

Code No. : 10480 E Sub. Code : CMCH 61

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2024

Sixth Semester

Chemistry - Core

INORGANIC CHEMISTRY - III

(For those who joined in July 2021 - 2022)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- Select the geometry of the coordination number 4 from the following :
 - Trigonal planar
 - Octahedral
 - Either tetrahedral or square-planar
 - Either Square pyramidal or trigonal planar
- Calculate the CFSE for metal ions having the d^4 electrons for low spin octahedral field
 - 16 Dq
 - 6 Dq
 - 4 Dq
 - 20 Dq

- Which of the following statement is not true with reference to ESR?
 - In many free radicals, the g value of the odd electron is close to that of a free electron value
 - In metal ions, g values are often greatly different from the free electron value
 - The energy of the transition is given by $E = g\beta H_0$
 - The number of peaks and shoulders in the absorption curve cannot be determined from the number of minima and maxima in the derivative curve

- Select the correct one to complete the following statement :

In Mossbauer Spectroscopy, for iron complexes in general more positive isomer shifts are obtained for

- σ - bonded complexes
 - extensive π -bonding complexes
 - only for iron complexes
 - It is difficult to predict
- Select the molecule which is the magnesium porphyrin complex
 - Carboplatin
 - Haemoglobin
 - Myoglobin
 - Chlorophyll

- Which of the following trans-directing ligand order is correct?

- $\text{CO} < \text{OH}^- < \text{RNH}_2 < \text{H}_2\text{O}$
- $\text{CO} > \text{OH}^- > \text{RNH}_2 > \text{H}_2\text{O}$
- $\text{CO} < \text{RNH}_2 < \text{OH}^- < \text{H}_2\text{O}$
- $\text{CO} > \text{RNH}_2 > \text{OH}^- > \text{H}_2\text{O}$

- Complete the correct statement that an increase in the positive charge on the reacting species _____

- increases its rate of aquation
- decreases its rate of aquation
- has no effect in its rate of aquation
- is becoming zero

- Which of the following is not obeying the 18 electron rule?

- $(\text{C}_5\text{H}_5)_2\text{Fe}$
- $\text{Ni}(\text{CO})_4$
- $\text{Fe}(\text{CO})_5$
- $\text{Mn}(\text{CO})_5$

- Identify the Wilkinson's catalyst from the following :

- Chlorotris(triphenylphosphine) rhodium(I)
- Bromotris(triphenylphosphine) rhodium(I)
- Chlorotris(triphenylphosphine) rhodium(II)
- Iodotris(triphenylphosphine)rhodium(II)

- Name the element which is involved in glucose metabolism

- Cr
- Co
- Cu
- Ni

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

- (a) Make use of the CFT to explain the magnetic properties of metal complexes.

Or

- Differentiate between high spin and low spin complexes with suitable examples.

- (a) How are Prussian blue and sodium nitroprusside prepared? Mention their uses.

Or

- How are the overall stability and stepwise stability constants related?

- (a) What is oxoprocess? Mention its importance. Discuss its mechanism using $\text{HCo}(\text{CO})_4$ as catalyst.

Or

- Discuss the structure and bonding in Zeise's salt.

14. (a) Analyze the various selection rules of electronic spectroscopy.

Or

- (b) Distinguish between Kramer's degeneracy and zero-field splitting in ESR.

15. (a) Examine the function of Na/K pump.

Or

- (b) Analyze the structure of any two iron-sulphur proteins.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Identify the different kinds of isomerism possible in coordination complexes. Give one example for each case.

Or

- (b) Inspect any four factors affecting the crystal field splitting energy.

17. (a) Compare the inner and outer sphere electron transfer reactions.

Or

- (b) (i) Assess any five factors which affect the stability of the complexes. (5)
(ii) Write down the preparation and uses of Nickel DMG complex. (3)

18. (a) What is Ziegler Natta catalyst? How does it catalyze the polymerization of olefins?

Or

- (b) Discuss the structure and bonding in $\text{Mn}_2(\text{CO})_{10}$, $\text{Co}_2(\text{CO})_8$ and $\text{Fe}_2(\text{CO})_9$.

19. (a) Analyze the principles of MB spectroscopy. How does it apply to explain the spectra of $\text{K}_4[\text{Fe}(\text{CN})_6]$ and FeCl_3 .

Or

- (b) Examine the Jahn-Teller distortion with suitable examples.

20. (a) Assess the structure and function of chlorophyll.

Or

- (b) Inspect the biological functions and toxicity of Fe, Cu, Zn and Hg.