REV-01
MSC/32/37

2025/11

SET A

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

[USE OMR FOR OBJECTIVE PART]

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

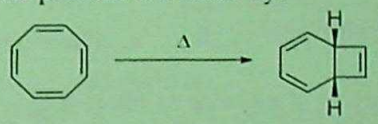
Objective

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

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

1. 1,3 – dipolar compounds are
   a. 4 – centre 4-electron system
   b. 3 – centre 4-electron system
   c. 3 – centre 3-electron system
   d. 3 – centre 4-electron system

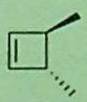
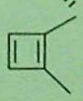
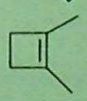
2. In the following reaction, the product is formed by:

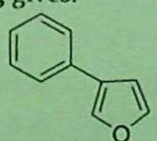
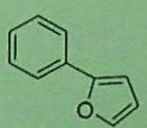
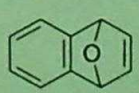
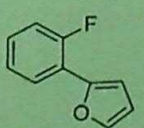


   a. 6π- disrotatory electrocyclization.
   b. 4π- disrotatory electrocyclization.
   c. 6π- conrotatory electrocyclization.
   d. 4π- conrotatory electrocyclization.

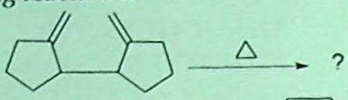
3. The product of the following electrocyclic ring closing reaction

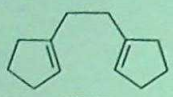


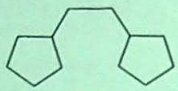
   a. 
   b. 
   c. 
   d. 

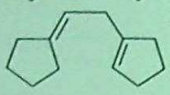
4. The reaction of 1-bromo 2-fluoro benzene with furan in presence of one equivalent of Mg gives:
   a. 
   b. 
   c. 
   d. 

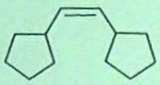
5. The product of the following reaction is:



a. 

b. 

c. 

d. 

6. Which of the following electronic transitions occurs with the lowest energy requirement?
   a. π-π* transition
   b. n-π* transition
   c. σ-π* transition
   d. π-σ* transition

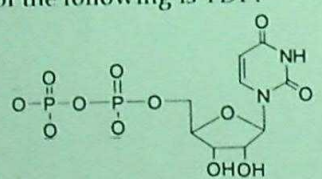
7. The Paternò–Büchi reaction involves:
   a. Photoreduction of aldehydes
   b. [2+2] Cycloaddition of carbonyl compounds with alkenes
   c. Cleavage of α-bonds adjacent to carbonyl group
   d. Photoisomerization of ketones

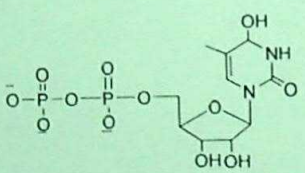
8. The Norrish Type-I reaction of a ketone is initiated by
   a. Absorption of ultraviolet light leading to α-cleavage
   b. Thermal decomposition of the ketone
   c. Oxidation by molecular oxygen
   d. Reaction with a strong base

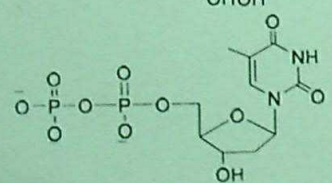
9. When **2-hexanone** undergoes a Norrish Type-II photochemical reaction, the major products formed are:
   a. Ethane and propanal
   b. Propene and acetone
   c. Butane and methanol
   d. Hexanol and ethene

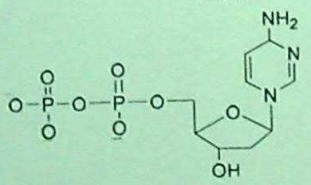
10. Barton reaction involves:
    a. Oxidation of an aldehyde to a carboxylic acid
    b. Photolysis of a nitrite ester leading to δ-hydroxylation of an alcohol
    c. Reduction of a nitro compound to an amine
    d. Formation of an imine from an amine and a carbonyl compound

11. Which of the following is TDP?

a. 

b. 

c. 

d. 

