Classification of Aminoacids

(1) Classification based on the structure

2) " " on polarity

3) " " nutrition

4) " " metabolic rate

(1) Classification based on the structure.

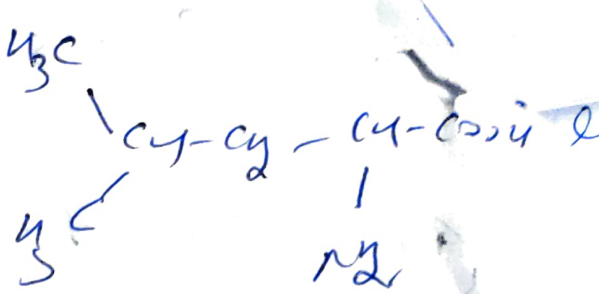
1: Aminoacids with aliphatic side Chains

1. Glycine Gly G $H-CH(NH_2)-COOH$

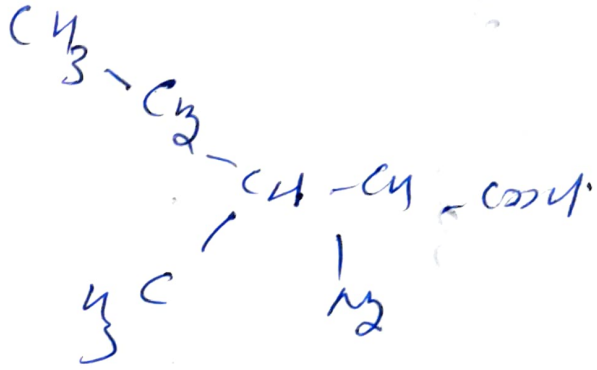
2. Alanine Ala A $CH_3-CH(NH_2)-COOH$

3 Valine Val V $(H_3C)_2CH-CH(NH_2)-COOH$

4) Leucine Leu L



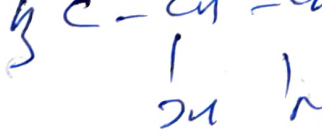
5) Isoleucine Ile I



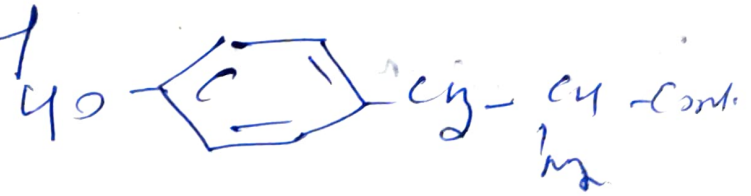
B Amino acids containing hydroxyl group (–OH)

6. Serine Ser S

7 Threonine Thr T



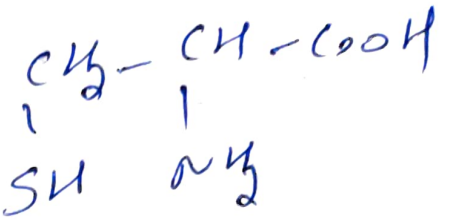
8 Thyrosine Tyr Y



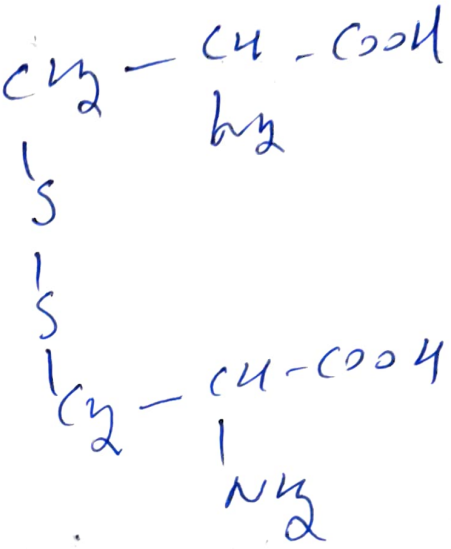
9)

