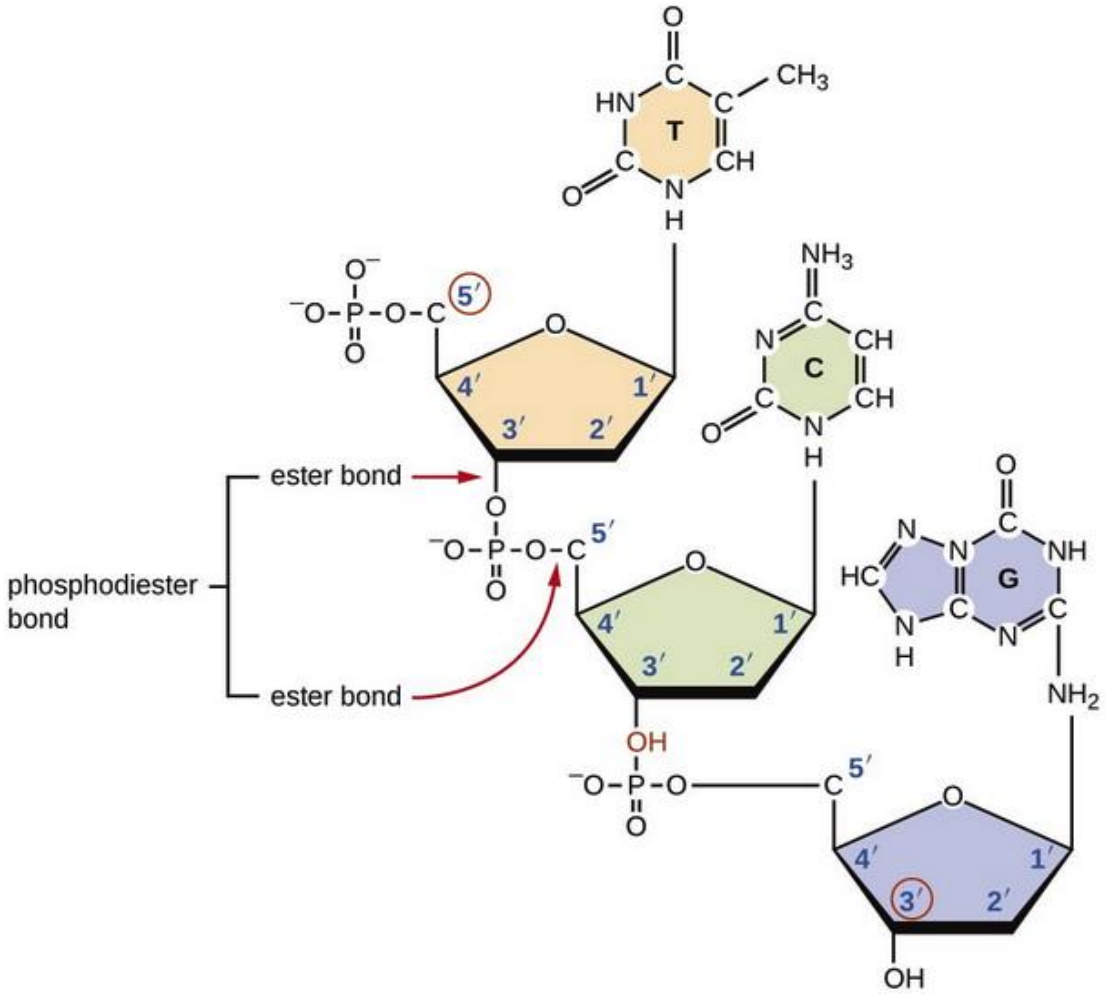
Nucleic acid

Nucleic acid:- are the polymers of nucleotides, consist of two main classes are deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). These molecules carry genetic information that directs all cellular functions.

Structure of DNA

DNA is a polymer of nucleotides units of deoxyribose sugar and nitrogenous bases included adenine (A), guanine (G) cytosine (C), and thymine (T) and mono phosphate .to compose four units of deoxyribonucleoside monophosphate: dAMP, dGMP, dCMP and dTMP. In DNA these units are joined to another by ester bonds that link 3 hydroxyl of one nucleotide to 5 phosphate of the next .



