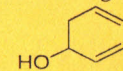
14. The excited state HOMO of 1, 3, 5 - hexatriene has:

- a. m -plane of symmetry
 b. C_2 -axis of symmetry
 c. Both a & b
 d. None of these

15. The Cope rearrangement is:

- a. [1,5] sigmatropic rearrangement
 b. [3,3] sigmatropic rearrangement
 c. [1,3] sigmatropic rearrangement
 d. [2,3] sigmatropic rearrangement

16. The following molecule on heating undergo the changes, having



- a. [3,3] sigmatropic shift with as product

- b. [2,3] sigmatropic shift with as product

- c. [2,3] sigmatropic shift with as product

- d. [3,3] sigmatropic shift with as product

17. Isoelectric point is the pH at which a given amino acid exist in the:

- a. Cationic form
 b. Anionic form
 c. Zwitterionic form
 d. All of the above

18. In the solution phase peptide synthesis of ala-gly, the amino group of alanine is protected using:

- a. *p*-(chloromethyl)styrene
 b. ethyl chloroformate
 c. benzyl chloroformate
 d. *N*-phthalimidomalonate ester

19. In Sanger degradation of the peptide gly-leu-phe, the peptide is treated with a reagent and the corresponding residue after the first cycle is:

- a. The reagent is phenyl isothiocyanate and the residue is

- b. The reagent is phenyl isothiocyanate and the residue is

- c. The reagent is 2,4-dinitrofluorobenzene and the residue is

- d. The reagent is 2,4-dinitrofluorobenzene and the residue is

20. The acidic and basic character of amino acids are due to:

- a. $-\text{COOH}$ and $-\text{NH}_2$ group respectively
 b. $-\text{NH}_2$ and $-\text{COOH}$ group respectively
 c. $-\text{COO}^-$ and $-\text{NH}_3^+$ group respectively
 d. $-\text{NH}_3$ and $-\text{COO}^-$ group respectively

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[**PART-B : Descriptive**]

Time : 2 hrs. 40 min.

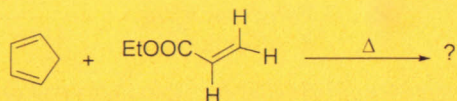
Marks : 50

[Answer question no.1 & any four (4) from the rest]

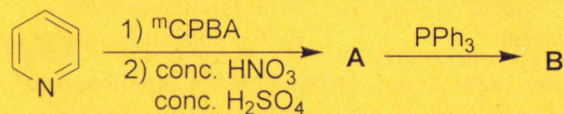
1. a) α -glucose show specific rotation of (+) 112° and β -glucose (+) 19°. Both these anomers of glucose exhibit mutarotation and specific rotation shown when the equilibrium is reached is (+) 52°. Calculate the percentage of α -glucose and β -glucose at equilibrium.

2x5=10

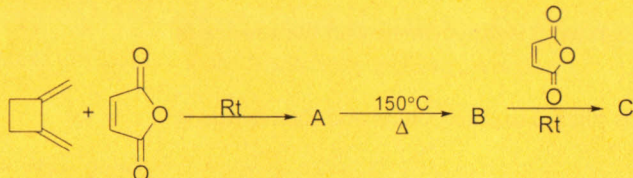
- b) For the Diels Alder reaction predict the product with appropriate geometry.



- c) Write down the products (A & B) of the following reactions:



- d) Identify A, B and C.

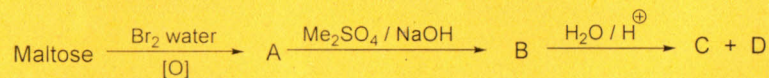


- e) Write a short note on disulfide linkages in peptides.

2. a) An unknown disaccharide was methylated with methyl iodide and then hydrolysed. The two products obtained were - 2, 3, 4, 6-tetramethyl-D-galactose and 2, 3, 6-trimethyl-D-glucose. Draw Haworth structures and name the disaccharide and the glycosidic linkage.

