

3.1 INTRODUCTION

Nucleic acids form an important class of compounds, having high molecular weights. They play an important role in the development and reproduction of all forms of life. Living cells contains nucleic acids in the form of nucleoproteins. Nucleoproteins consists of a protein and a nucleic acid.

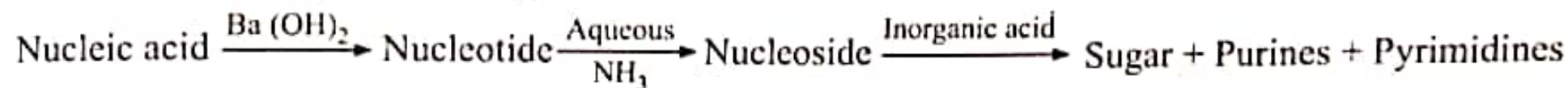
There are two types of nucleic acids:

(i) Deoxyribonucleic acid or DNA

(ii) Ribonucleic acid or RNA

These names for nucleic acids are derived from their hydrolysis products.

A nucleic acid on hydrolysis gives a nucleotide which on further hydrolysis gives a nucleoside and phosphoric acid. A nucleoside on hydrolysis in the presence of inorganic acid gives a mixture of sugar, purines and pyrimidines.



Nucleic acid : Before we study about Nucleic acid, we need to know the following important terms.

- ① Nucleotides : Nucleotides consists of 5- Carbon Sugar + nitrogenous base + 1,3 phosphate group
- ② Pentose Sugar : It is either ribose or deoxy ribose (Not having oxygen at C₂).
- ③ Nitrogenous base : Derived from Purines having two rings in their structure. eg. Adenine (A) and Guanine (G) and derived from pyrimidines having one ring in their structure eg. Thymine (T), Uracil (U) and cytosine (C). Two hydrogen bonds are present between A and T (A=T)

Three hydrogen bonds are present between C and G ($C \equiv G$).

④ Ribonucleotide :

Phosphate unit + Ribose + one base unit from A, G, C or U.

⑤ Deoxyribo nucleotide :

Phosphate Unit + ^{deoxy}Ribose + one base unit from A, G, C or T.

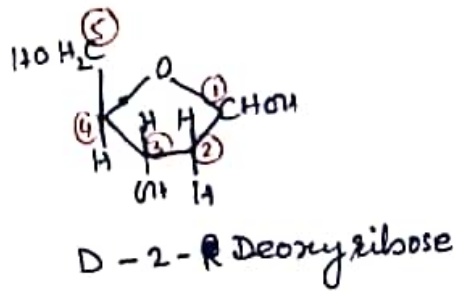
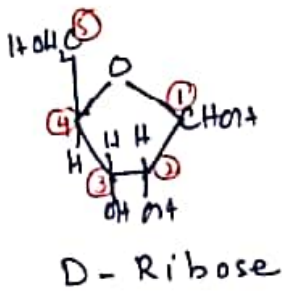
⑥ Nucleoside :

Ribose / ~~R~~ deoxyribose + one base unit from A, G, T, or U.

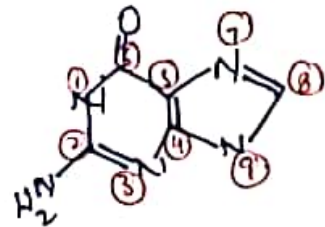
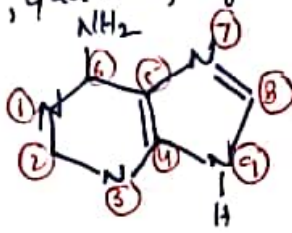
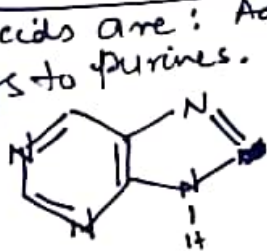
Constituents of nucleic acids:

Sugar present in nucleic acids:

only two sugars have been isolated from hydrolysis products of nucleic acids. They are D-Ribose and D-2-Deoxyribose.



Bases present in nucleic acids: The base present in nucleic acids are: Adenine, Guanine, Cytosine and uracil. Adenine and guanine belongs to purines.



