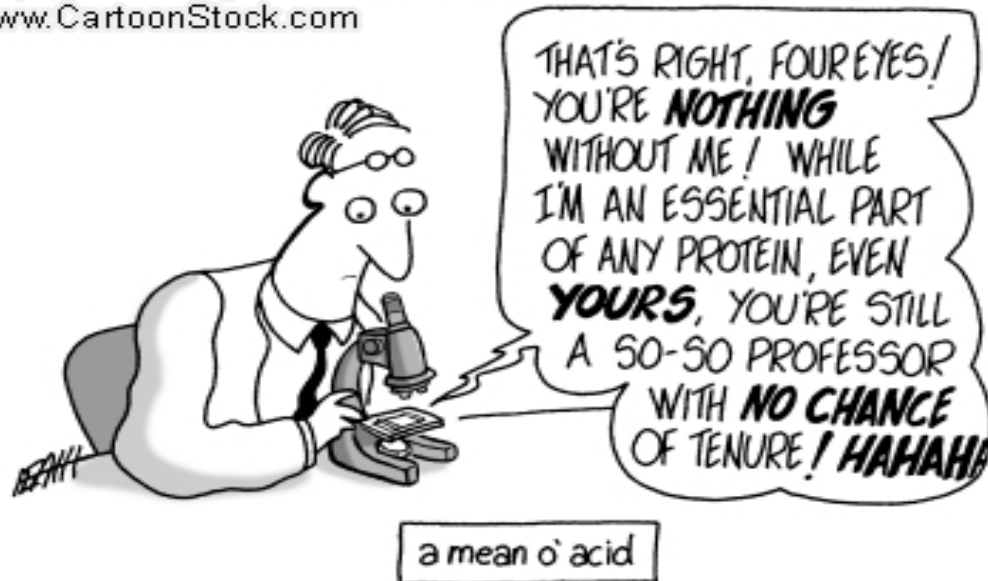


Amino acid

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search ID: mhen140

a mean o' acid

a mean o' acid

OF TENURE! HAAAAH

Objectives

- **What are amino acids?**
- **Structure**
- **Types**
- **Peptide bond: building blocks of proteins**
- **Non-standard amino acids**
- **Derivatives of amino acids**

