LECTURE 26/36 Nov/8/02

COORDINATION CHEMISTRY

READ GRAY CH 5 170 - 172 TODAY
148 - 158 NEXT

COORDINATION CHEMISTRY

WE WANT TO STUDY METAL COMPLEXES

$$M \longleftarrow :L$$

METAL LIGAND

$$Ni^{2+}_{(aq)} \xrightarrow{H_2O} Ni(H_2O)_6^{2+} \xrightarrow[\text{LIGAND SUBSTITUTION}]{NH_3} Ni(NH_3)_6^{+2}$$

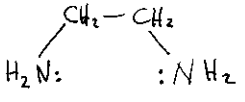
GREEN BLUE

$$\xrightarrow{en} Ni(en)_3^{+2} \xrightarrow{dmgh} Ni(H_2O)_2(dmgh)_2^{2+}$$

PURPLE PINK

en - BIDENTATE

ethylene diamine



RAPID LIGAND SUBSTITUTION

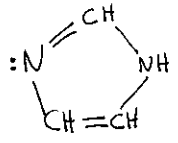
LIGANDS MONOPENTATE

IONS OR MOLECULES w/ lone pair

F^-, Cl^-, Br^-, I^- OH^-

$:NH_3$ $H_2\ddot{O}:$

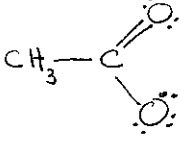
IMIDAZOLE



BIDENTATE

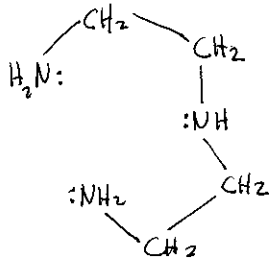
OR

ACETATE



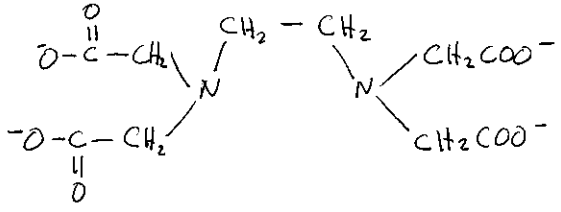
CHELATE COMPLEX

TRIDENTATE DIETHYLE TRIAMINE



CHELATE COMPLEX

EDTA Ethylene Diamine Tetra Acetate



WE FIND THAT

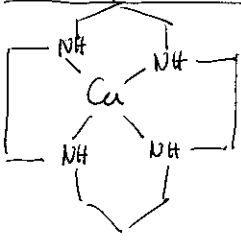
$Ni(en)_3^{+2}$ IS A MORE STABLE COMPLEX THAN

$Ni(NH_3)_6^{2+}$

CHELATE COMPLEXES ARE MORE STABLE

THAN HOMO DENTATE

MACROCYCLIC COMPLEXES



MORE STABLE

FOR THESE COMPLEXES WE WANT TO UNDERSTAND THEIR PROPERTIES

WE NEED A BONDING THEORY TO PREDICT

a) STRUCTURE

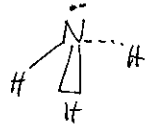
b) PROPERTIES (MAGNETISM)

c) COLOR

VSEPR — VALENCE BOND THEORY

USEFUL FOR a) BUT NOT FOR c)

sp^3 HYBRIDS



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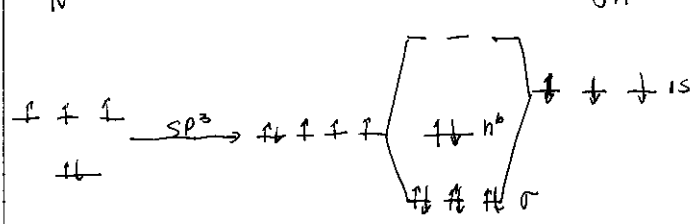
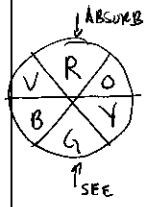


Highest Occupied MO LONE PAIR ON N
(HOMO)

Lowest Unoccupied MO
(LUMO)

SPECTRUM OF NH_3 HAS 3 peaks !


ABSORB
R
O
Y
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B
V
SEE