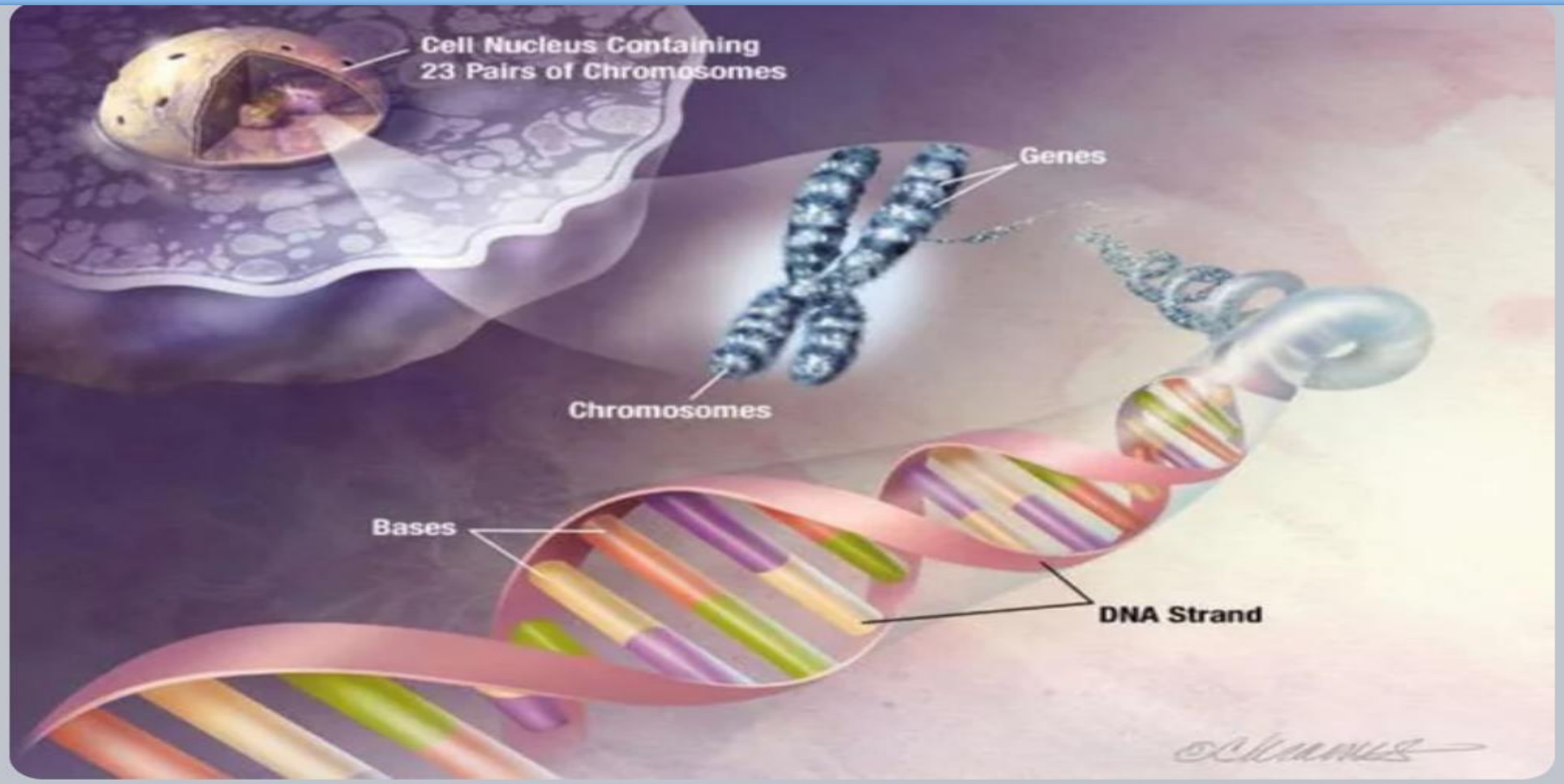
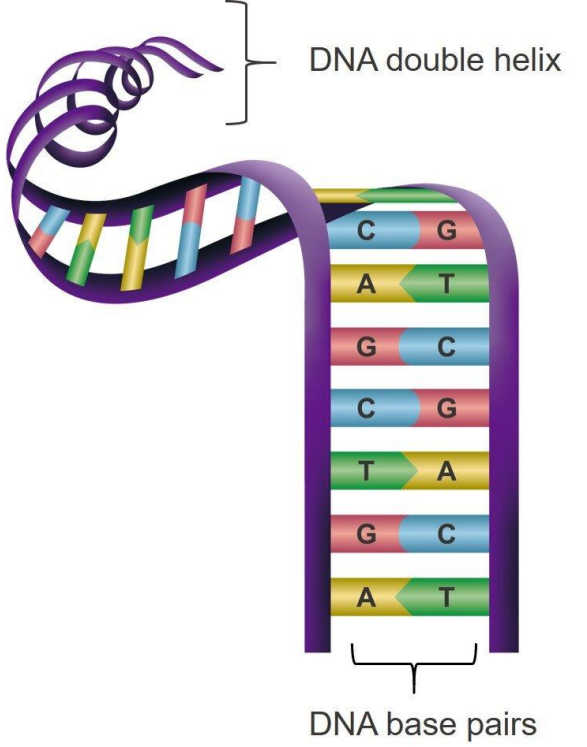
