Test Paper Solution

Section - B

1) $Co(H_2O)(CN)$

$H_2O \Rightarrow 0$

$CN^- \Rightarrow -1$

$Co \Rightarrow x$

$x + 4(0) + 2(-1) = +1$

$x - 2 = +1$

$\boxed{x = +3}$

2) $K_2[Ni(CN)_4]$

3) Hexaaquatitanium (II) ion

4) metal carbonyls exhibit synergistic bonding involving Both σ and π interaction

Section - C

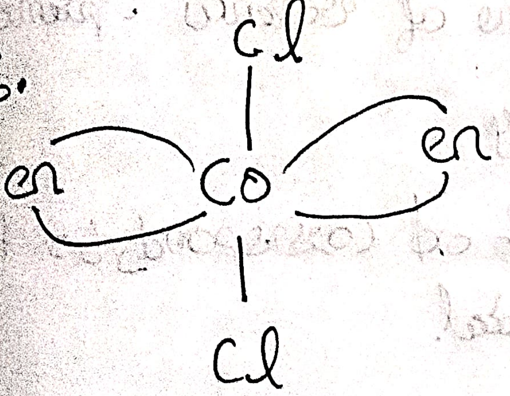
5. Limitations of valence bond theory included its inability to explain the colour of complexes,

(ii) the quantitative interpretation of magnetic data

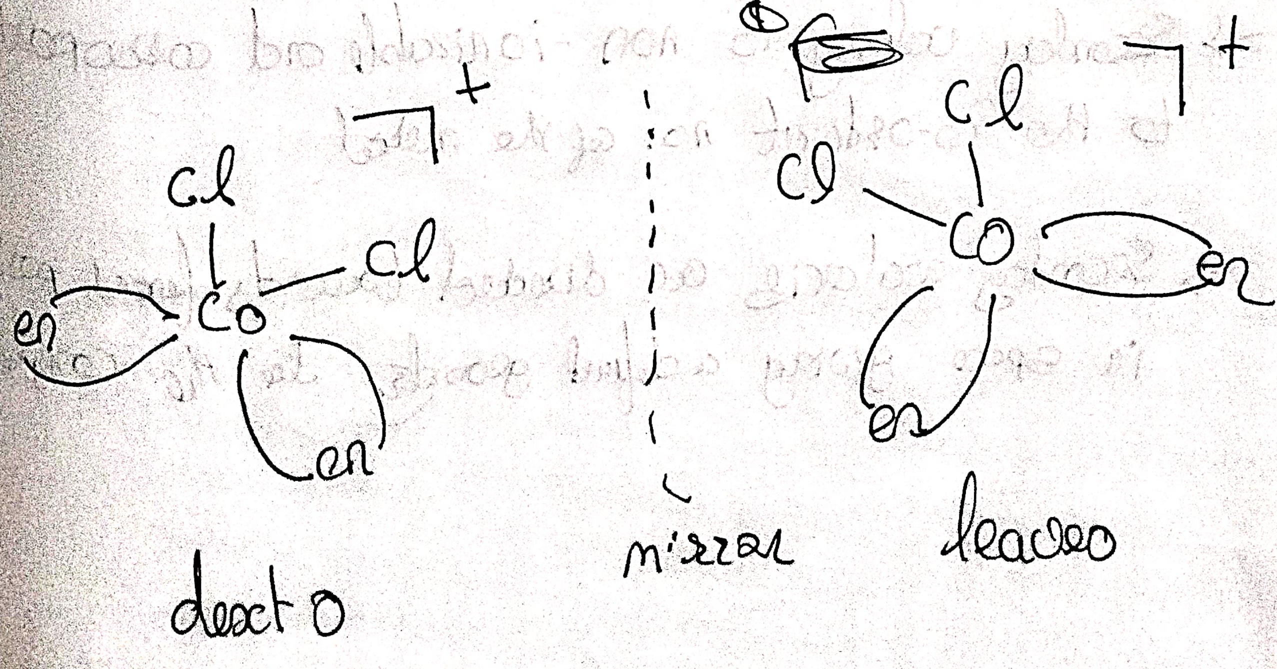
(iii) the thermodynamic or kinetic stability of co-ordination compound.

(iv) The distortion in shape of certain complexes.

6.



= Trans $[Co Cl_2 (en)_2]^+$



7.

i) Potassium tris (oxalato) chromate (III)

ii) dichlorobis (ethylenediamine) cobalt (III) chloride.

8) i) $[Cr(C_2O_4)_3]^{3-} \Rightarrow$ ⓪

(ii) $[Co(NH_3)_3Cl_3] \Rightarrow 2$

9) Alfred Werner's theory of co-ordination compound has the following main postulates.

=> Metal ion exhibit two type of valence - primary valency and secondary valency.

=> Primary valency is ionizable and corresponds to the oxidation state of the metal.

=> Secondary valency is non-ionizable and corresponds to the co-ordinate no. of the metal.

