

NUCLEIC ACID

- ↳ DNA (Deoxyribose Nucleic acid)
- ↳ RNA (Ribonucleic acid)

- Nucleic acids are biological molecules essential for life and include DNA & RNA.
- They are made up of polymers of Nucleotides.
- Nucleotides consist of a base, sugar and phosphate molecules.
- DNA differs from RNA by the absence of 'O' in the 'OH' group of sugar at 2' Carbon. Thus it is called as deoxyribose sugar.
- DNA has four bases adenine, guanine, thymine and cytosine while in RNA the thymine is replaced by Uracil.



deoxyribose



ribose

STRUCTURE OF DNA

- In 1953, Watson and Crick proposed model for arrangement of DNA which is known as "Double helical model" of DNA.
- The model is characterized by following features
 - DNA is formed of two polynucleotide chains coiled to form a double helix

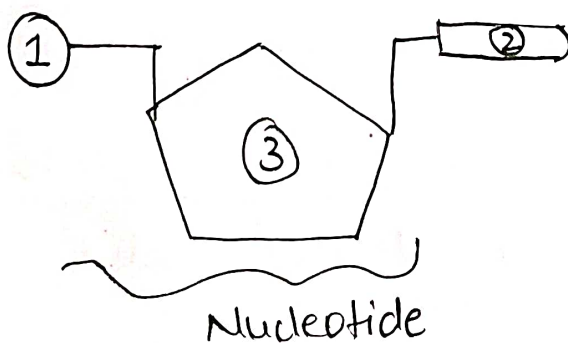
- Each chain is formed by many units called "nucleotides" which is building blocks of DNA.
- A nucleotide is formed of three components,
 - (i) phosphoric acid
 - (ii) a deoxyribose sugar &
 - (iii) a nitrogenous base. The bases are Adenine (A), Guanine (G), Cytosine (C) and Thymine (T).
- Deoxyribose sugar + nitrogenous base \rightarrow Nucleoside
- Deoxyribose sugar + nitrogenous base + phosphoric acid \rightarrow Nucleotide.
- Adenine & Guanine } Purines
Thymine & Cytosine } Pyrimidines

Purines always pair with Pyrimidines.

A = T (double bond)

G \equiv C (triple bond)