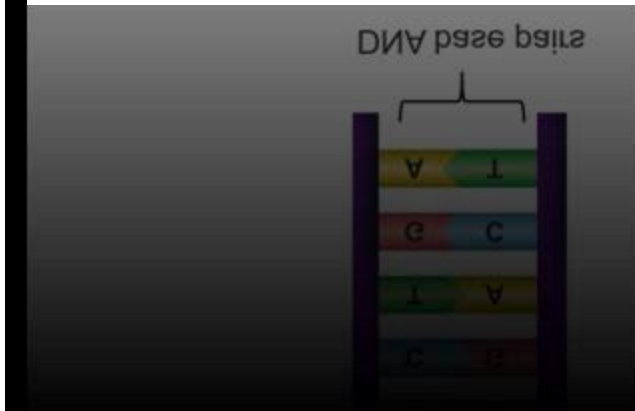
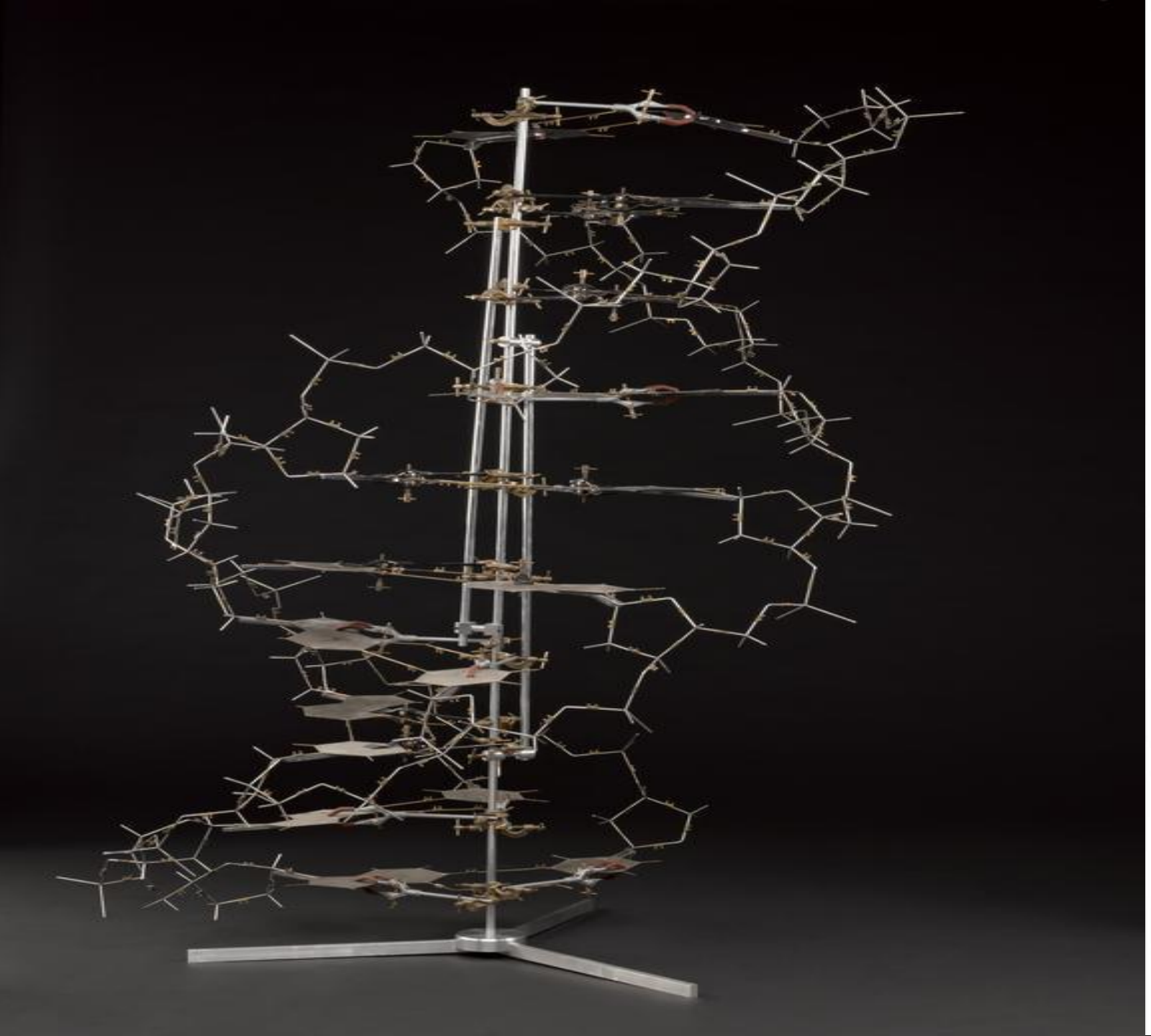
DOUBLE HELICAL STRUCTURE OF DNA



