REV-01
MSC/01/05

2023/08

M.Sc. CHEMISTRY
THIRD SEMESTER
ORGANIC CHEMISTRY III
MSC – 302 [SPECIAL REPEAT]
[USE OMR FOR OBJECTIVE PART]

Duration : 3 hrs. **Full Marks : 70**

[PART-A: Objective]

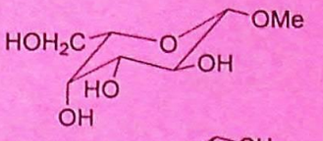
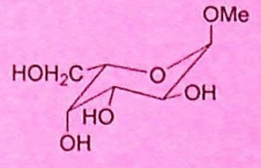
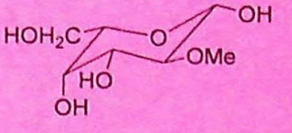
Time : 20 min. **Marks : 20**

Choose the correct answer from the following: ***1X20=20***

1. Which of the following statement is **not** correct
   a. Starch is a mixture of two polymers.
   b. Chitin is a polymer of N-acetyl glucosamine
   c. Cellulose is a polymer of glucose linked by α-1–4 glycosidic linkage.
   d. Glycogen is an animal sugar structurally similar to amylopectin.

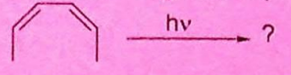
2. Pyruvate is fed in TCA cycle as
   a. Acetic acid
   b. Acetyl CoA
   c. Co-enzyme A
   d. Oxal acetate

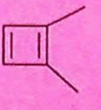
3. Oxidation sucrose with HIO_4 will have the following result
   a. consume 1 HIO_4 and produce 1 HCOOH
   b. consume 3 HIO_4 and produce 1 HCOOH
   c. consume 1 HIO_4 and produce 2 HCOOH
   d. consume 2 HIO_4 and produce 2 HCOOH

4. Structure for β-methyl-D(+) galatoside is
   a. 
   b. 
   c. 
   d. 

5. Which of the following will exhibit reducing properties
   a. α-ethyl glucoside
   b. Sucrose
   c. β-methyl maltoside
   d. β-lactose

6. The product of the following electrocyclic ring closing reaction



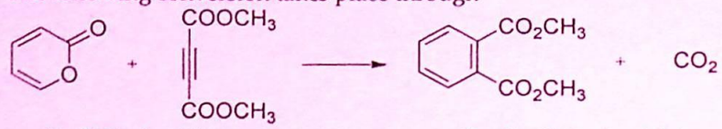
   a. 
   b. 

c. 

d. none of these

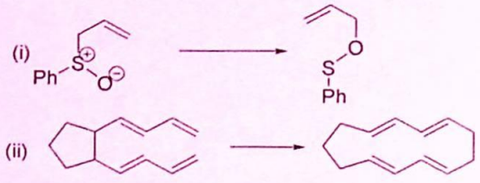
7. The ground state HOMO of 1, 3, 5 – hexatriene has
   a. Plane of symmetry
   b. Axis of symmetry
   c. Both- a & b
   d. None of these

8. The following conversion takes place through



   a. [4+2] Cycloaddition reaction
   b. [2+2] Cycloaddition reaction
   c. [8+2] Cycloaddition reaction
   d. None of these

9. . The order of the following sigmatropic shifts are, respectively:

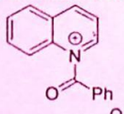


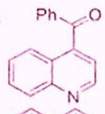
   a. [2,3] and [5,5]
   b. [1,3] and [5,5]
   c. [2,3] and [3,3]
   d. [2,3] and [3,5]

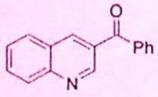
10. Chichibabin reaction of pyridine gives the product of

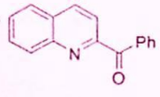
   a. C-alkylation
   b. C-nitration
   c. C-amination
   d. C-hydroxylation

11. Quinoline reacts with benzoylchloride to give

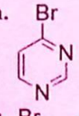
   a. 

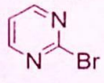
   b. 

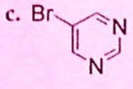
   c. 

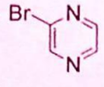
   d. 

12. The most reactive compound towards nucleophilic substitution reaction is

   a. 

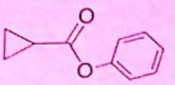
   b. 

   c. 

   d. 

