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الفرع العلمي: العلوم الأساسية

المادة: Biochemistry

المحاضرة: (Nucleic acids)

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(Nucleic acids)

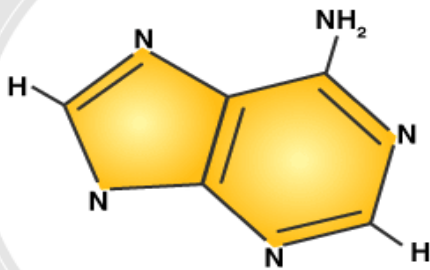
- ▶ Nucleic acids are cellular elements required for both the storage and expression of genetic information in the living organisms.
- ▶ They transmit hereditary information by determining what proteins a cell makes
- ▶ Differences in these genetic information will demonstrate different characteristics (**phenotypes**).
- ▶ There are two chemically distinct types of nucleic acids: deoxyribonucleic acid (DNA) and ribonucleic acid (RNA)
- ▶ A molecule of DNA or RNA is polymer made up of monomers called Nucleotides.

Each nucleotide consists of:

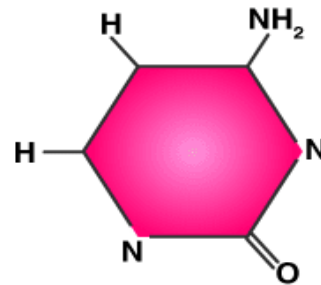
- ▶ Phosphate group
- ▶ 5 carbon sugar
- ▶ Nitrogenous base :

purines (**Adenine** and **guanine**) which are double- ringed nitrogenous bases and **pyrimidines** (**thiamine** , **uracile** ,and **cytosine**) are single- ringed nitrogenous bases

DIFFERENCE BETWEEN PURINE AND PYRIMIDINE



(a) Adenine



(b) Cytosine

DNA

- ▶ DNA is a polymer of deoxyribonucleoside monophosphates (dNMP) covalently linked by 3'→5'-phosphodiester bonds.
- ▶ 2 chains of nucleotides held together by hydrogen bonds Forms a double helix
- ▶ DNA stores hereditary information and carries the genetic information cells use to make proteins

DNA Structure

⤴ The building blocks of DNA are called Nucleotides.

⤴ One nucleotide is made of :

1. **5 Carbon Sugar Deoxyribose**

2. **Phosphate**

3. **Nitrogen base**

⤴ there are 4 nitrogen bases in DNA:

Adenine, Guanine, Cytosine, and Thymine that are pair together)



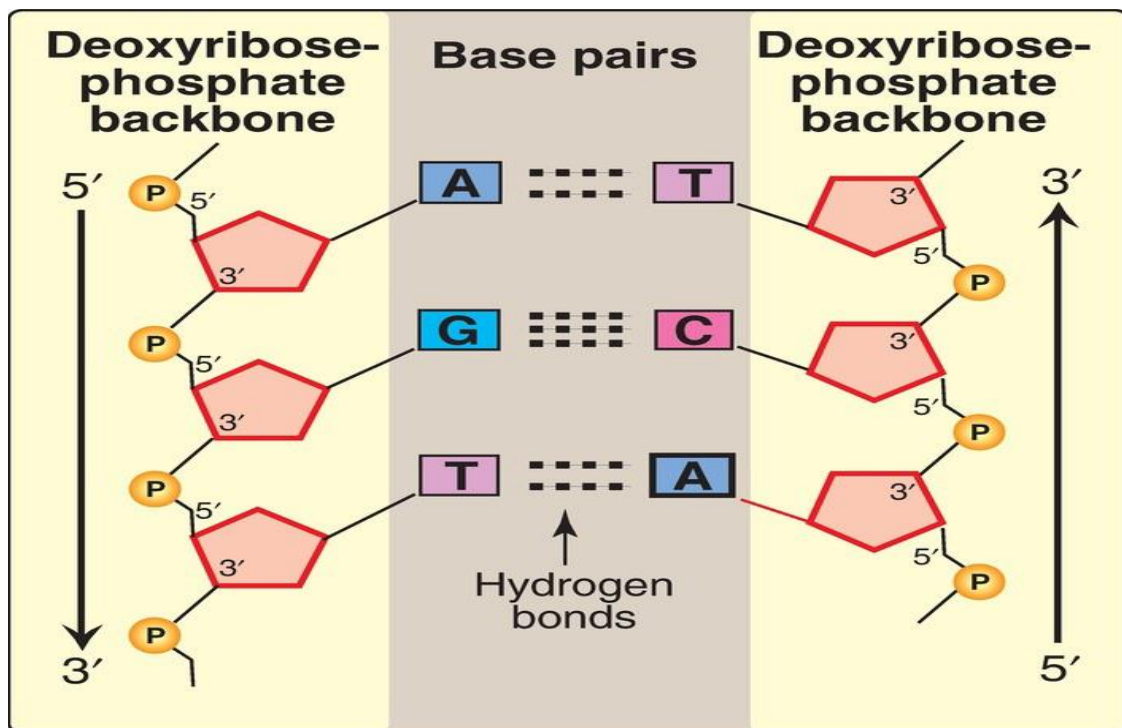
- ▶ DNA is typically a double stranded molecule
- ▶ the two strands twist into a double helix joined by hydrogen bonds between the nitrogenous bases