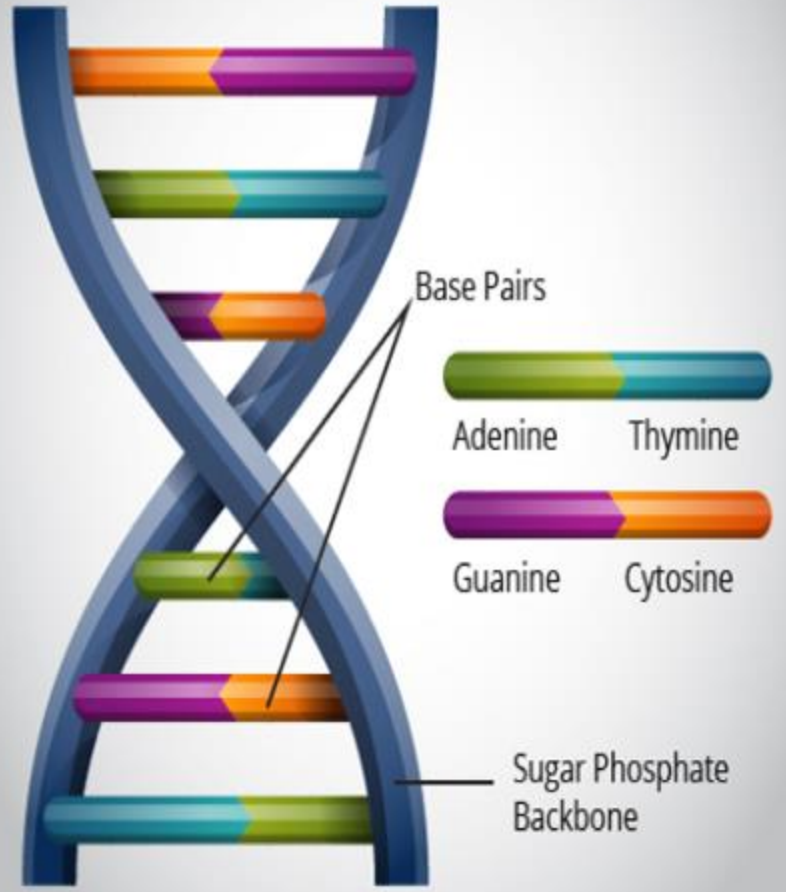




By Divya sharma

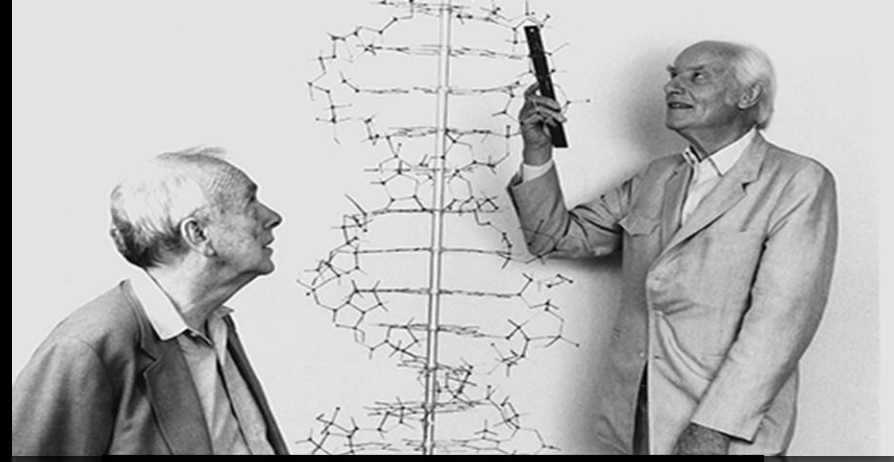


DNA Structure



History

THE DISCOVERY IN 1953 OF THE DOUBLE