Amino Acid

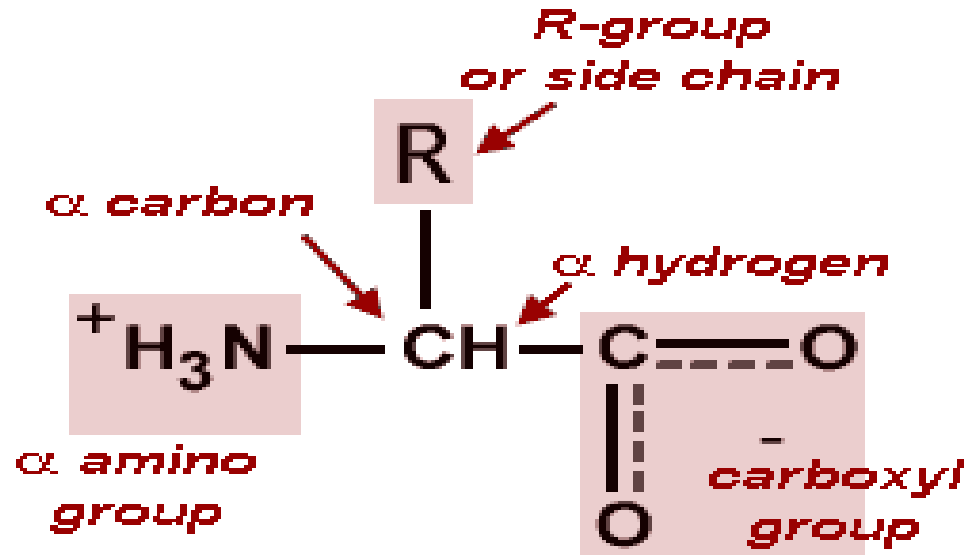
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graph TD; A[Amino Acid] --> B[✓ Building blocks of proteins]; A --> C[✓ joined together by peptide bond]; A --> D[✓ There are 20 standard amino acids present in mammalian proteins];
```

✓ Building blocks of proteins

✓ joined together by peptide bond

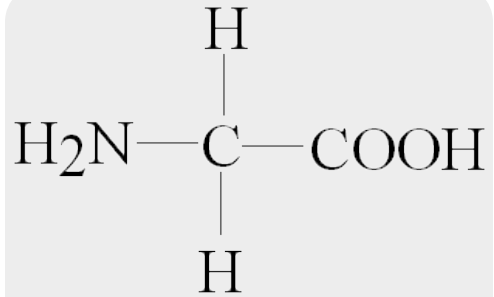
✓ There are 20 standard amino acids present in mammalian proteins

Structure of amino acids



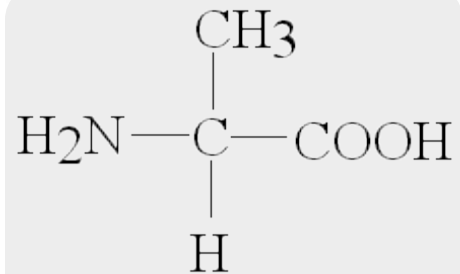
Side chain groups
are variable

Examples:-



glycine

α-AMINO ACID

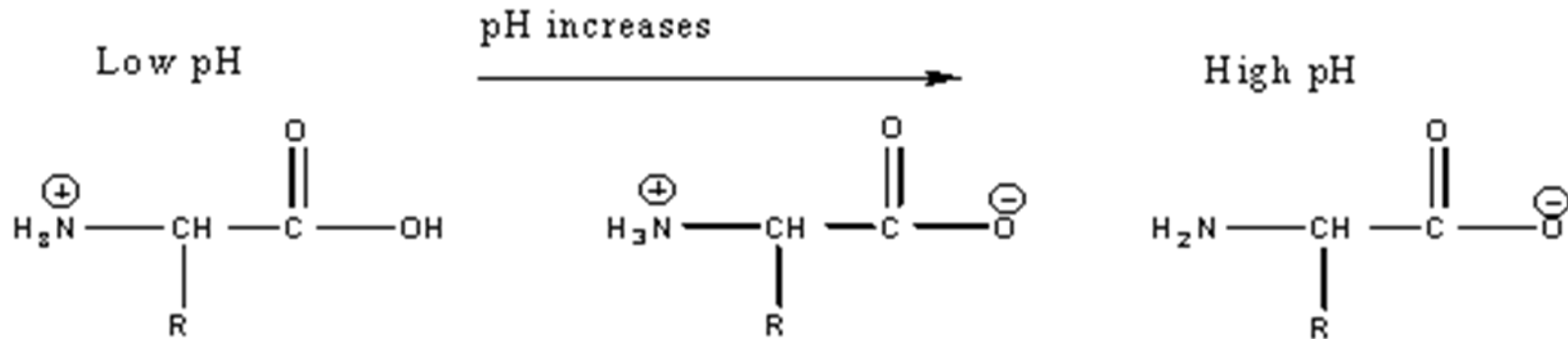


alanine

α-AMINO ACID

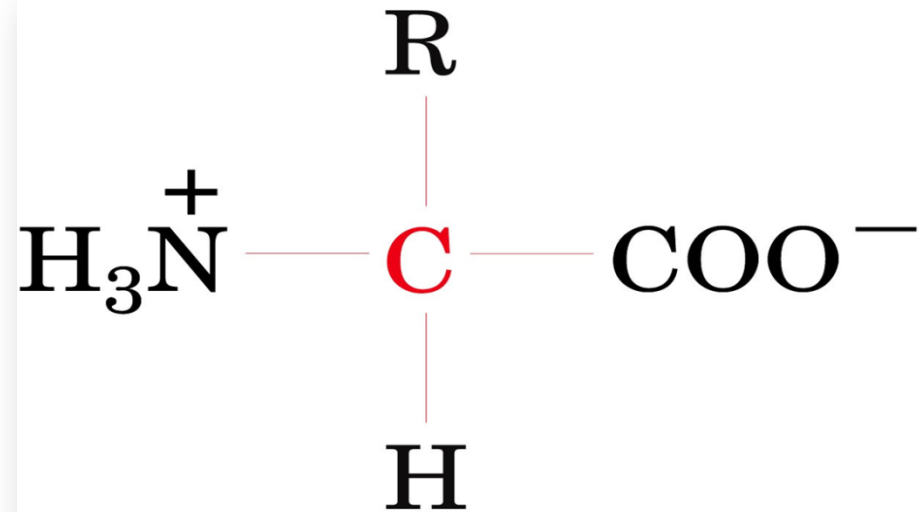


The amino and carboxylic groups of amino acids can readily ionize



- Low PH is more H (protons) concentration
- High PH is low H (protons) concentration

Zwitterions (Dipolar ions)



- ❖ It is an ion, with net zero charge that means that the negative and positive charges are equal within the ion itself.
- ❖ Net charge is zero on the molecule

Isoelectric point (pI)

The pH (of the solution) at which the molecule carries no net charge

In acidic solution-cationic (+)

