Roll No. ..... Exam Code : M-24

Subject Code—61411

B. Sc. EXAMINATION

(Batch 2019 Onwards)

(Main & Re-appear)

(Fourth Semester)

CHEMISTRY-INORGANIC CHEMISTRY–II

CCL-404

(Transition Metals and Coordination Chemistry)

Core Course–VII

Time : 3 *Hours* *Maximum Marks :* 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

1. (a) Why are d-block elements called transition elements ? 8×2=16

(b) Which of the d-block elements are not regarded as transition elements ?

(c) Which is more basic Gd_2O_3 or YbO ? Explain.

(d) Name two colourless tripositive lanthanide ions.

(e) What are linkage isomers ? Give one example.

(f) Why does NH_3 readily form complexes but NH_4^+ does not ?

(g) What is the effect of nature of ligands on magnitude of Δ value ?

(h) What are the basic assumption of crystal field theory ?

Unit I

2. (a) Why the ionization potential of 3d element do not vary much with increasing atomic number ? 5½

(b) Why zinc, cadmium and mercury have low melting point unlike other d-block elements ? Explain. 5

(c) The Latimer diagram for manganese system is :

MnO^{-}_{4} $\underline{0.56}$ MnO^{2-}_{4} $\underline{2.26}$ MnO_2 $\underline{0.95}$ Mn^{3+} $\underline{0.51}$ Mn^{2+}

Calculate the E° value for MnO_4^{2-}/Mn^{2+} couple. 5½

3. (a) Who do transition elements in zero and lower oxidation state form complexes with weak ligands like CO, NO or PR_3 ? 5½

(b) Why do transition metals exhibit various oxidation state ? 5½

(c) Explain why Cu^{+} disproportionate in solution ? 5

Unit II

4. (a) Write notes on stability of oxidation states of lanthanides. 5½

(b) Discuss briefly solvent exchange method for the separation of lanthanides. 5½

(c) Actinides have greater tendency for complex formation than lanthanides. Explain with examples. 5

5. (a) How is lanthanides contraction explained ? What is the effect on basic strength of lanthanide hydroxide ? 5½

(b) Discuss the actinides have uncertain configurations. 5½

(c) Discuss similarities between later actinides and later lanthanides. 5

Unit III

6. (a) Draw the various stereoisomers for the complex ion $[Co(en)_2Cl_2]^+$. 5½

(b) Write the IUPAC name of the following coordination compounds : 5

(i) $Hg[Co(CNS)_4]$

(ii) $[Cr(NH_3)_6][Co(CN)_6]$

(iii) $[Cr(en)_2Cl_2]Cl$

(iv) $Fe(C_5H_5)_2$

(v) $K[B(NO_3)_4]$.

(c) Write short note on Ionisation Isomerism. with suitable examples. 5½

7. (a) Discuss optical activity in octahedral complexes. 5½

(b) What is the difference between inner and outer d-orbital complexes ? Explain with suitable examples. 5½

(c) On the basis of VBT, explain why $[NiCl_4]^{2-}$ is tetrahedral whereas $[NiCN_4]^{2-}$ is square planer in nature. 5

Unit IV

8. (a) Explain crystal field splitting in tetrahedral complexes. How will you account for the non-existing of these complexes with low spin ? 5½

(b) How will you account for purple colour of $[Ti(H_2O^{3+}]$? 5½

(c) Discuss the spectrochemical seires on the basis of Crystal Field Theory. 5

9. (a) Calculate crystal field splitting energy for d^4 - High spin (octahedral) and d^5 -strong field (octahedral) **5½**

(b) Discuss the Jahn Teller effect in copper (II) complexes. **5½**

(c) Explain the tetragonal distortion of octahedral complexes.