

Unique Paper Code	:	42177926
Name of the Paper	:	<b>DSE Organometallics, Bio-inorganic Chemistry, Polynuclear Hydrocarbons and UV, IR Spectroscopy</b>
Name of the Course	:	B.Sc. (Prog.) 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) Equivalent mass of  $\text{KMnO}_4$  in acidic medium is one-fifth of its molecular weight, explain by giving chemical equation.
  - b) Draw structures of Methyl Lithium and Zeise's Salt.
  - c) Explain why heme group cannot function as biological oxygen carrier in the absence of globin chain? What serves as the trigger in the Perutz mechanism of oxygenation and deoxygenation of haemoglobin?
  - d) How is  $\text{K}_2\text{Cr}_2\text{O}_7$  prepared? Discuss its structure and oxidizing property giving two examples.

(0.75,6,6,6)

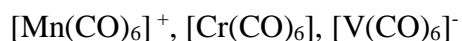
2.
  - a) Draw the structure of Ferrocene in eclipsed and staggered form.
  - b) Write ionic equations for  $\text{KMnO}_4$  as an oxidizing agent in acidic, alkaline and neutral media. Under what conditions it is the most powerful oxidizing agent?
  - c) Define effective atomic number rule. Which of the following species obey EAN?  $[\text{V}(\text{CO})_6]^-$  or  $[\text{Co}(\text{CO})_4]^{2-}$  Also predict the value of  $x$  in (a)  $\text{Co}_2(\text{CO})_x$  (b)  $\text{Fe}_3(\text{CO})_x$
  - d) Explain the term 'active transport' with respect to the working of sodium potassium pump in the animal cells. Illustrate diagrammatically the mechanism of the working of this pump.

(0.75, 6,6,6)

3. a) Which is not a  $\pi$  bonded complex?

- a) Ziese's salt                      b) ferrocene,  
c) tetraethyl lead                      d) dibenzene chromium

b) Predict the order of increasing carbonyl stretching frequencies in the following isoelectronic species and give explanation.



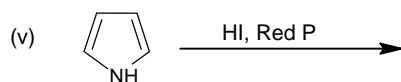
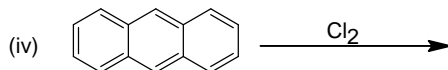
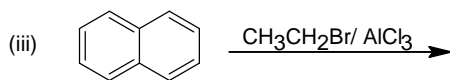
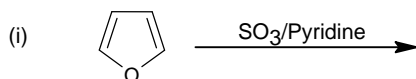
c) A green chromium compound (A) on fusion with alkali gives a yellow compound (B) which on acidification gives an orange-coloured compound (C). (C) on treatment with  $\text{NH}_4\text{Cl}$  gives a coloured product (D) which on strong heating decomposes to give back compound (A). Identify A, B, C and D. Give reactions for all and write down the structure of compound C.

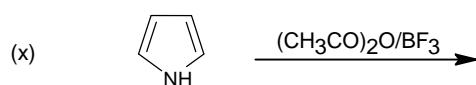
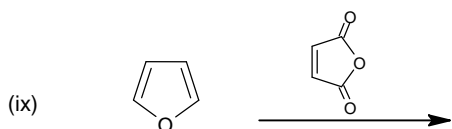
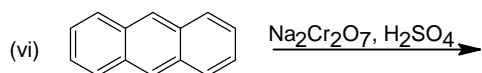
d) Where and in what form is iron stored in the human body? How is it taken from the storage sites for incorporation into haemoglobin?

(0.75,6,6,6)

### SECTION B

4. a) Complete the following reactions:





b) Pyridine is less reactive towards electrophilic substitution reaction than benzene. Give reason

c) Furan undergoes polymerization under acidic conditions. Give reason

d) Sulphonation of naphthalene yields different products at low and high temperatures. Explain.

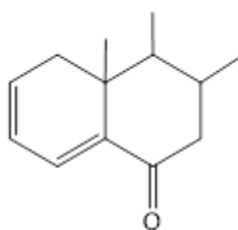
e) Pyrrole is a weak base. Explain

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

(10, 2, 2, 2,2, 0.75)

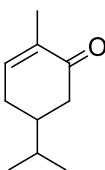
5. a) Calculate  $\lambda_{\text{max}}$  for the following:

(i)



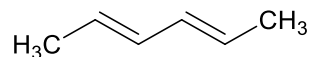
Base Value of  $\lambda_{\text{max}} = 215 \text{ nm}$

(ii)



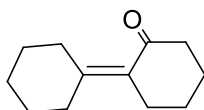
Base value of  $\lambda_{\text{max}} = 215 \text{ nm}$

(iii)



Base value of  $\lambda_{\text{max}} = 217 \text{ nm}$

(iv)



Base value of  $\lambda_{\text{max}} = 215 \text{ nm}$

b) How will you distinguish between  $\text{CH}_3\text{CH}_2\text{-CHO}$  and  $\text{CH}_3\text{-CO-CH}_3$  using IR spectrum.

c) What do you understand by bathochromic shift and hypsochromic shift.

d)  $\lambda_{\text{max}}$  of aniline shifts from 230 nm in neutral medium to 203 nm in acidic medium. Explain

e) Fill in the blank: Number of modes of vibration in  $\text{H}_2\text{O}$  molecule is \_\_\_\_\_.

(12, 2, 2, 2, 0.75)

6 a) Give the synthesis of following compounds from ethyl acetoacetate:

(i) Butanone

(ii) 2-Methyl-hexanoic acid

(iii) 3-ethyl pentane-2-one

(iv) 2,4-pentanedione

b) Give detailed mechanism for synthesis of ethyl acetoacetate starting from ethyl acetate.

c) Explain keto-enol tautomerism in ethyl acetoacetate.

d) Fill in the blank: Number of active hydrogens present in ethyl acetoacetate is \_\_\_\_\_.

(12, 3, 3, 0.75)