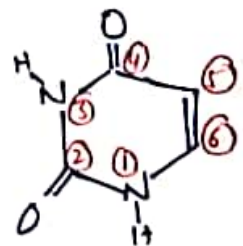
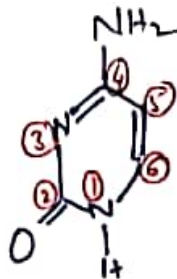
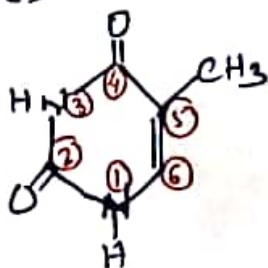
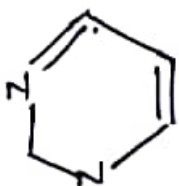
Purine

Adenine (A)

Guanine (G)

Cytosine, thymine and uracil belong to the class of pyrimidines. ~~Adenine, guanine~~

Pyrimidines



Pyrimidine

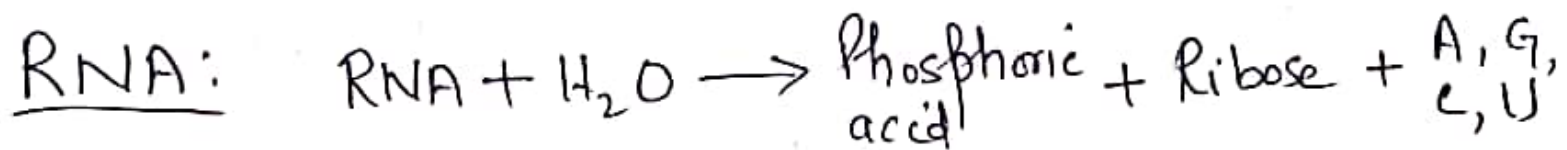
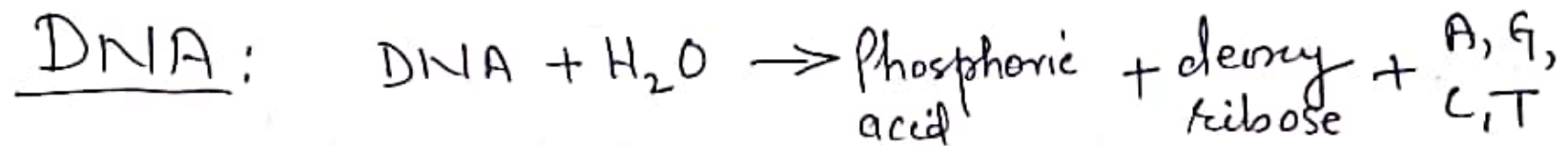
Thymine (T)

Cytosine (C)

Uracil (U)

Deoxyribonucleic acid (DNA) & Ribonucleic acid:

Nucleic acid is polynucleotide, Present in the living Cells or bacterial cells (having no nucleus) and in viruses (having no cells).



Structure of DNA: It consists of two polynucleotide chains, each chain form a right handed helical spiral with ten bases in one turn of the spiral. The two chains coil to double helix and run in opposite direction. These are held together by H-bonding.

general sequence of DNA molecule is shown in Fig.