Nucleic acid

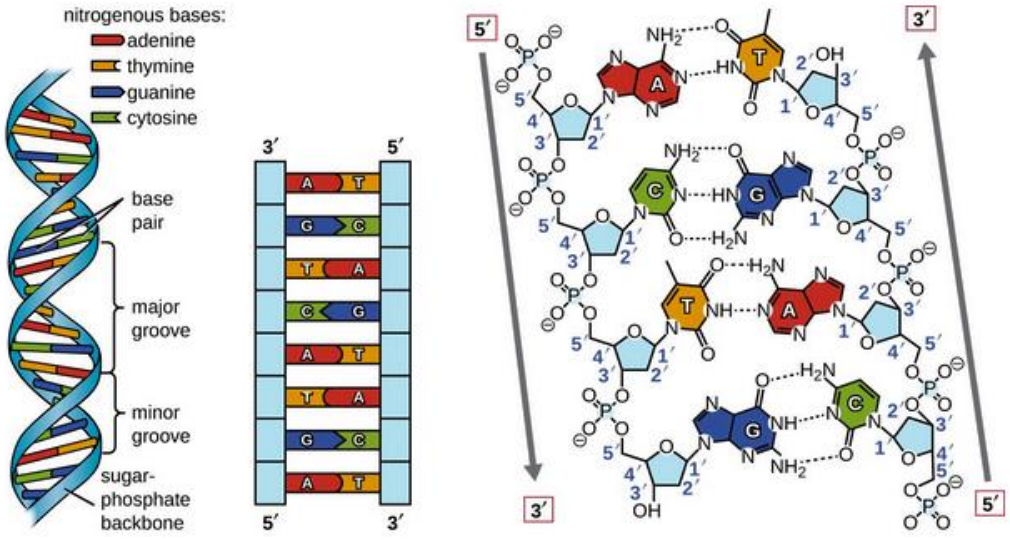
Chargaff's rules of DNA composition

In the 1940s, a biochemist named Erwin Chargaff discovered that the amounts of the nitrogenous bases (A, T, C, and G) in DNA were not found in equal quantities. Therefore, the amount of A always equaled the amount of T (linked by double hydrogen bond), and the amount of C always equaled the amount of G (linked by triple hydrogen bond).

The Watson and Crick model of DNA structure

James Watson and Francis Crick (1953) combined the physical and chemical data, and proposed a double helix model for DNA molecule. This model is widely accepted. According to this model,

1. The DNA molecule consists of two strands which are connected together by hydrogen bonds and helically twisted.
2. The two strands are antiparallel i.e., one strand runs in the 5 to 3 direction while the other in 3 to 5 direction.
3. The diameter of a double helix is 20 A°(2nm).
4. Each turn of the helix is 34 A°(3.4nm) with 10 pairs of nucleotides, and each pair placed at a distance about 3.4 A°.
5. The two strands are held together by hydrogen bonds where A-T pair has 2 hydrogen bonds while G-C pair has 3 hydrogen bonds.
6. the hydrogen bonds are formed between a purine and a pyrimidine only.
7. The genetic information resides on one of the two strands known as template strand or sense strand.



Nucleic acid

Structure of RNA

RNA is a polymer of ribonucleotides held together by 3, 5-phosphodiester.

- The different between RNA and DNA.

#	RNA	DNA
1-	Mainly seen in cytoplasm	Mostly inside nucleus
2-	Usually 100-200 bases	Million of base pairs
3-	Generally contain single strand	containing double strand
4-	Sugar is ribose	Sugar is deoxyribose
5-	Nitrogenous bases: adenine , guanine , cytosine , uracil	Nitrogenous bases: adenine , guanine , cytosine , thymine
6-	Guanine content is not equal to cytosine and adenine is not equal to uracil	Guanine content is equal to cytosine and adenine is equal to thymine
7-	Easily destroy by alkali	Alkali resistant

Types of RNA

There are three types of RNAs with their respective cellular composition

1. Messenger RNA (mRNA)
2. Transfer RNA (tRNA)
3. Ribosomal RNA (rRNA)

Messenger RNA (mRNA)

The mRNA is synthesized in the nucleus (in eukaryotes) as heterogeneous nuclear RNA (hnRNA). hnRNA, on processing, liberates the functional mRNA which enters the cytoplasm to participate in protein synthesis. mRNA has high molecular weight with a short half-life.

Nucleic acid

Transfer RNA (tRNA)

Transfer RNA (soluble RNA) molecule contains 71-80 nucleotides . There are at least 20 species of tRNAs, corresponding to 20 amino acids present in protein structure.

Ribosomal RNA (rRNA)

The ribosome's are the factories of protein synthesis the function of rRNA in ribosome's is not clearly known. lt is believed that they play a significant role in the binding of mRNA ribosome's and protein synthesis.

