EASTERN UNIVERSITY, SRILANKA

SECOND EXAMINATION IN SCIENCE 1994/ 95 (AUGUST/ SEPT. 1997)

MAIN GROUP CHEMISTRY, CO-ORDINATION CHEMISTRY AND ANALYTICAL CHEMISTRY (CH201)

Time : 02 Hours

Answer FOUR questions only .

1.) Answer All the parts.

a.) Write down the general properties of Group VII A elements.

b.) List the resemblance of fluorine with oxygen.

c.) Compare the properties of the following couples,

i.) Boron and Aluminium
ii.) Carbon and silicon

d.) Compare the differences between the following,

i.) Oxygen and other group VIA elements.
ii.) Nitrogen and other group V A elements.

2.) Answer All the parts.

a.) Write the IUPAC names of the following co-ordination complexes.

i.) trans-$[PtCl_2(NH_3)_4]^{2+}$

ii.) $[Ni(CO)_3(Py)]$

iii.)$[Cr(EDTA)]^-$

iv.) $[Co(C_2O_4)(en)_2]^+$

v.) $[Pt(NH_3)_5Cl]Cl_3$

vi.) $K[Pt(NH_3)Cl_5]$

b.) Write the formulas of the following complexes,

i.) Cis-diaquadichloroplatinum(II).

ii.) diamminetetra(isothiocyanato)chromate.

iii.) tris(ethylenediamine)-chromium(III).

iv.) μ-hydroxobis-[pentaamminechromium(III)] chloride.

v.) Tetraamminecobalt(III)-μ–amido-μ-peroxotetraamminecobalt(III).

vi.) Di-μ-chlorobis[diammineplatinum(II)]chloride.

c.) One pink solid has the formula $CoCl_3.5NH_3.H_2O$. A solution of this salt is also pink and rapidly gives 3 mole AgCl on titration with silver nitrate solution. When the pink solid is heated, it loses one mole H_2O and give a purple solid with the same ratio of NH_3:Cl:Co.

i.) Deduce the structures of the two octahedral complexes.
ii.) Draw and name the structures of the deduced complexes.

3.) a.) i.) The magnetic moment of an octahedral Co(II) complex is $4.0\mu_B$. What is its electronic configuration.

ii.) The magnetic moment of the complex $[Mn(NCS)_6]^{4-}$ is $6.06\mu_B$. What is its electronic configuration.

b.) Draw all the possible isomers of

i.) octahedral $[Ru(NH_3)_4Cl_2]$

ii.) Square-planar $[Ir(PR_3)_2H(CO)]$

iii.) tetrahedral $[CoCl_2(OH_2)_2]$

iv.) octahedral $[CoCl_2(en)(NH_3)_2]^+$

c.) Which of the following complexes show optical isomerism.
i.) $[Cr(Ox)_3]^{3-}$ ii.) Cis-$[PtCl_2(en)]$

iii.) trans-$[RhCl_2(NH_3)_4]^+$ iv.) Cis-$[Co(en)_2Cl_2]$

Draw the enantiomers of the complexes identified as optical isomer and identify the plane of symmetry in structures identified as optically inactive.

d.) Write a short account about Jahn-Teller distortion or Tetragonal distortion of octahedral complexes.

4.) i.) Outline the basic theoretical principles underlying Flame Atomic Emission Spectroscopy and Flame Atomic Absorption Spectroscopy used in inorganic chemical analysis.

ii.) Discuss briefly the major interference's that affect the above two techniques. Give a concise description of the more important methods used for the suppression of these interference phenomena.

5.) a.) Describe the essential features of the instrumentation used in Flame Emission Spectroscopy.

b.) Discuss the disadvantages of Flame Emission Spectroscopy in relation to Atomic Absorption Spectroscopy.

c.) If Rf values of some of the components of a particular mixture are almost identical for a given solvent, it results in poor resolution of the mixture due to incomplete separation. What kind of chromatographic technique overcomes this difficulty. Explain

6.) a.) i.) Explain the following terms.

1. Normal phase chromatography.
2. Reverse phase chromatography.

ii.) Indicate the significance of Rf value.

iii.) What are the most commonly used adsorbents for TLC?
What type of solvents can be used for TLC?
Suggest the reagents which can detect compounds with different functional groups such as phenols, carbonyls and carboxylic acids.

b.) i.) Describe the procedure for the development of TLC for an unknown compound.

ii.) Discuss the advantages of TLC when compared with other separation methods.