

CLASSIFICATION OF AMPHIBIA

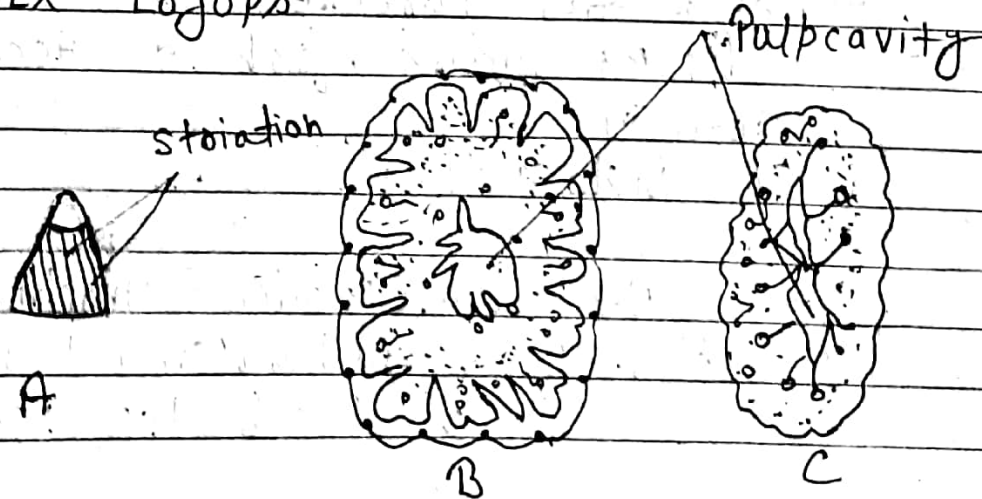
Amphibia का classification एक controversial matter है तथा अनेक authors ने विभिन्न प्रकार से इसका classification दिया है. Boulenger, Nieuwenhuis, Nobles इत्यादी ने विस्तार पूर्वक Amphibia का Taxonomy का अध्ययन किया

CLASSIFICATION :- निम्नलिखित classification का scheme Noble (1954) ने दिया है तथा class Amphibia को उनके निम्नलिखित orders एवं suborders में बाँटा है

Extinct orders →

Order 1 - Labyrinthodontia

- (1) Salamanders के समान Extinct form थे।
 - (2) ये aquatic एवं semi-aquatic form थे।
 - (3) skull heavily Armoured थे।
 - (4) Teeth large एवं उनके denticle greatly folded थे।
 - (5) Girdles strong थे, Pelvic girdles 'V'-shape एवं Pectoral girdles U-shaped थे जो जीव Carboniferous से Triassic period में पाए जाते हैं।
- Ex - Eryops



Order 2 - Phylopondyli

- (1) Amphibians, Net-like थे।
- (2) Vertebrae tubular थे।
- (3) Neural chord एग Notochord एग ही common cavity में पाए जाते थे -
- (4) Transverse process Rib के खोज well develop होते थे परन्तु ribs process absent थे।
- (5) ये Carboniferous से Permian Period में पाए जाते थे।

Ex - Ichthyostega

Order 3 - Lepospondyli

- (1) Lower Carboniferous से Permian Period में पाए जाने वाले Extinct form थे।
- (2) Neural arch, centrum से fuse थे।
- (3) Ribs, vertebral column से Articulated थे।
- (4) इनके कुछ characters जैसे skull, gills एवं girdles, fish के ancestors मिलते थे।

Ex - Diplocathis

Living Amphibia (Modern Amphibia) →

Sub class 1 - Lissamphibia (Smooth amphibian)

ये Living sub class Lissamphibia

को tail या limb की Absence एवं presence के आधार पर निम्नलिखित order एवं sub order में बाँटा गया है

Order 1 - Gymnophiona (Apoda)