HELIX, THE TWISTED-LADDER STRUCTURE OF DEOXYRIBONUCLEIC ACID (DNA), BY JAMES WATSON AND FRANCIS CRICK



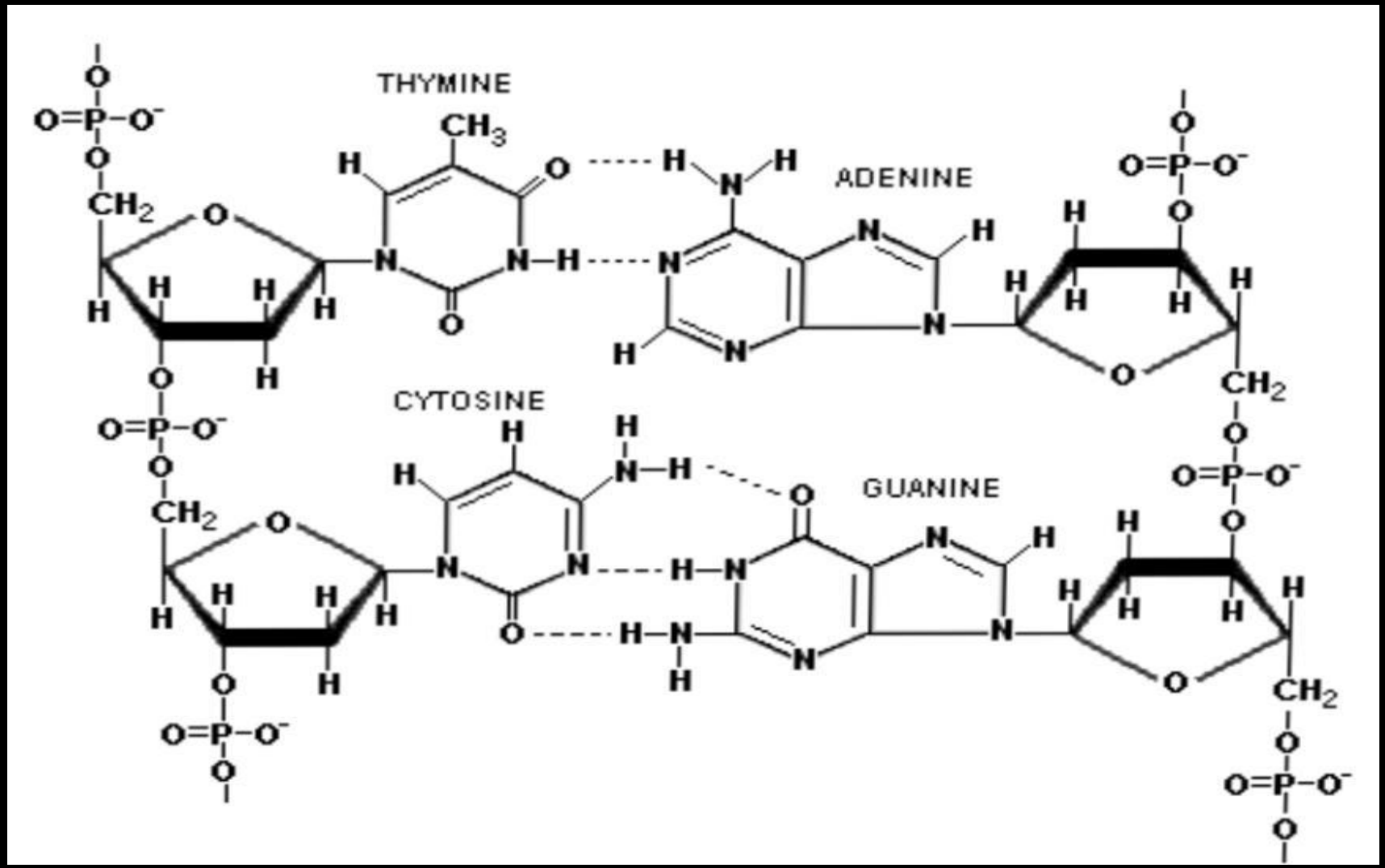
THEY DISCOVERED THAT :

