

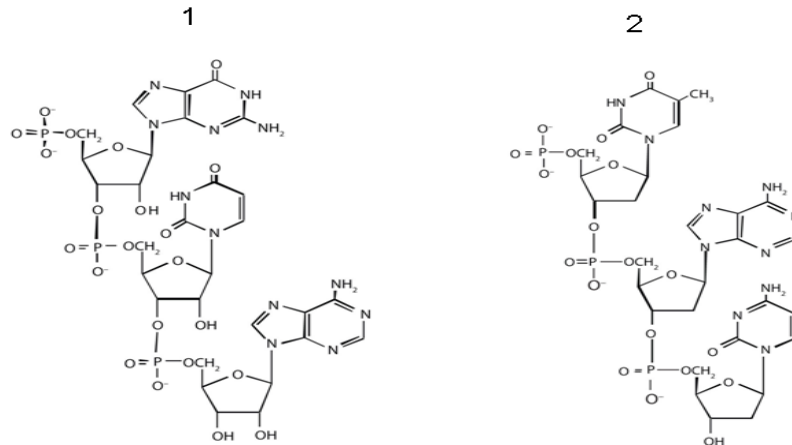
TD 1 (genetic material)

Exercise 1

1. What are the 2 main types of nucleic acids?

The 2 main types of nucleic acids are DNA and RNA

2. For this nucleic acid segment,

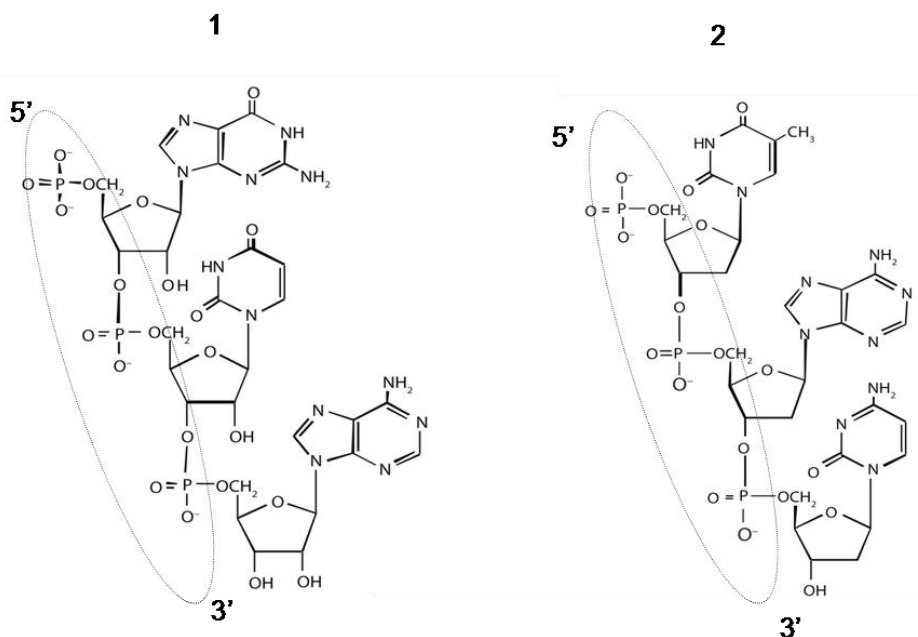


A. Define the type of nucleic acid of each of the two molecules 1 and 2. Justify your answer?

Molecule 1: an RNA; the sugar is a ribose (OH on carbon 2'), rather than deoxyribose

Molecule 2: a DNA; the sugar is a deoxyribose (H on carbon 2')

B. Determine the ends 5' and 3'? Circle the atoms that form the backbone of the nucleic acid chain



Dotted skeleton

TD 1 (genetic material)

Exercise 2

The sequence F: 5'ATCGTTCG3' refers to one of the strands of double-stranded DNA .

If a DNA chain (F) reads: 5'ATCGTTCG3'3:

1- What do the values and symbols 5' and 3' correspond to and what is their meaning?

- The 5' and 3' values correspond to the ends of a polynucleotide chain .
- 5' is the end that contains the only nucleotide with a phosphate group with two free acid functions on the C'5 of its ose. It is called 5'P and represents the end of the beginning of a polynucleotide chain .
- 3' is the end that contains the only nucleotide with a free OH group on the C'3 of its ose. It is called 3'OH and represents the end of the end of a polynucleotide chain .

