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Reg. No. : .....

Name : .....

**Third Semester M.Sc. Degree Examination, February 2019**  
**Branch : Chemistry**  
**CH/CL/CA/CM 231 : INORGANIC CHEMISTRY – III**  
**(2016 Admission Onwards)**

Time : 3 Hours

Max. Marks : 75

SECTION – A

Answer **any two** among (a), (b) and (c) of **each** question. **Each** sub-question carries **2** marks.

- a)  $\text{NO}^+$ ,  $\text{CN}^-$  and  $\text{CO}$  are isoelectronic species. Arrange them in the decreasing order of their  $\pi$  accepting tendencies. Rationalize your answer.

b) How is Zeise's salt prepared ? Give its structure.

c) 4-coordinate, 16-electron organometallic species are good catalyses. Why ?
- a) What is macrocyclic effect ? Illustrate with an example.

b) What is racemisation reaction ? Explain with an example.

c) What is photo-aquation reaction ? Illustrate with an example.
- a) What is the constitution of cell membrane ? Mention the role of metal ions to stabilize the cell membrane.

b) What is rubredoxin ? How does it differ from ferredoxins ?

c) What is catalase ? What are its functions ?
- a) The IR spectrum of  $\text{Fe}(\text{CO})_5$  shows a band at  $2024 \text{ cm}^{-1}$  for  $\nu(\text{CO})$ , where as the corresponding band for free  $\text{CO}$  occurs at  $2170 \text{ cm}^{-1}$ . Account for this.

b) The fluorine resonance of  $\text{BrF}_5$  contains an intense doublet and a weak quintet. Predict the structure and explain the spectrum.




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- c) What do you mean by Doppler broadening ?
5. a) What are mass defect and binding energy of nucleus ? How are they related ?
- b) Define and differentiate half-life period and average life period of a radio nuclide.
- c) What is nuclear fusion ? What is its importance ? **(10×2=20 Marks)**

## SECTION – B

Answer either **(a)** or **(b)** of **each** question. **Each** question carries **5** marks.

6. a) How are metal nitrosyls synthesized ? Discuss their structures and bonding.
- b) Discuss the important mechanistic steps involved in the following reaction :
- $$n (\text{CH}_2 = \text{CH}_2) \rightarrow [-\text{CH}_2 - \text{CH}_2^-]_n$$
7. a) Discuss the factors affecting the stability of complexes.
- b) Explain the Eigen-Wilkins mechanism for the nucleophilic substitution of an octahedral complex.
8. a) Differentiate passive and active transport of alkali metal ions in biological systems.
- b) Discuss the structure and function of carboxypeptidase A.
9. a) What is Cotton effect ? Sketch and explain the ORD and CD curves for a complex which exhibits positive cotton effect.
- b) How do the Mössbauer spectra of  $\text{Na}_4 [\text{Fe} (\text{CN})_6]$  and  $\text{Na}_2 [\text{Fe} (\text{CN})_5 \text{NO}]$  look like ? Account for the differences.
10. a) Discuss briefly the semiempirical mass equation.
- b) Using one example each, explain heavy ion induced nuclear reaction  and photonuclear reactions. **(5×5=25 Marks)**



SECTION – C

Answer **any three** questions. **Each** question carries **10** marks.

11. Illustrate the ligational behaviour of cyclopentadiene using ferrocene as an example. How is ferrocene synthesised ? Discuss its structure and bonding.

12. Discuss briefly the salient features of outer sphere electron transfer reaction. Illustrate the use of Marcus theory to explain its mechanism.

13. What are ferritin and transferrin ? Discuss their structures and functions.

14. What is the origin of ESR spectrum ? Predict the ESR spectrum of bis (salicylaldimine) copper (II) and explain. Indicate and justify the differences between the expected spectrum and the observed one.

15. Write on :

a) Fermi gas nuclear model, its merits and demerits compared to other models.

b) Ionization counter – principle and working.

**(3×10=30 Marks)**

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