



SHODH JUNE 2024



Inorganic Chemistry

Bioinorganic Chemistry

Lecture No.- 04

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RECAP *of previous lecture*

- 1) ✓ Hemocyanin
- 2) ✓ Metalloenzymes



TOPICS *to be covered*

- 1) ✓ Metalloenzymes
- 2) ✓ Electron Transfer system





Topic: Metalloenzymes



③ Vitamin B-12: It is naturally occurring organometallic compound.

○ Corrin Ring present.

$X = \text{CN}^-$ → cyanocobalamin / Vitamin B-12

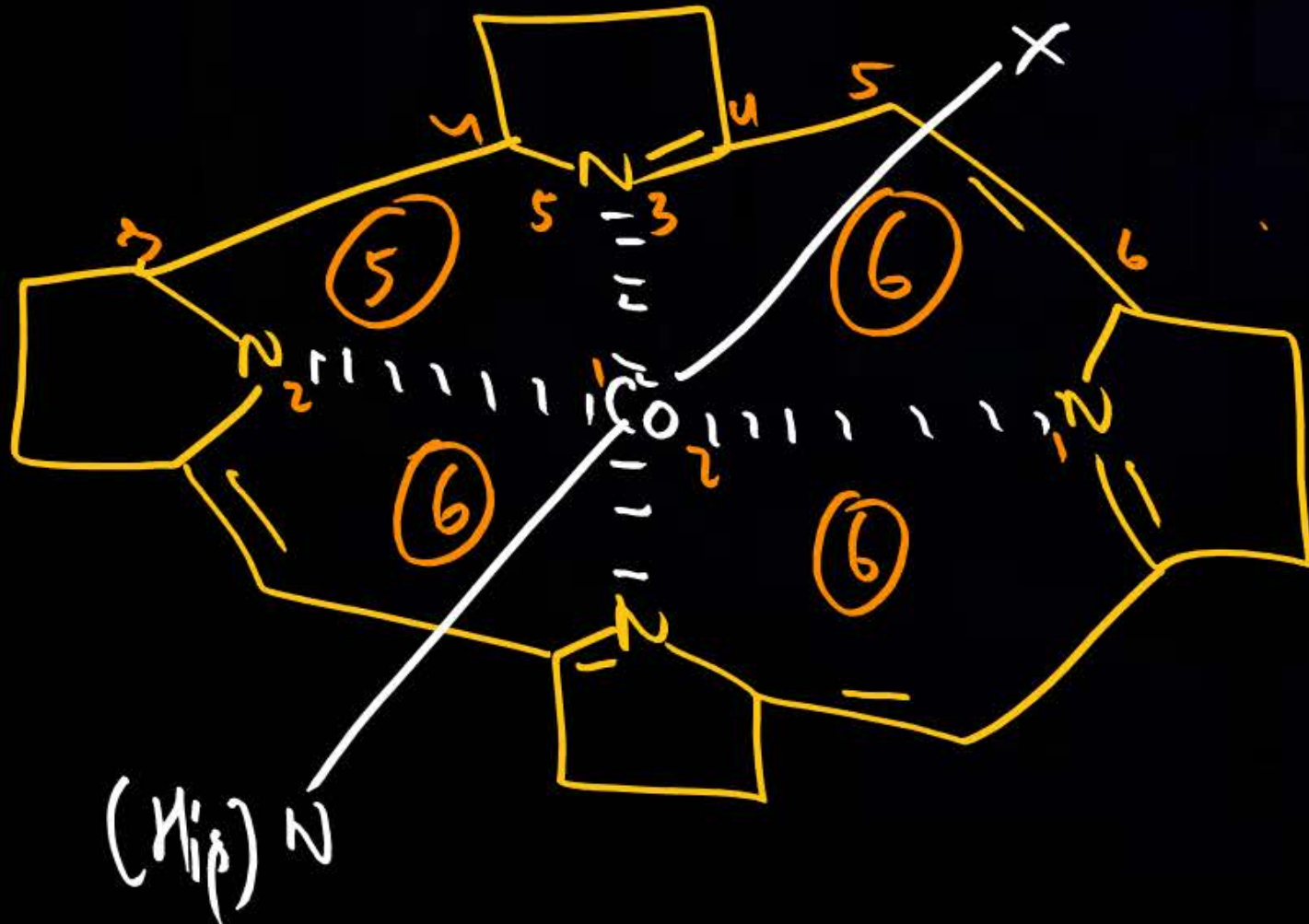
$X = \text{H}_2\text{O}$ → aquacobalamin

