CSM : 16

CHEMISTRY

PAPER - II

Time Allowed : 3 hours | Full Marks : 100

Marks for each question is indicated against it.

Attempt any 5 (five) questions taking not more than 3 (three) questions from each Part.

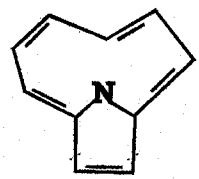
PART - A

1. (a) Which of the following compounds can be classified as aromatic? Give reasons. **(8)**

(i) 2, 4, 6 –Cycloheptatriene –1–Carboxylic acid.

(ii) Azulene

(iii) Sydnone.

(iv) 

(b) Complete the following reactions with suitable mechanism. **(4+8=12)**

(i) 

(ii) $PhNHNH_2 + PhCOCH_3 \longrightarrow A \xrightarrow{\text{Tautomerize}} B \text{ (enamine)} \xrightarrow[\text{Condensation}]{\text{Claisen-type}}$

$C \xrightarrow{\text{Rearomatization}} D \xrightarrow{\text{Cyclisation}} E \xrightarrow[-\overset{\oplus}{N}H_4]{H^{\oplus}} F$

2. (a) Write the reaction between methyl chloride and hydroxide ion. Sketch the potential energy diagram for this reaction showing transition state and activation energy involved in the reaction. **(6)**

(b) Arrange the following carbocations in their increasing order of stability. Give reasons to your answer. **(4)**

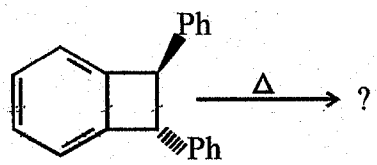
$(CH_3)_3\overset{\oplus}{C}$, $(CH_3)_2\overset{\oplus}{C}H$, $\overset{\oplus}{C}H_3$ and $CH_3\overset{\oplus}{C}H_2$

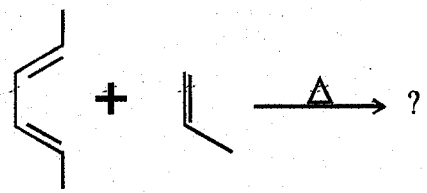
(c) For each of the following reactions, indicate whether elimination will occur through an E2 or E1. Give the major elimination product of each reaction with suitable mechanism. **(5+5=10)**

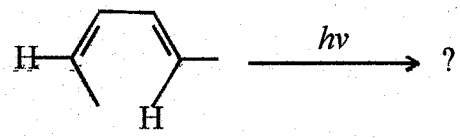
(i) $CH_3CH_2\underset{\underset{Br}{|}}{C}HCH_3 \xrightarrow[DMSO]{CH_3O^-} ?$

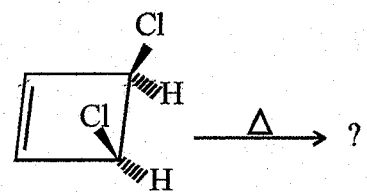
(ii) $CH_3CH_2\underset{\underset{Br}{|}}{C}HCH_3 \xrightarrow{CH_3OH} ?$

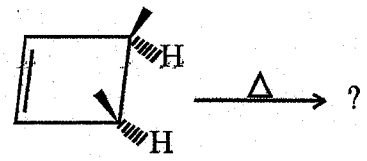
3. Predict the products of the following with proper stereochemistry: **(5×4=20)**

(i) 

(ii) 

(iii) 

(iv) 

(v) 

4. (a) Discuss in brief the primary, secondary and tertiary structures of proteins. **(5)**

(b) Draw the structure of purine nucleotide in DNA. **(3)**

(c) Give one method of preparation and one important property of the following: **(4×3=12)**

(i) Nylon 66 (ii) Polyvinyl chloride

(iii) Polythene (iv) Terylene

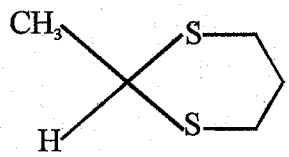
PART - B

5. (a) Benzoic acid on reduction with Na in liq. NH_3 gives 1, 2-dihydroproduct, whereas, anisole gives 2, 5-dihydroproduct. Explain. **(5)**

(b) Complete the following reactions with suitable mechanism: **(3×5=15)**

(i) $Ph-CH=CH-CH_3 + OsO_4 \longrightarrow ? \xrightarrow[\text{Reflux}]{Aq.Na_2CO_3} ?$

(ii) $C_6H_5COCH_3 \xrightarrow{SeO_2} ?$

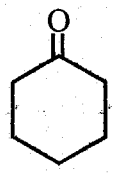
(iii) 

$\xrightarrow[\text{ii)}]{\text{i) n-BuLi}}$ $\xrightarrow{HgCl_2} ?$

6. (a) What is fluorescence? How is it different from phosphorescence? Explain using proper labelled diagram. **(6)**

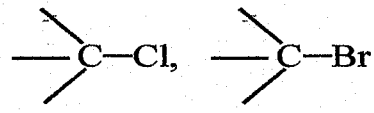
(b) What is a photosensitizer? Write the products involved in the photochemical reaction of butadiene in presence and absence of photosensitizer. **(8)**

(c) Write the product of the following reaction with suitable mechanism. **(6)**



$\xrightarrow{h\nu}$? (Norrish type-1 reaction)

7. (a) Which of the following has higher stretching frequency in IR spectra? Explain. **(5)**



(b) The force constant of CO is 1840 Nm^{-1}. Calculate the vibrational frequency in cm^{-1} and the spacing between the vibrational energy levels in *eV*. The atomic masses are $^{12}C = 19.9\times10^{-27}Kg$, $^{16}O = 26.6\times10^{-27}Kg$, $1eV = 8066\ cm^{-1}$. **(5)**

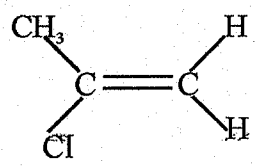
(c) Explain the origin of stokes and anti-stokes lines in the Raman Spectrum. Which lines are more intense and why? **(5)**

(d) Sketch all the vibrational modes of linear X-M-X and indicate the IR active and IR inactive ones. **(5)**

8. (a) Distinguish between 3-methyl and 4-methyl cyclohexanone on the basis of mass spectrometry. **(5)**

(b) Give the number of $^1H_{NMR}$ signals in the following compounds: **(5)**

(i) $PhCH_2CH_3$

(ii) 

(c) An organic compound A with molecular formula C_3H_9N show the following peaks in the IR spectrum (in cm^{-1}): 3012 (m), 3423(s), 3236(m) and 1615(m). When the compound A is treated with nitrous acid, we get a compound B which shows a strong peak at 3430 cm^{-1}. What are A and B and explain the reactions involved. **(10)**

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