

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: ISc
BRANCH: CHEMISTRY

SEMESTER: V
SESSION : MO/2019

SUBJECT : IMC5009 INORGANIC CHEMISTRY II

TIME: 1.5 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

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- Q1 (a) What is Catenation? [2]
(b) Distinguish between homocatenation and heterocatenation giving suitable examples [3]
- Q2 (a) What is the contribution of Alfred Stock and his research group in the chemistry of Boranes? [2]
(b) With the help of Wades theory explain whether the following are closo, nido or arachno structures : $B_4H_4^{2-}$, B_4H_8 , B_4H_{10} [3]
- Q3 (a) Discuss the physical features of Borazines and explain why they are also known as inorganic benzenes? [2]
(b) Give the equations for the following chemical reactions of borazines: Addition reaction, hydrolysis and formation of adducts. [3]
- Q4 (a) Alfred Werner and S.M Jorgenson were two astute chemists working in the area of bonding in coordination chemistry. Of the two who received the Nobel prize in chemistry in 1913 and why? [2]
(b) On the basis of the following statement write the secondary valence and formula of the complexes: [3]
- | Sr. no. | | Moles of Agcl precipitated on passing excess of $AgNO_3$ solution |
|---------|----------------------|---|
| 1 | $NiCl_2 \cdot 6H_2O$ | 2 |
| 2 | $CoCl_3 \cdot 4NH_3$ | 1 |
| 3 | $PtCl_2 \cdot 2NH_3$ | 0 |
- Q5 (a) Using the concept of CFT for the complex ion $[Fe(Cl)_6]^{3-}$, determine the number of d electrons for Fe, sketch the d-orbital energy levels and the distribution of d electrons among them, list the number of lone electrons, and label whether the complex is paramagnetic or diamagnetic. [3]
(b) What is the Crystal Field Stabilization Energy for a high spin d^7 octahedral complex? [2]
- Q6 (a) With the help of Jahn Teller effect explain the Z-in and Z-out phenomenon. [2]
(b) Draw the molecular orbital diagram of an octahedral complex $[CoF_6]^{3-}$. Explain the impact of pi bonding in this complex. [3]