Sr. No. of the Question Paper :

Unique Paper Code : 42177926

Name of the paper : Organometallics,Bio-Inorganic Chemistry,Polynuclear Hydrocarbons and UV,IR Spectroscopy

Name of the Course : B.Sc. (P) Chemistry

Semester : VI

Duration : 2 Hours

Maximum Marks : 75

Instructions for Candidate

[1]Attempt **two** questions each from Section A and Section B

[2] All questions carry equal marks

Section A

1. a) Define organometallic compounds. Which of the following is an organometallic compound?

$[Li(CH_3)]_4$, CH_3COONa, , $[SiH(C_2H_5)_3]$

b) What is meant by essential and non essential metal ions in biological system? Give atleast two examples of each type.

c) Write down the balanced chemical equation for the following reactions:

i. H_2O_2 is added to acidified potassium dichromate.

ii Potassium ferrocyanide is reacted with Chlorine.

iii Potassium permanganate in acidic medium is reacted with potassium iodide .

iv Sodium nitroprusside is reacted with sodium sulphide.

d) Describe the active transport with reference to Sodium-Potassium pump. Illustrate with a suitable diagram the working of the pump.

e) Draw the structures of the following dimeric carbonyls:

(i) $Mn_2(CO)_{10}$

(ii) $Fe_2(CO)_9$

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

(1.75,3,4,4, 6)

2. a) What is 18 electron rule. 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).Name the biomolecules involved in storage and transportation of iron.
In which part of human body are they found?

c) Account for the following:

(i) All Ni – C bond lengths in $Ni(CO)_4$ are identical but Fe – C bond lengths in $Fe(CO)_5$ are not identical.

(ii) CO is referred to as a π acid ligand.

d) How is Potassium dichromate prepared from chromite ore? Give the balanced chemical equations involved.
Write two important uses of Potassium dichromate.

e) Describe the Perutz mechanism of oxygenation of haemoglobin.

(1.75,3,4,4, 6)

3. a) What is the hapticity of a ligand in Ferrocene?

Draw the structures of
(i) Ferrocene in eclipsed and staggered form.
(ii) Zeise's salt

b) Discuss the role of magnesium in energy production.

c). Arrange the following species in increasing order of the property mentioned;

(i) $[Mn(CO)_6]^{2+}$, $[Cr(CO)_6]^{+}$, $V(CO)_6$ – IR stretching frequency of M – C bond

(ii) $[Fe(CO)_4]^{2-}$, $[Co(CO)_4]^{-}$ and $Ni(CO)_4$ – IR stretching frequency of C – O bond

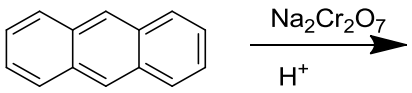
d). A green Chromium Compound A on fusion with alkali gives a yellow compound B which on acidification gives an orange coloured Compounds C 'C' on treatment with NH_4Cl, gives an orange coloured product D, which on strong heating decomposes to gives back compound A. Identify A, B, C and D write down the equations involved.

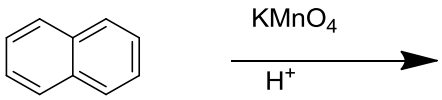
e) Draw the oxygen saturation curves for myoglobin and hemoglobin and justify myoglobin has greater affinity for oxygen than hemoglobin.

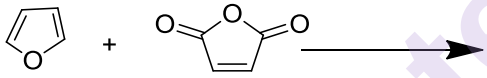
(1.75,3,4,4, 6)

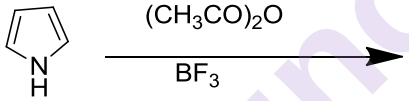
Section B

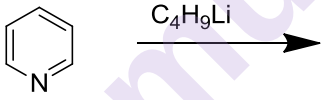
1. a) Complete the following reactions:

i) 

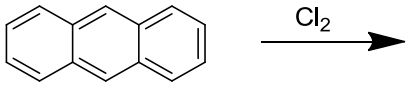
ii) 

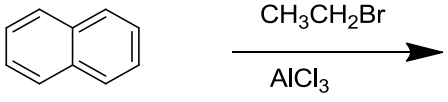
iii) 

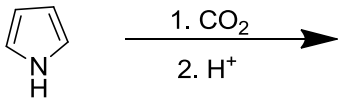
iv) 

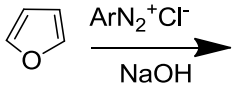
v) 

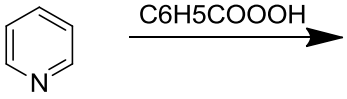
vi) 

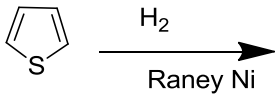
vii) 

viii) 

ix) 

x) 

xi) 

xii) 

b) Pyridine is more basic than pyrrole. Explain.

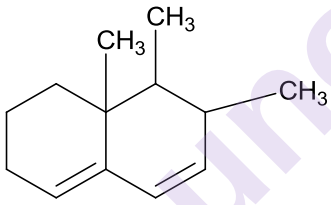
c) What are chromophores and auxohromes. Explain with examples.

d) Can you distinguish between *cis* and *trans* stilbene using UV spectroscopy. Explain.

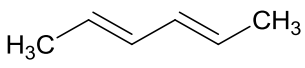
e) State if true or false: Furan is less aromatic than thiophene.

(12,2,2,2,0.75)

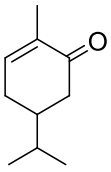
2 .a) Calculate λ_{max} for the following:

i) 

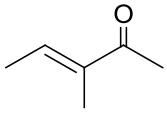
Base value 215nm

ii) 

Base value 217nm

iii) 

Base value 215nm

ii) 

Base value 215nm

b) i) Pyridine undergoes electrophilic reactions at C-3. Explain.

ii) Define the following: Bathochromic shift, hypsochromic shift, chromophore and auxochrome.

iii) State if true or false: Since n $\longrightarrow$ π^* transition is symmetry forbidden the intensity of this transition is much lower than that of allowed transitions in case of carbonyl compounds.

(12,2,4,0.75)

3. a) Starting with ethylacetoacetate synthesize the following:

i) 2-Methyl-hexanoic acid

ii) Cinnamic acid

iii) Butanone

iv) Succinic acid

v) Crotonic acid

b) i) How will you distinguish between following compounds using IR spectroscopy:

CH_3COCH_3 and CH_3CH_2CHO

c) Give the positions of following characteristic absorptions in IR spectroscopy:

i) C-H_{str} in alkanes and alkenes

ii) C=C_{str} in alkenes

iii) C≡N_{str}

iv) N-H_{str} in amines

v) O-H_{str} in intermolecular and intramolecular H-bonded O-H

d) Write down the resonating structures of furan.

(10,2,5,1.75)