- ▶ **Base-pairing:**
- ▶ The bases of one strand of DNA are paired with the bases of the second strand, so that an adenine (A) is always paired with a thymine (T), and a cytosine (C) is always paired with a guanine (G).
- ▶ Total amount of purines (A + G) equals the total amount of pyrimidines (T + C).

>>> Therefore, one polynucleotide chain of the DNA double helix is always the complement of the other.

- ▶ The base pairs are held together by hydrogen bonds: **two between A and T** and **three between G and C**

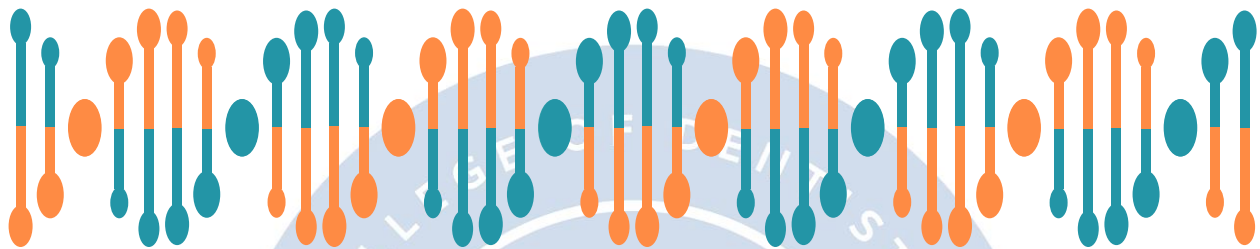


DNA strand separation

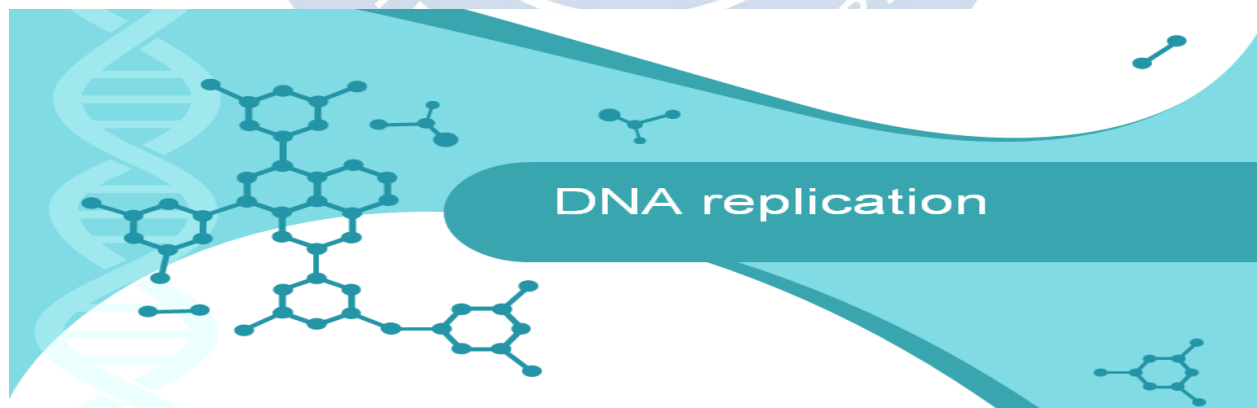
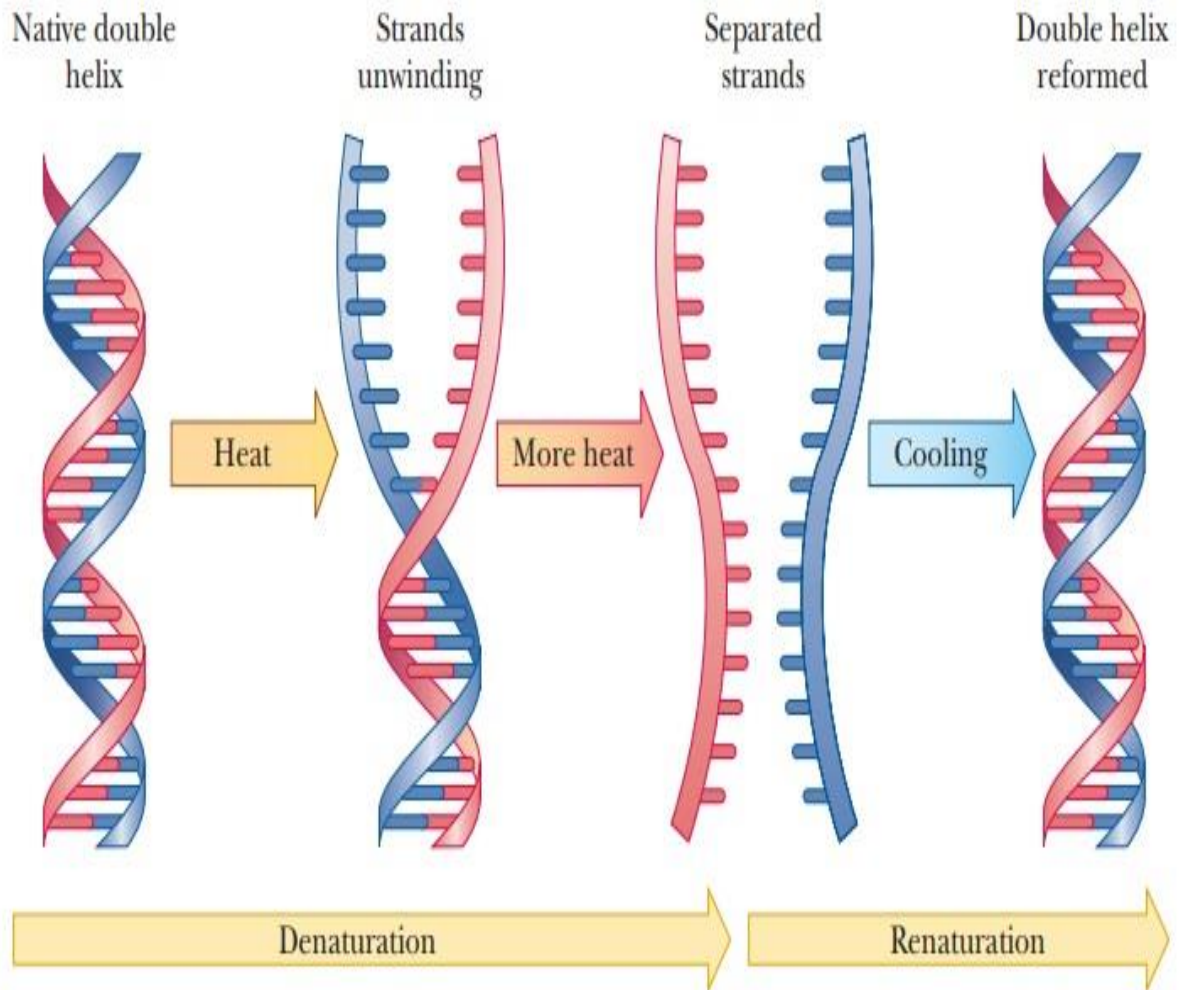
- ▶ The two strands are separate when hydrogen bonds between the paired bases are disrupted >>> loss of helical structure in DNA which called **denaturation**

- ▶ Disruption can occur in the laboratory if **the pH of the DNA solution is altered** so that the nucleotide bases ionize, or if the **solution is heated**.

Covalent phosphodiester bonds are **not broken** by such treatment.

