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Chapter 5 : Nucleic acids

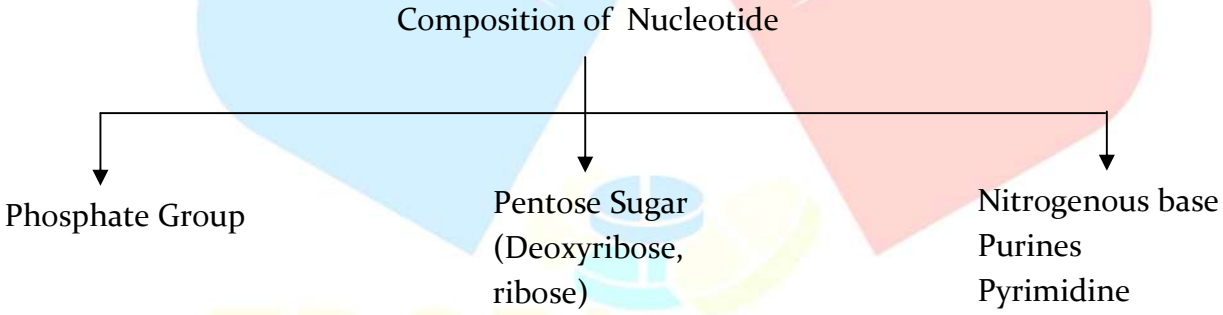
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Chapter 5
Nucleic acids

- Nucleic Acids (DNA & RNA) are formed by the polymerization of Nucleotide Subunits.
- Nucleic Acids are made up of a ribose sugar, nitrogenous base & Phosphate group.
- Deoxyribonucleic Acid (DNA) & Ribonucleic Acid (RNA) are two types of nucleic acids that act as sources and carriers of genetic Information.

Composition of Nucleotide



- **Purine :** They Contain two carbon nitrogen rings one of them is 6 membered and other is 5 membered
  - **Example :** Adenine, Guanine.
- **Pyrimidine :** It is 6 membered carbon nitrogen ring at the 1st & 3rd position it contain N(Nitrogen) instead of carbon
  - **Example :** Cytosine, Thymine, Uracil.

Component of Nucleoside & Nucleotide

- Nucleoside : It is made up with the combination of Pentose sugar and nitrogenous base by glycosidic bond.
- Nucleotide : Are Organic Substance made up of nucleoside and phosphate.

Or

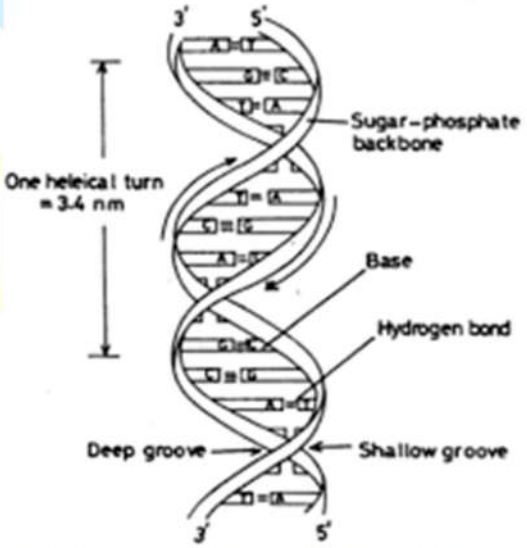
- Nucleotide are organic substance made up of pentose sugar, Nitrogenous base, phosphate group.

DNA (Deoxyribonucleic Acid)

→ DNA (a polymer molecule) is made up of monomeric units called nucleotides.
→ Polymer is known as polynucleotide.
→ A 5-Carbon sugar (deoxyribose), nitrogenous base attack to the sugar and a phosphate group.

Watson and Crick model of DNA

- DNA as an acidic substance present in the nucleus was first identified by Frederich Meischer in 1869. He named it as 'nucleon'. Due to technical limitations in isolating such a long polymer intact the elucidation of structure of DNA remained elusive for a long period of time.
- It was only in 1953 that James Watson and Francis Crick proposed the very simple but famous double helix model for the structure of DNA.
- The main opposition was base pairing between the two strands of polynucleotide chains



Watson and Crick Model of DNA Molecule

The salient features of double helix structure of DNA are as follows :

- It is made up of two polynucleotide chains.
- The two chains have antiparallel polarity if one has polarities and the second chain must have polarity.
- The base into strands is paired through hydrogen bond forming base pairs. Adenine forms to hydrogen bonds with thymine from opposite strands and vice versa.
- Similarly guanine forms three H bonds with cytosine. As a result, purine comes opposite to pyrimidine.
- Because of this approximate a uniform distance between the two strengths of The Helix occurs.

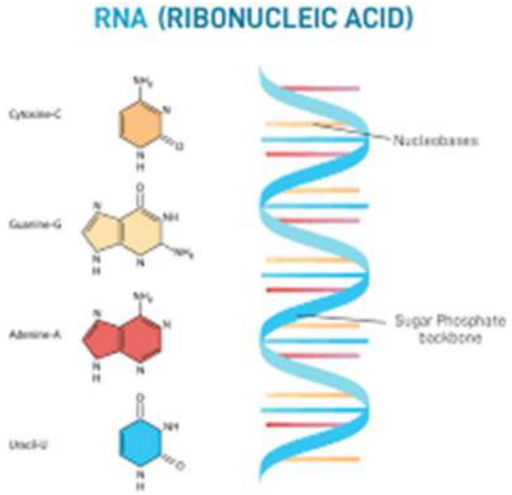
- The two chains are called in a right-handed fashion. Pitch of the helix is and there are roughly 10bp in each turn.
- The plane of one base pair is stacked over the other in a double helix. This confirms stability of the helical structure.

Function of DNA

1. **Genetic Information :** It transfer genetic information from mother to the child.
2. **Replication :** It makes its copy during cell division.
3. **Transcription :** When RNA is formed from DNA it is called transcription.
4. **DNA finger print :** It help to determine the identity of suspected person on the basis of nucleotide sequences

Structure of RNA

- Ribonucleic Acid RNA is a long unbranched macromolecule consisting of nucleotides joined by $3^{|}$ to $5^{|}$ Phosphodiester bonds.
- RNA is a single stand dose not contain regions of double helical structure.
- RNA contain ribose sugar instead of 2-deoxyribose that present in DNA.
- The Structure of RNA Molecule was described by Robert William Holley in 1965.
- It contain four major bases such as
  - Purine base : Adenine & Guanine
  - Pyrimidine base : Cytosine & Uracil
- RNA Pairs
  - Adenine with Uracil
  - Cytosine with Guanine



Types of RNA / Function

- ✓ **mRNA :** It takes genetic massages from DNA and help in protein synthesis.
- ✓ **t-RNA :** It transfer amino acids to the codes information of mRNA.
- ✓ **r-RNA (ribose RNA) :** It play an important role in protein synthesis.