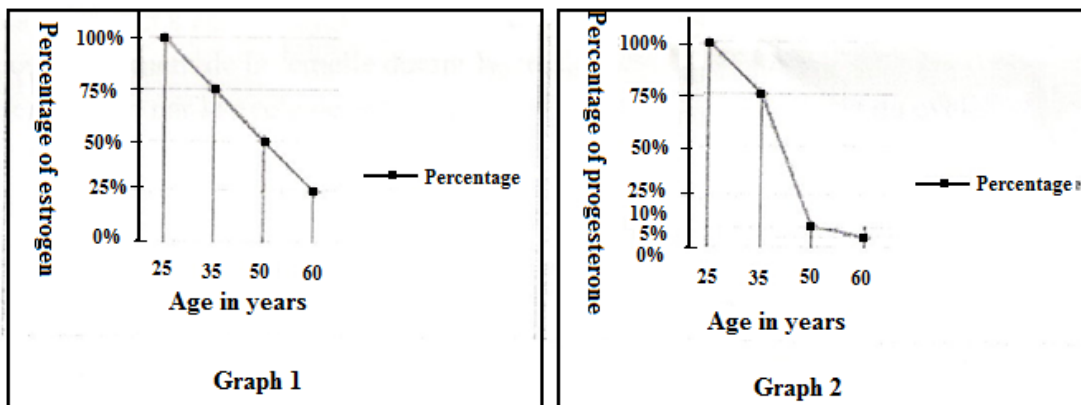


Exercise I: Hormonal system (6 pts)

A certain number of clinical analyses of the two female hormones estrogen and progesterone are done for a woman since she was 25 years old for medical reasons. The graphs (1) and (2) below show the percentage of these hormones in the blood with respect to the age of the female.

The age of 50 years old is considered as the age of menopause where the menstrual cycle is stopped. At the puberty, the two hormones estrogen and progesterone are secreted by the ovaries, but their amount starts decreasing during the life of the female till it reaches zero at the menopause.



1. Draw out, from the text, the hypothesis concerning the cause of the menopause.
2. Interpret the graphs (1) and (2). What can you deduce?
3. Translate the graph (1) and graph (2) into a table studying the variation of the percentage of estrogen and progesterone as the function of the age.

Exercise II: Nervous system and stress (5 pts)

In order to study the role of the hypothalamus and of the nervous system in the reaction against the stress, we realize the following experiments on a lot of mice:

First experiment: the lot of mice is submitted to increasing states of stress and we measure the plasmatic concentration of adrenaline, a hormone secreted during stress by the medullo-cortical gland in the mice. The results are presented in the table below:

	Normal state	Weak stress	Moderate	Strong
Plasmatic concentration of the adrenaline (in a.u)	5	15	30	90

Document 1

1. Analyze the results obtained in the first experiment, and draw out the effect of stress on the medullo-cortical gland.

Second experiment: the stimulation of the hypothalamus in these mice shows after dosage of the adrenaline the same values indicated in the table of document 1.

Third experiment: a stimulation of the hypothalamus preceded by a destruction of the medulla oblongata shows a weak plasmatic concentration of adrenaline after a state of strong stress.

2. Interpret the experiments 2 and 3.
3. Name another hormone produced during stress.

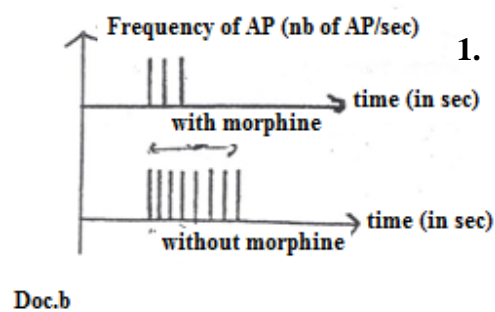
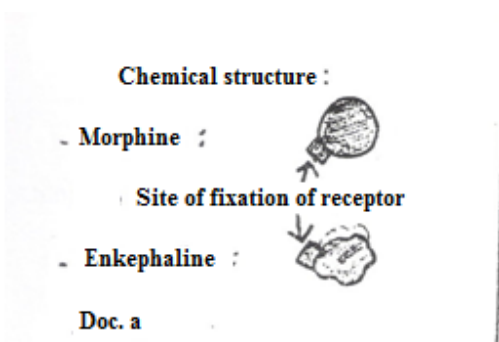
Exercise III: The drugs (5 pts)

The morphine is a molecule extracted from the poppy. It is utilized in medicine for the reduction of intense pains. It acts at the level of the neuron circuit of the pain sensation. This circuit is formed by a neuron N1 forming synapses with other neurons N2. The substance P is the mediator of pain (neurotransmitter) released by the neurons N1, the substance P find its postsynaptic receptor of N2.

Neurons N3 are called enkephalinerphics since they secrete enkephaline, these neurons are called also modulators, they form synapses with the neurons N1, and by secreting enkephaline that binds on the receptors of the presynaptic membrane of N1 they inhibit the secretion of the substance P inhibiting thus the pain.

Morphine, in high doses, activate certain synapses and their repeated injection is always accompanied with dependence. At extra high doses, it blocks the activity of the neurons that command the respiratory rhythm and provokes the death by an "overdose".

We stimulate in the presence and absence of morphine the neuron of pain. The document b shows the results obtained:



1. Pick out from the text the sentence that:
 - a. Shows that the morphine is utilized as a

medicine.

- b. Show that the morphine can be used as a drug.
2. By referring to the document a, formulate a hypothesis that explain the mode of action of the morphine on the center of pain.
 3. Analyze the two recordings of the doc.b and deduce the effect of morphine.
 4. The morphine has a more durable action than the enkephaline. Explain by using the acquired knowledge.

Exercise IV: The transgenesis (4 pts)

A – The following document represents a technique of cross between two races of cows:

	Finnish Foreign race ♂	+	Awassi locale race ♀	→	Finnawassi hybrids ♂ et ♀
Color	Grey, head and legs white		off white, spotted black and white		White spotted different colors
Number of lamb (prolificity)	1- 4		1 - 2		1 - 3
Butcher's aptitude (carcas, quality of meat)	Remarkable		Desirable		Remarkable
Growth	Early		Late		Early
Wool	For tissue		For carpet		For tissue
Tail	Small		Fatty		Different form
Adaptation	Weak		Perfect		Good

1. Name this technique.
2. Do you find this technique advantageous? Justify your answer by referring to the table.

B – Searching to improve the productivity of this race of cows, the following technique is proposed:

Extraction of DNA of the Finnish foreign race

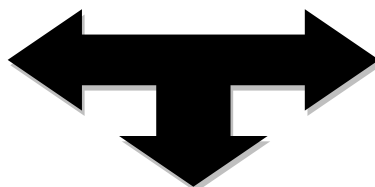


1- Isolation of gene V responsible for the good quality of meat



Local race Awassi

2- Extraction of an oocyte (already fertilized)



3 - Insertion of gene V in the chromosome the fertilized oocyte of the race Awassi.



4- Re-implantation of the oocyte in the uterus of a carrier female



5- Obtention of a transgenic cow

1. Name this technique.
2. What does the expression "transgenic cow" signify?
3. The steps 1 and 3 need the intervention of two specific enzymes, name these enzymes.
4. What characteristic is acquired by the transgenic cow?
5. Describe this technique.

Good Work!