DNA Structure:

1. **Deoxyribonucleic acid (DNA)**
2. **Nucleotide subunits**
3. **Nitrogenous bases (adenine, guanine, cytosine, thymine)**
4. **Sugar–phosphate backbone**
5. **Complementary strands**
6. **Double helix structure**

RNA Structure:

1. **Comparison with DNA structure**
2. **Differences in RNA structure (e.g., ribose sugar, uracil instead of thymine)**

Complementary Base Pairing:

1. **Understanding base pairing rules (A-T, C-G in DNA; A-U, C-G in RNA)**
2. **Significance in replication and transcription**

Nucleic acids

Are polymers made from smelled monomers called **nucleotides**

They consist of 5 elements -> C – H – O – N – P

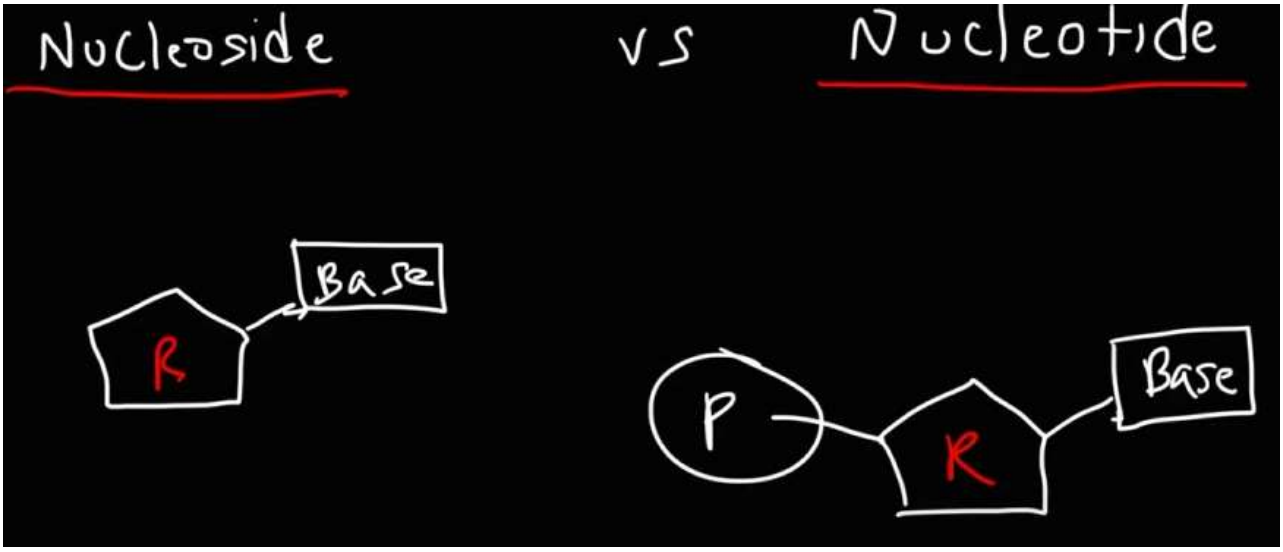
They are made when nucleotides form covalent bonds between each other and create a polynucleotide.

Polynucleotide is the building block for **DNA** and **RNA**

Nucleotide

Is the building block of a nucleic acid

But there is another thing that exists called **nucleoside**, which is a nucleotide with no phosphate

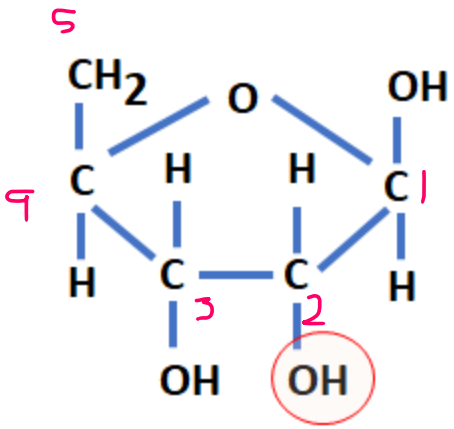


A nucleotide consists of 3 main parts

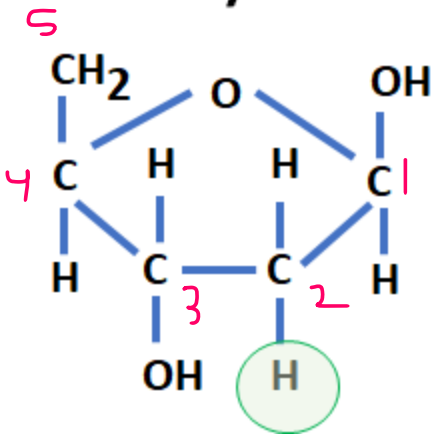
pentose sugar (ribose)

