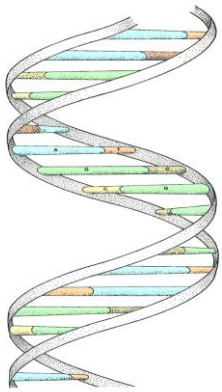
Al- Mustaqbal University College

First stage.
Department of Optometry(Optics)

جامعة المستقبل الاهلي
مرحلة الاولى
قسم التقنيات البصرية

DNA



Lecture : 3

Dr: Zainab waddah naser

DNA stands for **deoxyribose nucleic acid**

This chemical substance is present in the nucleus of all cells in all living organisms

DNA controls all the chemical changes which take place in cells

The kind of cell which is formed, (muscle, blood, nerve etc) is controlled by DNA

The kind of organism which is produced (plants, animals,human etc) is controlled by DNA

DNA molecule

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DNA is a very large molecule made up of a long chain of sub-units

The sub-units are called **nucleotides**

Each nucleotide is made up of

a sugar called **deoxyribose**

a phosphate group **-PO_4** and

an **organic base**

Ribose & deoxyribose

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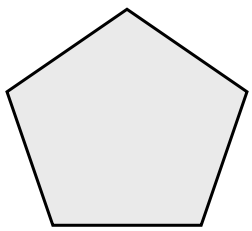
Ribose is a sugar, like glucose, but with only five carbon atoms in its molecule

Deoxyribose is almost the same but lacks one oxygen atom

Both molecules may be represented by the symbol



The bases

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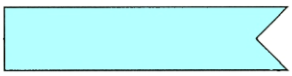
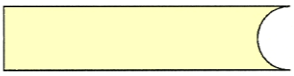
The most common organic bases are

Adenine  (A)

Thymine  (T)

Cytosine  (C)

Guanine  (G)

Nucleotides

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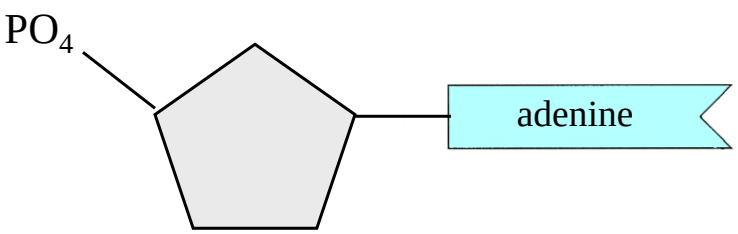
The deoxyribose, the phosphate and one of the bases

Combine to form a nucleotide



deoxyribose

Joined nucleotides

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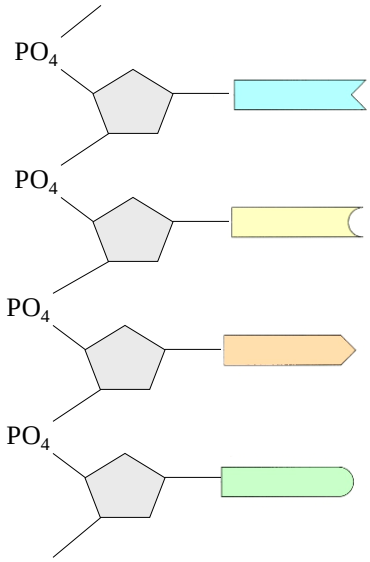

sugar-phosphate backbone + bases

A molecule of DNA is formed by millions of nucleotides joined together in a long chain

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In fact, the DNA usually consists of a double strand of nucleotides

The sugar-phosphate chains are on the outside and the strands are held together by chemical bonds between the bases

2-stranded DNA

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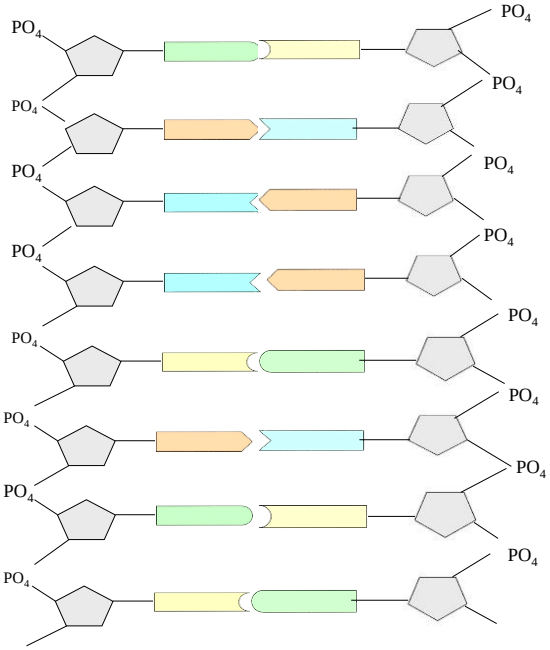