- (1) ये Living, Limb less Amphibia हैं तथा burrow-wing habit में tropical countries में पाए जाते हैं
- (2) Body रूखा एवं worm like होता है तथा इन पर ring के समान grooves पाए जाते हैं
- (3) tail छोटा या absent होता है
- (4) Anus, subterminal होता है तथा skin में concealed calcified scales पाए जाते हैं
- (5) Eyelid less होते हैं एवं opaque skin द्वारा cover होते हैं
- (6) Male में copulatory organ पाया जाता है इनमें कुछ oviparous तथा कुछ viviparous होते हैं
Ex - Siphonops, Ichthyophis and Typhlonectes

Order 2 - Urodela (Caudata)

- (1) इनमें सभी tailed amphibia पाए जाते हैं
- (2) शरीर head, trunk एवं tail में divided होता है
- (3) Limbs, equal shaped होते हैं तथा weakly develop होते हैं कभी-कभी hind limb absent होता है
- (4) Larvae एवं adult में lateral line system पाया जाता है

(4) vertebrae opisthocoelous या Amphicoelous
होते हैं

(5) Necturus में 17 vertebrae पाए जाते हैं

(6) vocal sac Absent होते हैं

(7) Tympanum absent होते हैं

(8) में Neotony exhibit करते हैं

(9) Fertilization, Internal होता है

Order Urodela को पाँच sub
order में बाँटा गया है:-

Sub order 1 - Cryptobranchioidea

(1) Gills, absent होता है

(2) Eye lid नहीं पाए जाते हैं

(3) शरीर Fleshy fold depressed होता है

Ex - cryptobranchus

Sub order 2 - Salamandroidea

(1) Adult में gills absent होते हैं तथा
Lungs पाए जाते हैं

(2) Vomer Plantin teeth पिछे की ओर
diverge होते हैं

(3) शरीर, Lizard के समान होता है

Ex - Salamandra, Triturus

Sub order 3 -

Sub order 3 - Ambystomoida

- (1) Adults, terrestrial एवं जो Pairs Limbs
पाए जाते हैं
 - (2) जो Neotenic forms होते हैं किन्तु गills
एवं lungs पाए जाते हैं
 - (3) Eyelids, present होता है
 - (4) Vomerine teeth present होता है
- Ex - Ambystoma, Exoloth larva

Sub order 4 - Meantes

- (1) Body slender होता है
 - (2) Hind limbs absent होता है एवं जो aquatic
होता है
- Ex - Siyen and Pes Pseudobranchus

Sub order 5 - Proteida

- (1) Permanently aquatic होता है तथा तीन
Pairs external gills पाए जाते हैं
 - (2) Tail एवं Fins पाए जाते हैं
- Ex - Necturus, Proteus

Order 3 - Salientia (Anura)

- (1) Head and trunk fuse होता है
- (2) Neck absent होता है

- (3) Hints limb लम्बे होते हैं तथा jumping में Adapted होते हैं
 - (4) Tail एवं external gill adult में external होते हैं
 - (5) Scail, absent होते हैं
 - (6) vertebrae खरगों में कम ही पाता है (at urostyle)
 - (7) vocal call present होता है
 - (8) Tympanus, present होता है
 - (9) Ear, air born sound waves को सुनने में सक्षम होता है
 - (10) Fertilization, External होता है तथा वह oviparous होता है
- Order Salientia को पाँच sub order में बाँटा गया है:-

Sub order 1 - Amphicoela

- (1) vertebrae में Amphicoelous पाए जाते हैं
- Ex - Liopolema

Sub order 2 - Opisthocoela

- (1) vertebrae typically opisthocoelous होते हैं
- Ex - Alytes, Pipa

Suborder 3 - Procoela

- (1) vertebrae procoelous होता है
Ex - Bufo, Hyla

Suborder 4 - Anomocoela

- (1) sacral vertebrae procoelous होता है
(2) Pre-sacral vertebrae आठ होता है
Ex - Pelobates and Scaphiopus

Suborder 5 - Diplaslocoela

- (1) यहाँ दो सातवाँ vertebrae procoelous होता है 8th vertebrae biconcave होता है तथा 9th vertebrae आगे की ओर convex होता है और double condyle प्राप्त होता है
(2) Ribs, absent होता है
Ex - Rana, Rhacophorus

DIGESTIVE SYSTEM OF HERDMANIA

Q. Describe the alimentary canal of Herdmania and mention feeding mechanism and mode of digestion.

- Herdmania is a marine, simple, ascidian.

