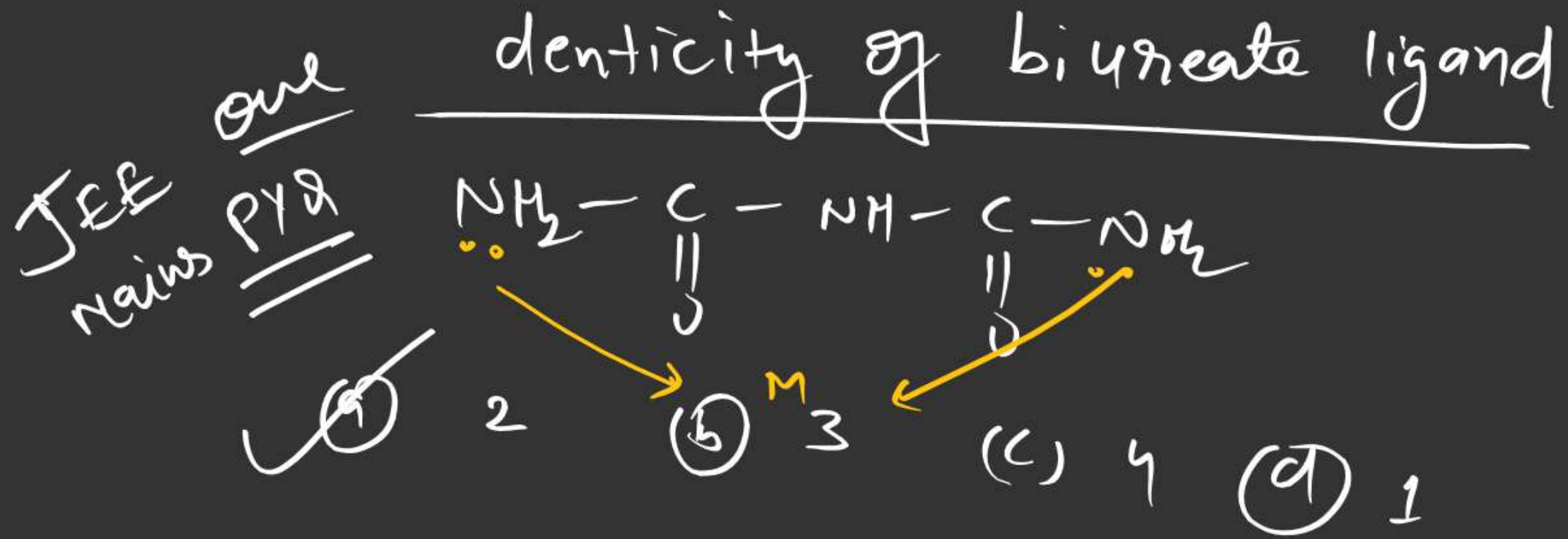


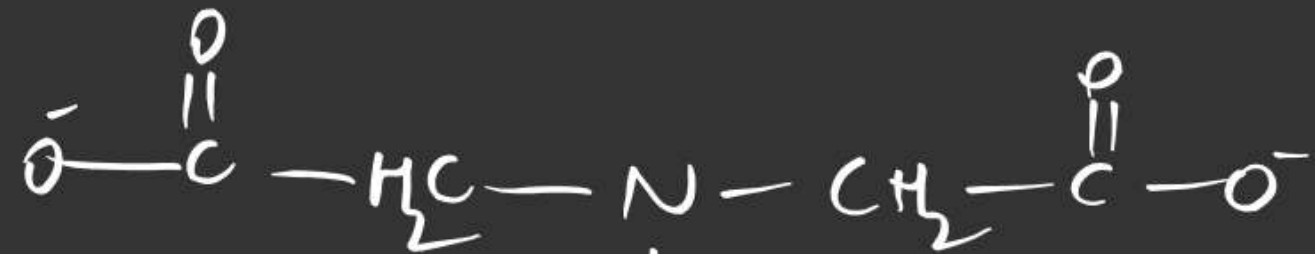
Polydentate ligand



Polydentate



Imino diacetate (Imda)



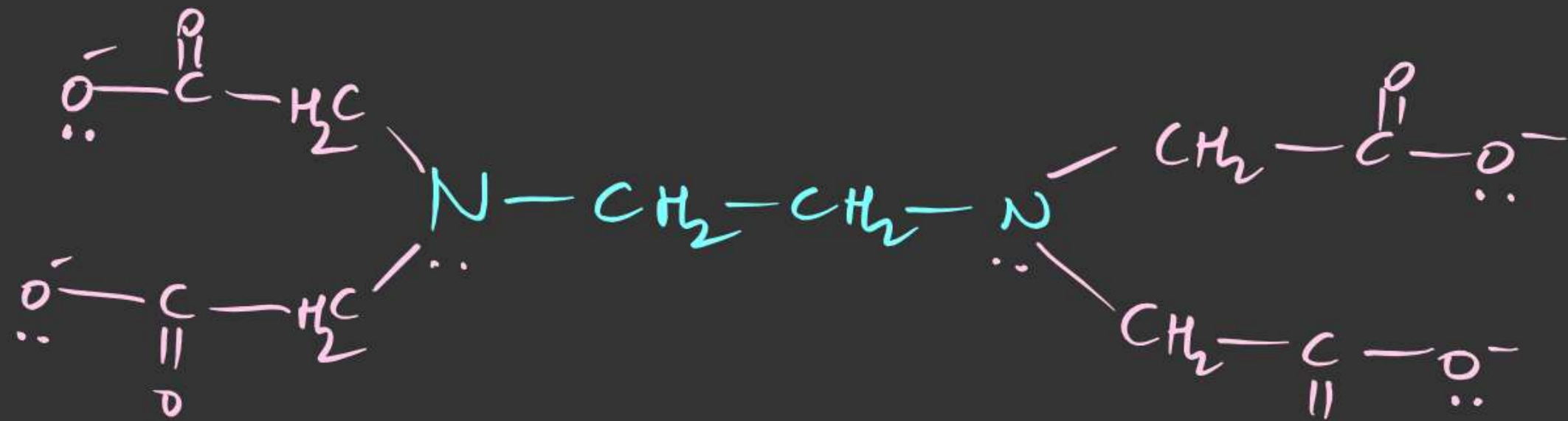
nitrilotriacetate
(NTA⁻³)



