THE OPEN UNIVERSITY OF SRI LANKA
B.Sc/B.Ed DEGREE PROGRAMME - 2010/2011
Level 4 - CMU2122/CME4122
INORGANIC CHEMISTRY
ASSIGNMENT TEST I (NBT)

20th September 2010 (Monday) Duration: 1.30 hours 4.00 – 5.30 p.m.

Part A - 15 Multiple Choice Questions (90 Marks)

Answer all questions

Select the most correct answer to each question given below and mark a cross ***X*** over the answer on the **given answer sheet**. Any answer with more than one ***X*** will not be counted. 1/6 th of a mark will be deducted for each incorrect answer.

1. Consider the following ligands/ions,
   (a) 2,2'-bipyridine (b) oxalate (c) ethylenediamine
   The **bidentate** ligand/s is/are
   1) (c) only 2) (a) & (b) only 3) (a) & (c) only.
   4) (b) & (c) only. 5) (a), (b) & (c)

2. What is the most likely **geometry** of diglycinatoplatinum(II)?
   1) Octahedral 2) Tetrahedral 3) Square planar
   4) Square-pyramidal 5) Trigonal planar

3. The IUPAC name of the complex $[FeCl_2(en)(NH_3)_2]$ is
   1) Diamminedichloro(ethylenediamine)ferrate(II)
   2) Diamminedichloro(ethylenediamine)iron(III)
   3) Dichloro(ethylenediamine)diammineiron(II)
   4) Diamminedichloro(ethylenediamine)iron(II)
   5) Diamminedichloro(ethylenediamine)ferrous(II)

4. What is the **coordination number** of Pt in diglycinatoplatinum(II)?
   1) +3 2) 4 3) 5 4) 6 5) +2

5. Which of the following statements is **true** about *fac*-$[CoCl_3(NH_3)_3]$?
   1) The secondary valency of Co is 3.
   2) This complex does show optical isomers.
   3) The molar conductivity of this complex is zero.
   4) The primary valency of Co is 6.
   5) Two of the three NH_3 ligands are *trans* to each other.

6. Predict the spin only **magnetic moment** of the complex $[Cr(NH_3)_6]Cl_3$. Water is a **weak ligand** and $\mu = [n(n+2)]^{1/2}$ B.M. (Atomic no. of Cr = 24)
   1) 1.73 2) 2.83 3) 3.88 4) 4.89 5) 5.91

7. Which of the following complex would give the **highest** molar conductivity measurement?
   1) $[Pt(NH_3)_4][PtCl_4]$ 2) $[FeCl_2(NH_3)_4]Cl$ 3) $[Fe(H_2O)_2(NH_3)_4]Cl_3$
   4) $[FeCl(NH_3)_5]Cl_2$ 5) $[FeCl_3(NH_3)_3]\cdot 5H_2O$

8. Pick the **incorrect** statement from the following statements about $[Fe(NH_3)_6]Cl_2$ of which $\mu = 0$ BM.
   1) It is a diamagnetic complex. 2) Oxidation state of Fe is +2.
   3) It is a low-spin complex. 4) It is an inner-orbital complex.
   5) Hybridization of the metal centre is d^2sp^3.

9. Consider the following statements regarding the complex $[PtCl_2(NH_3)_2]$.
   (a) Oxidation and coordination numbers of Pt are +2 and 4, respectively.
   (b) This shows square planar geometry.
   (c) The hybridization of Pt in this complex is sp^3.
   The **correct** statement/s is/are,
   1) (a) only 2) (a) & (c) only 3) (b) & (c) only
   4) (a) & (b) only 5) (a), (b), & (c)

10. The Coordination number of a central atom depends on,
   (a). Size and charge of the ligands.
   (b). Size of the metal
   (c). Group number of the metal
   The **correct** statement is/are
   1) (c) only 2) (a) & (c) only 3) (b) & (c) only
   4) (a) & (b) only 5) (a), (b), & (c)

11. The number of **geometric** isomers of the complex $[FeBr_2Cl(NH_3)_3]$ are,
   1) 4 2) 5 3) 6 4) 3 5) 7

12. Choose the **incorrect** statement regarding trioxalatoiron(III); Assume oxalate as a weak field ligand, atomic number of Fe is 26.
   1) It shows optical isomerism.
   2) This is a low spin complex.
   3) Fe has got two unpaired electrons in the e_g level.
   4) CFSE for this complex is zero.
   5) Coordination number of Fe is 6.

13. Consider the following statements about the complex $[M(H_2O)_x]^{n+}$.
   (a). $[M(H_2O)_x]^{n+}$ is an aqua complex of M^{n+}
   (b). x is the coordination number, n+ is the oxidation number of the metal.
   (c). Water molecules act as ligands by donating lone pair electrons.
   The **correct** statement is/are
   1) (b) only 2) (a) & (c) only 3) (b) & (c) only
   4) (a) & (b) only 5) (a), (b), & (c)

14. Consider the following statements

(a). Larger the β value lower the thermodynamic stability of the complex.

