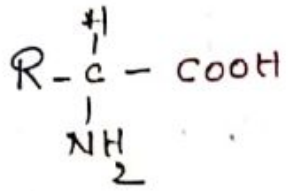
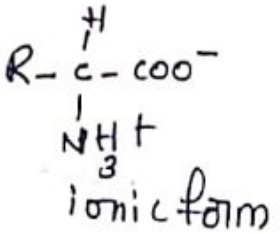
Amino acids

Amino acids are a group of organic compoun containing functional groups amino- carboxyl.

→ The amino group ($-NH_2$) is basic while the carboxyl group ($-COOH$) is acidic in nature.

→ General structure:-



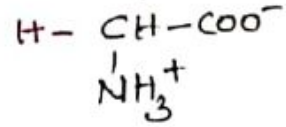


ionic form

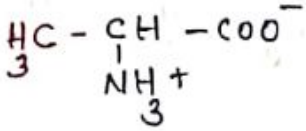
Structural classification of Amino acids :-

I Amino acids ~ Aliphatic side chain.

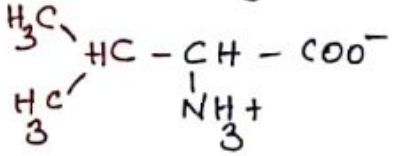
① Glycine



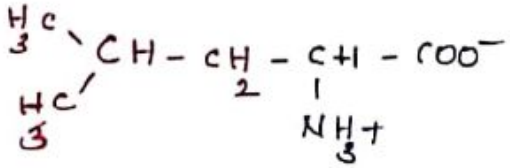
② Alanine



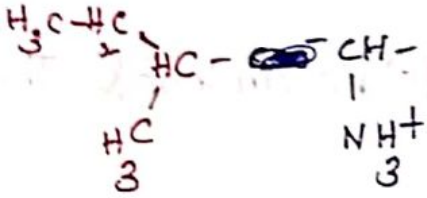
③ Valine.



④ Leucine

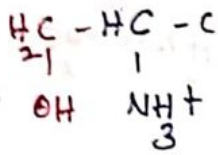


5. Isoleucine



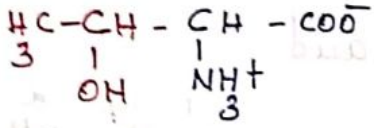
II Amino acids containg hydroxy l (OH) group:-

6. Serine



1-hydroxy methyl group.

7. Threonine

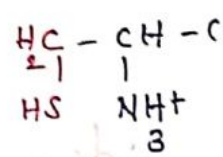


1-hydroxy ethyl group.

8. Tyrosine.

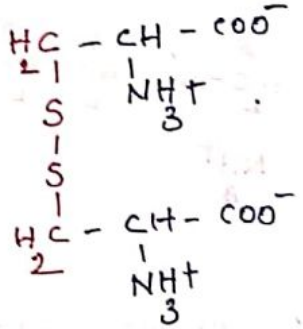
III Sulphurcontaining aminoacids:-

8. cystein



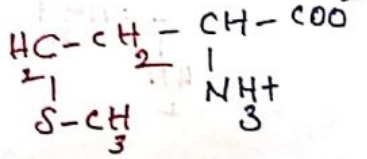
Sulphydryl
R-S-H

cystine.



Disulphide
R-S-S-R.

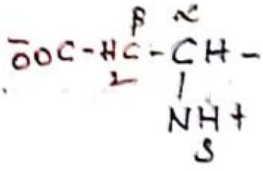
9. Methionine



Thioether
H_3C-S-CH_3

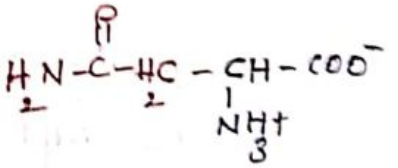
IV Acidic aminoā & Their amides.

