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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]

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(1)

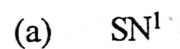
[P.T.O.]

1. (A) Multiple Choice Questions :

(i) Which shows minimum Trans effect?



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



(c) Both (a) and (b)

(d) None of the above

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

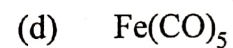
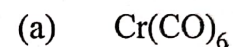
(a) 4120

(b) 4220

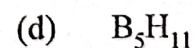
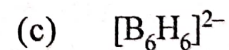
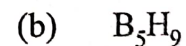
(c) 4012

(d) 3203

(iv) Which not obeys 18 electron rule?



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



(vi) The correct geometry for $[\text{Ru}_6(\text{CO})_{17}\text{B}]^-$ 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 $\text{M}(\text{CO})_5\text{x}$ is _____.

(viii) $\text{Fe}(\text{CO})_5 + \text{ZnO} \xrightarrow{95^\circ\text{C}}$
_____ + _____.

(ix) The Styx rules were given by _____.

(x) The number of metal metal bond in $\text{Ir}_4(\text{CO})_{12}$ 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.

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- (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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