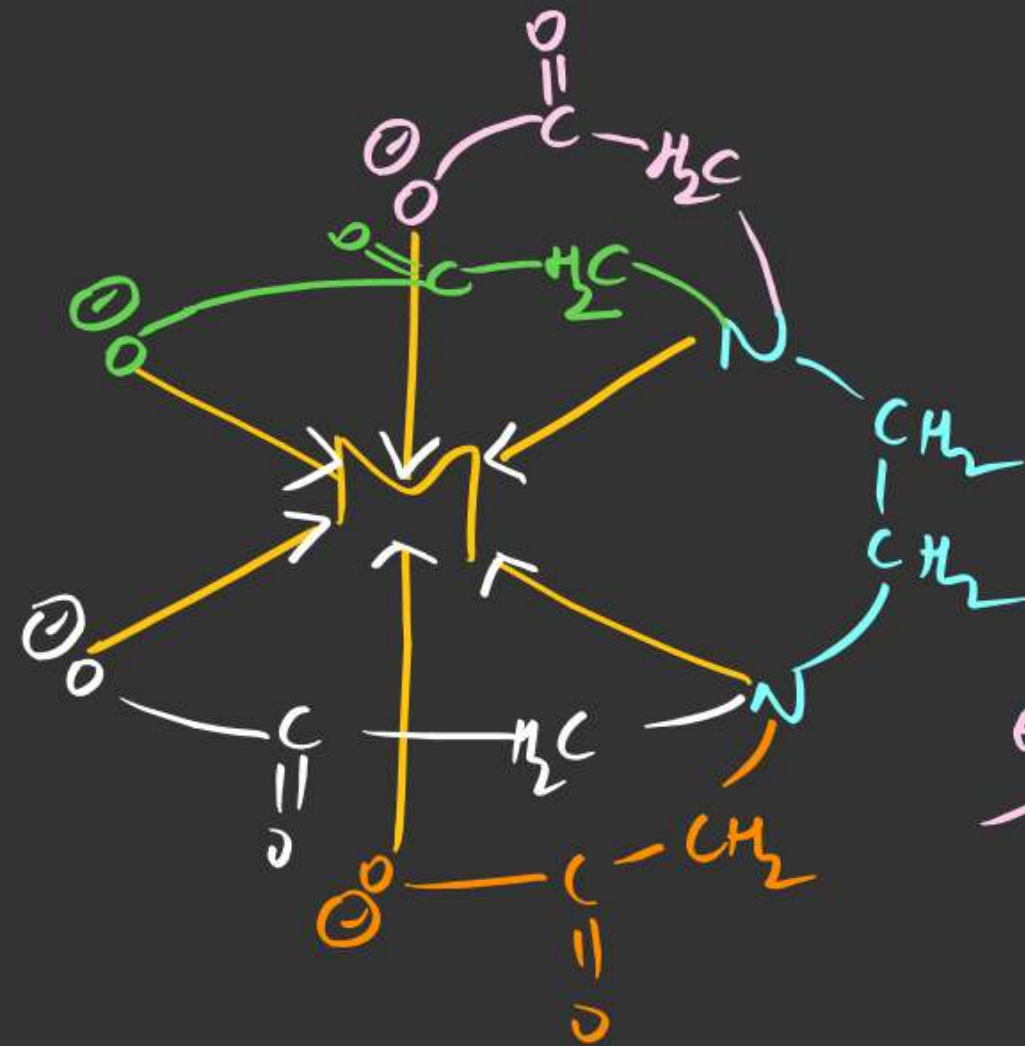
(dien)
(diethylene triamine) (dien)



(trien)
(triethylene tetraamine)



ethylenediamine tetraacetate $[EDTA]^{-4}$
Hexadentate (ligand)