$X = \text{adenosyl group}$ → Coenzyme B-12

○ Reduced form of porphyrin ring.

○ less conjugated & less symmetrical than porphyrin.

○ 6 double bond present



Function of coenzyme B-12

- 1-2 carbon shift reaction / functional group transfer

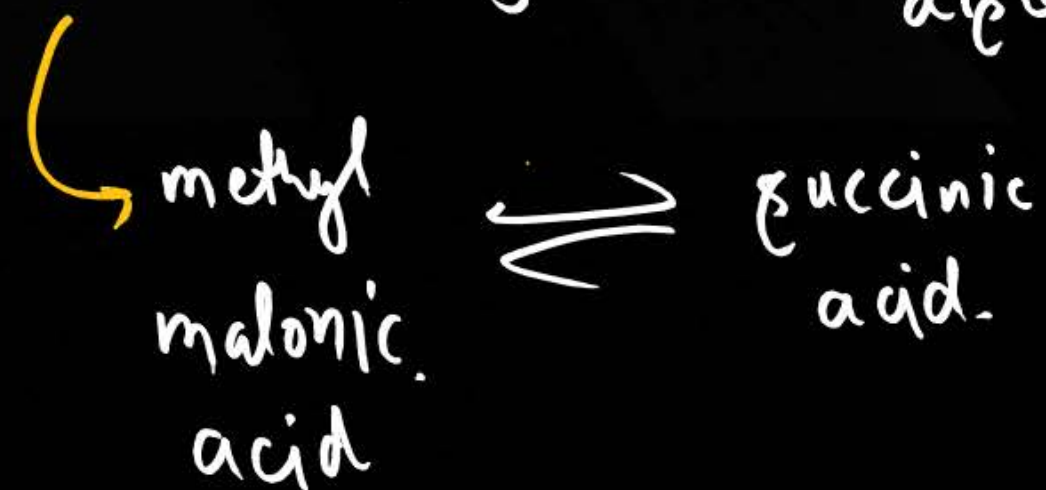


- RNA \rightleftharpoons DNA

- 1,2 diol dehydrase



