[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2534 IC

Unique Paper Code : 42177926

Name of the Paper : ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLYNUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY

Name of the Course : **B.Sc. Programme Physical Science/Life Science/App. Phy. Sc. : DSE-2B**

Semester : VI

Duration : 3 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 **three** questions each from **Section A** and **Section B.**
3. Use separate Answer booklet for each section.

SECTION A

1. (a) Explain the magnetic behaviour of potassium ferricyanide.

P.T.O.

(b) How is $Na_3[Co(NO_2)]$ prepared?

(c) What happens when : (Give balanced chemical equation)

(i) $Na_3[Co(NO_2)]$ is treated with KCl.

(ii) $K_2Cr_2O_7$ reacts with KI.

(iii) $K_4[Fe(CN)_6]$ is treated with $FeCl_3$.

(iv) Sodium nitroprusside is treated with sodium sulphide.

(d) (i) Explain the oxidising nature of $KMnO_4$.

(ii) To an orange red solution of compound X aqueous solution of KOH is added which results in the formation of yellow solution of compound Y. On acidifying with H_2SO_4, the yellow colour changes to orange red again. Identify the componds X and Y and give the chemical reactions involved. (2,2,4,4.5)

2. (a) Mn(CO)5 dimerises. Why?

(b) Explain the synergic effect in metal carbonyls.

(c) (i) Calculate the EAN of the following :

$Mn(CO)_5Cl$ and $Fe_3(CO)_{12}$

(ii) Draw the structure of ferrocene.

(d) The CO stretching frequency in IR spectra are as follows: $[Mn(CO)_6]^+$ 2090 cm^{-1}, $[Cr(CO)_6]$ 2000 cm^{-1}, $[V(CO)_6]^-$ 1860 cm^{-1}, $[Ti(CO)_6]^{2-}$ 1750 cm^{-1}. Its value for CO (g) is 2143 cm^{-1}. Discuss.

(2,2,4,4.5)

3. (a) What are metalloporphyrins? Discuss the role played by haemoglobin and myoglobin in transporting oxygen.

(b) Discuss the biological role of magnesium.

(c) What is active transport? Explain Na/K pump.

(4,4,4.5)

4. (a) Draw the structures of the following compounds :

(i) $Co_2(CO)_8$ in solid state

(ii) $Co_2(CO)_8$ in hexane

(iii) $Fe_3(CO)_{12}$

(iv) $Fe_2(CO)_9$

P.T.O.

(b) Explain why direct nitration of ferrocene is not possible? How can you get nitro derivative of ferrocene?

(c) Discuss the role of sodium ions present in the biological system. (4,4,4.5)

SECTION B

Attempt any three questions.

5. (a) Explain molecular orbital structure of naphthalene.

(b) What do you understand by bathochromic shift and hypsochromic shift? What shift would be observed on increasing the conjugation in the compound?

(c) Why electrophilic attack in anthracene is favoured at C-9?

(d) (i) How is ethyl acetoacetate prepared from acetaldehyde?

(ii) Why is methylene group of EAA reactive? (2,2.5,4,4)

6. (a) What is the finger print region in IR spectrum? How is it useful for structure determination?

(b) Pyridine is less reactive towards electrophiles than pyrrole and benzene. Explain.

(c) Calculate λ_{max} for the following compounds using Woodward Fieser rules :

(i) 

(ii) 

(d) How will you prepare the following from ethylacetoacetate :

(i) 2,4-pentanedione or Acetylacetone

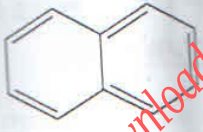
(ii) 2-methyl propanoic acid (2,2.5,4,4)

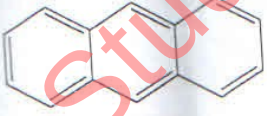
7. (a) Why are the peaks observed in UV spectrum broad in comparison to the peaks in IR spectrum?

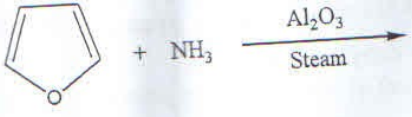
P.T.O.

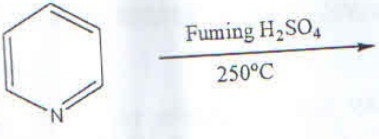
(b) Define tautomerism. What type of tautomerism exists in ethylacetoacetate? Draw the structures of tautomers.

(c) Give the products for the following reactions :

(i) 

(ii) 

(iii) 

(iv) 

(d) What is the order of following carbonyl compounds in decreasing wavenumber? Explain by giving reasons.

butanoyl chloride; ethylbutanoate; pentanal; propanoic acid (2,2.5,4,4)

8. (a) Why electrophilic substitution in pyrrole and furan cannot be carried in presence of concentrated strong acids?

(b) Arrange furan, pyrrole and thiophene in increasing order of aromatic character. Give reason for your answer.

(c) How would differentiate the following compounds by using IR spectroscopy :

(i) $CH_3CH_2OCH_3$ and $CH_3CH_2CH_2OH$

(ii) CH_3COCH_3 and CH_3CH_2COOH

(d) (i) Give the reaction for ketonic hydrolysis of ethylacetoacete.

P.T.O.

(ii) How would you synthesize butanone starting from ethylacetoacetate. (2,2.5,4,4)

(2000)