I.F.S. EXAM-2015

C–GEQ–O–DINB

CHEMISTRY

Paper—II

Time Allowed : Three Hours

Maximum Marks : 200

QUESTION PAPER SPECIFIC INSTRUCTIONS

Please read each of the following instructions carefully before attempting questions :

*There are **EIGHT** questions in all, out of which **FIVE** are to be attempted.*

*Question Nos. **1** and **5** are compulsory. Out of the remaining **SIX** questions, **THREE** are to be attempted selecting at least **ONE** question from each of the two Sections **A** and **B**.*

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

All questions carry equal marks. The number of marks carried by a question/part is indicated against it.

*Answers must be written in **ENGLISH** only.*

Unless otherwise mentioned, symbols and notations have their usual standard meanings.

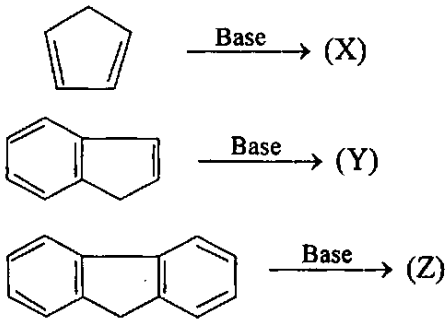
Assume suitable data, if necessary and indicate the same clearly.

Neat sketches may be drawn, wherever required.

SECTION—A

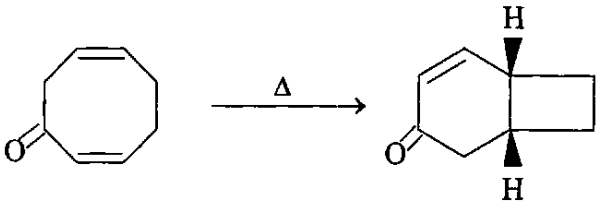
Q. 1. **Answer the following :** **5×8=40**

Q. 1(a) Write the product of given reactions and explain which product is most stable. 5



Q. 1(b) Aniline on treatment with sodium nitrite and HCl in cold gives a product (X), which on treatment with β-napthol gives (Y). Write the structures of (X) and (Y) and name of the reaction involved. 5

Q. 1(c) Write the mechanism of following electrocyclic reaction : 5



Q. 1(d) Write the product and its stereochemistry for the reaction :

$CH_3Br + OH^-$ (aq) ⟶

Draw energy profile diagram and write a mechanism. If concentration of CH_3Br is increased 4 times, what will be the effect on the rate of reaction ? 5

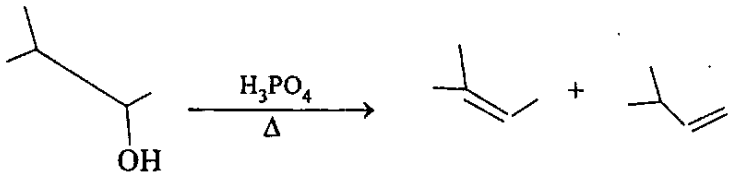
Q. 1(e) Write the product/s with their stereochemistry for the reaction of cyclohexene with :

(i) Br_2

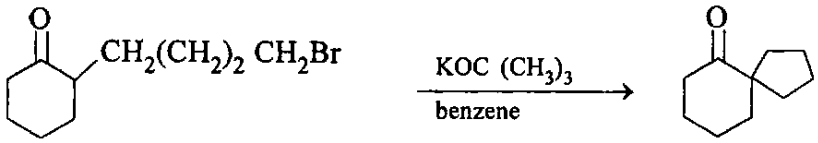
(ii) Br_2 in NaCl

(iii) Br_2 in CH_3OH 5

Q. 1(f) Write a mechanism for the reaction : 5



Q. 1(g) Sketch a mechanism for the following conversion : 5



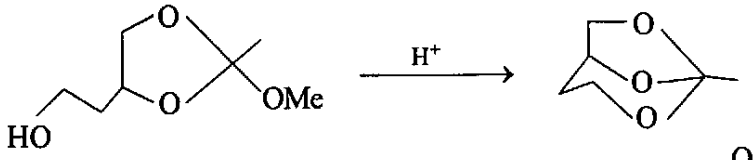
Q. 1(h) Cyclohexylmethyl ketone on treatment with peroxyacid in presence of $CHCl_3$ gives cyclohexyl acetate. Write a mechanism for the reaction. 5

Q. 2(a) Reaction of 1, 3-butadiene with HBr at –80°C and 45°C gives two regioisomeric allylic halides in different ratios. Write the products in both the cases and indicate the major product. Explain the reason for the influence of temperature on product distribution. 10

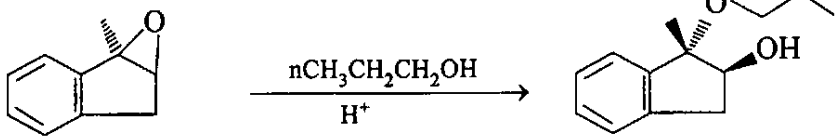
Q. 2(b) Write Zaitsev rule. Acid catalyzed dehydration of 1-methylcyclohexanol gives a mixture of two isomeric alkenes. Write the products and indicate major product. 10

