SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19GET277-BIOLOGY FOR ENGINEERS

IV B.E. ECE / VII SEMESTER

UNIT 3 – GENETICS AND IMMUNE SYSTEM

TOPIC –NUCLEIC ACIDS

Nucleic Acid as a Genetic Material

NUCLEIC ACID:

Nucleic acids, deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), carry genetic information which is ready in cells to make the RNA and proteins by which living things function. The well-known structure of the DNA double helix allows this information to be copied and passed on to the next generation.

Nucleic acids are large biomolecules that store and transmit genetic information, making them the genetic material of all living things:

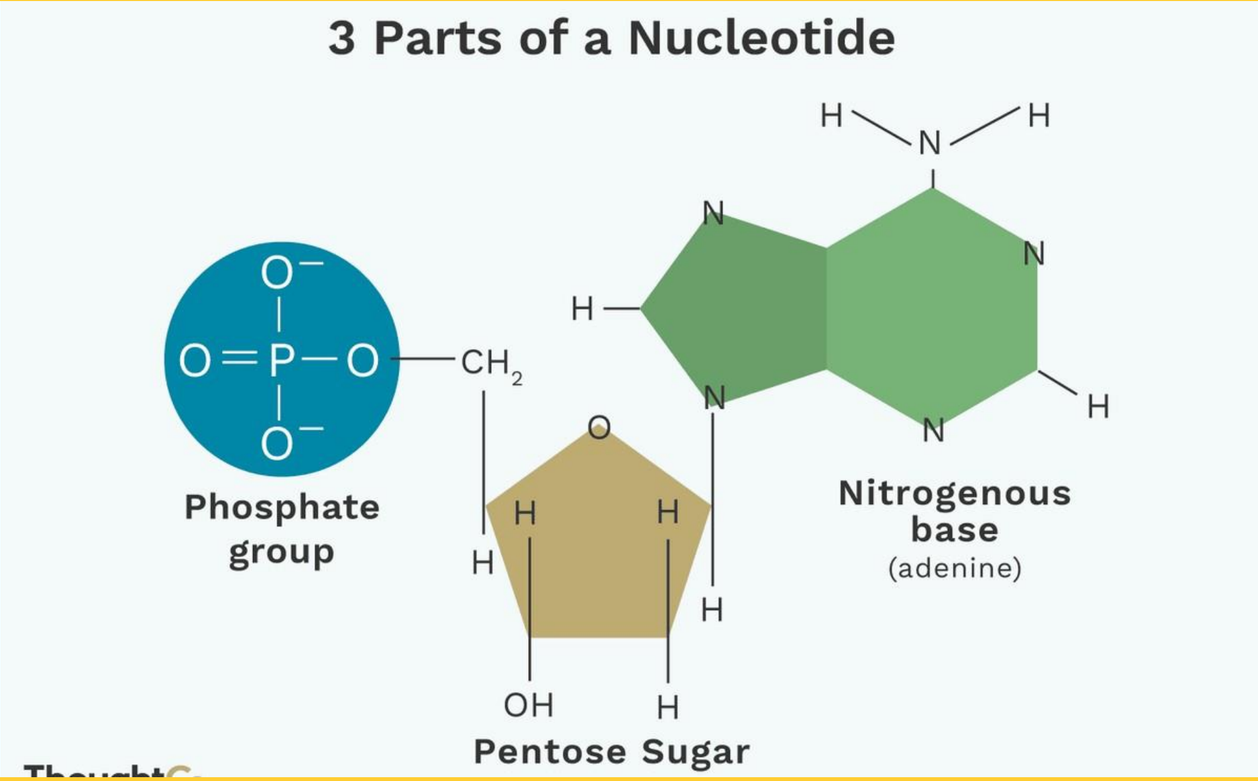
Structure

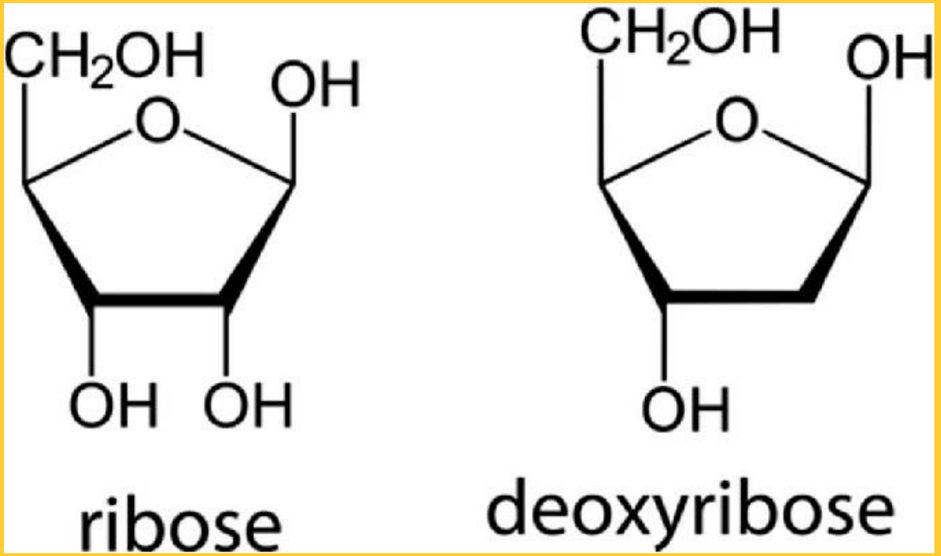