- The digestive system of herdmania consists of Alimentary Canal + Digestive glands.

ALIMENTARY CANAL

The AC of Herdmania is U-shaped.

It is formed of 3 regions.

① Foregut ② Midgut ③ Hindgut.

I. FOREGUT

The foregut is anterior region of AC. It consists of Branchial aperture, Stomodaeum, Pharynx + Oesophagus.

* Branchial aperture lies on a aperture called branchial siphon.

It is also called mouth.

It is bounded by 4 lips.

The branchial aperture leads into a narrow cavity called Stomodaeum or buccal cavity.

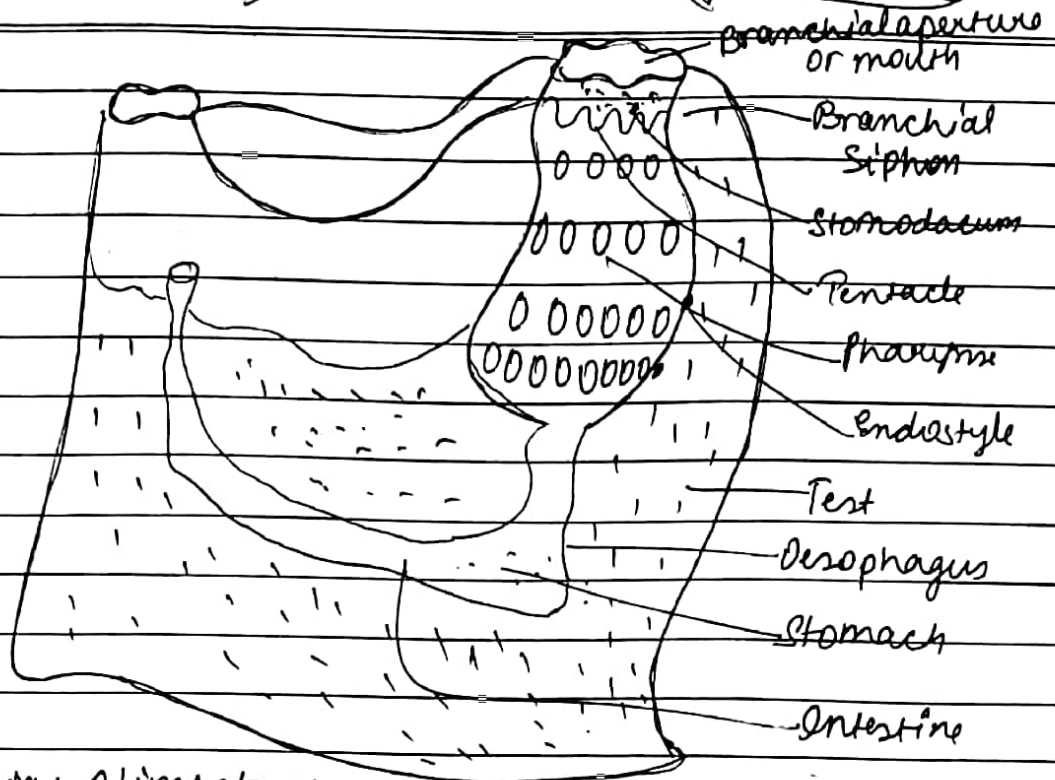


Fig: Alimentary canal of *Hydra*

At the base of the Stomodaeum, there is a ring of tentacles called Stomodaeal tentacles.

They remain ventral to the Siphon & melt in the centre.

