



EASTERN UNIVERSITY, SRI LANKA

SECOND EXAMINATION IN SCIENCE-2012/2013 (April/June 2015)

FIRST SEMESTER

CH 201 COORDINATION CHEMISTRY & MAIN GROUP CHEMISTRY

(Proper & Repeat)

Answer all questions

Time Allowed: One hour

1. (a) Explain the bonding in coordination compounds in terms of Werner's postulates.

(10 Marks)

(b) FeSO_4 solution mixed with $(\text{NH}_4)_2\text{SO}_4$ solution in 1:1 molar ratio gives positive test for Fe^{2+} ion while CuSO_4 solution mixed with aqueous ammonia in 1:4 molar ratio does not give positive test for Cu^{2+} ion. Explain these above observations.

(10 Marks)

(c) Explain each of the following with two examples:

i. coordination entity

ii. ligand

iii. coordination number

(30 Marks)

Contd...

(d) Calculate the spin-only magnetic moments at 25 °C for each of the following.

- i. $[\text{Fe}(\text{CN})_6]^{4-}$
- ii. $[\text{Ru}(\text{NH}_3)_6]^{3+}$
- iii. $[\text{Cr}(\text{NH}_3)_6]^{2+}$

(30 Mar

(e) The Co(III) forms paramagnetic complexes with weak field ligands while it forms diamagnetic complexes with strong field ligands.

(20 Mar

2. (a) Using crystal field theory, draw the crystal field *d*-orbital energy level diagram for each of the following complexes by assigning electrons to 3*d* orbitals.

- i. $[\text{Co}(\text{en})_2]^{2+}$ (square planar)
- ii. $[\text{FeF}_6]^{3-}$
- iii. $[\text{Fe}(\text{o-phen})_3]^{2+}$

Calculate in units of Δ_0 the difference in Crystal Field Stabilization Energy for the above complexes.

(20 Mar

(b) List the isomers for each of the following coordination complexes.

- i. linkage isomer of $[\text{Cr}(\text{H}_2\text{O})_5(\text{NO}_2)]\text{I}$
- ii. coordination-sphere isomer of $[\text{Co}(\text{o-phen})_2(\text{NH}_3)(\text{SCN})]\text{Cl}$
- iii. stereoisomers of $[\text{Fe}(\text{en})(\text{C}_2\text{O}_4)\text{Br}_2]\text{NO}_2$
- iv. stereoisomers of the square planar complex, $[\text{Pd}(\text{PPh}_3)_2\text{BrCl}]$

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(c) Briefly explain the structural effect on Jahn-Teller distortion of the complexes; $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ & $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$.

(20 Marks)

(d) List out the properties in which lithium resembles to Mg.

(10 Marks)

(e) (i) Write down the possible stereoisomers of the following complexes

- I. $[\text{Mn}(\text{H}_2\text{O})_2(\text{ox})_2]^{2-}$
- II. $[\text{Ni}(\text{NH}_3)_2\text{Cl}_2]$ (square planar)
- III. $[\text{Fe}(\text{en})_2\text{Br}_2]^+$

(15 Marks)

(ii) Write down the IUPAC name for each of the following coordination compounds:

- I. $\text{Na}_2[\text{Ni}(\text{CN})_4]$
- II. $[\text{Mn}(\text{en})_2\text{I}_2]\text{ClO}_4$
- III. $\text{Na}_3[\text{FeF}_6]$

(15 Marks)