- **Nucleic acids are made up of nucleotides, which are made of a five-carbon sugar, a phosphate group, and a nitrogenous base. The two main types of nucleic acids are deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). DNA contains deoxyribose, a variant of ribose, while RNA contains ribose.**

Function

- **Nucleic acids store and express genetic information, and regulate protein synthesis. DNA encodes the information cells need to make proteins.**

NUCLEOTIDE


3 Parts of a Nucleotide
Phosphate group
Nitrogenous base
(adenine)
Pentose Sugar


ribose
deoxyribose

NUCLEIC ACID:

Location

- **In eukaryotes, DNA is found in the nucleus and other organelles like mitochondria and chloroplasts. In prokaryotes, DNA is located in the nucleoid, a specialized cell region.**

Replication

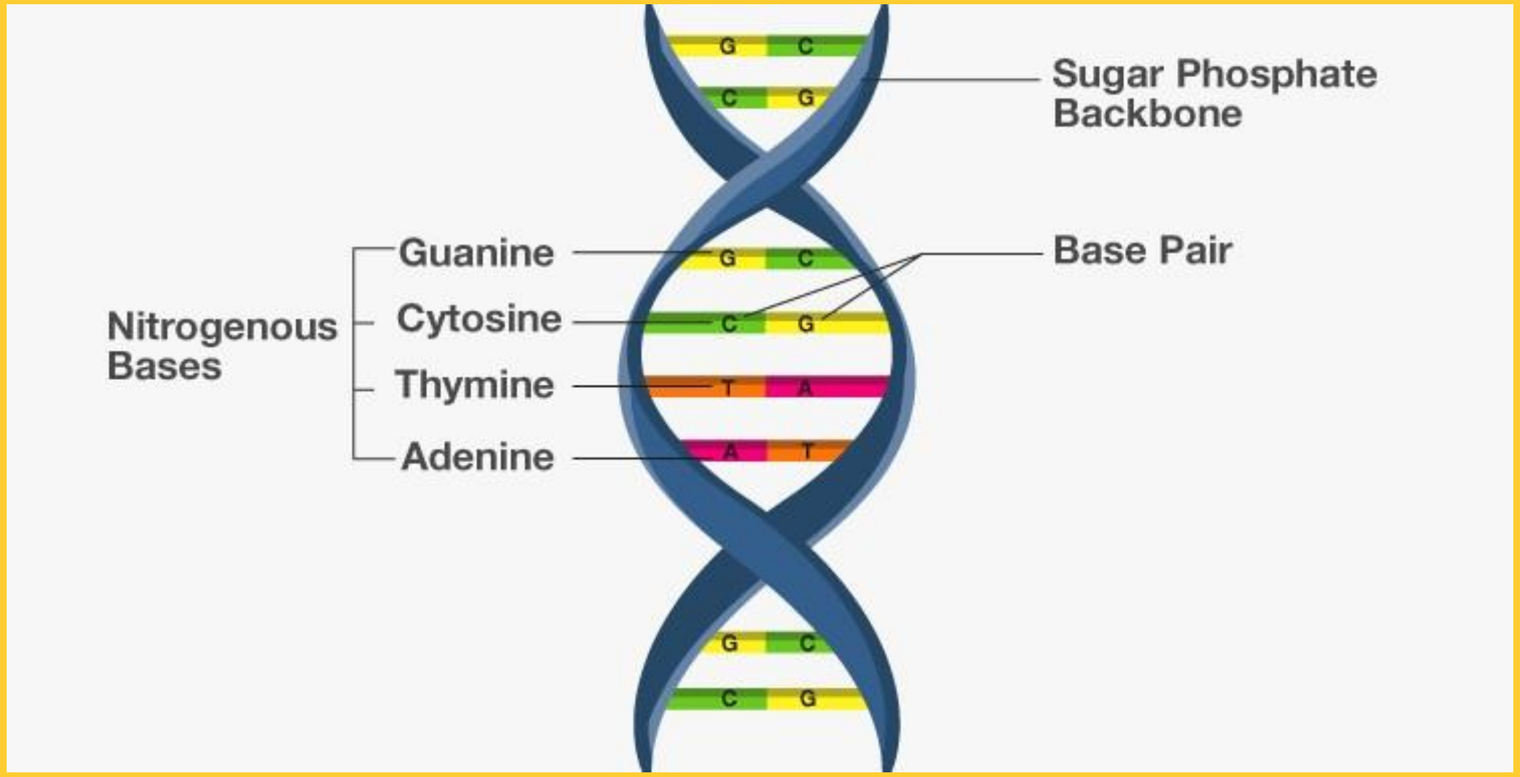
- **DNA's double helix structure allows it to copy and pass on its information to the next generation.**