- THE PHOSPHATE BACKBONE WAS ON OUTSIDE.
- WHICH PROTECTED THE BASES ON THE INSIDE.
- DNA ACTS AS A TEMPLATE OR A COPYING MECHANISM FOR REPRODUCTION.



Structure

Representation of Chemical structure of DNA



• Each DNA single strand comprises three parts:

sugar molecules
phosphate groups
nitrogen containing base pairs

There are two hydrogen bonds between adenine and thymine and there are three hydrogen bonds between guanine and cytosine pairing.

• The sub-unit containing only sugar and nitrogenous space is known as nucleoside. A nucleoside combines with phosphorus to form a nucleotide.

•Nucleotide are building blocks of DNA.

•Each nucleotide is made up of pentose sugar, a phosphate group and a nitrogenous base. Deoxyribose is the constituent sugar in DNA.

•The nitrogenous bases are of two types –purines and pyrimidines.

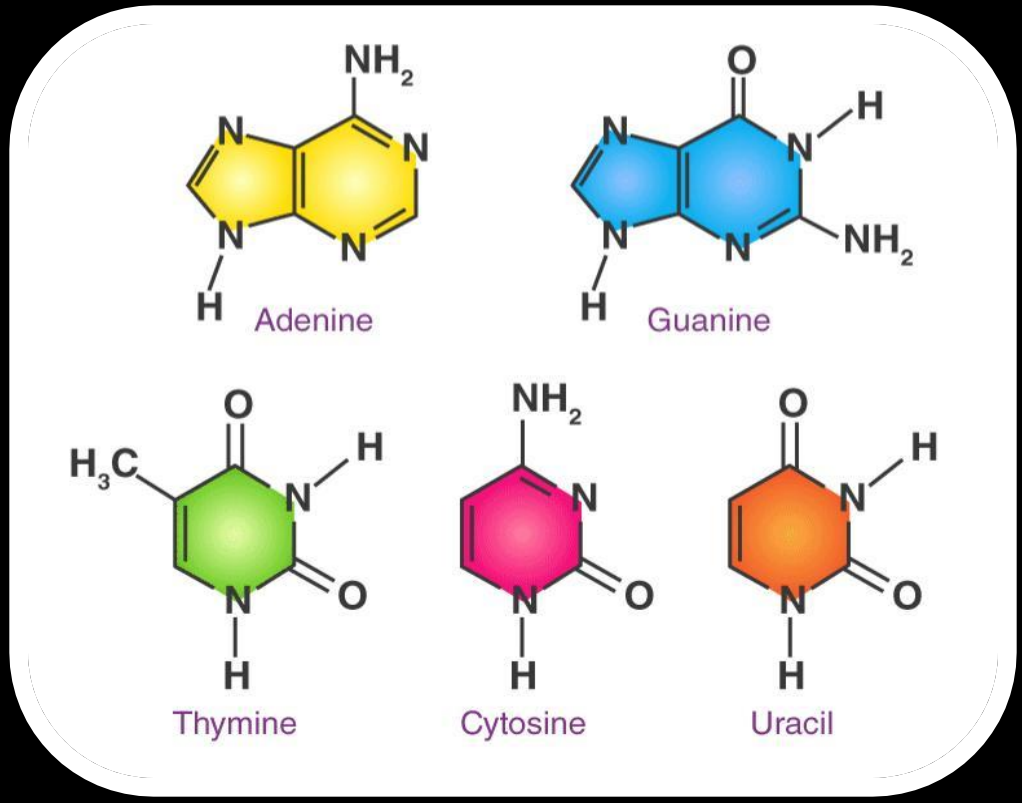
•Adenine and guanine are the purines and thymine and cytosine are pyrimidines.