In alkaline solution- anionic (-)

PK Value

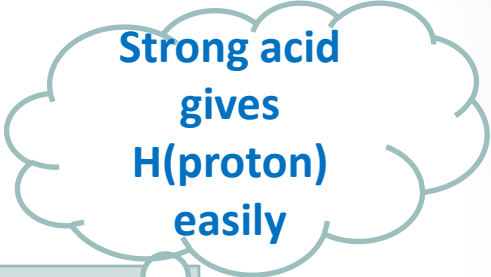
It is the ability of an acid to donate a proton (dissociate)

Also known as **pKa** or (acid dissociation constant).

Pka measures the strength of the acid (donation of proton)

The higher the Pka the lower the acidity (e.g. CH₃⁺ is less acidic than COOH, because the PK for CH₃⁺ is more).

- The **pK** values of α -carboxylic group is in the range of **2.2**
- The **pK** values of α -amino group is in the range of **9.4**



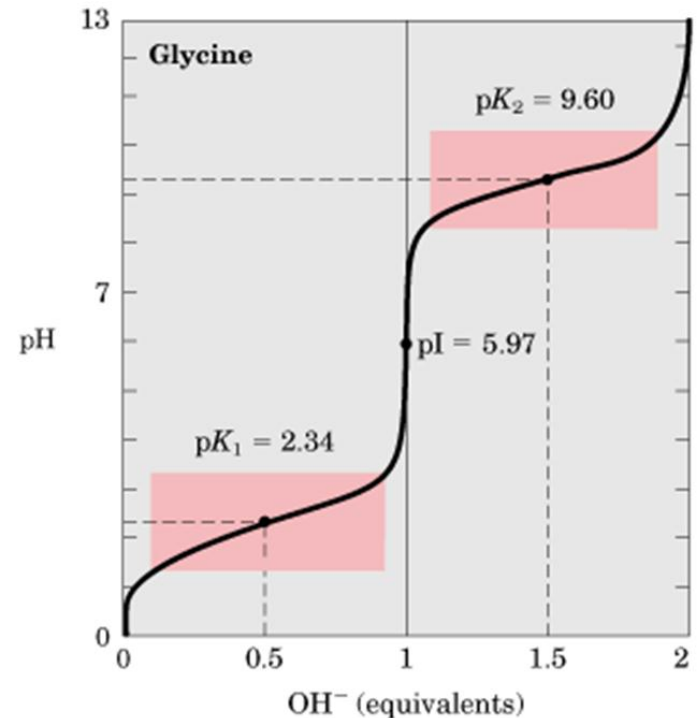
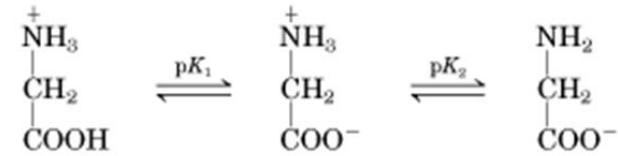
Strong acid
gives
H(proton)
easily

Titration curve of glycine

pK₁- pH at which 50% of molecules are in cation form and 50% are in zwitterion form

pK₂- pH at which 50% of molecules are in anion form and 50% are in zwitterion form

Buffering action is maximum around pK values and minimum at pI



Video

the video explains this part from 09:40 to 14:58



Classification on the basis of side chain

Non-polar Side chain

- ✓ does not bind or give off protons
- ✓ Hydrophobic

examples:-

Glycine **Alanine**
Valine **Leucine**
Isoleucine
Methionine
Proline
Phenylalanine
Tryptophan

Uncharged Polar