Bases

- **DNA contains adenine (A), guanine (G), thymine (T), and cytosine (C) bases. RNA contains adenine, guanine, cytosine, and uracil (U) bases.**

DEOXYRIBOSE NUCLEIC ACID (DNA)

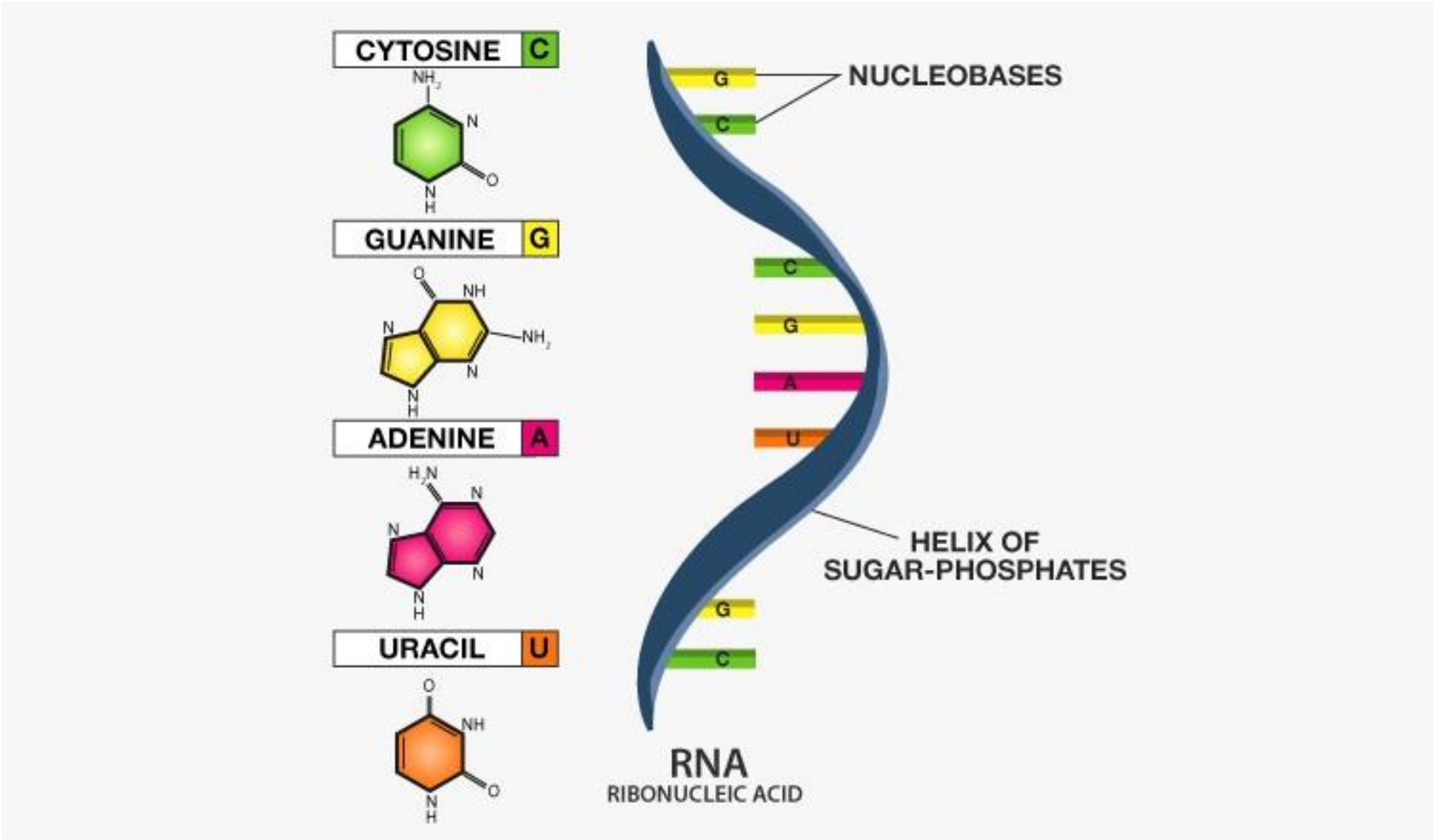
- **Genes carry genetic information from one generation to the other. The structure of nucleic acids such as DNA consists of a long polymer of nucleotides connected by phosphodiester bonds. In the case of DNA, the nucleotides are deoxynucleotides. The most widely accepted structure of DNA (right-handed double- helix) was proposed by Watson and Crick in 1963.**
- **The nitrogenous bases present in DNA are Adenine, Guanine, Thymine, and Cytosine. This suggests that there are four different types of deoxyribonucleotides in DNA- deoxyadenosine monophosphate (dAMP), deoxyguanosine monophosphate (dGMP), deoxythymidine monophosphate (dTMP) and deoxycytidine monophosphate (dCTP). The two strands of the DNA helix are antiparallel to each other exhibiting complementary pairing between two specific bases.**



Adenine pairs with thymine (A=T), while guanine pairs with cytosine (G≡C). If we imagine the structure of DNA in the form of a staircase model, the complementary base pairs will form the stairs and the sugar-phosphate backbone will form the stair railings.

RIBONUCLEIC ACID (RNA

- **Ribonucleic acid is an example of the nucleic acid formed by the polymerization of ribonucleotides. It is a single-stranded chain formed by 7-12000 ribonucleotides. This structure of nucleic acid contains a ribose sugar, a phosphate group, and a nitrogen base. The nitrogenous bases in RNA are Adenine, Guanine, Cytosine, and Uracil (U). RNA is formed from DNA by the process of 'transcription' and is generally involved in protein synthesis.**
- **Types of RNA include – Ribosomal RNA (rRNA), Transfer RNA (tRNA) and Messenger RNA (mRNA).**


CYTOSINE C
GUANINE G
ADENINE A
URACIL U
NUCLEOBASES
HELIX OF
SUGAR-PHOSPHATES
RNA
RIBONUCLEIC ACID

FUNCTIONS OF NUCLEIC ACIDS

- **DNA is the genetic material carrying hereditary information.**
- **By the process of transcription, it gives rise to RNA, which in turn contains the code for the synthesis of proteins.**
- **DNA controls cell metabolism along with differentiation and development of an organism.**
- **Mutations in DNA help organisms evolve and adapt to changing conditions.**
- **RNA forms the genetic code in certain viruses such as HIV.**


Thankyou