

مسابقة في الثقافة العلميّة – مادة علوم الحياة

المدة: ساعة واحدة

(باللغة الإنكليزية)

الاسم:

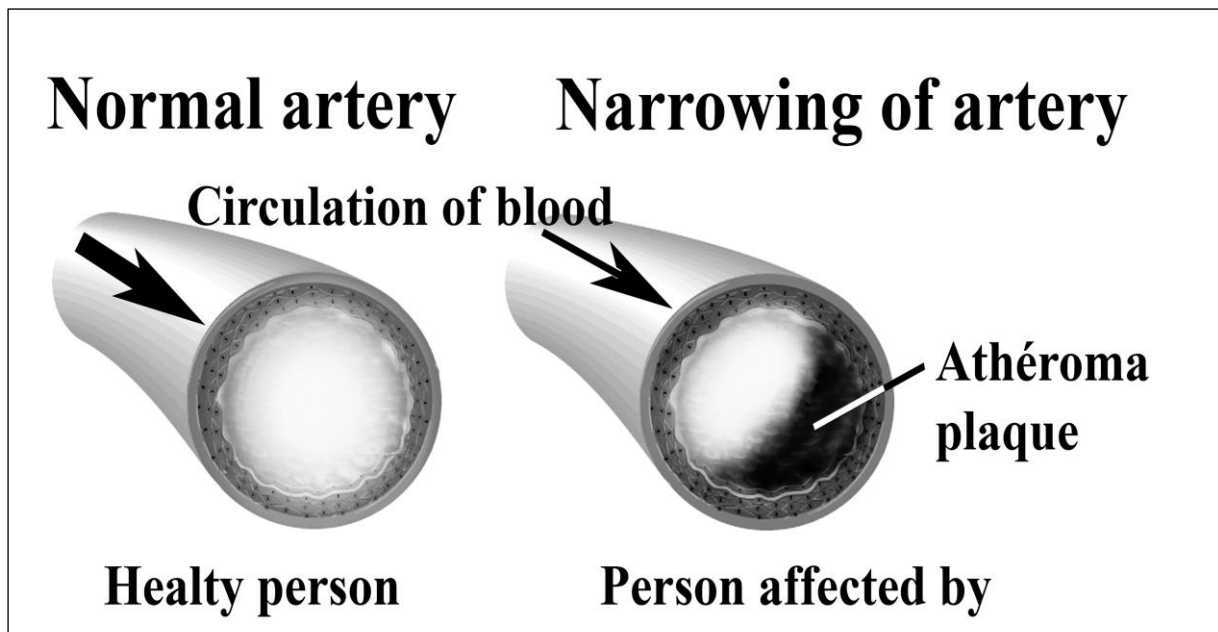
الرقم:

Exercise 1 (7 points)

Atherosclerosis

A food diet rich in lipids favors an increase in the concentration of cholesterol in blood. Consequently, lipids deposit on the walls of arteries causing the formation of atheroma plaque which is at the origin of atherosclerosis disease.

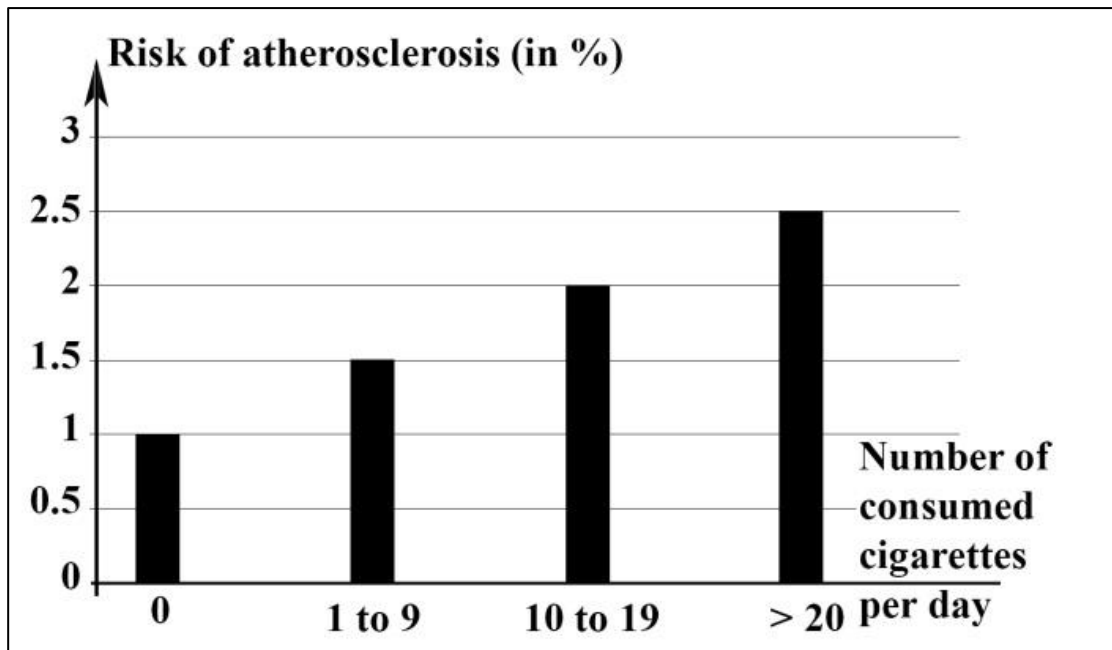
Document 1 shows a cross section of the coronary artery of a healthy person and that of an individual affected by atherosclerosis.