10. Aspartic acid



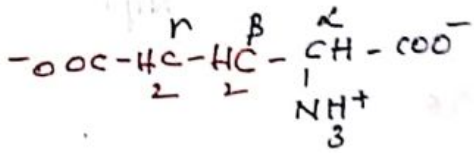
β-carboxy

11. Aspargine



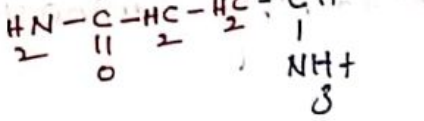
Amide
$R-\overset{O}{\overset{\|}{C}}-NH_2$

12. Glutamic acid



γ-carboxyl

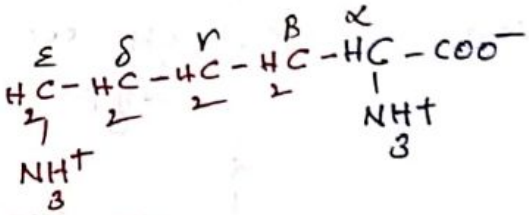
13. Glutamin



Amide propanamide

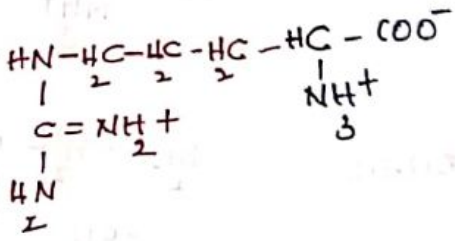
V Basic amino acids:-

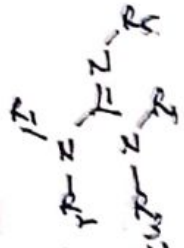
14. Lysin



ε-Amino

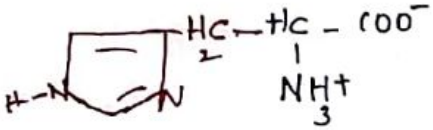
15. Arginine.



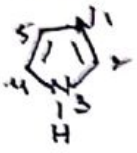


Guanido.

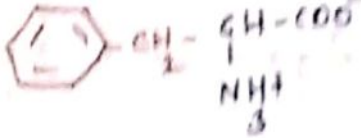
16. Histidine.

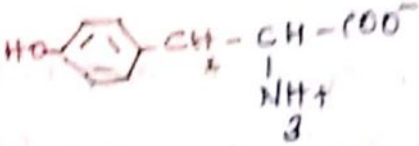


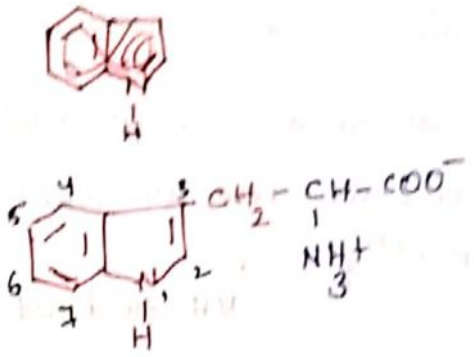
Imidazole

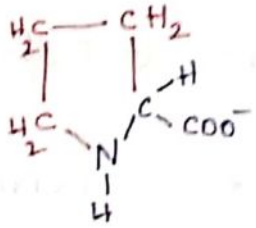


VI Aromatic amino Acids:-

17. phenylalanine  phenyl grp.

18. Tyrosine  phenol

19. Tryptophan  Indole + 6 membered benzene + 5 membered pyrrole ring

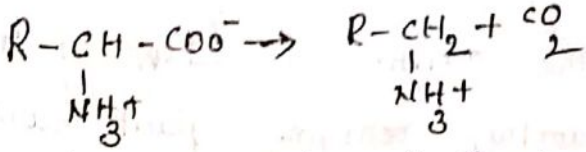
VII Imino acid:-  pyrrolidine

20. proline.

→ Chemical properties of aminoacids:-

→ Reaction Ninhydrin forms purple, pink, color complexes.

→ Decarboxylation:- undergo decarboxylation to produce corresponding amines.



Ex: Tyrosin, histamine, glutamate (amines) etc.

2. Reaction with ammonia:-

→ by Rea^{n} of Ammonia forms amide.

Aspartic acid + NH_3 → Asparigine

3. Transamination:-

Transfer of amino acid group from amino acid to keto acid to form new amino acid.

4. Oxidative deamination:-

The amino acid undergo oxidative deamination to liberate free ammonia.

5. Formation of salts. $-NH_2$ combined with Acid → NH_3^+Cl

Functions of Amino acids:-

→ Amino acids due to its amphoteric nature, acts as buffers (which resist pH change)

→ Asparigine, Glutamine acts as N reserves.