13. The major route that Cyclobutanone follows in Norish-I reaction in alcohol is
    a. decarbonylation
    b. hydrogen abstraction
    c. Five membered ring formation
    d. three membered ring formation

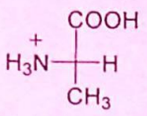
14. The major product obtained from the following molecule under photochemical reaction condition will be *via*



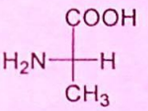
    a. α-cleavage (C-C bond)
    b. β-cleavage
    c. α-cleavage (C-O bond)
    d. γ-H abstraction

15. Electrophilic substitution reaction of N-alkylated-pyridine occurs regio-specifically at
    a. α-carbon
    b. β-carbon
    c. γ-carbon
    d. non-regio-specific

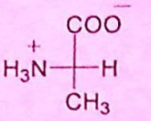
16. Which of the is the major structure of solute species in a solution of alanine at pH > 10?



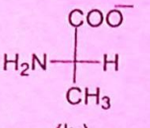
(I)



(II)



(III)



(Iv)

    a. Structure (I)
    b. Structure (II)
    c. Structure (III)
    d. Structure (IV)

17. Lecithin is the prosthetic group of
    a. Lipoprotein
    b. Phosphoprotein
    c. Glycoprotein
    d. Chromoprotein

18. For the conversion of alanine to glutamic acid, the α-keto acid needed is
    a. pyruvic acid
    b. α-keto valeric acid
    c. α-keto glutaric acid
    d. α-keto isovaleric acid

19. In the Edman degradation, the starting compound used is
    a. Isothiocyanate
    b. Phenyl hydantoin
    c. N-phenyl thiohydantoin
    d. Phenyl isothiocyanate

20. At isoelectric point of amino acids,
    a. the positively charged groups are greater than the negatively charged groups
    b. the positively charged groups are less than the negatively charged groups
    c. the positively charged groups are equal to the negatively charged groups
    d. none of the above

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Descriptive

Time : 2 hrs. 30 mins. **Marks : 50**

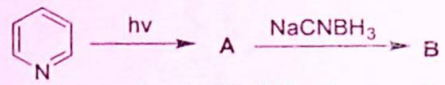
[Answer question no.1 & any four (4) from the rest]

1. (a) α-maltose show specific rotation of (+) 168° and β-maltose (+) 118°. Both these anomers of maltose exhibit mutarotation and specific rotation shown when the equilibrium is reached is (+) 136°. Calculate the percentage of α-maltose and β-maltose at equilibrium. **2+3+2+1 +2=10**

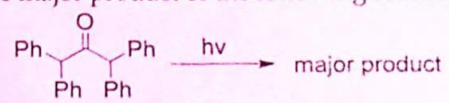
(b) Write a short note on energy production in Biological systems.

(c) What is trans amination? Using this method give the conversion of alanine to valine.

(d) Write down the products (A & B) of the following reactions

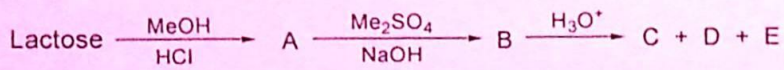


(e) Write down the major product of the following reaction



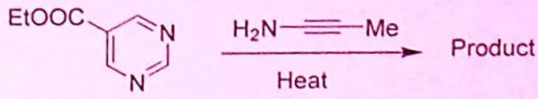
2. **(a)** Why in aq. solution of glucose, β-glucose is found to be present in higher concentration compared to α-glucose? But when methyl glucoside is prepared from glucose, α-methyl glucoside is found to be formed in higher concentration compared to its β-isomer. **3+5+2 =10**

(b) Complete the following. Give structures of all the molecules involved.

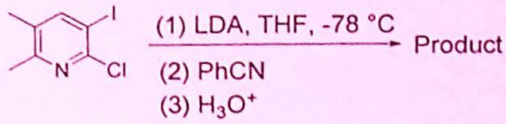


(c) An unknown disaccharide was methylated with methyl iodide and then hydrolysed. The two products obtained were – 2, 3, 4, 6- tetramethyl-D-galactose and 2, 3, 6-trimethyl-D-glucose. Draw Haworth sructures and name the disaccharide and the glycosidic linkage.