• The nitrogenous bases found in DNA are adenine, guanine, cytosine and thymine.

ABOUT THE CHEMICAL STRUCTURE OF DNA

- **Nitrogenous base :**

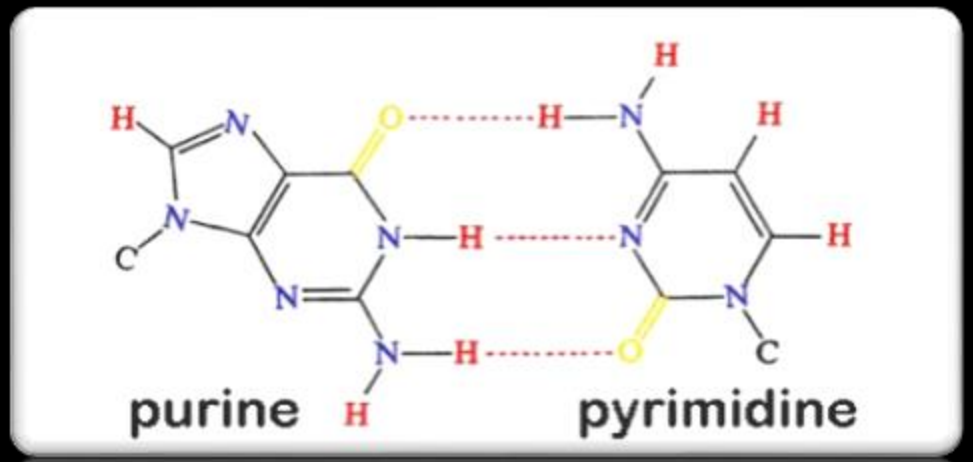
There are four bases: Adenine and Guanine (purines); Cytosine and Thymine (Pyrimidines). Purines have two carbon-nitrogen rings while pyrimidines have a single carbon-nitrogen ring. Thus, there are four different nucleotides that can be incorporated into DNA.

