BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

UG

Name: …… Roll No.: ……..

Branch: …… Signature of Invigilator: ……

Semester: IVth Date: 27/04/2022 (MORNING)

Subject with Code: **CH207 INORGANIC CHEMISTRY-III (COORDINATION CHEMISTRY)**

	Section A (30)	Section B (20)	Total Marks (50)
Marks Obtained			

INSTRUCTION TO CANDIDATE

1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.
2. The booklet will be distributed to the candidates before 05 minutes of the examination. **Candidates should write their roll no. in each page of the booklet.**
3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.
4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.
5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.
6. Write on both side of the leaf and use pens with same ink.
7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.
8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.
9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.
10. Always maintain the highest level of integrity. Remember you are a BITian.
11. Candidates need to **submit the question paper cum answer sheets before leaving the examination hall**.

BIRLA INSTITUTE OF TECHNOLOGY, MESRA: RANCHI

(END SEMESTER EXAMINATION)

CLASS : IMSc (CBCS) **SEMESTER : IV**

BRANCH : Chemistry **SESSION : SP/22**

TIME : 2.00 HOURS **FULL MARKS : 50**

Subject with Code : CH207 INORGANIC CHEMISTRY-III; Coordination Chemistry

Multiple Choice Questions. **15 x 2 = 30 marks**

1. Primary and the secondary valency of the metal in $[Co(NH_3)_5Cl]Cl_2$ are
a) 2 and 6 respectively b) 3 and 6 respectively
c) 2 and 5 respectively d) 4 and 6 respectively
2. Hybridisation of the central metal ion in $Fe(CN)_6]^{4-}$ is
a) sp^3 b) d^2sp^3 c) sp^3d^2 d) dsp^2
3. Number of moles of AgCl produced from reaction of $AgNO_3$ with 1 mole of roseocobaltic chloride and purpereocobaltic chloride are
a) 3 & 3 respectively b) 2 & 3 respectively c) 3 & 2 respectively d) 2 & 2 respectively
4. Metal-Ligand π back bonding is found in
a) $Cr(CO)_6$ b) $Cr(H_2O)_6$ c) in both a) and b) d) in none of a) and b)
5. CFSE of an octahedral high spin transition metal ion is
a) -12Dq a) +6Dq a) -4Dq d) -6Dq
6. Choose the correct trend of CFSE
a) $\Delta_{oh} > \Delta_{td} > \Delta_{cube}$ b) $\Delta_{oh} > \Delta_{cube} > \Delta_{td}$ a) $\Delta_{cube} > \Delta_{oh} > \Delta_{td}$ a) $\Delta_{td} > \Delta_{oh} > \Delta_{cube}$
7. Which of the following will undergo Jahn Teller distortion?
a) HS d^3 b) LS d^6 c) HS d^4 d) HS d^5
8. Oxidation state of Cr ions in $[Cr(NH_3)_5$-OH- $Cr(NH_3)_5]Ci_5$ are
a) +2 and +3 b) +2 and +2 c) +2 and +4 d) +3 and +3
9. Example of an ambidentate ligand is
a) H_2O b) Cl^- c) pyridine d) SCN^-
10. Carboxypeptidase contains – a) Fe b) Mn c) Zn d) Cu
11. In deoxyhemoglobin
a) Fe(II) lies above the plane of the porphyrin ring
b) Fe(III) lies above the plane of the porphyrin ring
c) Fe(II) lies in the plane of the porphyrin ring
d) Fe(III) lies in the plane of the porphyrin ring
12. Inversion of ATP (in Na^+/K^+ pump) binds to
a) Two Na^+ ions b) Three Na^+ ions c) Two K^+ ions d) Three K^+ ions
13. The ligand field bands of lanthanide complexes are generally sharper than those of transition metal complexes because
a) Transitions are allowed for lanthanides complexes
b) Intensity of the bands is higher for lanthanide complexes
c) *f*-orbitals have higher energy than d-orbital
d) *f*-orbitals as compared to *d*-orbitals, interact less effectively with ligands
14. The lanthanide contraction is due to [2]
a) Filling of 5*d* before 4*f* b) Filling of 4*d* before 4*f*
c) Filling of 4*f* before 5*d* d) Filling of 4*f* before 4*d*
15. Ligases enzyme are involved in
a) Formation of a new bond between two substrates b) Loss of H_2O or CO_2 from the substrate
c) Hydrolysis of ester, amide, phosphate groups d) Oxidation-reduction reactions

Short answer type questions

Answer any five **5x4 = 20 marks**

1. Validate the postulates of Warner's theory for the complex $[Co(NH_3)_5Cl]Cl_2$. 4
2. Identify the following as Inner sphere or outer sphere complex: $Fe(CN)_6]^{4-}$, $[CoF_6]^{3-}$. 4
3. Draw the orbital splitting pattern of Z_{in} and Z_{out} type of Jahn Teller distortion. 4
4. Draw the molecular orbital diagram of $[Ti(H_2O)_6]^{3+}$. 4
5. Discuss the structure, differences, and oxygen transport process by Hemoglobin and Myoglobin. 4
6. a) Considering the spin-orbit coupling in lanthanide elements, calculate the magnetic moment of Ln^{3+} systems which contains i) four electrons in f-orbitals (f^4-system) and ii) 12 electrons in f-orbitals (f^{12}-system). 2

   b) Why lanthanides are characterized by a uniform (+III) oxidation state? 2