4. Nucleotides

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Is an organic molecule that is the building block of nucleic acids DNA &RNA

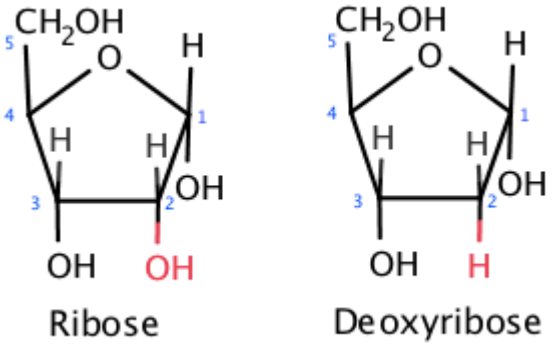
A **nucleotide** is made up of three parts

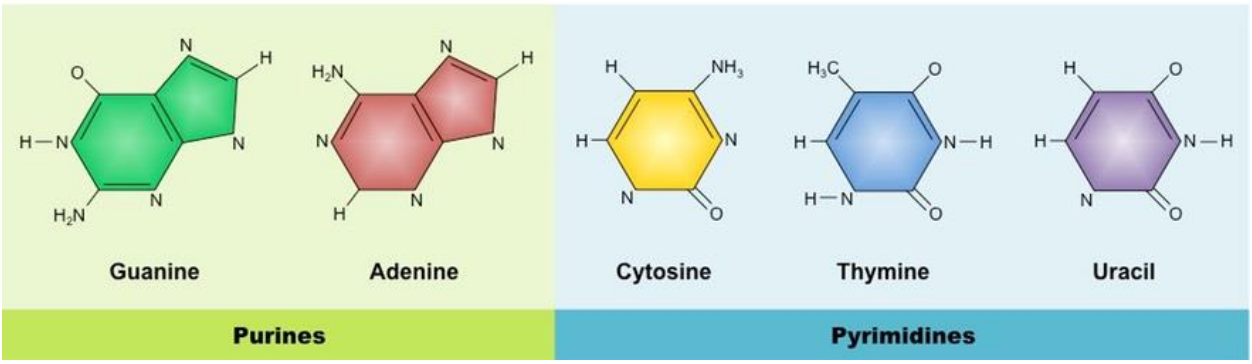
1. Nitrogenous base: the four nitrogenous bases in DNA are adenine, cytosine, guanine, and thymine.