Bonding 1

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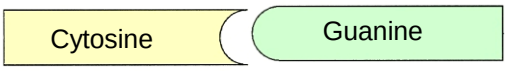
The bases always pair up in the same way

Adenine forms a bond with Thymine

and Cytosine bonds with Guanine



Bonding 2

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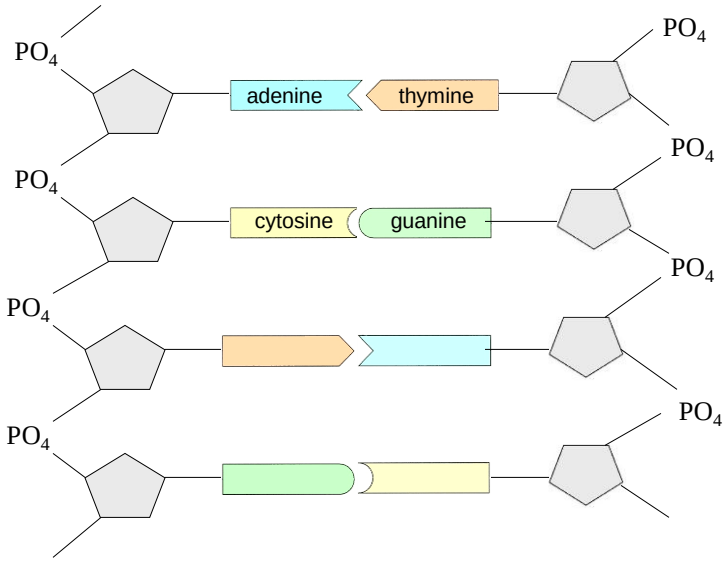

Pairing up

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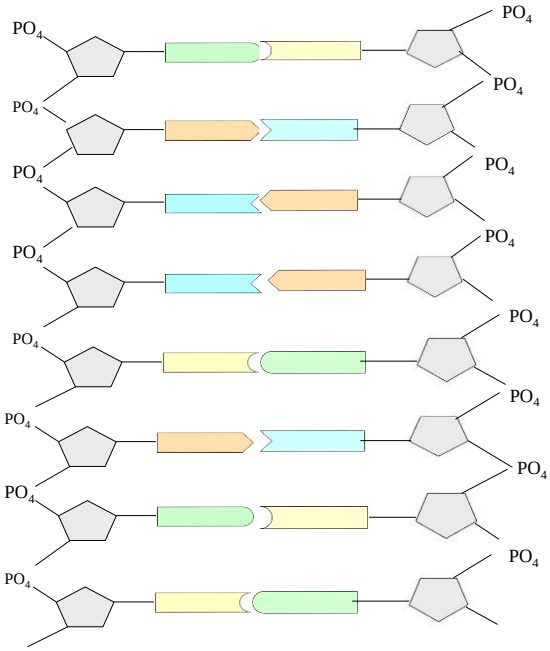

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The paired strands are coiled into a spiral called