Q. 2(c) Explain whether the reactions shown below will proceed by SN^1 or SN^2 mechanism. Justify your answer. 10

(i)

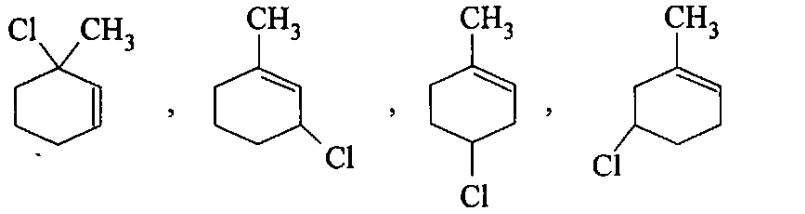


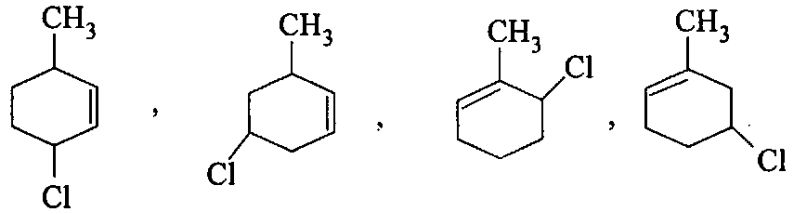
(ii)



(±) (±)

Q. 2(d) Which of the following compounds will give same allylic carbocation on ionization ? 10





Q. 3(a) Write the product formed and its stereochemistry when :

(i) trans, trans-2,4-hexadiene reacts photochemically.

(ii) cis, trans-2,4-hexadiene reacts thermally. 10

Q. 3(b) Write a mechanism to show the photolytic ring closure of α-pyrone. Predict the stereochemistry of the product. 10

Q. 3(c) Identify (Y) in the reaction :

$$(C_2H_5)_2\ CHCONH_2 \xrightarrow{Br_2/KOH} (Y)$$

(X)

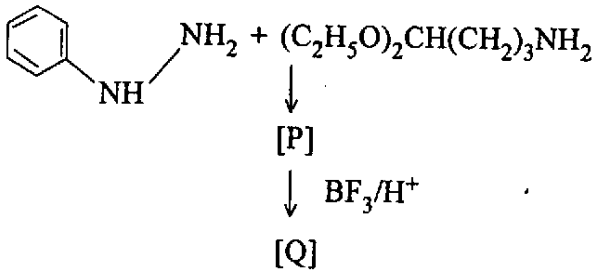
Write the name of the reaction and a detailed mechanism to explain the formation of (Y). 10

Q. 3(d) Using benzene as one of the reactants, how will you prepare the following using Friedal-Crafts reaction :

(i) 4-oxo-4-phenylbutanoic acid

(ii) Isobutylbenzene. 10

Q. 4. **Identify [P] to [W] in the following and write the name of reaction involved :** **10×4=40**

(i) 

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(ii) $C_6H_5CHO + H_2C(COOC_2H_5)_2 \xrightarrow[C_5H_5N/C_6H_6]{C_6H_5COOH}$

$$[S] \xleftarrow[ii)\ \Delta]{i)\ OH^-/H^+} [R]$$

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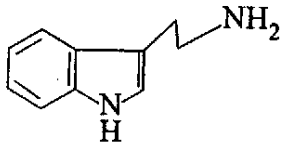
(iii) 

$\xrightarrow{CH_3COCl}$ [T] $\xrightarrow[ii)\ Pd\text{-}C]{i)\ P_2O_5}$ [U]

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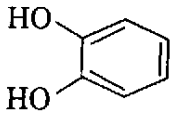
(iv) 

$\xrightarrow[ii)\ H^+]{i)\ CHCl_3/NaOH}$ [V] $\xrightarrow[NaOH]{CH_2I_2}$ [W]

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SECTION—B

Q. 5: **Answer the following :** **5×8=40**

Q. 5(a) Dacron is a polyester. It is obtained from 1, 4-benzenedicarboxylic acid and 1, 2-ethanediol. Write its structure. 5

Q. 5(b) Write the name and draw the structures for two purines and three pyrimidines that occur in RNA and/or DNA. 5

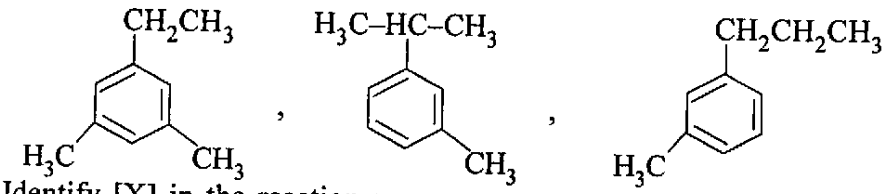
Q. 5(c) In ^{1}HNMR spectrum of a compound at 200 MHz, a signal at 1058 Hz was observed. Calculate the chemical shift (δ) for this proton. 5

Q. 5(d) Consider :

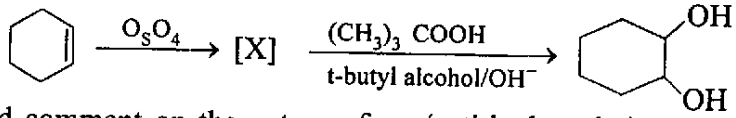
1, 4-pentadiene, 2-methyl-1,3-butadiene and cyclopentene.