→ Aromatic rings phenylalanine, Tyrosine Tryphtophan helps in electron transfer

→ Some amino acids forms glucose by loosing amino group.

→ Some aminoacids helps in formation of vitamins, coenzymes, plant harmones.

→ serine → helps in growth of Muscle.
→ Glycine acts as Neurotransmitter & plays a vital role in wound healing
→ Arginine → promotes biosynthesis of proteins.
→ proline → helps in ~~Hair~~ generation of new skin.
→ Tyrosine → Product^n of T3 & T4 thyroid harmony
→ Hystidine → product^n of RBC & WBC.
→ Lysine → synthesis enzymes, harmony

→ Based on Nutrition AA classification:-

→ The body can synthesize AA That is needed for Maintaining good health. They are considered as Non essential aacids.

→ The Amino acids that are ~~is~~ cant synthesized in our body & can be supplied through diet are called Non essential aminoacids.

Essential aminoacids:- MATT VILPHLY

Methionine	Isoleucine	Histidine
Arginine	Leucine	lysine.
Tryptophan	phenyl alanine	
Threonine.	valine.	

Non essential Aminoacids:- (GAC^2 HP ST)

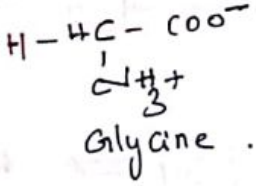
Glycine.
Alanine
Tyrosine.
Serine
proline
Hydroxyproline.
-cystein
-cystine
Asparticacid
Glutamicacid.

physicalproperty of Aminoacids:-

→ **Optical properties:-**

All aminoa except Glycine possey optical isomers. duto of Assymmetric 'c' atom.

→



Glycine.

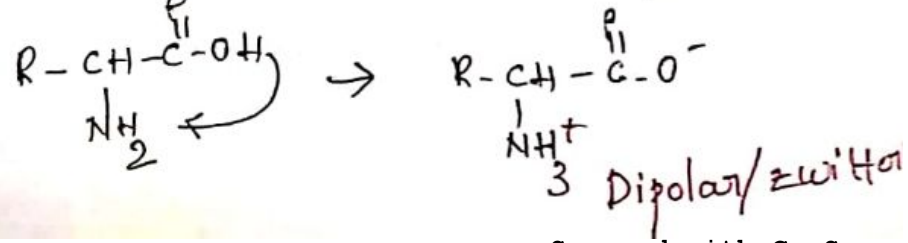
→ **Zwitterion/Dipolar ion:-**

Zwitter ion is a hybrid Molecule contains both positive & Negetive ionic groups.

→ In Aminoacids acidicgrp can loose a proton & basic $-NH_2$ group gain a proton by means acid-base reaction.

The prdct of this intonal rean is called Dipolarion/zwitterion.

↳ it contains both +ve & -ve char



Dipolar/zwitt

→ Isoelectric pH:-

→ The pH @ vch Molecule exist as Neutral ion. or dipolar ion. & carries no Net charge. thus the Molecule is electrically Neutral

→ A Neutral Molecule is not attracted Neither electrode @ certain pH.

→ Normally charged ions placed in electric field The +ve ion Migrate towards anode. −ve " cathod.

→ All amino a not contain same Isoelectric pH.

Amino acid pool

→ An adult has 100g of free aminoacids.

→ vch represents the Aminoacid pool.

→ Glutamate, Glutamin together constitute 50% & essential aminoacids about 10% of the bodypool.

