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5231

M.Sc. (Sem. I) Examination, Jan. 2020

CHEMISTRY

Paper 1.1

CHEM-511

Inorganic Chemistry

Time Allowed : Three Hours

Max. Marks : 70

Min. Pass Marks : 28

This question paper will be divided into three sections as under :

Section-A *Max. Marks-10*

will carry 10 marks with 1 compulsory question comprising 10 short answer type questions (maximum 20 words answer) taking two questions from each unit. Each question shall be of one mark.

Section-B *Max. Marks-25*

will carry 25 marks with equally divided into five long answer type questions (answer about in 250 words). Students are instructed to attempt five questions by selecting one question from each unit.

Section-C *Max. Marks-35*

will carry 35 marks with five long answer type questions comprising one compulsory question of 15 marks and four questions of 10 marks each. Students are instructed to attempt total three questions with one compulsory question (answer about in 500 words) and any two more questions (answer about in 400 words) out of remaining four questions.

Section A 10×1=10

1. (*i*) Write down *one* limitation of VSEPR theory.
   (*ii*) Define Bent Rule.
   (*iii*) What are π-acids ?
   (*iv*) Define Trans-effect.
   (*v*) What is meant by Irving-William order of stability ?
   (*vi*) What is steric strain ?
   (*vii*) What are the elements of symmetry ?
   (*viii*) What are schonflies symbols ?
   (*ix*) Write down the symmetry and elements of symmetry for H_2O molecule
   (*x*) What is irreducible representation of point group ?

Section B

UNIT-I

2. Describe the concept of energetics of hybridization. 5
3. Explain the acid-base behaviour of binary oxides. 5

UNIT-II

4. Describe the structure and bonding in any η^5-complex with the help of MOT. 5

5. Write short notes on : 2×2½=5

   (*i*) John-Teller Theorem.

   (*ii*) Relation between π-bonding ability of ligands and spectro-chemical series.

UNIT-III

6. What are the factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand ? 5

7. Explain chelate effect and its thermodynamic origin. 5

UNIT-IV

8. Describe the following : 2×2½=5

   (*i*) Symmetry operations

   (*ii*) Groups and sub-groups.

9. Write short notes on : 2×2½=5

   (*i*) Molecular point group

   (*ii*) The great orthogonality theorem.

UNIT-V

10. Explain the following : 2×2½=5

    (*i*) Reducible representation.

    (*ii*) Formation of character table of C_2 group.

11. Write down the symmetry aspects of molecular vibrations of H_2O in IR and Raman spectroscopy. 5

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Section C

12. Explain : 3×5=15

    (*i*) Walsh diagram for any triatomic molecule.

    (*ii*) Bonding in π-complexes with η^2 ligand with a suitable example.

    (*iii*) Relationship between reducible and irreducible representation by a suitable example.

13. Explain : 2×5=10

    (*i*) Main postulates of VSEPR theory with suitable example.

    (*ii*) $d\pi$–$p\pi$ bonds with some suitable examples.

14. Explain : 2×5=10

    (*i*) Stepwise and overall formation constants and their interaction.

    (*ii*) Determination of binary formation constant by pH metry.

15. Explain : 2×5=10

    (*i*) The point groups C_n, C_{nv}, C_{nh}, D_{nh} by giving *one* example each.

    (*ii*) Properties of character of representation.

16. Explain : 2×5=10

    (*i*) Mutual-exclusion rule.

    (*ii*) Formation of hybrid orbital for (σ) bonding in trigonal planar (BF_3) molecule.

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