They function as a sieve preventing the entry of large intestine particles.

The stomodaeum leads into the pharynx. Pharynx is called branchial apparatus because it contains gill-slits.

It is a large chamber and it is the largest part of the A.C.

It is laterally compressed sac.

It is divided into 2 regions namely an anterior pre-branchial region & a posterior

branchial sac.

These 2 regions are separated by two circular ciliated ridges called peri-pharyngeal bands situated on the inner surface. They enclose a groove called peri-pharyngeal groove.

The branchial sac is perforated by numerous longitudinal slits called gill slits or stigmata. These are about 400000 stigmata in branchial sac.

They are arranged in transverse rows.

The stigmata bears long cilia.

There is a groove in the mid ventral side of the pharynx. This groove is called endostyle. Anteriorly it is connected to the peripharyngeal groove and posteriorly the endostyle ends a little distance in front of oesophageal openings.

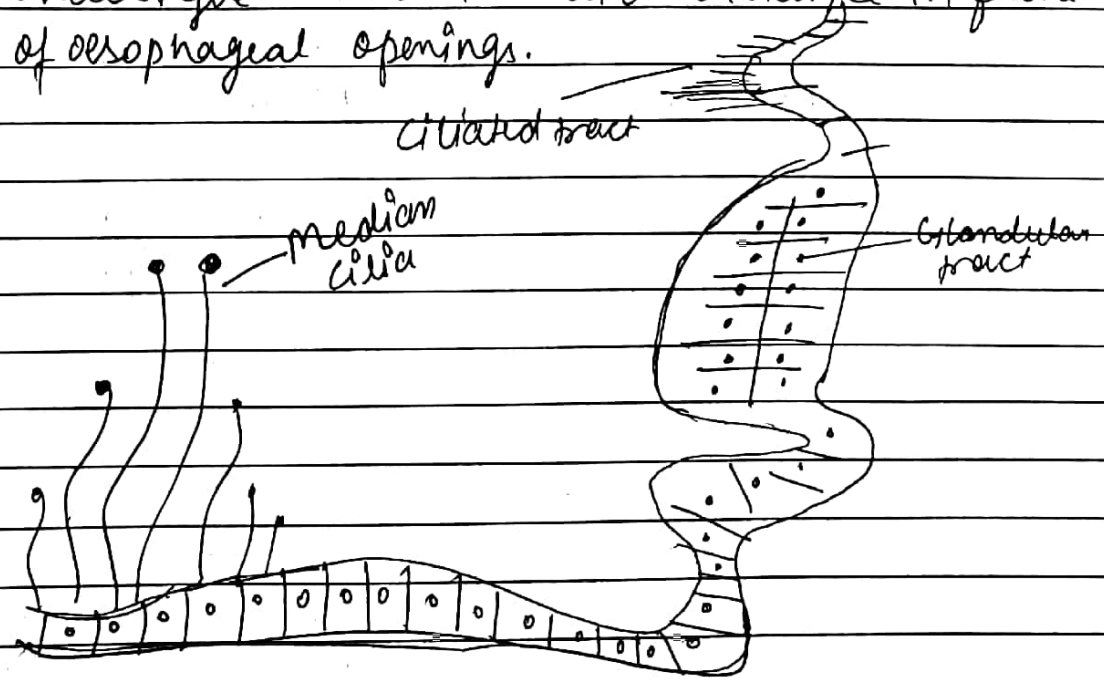
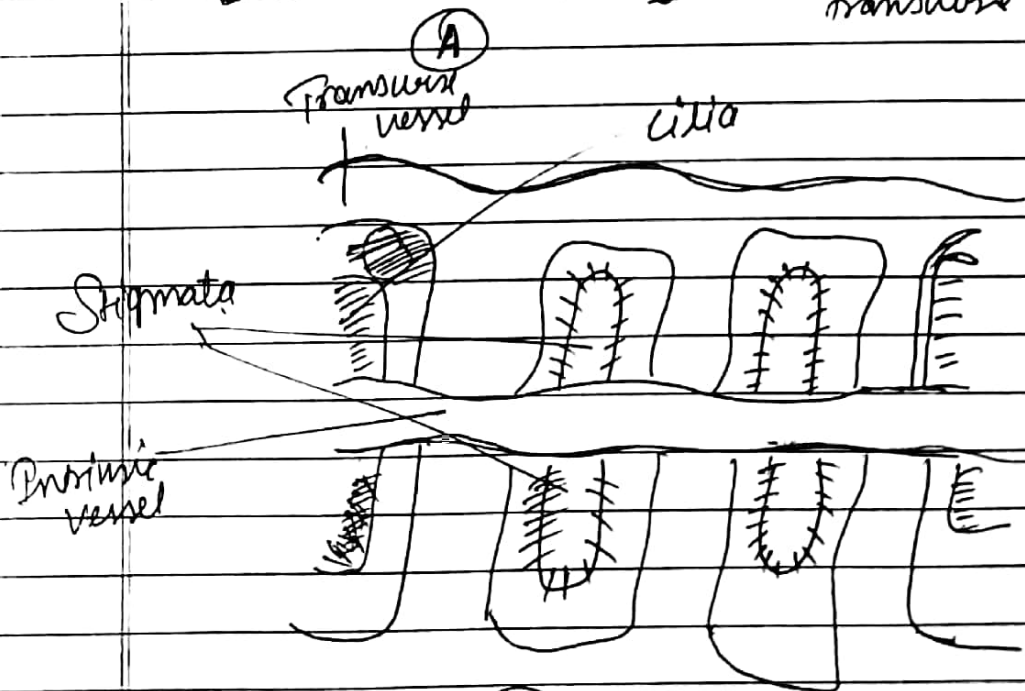
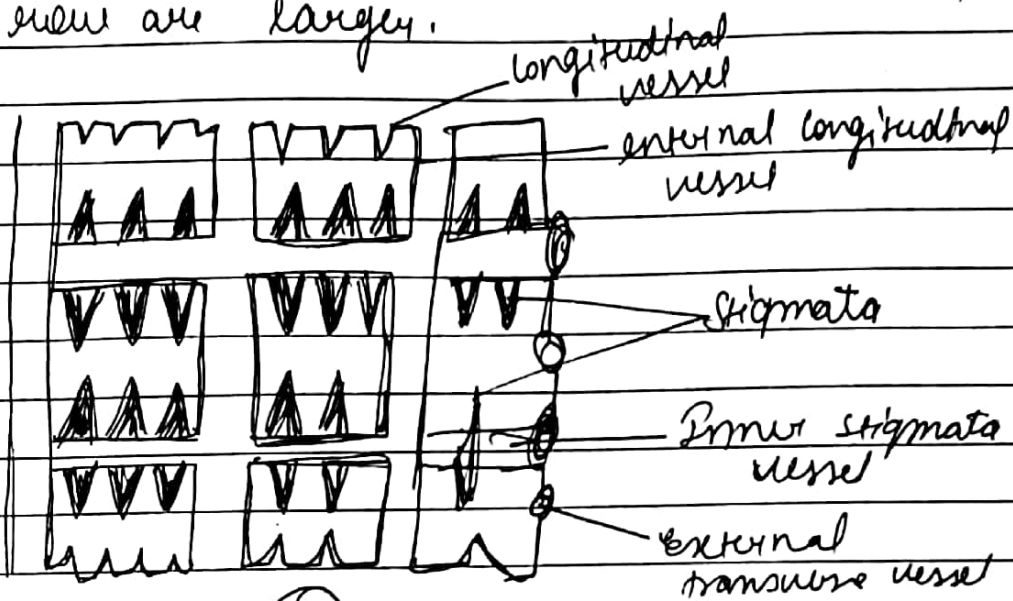


Fig: - Endostyle

The endostyle is formed of ciliated cells & mucous gland cells arranged in longitudinal rows. There are 5 rows of ciliated cells alternating with 4 rows of mucous gland cells. Of the 5 rows of ciliated cells, 1 row lies in mid-ventral line and the other four rows lie on the lateral sides. The cilia of median row are larger.