A DOUBLE HELIX

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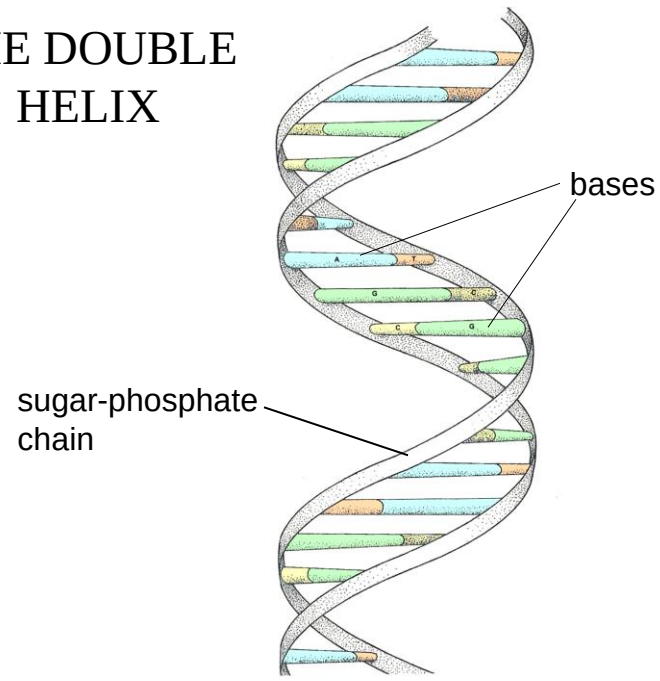
THE DOUBLE HELIX



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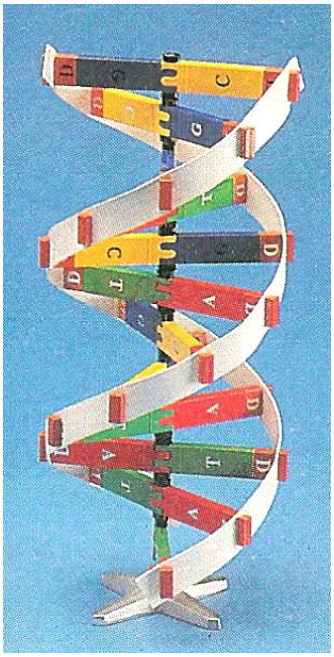
A DIY model of part of a DNA molecule



replication

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Before a cell divides, the DNA strands unwind and separate

Each strand makes a new partner by adding the appropriate nucleotides

The result is that there are now two double-stranded DNA molecules in the nucleus

So that when the cell divides, each nucleus contains identical DNA

This process is called **replication**

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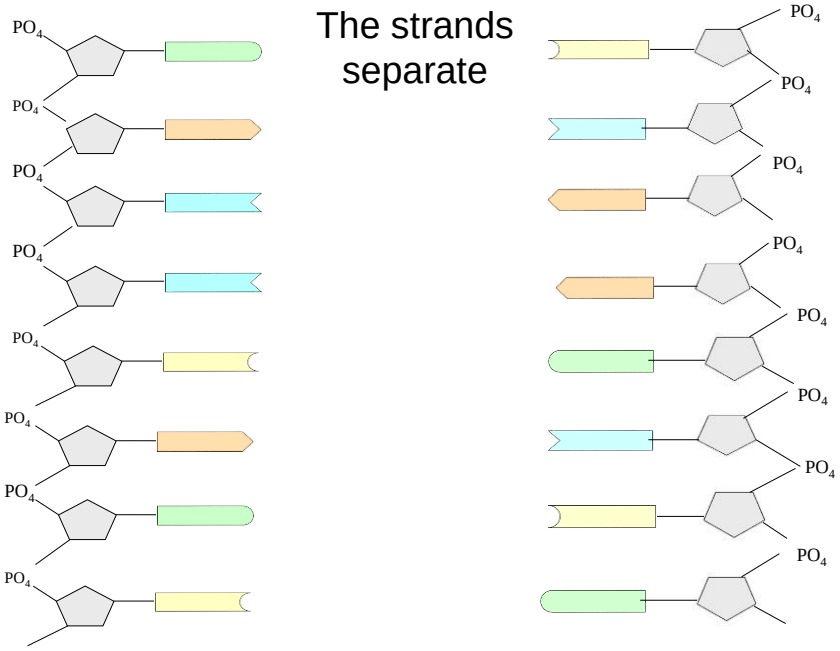
The strands separate



