



61911

Reg. No.

--	--	--	--	--	--	--	--

II Semester M.Sc. Degree Examination, October - 2023

CHEMISTRY

Inorganic Chemistry-II

Paper : CH - 201

(CBCS Semester Scheme 2019-2020 onwards)

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Answer question No. 1 and any five of the remaining.

1. Answer any **Ten** of the following questions. (10×2=20)
- Explain chelate effect on stability of metal complexes.
 - Distinguish between metal hydride and metal - dihydrogen complexes.
 - Explain Irving William series.
 - What is CFSE? Calculate CFSE of the complex $[Fe(CN)_6]^{4-}$.
 - Sketch the crystal field splitting of d orbitals in trigonal bipyramidal square pyramidal geometry. State the selection rules in electronic spectroscopy.
 - State the selection rules in electronic spectroscopy.
 - Calculate the number of microstates for Cr(III) and Ni(II) configuration.
 - What are the geometries of metal complexes whose coordination numbers are 3 and 5.
 - Why is $[Mn(H_2O)_6]^{2+}$ pale pink in colour?
 - Give the reason for $[Cr(NH_3)_6]^{3+}$ in water shows two bands around 475 and 365 nm.
 - What is meant by spin cross over? Mention a system exhibiting it.
 - State and explain Kasha's rule.

[P.T.O.]





(2)

61911

2. a. Describe the determination of stability of metal complex by spectrophotometric method.
- b. What are metal nitrosyl complexes? Explain various types of bonding in metal - nitrosyl complexes?
- c. Illustrate the bonding in tertiary phosphine complexes of transition metals. (4+3+3=10)
3. a. How does the crystal field theory explain the formation of low spin and high spin octahedral complex? Point out the limitations of CFT.
- b. Explain the bonding in metal - carbonyl complexes with suitable example. (5+5=10)
4. a. Explain various factors affecting Δ_o values in transition metal octahedral complexes.
- b. Construct an Orgel diagram for a d^2 configuration under octahedral crystal field and discuss its important features.
- c. What do you mean by nephelauxetic effect? How does it relate with delocalization of metal ligand bond? (4+3+3=10)
5. a. Explain the following :
- i. Ferromagnetism and
- ii. Anti - ferromagnetism.
- b. Write a brief note on photo substitution reactions in Cobalt (III) complexes.
- c. Illustrate on the magnetic properties of Lanthanide metal complexes. (4+3+3=10)
6. a. Define the term magnetic susceptibility and discuss the VSM method to measure the magnetic susceptibility.
- b. Write a short note on charge transfer transitions.
- c. Explain Jahn - Teller distortion in copper complexes. (4+3+3=10)
7. a. The electronic absorption spectrum of $d^8 [Ni(H_2O)_6]^{2+}$ displays bands at 8,700, 14,500 and 25,200 cm^{-1} . Draw the appropriate Orgel diagram and assign the bands to different transitions. Calculate Δ , β and B' (B of $Cr^{3+} = 918 cm^{-1}$).
- b. Discuss the electronic transitions in $[Cr(H_2O)_6]^{3+}$ with the help of Orgel diagram. What are the limitations of Orgel diagram? (4+6=10)
8. a. Obtain the relationship between stepwise and overall stability constant of a complex.
- b. Write a brief note on the following :
- i. Spin - orbit coupling.
- ii. Jablonski diagram. (4+6=10)