(B) One stigmatic area

Fig. (A) Branchial vessel and 4 stigmatic areas in a portion of pharyngeal wall of Hirudina

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Digestion

The secretion of liver is poured into the stomach. This secretion contains enzymes like amylase, protease & lipase.

Amylase digest starch. Protease digest protein and lipase digest lipid.

The intestine receives the secretion of pyloric gland and the digestion is finally completed in intestine.

Digested food is absorbed in the intestine & undigested food materials pass into the rectum then pass into the atrium through the anus.

From the atrium they are washed out through the atrial aperture.

Protein

Introduction:- Proteins are the polymer of α -amino acids and they are connected to each other by peptide bond or peptide linkage. Chemically, peptide linkage is an amide formed between $-\text{COOH}$ group and $-\text{NH}_2$ group.

\Rightarrow The reaction between two molecules of similar or different amino acids, proceeds through the combination of the amino group of one molecule with the carboxyl group of the other. This results in the elimination of a water molecule and formation of a peptide bond $-\text{CO}-\text{NH}-$

\Rightarrow The product of the reaction is called a dipeptide because it is made up of two amino acids. For example, when carboxyl group of glycine combines with the amino group of alanine we get a dipeptide, glycylalanine.

Primary Structure:- Primary structure of a protein is usually determined by its successive hydrolysis with either enzymes or mineral acids into various products having decreasing molecular mass as shown below:-

Proteins \rightarrow Proteoses \rightarrow Peptones \rightarrow Polypeptides
 \rightarrow Simple peptides \rightarrow α -amino acids.

\Rightarrow Proteins may have one or more polypeptide

chains. Each polypeptide in a protein has amino acids linked with each other in a specific sequence and it is this sequence of amino acids that is said to be the primary structure i.e., the sequence of amino acids creates a different protein.