- Deficiency of B-12 \rightarrow anaemia, discosis



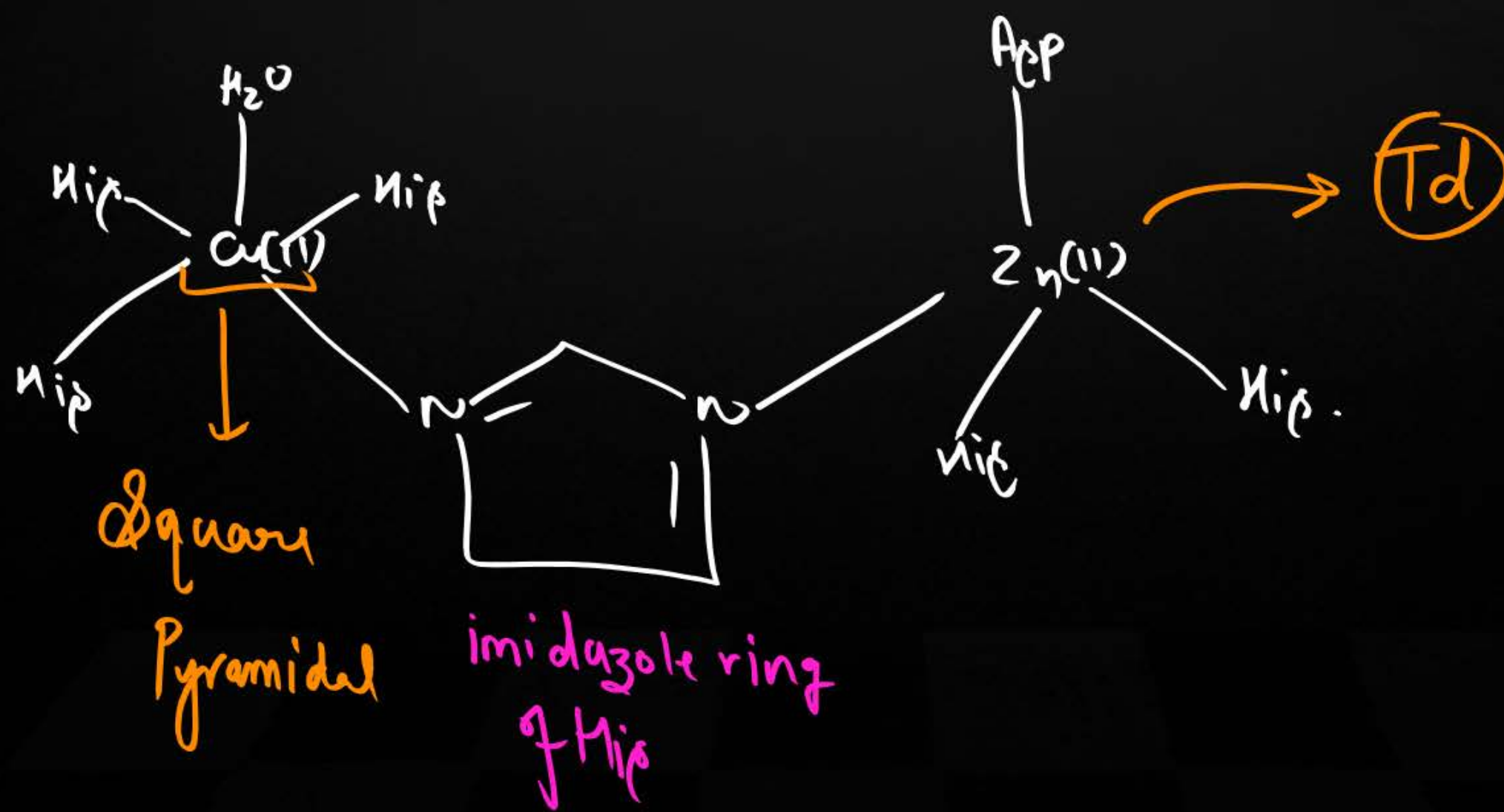
Superoxide dismutase Enzyme: (SOD)

①. Cu-Zn SOD:

Structure?

Superoxide (O_2^\ominus) is generated after the reduction of O_2 and it is very harmful for the healthy cells.





- Cu plays functional role and Zn plays supporting structural role.
- Zn can be replaced by divalent cations.

