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# RF-3563-64

## M. Sc. (Part - II) Examination

**April / May – 2010**

## Inorganic Chemistry : Paper - III

***(Special Paper : Coordination Chemistry)***

Time : **3** Hours] [Total Marks : **70**

**Instructions :**

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
**Fillup strictly the details of ☛ signs on your answer book.**

Name of the Examination :

☛ **M. Sc. - 2**

Name of the Subject :

☛ **INORGANIC CHEMISTRY - 3**

☛ Subject Code No. : **3 5 6 3** ☛ Section No. (1, 2,.....) : **NIL**

Seat No. :

Student's Signature

(2) Answer all questions.

(3) Figures to the right hand side of each question indicate full marks.

(3) Give Neat, and clean diagrams whenever applicable.

**1** (a) Give an account of qualitative treatment of molecular orbital theory adopting concept to explain metal-ligand bonding in $\sigma$-bonded $Na_3[CO(F)_6]$ complex. What difference does it make in the relative energies to molecular orbitals, when ligands also possess $\pi$- orbitals in addition to $\sigma$ orbitals ? Explain with - appropriate molecular energy level diagrams. **12**

(b) Find out the terms arises from $d^8$ - configuration and mention the ground and excited states.

**OR**

**1** (a) What is spectrochemical series? Why the crystal field of $H_2O$ is greater than $OH^-$ ion. **12**

(b) Explain, $d^n = d^{10-n}$ for free ion ground state whereas for crystal field ground state $d^n = d^{n+5}$

(c) State and explain the Jhan-Teller theorem. Indicate the splitting of d-orbitals caused by the Jhan-Teller effect in a $d^9$-system. In what other systems would you expect the Jhan-Teller effect? What is the dynamic Jhan-Teller effect?

2 (a) Discuss the electronic spectra of $d^2$ and $d^8$ configurations in weak octahcdral field. **12**

(b) The electronic spectrum of $[Ni(NH_3)_6]Cl_2$ exhibits bands at 10750 $cm^{-1}$, 17500 $cm^{-1}$ and 28000 $cm^{-1}$. Calculate the values of B, Dq, $\beta$, $\beta°$.
[Given B° of $Ni^{+2}$ = 1030 $cm^{-1}$.

**OR**

2 (a) Why the $\pi \rightarrow \pi^*$ transition appears as a much stronger bands than corresponding to the $n \rightarrow \pi^*$ transition in formaldehyde molecule? **12**

(b) What is charge transfer spectra? How many types of charge transfer spectra observed in compounds? Explain the ligand to metal charge transfer spectra in detail.

3 (a) Describe an experimental method for measuring the magnetic susceptibility of a paramagnetic substance in solution state. Give the advantages and disadvantages of this method. **12**

(b) What is spin-orbit coupling? How spin-orbit coupling is useful in explaining the magnetic properties of a compounds having A or E ground term?

**OR**

3 (a) What do you mean by antiferro-magnetic interaction? Why $(CH_3COO)_2Cu \cdot H_2O$ shows subnormal magnetic moment at room temperature? Explain. **12**

(b) Calculate the effective magnetic moment for $[Ni(H_2O)_6]Cl_2$ complex.
[Given : $10\mu$ = 8900 $cm^{-1}$ and $\lambda$ = –315 $cm^{-1}$]

(c) Why are the complexes $K_4[Ru_2OCl_{10}]$ and $[MO_2O_3(C_2H_5OCS_2)_4$ diamagnetic?

4 Explain the terms: **10**

(i) Stepwise stability constants

(ii) Overall stability constants

Derive the Yatsimirskii general Spectroscopic method for determining the stepwise stability constants for system with N=2.

**OR**

4 (a) Define : **10**

(i) $\bar{n}$

(ii) $\phi$ and

(iii) $\propto_c$

and give their interrelationship.

(b) What is `stability' of complexes? Discuss nay one factor in detail which govern the stability of complexes.

5 (a) Discuss the acid hydrolysis reaction of Co(iii) complexes in terms of **12**

(i) Effect of charge on the complex.

(ii) Effect of chelation.

(b) List all points of evidence of establish that base hydrolysis of octahedral complexes proceeds through $SN^1$-CB mechanism.

**OR**

5 (a) What is electron transfer reactions? How many ways electron transfer reaction takes place in complexes? Explain the mechanism of inner-sphere electron transfer reaction with suitable example. **12**

(b) What is transeffect? Explain the following order of transeffect of ligands?

(i) $F^- < Cl^- < Br^- < I^-$

(ii) Pyridine < CO.

**6** Write notes on (any three): **12**

(i) Stereochemistry of compounds having unusual coordination number

(ii) Orbital selection rule for electronic transition

(iii) Steric effect on metal ligand stability

(iv) Reach parameter and Nephelausetic effect

(v) Temperature Independent Paramagnetism

(vi) Anation reaction.

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