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

SET A

[USE OMR FOR OBJECTIVE PART]

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

Objective

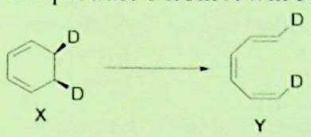
Time: 30 min. **Marks: 20**

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

1. The product of the following electrocyclic ring closing reaction

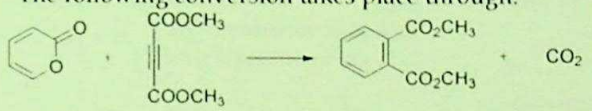
a. 
b. 
c. 
d. 

2. The product Y from X will be obtained, involving the process



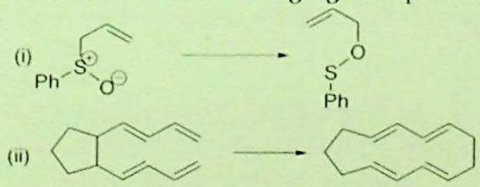
a. hv, conrotatory opening
b. hv, disrotatory opening
c. Δ, conrotatory opening
d. Δ, disrotatory opening

3. The following conversion takes place through:



a. [4+2] Cycloaddition reaction
b. [2+2] Cycloaddition reaction
c. [6+2] Cycloaddition reaction
d. [8+2] Cycloaddition reaction

4. The order of the following sigmatropic shifts are respectively:



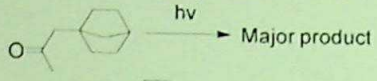
a. [1,3] and [5,5]
b. [2,3] and [5,5]
c. [2,3] and [3,3]
d. [2,3] and [3,5]

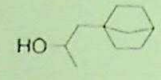
5. The Cope rearrangement is
   a. [1,5] sigmatropic rearrangement
   b. [3,3] sigmatropicrearrangement
   c. [1,3] sigmatropic rearrangement
   d. [2,3] sigmatropic rearrangement

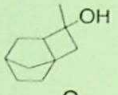
6. Which of the following molecules will undergo Norrish type II reaction?
   a. Carbonyl having α- hydrogen
   b. Carbonyl having β- hydrogen
   c. Carbonyl having γ- hydrogen
   d. Carbonyl having δ- hydrogen

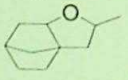
7. Which one of the followings generally forms **carbene intermediate** under Norish-I reaction in alcohol?
   a. Cyclobutanone
   b. Cyclopentanone
   c. Cyclohexanone
   d. Cycloheptanone

8. The correct major product of the following reaction is

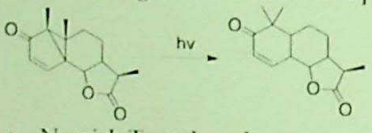


   a. 

   b. 

   c. 
   d. 

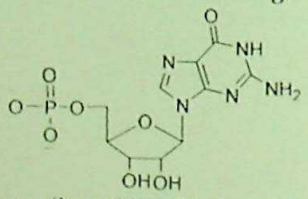
9. The following reaction is an example of



   a. Norrish Type-I, α-cleavage
   b. Norrish Type-I, β-cleavage
   c. α-cleavage (C-O bond)
   d. Norrish Type-II

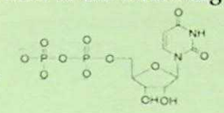
10. Di-π methane reaction produces product having
   a. a three membered ring
   b. a four membered ring
   c. a five membered ring
   d. a six membered ring

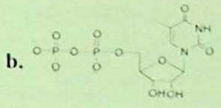
11. The name of the following nucleotide is

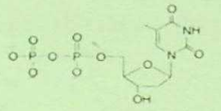


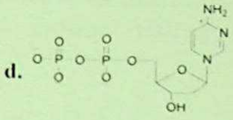
   a. ribocytidine-5'-phosphate
   b. 2'-deoxyriboadenosine-5'-phosphate
   c. riboadenosine-5'-phosphate
   d. riboguanosine-5'-phosphate

12. Which of the following is UDP?

a. 

b. 

c. 

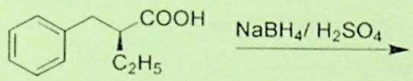
d. 