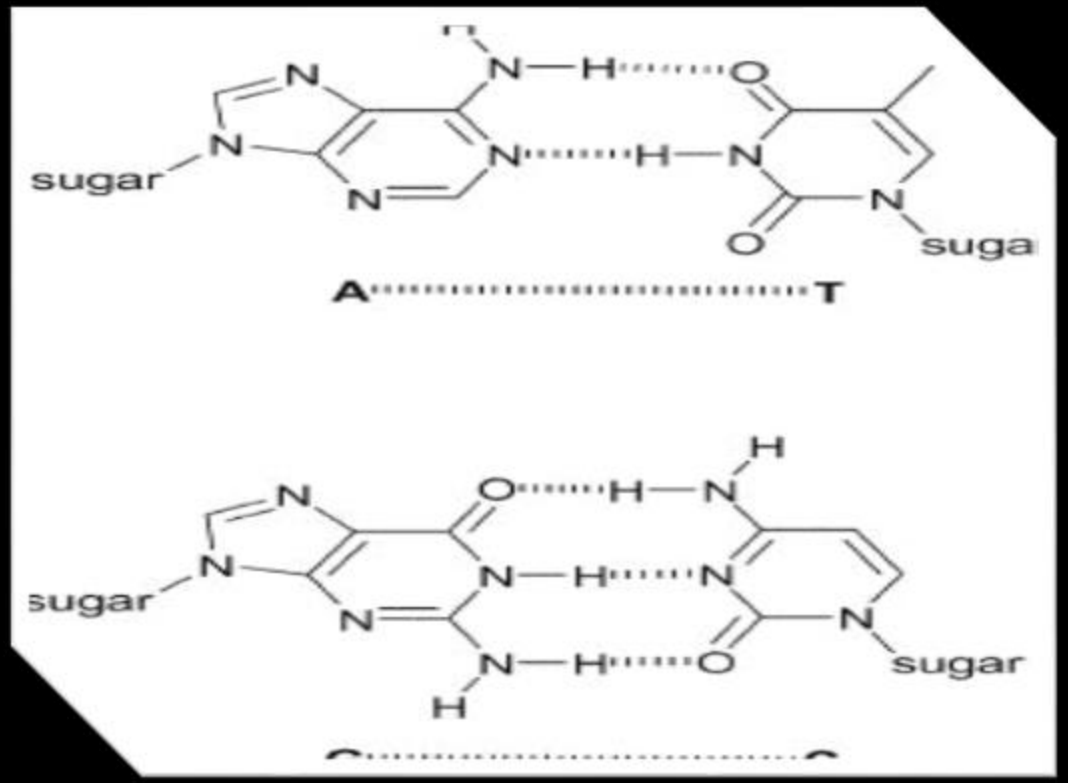


Hydrogen bonds

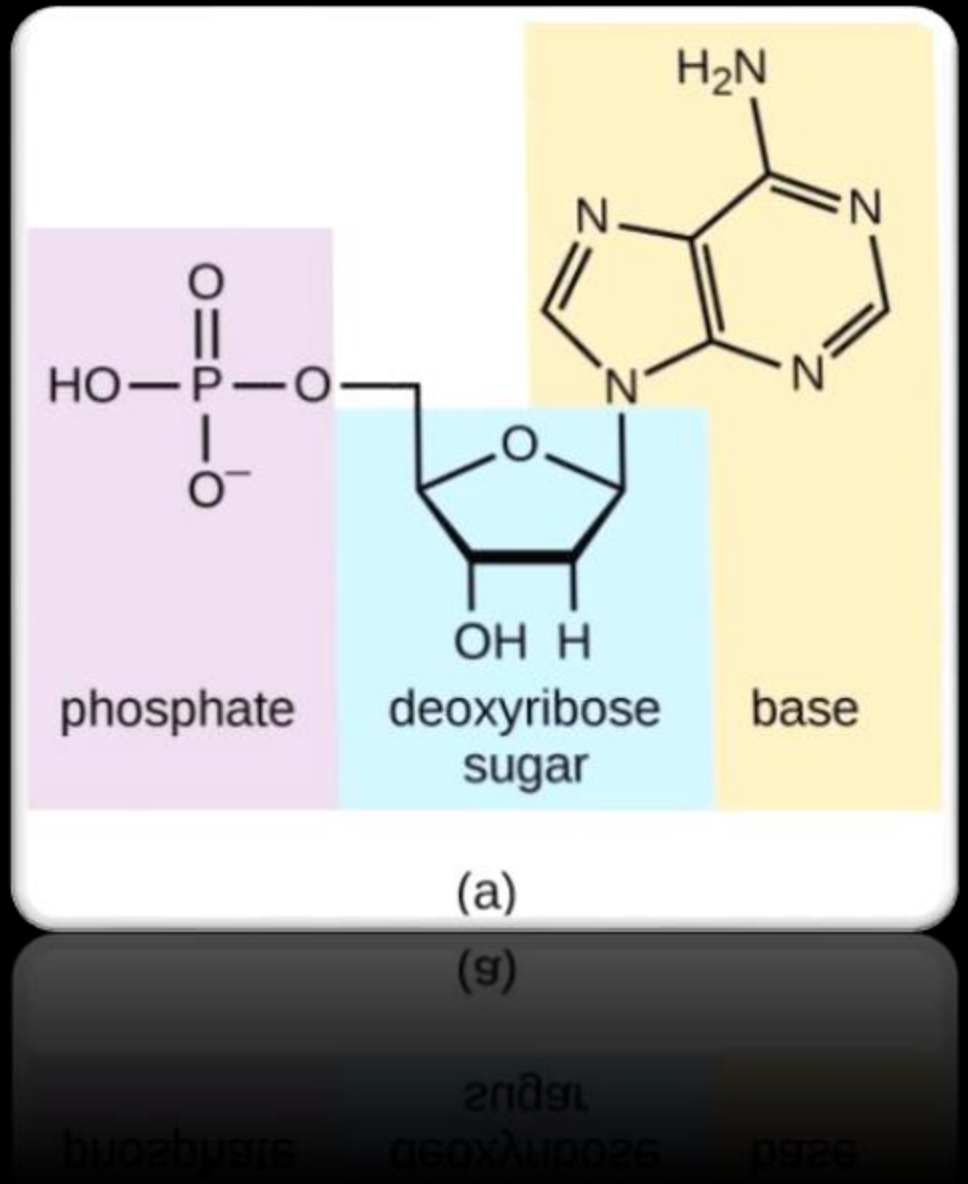
The hydrogen bonds between the base pairs form the double helical structure of DNA. There is no exchange or sharing of electrons in hydrogen bonds as seen in covalent or ionic bonds. Hydrogen bonds occur over short distances and can be easily formed and broken. Although individually each hydrogen bond is much weaker than the covalent bond, they can stabilize the double helix because of their large numbers.

