Nucleic Acids

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Nucleic acids are polymers, or small biomolecules , essential to all known forms of life .

*The term *nucleic acid* is the overall name for DNA and RNA.

*Nucleic acids composed of nucleotides , which are the monomers made of three components: a 5- carbon sugar a phosphate group a nitrogenous base.

If the sugar is ribose , the polymer is RNA (ribonucleic acid); if the sugar is derived from ribose as deoxyribose the polymer is DNA (deoxyribonucleic acid).

A nucleic acid is a chain of nucleotides which stores genetic information needed by cells to create proteins. This information is stored in multiple sets of three nucleotides, known as codons

UUU UUC phenylalanine UUA UUG leucine	UCU UCC UCA UCG serine	UAU UAC tyrosine UAA UAG stop	UGU UGC cysteine UGA stop UGG tryptophan
CUU CUC CUA CUG leucine	CCU CCC CCA CCG proline	CAU CAC histidine CAA CAG glutamine	CGU CGC CGA CGG arginine
AUU AUC AUA isoleucine AUG methionine	ACU ACC ACA ACG threonine	AAU AAC asparagine AAA AAG lysine	AGU AGC serine AGA AGG arginine
GUU GUC GUA GUG valine	GCU GCC GCA GCG alanine	GAU GAC aspartic acid GAA GAG glutamic acid	GGU GGC GGA GGG glycine

Functions of nucleic acids

- DNA is the chemical basis of heredity
- Reserve bank of genetic information
- Responsible for maintaining the identity of different species of organisms over millions of years
- Cellular function is under the control of DNA
- The basic information pathway
- DNA directs the synthesis of RNA, which in turn directs protein synthesis

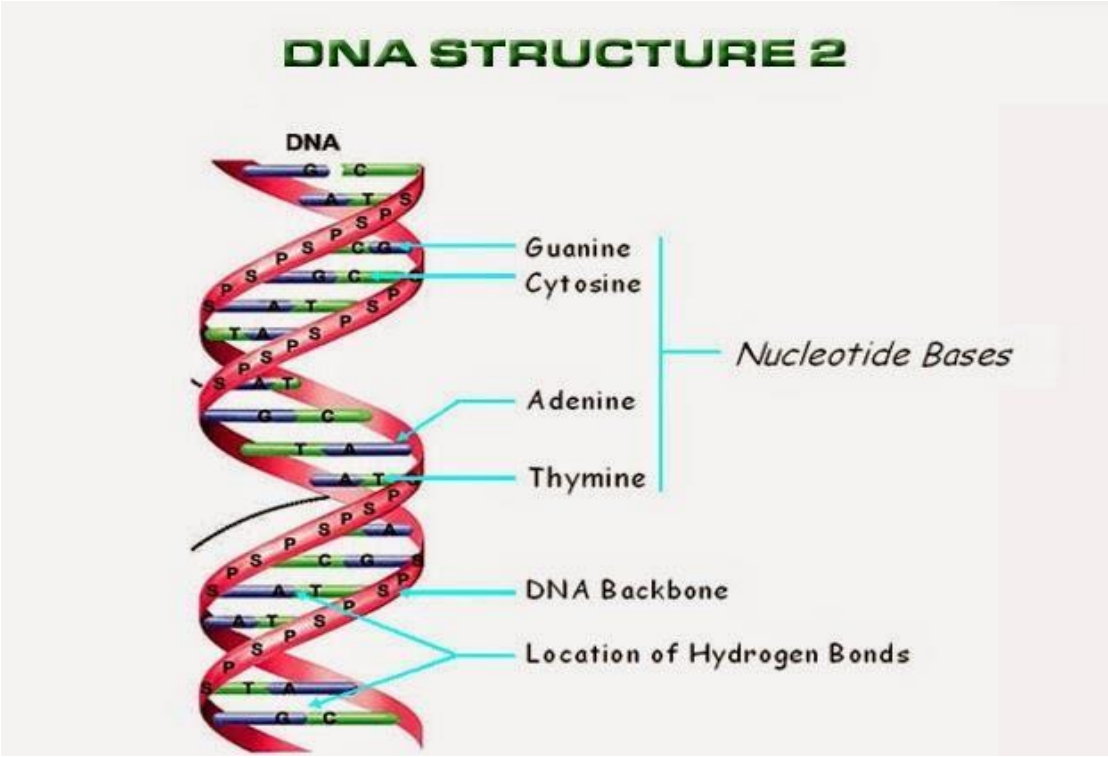
DNA

*double helix, made up of a pair of DNA strands

*The term nucleotide refers to the building blocks of both DNA (deoxyribonucleoside triphosphates, dNTPs) and RNA (ribonucleoside triphosphates, NTPs)