→ Metabolism of Aminoacids:-

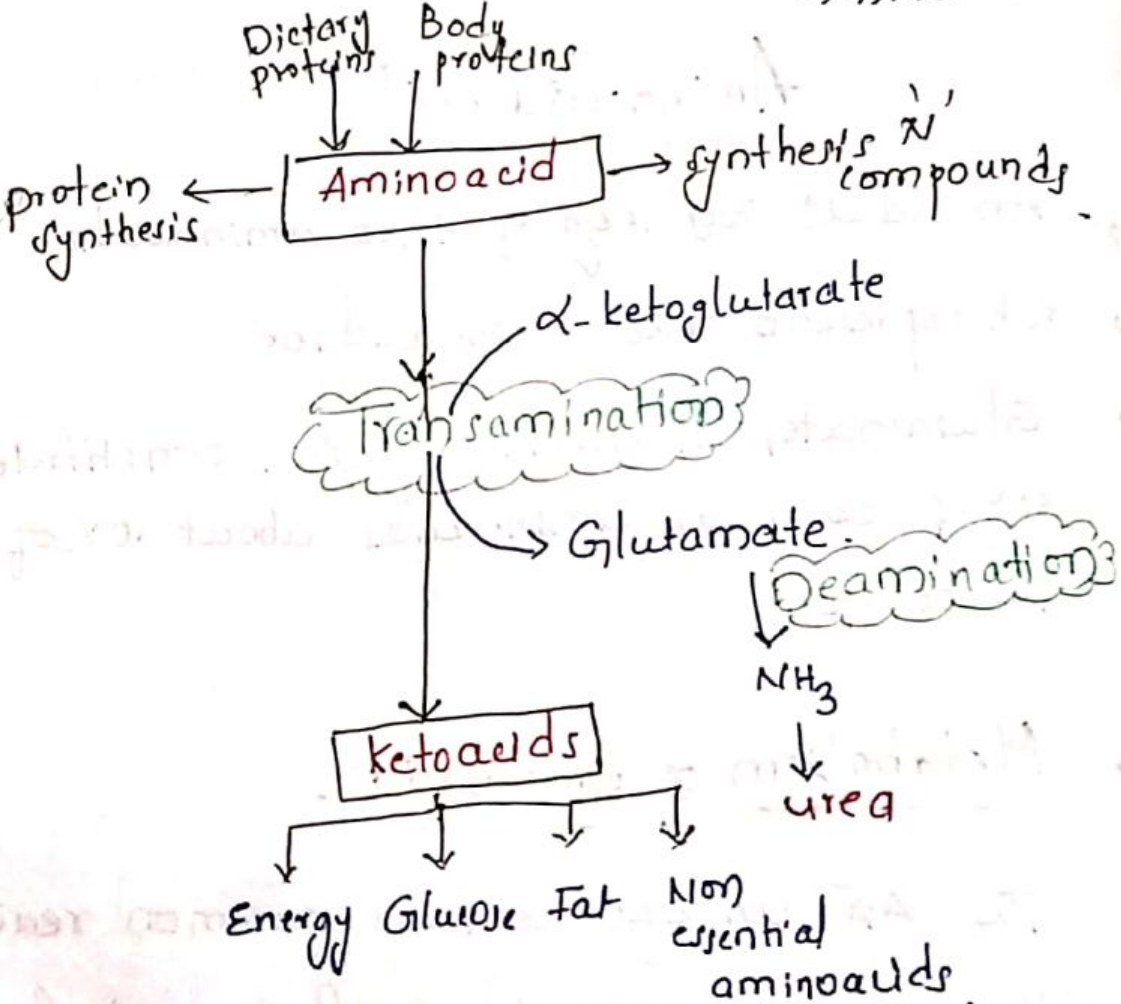
The AA undergo certain common reactions like transamination followed by Deamination for the liberation of ammonia.

→ The amino group of aminoacid is utilised for the formation of ureq. vch is excretory end prdct of protein Metabolism.

→ 'c' skeleton of AA converted to ketoacid.

→ this can be utilised for following fates.

1. Utilized to generate energy
2. used for the synthesis of glucose,
3. Diverted for the formatn of ketone bodiy
4. Involved in production of essential Aminoa.

