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4. Explain potentiometric method for determination of stability constant of a complex.

Or

On the basis of molecular orbital theory explain sigma bonding in octahedral complexes along with the relative order of energy of different MOs.



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Roll No.....

M.Sc. I Semester Examination, April-2021

CHEMISTRY

Paper I

(Inorganic Chemistry)

Time : 3 Hours]

[Maximum Marks : 80

Note : All questions are compulsory. Question Paper comprises of 3 sections. **Section A** is objective type/Multiple Choice questions with no internal choice. **Section B** is short answer type with internal choice. **Section C** is long answer type with internal choice.

SECTION 'A'

1×8=8

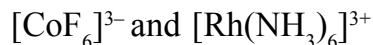
(Objective Type Questions)

Choose the correct answer :

- Which of the following species possess both C_3 and C_2 axis ?
(a) SO_3 (b) NH_3
(c) PCl_3 (d) $[H_3O]^+$
- Which of the following does not have centre of symmetry ?
(a) C_6H_6 (b) CO_2
(c) SF_6 (d) cis-dichloroethylene

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4. (a) Discuss why $[\text{Ni}(\text{CN})_4]^{2-}$ is diamagnetic and $[\text{Ni}(\text{Cl})_4]^{2-}$ is paramagnetic.
- (b) Which of the following complex ion is LS and which is HS ?



Or

Explain the applications and limitations of Crystal Field Theory.

SECTION 'C'

12×4=48

(Long Answer Type Questions)

Note : Answer the following questions in 500 words.

1. How do you find the point group of a molecule ? Explain your answer with suitable examples.

Or

Write notes on :

- (a) Point group C_{3v} and D_{4h} ,
 (b) Application of character table.
2. On the basis of VSEPR theory explain the shape of the following species :
- (a) $[\text{Be}(\text{NH}_3)_4]^{2+}$ (b) AlF_6^{3-}
 (c) NO_3^- (d) SF_6

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8. John-Teller effect is not observed in high spin complexes of :

- (a) d^4 (b) d^9
 (c) d^7 (d) d^8 .

SECTION 'B'

6×4=24

(Short Answer Type Questions)

Note : Answer the following questions in 250 words.

1. Define various symmetry of a molecule in brief (with examples).

Or

Describe the great orthogonality theorem and its consequences.

2. Write notes on Walsh diagram with example.

Or

Explain VSEPR theory and its limitations.

3. Describe the optical isomerism of 6 co-ordinated complex compounds.

Or

Give a brief account of resolution of racemic mixture.

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3. Find the molecule in which the central atom is having one lone pair of electrons :
 - (a) NH_3 (b) PCl_5
 - (c) H_2O (d) CH_4
4. What is the molecular shape of water ?
 - (a) Trigonal Planar (b) Tetrahedral
 - (c) Linear (d) Bent
5. Optical isomers are also known as :
 - (a) Structural isomers (b) Facial isomers
 - (c) Meridional isomers (d) Enantiomers
6. Which type of isomerism exhibits compounds with same chemical formula and bonds but different spatial arrangements ?
 - (a) Optical isomerism (b) Linkage isomerism
 - (c) Structural isomerism (d) Solvate isomerism
7. Two complexes A and B have dissociation constants 1.0×10^{-12} and 4.7×10^{-14} respectively, which complex will be more stable ?
 - (a) A (b) B
 - (c) Both are equally stable
 - (d) Cannot be determined

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Or

Write notes on :

- (a) $d\pi - p\pi$ bond,
 - (b) Effect on bond length due to bond multiplicity.
3. Draw the structure of all the possible isomers of the following complex ions/compounds :
 - (a) $[\text{Cr}(\text{NH}_3)_2(\text{H}_2\text{O})_2\text{Br}_2]^+$
 - (b) $[\text{Cr}(\text{en})_2\text{Cl}_2]\text{Cl}$
 - (c) $[\text{M}(\text{AA})_2\text{B}_2]$ type complex
 - (d) $[\text{Co}(\text{en})_2\text{Cl}(\text{NO}_2)]^+$

Or

Explain :

- (a) Differentiate between co-ordination isomerism and Ionisation isomerism, with example.
- (b) Why tetrahedral complexes are unable to exhibit geometrical isomerism ?
- (c) A solution of $[\text{Cu}(\text{NH}_3)_4\text{I}_2]\text{Cl}$ when treated with AgNO_3 gives white ppt. What must be the formula of the isomer of the dissolved compound that yields yellow ppt ? What are the above isomers called ?

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P. T. O.