and find the

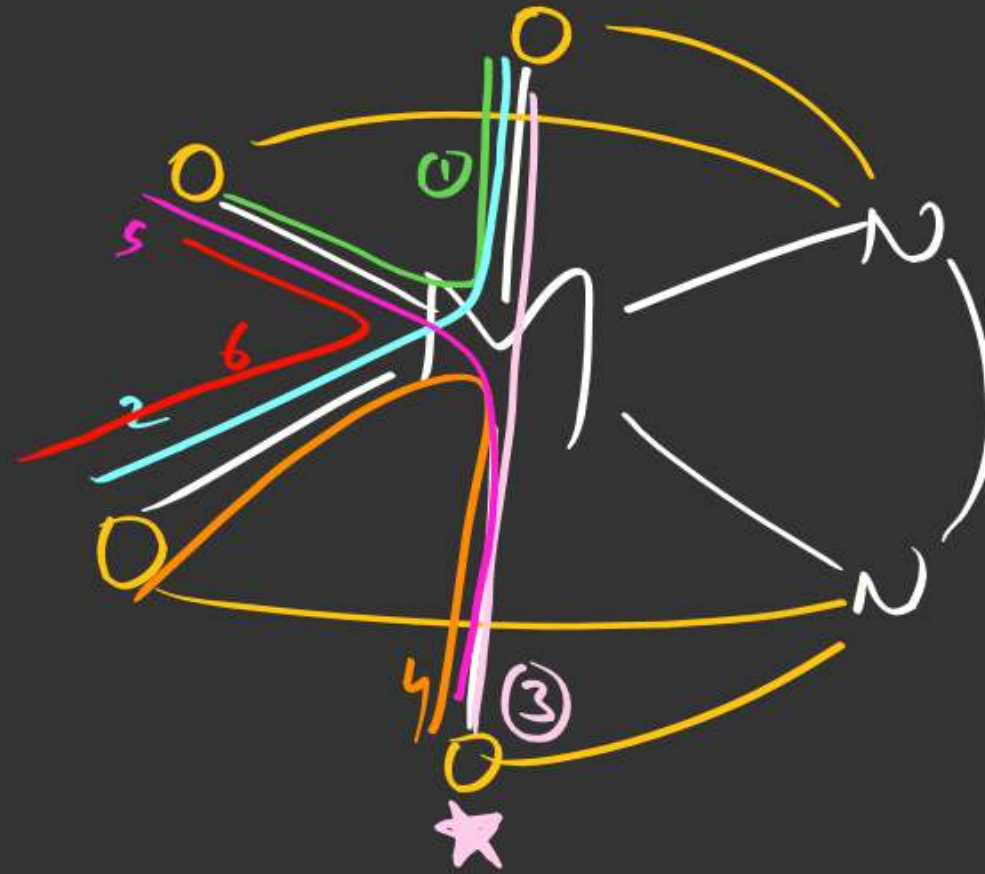
$N-M-O$ linkage

$$\text{Ans} = \underline{8}$$

and find the

$O-M-O$ linkage

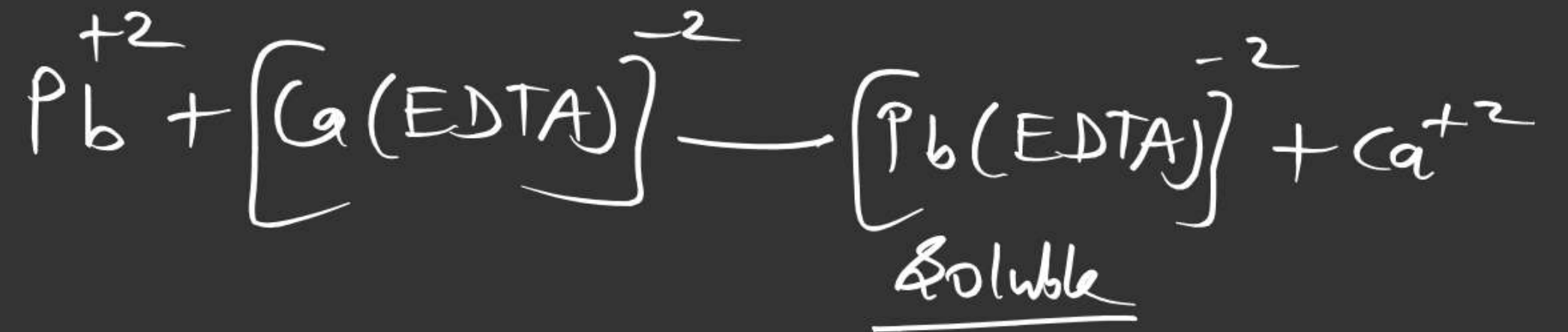
$$\text{Ans} = \underline{6}$$



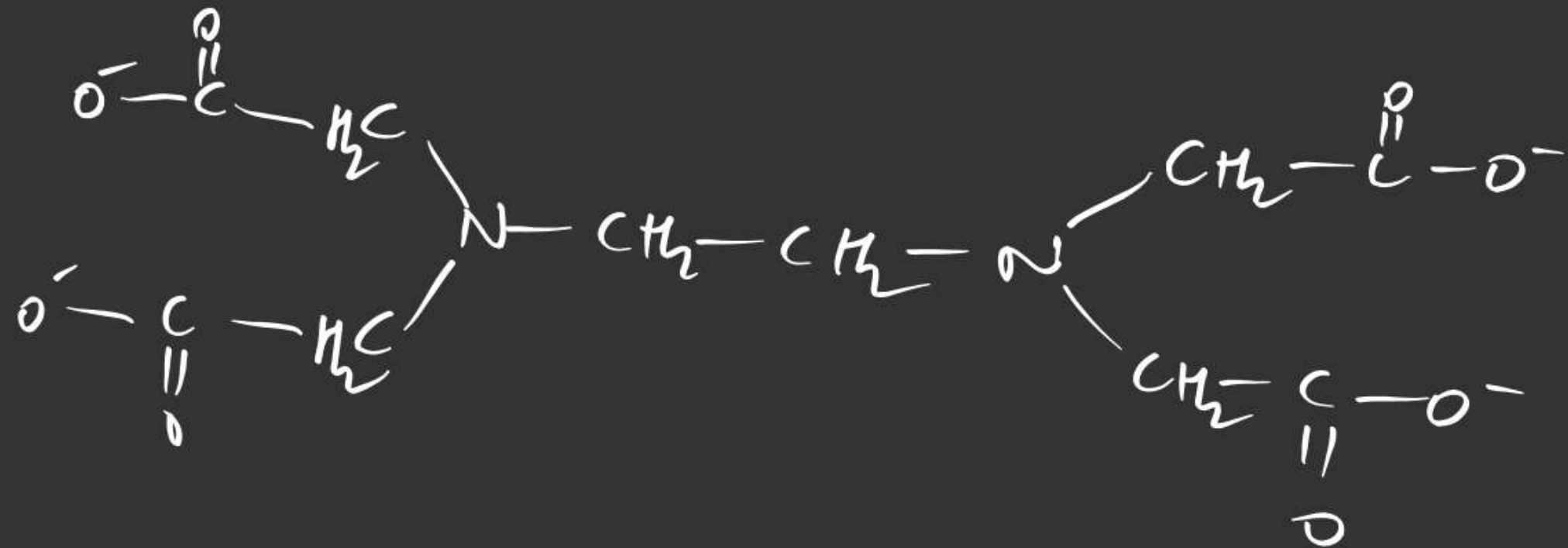
$$0 - 1 - 0$$

$$\text{Ans} = \underline{6}$$

Note \Rightarrow uses of EDTA



- (2) EDTA can be used for removal of hardness of water
- (3) EDTA can be used for estimation of Ca^{+2} and Mg^{+2} only at high pH because at low pH EDTA will be protonated.