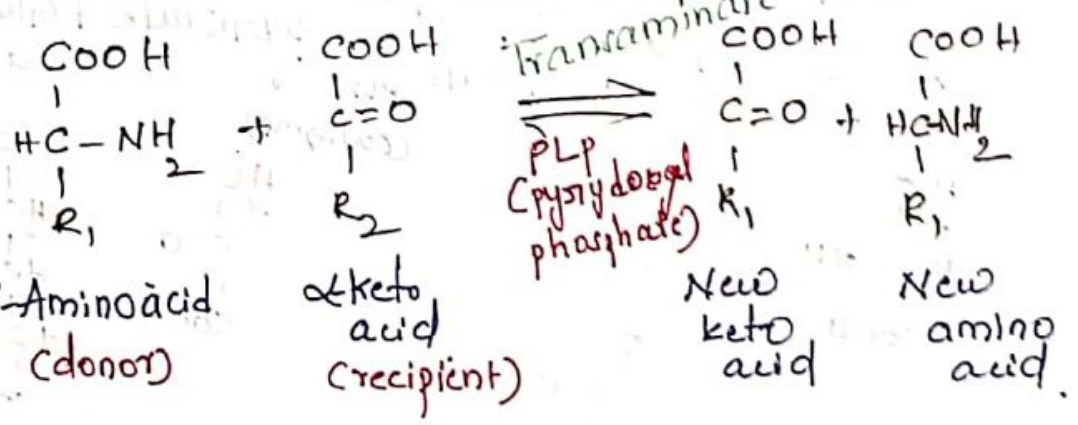


Transamination:-

→ It is a transfer of amino group from L-aminoacid to keto acid.

→ Definition:- It is a reversible reaction in which α-NH_2 group of one Aminoacid is transferred to α-ketoacid resulting in formation of a new aminoacid & a New ketoacid.

PLP → Derivative of Vit-B_6 (Riboflavin) acts as coenzyme



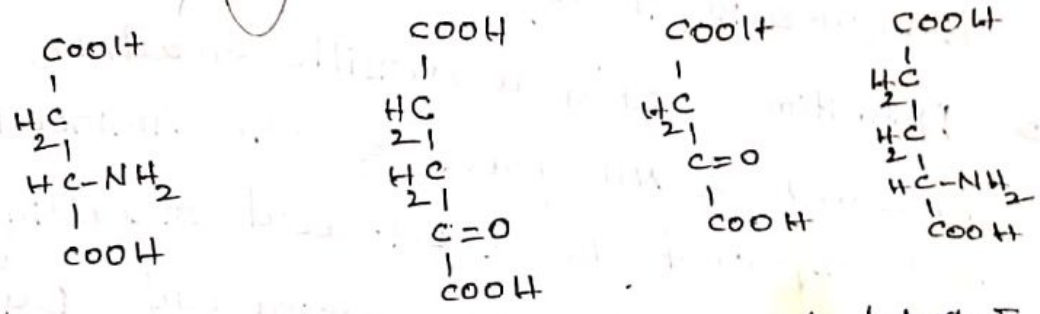
There are two active transaminases in tissues catalysing interconversion. They are.

① SGOT (Serum Glutamate oxaloacetate Transaminase)

② SGPT (Serum Glutamate pyruvate Transaminase)

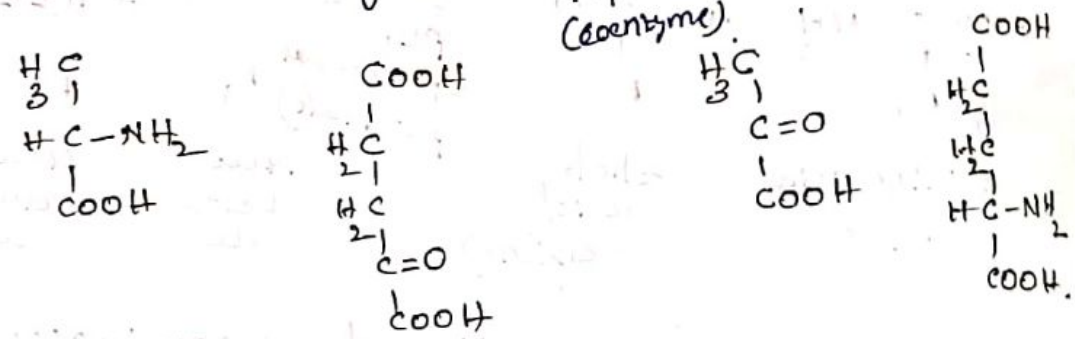
→ SGOT :- In this Aspartic acid → donor, α-ketoglutarate → acceptor
forms New AA → Glutamate, New keto acid → OAA

Aspartate + α keto glutarate $\overset{PLP.}{\rightleftharpoons}$ ovalo + Glutamate
Trans aminase.



→ SGPT :- In this Alanine → donor, α-ketoglutaric acid → donor
forms New aa (Glutamic acid) + New keto acid → pyruvate.