it has 5 carbons that go from 1:5 clockwise

Ribose

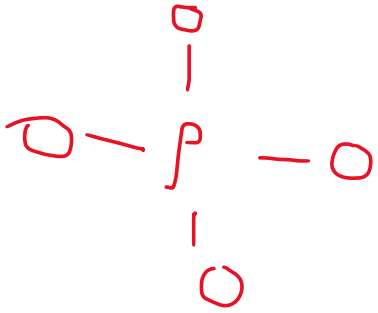


Deoxyribose



Phosphate group

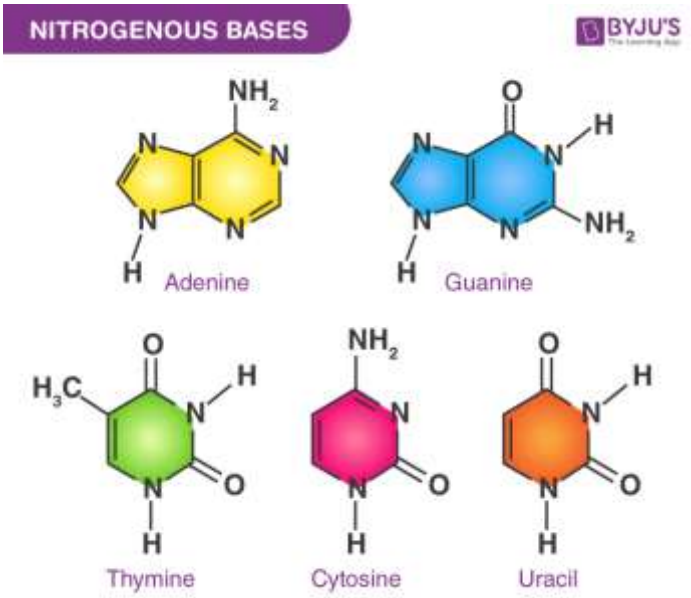
It's an inorganic compound that is negatively charged, it forms a covalent bond with carbon 5



Nitrogenous bases

Are also called nucleobases, they form the building blocks of DNA & RNA.

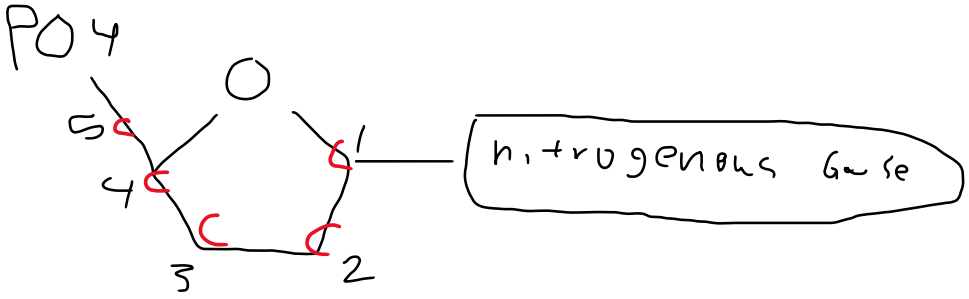
There is a total of 5 nitrogenous bases, they connect with carbon no.1 in the **pentose sugar**



purines	pyrimidines
nitrogenous bases that contain 2 rings	Nitrogenous bases that have 1 ring
Adenine - Guanine	Thymine – Uracil - Cytosine