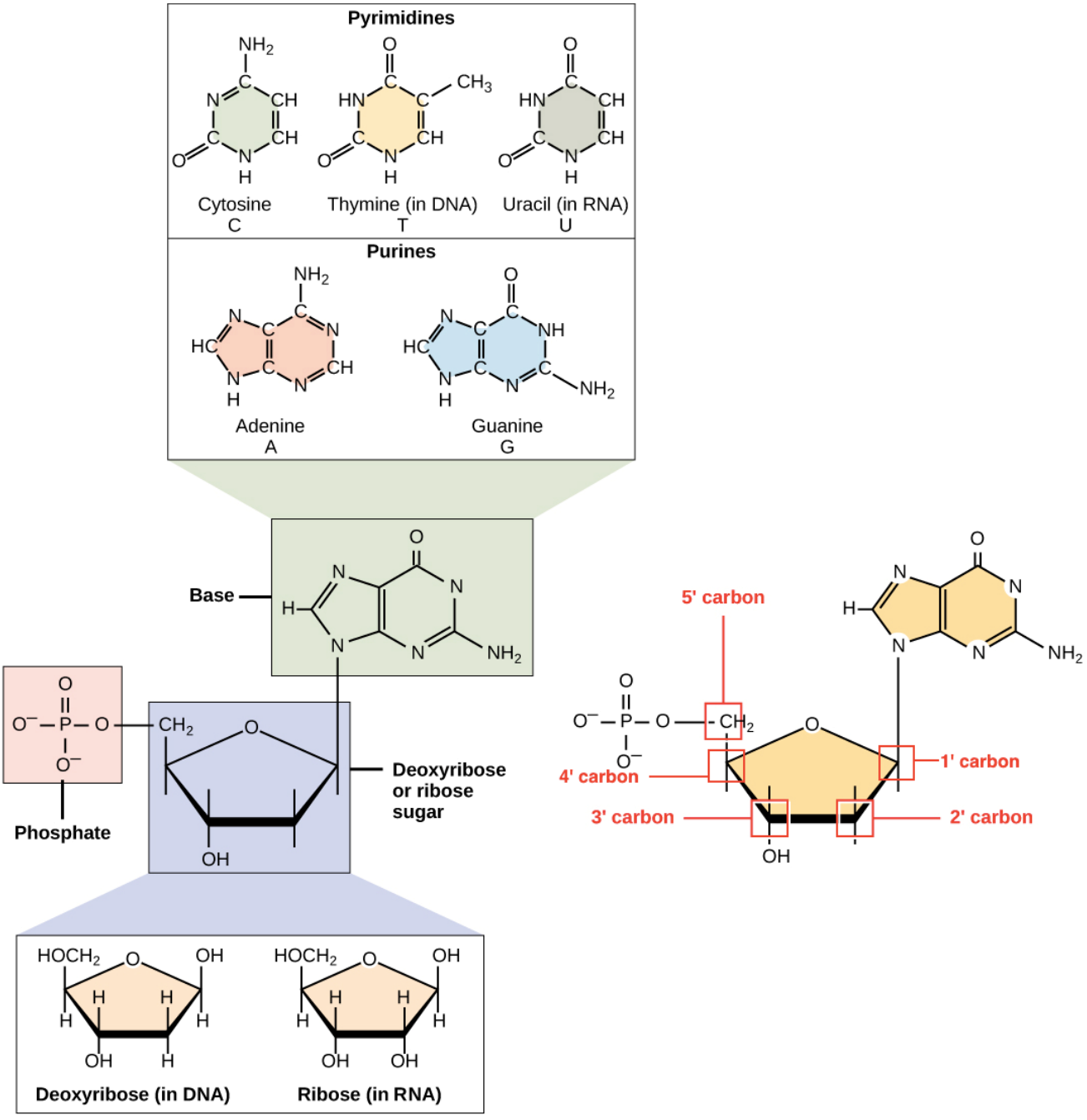
3. One or more phosphate groups

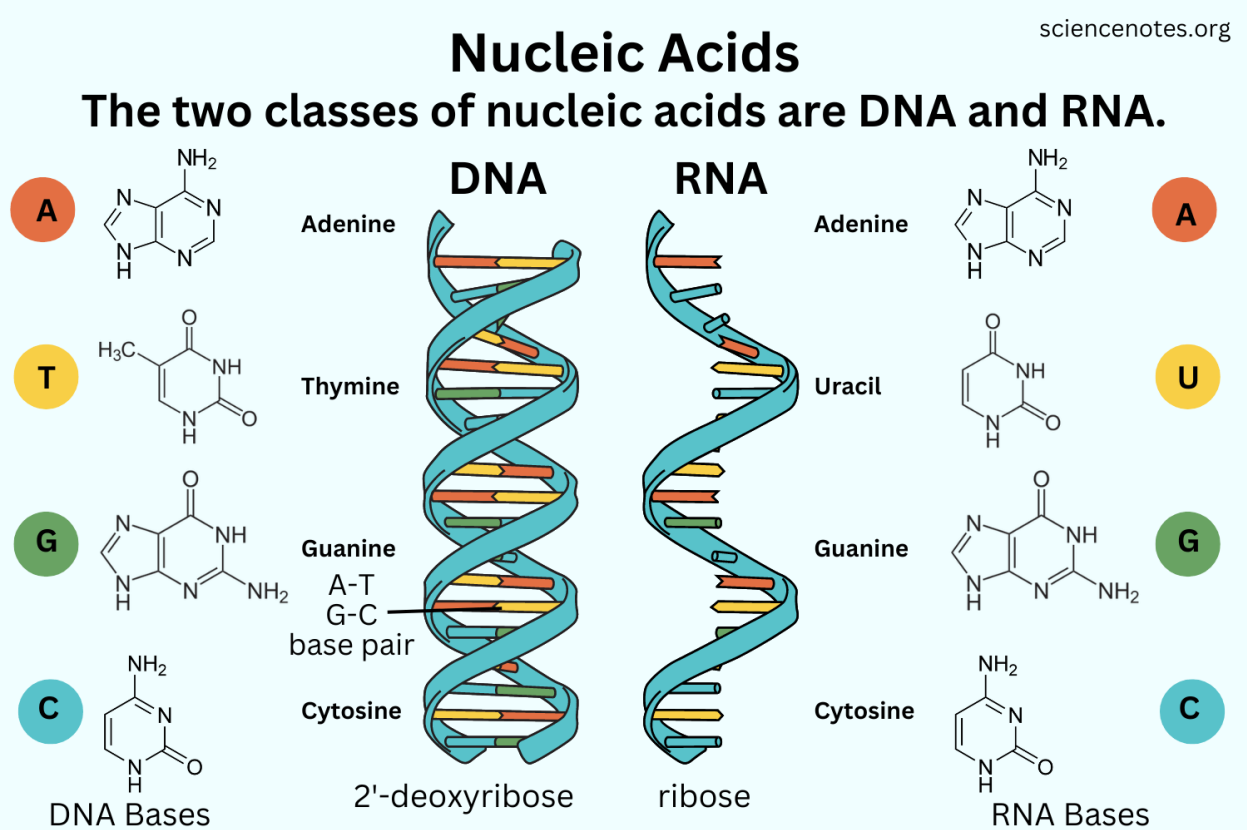
2. Pentose sugar

RNA contains uracil, instead of thymine. The pentose sugar in DNA (2′deoxyribose) differs from the sugar in RNA (ribose).






Pyrimidines
Cytosine
C
Thymine (in DNA)
T
Uracil (in RNA)
U
Purines
Adenine
A
Guanine
G
Base
Phosphate
Deoxyribose
or ribose
sugar
5' carbon
4' carbon
1' carbon
3' carbon
2' carbon
Deoxyribose (in DNA)
Ribose (in RNA)



Functions of nucleotides

1-They are the building block of (DNA) and (RNA).

2- Play a central role in metabolism .

3- They provide chemical energy in the form of adenosine triphosphate (ATP) .