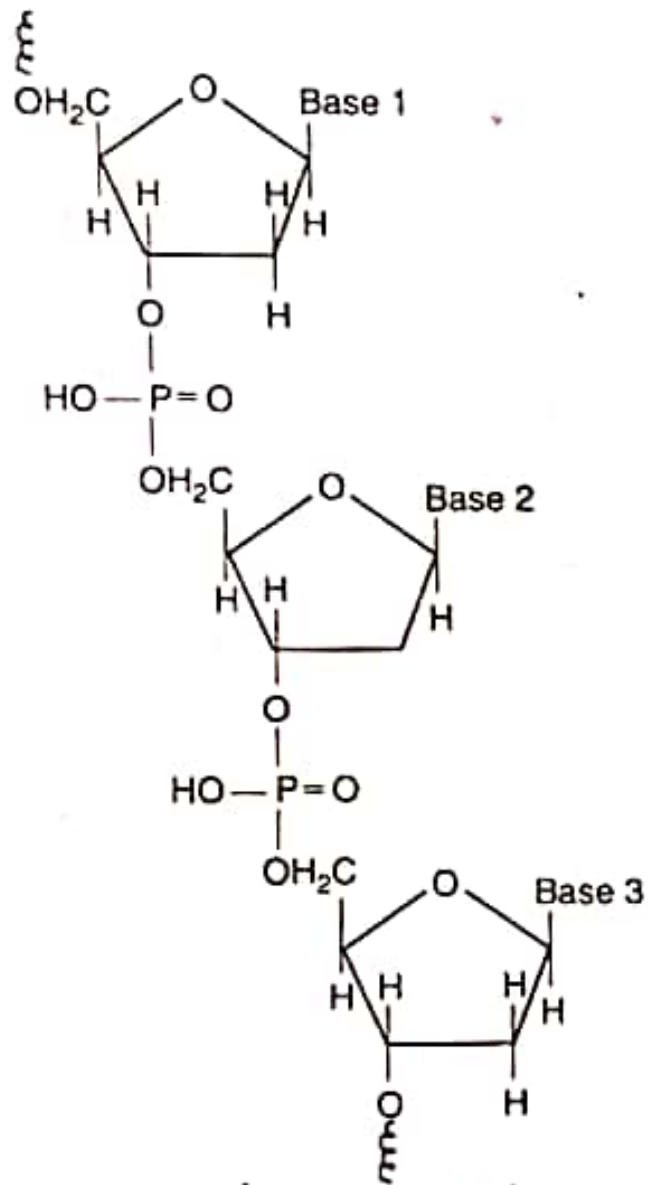


Fig. 3.1: Sequence of DNA molecule.

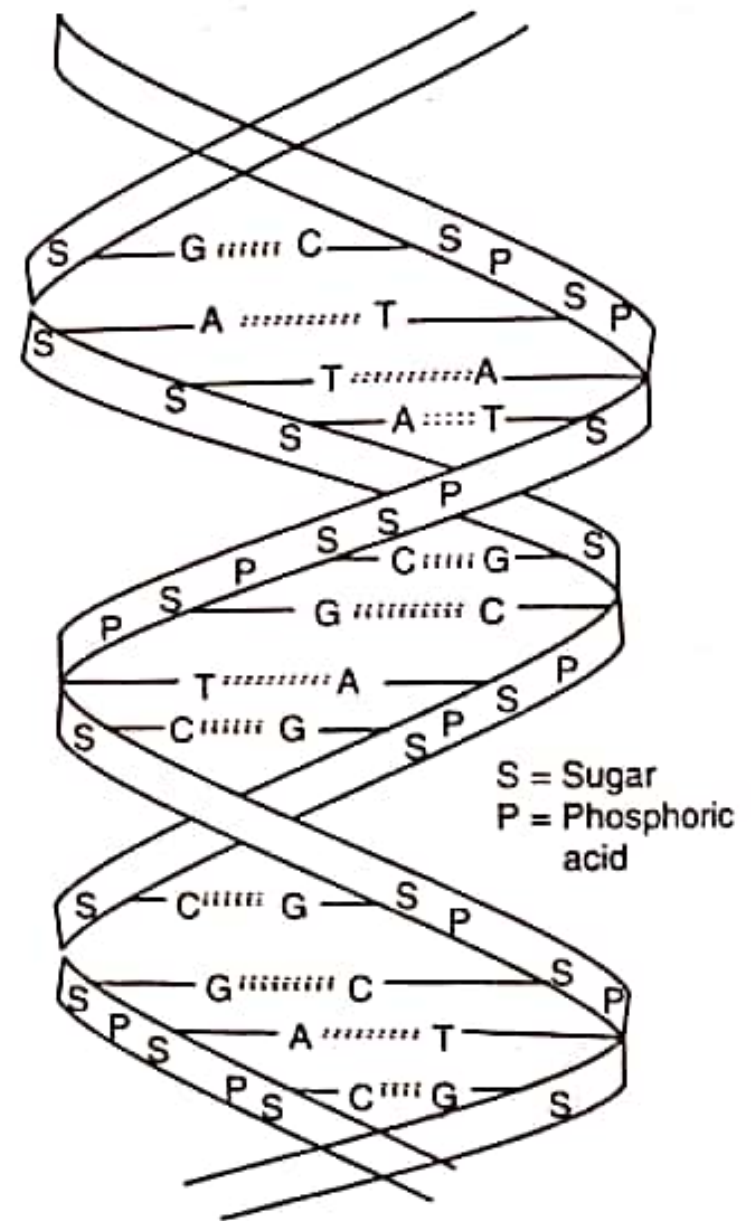


Fig. 3.2: Double helical structure of DNA.

Watson and Crick in 1953 gave the secondary structure of DNA. They described DNA molecule as two identical polynucleotide chains twisted about each other to form double helix with a diameter of 18 Å in which the heads of two chains are in opposite directions. Both helices are right handed and have ten nucleotide residues per turn. It is shown in Fig. 3.2.