H_4EDTA (ethylene diamine tetracetic acid)

H_3EDTA^-

$\text{H}_2\text{EDTA}^{2-}$

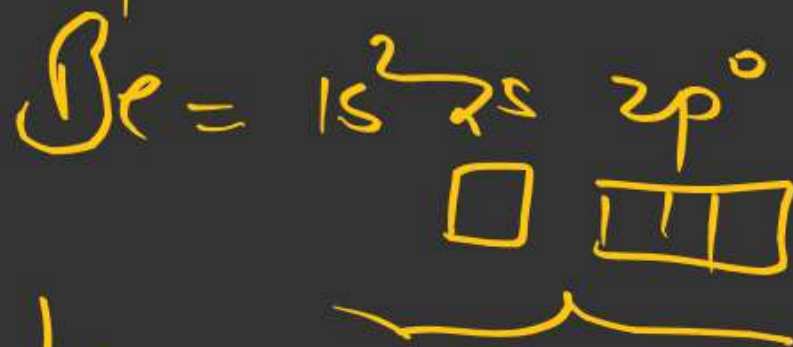
HEDTA^{3-}

EDTA^{4-}

ans

Which of the following
Cation does not form complex
With EDTA

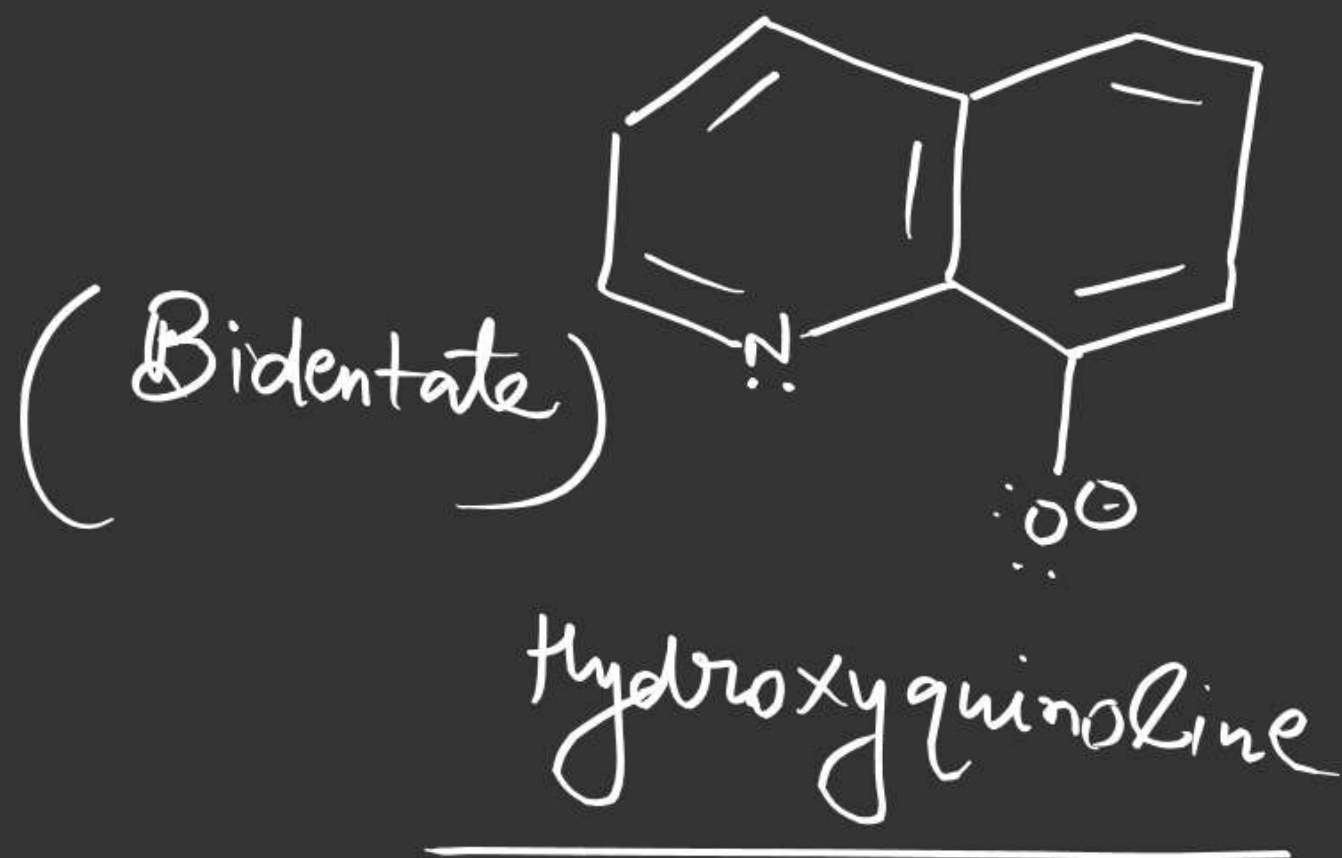
- ① Be^{+2} ② Ca^{+2} ③ Mg^{+2} ④ all can form complex



With EDTA

Ans = Be^{+2}

because, it has only 4 vac. orbital



(3) on the basis of donating and accepting prop.