Explain which of these will exhibit λ_{max} to longer wavelength and why ? 5

Q. 5(e) What do you understand by 'base peak' in mass spectrum ? Which of the following compounds will exhibit a base peak at m/z 105 ? 5



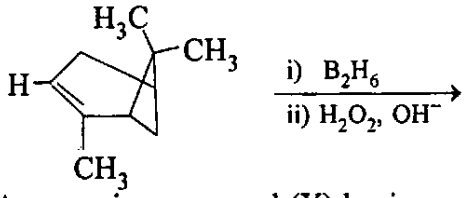
Q. 5(f) Identify [X] in the reaction :



and comment on the nature of syn/anti-hydroxylation of cyclohexene. 5

Q. 5(g) A compound [X] on treatment with $LiAlH_4$ gives an equal number of moles of 1-butanol and 2-propanol. Identify [X]. 5

Q. 5(h) Suggest a structure for the product of following reaction : 5



Q. 6(a) An organic compound (X) having molecular formula $C_7H_6Cl_3O$ exhibited m/z at 212.53. ^{1}HNMR spectrum of the compound exhibited signals at δ 3.9 (s), 6.8 (d) and 7.3 (d). Write the possible structure for the compound with suitable justification. 20

Q. 6(b) Explain what type of information is provided by the following spectroscopic techniques :

(i) UV

(ii) IR

(iii) ^{1}HNMR

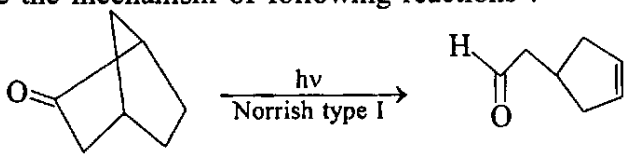
(iv) Mass and

(v) esr or epr

Justify your answer with suitable example. 10

Q. 6(c) Consider o-, m- and p-dichlorobenzenes. Write how many signals in ^{1}HNMR spectrum of these compounds you are likely to get. Justify your answer. 10

Q. 7(a) Write the mechanism of following reactions : **10×3=30**

(i) 

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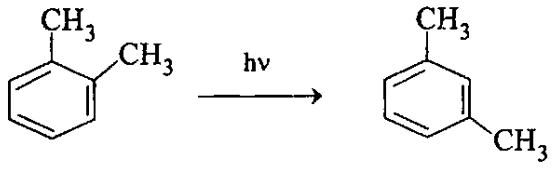
(ii) 

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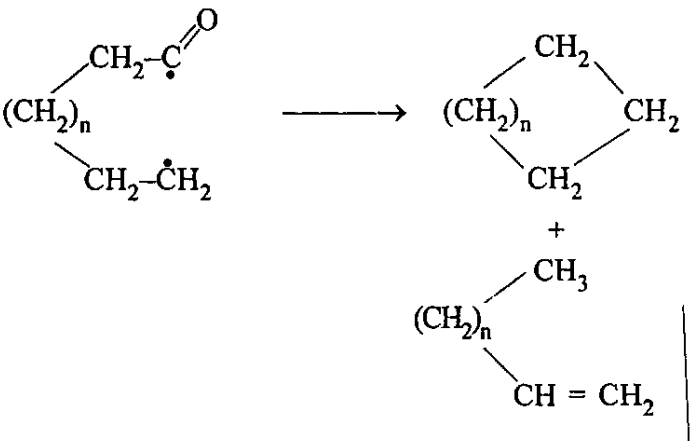
(iii) 

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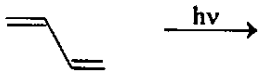
Q. 7(b) Write the product of following reactions : 10

(i) 

(ii) 

Q. 8(a) Calculate $\overline{M}_n$ and $\overline{M}_w$ for a polymer prepared by mixing equal number of molecules of molar mass 10,000 and 1,00,000. 10

Q. 8(b) How will you determine the relative viscosity and specific viscosity of a polymer solution using Ostwald viscometer ? 10

Q. 8(c) Write the monomers used in the preparation of following polymers :

(i) Polyisobutylene

(ii) Nylon 6, 6

(iii) Teflon

(iv) Nylon 6

(v) Polyvinylchloride. 10

Q. 8(d) What is a peptide bond ? What is the difference between a peptide, oligopeptide and protein ? What type of bonding is largely responsible in the secondary structure of protein ? 10