(b). CFSE of $[CrCl_6]^{3-}$ is lower than that of $[Cr(CN)_6]^{3-}$

(c). Fe^{3+} forms more stable compounds than Fe^{2+}.

The **correct** statement is/are

1) (b) only 2) (b) & (c) only 3) (a) & (c) only
4) (a) & (b) only 5) (a), (b), & (c)

15. The reaction, $[RhBr(PPh_3)_3] + Br_2 \rightarrow$ *fac*-$[RhBr_3(PPh_3)_3]$ can be classified as

1) an association reaction. 2) a redox reaction.
3) an insertion reaction. 4) an oxidation reaction.
5) an oxidative addition reaction.

Part A – MCQ ANSWERS

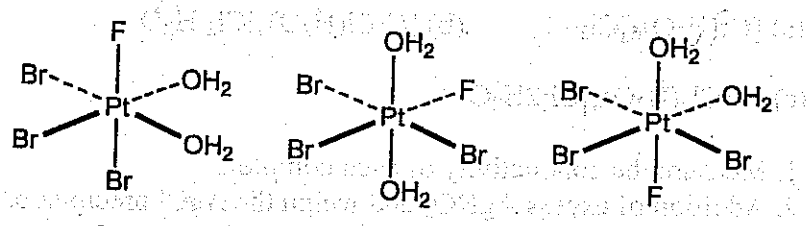
1. (5)	**2.** (3)	**3.** (4)	**4.** (2)	**5.** (3)
6. (3)	**7.** (3)	**8.** (all)	**9.** (4)	**10.** (5)
11. (4)	**12.** (2)	**13.** (5)	**14.** (2)	**15.** (5)

Part B

1. (a) (i) Diaquatribromofluoroplatinum(IV)

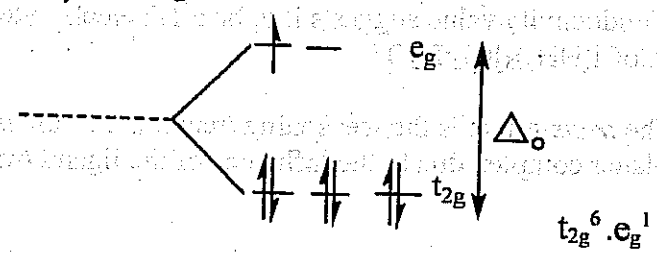
(ii) EAN = (Atomic no. – Oxidation no.) + (2 x Coordination number)
= (26 – 2) + 2x5 = 34

(iii)



fac *mer,trans* *mer,cis*

2. (b) (i) $Co^0 - d^9$; $Co^{2+} - d^7$



$t_{2g}^6 . e_g^1$

(ii) CFSE = $(-0.4 \times 6 + 0.6 \times 1)\ \Delta_o$
= $-1.8\ \Delta_o$ = -1.8×450 kJ mol^{-1}
= -810 kJ mol^{-1}

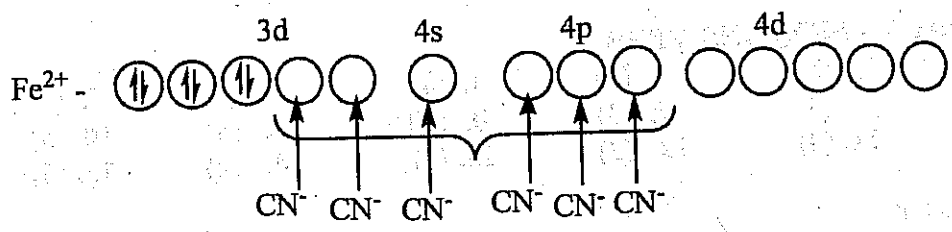
(iii) TSE = CFSE + 3 x Pairing Energy
= -810 kJ mol^{-1} + 3 x 120 kJ mol^{-1}
= -450 kJ mol^{-1}

(iv) $\mu_s = \sqrt{n(n+2)}$ n = 1

$\mu_s = \sqrt{1(1+2)} = \sqrt{3} = 1.73$ BM

2 (a) (i) $Fe^0 = d^8$; $Fe^{2+} = d^6$

diamagnatic → no unpaired electrons



d^2sp^3 - hybridization

(ii) $Na[CrCl_3(CO)(NH_3)_2]$

(b) (i) (a) $[Cr(H_2O)_6]Cl_3$ (b) $[CrCl(H_2O)_5]Cl_2 \cdot H_2O$

(c) $[CrCl_2(H_2O)_4]Cl \cdot 2H_2O$

(ii) 1. Measure the conductivity of each complex.
2. Addition of excess $AgNO_3$ and weigh the AgCl precipitate.
3. Heat the salt at 120 °C, calculate the weight loss.

(c) $Cl^- < H_2O < NH_3 < CN^-$

(d) Conductivity value suggests it to be a 1:2 electrolyte
$[CoCl(NH_3)_5]Cl_2 \cdot H_2O$

(e) The *trans*-effect is the weakening /removing of the *trans*-ligand in a square planer complex due to the influence of the ligand *trans* to it.