TD Molecular Biology and Genetic Engineering

Licence Microbiologie

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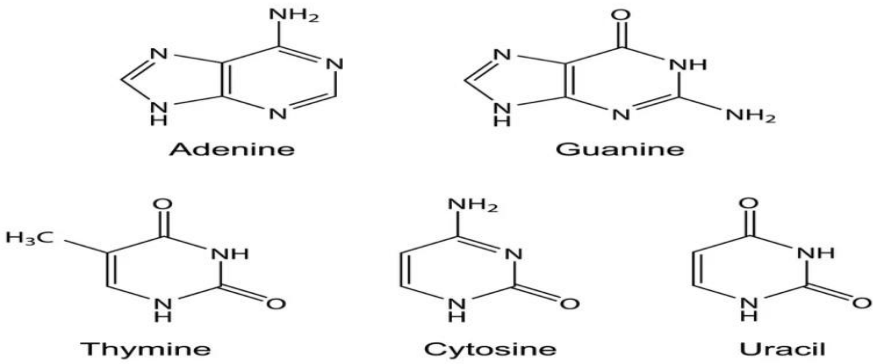
Correction :



1. (a) *(adenine is a purine base with two rings, with an NH_2 group at C6 and no oxygen atom).*
2. **Purines:** Adenine (A), Guanine (G)
   Pyrimidines: Cytosine (C), Thymine (T), Uracil (U)

- Purines are **double-ring structures** (a fused imidazole and pyrimidine ring).
- Pyrimidines are **single-ring structures**.

3 All nucleotides, the monomers of nucleic acids, are composed of three components:

1. **A nitrogenous base** (purine or pyrimidine)
2. **A pentose sugar** (deoxyribose in DNA, ribose in RNA)
3. **One or more phosphate groups**

4. ➡ Deoxyribose

5. ➡ Ribose

<u>6. légende :</u>

Phosphodiester bond

Nitrogenous base / Adenine.

Base pair hydrogen bond .

5′ end – The end of a DNA strand that begins with a phosphate group attached to the fifth carbon of the sugar.

3′ end – The end of a DNA strand that terminates with a hydroxyl group (-OH) attached to the third carbon of the sugar.

Width of the helical structure, which is generally constant in DNA: 2 nm.

Helical pitch (10 base pairs)

DNA double helix, Watson and Crick model.

Légende 2 :

Histones – Proteins (shown in blue) around which DNA is wrapped to form nucleosomes. This complex is made up of two copies of each histone among the four main types: H2A, H2B, H3, and H4.

Histone H1 – In addition to the four major histones (H2A, H2B, H3, and H4), another histone called H1 binds to the outside of the nucleosome to help stabilize DNA and form more compact chromatin structures.

DNA linker

Nucleosome – The histone octamer is associated with approximately 147 base pairs of DNA, which wrap around this complex to form a structure called a nucleosome, the basic unit of chromatin.

Histone octamer – The histones are organized into a complex of eight proteins, called a histone octamer.

DNA and nucleosome

Chromosome – A higher-order level of compaction where nucleosomes form a denser structure.

Shema 3 :

(3) **DNA double helix** – Represents DNA in its double-helix form, the basic structure before compaction.

(6) **DNA and nucleosomes** – DNA begins to wrap around histone proteins, forming nucleosomes (as shown in the previous figure with DNA coiled around histone proteins).

(10) **Chromatin fiber**

(11) **Chromatin loops** – Chromatin forms loops, a higher level of compaction, often associated with a stage before chromosome formation.

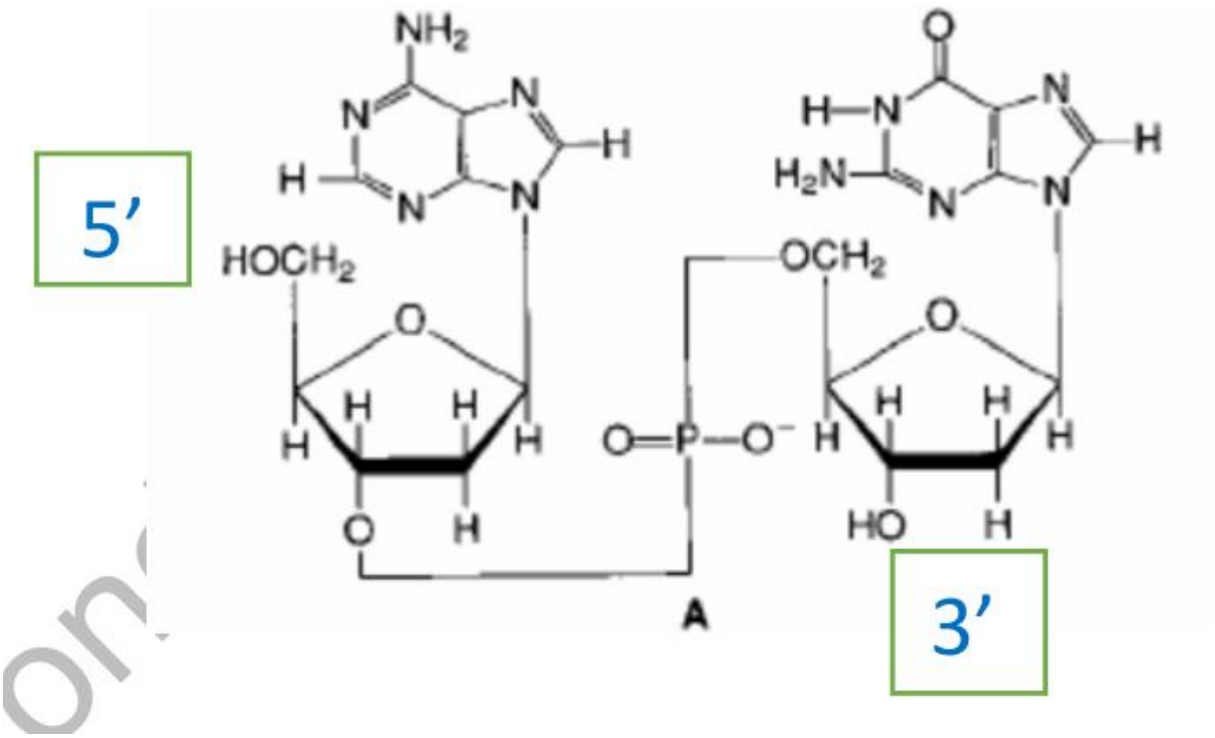
(9) **Condensed chromosome** – The most compact structure DNA can take, corresponding to a metaphase chromosome ready for cell division.

Exercice

Molecule A (the dinucleotide):
First sugar (left): At the 2′ position and At the 2′ position → (H) → DEOXY**RIBOSE**

Molecule B:
at the 2′ carbon of the sugar HO and OH marked → **RIBOSE (RNA)**.

Molecule C:
At the 2′ position of the sugar → (H) → DEOXY**RIBOSE Molecule D:**
Molecule D:
No sugar, just the base **thymine**.



The OH group at the 3′ position of the first sugar reacts with the phosphate attached to the 5′ carbon of the second sugar.
This reaction:

- Eliminates a water molecule (H_2O)
- Creates an O–P–O bond (phosphodiester bond)
- Links the two nucleotides together

It is exactly this:
3′-OH + 5′-Phosphate → 3′–5′ phosphodiester bond + H_2O