

BITS PILANI -DUBAI CAMPUS,KNOWLEDGE VILLAGE ,DUBAI
I YEAR SECOND SEMESTER,2003-2004

TEST 1 – (CLOSED BOOK)

Make up test

Course Title :Chemistry 2

Course No : CHEMUC142

Date:

Total Marks:40

Time:50 min

Weightage:20%

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1. Answer in brief and to the point.
 2. Answer all parts of a particular question together.
 3. Useful atomic numbers
:Mn(25), Co(27), Fe(26), Ni(28), Cu(29), V(23), Os(76), Ti(22), Zn(30).
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1. Write the chemical formula of the following complex ions
 - (a) Tris(ethylene diamine)cobalt(III)nitrate.
 - (b) Calcium tetrachloroplatinate(II) (2+2)
2. Calculate the CFSE values in terms of Δ_o and P for high spin and low spin octahedral complexes of Fe(II). (2+2)
3. Consider complex $[\text{MnBr}_4]^{2-}$
 - (i) On the basis of VB theory predict the type of hybridization and geometry of the complex.
 - (ii) Draw the shape of the complex .
 - (iii) Calculate the value of μ_s for this complex. (3+2+2)
4.
 - (i) Draw the structure of DMG clearly showing the donor atoms
 - (ii) Draw the structure of the chelate formed when Cu^{2+} is treated with ethylene diammine. (2+3)
5.
 - (i) Calculate the crystal field stabilization energy (CFSE) in KJ/mol attained by Fe^{2+} ions in an octahedral environment of oxide ions (O^{2-}). Given that Δ_o for Fe^{2+} in O^{2-} ion environment = 124 KJ/mole.
 - (ii) What will be the value of CFSE attained by Fe^{2+} ions in a tetrahedral environment of oxide ions. (5+5)

6. Which of the following complex ion has higher Δ_o value

- (a) $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$
(b) $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Os}(\text{CN})_6]^{4-}$

(2)

7. (i) Draw CFT diagram and indicate the occupancy of orbitals splitted in d^7 (tetrahedral) ion. Calculate CFSE for this ion in terms of Δ_o .

(ii) Why are compounds of Ti^{4+} and Zn^{2+} typically white?

(4+4)

BITS PILANI -DUBAI CAMPUS,KNOWLEDGE VILLAGE ,DUBAI
I YEAR SECOND SEMESTER,2003-2004

TEST – 1 (Closed Book)

Course Title :Chemistry II
Date: 7.3.2004
Time:50 min

Course No:CHEM UC142
Max Marks:40
Weightage:20%

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1. Answer in brief and to the point.
 2. Answer all parts of a particular question together.
 3. Useful atomic numbers :Mn(25),Fe(26),Co(27),Ni(28).

1. Write the chemical formula of the following complex ions

- (i) Hexaammine cobalt(III) chloride
- (ii) Potassium hexachlorostannate (IV) (2+2)

2. Write the oxidation state and coordination number of the central metal ion in each of the following coordination complexes

- (i) $K[Ag(CN)_2]$ (ii) $[Co(en)_2Br_2]$ (2+2)

3. Consider the complex $[Ni(H_2O)_4]^{2+}$

- (i) On the basis of VB theory predict the type of hybridization and geometry of the complex.
- (ii) Draw the shape of the complex .
- (iii) Calculate the value of μ_s for this complex. (3+2+2)

4. (i) Draw the structure of the following ligands clearly showing the donor atoms

- (a) 8-hydroxyquinolinol ion and (b) Acetylacetonato ion
- (ii) Mention any 2 applications of EDTA as chelating agent. (2+2+2)

5. For $[Mn(CN)_6]^{3-}$ ion the electron pairing energy is about $28,000\text{cm}^{-1}$.

Δ_o value for this complex ion is $38,500\text{cm}^{-1}$

- (i) Sketch the CFT diagram of Mn^{3+} ion corresponding to high spin and low spin states.
- (ii) Calculate the CFSE of this complex ion corresponding to high spin and low spin states.
- (iii) Which state is more stable? (4+4+2)

6.(i) Which of the following pairs of complex ion has higher value of Δ_o and why?
 $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{4-}$ and $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$

(ii) Explain the following giving appropriate reason for your answer.

(a) $\text{Co}(\text{III})$ is stabilized in presence of strong field ligands while $\text{Co}(\text{II})$ is stabilized in presence of weak field ligands.

(b) Octahedral complexes are generally more stable than tetrahedral complexes.

