CSM : 14

CHEMISTRY
PAPER - II

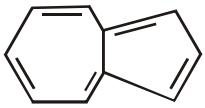
Time Allowed : 3 hours | Full Marks : 100

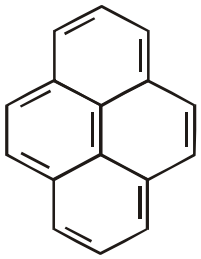
Marks for each question is indicated against it.

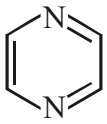
Attempt <u>any 5 (five)</u> questions taking not more than 3 (three) questions from each Part.

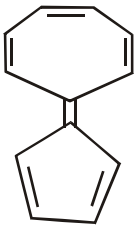
PART A

1. (a) State Huckel's $(4n+2)\ \pi e^-$ rule. Based on this rule justify whether the following molecules are aromatic or non-aromatic. **(10)**

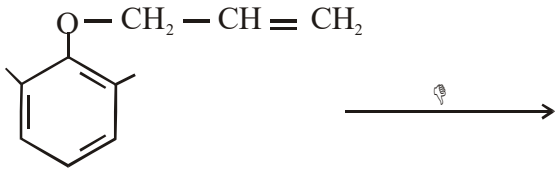
(i) 

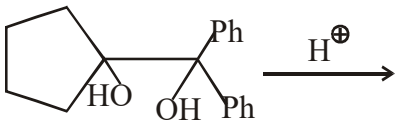
(ii) 

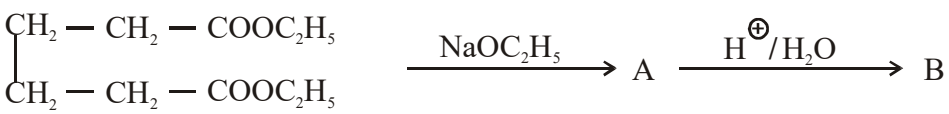
(iii) 

(iv) 

(b) Predict the product(s) for the following reactions with proper mechanism *(any two)*. **(2×5=10)**

(i) 

(ii) 

(iii) 

2. (a) Butenone on addition of HCN gives two different products. On the basis of the mechanism involved, draw an energy profile diagram showing formation of both kinetic and thermodynamic product. Also, predict the more stable product. **(5)**

(b) Which SN^2 reaction will occur more rapidly? Assume the temperatures and concentrations are all the same. Give proper justification. **(5)**

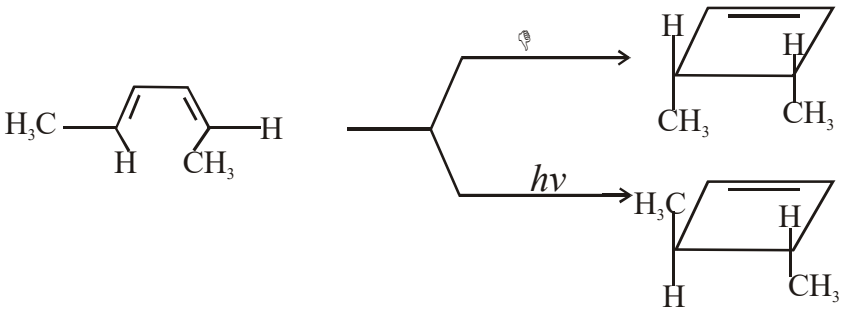
(i) $CH_3O^- + CH_3CH_2 - I \longrightarrow CH_3CH_2OCH_3 + I^-$

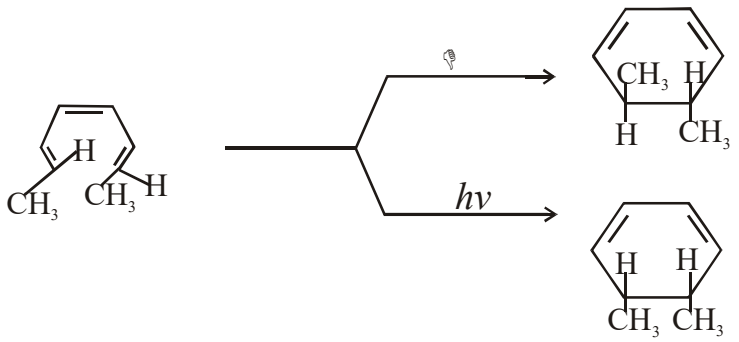
(ii) $CH_3O^- + CH_3CH_2 - Br \longrightarrow CH_3CH_2OCH_3 + Br^-$

(c) Explain why the reaction of t-butylbromide is faster through SN^1/E1 pathway in the presence of Ag^+ ion. **(5)**

(d) Two substitution products result from the reaction of 3-Chloro-3-Methyl-1-butene with sodium acetate (CH_3COONa) in acetic acid under SN^1 conditions. Identify the thermodynamic product and the Kinetic product. **(5)**

