[This question paper contains 2 printed pages.]

Your Roll No.....

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Sr. No. of Question Paper : 9901

Unique Paper Code : 2173010040

Name of the Paper : DSE - Reactive Intermediates of Organic Chemistry

Name of the Course : **B.Sc. (Prog.) Life Sciences / B.Sc. (Prog.) Physical Sciences**

Semester : VII

Duration : 2 Hours

Maximum Marks : 60

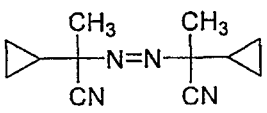
Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **four** questions in all. Each question carries equal marks.

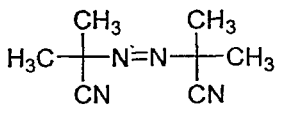
1. (a) Write the structure of following bicyclic compounds (**any three**):
   i) Bicyclo [3.2.1] octane
   ii) Bicyclo [2.2.2] octane
   iii) Spiro [4.4] nonane
   iv) Bicyclo [2.2.1] heptane **(3,4,4,4)**

   (b) What is meant by neighbouring group participation? Explain the concept with the help of an example having oxygen as the neighbouring atom in the chain.
   (c) Define an ion pair. Explain the role of ion pairs in racemization and retention of configuration during carbocation reactions.
   (d) Write short note on Norbornyl cation.

2. (a) Arrange the following in order of decreasing stability and explain: CH_3^-, $CH_2{=}CH{-}CH_2^-$, $C_6H_5^-$
   (b) Differentiate between singlet and triplet carbenes and give one reaction of each.
   (c) Explain, decomposition rate of the following compound (I) is 20 times greater than that of (II).



(I)



(II)

   (d) Write any two methods for the generation of carbanions and comment on the geometry of methyl carbanion. **(3,4,4,4)**

3. (a) Thermal decomposition of $R{-}N_3$ produces a reactive intermediate, which reacts with an alkene ($R_2C{=}CR_2$). Write the name and structure of the product formed.
   (b) Acid chlorides react with sodium azide to yield a primary amine and carbon dioxide. Name the reaction and write its mechanism.
   (c) Using a suitable ylide, show with a chemical equation how an alkene can be synthesized from a carbonyl compound. Mention the name of the reaction.

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(d) Complete the following reaction and write the mechanism.

$$RCONH_2 + Br_2 + KOH \longrightarrow ?$$ **(3,4,4,4)**

4. (a) Write any two common methods used for the generation of free radicals.
   (b) Complete the following reaction and write its mechanism, clearly indicating the intermediates formed during the process.

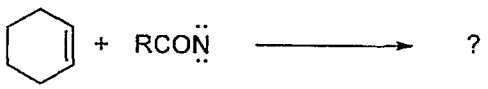
$$RCH_2{=}CH_2 + HBr \xrightarrow{ROOR} ?$$

   (c) What are Baldwin's Rules? apply Baldwin's Rules to determine which of the following cyclizations are favorable:
      i) 3-exo-tet
      ii) 5-endo-tet
   (d) Explain the mechanism of the Beckmann rearrangement, indicating intermediates formed. **(3,4,4,4)**

5. (a) Label each hydrogen atom in the following compound as primary, secondary or tertiary

$$(CH_3)_3CCH_2C(CH_3)_3$$

   (b) Identify the type of reactive intermediate formed in each of the following reactions:
      i) Nucleophilic substitution of alkyl halides in polar solvent
      ii) Electrophilic addition to alkenes
   (c) Give two examples of ambident nucleophiles and write reactions showing their two possible modes of attack.
   (d) Complete the following reaction and identify the type of reaction involved.



(3,4,4,4)

6. (a) How does the stability of reactive intermediates influence the rate and direction of organic reactions?
   (b) Write short notes on the following: (**any three**)
      (i) HSAB
      (ii) Nitrene
      (iii) Carbocations
      (iv) Wolff rearrangement **(3,4,4,4)**