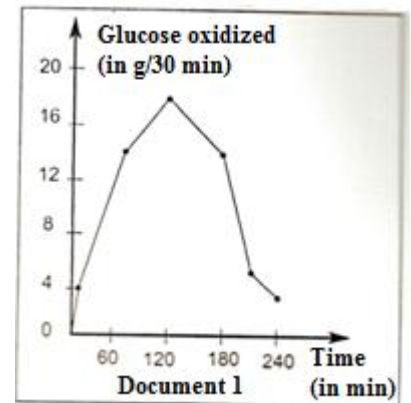


Exercise I: Hormonal system (5pts)

Before executing a race of 240 minutes and of constant intensity, the athletes ingested a glucose solution. We measure for these persons, the amount of oxidized glucose, during the exercise. The results are represented in the document 1.

Once the amount of oxidized glucose is depleted, many other energy sources are used such as the oxidation of lipids and amino acids.



- Analyze the graph.**
- Formulate a hypothesis concerning the new energy source allowing the athletes to finish the last two hours of the race.**

At the laboratory, muscular fibers are placed in many culture medium of same concentration of glucose, and to which different amount of insulin are added.

We measure the consumption of glucose per cell during the same time. (Document 2)

| | | | | | |
|--|------------|------------|------------|------------|-----------|
| Amount of insulin (in arbitrary unit) | 0 | 2.5 | 4 | 10 | 40 |
| Consumption of glucose (in mg/g of muscle/h) | 2.5 | 3 | 3.5 | 4.5 | 6 |

Document 2

- Construct the graph representing the results of the table of document 2.**
- Interpret the document 2.**

Exercise II: Nervous system and stress (5pts)

In the framework of studying the role of the hypothalamus and the nervous system in the stress response, the following experiments are performed on a lot of mice:

Experiment 1: The lot of mice is submitted to different stressful situations of increasing intensities, and we measure the plasmatic concentrations of Adrenaline, hormone secreted by the medullo-adrenal gland of the mouse during the stress. The results are represented in the table below of doc.1:

Doc.1

| Intensity of stress | Normal stress | Weak stress | Medium stress | Hard stress |
|--|---------------|-------------|---------------|-------------|
| Plasmatic concentration of adrenalin (in a.u) | 5 | 15 | 30 | 90 |

- Analyze the results of the first experiment (doc.1) and deduce the effect of the stress on the medullo-adrenal gland.**

Second experiment: The stimulation of the hypothalamus in these mice shows, after dosage, the same values as those indicated in the table above.

Third experiment: A stimulation of the hypothalamus preceded by a destruction of the medulla oblongata shows after a hard stressful situation a weak plasmatic concentration in adrenalin.

2. Interpret the results of the experiments 2 and 3.
3. Name a hormone secreted during stress other than the adrenalin.

Exercise III: The drugs (3.5pts)

The alcohol increases the secretion of dopamine in the brain, a neurotransmitter leading to the pleasant state. The excessive consumption of alcohol leads to a temporary intoxication, an emotional state characterized by behavioral modifications and a dependency leading to an addiction state, headache, and a sensation of euphoria at the moment of the consumption.

The chronic alcoholism can lead to the degeneration of the neurons secreting the dopamine, which can lead to Parkinson disease.

In order to conserve the normal behavior the alcoholic needs a certain dose of alcohol in the blood, thus we noticed not only a physiological dependency to alcohol, but also a psychological one.

1. Pick up from the text, the symptoms provoked by an excessive consumption of alcohol.

| | 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 | | carpet and tissue |
| Tail | Small | | Fatty | | Different form |
| Adaptation | Weak | | Perfect | | Good |

2. Justify, referring to the text, the relation between the dopamine and the sensation of euphoria and pleasure of the alcoholic.
3. Can we consider the alcohol as a drug? Justify by referring to the text.

Exercise IV: The transgenesis(6.5pts)

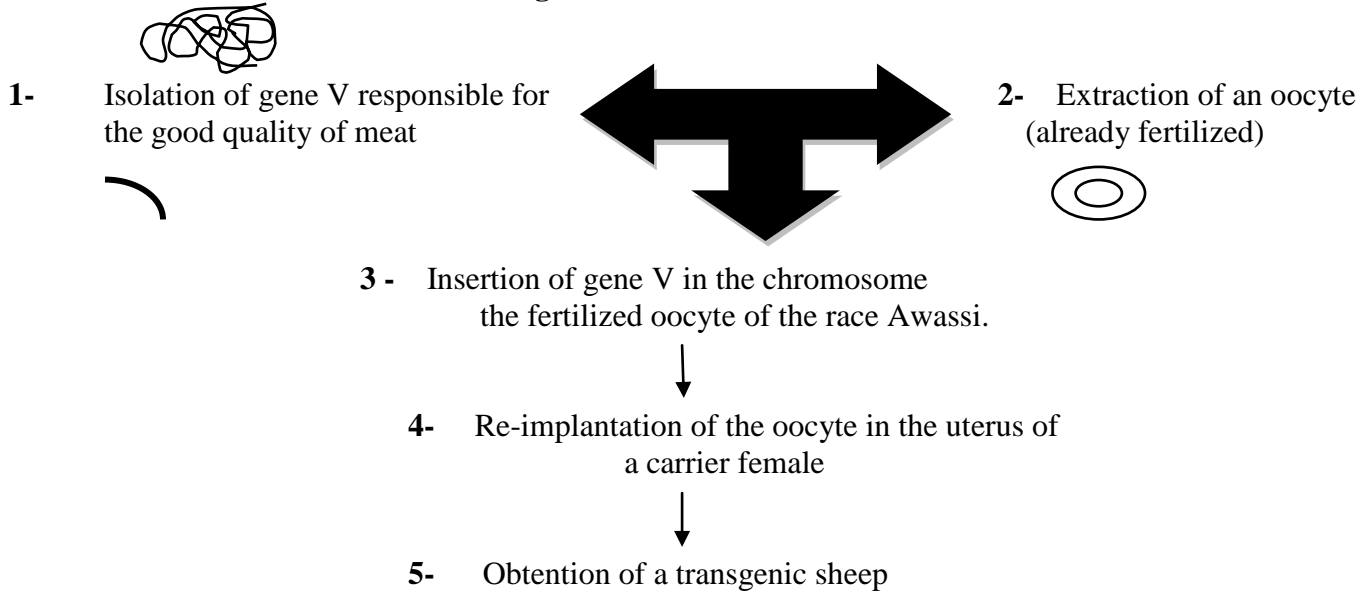
A – The following document represents a technique of cross between two races of sheeps:

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 sheep, the following technique is proposed:

Extraction of DNA of the Finnish foreign race

Local race Awassi



1. Name this technique.
2. What does the expression "transgenic sheep" 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 sheep?
5. Describe this technique.

Good Work