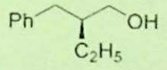
13. In a nucleoside, the anomeric carbon of sugar is linked to the nitrogenous base through a bond known as
    a. phosphodiester bond
    b. N-glycosidic bond
    c. C-glycosidic bond
    d. hydrogen bond

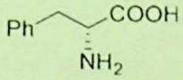
14. During replication, the enzyme which unzips the DNA strands by breaking the hydrogen bonds between them is
    a. primase
    b. ligase
    c. polymerase
    d. helicase

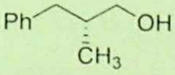
15. The process where an unusual nucleotide called methyl guanosine triphosphate is added to the 5' end of hnRNA is known as
    a. splicing
    b. tailing
    c. capping
    d. replication

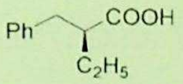
16. The product of the following asymmetric synthesis is



a. 

b. 

c. 

d. 

17. Jacobsen-KatsukiEpoxidation used the metal
    a. Sn
    b. Rn
    c. Zn
    d. Mn

18. Which of the following synthetic equivalents would be most appropriate for the retrosynthetic disconnection of a tertiary alcohol?
    a. A Grignard reagent and a ketone
    b. An alkene and an organolithium
    c. A carboxylic acid and a primary amine
    d. An alkyl halide and an amine

19. Which of the following is a synthetic equivalent for the vinyl cationsynthon, which can be used to introduce a vinyl group in an electrophilic form?

a. Vinyl Grignard (CH_2=CHMgBr)
b. Acetylene (HC≡CH)
c. Vinyl triflate (CH_2=CH-OTf)
d. Allyl bromide (CH_2=$CHCH_2$Br)

20. Sharpless epoxidation reaction is highly chemoselective and convertsonly .....alcohol to the epoxide – Fill the blanks

a. Vinyl
b. Propyl
c. Allyl
d. Benzyl

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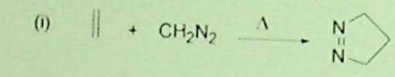
Descriptive

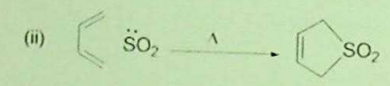
Time : 2 hrs. 30 mins. Marks : 50

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

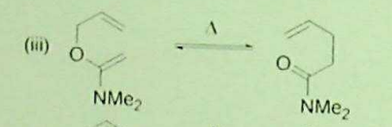
1. a. Match the following 2+3+3+2=10



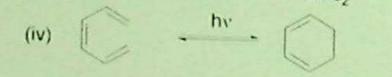
(a) electrocyclic reaction



(b) 1,3 dipolar addition

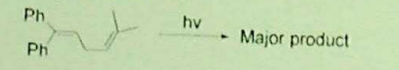


(c) Cheleotropic reaction



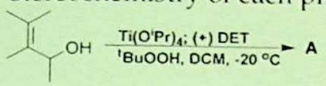
(d) [3,3] sigmatropic shift

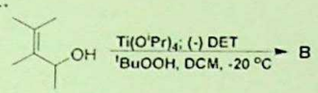
b. Write the major product of the following reactions with justification



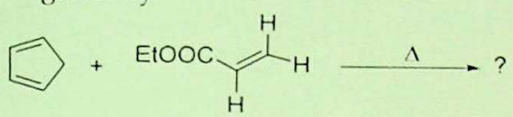
c. What are nucleotides? Draw the structure of a dinucleotide with the base cytosine and guanine and label the phosphodiester bonds.

d. Identify the products A and B, with clear representationof the stereochemistry of each product.

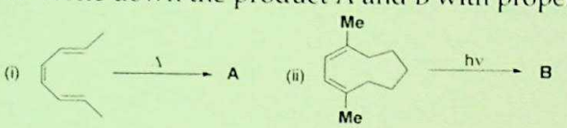
i) 

ii) 

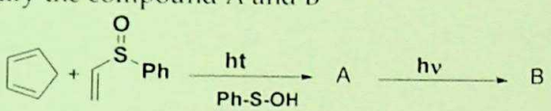
2. **a.** For the Diels Alder reaction predict the product with appropriate geometry **2+3+3+2=10**



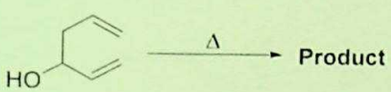
b. Write down the product A and B with proper geometry.



