

SHIVAJI COLLEGE, UNIVERSITY OF DELHI

DEPARTMENT OF CHEMISTRY

INTERNAL TEST-I (Academic Year 2023-24)

Name of the Course : B.Sc. (P) Life Sciences Section-B

Semester : V

Name of the Paper: Chemistry of d-Block Elements, Quantum Chemistry and Spectroscopy (UPC: 42177925)

Faculty Name: Dr. Sunil Yadav

Duration: 1 Hour

Maximum Marks: 10

Date of Test: 22.11.2023

Attempt **any five** questions. All Questions carry equal marks.

1. Densities of third transition series elements are almost double the respective elements of second transition series. Explain.
2. A compound with empirical formula $\text{CoBr}_3(\text{NH}_3)_3 \cdot 3\text{H}_2\text{O}$ dissolves in water to give a red colour solution. The molar conductance of the red solution is found to be $363.5 \text{ ohm}^{-1} \text{ mol}^{-1}$. It was also observed that 3 moles of bromine per mole of red compound could be precipitated as AgBr per formula weight of the compound. On the basis of above information, explain and suggest the Werner's structure for red compound. Also indicate the possible geometrical isomers and give their structure.
3. Why the magnetic moment of high spin octahedral Fe(III) drop from 5.8 B.M. at 300 K to 4.0 B.M. at 78 K?
4. Draw and explain the type of isomerism in the following pairs of isomers:
 - (i) $[\text{Cr}(\text{en})_2(\text{H}_2\text{O})\text{Cl}]\text{Cl}_2$ and $[\text{Cr}(\text{en})_2(\text{H}_2\text{O})\text{Cl}]\text{Cl} \cdot \text{H}_2\text{O}$
 - (ii) $[(\text{NH}_3)_4\text{Co}(\text{NH}_2)(\text{O}_2)\text{Co}(\text{NH}_3)_2\text{Cl}_2]\text{Cl}_2$ and $[\text{Cl}(\text{NH}_3)_3\text{Co}(\text{NH}_2)(\text{O}_2)\text{Co}(\text{NH}_3)_3\text{Cl}_2]\text{Cl}_2$
5. Draw the crystal field splitting of $[\text{Co}(\text{NH}_3)_6]^{3+}$ and write the electronic configuration.
6. $[\text{Cu}(\text{NH}_3)_4]^{2+}$ is Square planar while $[\text{CuCl}_4]^{2-}$ is tetrahedral. Justify.
7. For a metal ion having d^6 configuration in an octahedral complex, the magnitude of crystal field splitting is $32,200 \text{ cm}^{-1}$, and the electron-pairing energy is $17,600 \text{ cm}^{-1}$. Predict whether, the complex will be high spin or low spin. Calculate the crystal field stabilization energy for the predictable spin state.

Faculty Signature:

Sunil
-30/11/2023

SHIVAJI COLLEGE, UNIVERSITY OF DELHI

DEPARTMENT OF CHEMISTRY

INTERNAL TEST-II (Academic Year 2023-24)

Name of the Course : B.Sc. (P) Life Sciences Section-B

Semester : V

Name of the Paper: Chemistry of d-Block Elements, Quantum Chemistry and Spectroscopy
(UPC: 42177925)

Faculty Name: Dr. Sunil Yadav and Dr. Richa Arora

Duration: 1 Hour

Maximum Marks: 10

Date of Test: 23.11.2023

Attempt **any five** questions. All Questions carry equal marks.

1. Draw the CFT diagram for $[\text{Ni}(\text{CN})_4]^{2-}$ complex.
2. Arrange the following complexes in order of their CFSE:
 $[\text{CoF}_6]^{3-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{CN})_6]^{3-}$
3. Why d-block elements shows catalytic property? Explain.
4. Discuss the colour property of potassium permanganate.
5. Identify the complex(s) which show Jahn Teller distortion.
 $[\text{Cr}(\text{NH}_3)_6]^{3+}$, $[\text{Fe}(\text{CN})_4]^{4-}$ and $[\text{Cu}(\text{NH}_3)_6]^{2+}$
6. Why the melting points of transition elements are very high? Discuss the reason behind it.

Faculty Signature:

Sunil
30/11/2023