

The Assam Royal Global University, Guwahati

Royal School of Applied and Pure Sciences

Programme: B.Sc Chemistry Semester = 3rd

Semester End Examination, January 2022

Course Title : Inorganic Chemistry III

Course Code : CHY012C302

Time: 3 Hours

Maximum Marks: 70

Note: Attempt all questions as per instructions given.

The figures in the right-hand margin indicate marks.

Section – A

1. Attempt all questions. (Maximum word limit 50) 2 x 8
- What do you mean by facial and meridional isomer? Give examples.
 - “ $[\text{Rh}(\text{NH}_3)_6]^{3+}$ has higher crystal field splitting than $[\text{Co}(\text{NH}_3)_6]^{3+}$.” Why ?
 - Count the TVE of $[\eta^5\text{-Cp}_2\text{Co}]^+$.
 - How catalysts speed up a chemical reaction?
 - Why Cu and Cr unlike other transition metals have a single electron in the 4s orbital?
 - Which is the most stable oxidation state of lanthanoids and why?
 - What is hydrometallurgy?
 - How do you differentiate between calcination and roasting?

Section – B

2. Attempt any two of the following: 6 x 2
- Discuss the crystal field splitting in tetrahedral complexes. Compare the magnetic moment of $[\text{Fe}(\text{CN})_6]^{3-}$ and $[\text{FeF}_6]^{3-}$. 4+2
 - “Square planar complexes are optically inactive.” Why? Draw the optical isomers of $[\text{Co}(\text{en})_2\text{Cl}_2]^+$ and $[\text{Co}(\text{en})_3]^{3+}$. What is ligand isomerism? 2+2+2
 - What are the main postulates of Warner’s theory? Discuss the structures of $\text{CoCl}_3 \cdot n\text{NH}_3$ (where $n=6,5,4,3$) from Warner’s theory. 3+3
3. Attempt any two of the following: 7 x 2
- Discuss the bonding in square planar and trigonal bipyramidal structure with the help of molecular orbital theory. What is the difference between terminal and bridging M-CO bonding? 4+3
 - Discuss the synergic bonding in metal ethylene complex. Why ferrocene exhibit aromatic behavior? 4+3
 - Describe the conditions for reductive elimination reaction of a transition metal ion. Discuss the bonding in Fischer and Schrock carbene. 3+4
4. Attempt any two of the following: 7 x 2
- Define lanthanoid contraction. Explain the ion exchange chromatography technique for separation of lanthanoid. 3+4
 - How do the atomic radii of transition elements vary with increase in atomic number? Why iron, cobalt and nickel are ferromagnetic? 4+3
 - Describe the basicity trend in lanthanoids. Why molar volumes of transition elements are much lower than s and p block elements? 3+4

5. Attempt any two of the following:

7 x 2

- a. How does exchange of π -mesons account for the binding energy between neutron and proton? What is neutron emission and orbital electron capture? Define binding energy. 2+4+1
- b. What is nuclear fusion? What are the ways to obtain controlled fusion reactions? Discuss the nuclear fusion reaction occurring in sun's atmosphere and hydrogen bomb. 2+2+3
- c. Explain the application of radioactive isotopes in tracer techniques and radio carbon dating.
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