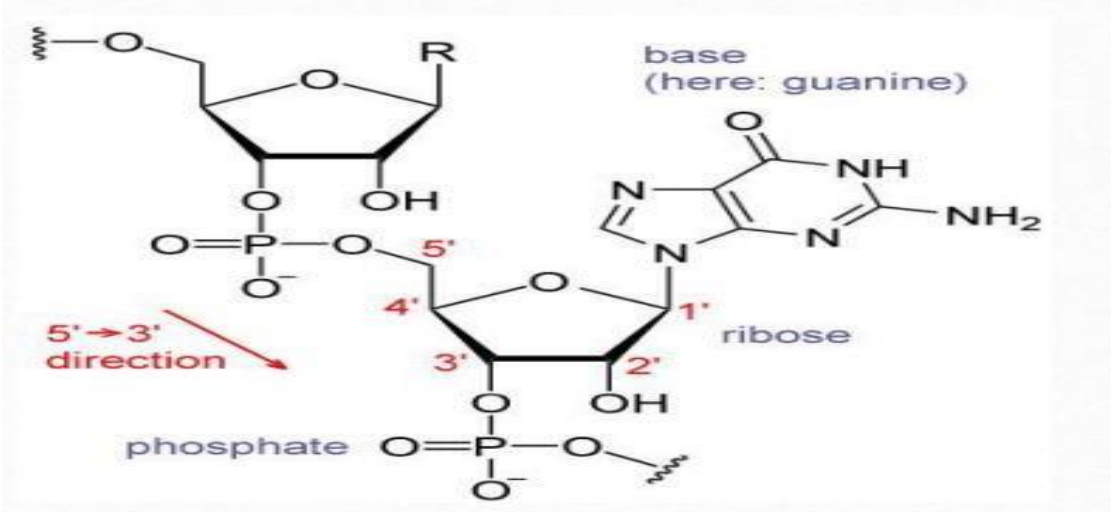
*Nucleotide contain three primary structural components. these are a nitrogenous base, a pentose sugar, and at least one phosphate group Nitrogen bases joined by hydrogen bonds to form base pairs - adenine always paired with thymine, and guanine paired with cytosine. Two hydrogen bonds are formed between adenine and thymine, but three hydrogen bonds hold together guanine and cytosine.

*Molecules that contain only a sugar and a nitrogenous base (no phosphate) are called nucleosides



RNA

- The structure of RNA is very similar to that of a single strand of DNA.
- **RNA** consists of ribose nucleotides (nitrogenous bases appended to a ribose sugar)attached by phosphodiester bonds, forming strands of varying lengths .
- The nitrogenous bases in **RNA** are adenine, guanine, cytosine, and uracil, which replaces thymine in DNA.



Types of RNA

- 1- **mRNA**, or messenger **RNA**, that serve as temporary copies of the information found in DNA-
- 2- **rRNA**, or ribosomal **RNA**, that serve as structural components of protein-making structures known as ribosomes
- 3- **tRNA**, or transfer **RNA**, that ferry amino acids to the ribosome to be assembled

Difference between DNA and RNA are:

DNA	RNA
It is double stranded nucleic acid.	It is single stranded nucleic acid.
It contains deoxyribise sugar.	It contains ribose sugar.
It contains Thymine (T) as a nitrogenous base.	It contains Uracil (U) instead of Thymine.
It is the genetic and hereditary material of the cells.	It is involved in synthesis of proteins.
It is present in the nucleus of the cells.	It is present in both nucleus and cytoplasm.