Alanine + α-keto glutarate $\overset{PLP}{\rightleftharpoons}$ pyruvate + Glutamic acid.
Transaminase
(Coenzyme)



But these two transaminases have greater clinical importance.

→ The Aminoacids which don't participate in transamination are lysine
threonine
proline.

(A). Involvement of PLP in transfer of Aminogroup
(B). Formation PLP schiff base of act PLP schiffbase

Mechanism of Transamination:-

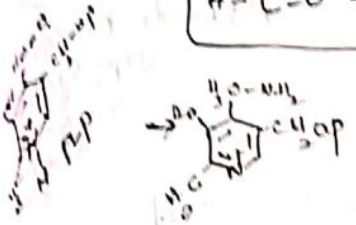
→ Transmission occurs in two stages.

① Transfer of Aminogroup to pyridoxal phosphate. (PLP)

↓

pyridoxamine phosphate.

$H-C=O \rightarrow H_2C-NH_2$



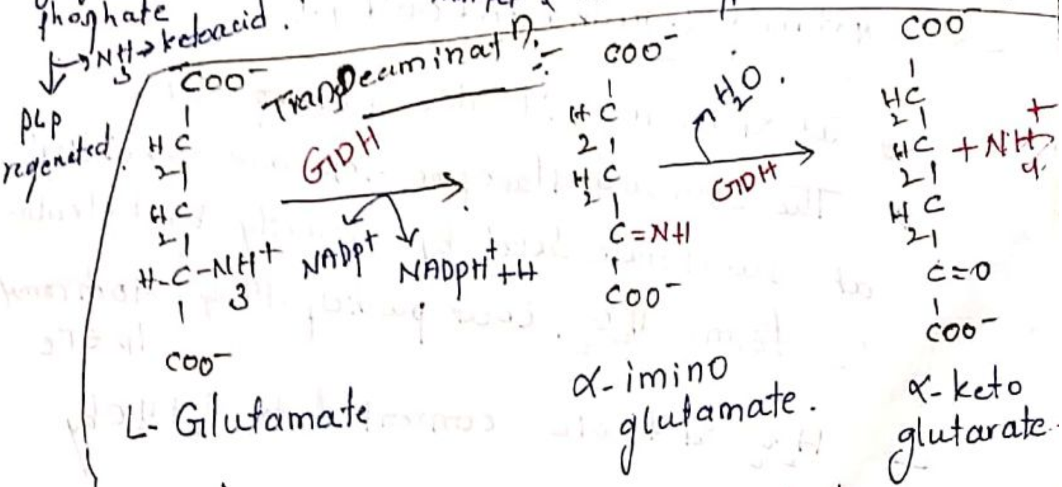
②. The amino group of pyridoxamine phosphate is then transferred to ~~form~~ keto acid. to produce new Aminoacid.

& enzyme PLP generated

③ PLP linked with ε group of lysin residue of the active side of enzyme forming schiffs base
→ α amino acid (substrate) combine with enzyme it imine linkage
displace lysin C=N from PLP & New schiff base formed with New

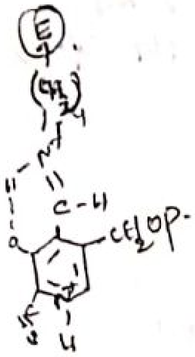
NH_3
↓ transfer
PLP
↓ converted
Pyridoxamine phosphate
↓ NH_3 → ketoacid.
PLP regenerated.

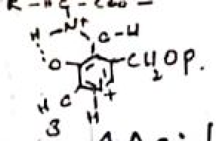
Schiff base.: $R-\overset{O}{\overset{\|}{C}}-R + RNH_2 \rightarrow R-\overset{NR}{\overset{\|}{C}}-R + H_2O$
Schiffs base.



not deaminated L-aminooxidase.

Oxidation of glutamate ~~to~~ by Glutamate dehydrogenase (GDH).

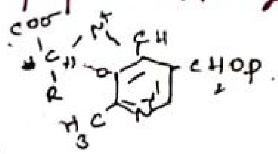




E (CH2)4 PLP schiffbase. —AA cid connected→ AAcids | PLP schiffbay + E (CH2)4 NH2

↓ it displace lysin & New schiff base formed

Enzym PLP schiffbase — Amino acid PLP schiffbase.



