

Metalloprotein = Protein + Metal  
ion

Metal can be introduced

→ at polypeptide level

→ apo-protein

fully folded

→ unfolded -  
but complete Protein

NPTTEL

Metalloenzyme = Protein +  
metal ion as integral  
part of the protein

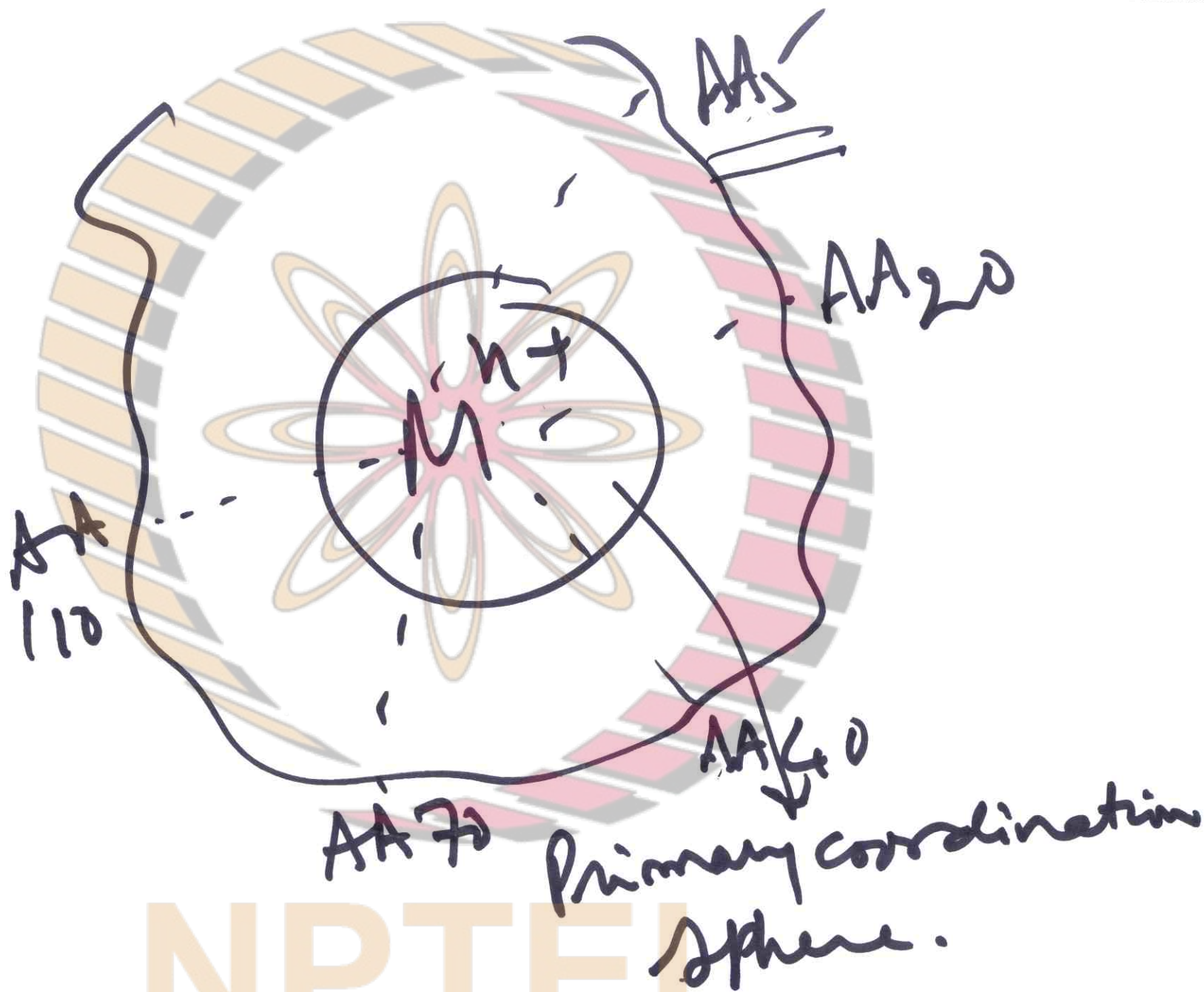
Heme : Porphyrin +  $\text{Fe}^{2+}$

NPTTEL

Holo Protein : Protein + metal ion

Apo-protein : Metalloprotein —  
metal ion

NPTTEL



Mutation

Single

double

multiple

↓  
Site linked  
mutagenesis

NPTTEL

The amino acid is changed at  
that particular site.

Site targeted mutagenesis

NPTTEL

Elements



Essential Elements  
(Essentiality)



Deficiency & excess syndrome



Element or ion absorption  
by intestines

NPTTEL

↓  
Mutual interactions between  
elements absorbed

{Antagonistic & Synergistic}

↓  
necessary dosages & essential  
trace & ultra trace elements

↓  
How these are bound

NPTTEL

Why only these elements  
are chosen by nature



Coordination characteristics, stability  
& lability aspects are important



How these are bound thro' side  
chains



metalloprotein : metal ion complex  
inside a protein

Metal ion in water

vs.

Metal ion protein

Amino acids → peptides → proteins → their structures

nucleic bases, nucleosides, nucleotides  
& nucleic acids & their structures

Protein synthesis

↓

Metalloprotein synthesis

Holo protein vs. Apoprotein

mutagenesis

NPTTEL