The difference between Uracil & Thymine Is that **Thymine has a methyl group**

A normal looking nucleotide



You can differentiate between nucleic acids based on two things

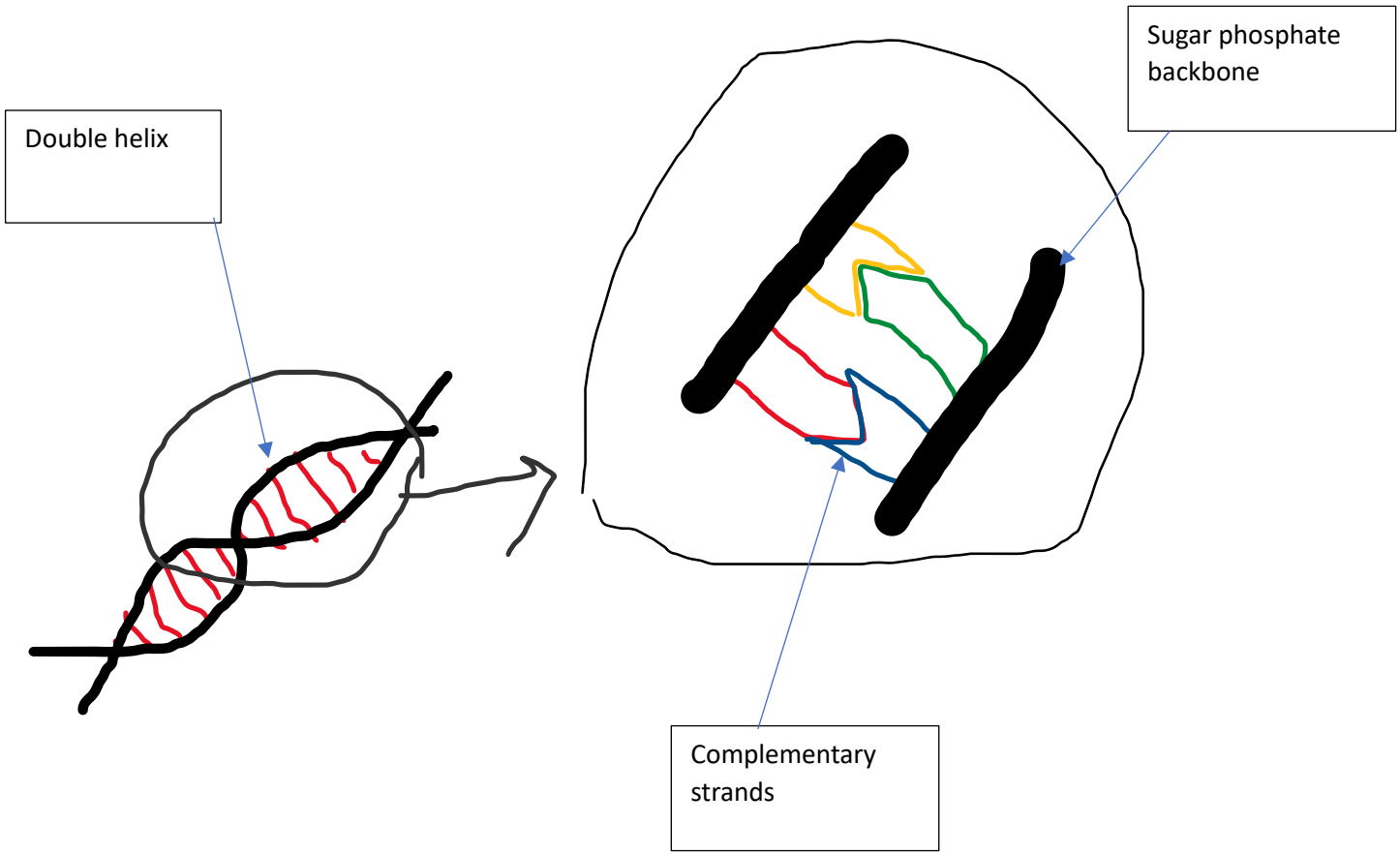
- The type of the **pentose** sugar
- The type of the **nitrogenous base**

Nucleic acids can be classified into 2 things

	DNA (**d**eoxyribo**n**ucleic **a**cid)	RNA (**ribonucleic a**cid)
Sugar type	Deoxyribose (C5H10O4)	Ribose (C5H10O5)
Nitrogenous base	Cytosine (C) – Guanine (G) – Adenine (A) – Thymine (T)	Cytosine (C) – Guanine (G) – Adenine (A) – Uracil (U)
Number of nucleotide strands	Two strands of nucleotides **(double-helix)**	Single strand of nucleotides
Where it exists	Inside the cell as it makes up the chromosomes	It gets made by transcripting DNA and get sent into the cytoplasm
importance	It contains the genetic information of a creature, plays a role in cell division, aka it contains the **blueprints** of a living organism	It's used to make protein which is the thing that • Shows the genetic features • Organize the biological tasks Basically, it's the **doer** of the **blueprint**