12. During replication, the enzyme which unzips the DNA strands by breaking the hydrogen bonds between them is
    a. Primase
    b. Ligase
    c. Helicase
    d. Polymerase

13. In a nucleoside, the anomeric carbon of sugar is linked through a glycosidic bond to the ----------.
    a. N-7 of a purine or the N-2 of a pyrimidine.
    b. N-5 of a purine or the N-3 of a pyrimidine.
    c. N-3 of a purine or the N-2 of a pyrimidine.
    d. N-9 of a purine or the N-1 of a pyrimidine

14. Which of the following nucleotide is added at 5^{l}-end of h_n RNA during capping?
    a. Methyl adenosine triphosphate
    b. Methyl guanosine triphosphate
    c. Methyl glucosamine phosphate
    d. Methyl glucosamine triphosphate

15. The enzyme involved for the synthesis of rRNA during transcription process is
    a. RNA polymerase-I
    b. RNA polymerase-II
    c. RNA polymerase-III
    d. DNA polymerase

16. The main aim of retrosynthetic analysis is to:
    a. Determine molecular orbitals
    b. Develop an experimental method
    c. Plan a synthetic route from simple to complex molecules
    d. Measure thermodynamic stability

17. Which of the following best describes the transition state in Cram's model?
    a. Staggered arrangement minimizing steric interactions
    b. Eclipsed arrangement of substituents
    c. Planar conformation
    d. Tetrahedral intermediate

18. If enantiomeric excess (ee) is 90%, the ratio of the two enantiomers is:
    a. 70:20
    b. 90:10
    c. 95:5
    d. None of these

19. The Felkin–Anh model is used to predict:
    a. Regioselectivity in electrophilic addition
    b. Stereochemical outcome of nucleophilic addition to a carbonyl compound
    c. Radical substitution products
    d. The orientation of electrophilic aromatic substitution

20. The Jacobsen epoxidation employs a chiral:
    a. Ruthenium complex
    b. Manganese–salen complex
    c. Osmium tetroxide complex
    d. Titanium–tartrate complex

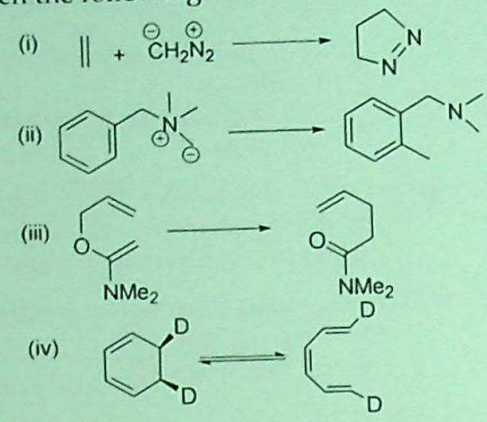
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Descriptive

Time : 2 hrs. 30 mins. Marks : 50

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

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



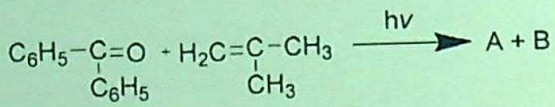
(a) electrocyclic reaction

(b) [3,3] sigmatropic shift

(c) [2,3] sigmatropic shift

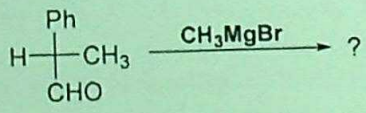
(d) 1,3 dipolar addition

b. Identify the major product (A or B) of the following reaction and outline its photochemical mechanism.

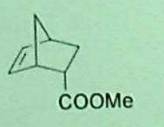


c. Discuss the structure of DNA with a neat diagram.

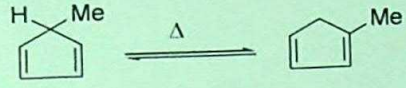
d. Write down the major diastereomer in the following reaction



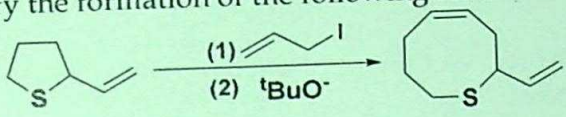
2. **a.** Write the starting material for the following Diels Alder reaction product. 2+2+3+3 =10



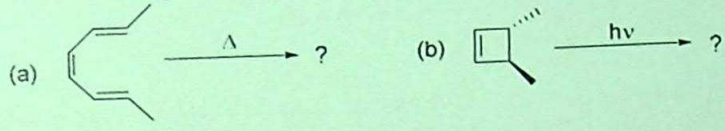
b. What type of sigmatropic reaction is shown by the following. Give mechanism of formation of the product.



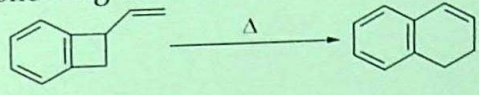
c. Justify the formation of the following reaction:



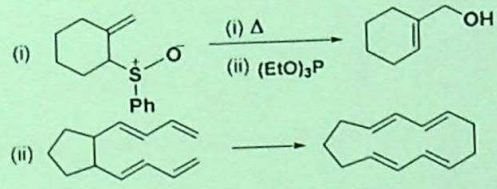
d. Write down the product formed.



