

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 ? $8 \times 2 = 16$

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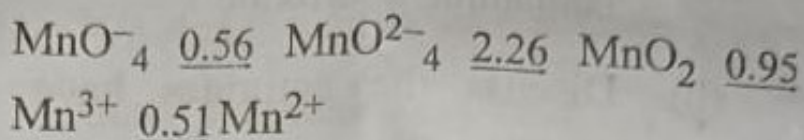
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- (b) Which of the d-block elements are not regarded as transition elements ?
- (c) Which is more basic Gd_2O_3 or YbO ? Explain.
- (d) Name two colourless tripositive lanthanide ions.
- (e) What are linkage isomers ? Give one example.
- (f) Why does 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 :



Calculate the E° value for $\text{MnO}_4^{2-}/\text{Mn}^{2+}$ 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 $[\text{Co}(\text{en})_2\text{Cl}_2]^+$. 5½
- (b) Write the IUPAC name of the following
coordination compounds : 5
- (i) $\text{Hg}[\text{Co}(\text{CNS})_4]$
- (ii) $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$
- (iii) $[\text{Cr}(\text{en})_2\text{Cl}_2]\text{Cl}$
- (iv) $\text{Fe}(\text{C}_5\text{H}_5)_2$
- (v) $\text{K}[\text{B}(\text{NO}_3)_4]$.
- (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 $[\text{NiCl}_4]^{2-}$ is tetrahedral whereas $[\text{NiCN}_4]^{2-}$ 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 $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$? 5½
- (c) Discuss the spectrochemical series 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) $5\frac{1}{2}$
- (b) Discuss the Jahn Teller effect in copper (II) complexes. $5\frac{1}{2}$
- (c) Explain the tetragonal distortion of octahedral complexes.