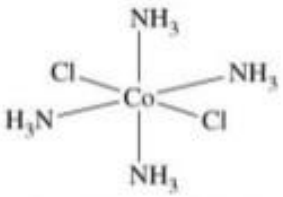
Spect. Study of Complex Compound

Introduction:

Complex (Coordination) compound, any of a class of substances with chemical structures in which a central metal atom is surrounded by nonmetal atoms or groups of atoms,, joined to it by chemical bonds.



What is:

Ligand?
Werner's Theory?
Complex Study Methods?
Metal & Ligand General Reaction Equation?
Iron and Thiocyanate Complex Reaction?
Used λ_{MAX}?

Ligand:

A ligand is an ion or molecule that binds to a central metal atom to form a complex (alternatively known as a coordination entity). Ligands may be neutral or negatively charged species with electron pairs available to donate to attract the metal at the center of the complex. Metals are electron acceptors.

Werner's Theory:

1. In coordination compounds metals show two types of linkages (valences)-primary and secondary.
2. The primary valences are normally ionisable and are satisfied by negative ions.
3. The secondary valences are non ionisable. These are satisfied by neutral molecules or negative ions. The secondary valence is equal to the coordination number and is fixed for a metal.
4. The ions/groups bound by the secondary linkages to the metal have characteristic spatial arrangements corresponding to different coordination numbers.

Complex Study Methods:

I– Mole–Ratio Method:

A series of solution ids prepared in which the analytical concentration of one reactant (usually the cation) is held constant while the concentration of the other reactant is varied. The absorbance of each solution is measured at a wavelength where the complex absorbs maximally

II– Continuous Variation Method:

Solutions of the cation and ligand with identical analytical concentrations are mixed in such a way that the total volume and total number of moles of reactants in each mixture are constant but the mole ratio varies systematically. (For example, 1:9, 2:8, 3:7----------7:3, 8:2, 9:1)

III– Slope–Ratio method:

The slope-ratio method is particularly useful for weak complexes but is applicable to a system in which only one complex is formed. However, the method assumes that (i) the complex formation reaction can be forced to completion in presence of large excess of either reactant (ii) Beer's law is obeyed under these conditions.

Metal & Ligand General Reaction Equation:

$$mM + nL \longrightarrow M_mL_n$$

Iron and Thiocyanate Complex Reaction:

Reaction	Possible Product	Ratio
$Fe^{3+}_{(aq)} + SCN^-_{(aq)} \rightleftharpoons$	$[Fe_3SCN^{8+}]_{(aq)}$	3:1
	$[Fe_2SCN^{5+}]_{(aq)}$	2:1
	$[Fe\ SCN^{2+}]_{(aq)}$	1:1
	$[Fe(SCN)_2^+]_{(aq)}$	1:2
	$[Fe(SCN)_3]_{(aq)}$	1:3

Used λ_{MAX}?

480nm

Expermental:

1- Prepare **50ml** Of [0.005M] (Fe^{3+}) from $[Fe(NO_3)_3]_{(S)}$ using distelled water.

2- Prepare **50ml** Of [0.005M] (SCN^-) from $[KSCN]_{(S)}$ using distelled water.

3- Prepare next (all in **50ml** Volumetric Flask):

NO	1	2	3	4	5	Blank
50ml						
Fe^{3+} (ml)	9	8	6	4	3	NIL
SCN^- (ml)	3	4	6	8	9	NIL

4- Add to each (**0.5ml**) of [2M] H_2SO_4.

5- Fill with distelled water and **SHAKE** well.

6- Move to the next Laboratory and determine the Mole-Ratio.

Results:

No	$C_{M/L}$	$C_{L/M}$	MR	MR_{dig}	Abs.
Blank	0	0	0	0	0
1	C_1	C_1	1:3	0.333	A_1
2	C_2	C_2	1:2	0.5	A_2
3	C_3	C_3	1:1	1	A_3
4	C_4	C_4	2:1	2	A_4
5	C_5	C_5	3:1	3	A_5

Calibration Graphs (Possibility of one only):