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B.Sc. (Part-III) Examination, 2022

CHEMISTRY

First Paper

(Inorganic Chemistry)

Time : Three Hours] *[Maximum Marks : 75*

Note : Attempt questions from **all** sections as per instructions.

Section - A

(Very Short Answer Type Questions)

Note : Attempt **all** parts of this question. Give answer of each part in about 50 words. 1½×10=15

1. (i) Find out the ground state term for d^2 ion.

   (ii) Write down the structure of $CO_2(CO)_8$.

   (iii) Show relation between Δ_o and Δ_t.

   (iv) Calculate the spin magnetic moment of Ti^{3+} ion.

(v) Predict the following reaction will occur or not and why?

$LiI + CsF \rightarrow LiF + CsI$

(vi) What is microstate?

(vii) Write selection rules for electronic spectra.

(viii) What are labile and inert complexes

(ix) What is 18 electron rule?

(x) Why C.F.S.E. of Zn^{2+}(II) complex is zero?

Section - B

(Short Answer Type Questions)

Note : Attempt **all** questions. Give answer of each question in about 200 words. 6×5=30

2. What are the various factors which influence the magnitude of crystal field splitting energy in complexes.

OR

Discuss the nature of bonding in trimer of phosphonitrilic chloride.

3. What do you understand by the term paramagnetism and diamagnetism? Predict the magnetic moment for octahedral complexes of Fe^{2+} with strong field ligands.

OR

What are silicones? Discuss important properties of silicones.

4. Define C.F.S.E. and calculate its value for the following systems.
   (i) d^4-high spin octahedral
   (ii) d^5 - tetrahedral

OR

What is porphyrin? Draw the structure of Heme.

5. What is symbiosis? Give applications?

OR

What is L-S coupling? What is meant by spectrochemical series.

6. Define trans effect. Illustrate trans effect using reaction of $[PtCl_4]^{2-}$ and $[Pt(NH_3)_4]^{2+}$.

OR

Discuss bonding in metal carbonyls. How does IR spectroscopy help in explaining bonding in metal carbonyls.

Section - C

(Long Answer Type Questions)

Note : Answer **any two** questions. Give answer of each question in about 500 words.

15×2=30

7. What is crystal field splitting? Describe the splitting of d-orbitals in octahedral and tetrahedral complexes.
8. Discuss HSAB principle? Give its applications with suitable examples.
9. What is magnetic susceptibility? Give the relationship between magnetic moment and magnetic susceptibility. How magnetic susceptibility varies with temperature.
10. Find the Russel-Saunders terms for p^2 configuration. What will the ground state? Draw their splitting diagrams in terms of energy.
11. What is meant by stability of complex? Derive relationship between stepwise and overall stability constants?