PLP binds r amino grp of lysin residue linked in enzym → form schiff base.

Deamination:-

Deamination is the process by wch N- of amino acid is removed as NH_3.

Types:- → oxidative deamination
→ Non oxidative deamination

oxidative deaminatn:-

site of oxidative deaminatn:-

→ Liver, kidney

→ Enzymes:- L-amino acid oxidase → act on L-amino a
D-amino acid oxidase → " D-amino a.

→ Nature of L-amino acid oxidase:-

→ It is auto oxidisable flavoprotein.

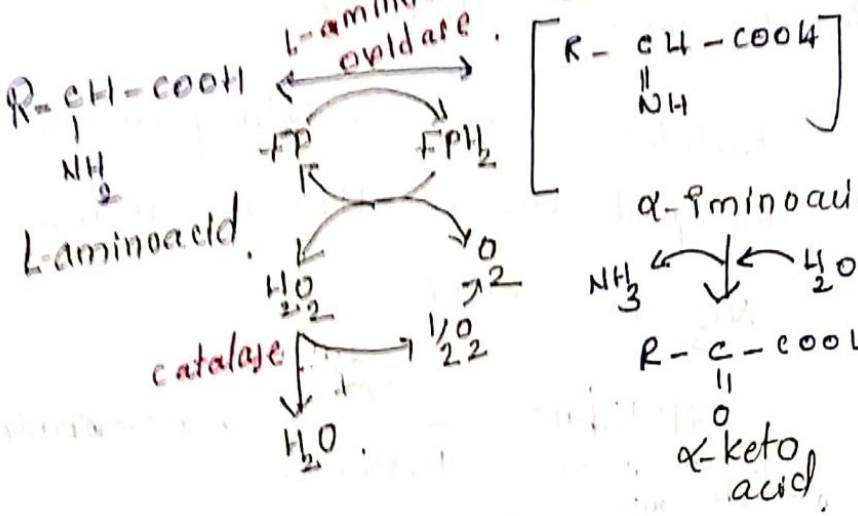
→ The reduced flavoproteins are reoxidisabl at substrate level by directly by Molecula O_2 forms H_2O_2. Exclu participatn of cytochrom in ETC

→ H_2O_2 is toxic converted to $O_2 + H_2O$ by catalase.

Scanned with CamScanner

Process of oxidative deamination

(Dehydrogenation)



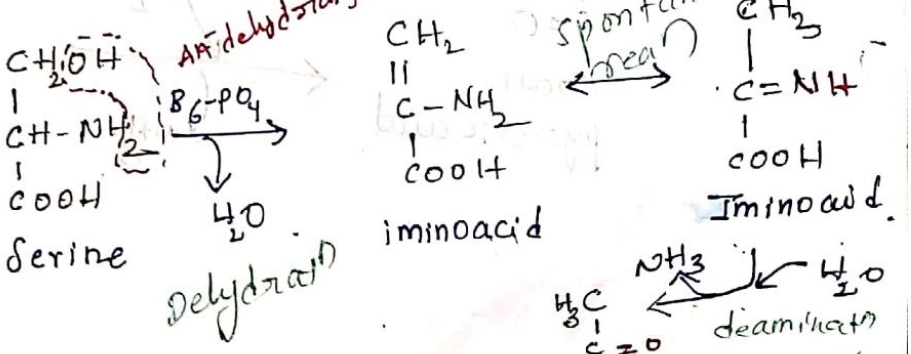
(a) The AA first dehydrogenate by flavoprotein of the enzyme L-amino oxidase & forms iminoa.

(b) water Molecule is added to the iminoa & decompose to α-ketoacid. & loss of α-imino nitrogen as NH_3

Non-oxidative deamination

(a) There are certain Aminoa, which can be non-oxidative deaminated by specific enzymes called aminoacid dehydratases

Amino acid dehydratase:- aminoa dehydratase requires which requires PLP (B_6-P) as coenzymes

(1) 