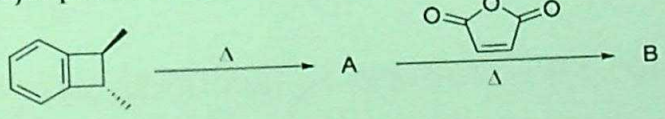
3. a. Explain the following conversion. 2+2+3+3 =10



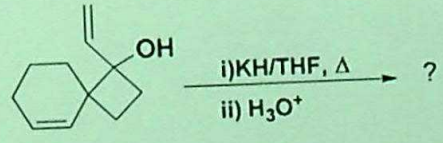
b. Find out the order of following sigma tropic rearrangements:



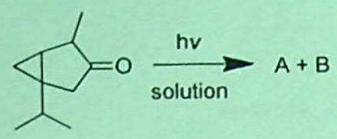
c. The major product in the following reaction sequence are:



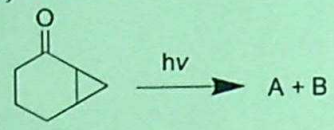
d. Predict the product formed in the following reaction with mechanism,



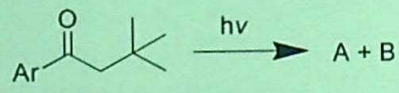
4. **a.** Write the products of the following reaction mentioning the major one. Show the detailed mechanism of the following Norrish type-I reaction. **5+2+3 =10**



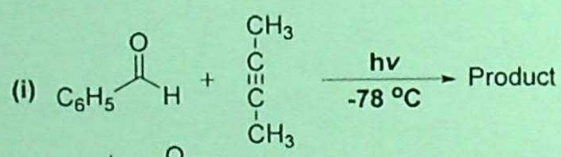
b. Write the products of the following Norrish type-I reaction mentioning the major one.

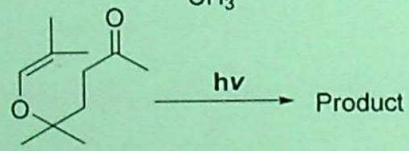


c. Write the products of the following Norrish type-II reaction mentioning the major one with detailed mechanism.

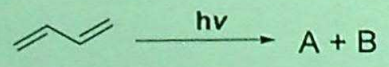


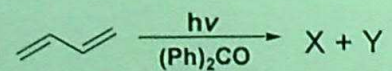
5. **a.** Write down the product of the following reaction with mechanism **3+3+2+2 =10**

(i) 

(ii) 

b. Write down the products of the following reaction with suitable mechanism

(i) 

(ii) 

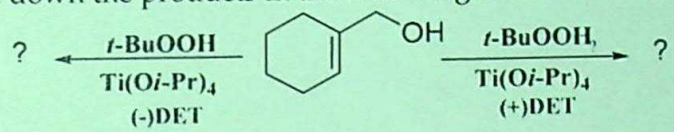
6. **a.** Give a brief outline of the steps involved in DNA replication. **4+3+3 =10**

b. What are leading and lagging strands? Explain with a neat diagram.

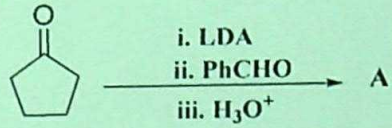
c. What are codons? Explain the term "degeneracy of codons" with examples?

7. **a.** Explain the deviation of Cram's rule with an example when the chiral center contains a strong electronegative atom like F. **4+3+3 =10**

b. Write down the products in the following reactions



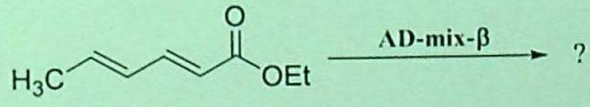
c. Write down both the enantiomers of **A** in the following reaction, showing each step



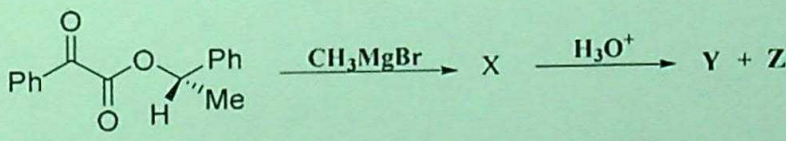
8. **a.** Explain post transcriptional modification of hnRNA. **2+3+2+3 =10**

b. Define translation. Discuss the role of the different RNAs in this process.

c. Write down the product of the reaction



d. Write down the products X, Y, and Z in the following reaction



= = *** = =