[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1352 **A**

Unique Paper Code : 32171602

Name of the Paper : Organic Chemistry V : Spectroscopy

Name of the Course : **B.Sc. (Hons.) Chemistry**

Semester : VI

Duration : 3.5 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **six** questions.
3. **All** questions carry equal marks.

1. (a) A and B are two isomers of C_3H_6O based upon peaks obtained in spectral data recorded in ^1H NMR spectrophotometer: Identify A and B, give their IUPAC names and explain :

   (i) A : ^1H NMR, (in $CDCl_3$): δ1.1(t,3H), δ2.1 (m,2H), δ 9.5 (t, 1H)

P.T.O.

IR (in Nujol) wave number: 2720cm^{-1} (doublet, m) and 1735cm^{-1}(s)

(ii) B: ^{1}H NMR, (in $CDCl_3$) δ2.3(s,6H)

IR (in Nujol) : 1710 cm^{-1}(s)

(b) Compound A shows strong peak in IR spectrum at 1717 cm^{-1} and give positive test with DNP. on reaction with hydroxylamine and followed by a well known Beckmann rearrangement gives compound B. Compound B polymerizes to give polymer, C. Identify, give name and structural formula of the compounds A, B and C (polymer).

$$\underset{\text{A}}{C_6H_{10}O} \xrightarrow[\text{(ii) } H_2SO_4]{\text{(i) } NH_2OH} \text{B} \xrightarrow{H_2O} \text{C (Polymer)}$$

(c) λ_{max} of Acetone in hexane is 279 nm while in water is 264.5 nm. Assign the given peak and explain by drawing transitions involved showing HOMO-LUMO. (4,4,4.5)

2. (a) Using N,N-Dimethylaniline writing all necessary conditions and reagents give synthesis of :

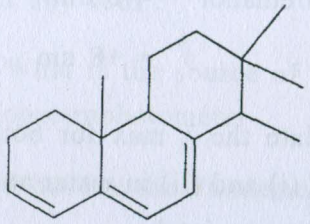
(i) Methyl orange and

(ii) Malachite green

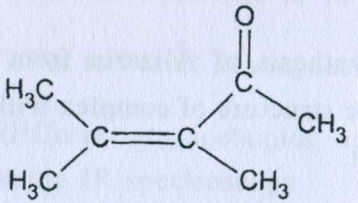
(b) Give stereochemical structure of (-)-chloramphenicol, its IUPAC name, uses and the name of species from which it is isolated.

(c) Calculate the λ max. for π→π* in nm for the following compounds :

(i)



(ii)



Homoannular conjugated diene's base value = 253 nm

Heteroannular conjugated diene's base value = 215 nm

Increment for each substitution

Alkyl substituent or ring residue	= 5 nm
Exocyclic double bond	= 5 nm
Double bond extending conjugation	= 30 nm
Acyclic enone base value	= 215 nm

P.T.O.

α-Alkyl group or ring residue = 10 nm

β-Alkyl group or ring residue = 12 nm

γ-Alkyl group or ring residue = 17 nm

for correction in solvent :

methanol/ethanol = 0 nm

water = +8 nm

Also calculate the λ max for both of the above compounds (i) and (ii) in water and ethanol using correction appropriately. (4,4,4.5)

3. (a) Give synthesis of Alizarin from anthraquinone. Give the structure of complex with Aluminium as mordant.

(b) Give the synthesis of Congo red dye. Mention the pH at which it gives the blue colour and red and explain with structure change.

(c) What is Leuco base in a triphenylmethane dyes? Explain with appropriate reaction. Give synthesis of crystal violet dye. (4,4,4.5)

4. (a) Calculate the frequency of C-H stretching vibration from the following data :

Force Constant K = 5×10^{5} gm sec^{-2}

Mass of carbon atom = 20×10^{-24} gm

Mass of hydrogen atom = 1.6×10^{-24} gm

Velocity of the radiation(c) = 2.998×10^{10} cm sec^{-1}

(b) Attempt any **four** :

(i) What is the source of IR radiations in IR spectrophotometer

(ii) What are the Fundamental Vibrations?

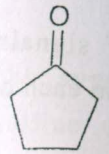
(iii) What are overtones in IR spectra?

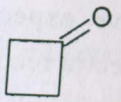
(iii) What is Fermi Resonance?

(iv) Differentiate acetamide and ethyl amine using IR spectroscopy.

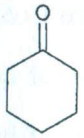
(v) Differentiate in 1-Butyne and 2-Butyne using IR spectroscopy.

(c) Assign the appropriate C=O stretching frequency against the following structures. Justify the answer :

(i) 

(ii) 

P.T.O.

(iii)  (iv) 

Stretch frequencies are

(a) 1745 cm^{-1}

(b) 1780 cm^{-1}

(c) 1815 cm^{-1}

(d) 1715 cm^{-1} (4,4,4.5)

5. (a) Give the synthesis of Bakelite and its uses.

(b) Outline the synthesis of Nylon-6,6 and its uses.

(e) Write the mechanism involved when vinyl chloride in polymerised in presence of benzoyl peroxide? (4,4,4.5)

6. (a) (i) Define chemical shift and coupling constant.

(ii) How will you differentiate in between cis and trans cinnamic acid ^1H NMR spectroscopy.

(b) Give expected number of signals by ^1H NMR spectra recorded in $CDCl_3$ in each of the following compounds :

(i) 1,2-dichloroethane

(ii) Ethyl acetate

(iii) cyclohexane (at low temperature)

(iv) 2-chloroethanol

(c) A compound with molecular weight 116 gave the following spectral information :

(i) UV (in ethanol): λ_{max} = 283 nm ε_{max} = 22

(ii) IR (in Nujol): 3000-2500 (b), 1715 (s), 1342 cm^{-1} (w)

(iii) NMR (in $CDCl_3$): δ 2.12 (s, 3H)
δ 2.60 (t, 2H)
δ 2.25 (t, 2H)
δ 11.1 (t, 1H)

Find the structural formula of the compound. (4,4,4.5)

7. (a) Give the Boots synthesis of Ibuprofen and its uses.

(b) Give the synthesis of chloroquine from m-chloroaniline. Give its uses and side effects.

P.T.O.

(c) Give the structure of the main alkaloid present in curcumin. Discuss the therapeutic uses of curcumin. (4,4,4.5)

8. (a) Give the synthesis and uses of Buna-S rubber.

(b) (i) What is Dacron? Write structures of its monomer(s).

(ii) Give name and structures of two biodegradable polymers.

(c) How do you prepare Polyurethane? Mention two uses. (4,4,4.5)

9. An organic compound with molecular formula C_4H_9NO gave the following spectral data :–

(i) UV (in Ethanol): λ_{max}: 220 nm, $\in$max : 63

(ii) IR (in Nujol): 3500 cm^{-1} (m), 3402 cm^{-1} (m), 2960 cm^{-1} (w), 1682 cm^{-1} (s), 1610 cm^{-1} (s)

(iii) NMR (in $CDCl_3$): δ 1 (d, 6H), δ 2.1 (septet, 1H), δ 6.8 (br s, 2H)

Calculate DBE, assign spectral peaks appropriately in spectral data, give structural formula and the name of the compound. (12.5)