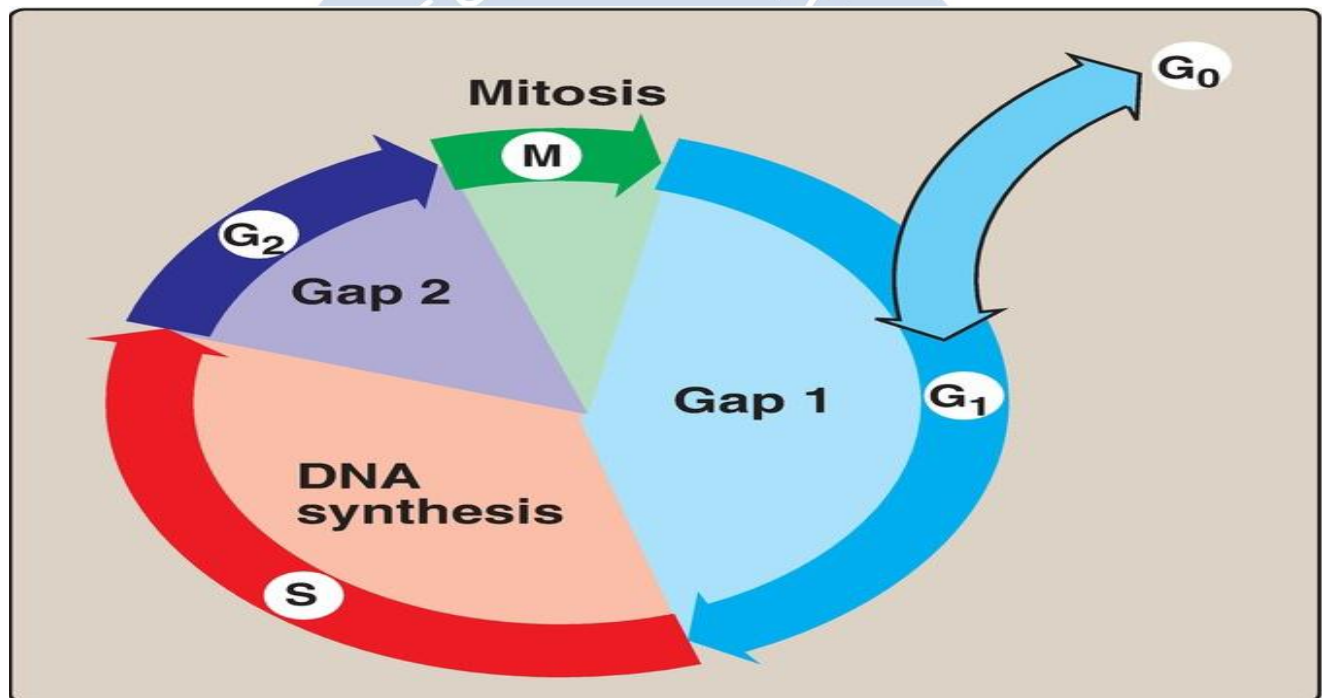


- ▶ Because there are three hydrogen bonds between G and C but only two between A and T, DNA that contains high concentrations of A and T denatures at a lower temperature than does G- and C-rich DNA
- ▶ Under appropriate conditions, complementary DNA strands can reform the double helix by the process called renaturation (or, reannealing).
- ▶ Separation of the two strands over short regions occurs during both DNA and RNA synthesis

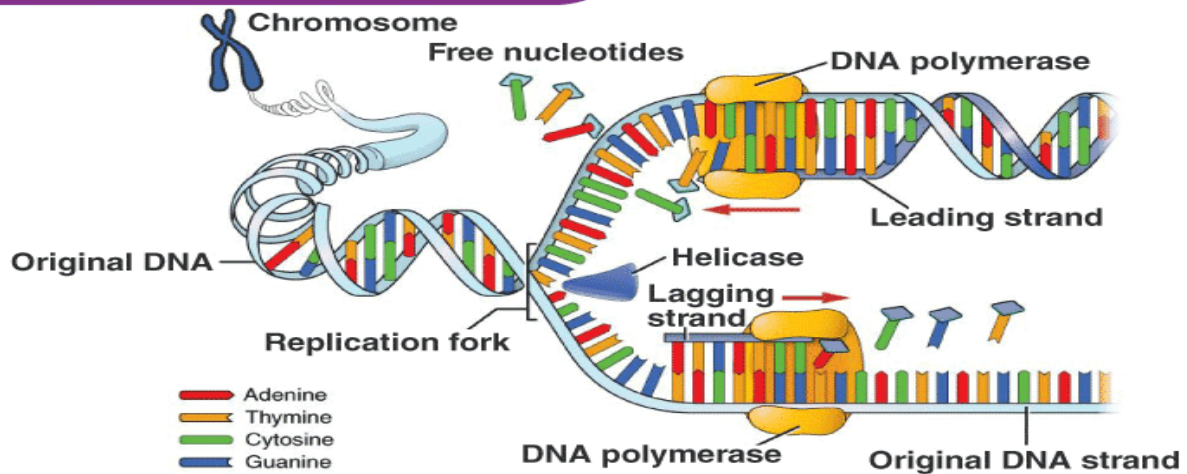


❖ DNA replication

- ▶ The events surrounding DNA replication and cell division (mitosis) are coordinated to produce the **cell cycle**
- ▶ The period preceding replication is called the G1 phase (Gap 1), **DNA replication occurs during the S (synthesis) phase.**
- ▶ Following DNA synthesis, there is another phase (G2, or Gap 2) before mitosis (M).



DNA REPLICATION



A SUMMARY OF DNA REPLICATION

