

**TD 2 (DNA Replication and Transmission of Characteristics )****Exercise 1**

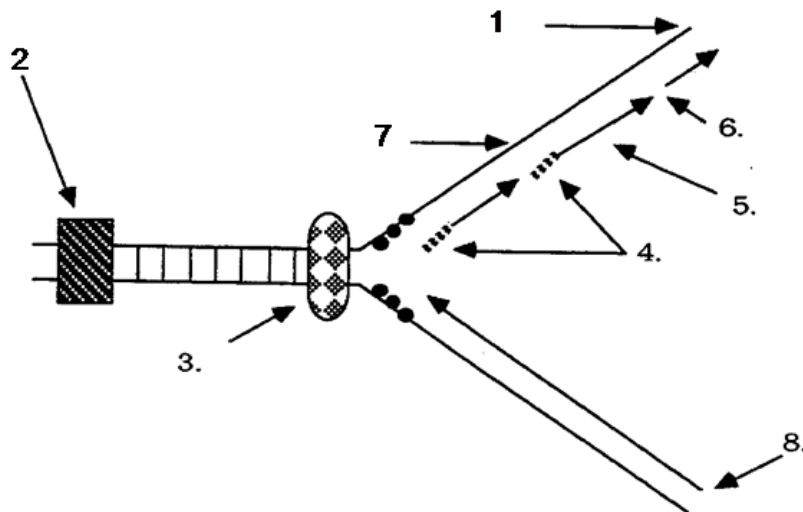
Write the daughter molecules obtained by duplicating the following portion of DNA:

**AATGCTGGCAATCCTTGGAA3'**

**TTACGACCGTTAGGAACCTT5'**

**Exercise 2:**

Here is a simplified diagram of DNA replication in prokaryotes. The numbers in the following questions correspond to the numbers in this figure.



- Which end (5' or 3') of the molecule is indicated by arrow number 1?
- Which end (5' or 3') of the molecule is indicated by arrow number 8?
- What type of nucleic acid is indicated by arrow number 4? What enzyme synthesizes it?
- What are the short fragments of DNA indicated by arrow number 5?
- What enzymatic function to join the short fragments indicated by arrow number 6?
- Which enzymes are indicated by arrows number 2, 3? What is their role?
- What is the name of the strand indicated by arrow number 7?
- E) Explain why the main strand (direct or leading strand) strand ) is replicated much faster than the lagging strand strand ).

**Exercise 3**

Answer true or false to the following statements:

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### Mitosis

- 1- Interphase and mitosis together constitute the cell cycle .....
- 2- Mitosis allows the separation of homologous chromosomes. ....
- 3- During anaphase, there is a homogeneous distribution of genetic information . . . . .
- 4- Only gametes are haploid cells in higher organisms. . . . .
- 5- The somatic cells of a diploid organism all have  $2n$  chromosomes . . . . .
- 6- The nuclear membrane forms around the newly formed sets of daughter chromosomes during telophase .....
- 7- The duplication of chromatids occurs during prophase .....

### Meiosis

- 1- Anaphase I begins with the division of the centromeres of each chromosome .....
- 2- At anaphase II, the two sister chromatids of each chromosome separate, resulting in two daughter chromosomes each attached to a daughter centromere .....
- 3- Meiosis separates the pairs of chromosomes, fertilization reunites them .....
- 4- Chromatid crossing over allows non-sister chromatids to exchange genes .....
- 5- In daughter cells resulting from division I of meiosis, the quantity of DNA is diploid .....
- 6- Centromeres do not divide during meiosis I. ....
- 7- A cell in prophase I of meiosis has half the number of chromosomes as a cell in prophase II .....
- 8- Crossing-over takes place during the diplotene stage of prophase I, meiosis I .....

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### Exercise 4

In humans, the chromosome number is  $2n=46$ .

- How many chromosomes will be found in the somatic cells of the male? ....
- How many chromosomes will be found in female gametes? .....
- How many chromatids are there at mitotic metaphase? .....
- How many chromosomes does a girl get from her father? .....
- How many autosomes are found in a gamete? .....
- How many sex chromosomes are found in an egg? .....
- How many autosomes are there in a somatic cell in a female? .....

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### Exercise 5

Fill in the blanks:

- Mitosis always occurs at the cell level .....
- Meiosis always occurs at the cell level .....
- Mitosis is a division .....
- In mitosis we obtain from a diploid cell .....
- Gametes are cells .....
- The production of male gametes is called .....
- The nuclear membrane shatters into fragments at the beginning of the .....
- The equatorial plate of the mitotic spindle is formed during the.....
- The chromatids separate to form two sets of daughter chromosomes during .....
- The period during which DNA is synthesized is called .....
- The mitotic spindle is made up of microtubules which are polymers of a subunit protein of .....
- Chromosome migration is made possible by the binding of spindle microtubules to a structure associated with the centromere of each chromosome: the .....
- Cytokinesis is the division of .....
- A meiotic event called ..... produces a genetic exchange between homologous chromosomes .....
- ..... complex is formed between homologous chromosomes
- Prophase I of meiosis is subdivided into 5 stages:  
.....  
.....  
.....
- zygotene stage is completed, the pairs of homologous chromosomes are present in the form of .....
- Each tetrad contains two pairs of .....
- During diakinesis , the chromosomes separate further, but the non-sister chromatids still remain attached at the .....

Genetics, L2 Biology

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