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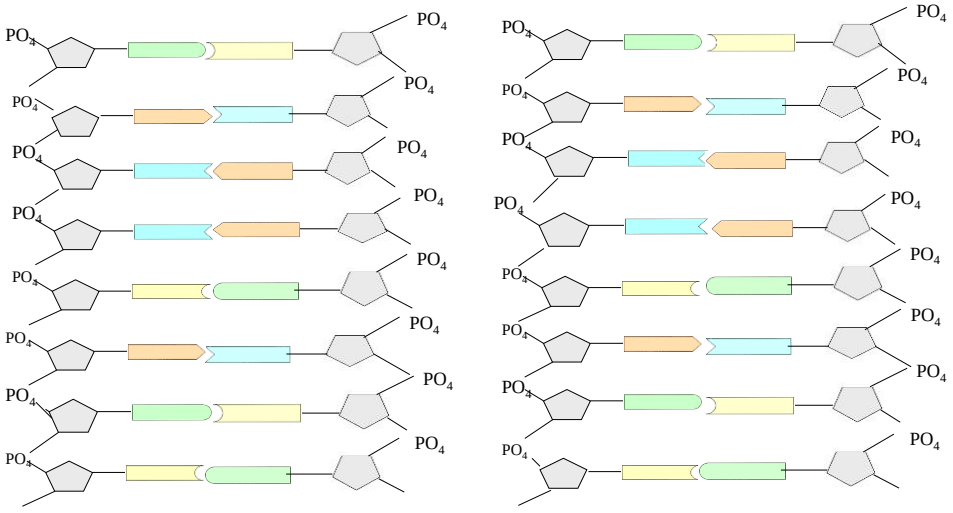
Each strand builds up its partner by adding the appropriate nucleotides



Genetic code 1

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The sequence of bases in DNA forms the **Genetic Code**

A group of three bases (**a triplet**) controls the production of a particular amino acid in the cytoplasm of the cell

The different amino acids and the order in which they are joined up determines the sort of protein being produced

Genetic code 2

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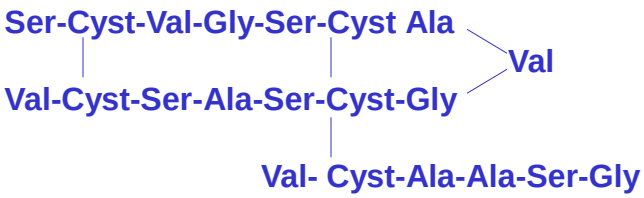
This is a small, imaginary protein molecule showing how a sequence of 5 different amino acids could determine the shape and identity of the molecule



Each amino acid (Serine, Cysteine, Valine, Glycine and Alanine) is coded for by a particular triplet of bases

Coding

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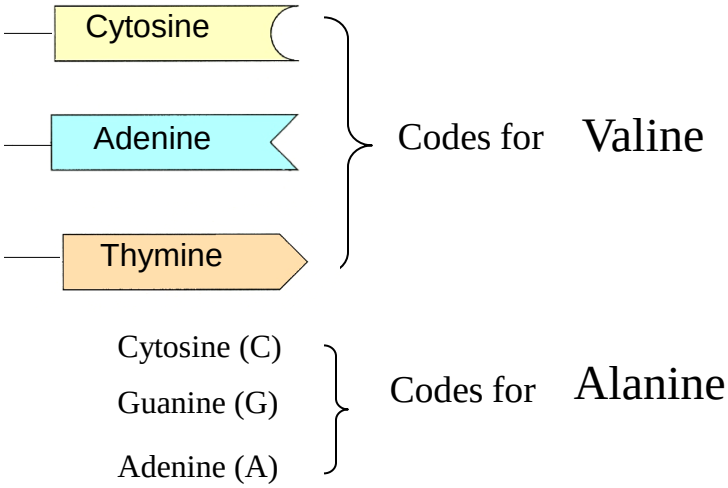
For example



Triplet code

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This is known as the **triplet code**

Each triplet codes for a specific amino acid

CGA - CAA - CCA - CCA - GCT - GGG - GAG - CCA -

Ala Val Gly Gly Arg Pro Leu Gly

The amino acids are joined together in the correct sequence to make part of a protein

—**Ala**—**Val**— **Gly**— **Gly**—**Arg**— **Pro**— **Leu**—**Gly**—

DNA and enzymes

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The proteins build the cell structures

They also make enzymes

The DNA controls which enzymes are made and the enzymes determine what reactions take place

The structures and reactions in the cell determine what sort of a cell it is and what its function is

So DNA exerts its control through the enzymes

Genes

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A sequence of triplets in the DNA molecule may code for a complete protein

Such a sequence forms a **gene**

There may be a thousand or more bases in one gene