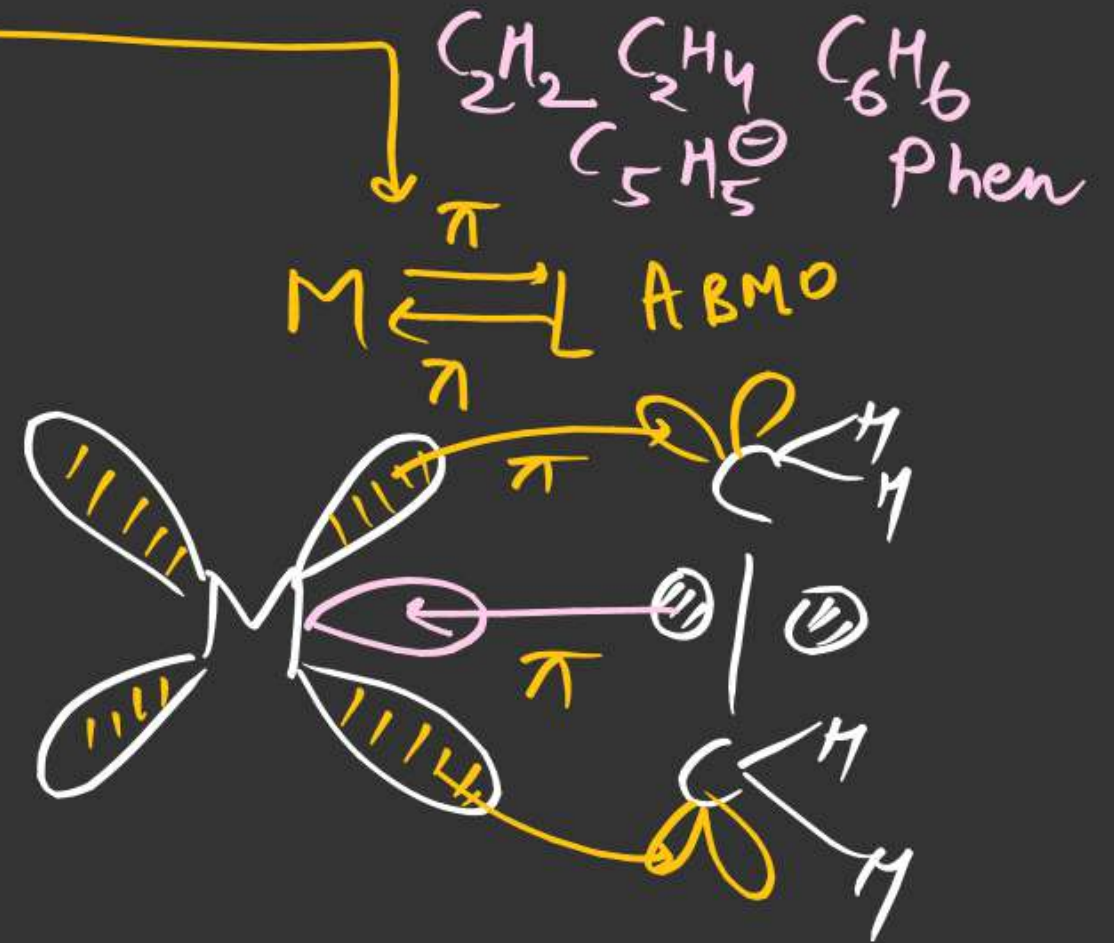
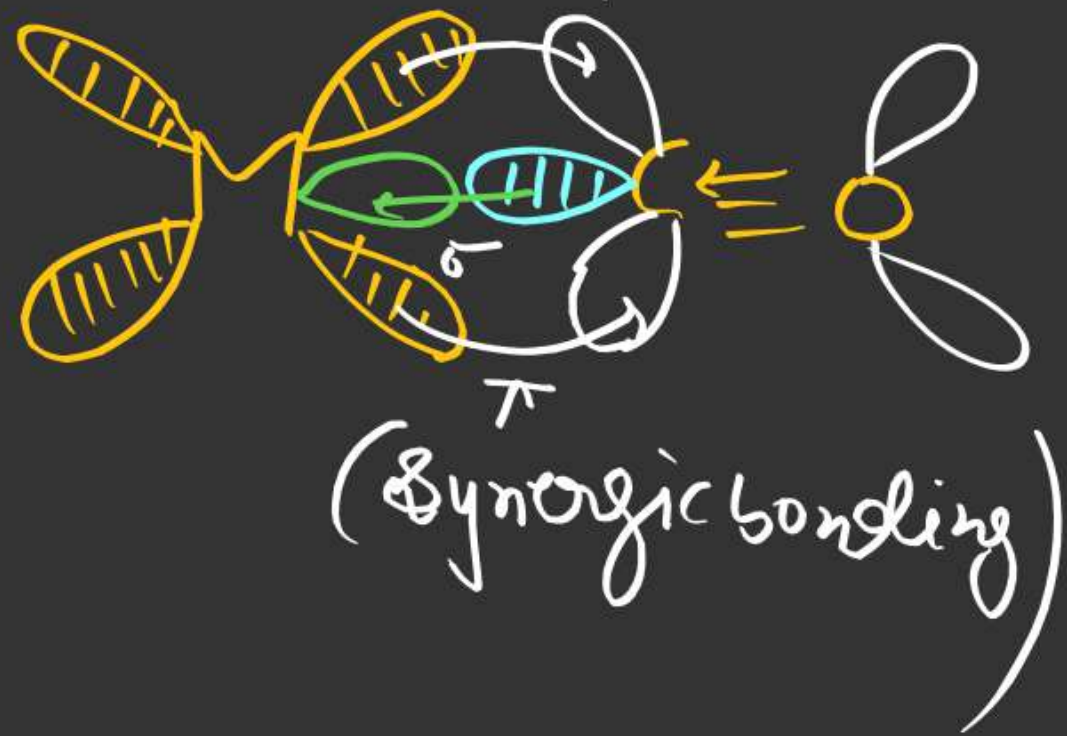
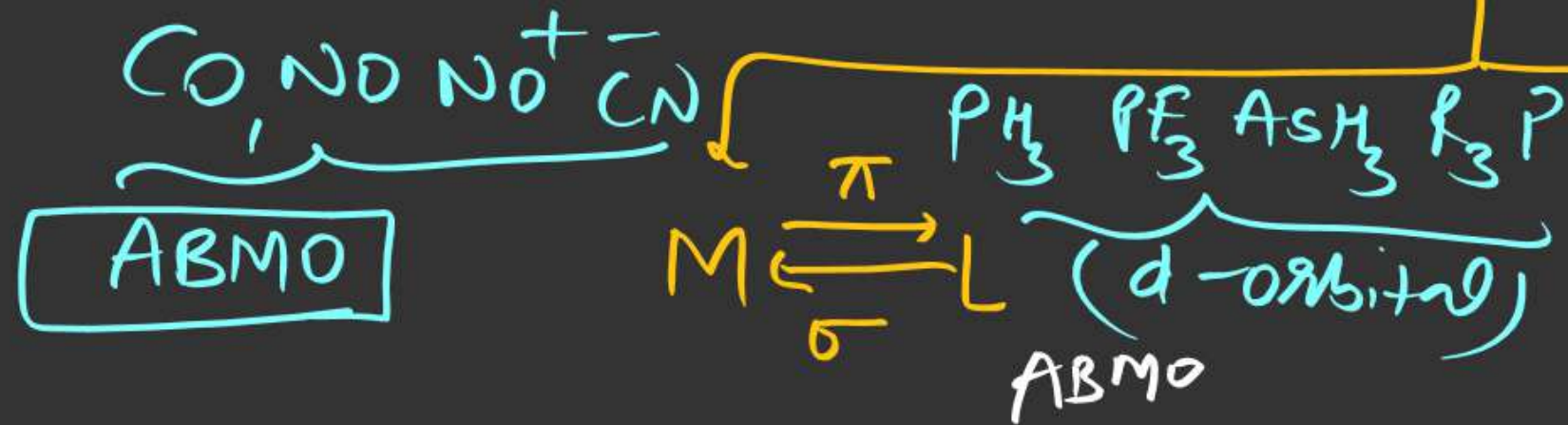
Classical