4- Are participate in cell signaling (cyclic guanosine monophosphate or cGMP and cyclic adenosine monophosphate or cAMP).

5- Are incorporated into important cofactors of enzymatic reactions e.g. coenzyme A

Nucleic acids

DNA and RNA are long chains of repeated nucleotides

DNA (deoxyribonucleic acid)

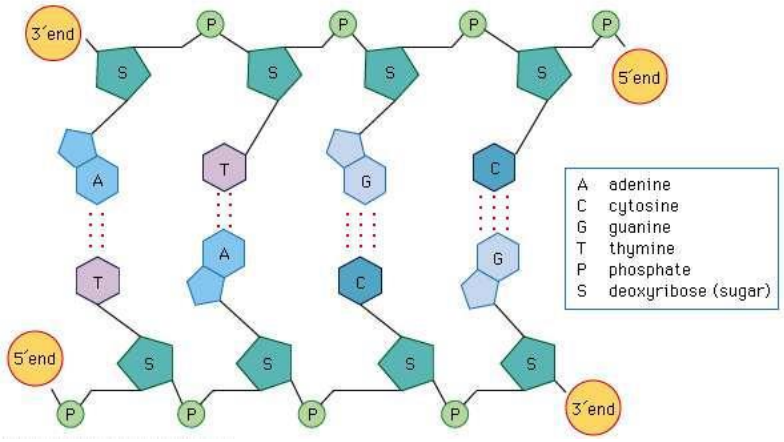
DNA is double-stranded, with the two strands twisted about each other in the form of a double helix. In DNA the two strands are held together by hydrogen bonds between the bases. When coiled, DNA resembles a **spiral staircase**. The uprights (sides) of the ladder are made entirely of **phosphate and sugar molecules**, and the rungs of the ladder exhibit complementary base pairing.