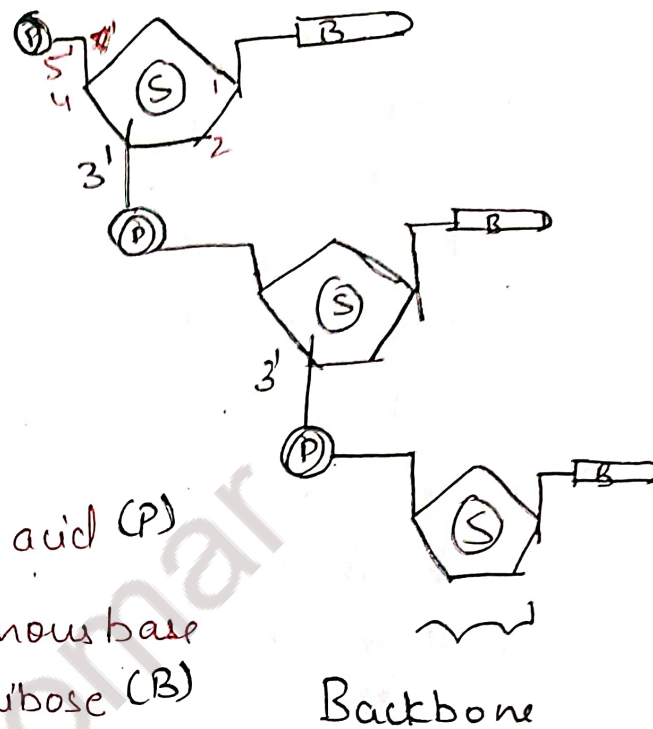
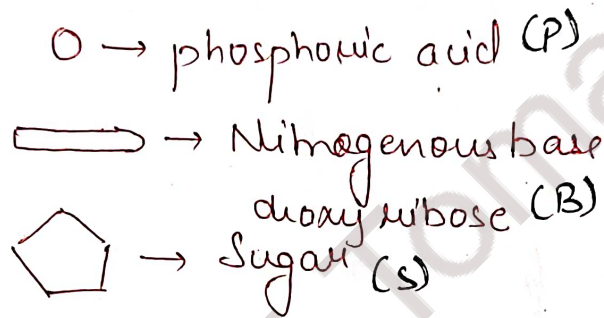
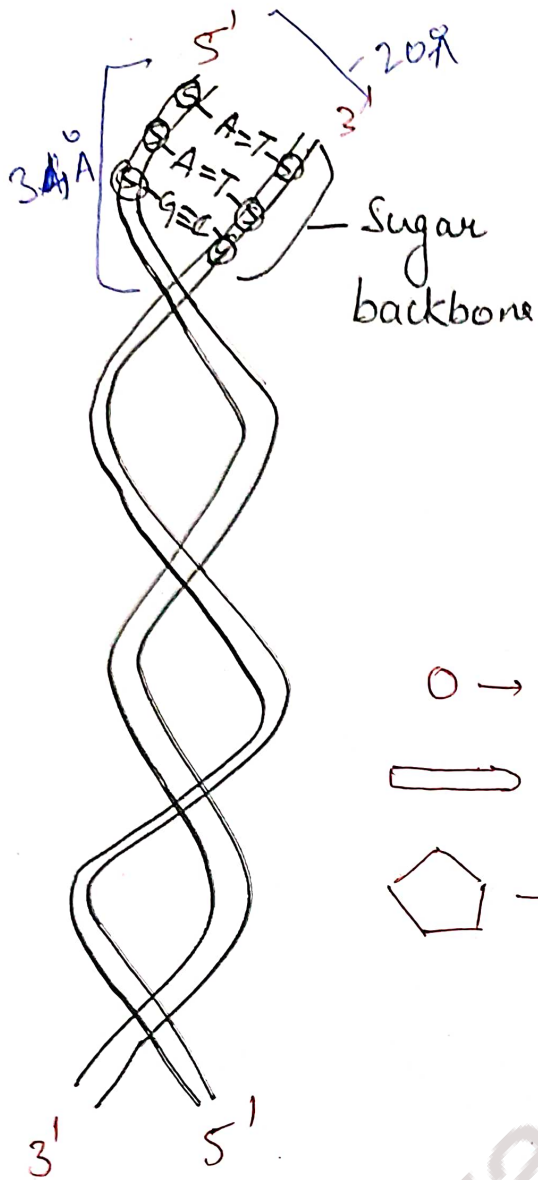
- The amount of adenine is always equal to thymine and guanine is always equal to cytosine i.e. $A=T$ & $G=C$ } k/a "Chargaff's Rule"



1 \rightarrow Phosphate

2 \rightarrow Nitrogenous base

3 \rightarrow Deoxyribose sugar



- The two chains of a DNA are complementary to each other. One end of the chain is called 3' end and the other is called 5' end. The strands are anti-parallel to each other.
- The two complementary chains are twisted around each other to form a double helix. One turn of helix is about 34 Å and ten paired nucleotides with a distance of 3.4 Å between each pair of bases. The width of DNA molecule is 20 Å.

STRUCTURE OF RNA

- RNA is a nucleic acid containing ribose sugar, with an extra -OH at 2' carbon.
- It is found in large amount in cytoplasm fewer in nucleus.
- RNA is single stranded.
- The purines and pyrimidines amount is not equal.
- Thymine is replaced by Uracil in RNA
- Three types of RNA are present:
 - a) Messenger RNA (mRNA) (Blueprint for protein synthesis)
 - constitutes 3-5% of total RNA content.
 - carries genetic information to the ribosomes.
 - b) Ribosomal RNA (rRNA) (construction site where the protein is synthesized)
 - constitutes 80% of total RNA content.
 - along with certain protein, it makes up the ribosomes.
 - c) Transfer RNA (tRNA) (transfers amino acids to the ribosomes where proteins are synthesizing).
 - constitutes 15-17% of total RNA content.

RNA Differs from DNA

1. RNA has ribose sugar
DNA has deoxyribose sugar
2. RNA contains the base Uracil (U)
DNA has thymine (T)
3. RNA molecule is single stranded
DNA is double stranded.

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