iii. Sulphur containing amino acids

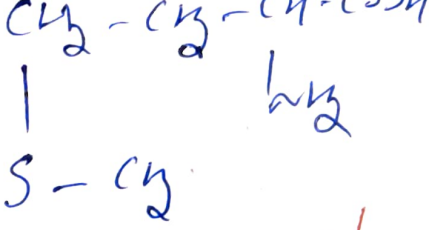
8. Cysteine Cys C



9. Cystine

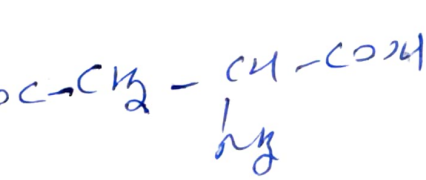


9) Methionine Met M

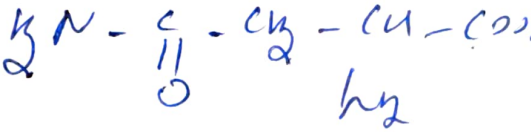


iv. Acidic Amino acids and their Amides

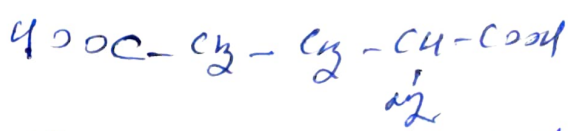
10. Aspartic acid (Asp) D



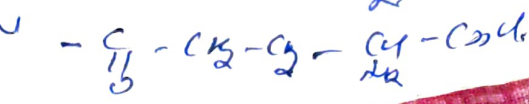
11. Asparagine (Asn) N



12. Glutamic acid (Glu) E

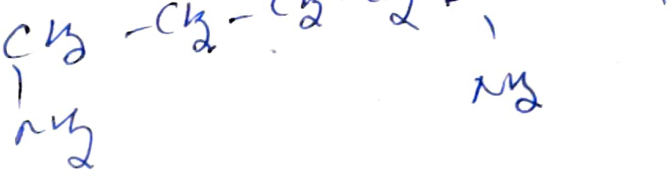


13. Glutamine Gln Q

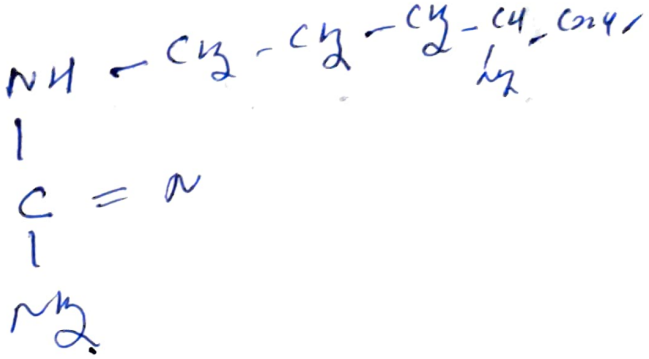


5. Basic Aminoacids

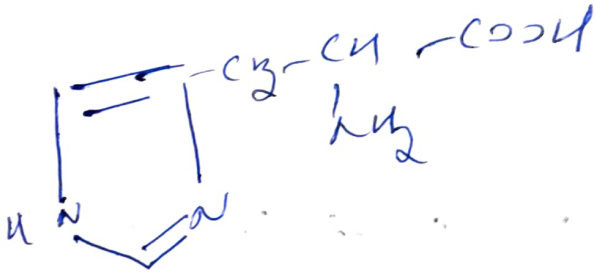
14. Lysine Lys K



15. Arginine Arg. R

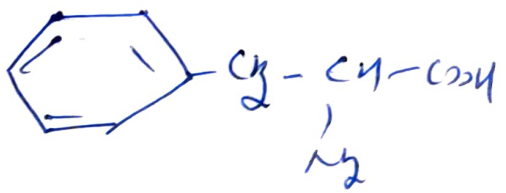


16) Histidine. His H

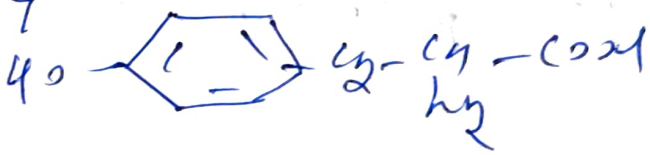


6) Aromatic Aminoacids

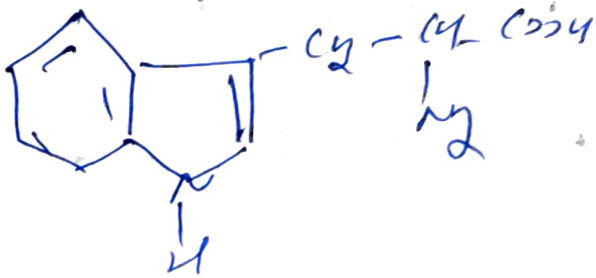
17) Phenylalanine Phe F



18) Tyrosine Tyr Y

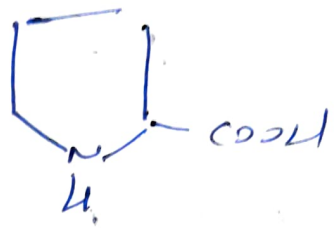


19) Tryptophan Trp W



Imino acid

2. Proline Pro P



proline

Properties of Amino Acids

A physical properties

B. Chemical properties

A physical Properties

1. Solubility — Soluble in water and insoluble in organic solvents

2) Melting pont — Melt at high temperature at above 200°C

3. Taste - Amino acids may be sweet
eg Glycine, Valine
Tasteless - Leucine
Bitter - Arginine, Isoleucine

4. Optical property
All the amino acids except glycine possess optical isomers due to the presence of asymmetric carbon atom