3+2+5=10

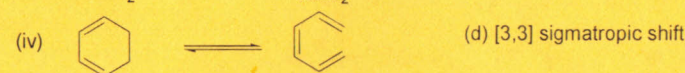
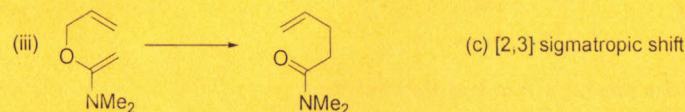
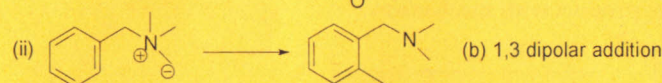
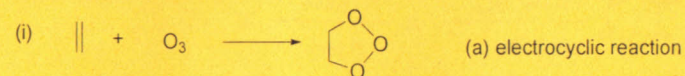
- b) Write down the reactions of oxidation of (i) maltose or (ii) sucrose with periodic acid.
c) Write down the structure of the products A, B, C & D.



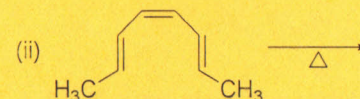
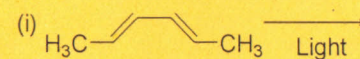
What information you can get from this result about the structure of maltose?

3. a) Match the following:

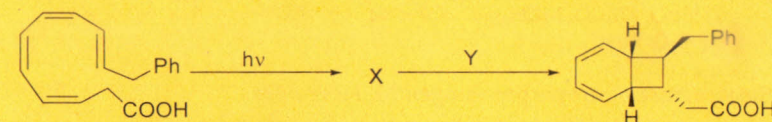
2+3+2+3=10



- b) Predict the products with proper geometry of the following reactions. Also indicate the rotation of the terminal lobes of the π -system.



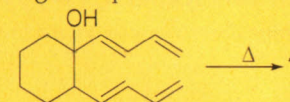
- c) In the following sequence of pericyclic reactions reactions - predict X and Y.



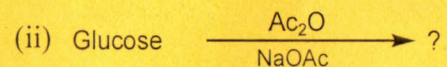
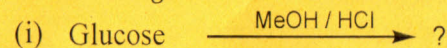
- d) Write note on Claisen rearrangement.

4. a) Write down the product in the following sigmatropic shift. Mention the order of the sigmatropic shift.

2+3+3+2=10

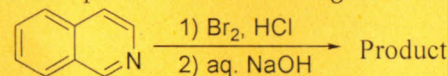


- b) Discuss the FMO theory of [1,5] sigmatropic shift.
c) What do you understand by mutarotation? Explain why maltose undergoes mutarotation but not sucrose?
d) Complete the following reactions:

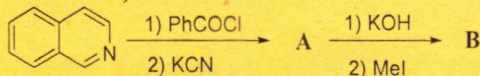


5. a) Write down the product of the following reaction with explanation.

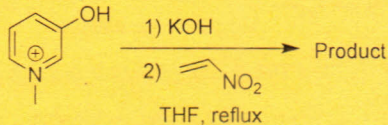
3+4+3=10



b) Identify A & B with justification.

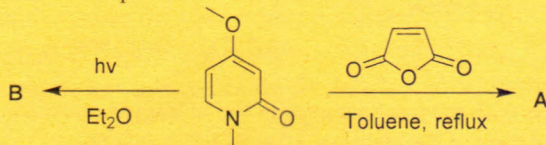


c) Write down the product with mechanism.



6. a) Write down the products A & B of the reactions.

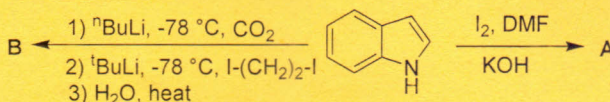
3+3+4=10



b) Write down the suitable reagents for the following transformation. Give the reaction mechanism.



c) Identify the products A & B. Suggest the mechanistic route of the product formation.



7. a) Write the structure of uroporphyrinogen III. How does uroporphyrinogen III differ from uroporphyrinogen I, structurally? Discuss the Biosynthesis of uroporphyrinogen III.

5+2+2+1=10

b) Draw and discuss the titration curve for glycine.

c) Discuss the role of DCC in the Merrifield synthesis of peptides.

d) Discuss how you would use bromination followed by amination to synthesize leucine.

8. a) Discuss the Edman degradation of the peptide Ser-Phe-Cys.

2+3+2+2+1=10

b) Discuss how the solution phase synthesis would be used to synthesis Valylalanylglycine from Valylalanine.

c) Give a brief classification of proteins.

d) Briefly describe the secondary structure of protein.

e) What is protein denaturation?

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