Roll No. .....

Total No. of Questions : **9**] [Total No. of Printed Pages : **7**

(2032)

UG (CBCS) IIIrd Year (Annual) Examination

3221

B.Sc. CHEMISTRY

(Chemistry of Transition and Inner Transition Elements, Coordination Chemistry, Organometallics, Acids and Bases)

(DSE–2B)

Paper : CHEM 304 TH

Time : 3 Hours] **[Maximum Marks : 50**

Note :– (i) Attempt *five* questions in all, selecting *one* question from each Section.

(ii) All questions carry equal marks. Section E is compulsory.

Section–A

1. (a) Explain oxidizing properties of $KMnO_4$ in acidic and basic medium with suitable example.

(b) How do sodium nitroprusside react with sodium sulphide and silver nitrate ?

(c) What do you mean by Latimer diagram ? Explain Latimer Diagram for Manganese System. 4,2,4

2. (a) How do magnetic properties of Lanthanides differ from transition elements ? Assign reason.

(b) (i) Why Actinides have greater tendency to form complexes compared to lanthanides ?

(ii) Out of $La(OH)_3$ and $Lu(OH)_3$, which is more basic and why ?

(c) How is the separation of Lanthanides done using ion exchange method ? 3,3,4

Section–B

3. (a) Explain ionization and geometrical isomerism in co-ordination compounds taking suitable examples.

(b) Write down IUPAC names of the following :

(i) $[Co(en)_2Cl_2]Br$

(ii) $K[PtCl_3(C_2H_4)]$

(iii) $[(NH_3)_5Fe–OH–Fe(NH_3)_5]Cl_3$

(iv) $[Mn_3(CO)_{12}]$

(c) Using VBT, explain the formation of $[Cu(NH_3)_4]^{2+}$ ion. 3,4,3

4. (a) What is Hapticity ? Explain how cyclo-octatetraene can act both as octahepto and tetrahepto ligand.

(b) Find out effective atomic number of :

(i) $[Fe(CO)_3(C_4H_6)]$

(ii) $[Fe(\pi\text{-}C_5H_5)(CO)_3]$

(c) What is Zeise Salt ? Discuss its structure 4,3,3

Section–C

5. (a) What is Crystal field splitting ? Explain taking example of tetrahedral complex.

(b) How Crystal field splitting can explain colours in octahedral complexes ?

(c) Calculate CFSE for the following :

(i) d^8 (Strong field octahedral)

(ii) d^5 (Tetrahedral) 4,3,3

6. (a) How do oxidation state and type of transition series (*d*-orbital) affect the crystal field splitting ? Explain with suitable example.

(b) Which out of Mn(II) and Fe(III) will form low spin complex and why ?

(c) What is Jahn-Teller Distortion ? Under what condition this distortion will cause tetragonal distortion ? 4,3,3

Section–D

7. (a) What is Symbiosis ? Explain taking suitable example.

(b) What are levelling and differentiating solvents ? Discuss using at least *one* example in each case.

(c) Hard–hard interactions are generally ionic, soft-soft interactions are generally covalent, why ? 3,4,3

8. (a) Which out of pyridine and 2-methyl pyridine act as stronger base towards trimethyl boron ? Explain.

(b) How does solvent affect the strength of acids and bases ?

(c) Arrange HClO, $HClO_3$, $HClO_4$ and $HClO_2$ in the increasing order of their acidic strengths, giving suitable explanation. 3,3,4

Section–E

9. (i) CuI_2 is hard-hard substance. (True/False)

(ii) Which out of Ca^{2+}, Cu^{1+}, Cd^{2+} or Ag^{1+} will prefer to exist as oxide ?

(iii) Formula of Zeise's salt is .....

(iv) Write down formula of Potassium Hexacynoferrate (II)

(v) Which out of Lanthanides and actinides form oxocations ?

(vi) Cu^{2+} salts are coloured but Cu^{1+} salts are white. Why ?

(vii) How many water molecules are co-ordinated in $CuSO_4.5H_2O$?

(viii) How many unpaired electrons are present in d^7 tetrahedral configuration ?

(ix) CFSE for d^3 octahedral complex will be ..... .

(x) Which out of $Mn(CO)_{10}$ and $Co(CO)_8$ have all the CO as terminal groups ? $1 \times 10 = 10$

$7 - 6 = -4$

$2 - 6$

MTT December -2021

CHEM -304 (B.Sc. 3nd Year)

Time: 01: 30 hour

M. Marks: 15

NOTE : Attempt any 5 questions . Question no. 1 is compulsory.

Q.1

I. What is neutral complex? Give one example.

II. What are chelates? Give one example.

III. Write are the names of following compounds?

$K_4[Ni(CN)_4]$ & $[Co(NH_3)_4(H_2O)Br](NO_3)_2$

IV. Write the formula of following compounds :

sodium dicyanoaurate (I) & sodium trioxalatoferrate (III)

V. What is EAN ? Calculate EAN of central atom in $[Fe(H2O)_6]^{2+}$.

VI. What is the oxidation state and coordination number of cobalt ion in $[Co(NH_3)_4(H_2O)Br](NO_3)_2$?

VII. What is high spin complex ?

VIII. $[NiCl_4]^{2-}$ involves———hybridisation. (5.0)

Q.2 Determine the number of unpaired electrons in the following : (2)

a. Co^{3+} (octahedral strong field), Fe^{3+} (octahedral weak field) & $[Fe(H2O)_6]^{3+}$

b. Calculate CFSE for $[Fe(H_2O)_6]^{3+}$ & d^6 tetrahedral (2.5)

Q.3 Why is the magnitude of crystal field splitting in tetrahedral complexes smaller than in octahedral complexes? (2.5)

Q.4 Explain ionisation and hydrate isomerism with example. (2.5)

Q.5 Explain geometry and magnetic character of $[Fe(CN)_6]^{4-}$ complex ion on the basis of valence bond theory . (2.5)

Q.6 Why is $[Co(NH_3)_6]^{3+}$ diamagnetic while $[CoF_6]^{3-}$ paramagnetic? (2.5)