DNA

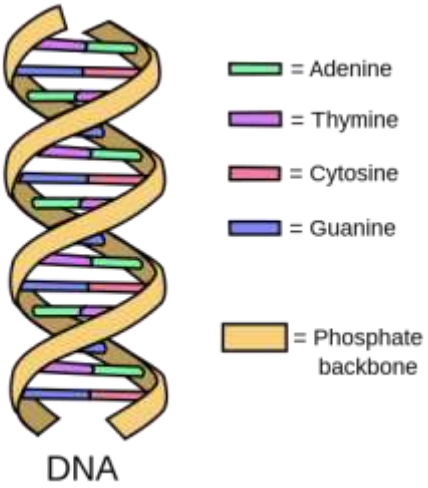
Often called deoxyribonucleic acid, it's two strands of nucleotides in a spiral shape often called **double-helix**



Double helix

It refers to the spiral structure of the DNA, the spiraling helps for efficient packaging of the genetic information while being stable

In each helix, the DNA strands repeat in the pattern ATCG in DNA or AUCG in RNA



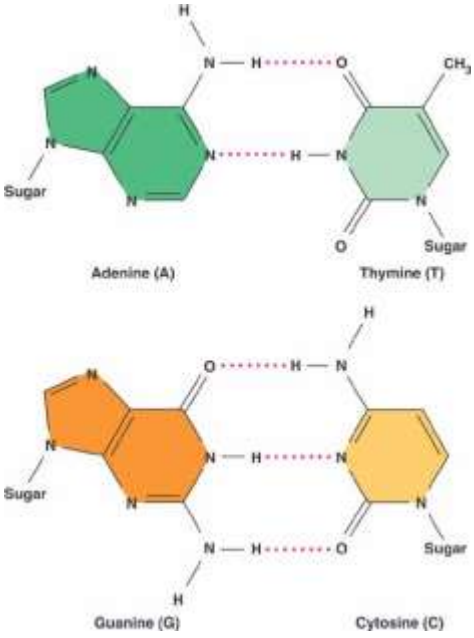
DNA

Complementary strands

It means that nitrogenous bases do not bond with anything

To make the double helix in the DNA, specific nitrogenous bases must form **hydrogenous bonds** with other specific nitrogenous bases, they need to **complement** each other
in our case
it is **A = T** or **U = T**

And **G ≡ C**

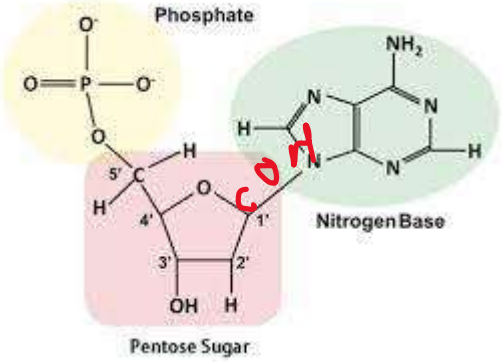


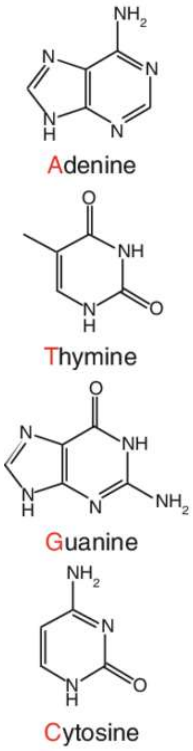
Sugar-phosphate backbone

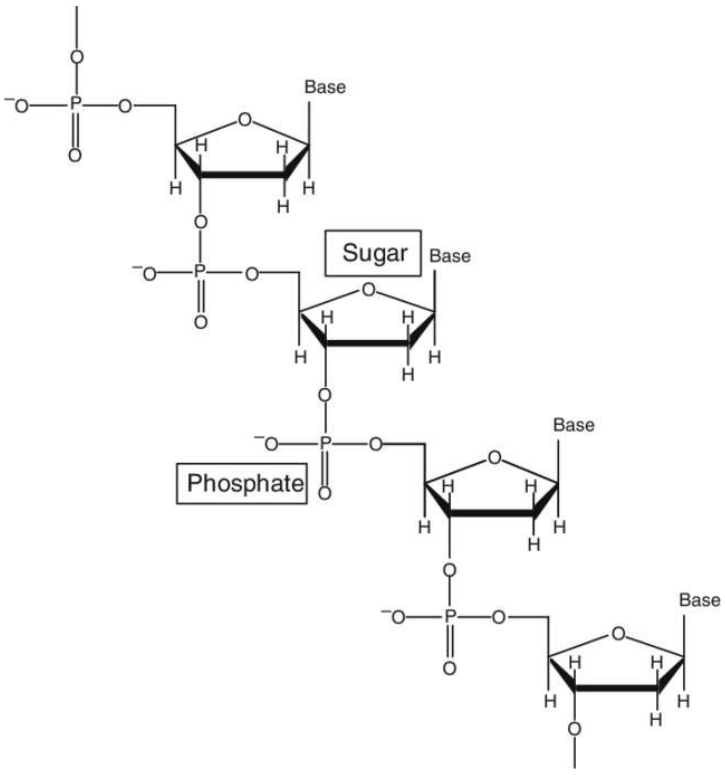
It refers to the **pentose** and **phosphate molecules connecting the DNA together**

