

Pyrimidine component of
of in DNA molecule.

2. The amount of Adenine (A) is equivalent to the amount of thymine (T) and cytosine (C) is equivalent to guanine (G)

3. The base ratio $A = T / G = C$ may vary in the DNA of different groups of animals but is constant for a particular species.

Salient features of double helical model of DNA by Watson and Crick:

→ The double helix comprises of two polynucleotide chains.

→ The two polynucleotide chains are wound clockwise around a central axis to form right handed helix.

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→ The polynucleotide chains of double helix are antiparallel, one is $5' \rightarrow 3'$ direction and its antiparallel chain is aligned in $3' \rightarrow 5'$ direction.

→ Each polynucleotide chain has a sugar-phosphate backbone with nitrogenous bases directed inside the helix towards central axis.

→ The phosphate molecule groups give the molecule a negative charge.

→ The nitrogenous bases lie almost perpendicular to the long axis of the molecule.

→ Therefore, these are stacked one on top of another like a pile of saucers.

→ The distance from phosphorus atom of the backbone to the centre of the axis is 10^- and therefore, width or diameter of the double helix is 20^- or 2nm .

→ The two polynucleotide chains in a double helix are complementary.

→ The nitrogenous bases are antiparallel polynucleotide strands are linked through

hydrogen bonds. There are two hydrogen bonds between A and T, three between G and C. These are complementary base pairs.

→ Ten base pairs occurs per turn of helix. The spacing between adjacent base pairs ~~These are called comp~~ is 3.4 or 34 nm. Therefore, each turn of helix is 34 or 34 nm.

→ The double helix has two external helical grooves: a major groove which is deep and wide and a minor groove which is shallow and narrow, but large enough to allow protein molecules to come in contact with nitrogenous bases.

Watson and Crick's models of DNA:

Watson and Crick suggested that DNA molecule there are two such polynucleotide chains arranged antiparallel or in opposite direction i.e., one polynucleotide chain runs in $5' \rightarrow 3'$ direction, the other $3' \rightarrow 5'$

direction, it means the 3' end of one chain lies beside the 5' end of other. In such a structure the phosphate groups of nucleotides on each polynucleotide chain on strands lie on the deoxyribose and nitrogenous base are inward. Unique features are —

1. Purines (A and G) pairs with pyrimidines (Cytosine and thymine)

2. Adenine pairs with thymine and cytosine pairs with guanine.

There are special reasons for pairing:

1. Such pairing forms a perfect match between hydrogen donor and hydrogen acceptor sites on the two molecules. Adenine (A) and thymine (T) share two hydrogen atoms whereas cytosine and guanine are joined by three hydrogen bonds.

2. Such a pairing is further supported by the occurrence of constant diameter of DNA. In a limited area a two ringed (purine) molecule joins a single ringed pyrimidine molecule maintaining a constant and

roughly equal distance.