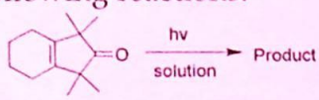
3.. a. Write down the major product with mechanism. **2+3+5 =10**

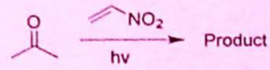


b. Write down the major product with mechanism.

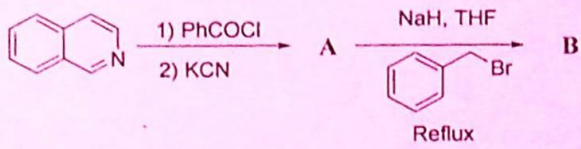


c. Write down the major products with mechanism of the following reactions.

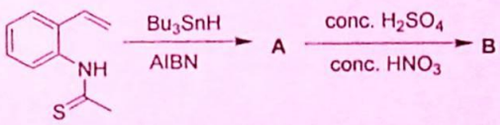
i) 

ii) 

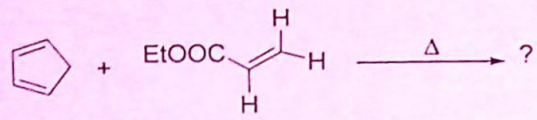
4. a. Write down the products (A & B) with explanation. **5+5=10**



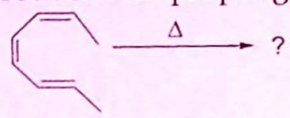
b. Identify the products A & B. Suggest the mechanistic route of the product formation.



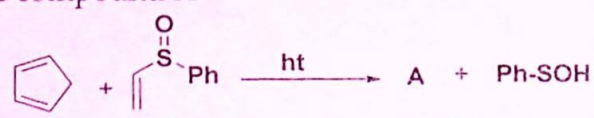
5. **(a)** For the Diels Alder reaction predict the product with appropriate geometry **2x5=10**



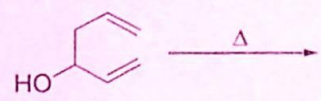
(b) Write down the product with proper geometry.



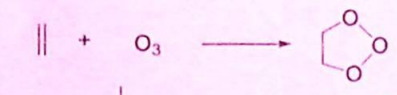
(c) Identify the compound A



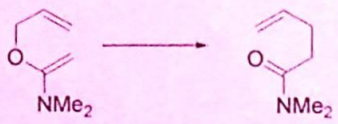
(d) Write down the product formed in the following



(e) Match the following

(i)  (a) electrocyclic reaction

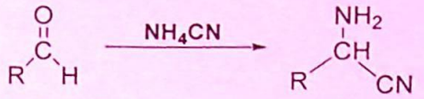
(ii)  (b) 1,3 dipolar addition

(iii)  (c) [2,3] sigmatropic shift

(iv)  (d) [3,3] sigmatropic shift

6. (a) Write the synthesis of alanine starting from phthalimido malonic ester. **2+3+5 =10**

(b) What is Strecker's synthesis? Write the mechanism of the following reaction.



(c) Explain in brief the primary and secondary structure of protein.

7. .(a) Explain, what do you mean by inversion of sucrose? 2+3+2+3 =10

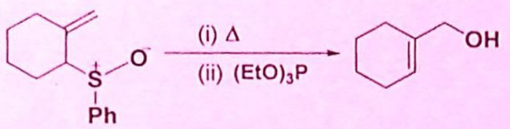
(b) What do you understand by mutarotation? Explain why maltose undergo mutarotation but not sucrose?

(c) Name two compounds with their structures used to protect the -NH_2 group of amino acid during the synthesis of dipeptides.

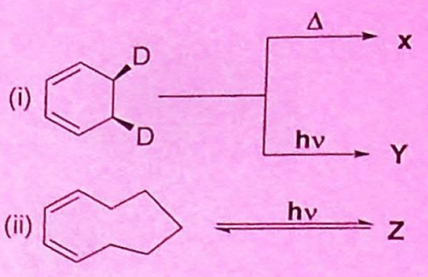
(d) What is benzoylation of glycine? Give reason why during benzoylation, the pH of the solution is to be raised to higher than 10? Write the reactions involved in benzoylation of glycine.

8. (a) Discuss FMO theory of (4+2) cyclo-addition reactions. 3+2=5

(b) Explain the formation of the product in the following reaction



(c) Predict the products under the condition of the reactions mentioned. Indicate the rotation mode in the respective cases. 2+3



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