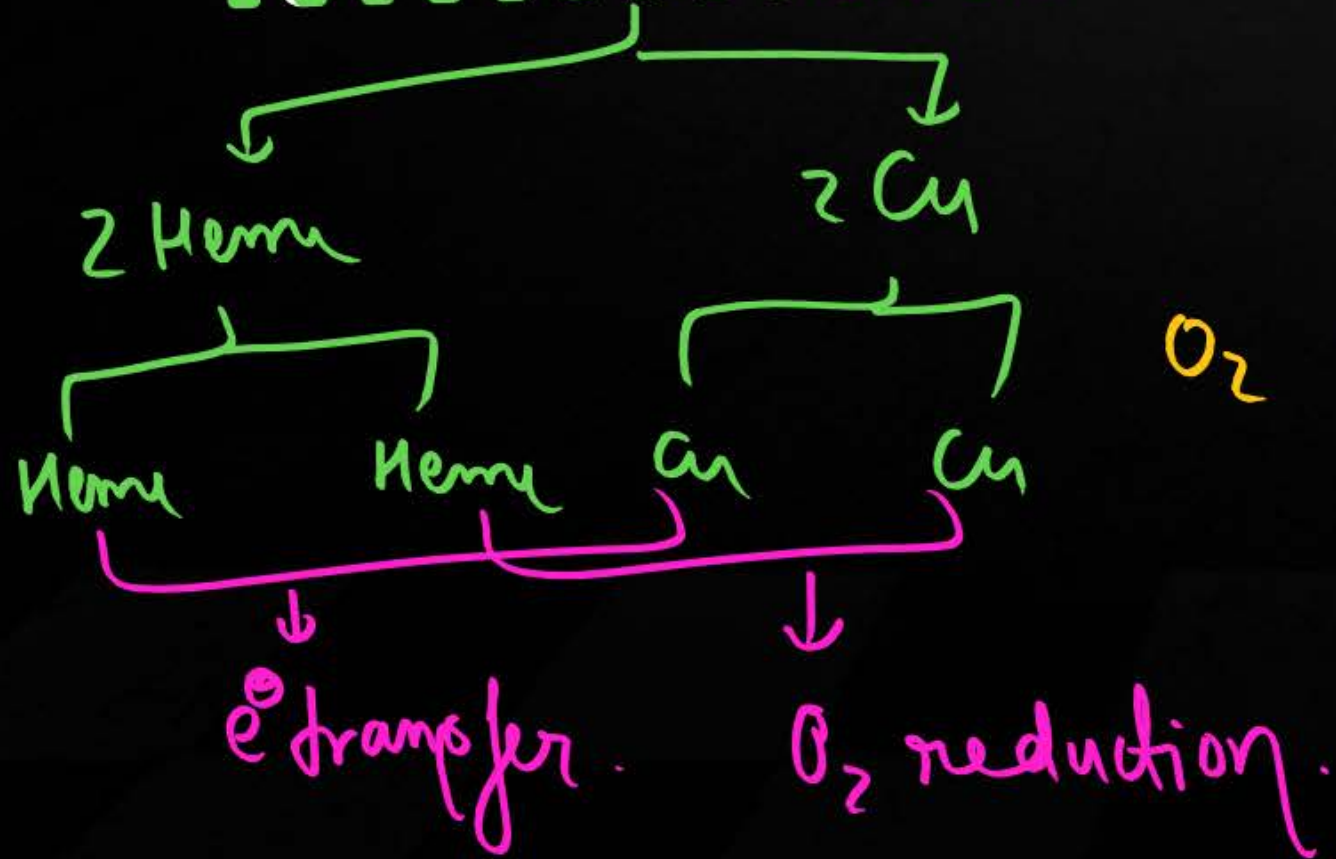
①. Tyrosinase → Cu centered Metalloenzyme.

• It converts phenol into diphenol.

Oxygenase
enzyme



Cytochrome C-oxidase:



It catalyzes the reduction of O₂ which involves 4e⁻.



Some other metalloenzyme information:

Name	Function	Metal Present.
○ Urease.	○ Hydrolysis of urea into CO_2 & NH_3	Ni
○ Arignose	○ transfer of e^-	Mn
○ Amino oxidase	○ Oxidation of amino into aldehyde	Cu
○ Hydrogenase	○ Reduction of H_2	Fe
○ Galactose oxidase.	○ Oxidation of alcohol into a aldehyde and H_2O	Cu

Electron Transfer System

Fe-S system



o Td \rightarrow High spin.

cytochromes



o oh \rightarrow low spin.

Blue Copper Protein.



Fe-S system:

- It is combination of Fe & protein.
- It is involve in e transfer.
- Fe \rightarrow high spin.
- Td environment.