5. Amino acids as ampholyte
→ Amino acids contain both acidic and basic groups
→ They can donate a proton or accept a proton, hence amino acids are regarded as ampholyte

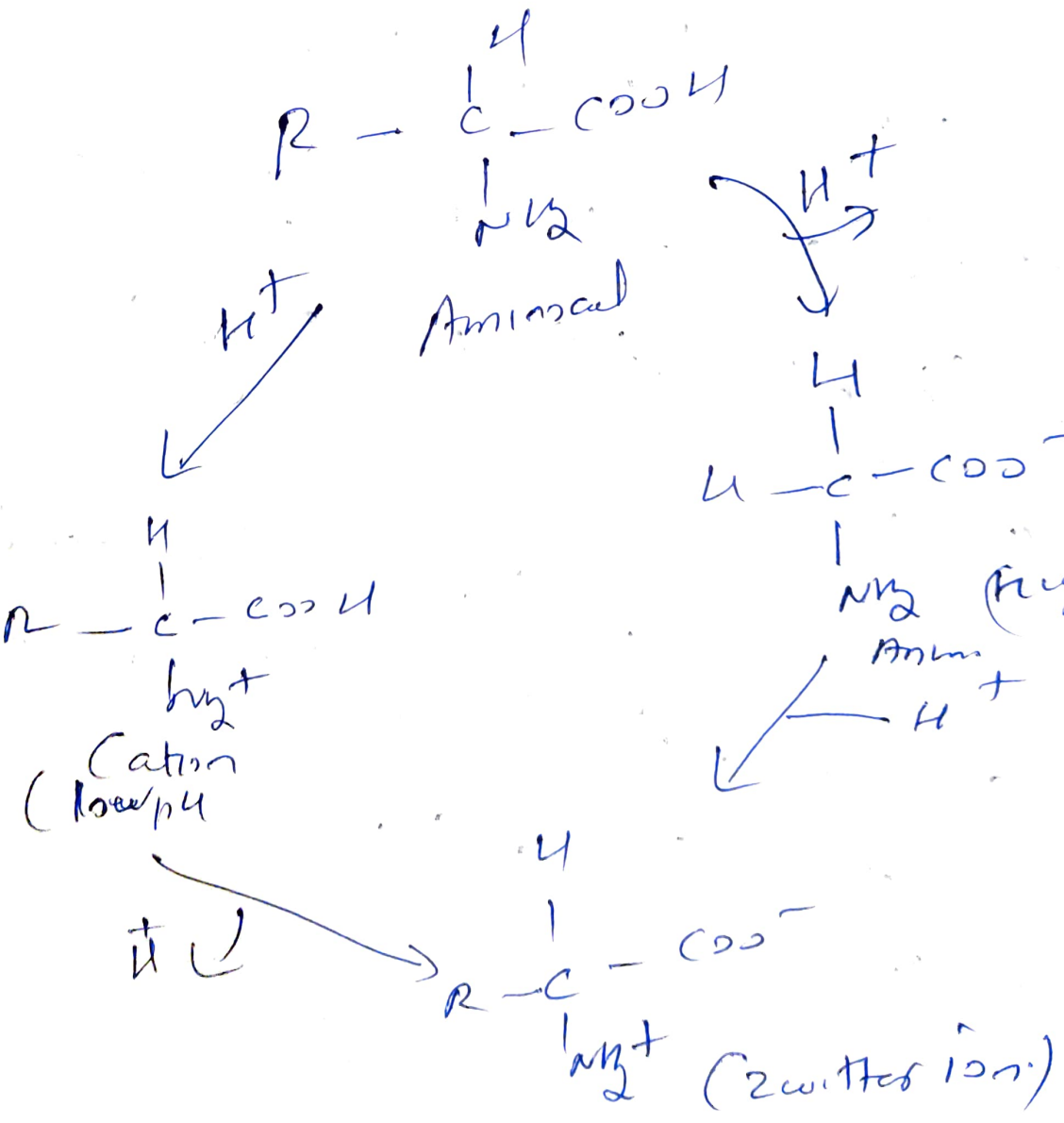
4) Zwitterion or dipolar ion

→ The amino acids rarely exist in a neutral form with free carboxylic ($-COOH$) and free amino ($-NH_2$) groups.