- ✓ Have zero net charge at neutral pH
- ✓ Hydrophilic

Examples:-

Serine
Threonine
Asparagine
Glutamine
Tyrosine
Cysteine

Charged Polar

- 1) Acidic amino acids (Have a negative charge on the R-group)

Ex: aspartic acid
Glutamic acid

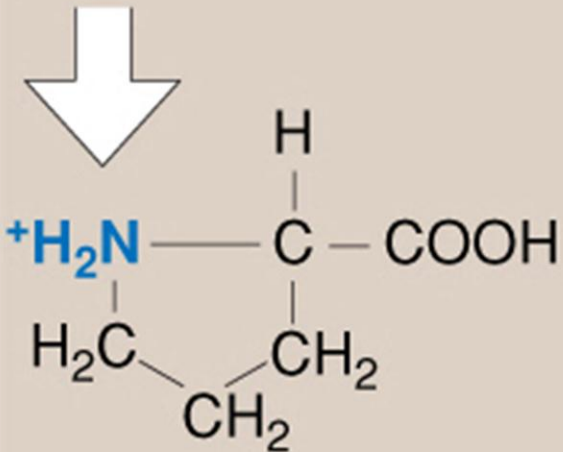
- 2) Basic amino acids (Have a positive charge on the R-group)

Ex: histidine
Lysine
Arginine

Proline

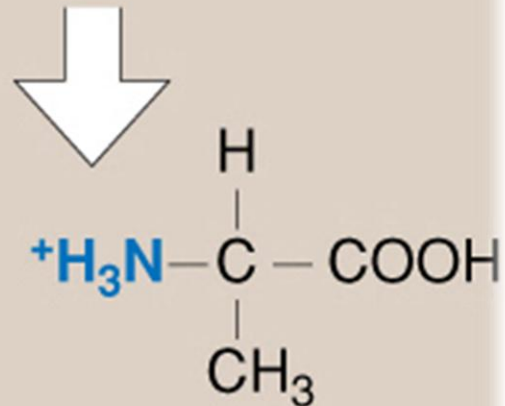
- Imino acid.
- Has a secondary amino group.

Secondary amino group



Proline

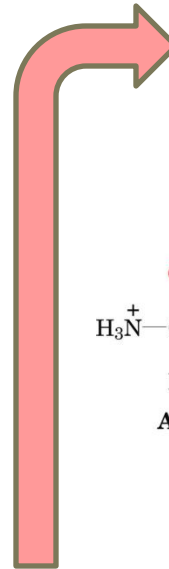
Primary amino group



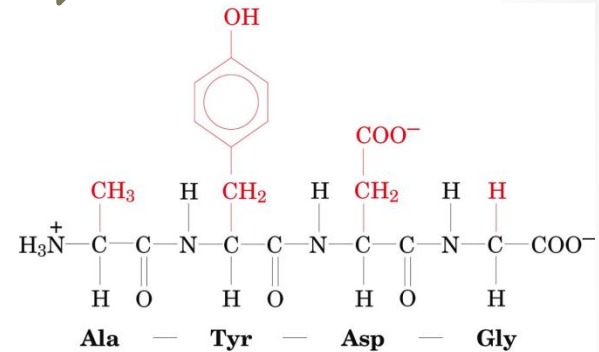
Alanine

Peptide bond

- Amino acids can be polymerized to form chains
- Amino acids are joined together in a chain by peptide bond [CO-NH linkage] (α -carboxyl group of one amino acid reacts with α -amino group of another amino acid).



Example :

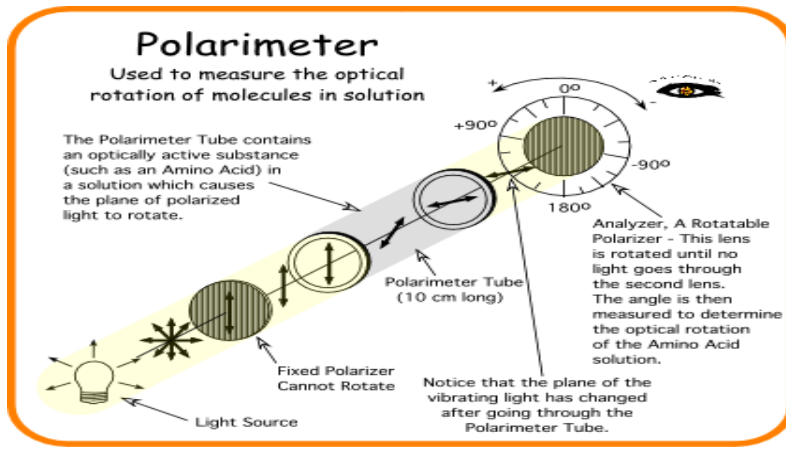


Tetrapeptide

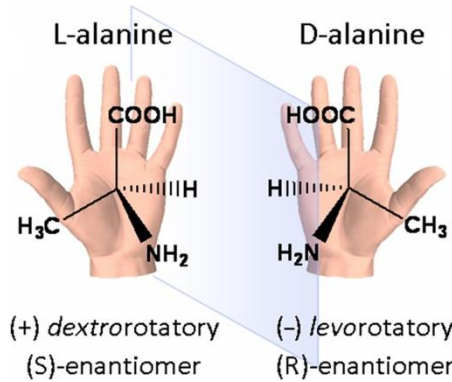
No. of amino acid	Name of the bond
2	Dipeptide
3	Tripeptide
4	Tetrapeptide
Up to 10	Oligo peptide
10-50	Polypeptide
More than 50	Protein

Optical activity

All amino acid are optically active **except** glycine
