[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1590 **A**

Unique Paper Code : 42177926

Name of the Paper : DSE : Organometallics, Bio-inorganic Chemistry, Polynuclear Hydrocarbons and UV, IR Spectroscopy

Name of the Course : **B.Sc. (Prog.)**

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 **three** questions from **Section A** and **three** from **Section B**.

SECTION A

(Attempt any **three** *questions)*

1. (a) Compound A when heated with a soluble chloride and concentrated H_2SO_4 gives orange red vapours of compound B. When an alkali is added to A it gives yellow coloured compound C which on

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acidifying converts back to A. Identify compounds A, B and C and write the chemical reactions involved.

(b) Draw and explain the structure of Ferrocene.

(c) What do you mean by cooperativity in haemoglobin? Discuss the role of haemoglobin and myoglobin in biological system. (4,4,4.5)

2. (a) Discuss 18-electron rule for metal carbonyls. Predict which of the following molecule does not obey 18-electron rule

(i) $[Fe(CO)_5]$

(ii) $[Cr(CO)_5]^{2-}$

(iii) $[Mn(CO)_4Cl_2]^{2-}$

(iv) $[(\eta^5\text{–}C_5H_5)_2Fe]$

(b) With reference to molecular orbital diagram explain that CO acts as both Lewis acid and Lewis base.

(c) With the help of diagram explain the mechanism of sodium-potassium pump. Why it is considered as an active transport. What is the source of energy for its functioning? (4,4,4.5)

3. (a) Give Reasons for the followings :

(i) Nickel tetracarbonyl is a stable carbonyl but Manganese does not form stable mononuclear carbonyl.

(ii) IR stretching frequency of CO bond is different in terminal and bridging carbonyls.

(b) Discuss the role of Na^+ and Mg^{+2} ions in biological system.

(c) Give method of preparation of potassium ferrocyanide. What is the oxidation state of iron in it? How is it used for the identification of Zn^{+2} ions present in an organic salt? Give chemical reactions. (4,4,4.5)

4. (a) What happens when (give balanced chemical equations)

(i) $KMnO_4$ reacts with a ferrous salt in acidic medium.

(ii) A solution of potassium dichromate containing dilute H_2SO_4 and ether is treated with H_2O_2.

(iii) Sulphuric acid is added to a saturated solution of K_2CrO_4.

(iv) $K_4[Fe(CN)_6]$ is treated with copper sulphate.

(b) Discuss lead-poisoning and mercury-poisoning in brief.

(c) What are organometallic compounds? Which of the followings are not organometallic compounds?

(i) Zeise's Salt

(ii) Cisplatin

(iii) Ferrocene

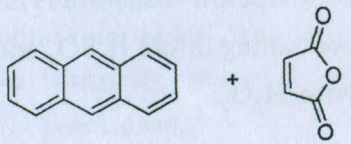
(iv) Sodium ethoxide

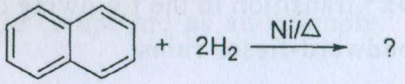
(v) Grignard Reagent (4,4,4.5)

SECTION B

(Attempt any **three** *questions)*

5. (a) What happens when :

(i) 

(ii) 

(b) Pyridine primarily undergoes nucleophilic substitution at 2- or 6- position. Explain

(c) How will you convert :

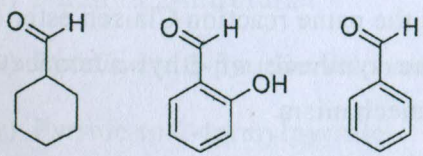
(i) Ethyl acetoacetate $\xrightarrow{\text{Ketonic hydrolysis}}$ Acetone

(ii) Ethyl acetoacetate $\xrightarrow{\text{Acidic hydrolysis}}$ Acetic acid

(d) Discuss the theory of electronic spectroscopy with a neat diagram showing electronic transitions in 1,3-butadiene.

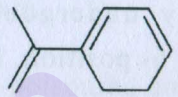
(e) Explain: chromophores. (2,2,4,2.5,2)

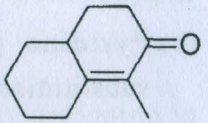
6. (a) Giving reasons, predict the C=O frequency shift in the given aldehydes, C=O stretching frequencies are 1665 cm^{-1}, 1700 cm^{-1} and 1730 cm^{-1}.



P.T.O.

(b) Calculate the absorption maximum (λ_{max}) for $\pi \rightarrow \pi^*$ transition in the following compounds using Woodward-fieser rules.

(i) 

(ii) 

Parental/Base values	λ_{max} (nm)
Acyclic/ Heteroannular dienes	214
Homoannular dienes	253
α, β unsaturated Acyclic ketones	215
α, β unsaturated Aldehydes	210

Increments	(nm)
Alkyl substitution/ Ring residue	+5
Additional conjugation	+30
Exocyclic double bond	+5
α-alkyl substituent	+10
β-alkyl substituent	+12

(c) Write notes on: Bathochromic shift

(d) How will you distinguish the following pair of compounds using IR spectra?

(i) $CH_3CH_2COOCH_3$ and CH_3COCH_3

(ii) $CH_3CH_2CH_2COOH$ and $CH_3CH_2CH_2CHO$

(4,3,1.5,4)

7. (a) Write the name reaction Claisen ester condensation for the synthesis of ethyl acetoacetate. Explain with mechanism.

(b) Explain the Keto-enol tautomerism by taking active methylene compound as an example.

(c) How will you prepare the following from ethyl acetoacetate : **(Attempt any six)**

(i) Gluteric acid

(ii) Crotonic acid

(iii) Cinnamic acid

(iv) 4-methyluracil

(v) Pentane 2,4-dione

(vi) Methylisoxazolone

(vii) Cyclohexyl methyl ketone

(viii) Ethyl methyl ketone (4,2.5,6)

8. (a) How will you carry out the following conversions?

(i) Anthracene to 9-bromoanthracene

(ii) Naphthalene to Decalin

(iii) Furan to 2-nitrofuran

(iv) Pyridine to 3-pyridinesulphonic acid

(v) Pyrrole to 2-formylpyrrole

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(b) How do you synthesize anthracene using Haworth synthesis?

(c) Pyridine is more basic than pyrrole. Explain

(d) Draw the resonating structure of naphthalene.

(5,3,3,1.5)