Two type of S present



labile S
acidic S
inorganic S

Non-labile S
nonacidic S
organic S



$Fe_n S_y$ $n \rightarrow$ No. of Fe
 $y \rightarrow$ No. of labile S

Fe-S system

Rubredoxin



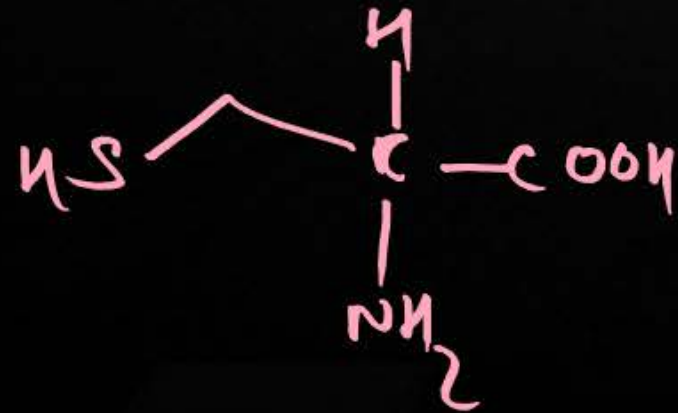
Ferridoxin.



④ Rubredoxin:

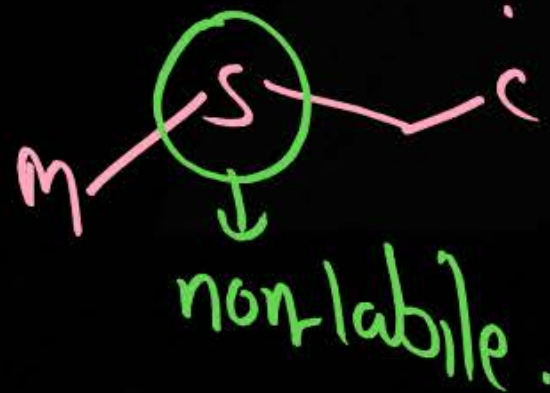


cysteine

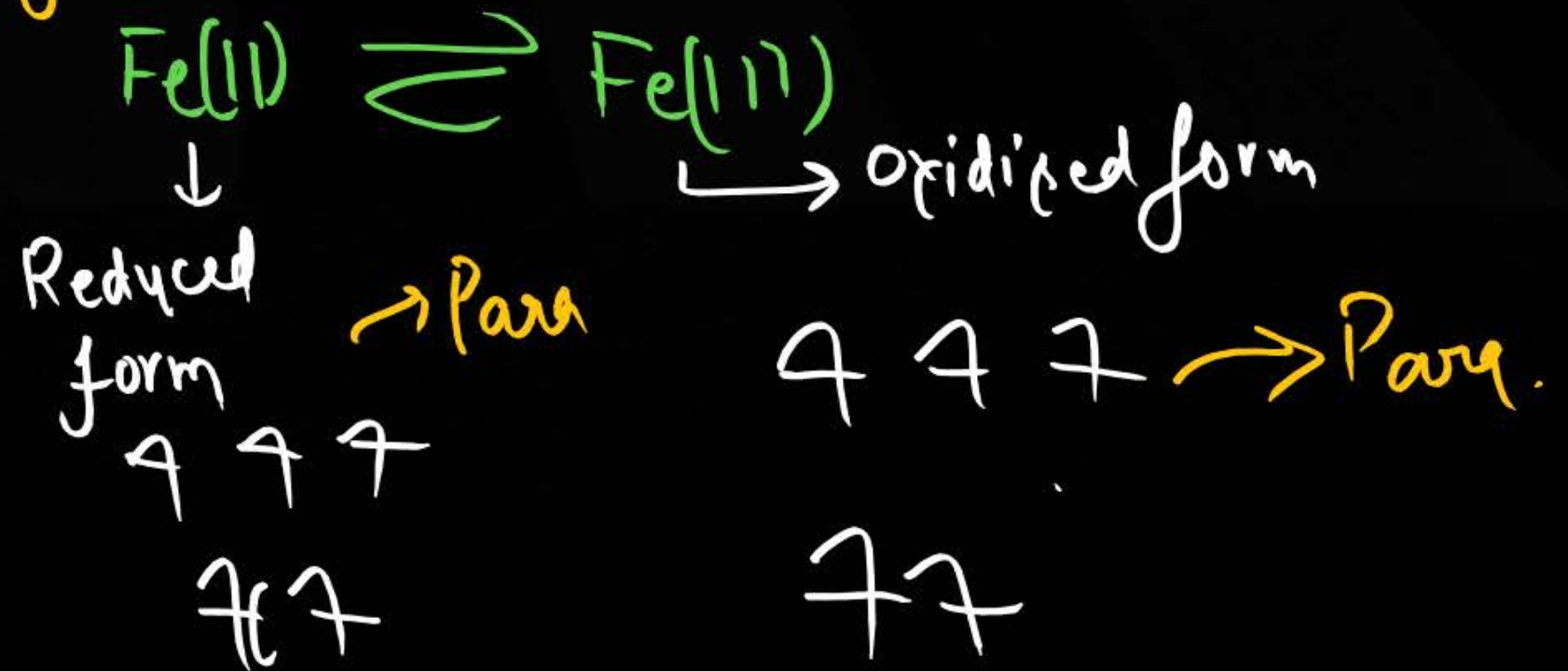


labile S = 0
non-labile S = 4

m-cys

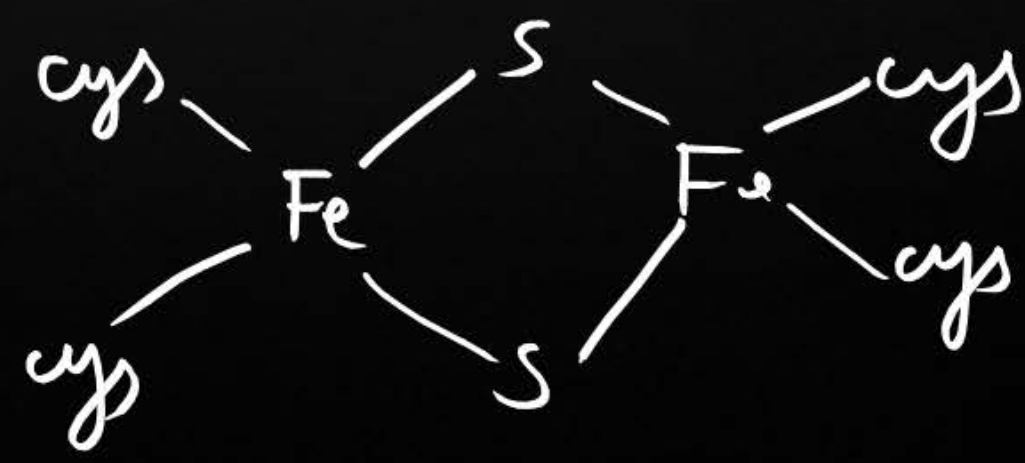
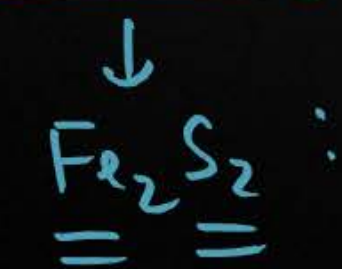


Redox form



⑧ Ferridoxin:

↳ 2Fe Ferridoxin:



