

Exercise 1 (6 points)

The origin of Goiter

Hypothyroidism, an insufficient secretion of the thyroid gland, is either due to dysfunction of the thyroid gland or due to malnutrition. In infants, this disease is manifested by severe mental retardation, dwarfism and retarded puberty. The adults show weak muscles, hypothermia, as well as goiter. The goiter is the swelling of the anterior part of the neck due to the increase in the volume of the thyroid gland.

- Pick out from the text :
 - two symptoms observed in infants affected by hypothyroidism.
 - the definition of goiter.
 - the possible causes of hypothyroidism.

In order to determine the origin of this disease, the percentage of individuals showing goiter are assessed as a function of the average concentration of iodine in their urine. This concentration reveals the quantity of ingested iodine. The results are shown in the adjacent document.

The average concentration of Iodine in urine ($\mu\text{g}/\text{liter}$)	50	20	5
Individuals showing goiter (%)	5	40	60

- Draw the curve which shows the variation of the percentage of individuals presenting goiter as a function of the average concentration of iodine in urine.
- Determine the origin of goiter.

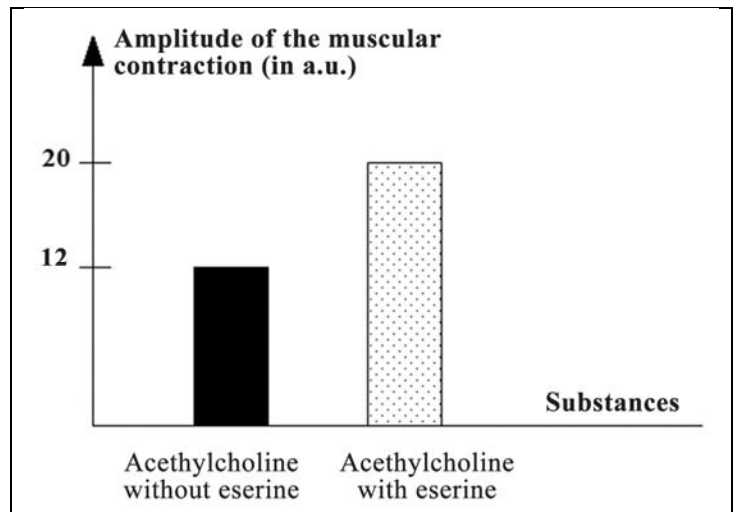
Exercise 2 (7 points)

Eserine and Acetylcholine

In the framework of studying the action of eserine, a substance extracted from plants, on the function of acetylcholine synapses, the following experiment is performed:

The muscle innervated by a nerve is placed in a physiological liquid containing acetylcholine in the absence or presence of eserine. After that, the amplitude of muscular contraction in each of the two cases is measured. The obtained results are shown in document 1.

- List the steps of the transmission of nerve message at the level of a synapse.
- Draw a table which shows the amplitude of muscular contraction in each of the cases.
 - Compare the results in document 1.
 - What can you draw out from this comparison?
- Formulate one hypothesis explaining the mode of action of eserine.



Document 1

In another experiment, acetylcholinesterase enzyme, an enzyme responsible for the degradation of acetylcholine in the synaptic cleft, is added in the absence or presence of eserine.

The activity of acetylcholinesterase enzyme is measured and the obtained results are shown in document 2.