nonClassical

① Classical — ligand which can only donate l-p.

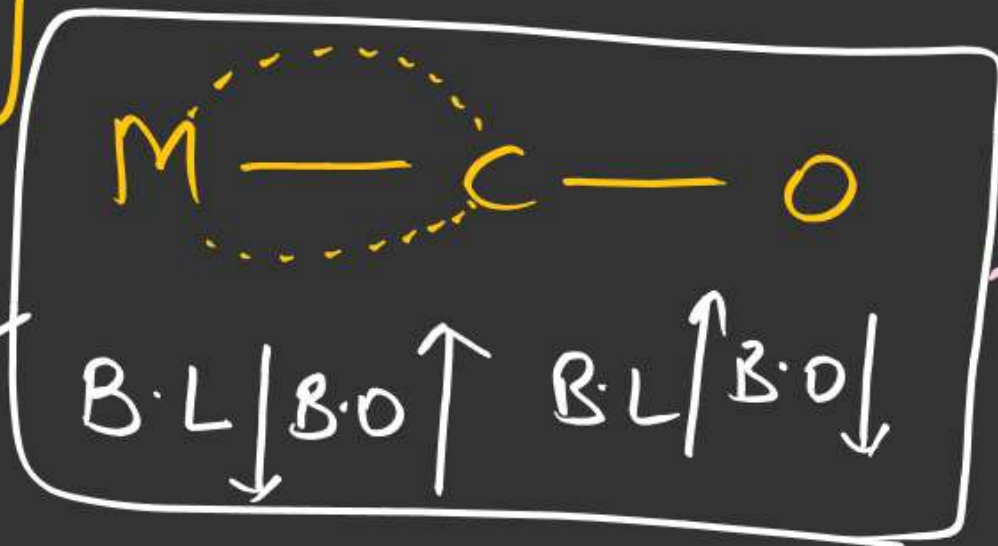
nonClassical — ligand which can donate its l-p in vacant orbital of Metal cation or atom but simultaneously e^- accept in its vacant Anti Bonding molecular orbital or d-orbital through Back bonding. this back bond formation process is known as Synergic bonding.

non Classical ligand (π -acid ligand)



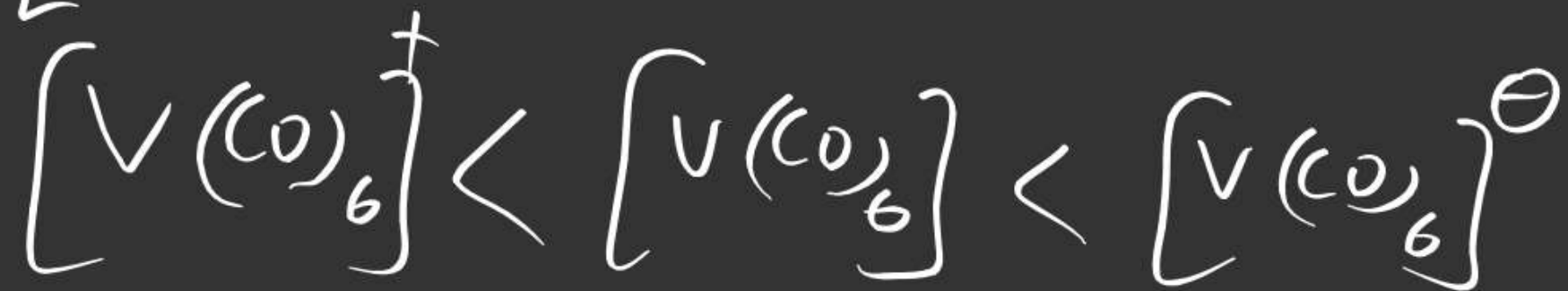
Keypoint

★



Synergic bonding → depends on donating prop. of metal cation and accepting prop. of ligand

Order of C-O B.L



Order of C-O B.O

> >

Order of M-C B.O

< <

Order of M-C B.L

> >

Ques Which of the following complex ion have higher C-O B.L

- ① $\text{Ni}(\text{CO})_4$ ② $[\text{V}(\text{CO})_6]^+$ ③ $\text{Fe}(\text{CO})_5$ ④ $[\text{Ti}(\text{CO})_6]^{2-}$

$$\nu_{C-O} \propto \text{Bond order of } C-O$$

Stretching
Vib. fr.