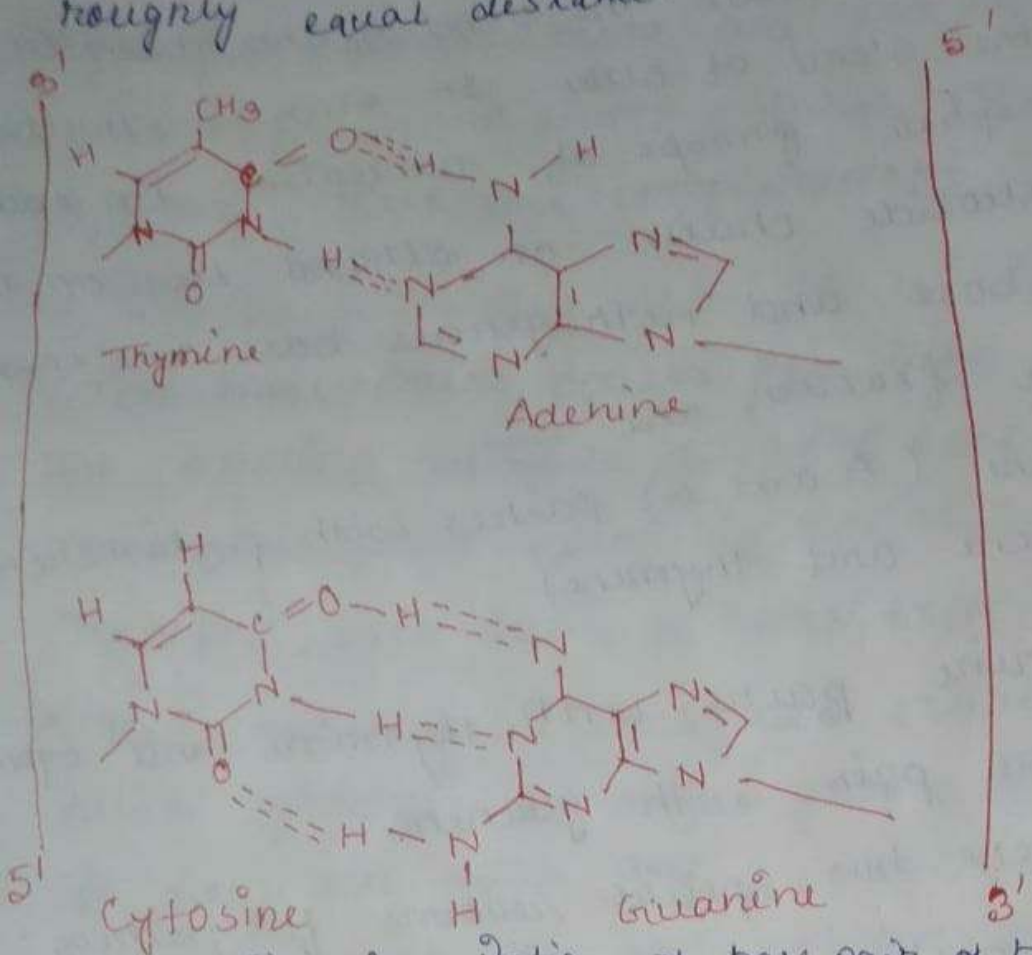


Fig: Association of base pair of H-bonds & the distance between the different bonds are indicated in above fig. A and G pair will be too large to fit inside the helix and C and T would appear to be far apart. Due to this type of base pairing the two strands are complementary to each other. It means if a chain has a region with a sequence of nitrogen bases, thymine - cytosine - adenine - cytosine - adenine - guanine - thymine - guanine - cytosine.

DNA consists around each One turn diameter of minor groove run along groove while successive

Major groove
One complete turn 34 Å

DNA consist of two complementary chain twists around each other forming a righthanded helix. One turn of helix measures about 34 \AA . The diameter of the helix is roughly 20 \AA . A narrow minor helical groove and a wide helical groove run along the length of DNA helix. The narrow groove is the distance between the paired molecules while the major groove is the space between successive turns the pair is wound into a helix.

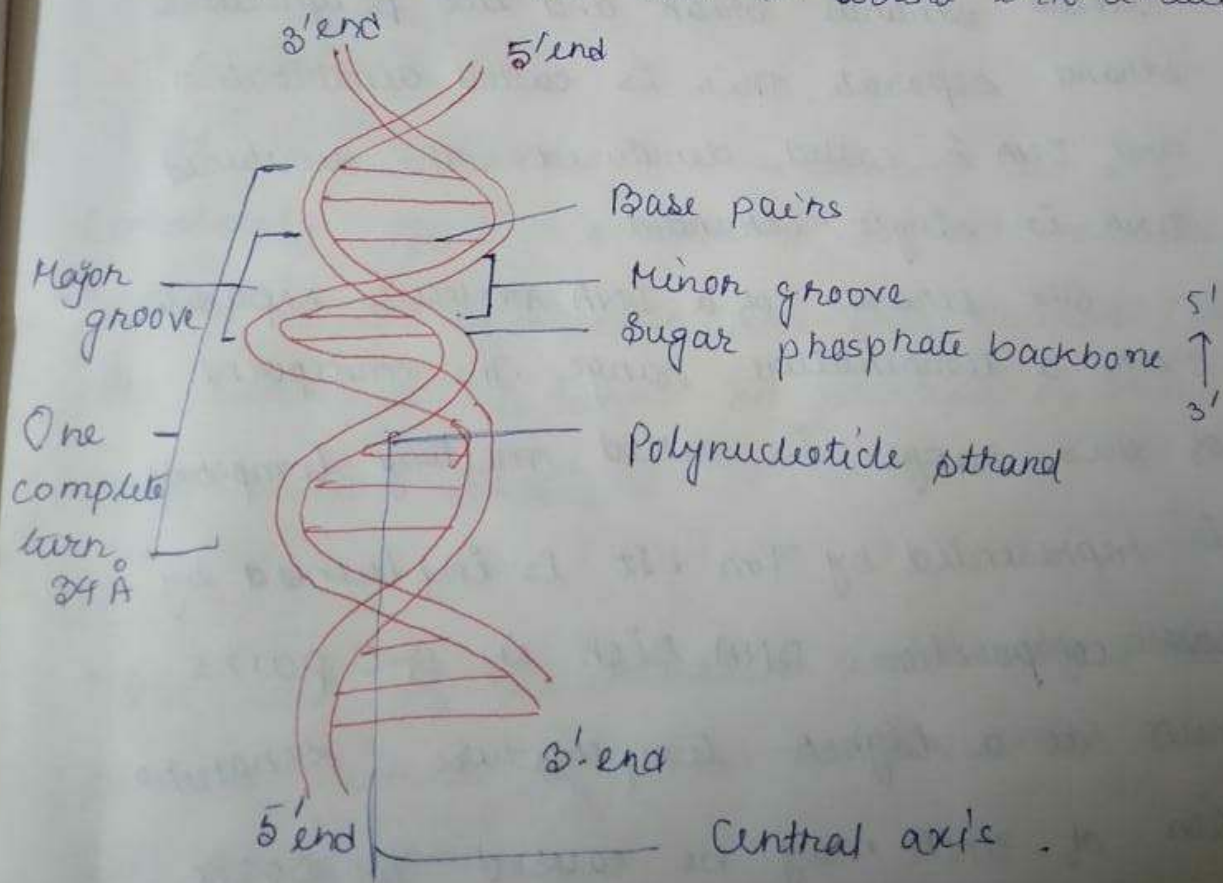


Fig: Double helical structure of a part of DNA molecule.

-ions. These are called denaturants. When heated DNA solution is slowly cooled, the two strands pair again forming double helix. This is renaturation or reannealing. This property of DNA is discovered by Julius Marmur and co-workers of Harvard University 1960. This has helped to synthesized hybrid DNA. More length of hybrid DNA denotes taxonomic nearness.