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. Life Science/ Physical Science/ Analytical Chemistry/ Industrial Chemistry
Semester	:	VI
Duration	:	3 Hours
Maximum Marks	:	75

Instructions for the candidate:

(i) Attempt two questions each from Section A and Section B

(ii) All questions carry equal marks.

(iii) Attempt each section separately

SECTION A

1.a) Draw structure of the Zeise's salt and mention in which class of compounds will you place it?

b) Arrange the following species in their decreasing CO stretching vibrational frequencies and explain the reason:

(i) $V(CO)_6^-$, $Cr(CO)_6$, $Fe(CO)_6^{2-}$

(ii) $[Mn(CO)_6]^+$, $[V(CO)_6]^-$, $Cr(CO)_6$

c) Explain with the help of a suitable diagram the working of sodium potassium pump in the human body. What is the source of energy for the functioning of this pump?

d) How is sodium nitroprusside prepared? How does it react with:

alkali metal sulfides, alkali metal sulfites and silver nitrate solution?

(0.75,6,6,6)

2. a) Using the 18 electron rule as a guide find **m** and **n** in

$[(\eta^6\text{-}C_6H_6)_mCr(CO)_n]$, $Fe_3(CO)_n$

b) Give balanced chemical equation for the following:

(i) Potassium ferrocyanide is added to copper sulphate solution.

(ii) Potassium dichromate is treated with lead nitrate solution.

(iii) Potassium iodide reacts with moderately alkaline potassium Permanganate solution.

(iv) Potassium ferrocyanide is treated with concentrated sulfuric acid.

(v) Potassium ferrocyanide is treated with ferric salts.

(vi) SO_2 gas is passed through acidic $K_2Cr_2O_7$ solution.

c) How is iron transferred from storage sites to the sites for incorporation in haemoglobin? Inability to synthesize transferrin may result in anaemia as well as overload of iron. Explain.

d) State effective atomic number rule. What are effective atomic numbers of the metal atoms in

(i) $V(CO)_6$ (ii) $[Fe(CO)_4]^{2-}$ (iii) $Co_2(CO)_8$

(0.75,6,6,6)

3. a) Name the metal involved in following metallobiomolecules.

(i) Transferrin

(ii) Chlorophyll

(iii) Myoglobin

b) Discuss the behaviour of CO as strong π acid ligand with the help of molecular orbital diagram.

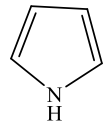
c) Draw structures of CrO_4^- and $Cr_2O_7^{2-}$? Write ionic equations for inter conversion of CrO_4^- and $Cr_2O_7^{2-}$ in acidic as well as alkaline medium.

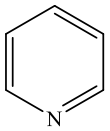
d) What are the functions of haemoglobin and myoglobin? What changes occur in the heme groups of hemoglobin on going from deoxy to oxy form?

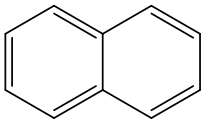
(0.75,6,6,6)

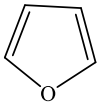
SECTION B

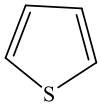
4.a) Complete the following reactions:

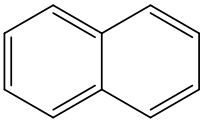
i  $CHCl_3$/ KOH

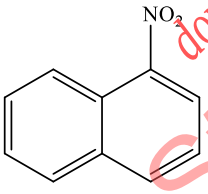
ii  H_2SO_4 , $HgSO_4$, 220°C

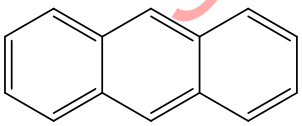
iii  CrO_3, CH_3COOH

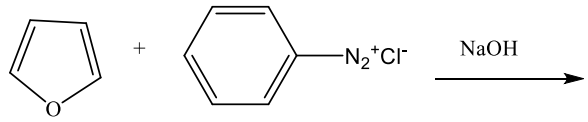
iv  + $(CH_3CO)_2O$ BF_3, 0°C

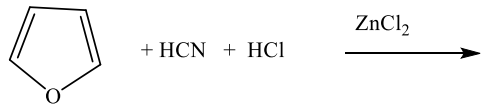
v  + HCHO + HCl

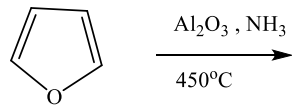
vi  H_2/Ni, 150°C

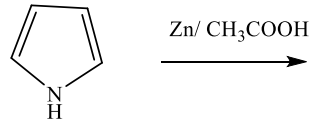
vii  HNO_3, H_2SO_4

viii  Na/Hg, Isopentanol

ix 

x 

xi 

xii 

b) Nucleophilic substitution reactions takes place more readily in pyridine ring as compared to benzene ring.

OR

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

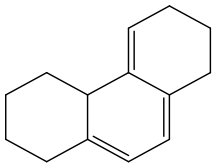
c) How will you show that naphthalene molecule consists of two benzene rings fused together at ortho positions. Give reactions involved.

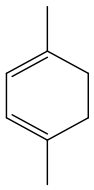
d) State weather the following statement is true or false

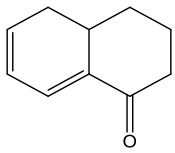
The C1-C2 bond length in naphthalene is longer than C2-C3 bond length.

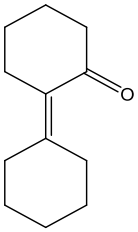
(12, 3, 3, 0.75)

5.a) Calculate the λ_{max} of the following compounds using Woodward-Fieser rules.

i 

ii 

iii 

iv 

Use the following data for calculation

i) Parent Six membered ring ketone = 215 nm
ii) Parent acyclic diene = 217 nm
iii) Parent Heteroannular diene = 214 nm
iv) Parent Homoannular diene = 253 nm

b) How will you distinguish between the following pairs of compounds using IR Spectroscopy. **(ANY 2)**

(i) Propanal and Acetone

(ii) o-hydroxy benzoic acid and p-hydroxy benzoic acid

(iii) cis and trans Cinnamic acid

c) "Increase in polarity of the solvent shifts π- π* band to longer wavelength but n- π* to short wavelength." Comment on the statement.

d) Arrange the following molecules in increasing order of carbonyl group absorption frequency

(i) p-amino acetophenone

(ii) p-nitro acetophenone

(iii) p-methoxy acetophenone

(10, 4, 3, 1.75)

6.a) Prepare the following organic compounds using ethylacetoacetate **(ANY 3)**

(i) 3-Methyl-2-pentanone

(ii) Succinic acid

(iii) n-Butyric acid

(iv) Methylethyl ketone

b) Pyridine on nitration gives mainly 3-nitropyrdine but on treatment with $NaNH_2$ 2-aminopyridine is obtained. Explain.

c) Account for the formation of 1-naphthalene sulphonic acid at low temperature and 2-naphthalenesulphonic acid at high temperature.

d) The U.V Spectrum of acetone shows the peaks at

(i) $\lambda max = 280$ nm $\varepsilon max = 15$

(ii) $\lambda max = 190$ nm $\varepsilon max = 100$

Form the data given above identify

(i) The electronic transition for each

(ii) Which is more intense and why?

e) Write stepwise synthesis of naphthalene using Haworth's method.

f) Define the term bathochromic shift and what structural feature may produce a bathochromic shift.

(9, 2, 2, 2, 2, 1.75)