This pairing is very specific: adenine pairs with thymine and cytosine pairs with guanine. This selective pairing is called ‘complementary base pairing’. A-T pair forms two hydrogen bonds, while C-G pair forms three





DEOXYRIBOSE SUGAR AND PHOSPHATE GROUP



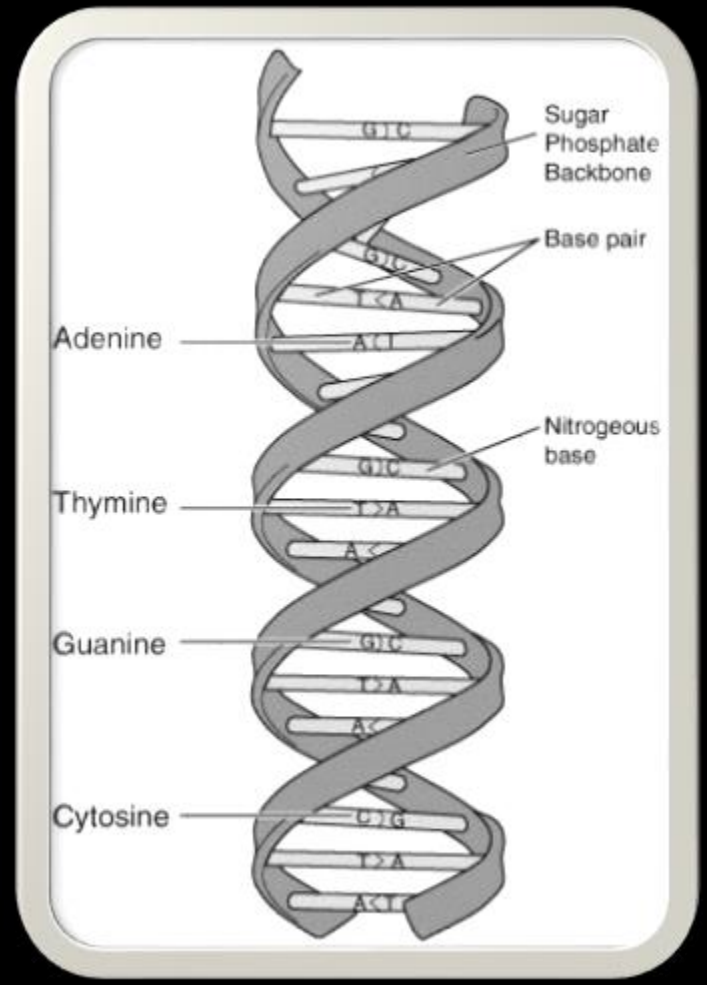
- when deoxyribose sugar Combines with the nitrogenous base it forms 'Neucleoside'.
- and one one neucleoside combines with phosphate group then it is one neucleotide.

Double helical model of DNA

- The double helix describes the appearance of double-stranded DNA, which is composed of two linear strands that run opposite to each other, or anti-parallel, and twist together. Each DNA strand within the double helix is a long, linear molecule made of smaller units called nucleotides that form a chain

- A DNA molecule is made up of two linked strands that wind around each other to resemble a twisted ladder in a helix-like shape.

- The helix is made up of pentose sugar and phosphate which is the backbone of the structure.



- The two strands that make up double-helical DNA face opposite directions. The phosphate carrying the end of one strand evens up with the hydroxyl carrying the end of the other strand and vice versa.

- While a hydrogen bond links the base pairs inside the ladder, the exposed outer edges are important for binding other molecules such as proteins for DNA maintenance.