- Labile S = 2
- non labile S = 4

Redox form

⑧.F



spin coupling
Dia

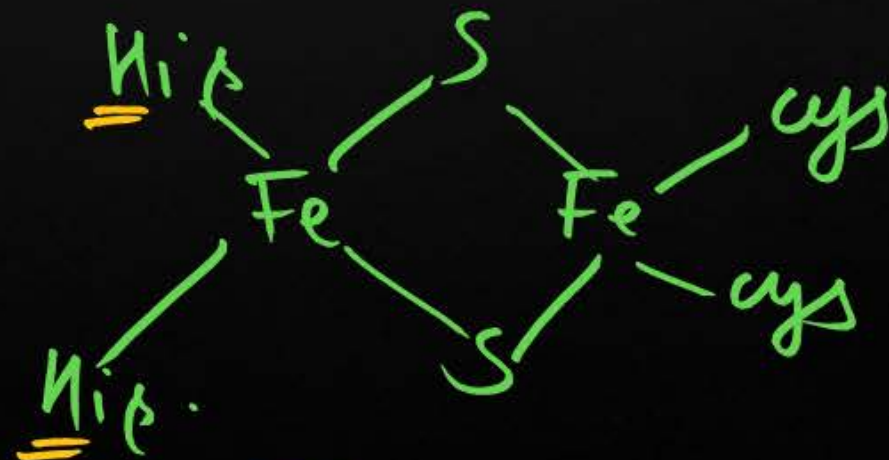
R.F



Para

①. Riskie Protein

e^- transfer



Labile S = 2

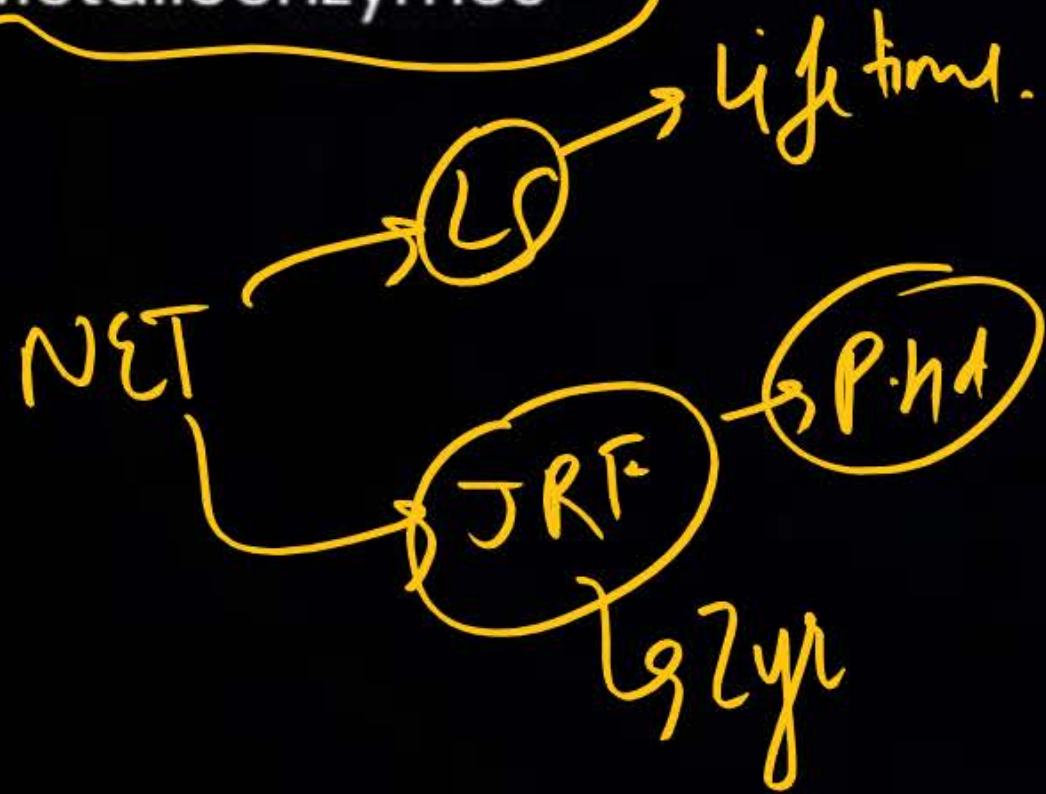
Non labile S = 2



2 mins Summary



1) Metalloenzymes



3 April 2024

3 April 2026



THANK
You