(iii) Calculate the CFSE (in units of Δ_o) and the spin only magnetic moment for d^6 ion in tetrahedral ligand field. (2+3+2+2)

BITS PILANI -DUBAI CAMPUS,KNOWLEDGE VILLAGE ,DUBAI
I YEAR SECOND SEMESTER,2003-2004

Name of the student :
ID No & Sec :

QUIZ (Closed Book)

Course Title :Chemistry II
Date: 30.3.2004
Time:30 min

Course No:CHEMUC142
Total Marks:20
Weightage:10%

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1. For multiple choice questions tick and underline the correct answer.
2. Useful atomic numbers :Cr(24),Mn(25),Co(27),Fe(26),Ni(28),Cu(29),Zn(30)
-

1. Which of the following complex will not show geometrical isomerism?
(i) $[\text{Pd}(\text{NH}_3)_2(\text{NO}_2)_2]$ (ii) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ (iii) $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$
(iv) $[\text{Ir}(\text{C}_2\text{O}_4)_2\text{Cl}_2]^{2-}$

(2)

2. Which of the following will have distorted octahedral structure?
(a) $[\text{Co}(\text{CN})_6]^{4-}$ (b) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ (c) $[\text{NiF}_6]^{4-}$ (d) $[\text{Zn}(\text{H}_2\text{O})_6]^{2+}$

(2)

3. Which of the following complex is tetrahedral ?
(i) $[\text{Ni}(\text{dmg})_2]$ (ii) $[\text{Cu}(\text{NH}_3)_4]^{2+}$ (iii) $[\text{FeO}_4]^{2-}$ (iv) none of the above.

(2)

4. In the crystal structure CrF_2 , Cr^{2+} is octahedrally surrounded by six F^- bonds. There are four Cr—F bonds of length _____ Å and two Cr—F bonds of length _____ Å.

(2)

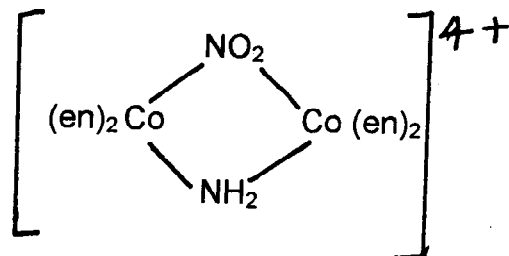
5. Mn(+III) and Cu(+II) salts and complexes show tetragonally distorted octahedral structures. This type of distortion occurs whenever the _____ and _____ orbitals are unequally occupied.

(2)

6. Sketch the enantiomers of the complex $[\text{Co}(\text{en})_2\text{Cl}_2]^+$

(2)

7. Sketch all the isomers of



(3)

8. How will you distinguish between the cis $[\text{PtCl}_2(\text{NH}_3)_2]$ and trans $[\text{PtCl}_2(\text{NH}_3)_2]$ isomers ?

(2)

9. On the basis of CFT, predict the geometry of the following ion



and show the distribution of d-electrons of the central metal atom in the splitted d-orbitals.

(1+2)

BITS PILANI -DUBAI CAMPUS,KNOWLEDGE VILLAGE ,DUBAI
I YEAR SECOND SEMESTER,2003-2004

QUIZ -Make up (Closed book)

Course Title :Chemistry II

Course No:CHEMUC142

Date: 13.4.2004

Total Marks:20

Time:30 min

Weightage:10%

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1. For multiple choice questions tick and underline the correct answer.
2. Useful atomic numbers :Mn(25),Co(27),Fe(26),Ni(28),Cu(29),Zn(30),Pt (78)
-

1. Which of the following show optical activity
(i) chloroethane (ii) chloromethane (iii) chlorobromoethane
(iv) chlorobromomethane (2)
2. The number of isomers possible for square planar complex $[\text{PtClBr}(\text{NH}_3)]^-$
would be
(i) 2 (ii) 3 (iii) 4 (iv) 6 (2)
3. Which of the following complex is square planar ?
(i) $[\text{CoCl}_4]^{2-}$ (ii) $[\text{ZnCl}_4]^{2-}$ (iii) $[\text{MnO}_4]^{2-}$ (iv) $[\text{Ni}(\text{CN})_4]^{2-}$ (2)
4. Which of these form distorted octahedral structure
(i) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ (ii) $[\text{FeF}_6]^{3-}$ (iii) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (iv) $[\text{Co}(\text{CN})_6]^{4-}$ (2)
5. Which of the following constitutes the strongest ligands
(i) C donors (ii) O donors (iii) N donors (iv) Halide donors (2)

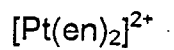
6. Draw all the isomers of an octahedral complex which has three identical bidentate ligands $[M(AA)_3]$.

(2)

7. Sketch the optically active isomers of the complexes
(i) $[\text{Ir}(\text{C}_2\text{O}_4)_2 \text{Cl}_2]^{2-}$ and (ii) $[\text{Co}(\text{en})_2(\text{NH}_3)\text{Cl}]^{2+}$

(2)

8. On the basis of CFT, predict the geometry of the following ion



and show the distribution of d-electrons of the central metal atom in the splitted d-orbitals.

(3)

9. Sketch the d – orbital splitting of Co^{2+} in tetrahedral and square planar complexes.

(3)