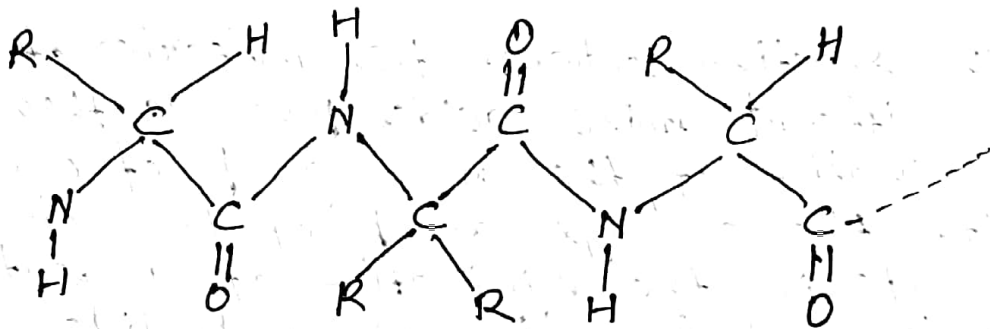


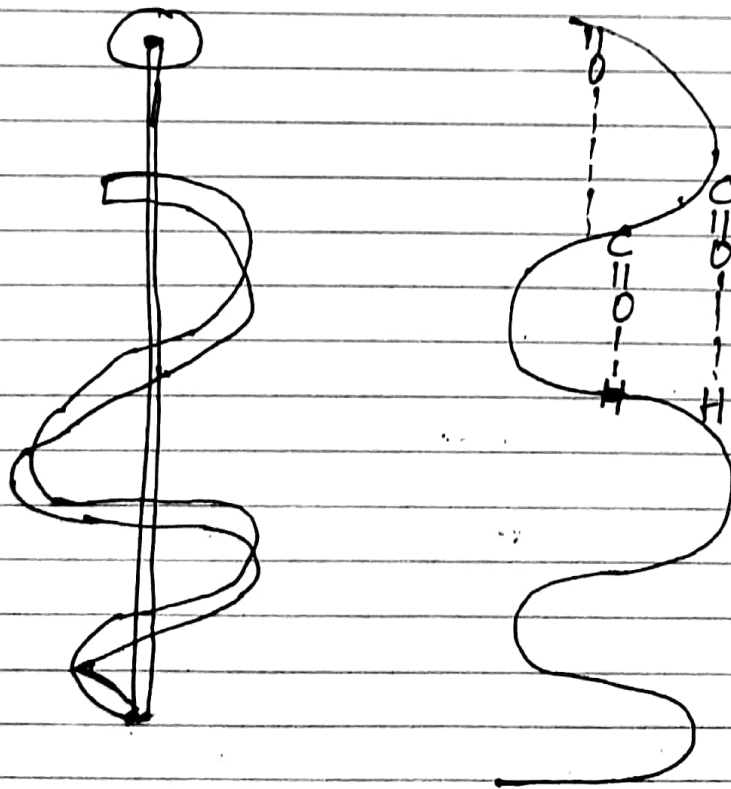
Fig:- Primary structure of a protein.

Secondary structure of proteins:-

- ⇒ The secondary structure of protein refers to the shape in which a long polypeptide chain can exist.
- ⇒ The case ~~formed~~ to found to exist in two different types of structures viz. α -helix and β -pleated sheet structure.
- ⇒ These structures arise due to the regular folding of the back bone of the polypeptide chain due to hydrogen bonding between $-C=O-$ and $-NH-$ groups of the peptide bond.
- ⇒ α -Helix is one of the most common ways in which a polypeptide chain forms all possible hydrogen bonds by twisting into a right

handed screw (Helix) with the $-NH$ group of each amino acid residue hydrogen bonded to the $>C=O$ of an adjacent turn $>C=O$ of the helix as in fig.

\Rightarrow In β -structure all peptide chains are stretched out nearly maximum extension and then laid side by side which are held together by inter-molecular hydrogen bonds. The structure resembles the pleated folds of drapery and the form is known as β -pleated sheet.

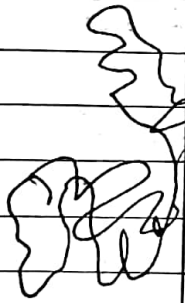


α -helix structure of proteins

Tertiary structure of Protein:-

The overall three dimensional shape of an entire protein molecule is the tertiary structure. The protein molecule will bend and twist in such a way as to achieve maximum stability or lowest energy state. Although the three-dimensional shape of a protein may seem irregular and random, it is fashioned by many stabilizing forces due to bonding interactions between the side chain groups of the amino acids.

Under physiologic conditions, the hydrophobic side-chains of neutral, non-polar amino acids such as phenylalanine or isoleucine tend to be buried on the interior of the protein molecule thereby shielding them from the aqueous medium.



The formation of disulfide bridges by oxidation of the sulfhydryl groups on cysteine is an important aspect of the stabilization of protein tertiary structure, allowing different parts of the protein chain to be held together covalently. Additionally, hydrogen bonds may form between different side-chain groups.

Quaternary structure - many proteins are made up of multiple polypeptide chains, often referred to as protein subunits. These subunits may be the same or different.



The quaternary structure refers to how these protein subunits interact with each other and arrange themselves to form a larger aggregate protein complex. The final shape of the protein complex is once again stabilized by various interactions including hydrogen-bonding, disulfide-bridges and salt bridges. The four levels of protein structure are shown:

Organism	Genome (Mb) ^a	Protein-coding sequence (kb) ^b	Number of genes ^b
E. coli	4.6	90	4,288
S. Cerevisiae	12	70	5,885
C. elegans	97	25	19,099
Drosophila	180	13	13,600
Human	3,000	3	100,000