By convention, a nucleic acid is always read from the 5' end to the 3' end.

2- Among the polynucleotides (A), (B) and (C); determine the one which corresponds to the strand of DNA F, justify your answer.

A= 5'TAGCAAGC3' B= 5'CGAACGAT3' C= 3'CGAACGAT5'

The DNA strand that corresponds to the F DNA strand and the B strand because it is complementary and antiparallel to (F), provided that it is read in the antiparallel direction: 3'-5'

Exercise 3

A DNA molecule is shown below:

Strand1 5'AAATGCCC ATGGCC3'

Strand2 3'TTT ACGGGTACCGG5'

1-Check if CHARGAFF rules apply to this DNA.

The chargaff rules to check are:

A) The Nb of A = T 6=6 this conclusion applies perfectly

And number of C=G 8=8

B) Number of purine bases (A+G)/number of pyrimidine bases (T+C) = 1 6+8/8+8 =1

This conclusion also applies

double-stranded DNA molecule , Chargaff 's rules apply perfectly.

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2- If a DNA molecule contains 10% adenine, what will be the different percentages of the other three bases of this DNA?

A = 10%, so T = 10% (since A = T). So A + T = 20%

G + C + A + T = 100%

G + C = 100 - 20 = 80%

So: C = 80/2 = 40% (and G = 40%, since C = G)

3-RNA polymerase only transcribes strand 1, what will be the structure of the newly formed RNA strand?

Strand1 5'AAATGCCC ATGGCC3'

RNA 3'UUU ACGGGUACCGG5'

Exercise 4 (chromatin in eukaryotes)

1) Define chromatin? What is the difference between DNA, chromatin and chromosomes?

Chromatin is the material that chromosomes are made of (mainly DNA + protein). DNA is a component of both chromatin and chromosomes.

2) If species A has 4 chromosomes and species B has 6 chromosomes. Can you tell from this information which species has more DNA? Can you tell which species has more genes ?

No, since chromosomes vary considerably in size, chromosome number does not correlate with total DNA content. Also, gene number is not closely correlated with DNA content.

3) The answer to question 2 implies that not all DNA on a chromosome encodes genes. Can you give examples of chromosomal regions that contain relatively few genes ?

Heterochromatic regions (including repeated DNA sequences), such as centromeres and telomeres, are examples of gene-poor regions of chromosomes.

Exercise 5

Answer true or false and justify your answer.

QCM 1-The DNA molecule:

a- Is composed of nitrogenous bases, riboses and phosphates. false

Is composed of nitrogenous bases, 2 deoxy-riboses and phosphates. Ribose is specific for RNA

b- Contains pyrimidine and purine nitrogenous bases. true

Which are adenine, guanine (purine bases), cytosine and thymine (pyrimidine bases)

c- Contains as many pyrimidine and purine nitrogenous bases. true

This is the second rule of Chargaff A+G= C+T

TD 1 (genetic material)

QCM 2-Concerning the DNA double helix:

a- It is a coiling of two parallel strands of DNA . **false**

It is a coil of two antiparallel strands of DNA.

b- Each of its strands has a 5'hydroxyl end and a 3'phosphate end. **false**

Each of its strands has a 5' phosphate end and a 3' hydroxyl end.

c- Each strand is made up of a different sequence of nitrogenous bases. **true**

The sequence of nitrogenous bases of one strand is complementary to that of the other strand and therefore different

d- The pairing of its strands is stabilized by covalent bonds . **false**

The pairing of the two strands is stabilized by low energy, non-covalent, hydrogen-type bonds; the A-T pair by two bonds and the CG pair by 3 bonds

MCQ 3-The human karyotype includes:

a- 46 chromosomes **true**

b- 48 **false chromosomes**

c- 45 chromosomes plus a pair of sex chromosomes. **false**

d- 23 pairs of autosomes plus one pair of sex chromosomes. **false**

e- 12 pairs of chromosomes . **false**

QCM 4-The members of a chromosome pair are:

a- Homologous chromosomes. **true**

b- Sex chromosomes. **false**

c- Both inherit from the mother. **false**

d- Inherit both from the father. **False half from the mother and the other half from the father**

e- Carriers of homologous genetic information. **True the same genes but not the same alleles**