→ In strongly acidic pH (low pH) the amino acid is positively charged (cation) while in strongly alkaline pH (high pH), it is negatively charged (anion).

→ Each aminoacid has a characteristic pH at which it carries both positive and negative charges and exists as zwitterion.

Isoelectric pH (pI) is defined as the pH at which a molecule exist as a zwitterion or dipolar ion and carries no net charge → thus, the molecule is electrically neutral

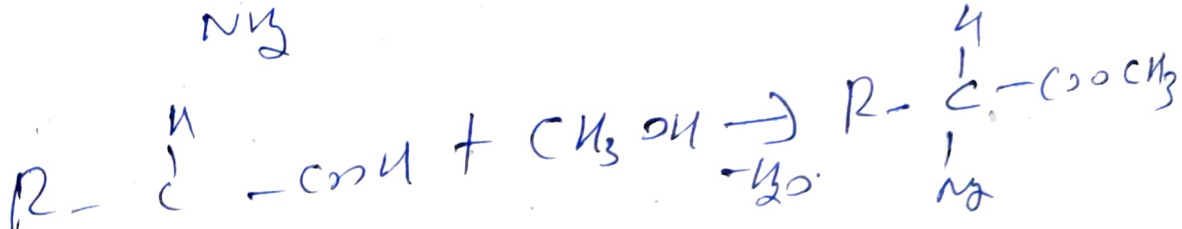


B. Chemical Properties

→ The general reactions of amino acids are mostly due to the presence of two functional groups namely Carboxyl (-COOH) grouped amino (-NH_2) group.

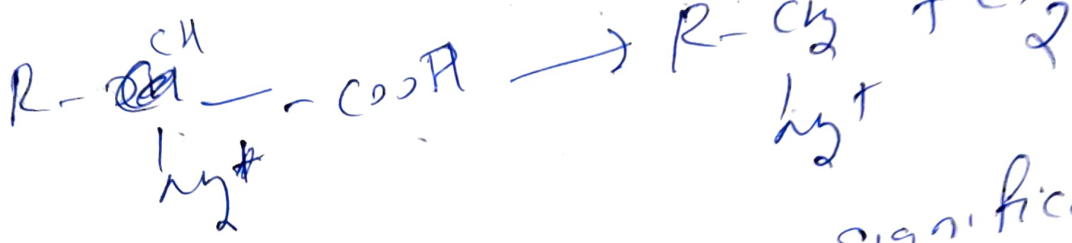
Reactions due to -COOH group:

1. Amino acids form salts with bases and esters with alcohol



2) Decarboxylation

Amino acids undergo decarboxylation. to produce corresponding amines



→ This reaction assumes significance in the living cells due to the formation of many biologically important amines

→ These includes

histidine → histamine

Tyrosine → Tyramine

Glutamate → γ-aminobutyric acid

3) Reactions with ammonia

→ The carboxyl group of dicarboxylic aminoacids reacts with NH_3 to form amide

Aspartic acid + NH_3 → Asparagine

Glutamic acid + NH_3 — Glutamine

II Reactions due to NH_2 group

1) The amino group behave as base and combine with acids (eg HCl) to form salts ($NH_3^+ Cl^-$)

2) Aminoacids can be identified by specific color reactions

-cont

3) Transamination

Transfer of an amino group from an amino acid to a keto acid to form a new amino acid is a very important reaction in amino acid metabolism

4) Oxidative deamination

→ The amino acids undergo oxidative deamination to liberate free ammonia

Based on polarity

1) Non polar - Alanine, leucine, isoleucine, valine, methionine, phenylalanine, Tryptophan, proline

2) polar - glycine, serine, threonine, cysteine, glutamine, tyrosine,

Boarder nutrition

Essential aminoacids

∴ An essential aminoacid that cannot be synthesized by the organism and must therefore come from the diet

They are

- phenylalanine
- Valine
- Threonine
- Tryptophan
- Methionine
- Leucine
- Isoleucine
- Semi essential: Histidine, Lysine
- Alanine
- Arginine
- Asparagine
- Cysteine
- Glutamic acid
- Glucine
- Proline
- Selenocysteine
- Serine
- Tyrosine.

Based on metabolic fate

1) Glucogenic amino acid
Alanine, aspartic, glycine, methionine

2) Ketogenic
leucine and lysine

3) Glucogenic and ketogenic
Isoleucine, phenylalanine, tryptophan, tyrosine