

**CARMEL COLLEGE OF ARTS, SCIENCE & COMMERCE FOR WOMEN,  
SEMESTER END EXAMINATION, JULY 2021**

**Semester: VI**

**Inorganic Chemistry - CHC109**

**Total marks: 30      Date: 12/07/2021      Duration: 2 Hours      No. of Pages: 03**

**Instructions:** 1. Upload your answers as one PDF file. The file should be named as follows

**Name of student roll number CHC-109.**

2. Upload the paper in the google class room or Email to  
[thirdyearchemistry@gmail.com](mailto:thirdyearchemistry@gmail.com)

**Q.1 Answer any FIVE of the following**

**(2\*5= 10 Marks)**

- i) Explain synergic mechanism in linear MCO group in mononuclear carbonyls.
- ii) On the basis of VSEPR theory, discuss the structure of Iron Pentacarbonyl
- iii) Calculate the EAN of the following organometallic compounds
  - i)  $\text{Co}_2(\text{CO})_8$
  - ii)  $\text{V}(\text{CO})_3(\pi\text{-C}_5\text{H}_5)(\text{R}_2\text{C}_2)$
  - iii)  $\text{Mn}(\text{CO})_4(\pi\text{-C}_3\text{H}_5)$
  - iv)  $\text{Mn}(\text{CO})_3(\sigma\text{-C}_3\text{H}_5)(\pi\text{-C}_5\text{H}_5)$
- iv) Calculate the magnetic moment of the transition metal complex  $[\text{CoF}_6]^{4-}$ . (The total orbital quantum number of the complex is 3 and the spin and orbital motion of the metal ion do not couple together).
- v) Which of the following complexes are expected to be labile or inert. Explain giving reasons
  - a)  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
  - b)  $[\text{V}(\text{H}_2\text{O})_6]^{2+}$
  - c)  $[\text{Mn}(\text{CN})_6]^{3-}$
  - b)  $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$
- vi) What happens when (give equations and name the product)
  - a) Sodium amide reacts with ammonium nitrate in liquid ammonia
  - b) Sodium hydride is dissolved in liquid ammonia

vii) Complete the following equations



viii) How many symmetry operations will a  $S_5$  axis generate? List all these symmetry operations.

Q.2. Answer any **FOUR** of the following

(5\*4= 20 Marks)

i) Discuss the structure and bonding in ferrocene on the basis of MOT

(ii) a) Determine the ground state term symbol for low spin and high spin  $d^6$  octahedral configuration.

b) On the basis of CFT, explain the violet colour of aqueous solution of  $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$

(iii) Draw the Orgel energy level diagram for the complex  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ . The spectra of this complex shows three transition bands at  $8000\text{ cm}^{-1}$ ,  $16000\text{ cm}^{-1}$  and  $20000\text{ cm}^{-1}$ , assign these bands to the correct transition. Which transition will have the lowest wavelength?

(iv) Discuss the different mechanisms for ligand substitution reactions.

(v) Considering ammonia as a solvent, answer the following questions (3 marks)

(a) Give the chemical equation for the autoionization of pure solvent

(b) What will happen if urea is dissolve in liquid ammonia, which ions will form? Give appropriate equations.

(c) Describe what will happen when metallic sodium is dissolved in liquid ammonia.

Identify the conjugate acid-base pairs in each of the following reactions.

(2 Marks)



(vi) How many symmetry operations will an axis of symmetry generate? Which of the following molecules will possess an inversion centre? (2 Marks)

- a)  $\text{NH}_3$       b)  $\text{SF}_6$       c)  $\text{CH}_4$

Which of the following molecules will possess a  $C_4$  axis of symmetry?

(1 Marks)

- a)  $\text{SiCl}_4$       b)  $\text{CH}_4$

List all the symmetry elements of the trans-dichloro ethene molecules and hence obtain its point group. (2 Marks)

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