CSM : 22

CHEMISTRY

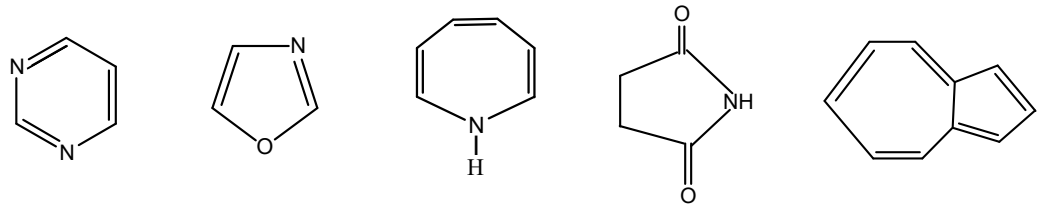
PAPER - II

Time Allowed : 3 hours | Full Marks : 100

Marks for each question is indicated against it.
Attempt <u>any 5 (five)</u> questions taking not more than 3 (three) questions from each Part.

PART - A

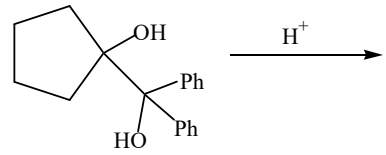
1. (a) Classify the following compounds as aromatic, anti-romatic or non-aromatic: **(5)**

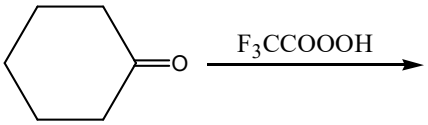


I II III IV V

(b) Cyclopentadiene ($K_a=10^{-15}$) is much more acidic than cycloheptatriene ($K_a=10^{-45}$). Explain. **(5)**

(c) Predict the product and suggest mechanism for the following reactions. **(10)**

(i) 

(ii) 

2. (a) Two elimination products are obtained from the following E2 reactions: **(4)**

$CH_3\text{-}CH_2\text{-}CHD\text{-}CH_2Br \rightarrow (A) + (b)$

(i) What are the elimination products (A) and (B)

(ii) Which is formed in greater yield? Explain?

(b) Arrange the following in order of their decreasing stablility and explain the reason for it. **(6)**

(i) $(C_6H_5)_3C^-$; $(CH_3)_3C^-$; $(CH_3)_2CH^-$; CH_3^- ; $CH_3CH_2^-$

(ii) $^+CH_3$; $(CH_3)_3C^+$; $C_6H_5\overset{+}{C}H_2$; $CH_3\overset{+}{C}H_2$; $(C_6H_5)_3C^+$

(c) Which in each of the following pairs is more stable and why? **(6)**

(i) $PhCH_2CH_2^+$ and $PhCH_2^+$

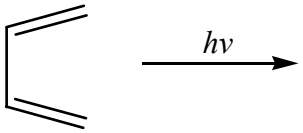
(ii) CH_3^- and CCl_3^-

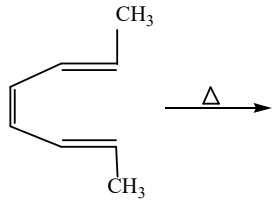
(iii) $CH_3CH_2CH_2^+$ and $CH_3\text{-}O\text{-}CH_2^+$

(d) Draw the energy profile diagrams for SN^1 and SN^2 reactions. **(4)**

3. (a) What are pericyclic reactions and how are they classified? Give suitable examples of each type. **(10)**

(b) Predict the products of the following electrocyclic reactions and predict whether the process will be "con" or "dis". **(2×5=10)**

(i) 

(ii) 

4. (a) What do you mean by vulcanization of rubber? What are the advantages of vulcanised rubber over natural rubber? **(10)**

(b) Write a step by step mechanism for the polymerization of ethylene in presence of an organic peroxide **(5)**

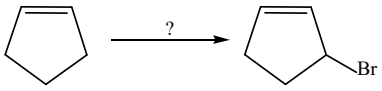
(c) Give the name and structure of the monomers that are used to produce **(5)**

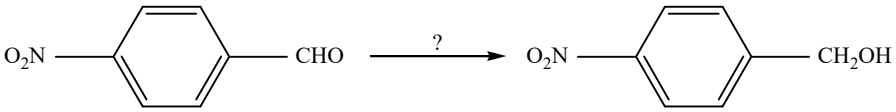
(i) Terylene

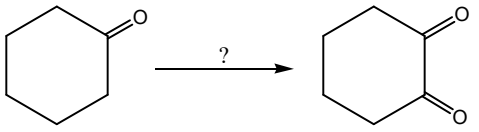
(ii) Nylon-6,6

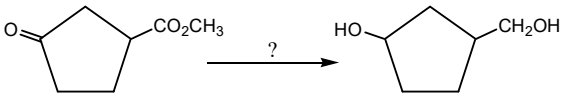
PART - B

5. Identify the reagents in the following reactions and show the mechanism. **(4×5=20)**

(a) 

(b) 

(c) 

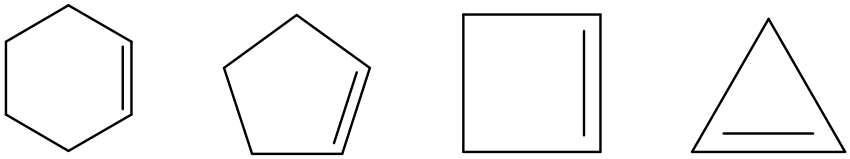
(e) 

6. (a) Write down the products obtained by Norrish type I and Norrish type II photochemical cleavage reaction of 2-pentanone. **(7)**

(b) What is paterno-Buchi reaction? Discuss the mechanism along with the stereochemical consequences. **(7)**

(c) Discuss the mechanism of the photoreduction of benzophenone leading on the formation of benzopinacol. **(6)**

7. (a) Arrange the following cycloalkenes in order of their increasing wave number and explain:



I II III IV

(5)

(b) The rotational spectrum of CO shows a series of lines placed 3.84235 cm^{-1} apart. Calculate the moment of inertia of C=O bond. **(5)**

(c) The infrared and Raman spectra of a triatomic molecule of the type MX_2 shows two infrared frequencies and one Raman frequency. Determine the structure of MX_2. **(5)**

(d) Discuss the effect of hydrogen bonding on the IR stretching frequency of carbonyl compounds. **(5)**

8. (a) Distinguish between the following compounds using proton NMR spectra : **(6)**

(i) 1 - bromopropane and 2 - bromopropane

(ii) Chlorobenzene and 1, 2 - dichlorobenzene

(b) Why do polar solvents shift the $\pi \rightarrow \pi^*$ transition to a longer wavelength and $n \rightarrow \pi^*$ transition to a shorter wavelength? **(6)**

(c) A non-polar organic compound with molecular formula C_4H_6O does not show any significant UV absorption and has IR absorption at 3300 - 2900 and 2200 cm^{-1}. Its H-NMR spectrum consists of three signals at δ : 3.0 (1H), 3.5 (3H) and 4.9 (2H). Elucidate the structure of the compound. **(8)**

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