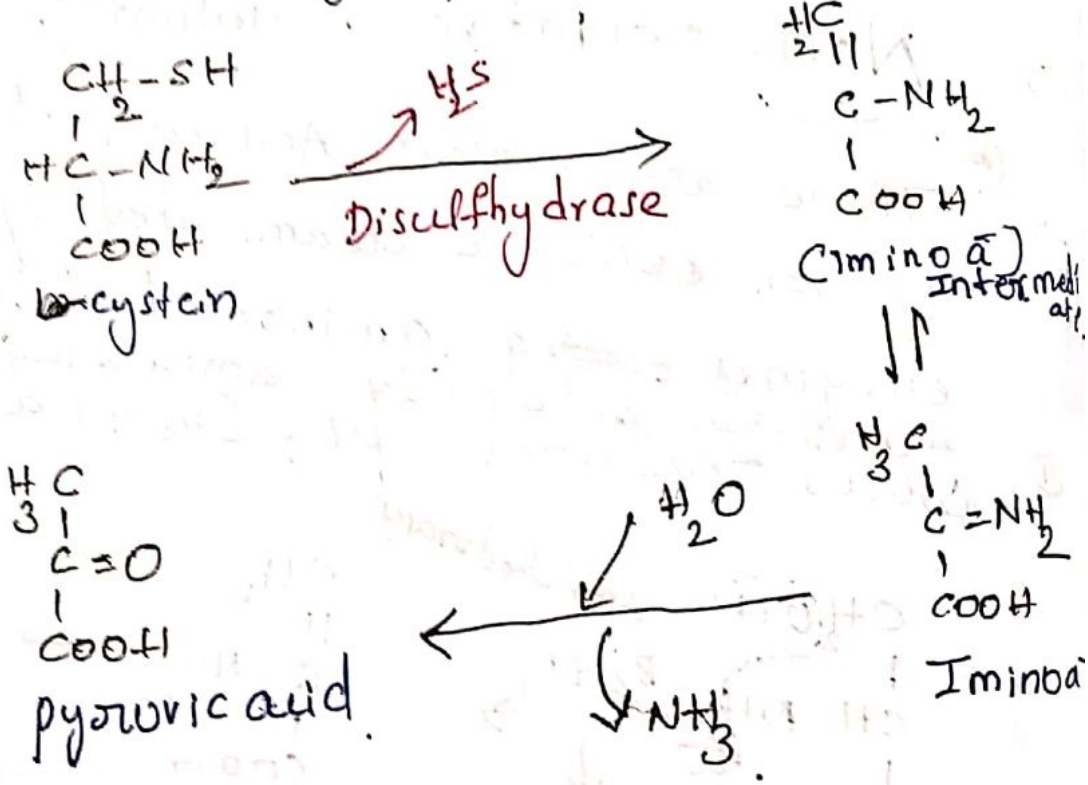
The hydroxy AA - serine, threonine etc. are deaminated by proline aminoacid dehydrases

(2) Deamination of Histidine:

Histidine is non-oxidatively deaminated by specific enzyme Histidase to form NH_3 and urocanic acid.

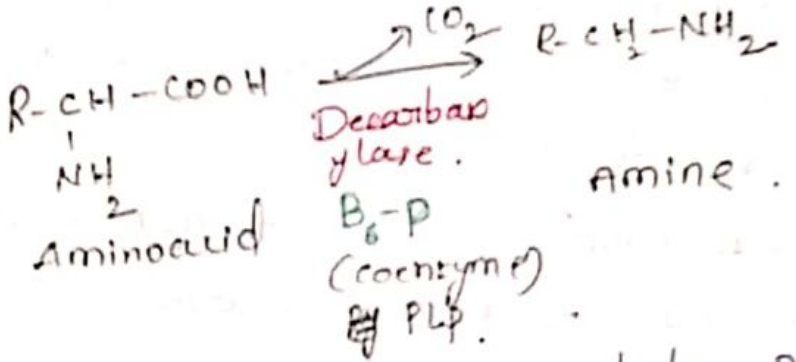
(3) Amino acid disulfhydrases:

S- containing amino acid, eg:- cystein & homocystein are deaminated by a 1° desulfhydration (removal of H_2S) forming imino acid, which then spontaneously hydrolysed



→ Decarboxylation :-

Decarboxylation is the reaction by which CO_2 is removed from the COOH group of an aminoacid as a result of an amine is formed catalysed by Decarboxylase.



Tissues like liver, brain, kidney possess decarboxylase enzyme, & H.O present GIT also possess decarboxylase.