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Reg. No. :

Code No. : 20063 E Sub. Code : CMCH 61

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Sixth Semester

Chemistry — Core

INORGANIC CHEMISTRY – III

(For those who joined in July 2021 and 2022 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Choose the IUPAC name of $[\text{Cr}(\text{en})_3]\text{Cl}_3$ from the following
 - (a) Chromium tri ethylene di amine tri chloride
 - (b) Tris (ethylene di amine) chromium (III) chloride
 - (c) Tris-chloro (ethylene di amine) chromium (III) ion
 - (d) Tri chloro-ethylene di amine chromium (III)

2. Specify the type of isomerism present in $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$ and $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$
 - (a) Ionisation isomerism
 - (b) Linkage isomerism
 - (c) Co-ordination isomerism
 - (d) Co-ordination position isomerism
3. Find out the relationship between stability of the complexes and charges of the central metal ions
 - (a) Stability increases with increase in the charges
 - (b) Stability decreases with decrease in the charges
 - (c) Stability is not dependent on charges
 - (d) Stability increases, charges may decrease or increase
4. Identify the molecular formula of Prussian blue
 - (a) $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$
 - (b) $\text{K}_3[\text{Fe}(\text{CN})_6]_2$
 - (c) $\text{Fe}_3[\text{Fe}(\text{CN})_6]_2$
 - (d) $\text{Fe}_4[\text{Fe}(\text{H}_2\text{O})_6]_3$
5. Which of the following is Zeise's salt?
 - (a) $\text{K}[\text{PtCl}_3\text{C}_2\text{H}_4]$
 - (b) $\text{Fe}(\text{C}_5\text{H}_5)_2$
 - (c) $\text{K}_2[\text{RuCl}_3\text{C}_2\text{H}_4]$
 - (d) $[\text{PtCl}_2(\text{NH}_3)_2]$

6. The Ziegler-Natta catalyst is formed between
- (a) Triethyl aluminium and titanium halide
 - (b) Triethyl aluminium and silver halide
 - (c) Triethyl aluminium and platinum halide
 - (d) Triethyl aluminium and carbon halide
7. Which of the following is true if the paramagnetic radical or ion is located in a perfectly cubic crystal site, the g value
- (a) is independent of the orientation of the g crystal
 - (b) is dependent of the orientation of the crystal
 - (c) becomes zero
 - (d) cannot be predicted
8. Which one of the following is the incorrect statement about Mossbauer Spectroscopy?
- (a) Determine the valence state of iron
 - (b) Does not determine the type of coordination polyhedron occupied by iron atoms
 - (c) Identify of Fe oxide phases
 - (d) Mossbauer parameters are difficult to predict from theory because of long-range interactions

9. Select the molecule whose function is oxygen transport
- (a) Chlorophyll
 - (b) Vitamin B12
 - (c) Cis-platin
 - (d) Haemoglobin
10. What is the oxidation state of iron present in haemoglobin?
- (a) +2
 - (b) +3
 - (c) 0
 - (d) +1

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Apply the CFT to explain the colour and spectra of the complexes.
- Or
- (b) Select any five factors affecting the crystal field splitting energy.
12. (a) Explain the base hydrolysis of metal complexes with the mechanism.

Or

- (b) Write the preparation of sodium nitroprusside and nickel DMG complex. Mention their important uses.
13. (a) How is ferrocene prepared? List and explain any three properties of ferrocene.
- Or
- (b) Discuss the structure of $\text{Mo}(\text{CO})_6$ and $\text{Ni}(\text{CO})_4$.
14. (a) Distinguish between MLCT and LMCT with suitable examples.
- Or
- (b) Analyze the MB spectra of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ and FeCl_3 .
15. (a) Identify the biological applications of Zn, Co, Cu, Mn and Ni.
- Or
- (b) Analyze the structure of vitamin B₁₂. Mention its important function.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Compare the splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes.
- Or
- (b) Examine the stereochemistry of complexes with four co-ordination number.
17. (a) Analyze both the polarization theory and π -bonding theory of Trans-effect.
- Or
- (b) Assess the anation and aqueous reactions with suitable mechanisms.
18. (a) Describe the catalytic action of Wilkinson's catalyst in the hydrogenation of alkene.
- Or
- (b) Explain the EAN rule with suitable examples. Discuss the structure and bonding in $\text{Fe}(\text{CO})_5$, $\text{Fe}_2(\text{CO})_9$ and $\text{Fe}_3(\text{CO})_{12}$.

19. (a) Analyze the effect of Jahn-Teller distortion on electronic spectra of $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$.

Or

- (b) Examine the basic principles of Electron Spin Resonance spectroscopy and Mossbauer spectroscopy.

20. (a) Analyze the structure and function of haemoglobin.

Or

- (b) Inspect the applications of cis-platin and carboplatin.
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