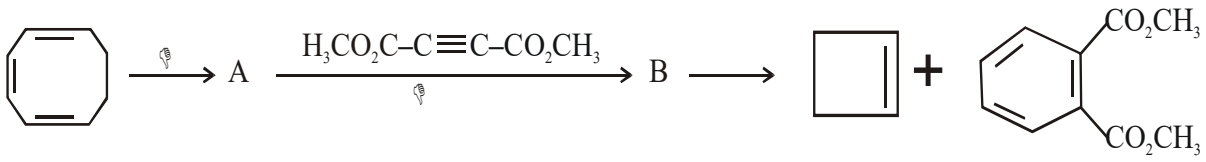
3. (a) Explain the results of the following electrocyclic reactions by Frontier Molecular Orbital (FMO) approach: **(10)**





(b) Write down the selection rules for cycloaddition reactions. **(5)**

(c) Complete the following reactions sequence: **(5)**



4. (a) How can you prepare Nylon-66 starting from its monomers? **(5)**

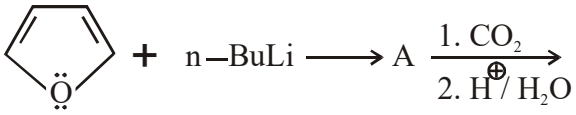
(b) Explain why natural rubber is elastic in nature. How can you reduce its elasticity by applying a suitable chemical process? **(5)**

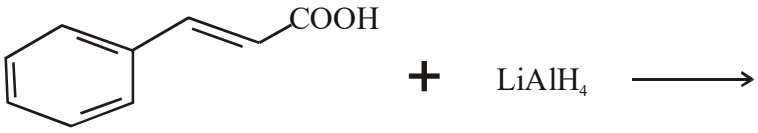
(c) Give the names and write the structures of the monomers of the following polymers. **(2×5=10)**

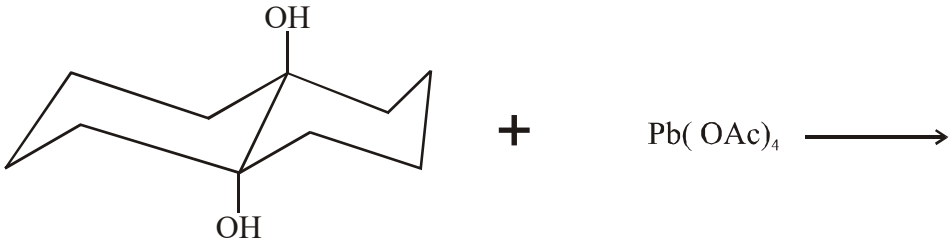
(i) Buna–N
(ii) PVC
(iii) Teflon
(iv) Terylene
(v) Nylon–6

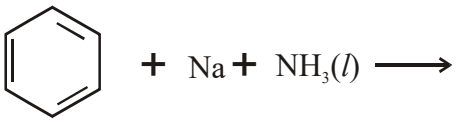
PART B

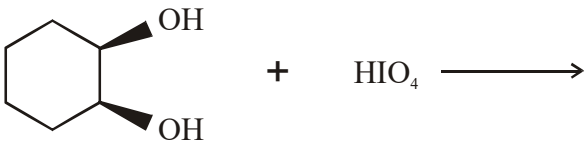
5. Write the products of the following reactions with mechanism. **(5×4=20)**

(a) 

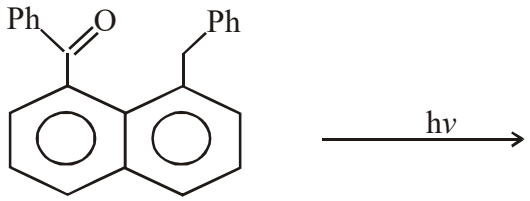
(b) 

(c) 

(d) 

(e) 

6. (a) Predict the products in the following photo chemical reactions. **(2×5=10)**

(i) 

(ii) $CH_3CH_2CH_2CH_2-\overset{\overset{O}{\|}}{C}-NH_2 \xrightarrow{h\nu}$

(b) Gas phase irradiation of 2-pentanone produces acetone and ethylene in about 90% yields along with 10% of 1-methylcyclobutane. Account for the formation of these three photo chemical products. **(5)**

(c) Irradiation of ethylmethylketone leads to the formation of varieties of products. Predict them with proper justification. **(5)**

7. (a) Show that for a diatomic molecule, the moment of inertia, $I = \mu r^2$. **(10)**

(b) Why are the anti–stokes line less intense than the stokes line in the Raman Spectrum? **(5)**

(c) Write any two applications of Raman Spectroscopy. **(5)**

8. (a) What is McLafferty rearrangement? Explain with suitable examples. **(5)**

(b) How can you distinguish the isomeric ketones, 3 – methylpentan – 2 – one and 4 – methylpentan – 2 – one by mass spectrometry? **(5)**

(c) An organic compound A of molecular formula $C_6H_{12}O$ forms 2, 4 – DNP derivative. It does not reduce Tollen's reagent but undergoes haloform reaction. Its mass spectrum has m/z = 43 (base peak), 73,100 (molecular ion peak). Deduce its correct structure. **(5)**

(d) Sketch the ^{1}HNMR spectra of anhydrous ethanol with proper justification. **(5)**

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