Thymine (T) always pairs with adenine (A),
and guanine (G) always pairs with cytosine (C).

DNA nitrogen-containing bases (A, T,G and C)

A always pairs with T through two hydrogen bonds, and G always pairs

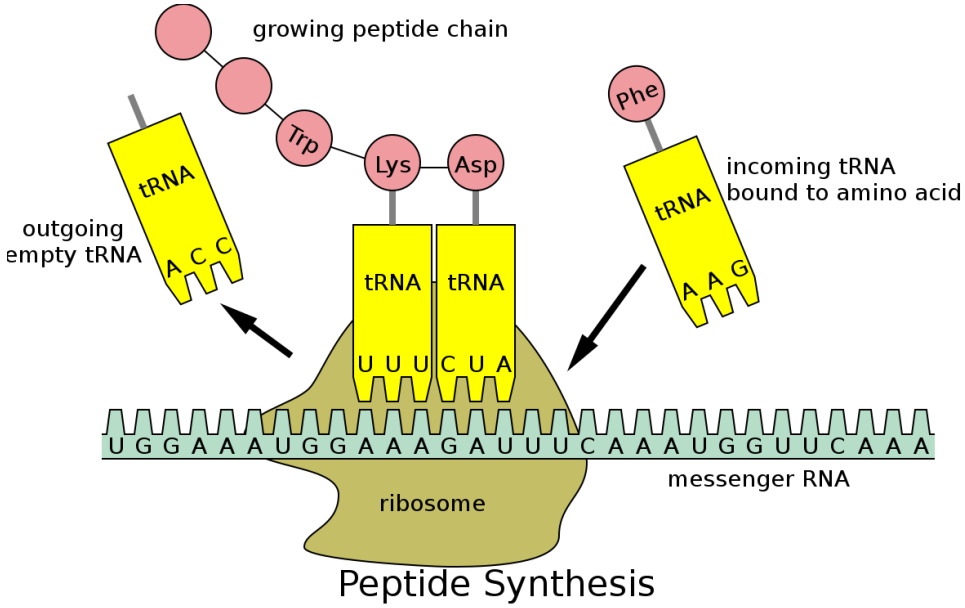
with C through three hydrogen bonds



RNA (Ribonucleic acid)

RNA is single-stranded. When RNA forms complementary base pairing with one DNA strand passes the correct sequence of bases to RNA.
RNA is the nucleic acid directly involved in protein synthesis. RNA is a diverse type of nucleic acid that has multiple uses, RNA main types contains:

1-Messenger RNA (mRNA) is a temporary copy of a gene in the DNA that specifies what the amino acid sequence will be during the process of protein synthesis.
2-Transfer RNA (tRNA) is also necessary in synthesizing proteins and helps translate the sequence of nucleic acids in a gene into the correct sequence of amino acid during protein synthesis.
3-Ribosomal RNA (rRNA) is the RNA component of the ribosome, it works as an enzyme to form the peptide bonds between amino acids in a polypeptide.



Peptide Synthesis

Differences in the Structures of DNA and RNA

There are some small differences in the types of subunits each contains and in their final structure. These differences give DNA and RNA their unique functions in the body.

Features	**DNA**	**RNA**	
Sugar	Deoxyribose	Ribose	
Bases	Adenine, guanine, thymine, cytosine	Adenine, guanine, uracil, cytosine	
Strands	Double-stranded with base pairing	Single-stranded	
Helix	Yes	No	