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). What is meant by hapticity of a ligand? Give an example of ligands with hapticity 3, 5 and 6.
  - b).Hemoglobin becomes saturated with oxygen in the lungs and then deoxygenated in the capillaries ,discuss.
  - c). Write down the method of preparation of Potassium permanganate from pyrolusite ore. Why is it intense purple in colour?
  - d) How is iron transferred from storage sites to the sites for incorporation

in haemoglobin?

e) What is synergic effect? How does it account for the stability of carbonyls with

transition metals in low oxidation states? Which one will have higher

Fe - C bond order in  $Fe(CO)_5 \& [Fe(CO)_4]^{2-}$ ? Justify your answer.

(1.75,3,4,4,6)

- 2 . a) What do you mean by essential, trace and toxic elements in biological system. Give an example of essential trace metal ion in human beings.
  - b) What is meant by  $\pi$  acidity? Why is CO a  $\pi$  acid ligand?

- c) In solid phase,  $Co_2(CO)_8$  shows IR CO stretching frequencies in two different regions, 2100-2000 cm<sup>-1</sup> and 1880-1850 cm<sup>-1</sup>.Explain with relevant structures the changes if any, occur when solid compound is dissolved in hexane .
- d) What are peroxo compounds of chromium? Give the structures of any two.
- e) How is the unequal concentration of Na<sup>+</sup> and K<sup>+</sup> ions in extra cellular and intracellular fluid controlled in the human body? Give a diagrammatic representation of the process and explain the mechanism involved in it.

What is the source of energy in it?

(1.75,3,4,4,6)

3. a). State Effective atomic number rule. What are effective atomic numbers of the metal

atoms in;

```
(i)V(CO)<sub>6</sub> (ii)[Fe(CO)<sub>4</sub>]<sup>2-</sup> (iii)Co<sub>2</sub>(CO)<sub>8</sub>
```

- b). Discuss Bohr's effect.
- c). Name the metal involved in following metallobiomolecules

(i)Transferrin (ii)Chlorophyll (iii)Myoglobin (iv) Vitamin B12

- d) Write the chemical composition of
  - (i) blue violet peroxochromium(VI) species.
  - (ii) Prussian blue
  - (iii) Sodium Nitroprusside
  - (iv) Sodium Cobaltinirite
- e) Write down any one method of preparation of a metal carbonyl. Give suitable example. Draw the structures of

(i) Methyl lithium (ii) Zeise's salt

(1.75,3,4,4, 6)

## Section B

## 1 a) Complete the reactions:



- b) Sulphonation of naphthalene yields different products at low and high temperatures. Explain.
- c) Furan acts as a good conjugated diene in Diel's Alder reaction but pyrrole and thiophene do not. Explain
- d) Pyridine is stronger base than pyrrole but weaker than aliphatic amines.
- e) Fill in the blank: Number of resonating structures in naphthalene are \_

(10, 3, 2,3, 0.75)

2 a) Calculate the  $\lambda$ max for the following compounds:



Base Value of  $\lambda max = 221 nm$ 



Base Value of  $\lambda max = 237nm$ 



Base Value of  $\lambda max = 249$  nm

Base Value of  $\lambda max = 258nm$ 

b) How will you distinguish between CH<sub>3</sub>CH<sub>2</sub>-CHO and CH<sub>3</sub>-CO-CH<sub>3</sub> using IR spectrum.

c)Explain the synthesis of ethylacetoacetate by Claisen ester condensation with mechanism.

d)Electrophillic substitution reaction in 5 membered aromatic heterocyclic compounds

are preferably favoured at 2-position and not at 3-position.

e) Fill in the blank: Number of modes of vibration in CO<sub>2</sub> molecule is \_\_\_\_\_\_

(12, 2, 4, 2, 0.75)

3 a) Give the synthesis of following compounds from ethyl acetoacetate: (any three)

- i) 3-butyl-2-hexanone
- ii) Succinic acid
- iii) 3-ethyl pentane-2-one

iv) 3-butyl-2-hexanone

- b) Isolated double bonds absorbs at lower wavelength as compared to conjugated double bond. Justify the statement.
- c) The C<sub>2</sub>-C<sub>3</sub> bond of naphthalene has lesser double bond character than C<sub>1</sub>-C<sub>2</sub>. Explain
- d) Arrange C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub>, (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>NH, NH<sub>3</sub>, CH<sub>3</sub>NH<sub>2</sub>, (C<sub>6</sub>H<sub>5</sub>)<sub>3</sub>N in decreasing order of their basic strength.
- e) Fill in the blank: Dipole moment of pyrrole is \_\_\_\_\_\_ as that of corresponding tetrahydropyrrole.

(9, 3, 3, 3, 0.75)