

NUCLEIC ACIDS

Nucleic acids are found originally in nucleus of cell hence named. Now they are reported from plastids, mitochondria and even cytoplasm. They are also present in Bacteria and Viruses. They are considered as Genetic material of the organism.

They are strong acids. Giant molecules, having high molecular weight and a complex structure. They are polymers of nucleotides, also known as Polynucleotides.

A nucleotide consists of a Nitrogenous Base, a sugar and Phosphate

$$1. \text{ Nitrogenous Base} + \text{ Sugar} = \text{Nucleoside} + 1$$

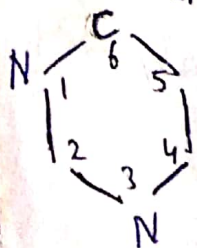
$$2. \text{ Nucleoside} + \text{ Phosphate} = \text{Nucleotide}$$

Nitrogenous Base: Nitrogen gives the base.

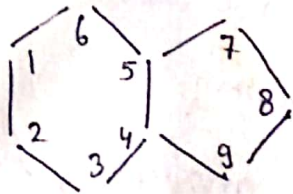
Nitrogenous Bases are mainly of two types.

(A) Pyrimidines → Single ring compounds with

nitrogen in position 1' and 3' of a 6 membered Benzene ring e.g. Cytosine, Thymine and Uracil.



(B) Purines : Are double ring compounds consists of 5 membered imidazole ring joined to a pyrimidine ring at position 4' and 5'.

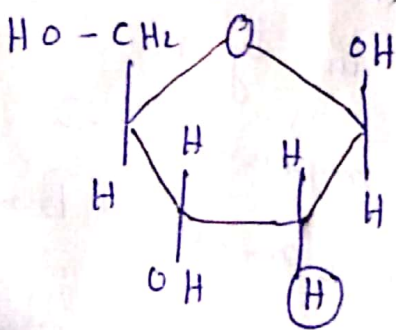


e.g. Adenine and Guanine.

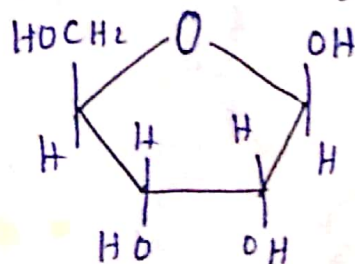
Sugar :- There are pentose sugars. (With five carbon atoms).

They are of two types Deoxyribose and Ribose.

(i) Deoxyribose \rightarrow The four carbon atoms are at 1', 2', 3' & 4' and a 5th position there is oxygen. The 5th carbon is outside the ring and forms a part of a $-CH_2$ group. There are 3-OH groups attached to 1', 3' & 5' and four Hydrogen atoms attached to 1', 2', 3' and 4'.



(ii) Ribose Sugar: There is one more $-OH$ group at place of H at carbon atom 2'



(c) Phosphate :- Phosphate group alternates with sugar.

Each phosphate group is joined to carbon atom 3' of one deoxyribose and to carbon atom 5' of another. Resulting 3' & 5' end of nucleotides.

In DNA 3' end of one strand corresponds to 5' end of the other. Consequently the oxygen atom of deoxyribose point in opposite directions in the two strands.

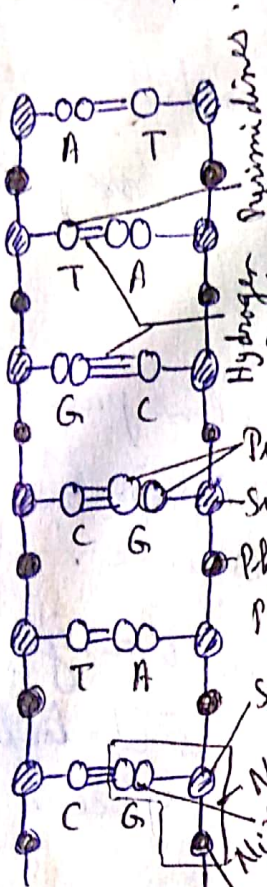
Base Pairing :- One purine and one pyrimidine pair and make ladder of DNA. Adenine pair with Thymine and Cytosine pair with Guanine.

It is to adjust one single ring with a double ring. As two purines take much ~~less~~ & two pyrimidines take less space.

STRUCTURE OF DNA

The widely accepted and explained model was proposed by Watson & Crick (1953) as Double helix.

→ The It consists of two helically twisted strands connected together by steps.



Each strand consists of alternating molecules of deoxyribose and phosphate group.

Each step is made up of a double

ring purine and a single ring pyrimidine and connected to deoxyribose sugar

The two strands are clockwise interwind i.e. in Right hand direction and anti-parallel.

There is a turn at each 34 \AA , having 10 pairs of nucleotide. hence 3.4 \AA space in between two nucleotides. and a rise of 36° in the horizontal plane. The width is 20 \AA .

The twisting results in Deep and Shallow Spiral Grooves.

Thus DNA molecule is a polymer of several thousands of nucleotide monomers.