M. Sc. (Chemistry) Examination, 2022

(4th Semester, CBCS)

Inorganic Chemistry Special

Paper – XIV-I

Time : Two hours Full Marks : 40

(20 marks for each unit)

Use a separate answer script for each Unit.

UNIT: I-4141

1. Justify the following statements: 6×2

   a) 2^{nd} order Zeeman effect very often leads to temperature independent paramagnetism (TIP).

   b) μ_{eff} of $K_2[ReI_6]$ increases from 3.32 to 3.55 B.M. when the solid is dissolved in water.

   c) μ_{obs} value of $[Co(SCN)_4]^{2-i}$ is lower than $[CoI_4]^{2-}$.

   d) For the low spin octahedral complexes of Mn(III), Os(IV) and Ru(IV), μ_{obs} (at 300 K) follows the sequence: Mn(III) (3.5 B.M.) > Ru(IV) C2.65 B.M.) > Os(IV) (1.50 B.M.).

   e) Magnetic properties of Fe_3O_4 can be explained through double exchange phenomenon.

   f) The magnetic moment of $[Fe(dtc)_3]$ (dissolved in $CHCl_3$) decreases with increase of pressure.

2. Answer the following questions: 2×4

   a) Apply Goodenough-Kanamori-Anderson rule to explain magnetic properties of MnO and $CuCl_2$ solids.

   b) Explain how the ease of spin pairing (d^4 to d^7) can be rationalized in terms of exchange energy.

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3. Answer the following questions:

   a) For a common oxidant, if V^{2+}_{aq} reacts faster than $Cr^{2+}_{aq.}$ then we can conclude the occurrence of OSET process. Discuss with at least one example. 3

   b) Discuss one ISET reaction where bridging ligand is retained with the oxidising centre. 3

   c) Consider the reduction of $[Co^{III}(NH_3)_5X]^{n+}$ by Cr^{2+}_{aq}. The second order rate constants ($M^{-1}s^{-1}$) for $X = H_2O$, HO^-, Cl^-, NCS^- and SCN^- are, 0.5, $\sim10^6$, $\sim10^5$, 20 and $\sim10^5$ respectively. Explain these drastic differences. 4

4. Answer the following questions:

   a) Comment on the limitations and side effects of cisplatin as anticancer drug. 2

   b) Mention the symptoms of Alzheimer's disease. Comment on the role of metal ions in Alzheimer's disease. How do metal chelating agents help to treat Alzheimer's disease? 1+1+2

   c) Write down the structures of two vanadium based insulin-mimetic agents used for treating diabetes. 1

   d) Mention the role of copper in Wilson's and Menkes diseases. How can Wilson's and Menkes diseases be treated? 1+2