Ques Which of the following complex ion have higher ν_{M-C} bond

- (A) $[Mn(CO)_6]^+$ (B) $[Ti(CO)_6]^{2-}$ (C) $Fe(CO)_5$ (D) $Ni(CO)_4$

Note \Rightarrow B.L of C-O in isolated

Condition is 1.128 \AA but in
Complex compound it will be 1.150 \AA
due to synergic bonding

Co

C — O
 1.128 \AA

C — O
 1.15 \AA

ans ²⁰⁰⁷
C-O B.L in $[\text{Fe}(\text{CO})_5]$

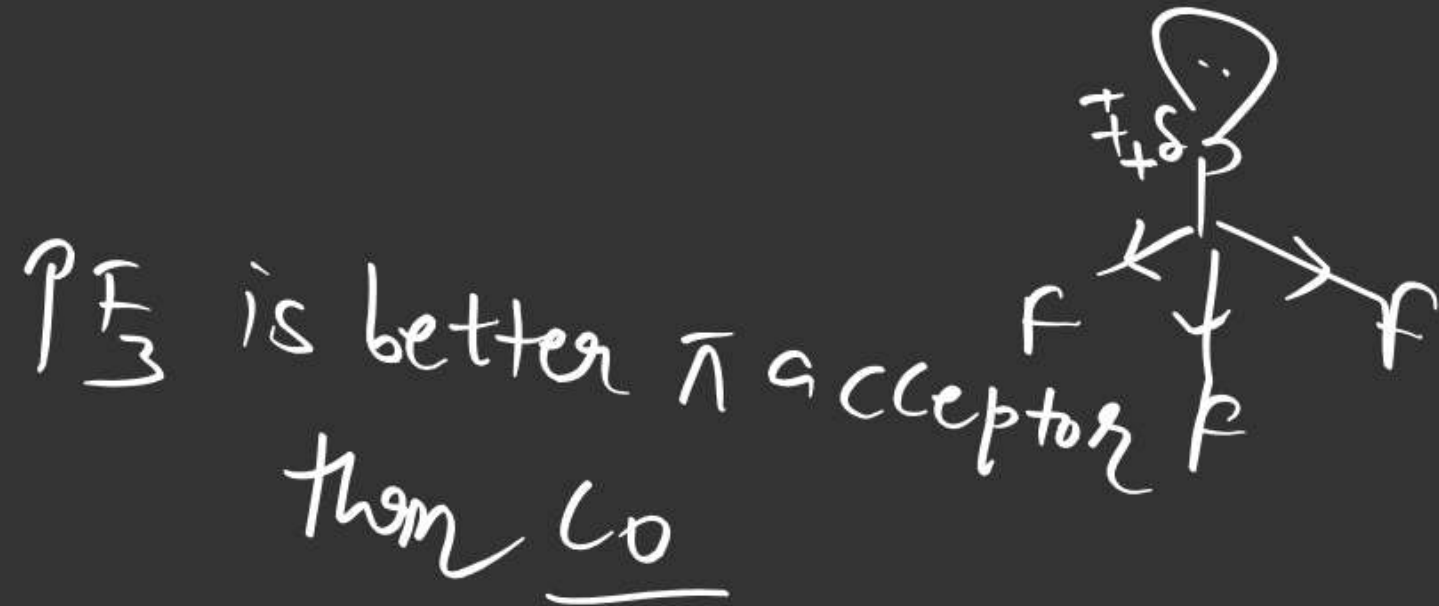
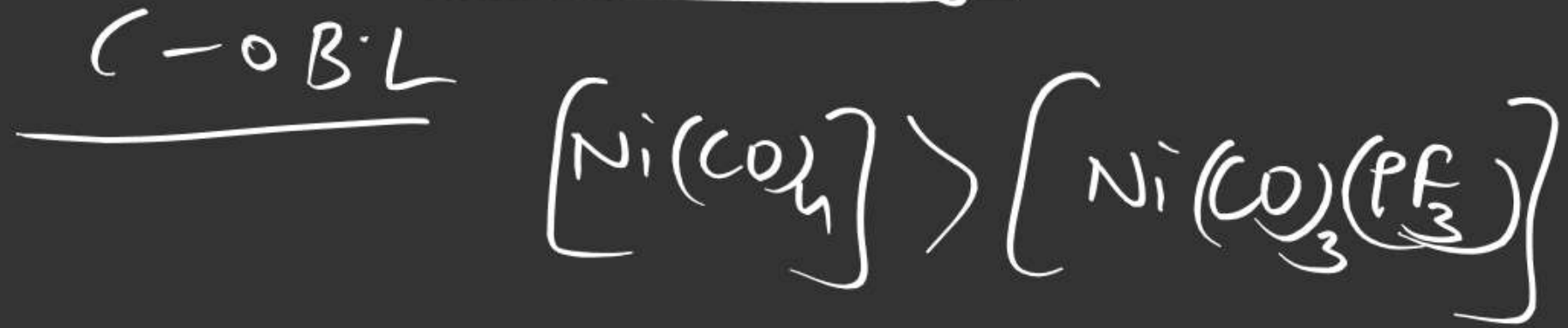
(1) 1.128 \AA