	Activity of Acetylcholinesterase (%)
without eserine	100
with eserine	52

Document 2

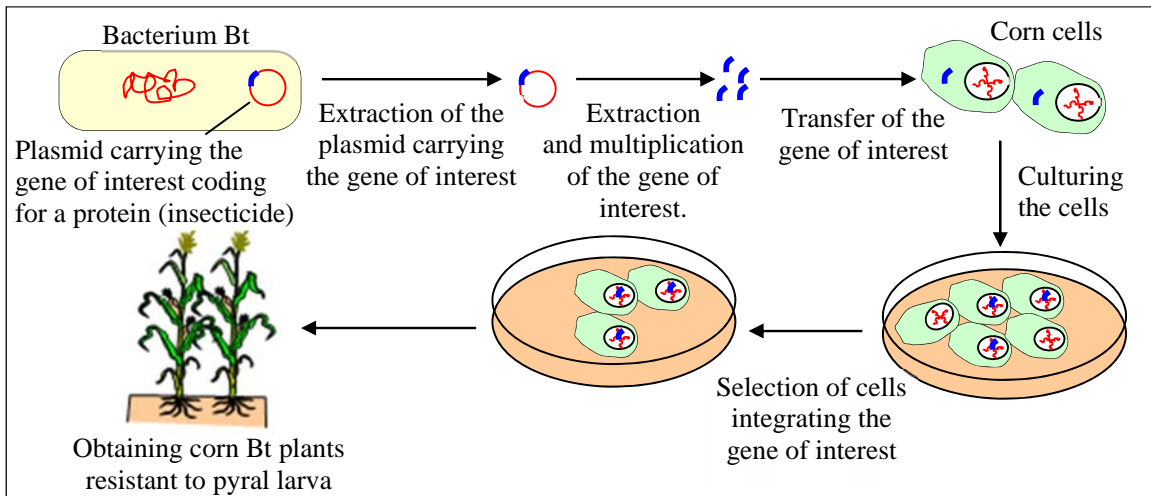
5. Deduce the mode of action of eserine.
6. Explain the variation of the amplitude of muscular contraction in the presence and in the absence of eserine.

Exercise 3 (7 points)

Corn Bt plants

An important loss in the yield of corn plants is observed due to their damage by larval insects such as the larva of pyral. In the frame work of protecting the cultivated plants, the first practical application of transgenesis was the production of corn Bt plants.

Document 1 shows the main steps of the production of corn Bt plant.



Document 1

1. Indicate the cause which leads to the loss of corn plants.
2. Name :
 - 2.1. The donor of the gene of interest.
 - 2.2. The receiver of the gene of interest.
 - 2.3. The enzyme involved in the extraction of the gene of interest.
3. Justify why the corn Bt plants are transgenic.

The mortality rate of pyralis is followed up in a yield cultivated with transgenic corn Bt plants and in another yield cultivated with non-transgenic corn plants treated with an insecticide. The obtained results are shown in document 2.

4. Show that adopting transgenesis in fighting pyralis is more effective than using insecticides.
5. Justify the following statement: "Cultivating corn Bt plants contributes to the protection of the environment".

Cultivated yield	Transgenic corn Bt plants	Non transgenic corn plants treated with insecticides
Mortality rate of pyralis (%)	100	70

Document 2

مسابقة في الثقافة العلمية: مادة علوم الحياة
اسس التصحيح

Q.	Exercise 1 (6 points) The Origin of Goiter	Mark
1.1	Severe mental retardation, dwarfism and retarded puberty	0.75
1.2	The goiter is the swelling of the anterior part of the neck due to the increase in the volume of the thyroid gland.	0.75
1.3	Hypothyroidism is either due to the dysfunction of the thyroid gland or due to malnutrition.	0.75
2	<p>Title: The variation of the individuals showing goiter as a function of the average concentration of iodine in urine</p> <p>Scale: on x-axis: 1 cm for 10 µg/L on y-axis : 1 cm for 10%</p>	2
3	Since the quantity of iodine in urine reveals the quantity of ingested iodine, this indicates that the people with the lowest average concentration of Iodine in urine consume the least quantity of iodine. Moreover, The percentage of individuals showing goiter increases from 5% to 60% as the concentration of iodine in urine decreases from 50 to 20 (µg/liter) meanwhile, the concentration of ingested iodine decreases. Consequently the low intake of iodine is the origin of goiter.	1.75

Q.	Exercise 2 (7 points) Eserine and Acetylcholine	Mark						
1	<p>The steps of the synaptic transmission:</p> <ol style="list-style-type: none"> 1. Arrival of nerve message to the presynaptic terminal bud. 2. Liberation of neurotransmitters into the synaptic cleft by exocytosis. 3. Fixation of neurotransmitters on the specific receptor on the postsynaptic membrane. 4. Generation of nerve message at the level of postsynaptic neuron 5. Recapture and/or degradation of neurotransmitters. 	2						
2	<table border="1"> <thead> <tr> <th>Substances</th> <th>Amplitude of muscle contraction (a.u)</th> </tr> </thead> <tbody> <tr> <td>Acetylcholine without eserine</td> <td>12</td> </tr> <tr> <td>Acetylcholine with eserine</td> <td>20</td> </tr> </tbody> </table> <p>Amplitude of muscular contraction without or with eserine.</p>	Substances	Amplitude of muscle contraction (a.u)	Acetylcholine without eserine	12	Acetylcholine with eserine	20	1
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Acetylcholine without eserine	12							
Acetylcholine with eserine	20							