=> Secondary valencies are directed towards fixed position in space giving a definite geometry to the complex

Section - D

10. Primary valence and secondary valency are concepts proposed by Alfred werner.

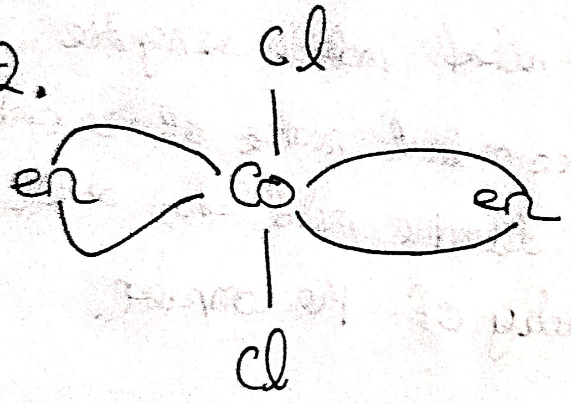
=> Primary valence : This is the ionizable valence of the metal and is satisfied by negative ions. It is equal to the oxidation state of the central metal atom or ion.

=> Secondary valence: This is the non-ionizable valence of the metal and its satisfied by neutral molecules or negative ions. It is equal to the co-ordinate number of the central metal atom or ion and determine metal atom or ion and determind the geometry of the complex

Section - E

11. The complex $[Ti(H_2O)_6]^{3+}$ is violet because the Ti^{3+} ion has a d^1 configuration. In the octahedral field the d electron absorbs light in the green yellow region of the spectrum to undergo a d-d transit from the t_{2g} to the e_g orbital. The transmitted light is violet the complementary colour.

12.



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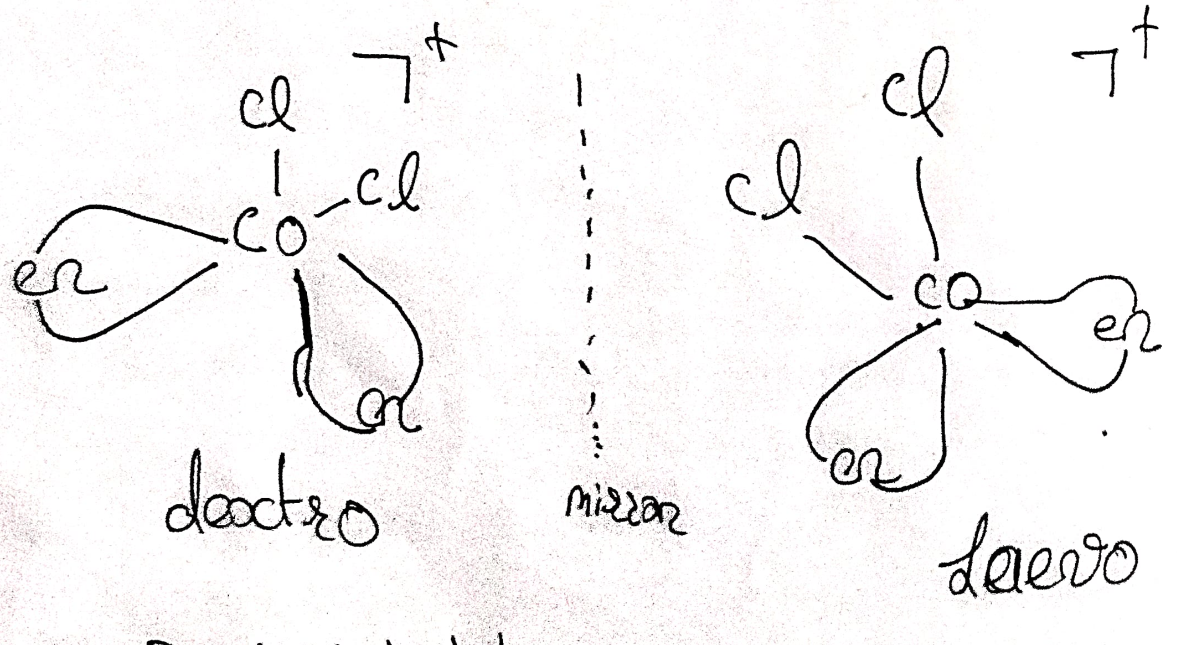

cis $[CoCl_2(en)_2]^+$ optical isomers (d and l)

b) Inoization isomers dissolve in water to give different ions, hence giving different reaction with different reagents

⇒ $[Co(NH_3)_5Cl]SO_4 + Ba^{2+} \rightarrow BaSO_{4(s)}$

⇒ $[Co(NH_3)_5SO_4]Cl + Ba^{2+} \rightarrow$ No reaction

⇒ $[Co(NH_3)_5Cl]SO_4 + Ag^{+} \rightarrow$ No Reaction.

⇒ $[Co(NH_3)_5SO_4]Cl + Ag^{+} \rightarrow AgCl_{(s)}$

* Since the given complex gives different reaction with reagents, hence they are ionization isomers.