 They rotate the plane of polarized light in a polarimeter

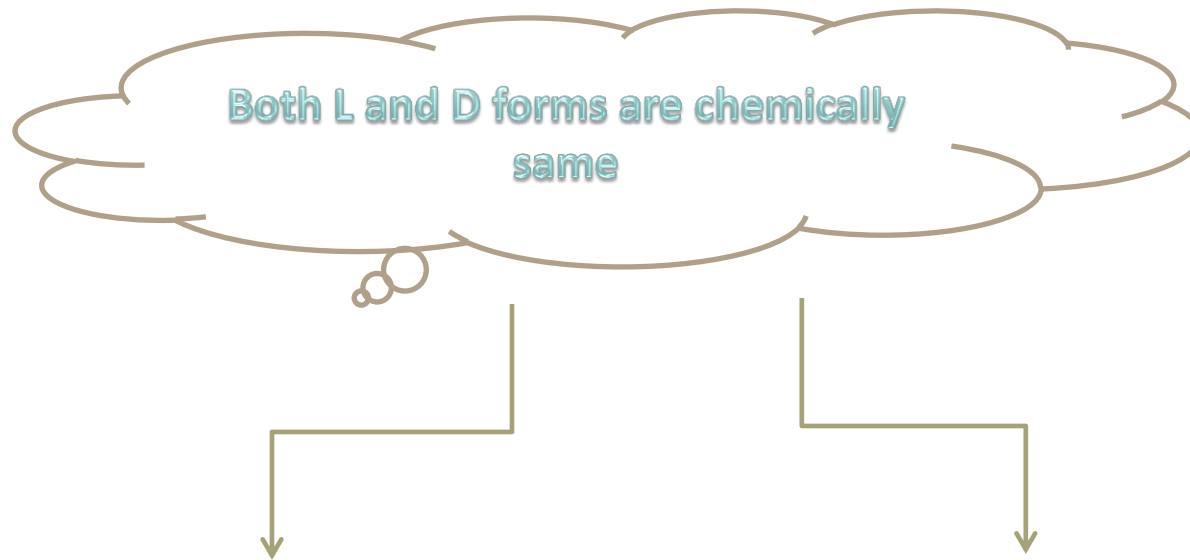


Optically active molecules are asymmetric: (means α -C is bonded to four different groups) They are not superimposable on their mirror image



Continue ..,

D and L amino acid ..!



- L-Amino acids rotate polarized light to the left
- They are found in natural amino acids

- D-Amino acids rotate polarized light to the right
- are found in antibiotics (like Gramicidin-S, Actinomycin-D and Valinomycin) and in plant and bacterial cell walls

Why isn't glycine optically active ?

because;

- ✓ Glycine contains two hydrogen atoms on α -C
- ✓ The α -C of glycine is not asymmetric
- ✓ Therefore glycine is optically inactive

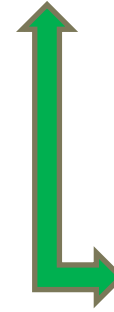
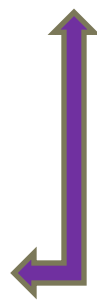
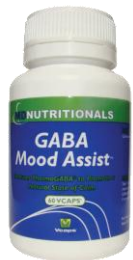


What is the non-standard amino acid ?!

- ✓ It is modified from the standard amino acids .

Amino acid derivatives of importance

- Gamma amino butyric acid (GABA, a derivative of glutamic acid) and dopamine (from tyrosine) are neurotransmitters



Histamine (Histidine) is the mediator of allergic reactions



Thyroxin (Tyrosine) is an important thyroid hormone