~~(2)~~ 1.150 \AA

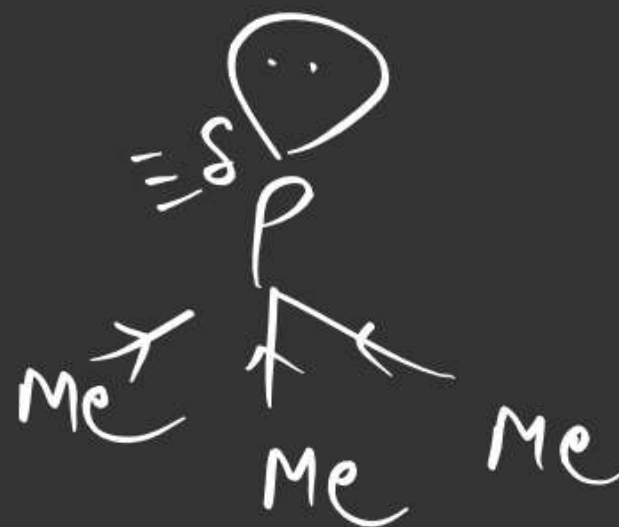
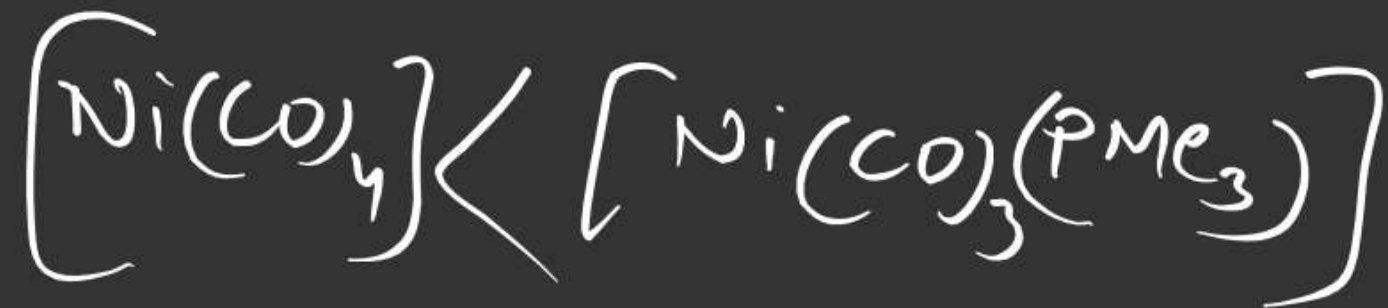
(3) 1.115 \AA

(4) 1.172 \AA

Mixed Carbonyl



C-O B-L

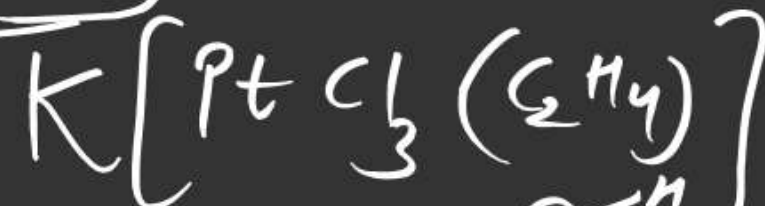


C-O B-L

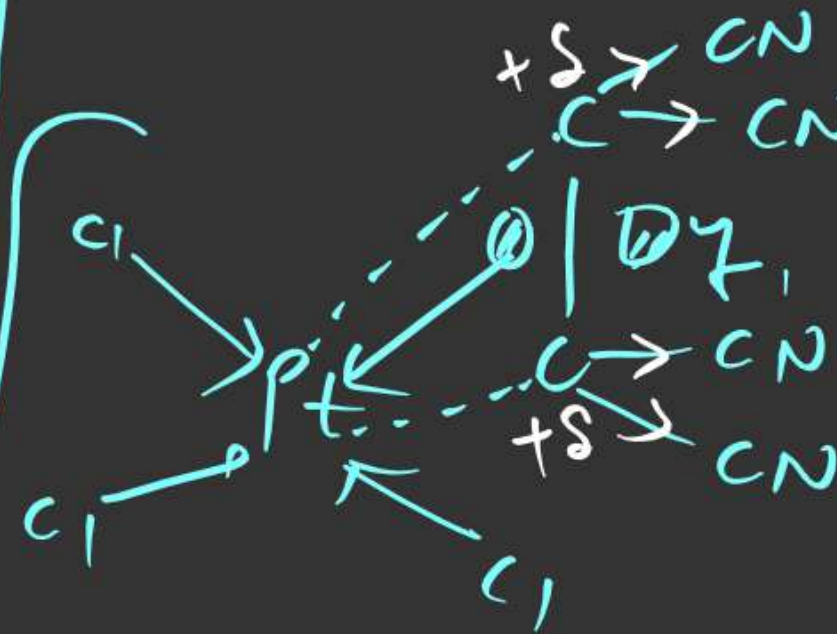
Draw the Zeise salt

★ due to trans effect

$$x = y < z$$

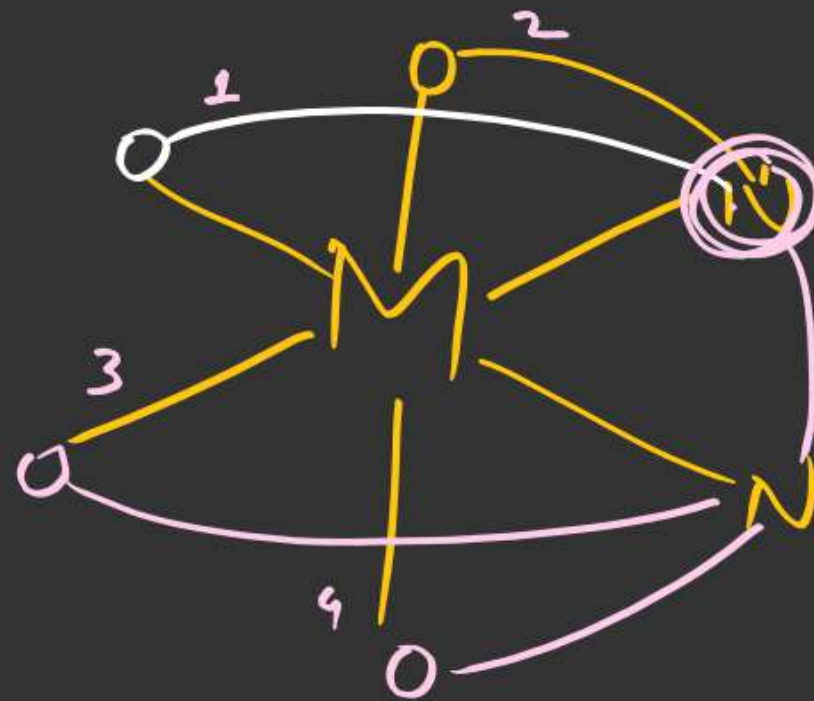


$$x < y$$



In isolated condition $C-C$ B.L is x but in complex compound $C-C > x$ due to synergic bonding

Note \rightarrow dsp^2
sq. planar, but not perfect sq. planar
because $2H_y \perp$ to the plane



$$\underline{N - M - O \text{ linkage} = \underline{\underline{8}}}$$