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AB-233673

M.Sc. (Semester-II) Examination, June-2025

(Backlog)

CHEMISTRY

[Paper : First]

(Inorganic Chemistry - II)

Time Allowed : Three Hours

Maximum Marks : 70

Note : This question paper is divided into four sections. Attempt questions of all four sections as per given direction. Distribution of marks is given in each section.

SECTION-A

(Objective Type Questions)

Note : Attempt **all ten** questions. Each question carries 1 mark. [10x1=10]

1. **(A)** Multiple Choice Questions :

(i) Which shows minimum Trans effect?

(a) CN^-

(b) H_2O

(c) OH^-

(d) Cl^-

(ii) Mechanism of Nucleophilic substitution in Square planar complexes is :

(a) SN^1

(b) SN^2

(c) Both (a) and (b)

(d) None of the above

(iii) The STYX code of B_4H_{10} is :

(a) 4120

(b) 4220

(c) 4012

(d) 3203

(iv) Which not obeys 18 electron rule?

(a) $Cr(CO)_6$

(b) $Ni(CO)_4$

(c) $Mn(CO)_5$

(d) $Fe(CO)_5$

(v) Which of the following is a nido-borane?

(a) B_4H_{10}

(b) B_5H_9

(c) $[B_6H_6]^{2-}$

(d) B_5H_{11}

(vi) The correct geometry for $[Ru_6(CO)_{17}B]^-$ is :

(a) Pentagonal Bipyramidal

(b) Trigonal prismatic

(c) Tetrahedral

(d) Octahedral

(B) Fill in the blanks :

(vii) The number of carbonyl stretching modes observed in the IR spectra of $M(CO)_5x$ is _____.

(viii) $Fe(CO)_5 + ZnO \xrightarrow{95°C}$

_____ + _____.

(ix) The Styx rules were given by _____.

(x) The number of metal metal bond in $Ir_4(CO)_{12}$ is _____.

SECTION-B

(Very Short Answer Type Questions)

Note : Attempt **any five** questions. Each question carries **2** marks. (Word limit : **25-30** words) [5×2=10]

2. (i) What is Synergic effect?

(ii) What are anation reactions?

(iii) Give the uses of trans effect.

(iv) What are Metalloboranes?

(v) What are inert and labile complexes?

(vi) Give physical properties of Carbonyls.

(vii) What are metal σ and π bonded boranes/ carborane clusters?

SECTION-C

(Short Answer Type Questions)

Note : Attempt **any five** questions. Each question carries **4** marks. (Word limit : **250** words) [5×4=20]

3. Discuss the following **(any five)** :

(i) Simple and condensed metal carbonyl clusters.

(ii) Polyhedral boranes - Types and IUPAC nomenclature

(iii) Carboranes : Structure, bonding and IUPAC nomenclature.

(iv) Marcus-Hush Theory

(v) Kinetic application of VBT and CFT

(vi) Kinetics of octahedral substitution

(vii) Vibrational spectra of metal carbonyls.

SECTION-D

(Essay Type Questions)

Note : Attempt **any three** questions. Each question carries **10** marks. (Word limit : **500** words) [3×10=30]

4. (i) What are Metal Clusters? Discuss their types and multiplicity of M-M bonds. Give application of PSEPT for metal carbonyl clusters.

(ii) (a) Explain Styx rule and semi-topological structure of boranes.

(b) Discuss the structure and bonding in metallocarboranes.

(iii) Explain preparation, structure and bonding in metal carbonyls.

(iv) What are electron transfer reactions? Explain mechanism of outer-sphere type reaction and inner-sphere type reactions.

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