The oxygen In the phosphate connects both the hydrogen of carbon 5 and the hydrogen of carbon 3

The pentose connects to the nitrogenous base by the hydrogen of the **OH** connected to carbon 1



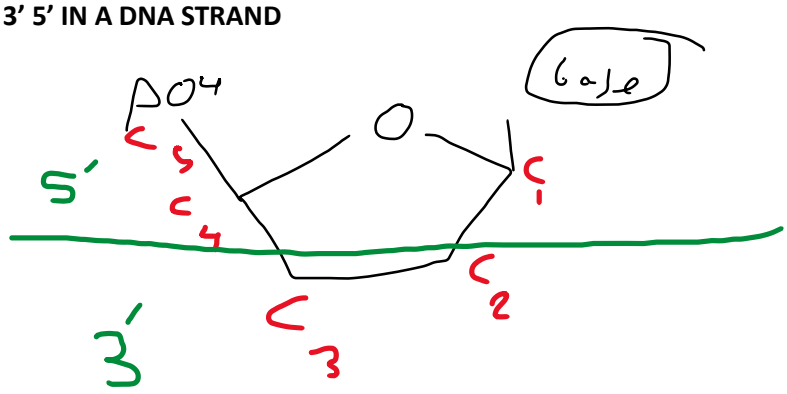




THE DEFINITION OF 3’ 5’ IN A DNA STRAND

3’ -> the strand ends with carbon 3

5’ -> the strand ends with carbon 5



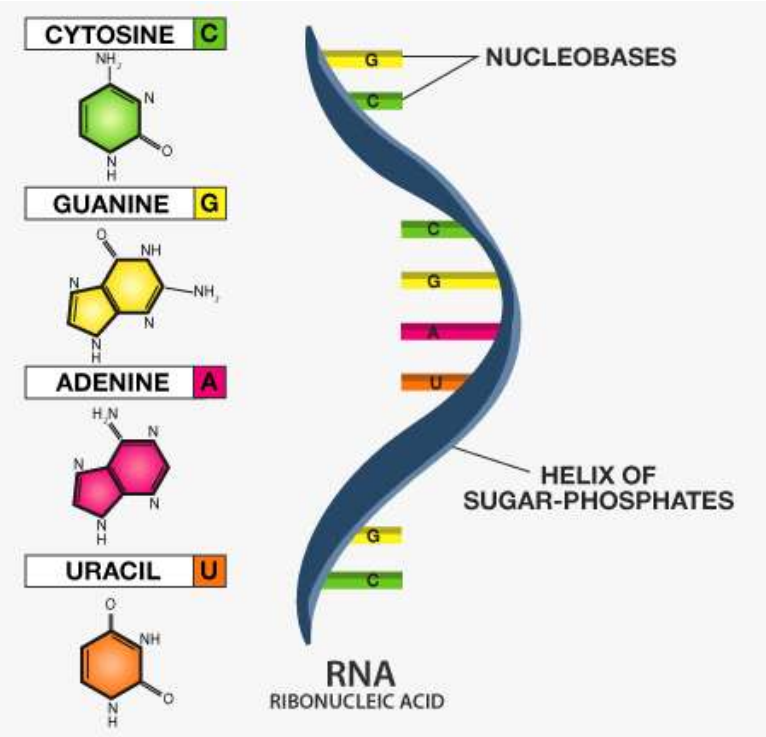
HOW TO LOCATE?

RNA

Often called **ribonucleic acid**, it’s a single strand of nucleotides

It has **uracil** instead of **Thymine**

it goes in a spiral shape and but just a single **helix**, because it makes it more flexible and able to be fold into variety of complex shapes and perform a wide range of functions within the cell



TRANSCRIPTION

It’s the process of copying a gene’s DNA sequence into RNA strand

TRANSLATION

It’s the process of turning the RNA strand into protein