c. Identify the compound A and B

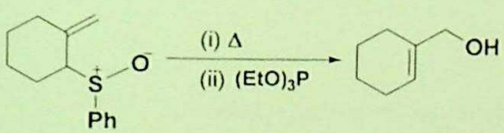


d. Write down the product formed in the following

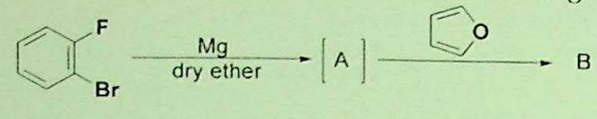


3. **a.** Discuss FMO theory of (4+2) cyclo-addition reactions. **3+2+2+3=10**

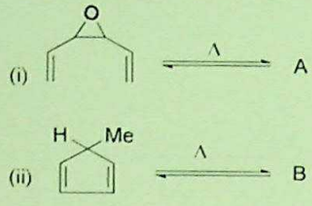
b. Explain the formation of the product in the following reaction



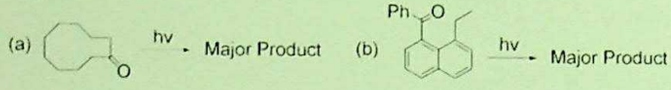
c. Predict the products A and B in the following reaction



d. Write down the products A and B in the following sigmatropic reactions. Mention the order of these sigmatropic reactions.

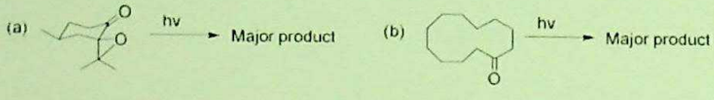


4. a. Write the major products of the following reactions with justification — 4+3+3 =10

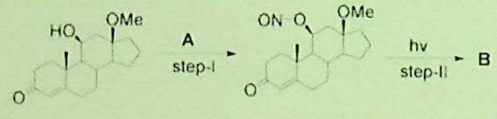


b. Write a short note on photochemical *E-Z* **isomerization** reaction.

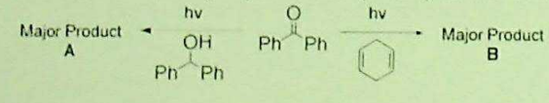
c. Write the probable major products of the following reactions with explanation



5. a. Identify the reagent (**A**) and the product (**B**) of the following reaction. Show the reaction mechanism. — 3+2+2+ 3=10



b. Write the major products (**A&B**) of the following reactions.



c. What are codons? Give reason why codons are said to be degenerate?

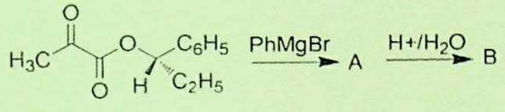
d. Describe the role of different RNAs taking part in the synthesis of proteins.

6. a. Explain complementary bases of DNA molecule and show the formation of hydrogen bonds between those complementary base pairs. **3+3+4 =10**

b. Describe silyl-Hilbert-Johnson reaction for the synthesis of nucleoside.

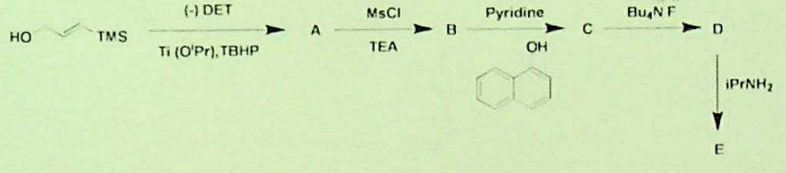
c. Illustrate the important steps involved in the process of DNA replication. What are leading and lagging strands?

7. a. Write the products A and B with proper stereochemical arrangement **2+3+5 =10**



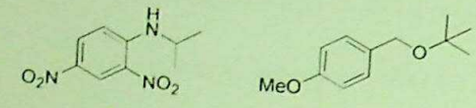
b. In Sharpless asymmetric epoxidationa dimeric titanium complex is produced. Show the reaction and draw the structure of the active complex.

c. Write down the product A to E of the following asymmetric epoxidation reaction



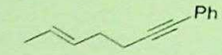
8. **a.** Illustrate the molecular structure of Jacobsen's Catalyst and elucidate the mechanistic pathway involved in its synthesis. **2+6+2 =10**

b. Perform a retrosynthetic analysis of the given compounds to identify possible disconnections, synthons, and their corresponding synthetic equivalents. Propose the most efficient synthetic pathway for the preparation of the compound.



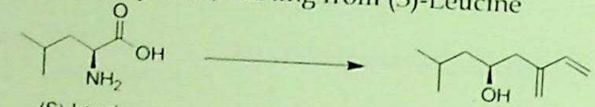
A

B



C

c. Outline the synthetic steps involved in the asymmetric synthesis of (S)-(-)-ipsenol, starting from (S)-Leucine



(S)-Leucine

(S)-(-)-ipsenol

= = *** = =