Document 1

- 1- **Draw out** the consequence of the formation of atheroma plaque on blood circulation.
- 2- **Justify** the following statement: LDL is a "bad cholesterol".

Document 2 represents the results of a study showing the relation between smoking and the risk of atherosclerosis development.



Document 2

3- Draw a table representing the results of document 2.

4.1- Analyze the obtained results.

4.2- Derive a conclusion.

5- Suggest two actions that the government would take to prevent the atherosclerosis development in the population.

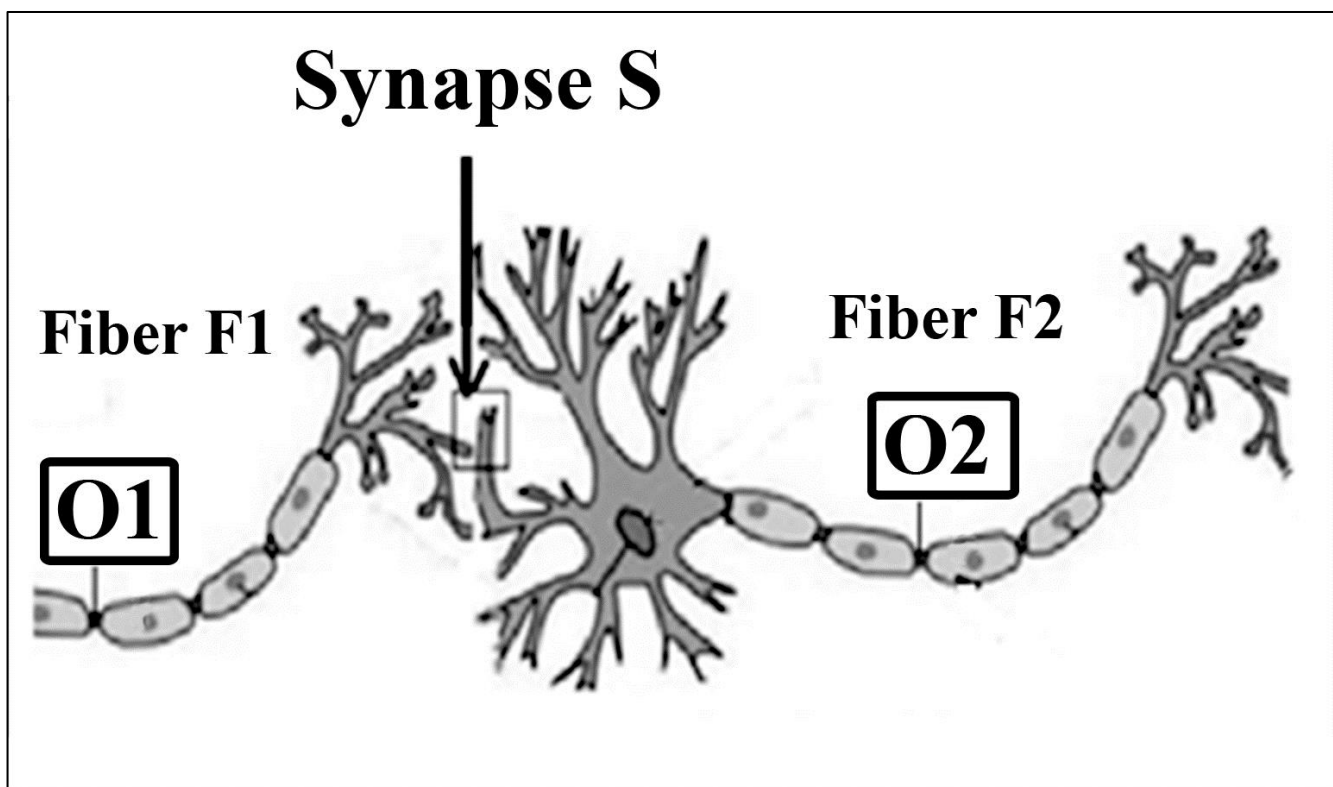
Exercise 2 (7 points)

Nerve Message

Sensory cells for taste are sensory receptors situated on the surface of the tongue. These receptors are involved in the detection of taste: salty, sour, bitter, and sweet.


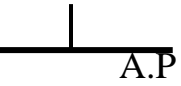



In order to determine the characteristics of the nerve message, NaCl solutions of increasing concentrations are applied on a taste receptor.

Two oscilloscopes O1 and O2 are connected to the nerve fibers F1 and F2 respectively (document 1). F1 belongs to the sensory neuron issued from the sensory taste receptor, and F2 belongs to the neuron synapsing with this sensory neuron.



Document 1

The conditions and the recordings registered at the level of O1 are shown in document 2.

Concentration of NaCl solution (mmol/L)	1	3	10	30	100
Recordings registered at the level of O1					
Number of A.P	0 A.P	1 A.P	5 A.P	8 A.P	12 A.P

Document 2

A.P: Action Potential

- 1- **Specify** the threshold intensity of fiber F1.
- 2- **Show that** the nerve message at the level of fiber F1 is coded by frequency of action potential and not by amplitude.

Oscilloscope O2 records a nervous message for a concentration of the NaCl solution which is equal or above 10 mmol/L.

- 3- **Indicate** if synapse S is excitatory or inhibitory. Justify the answer.
- 4- **List** the steps of the transmission of the nerve message at the level of the synapse.

Exercise 3 (6points)

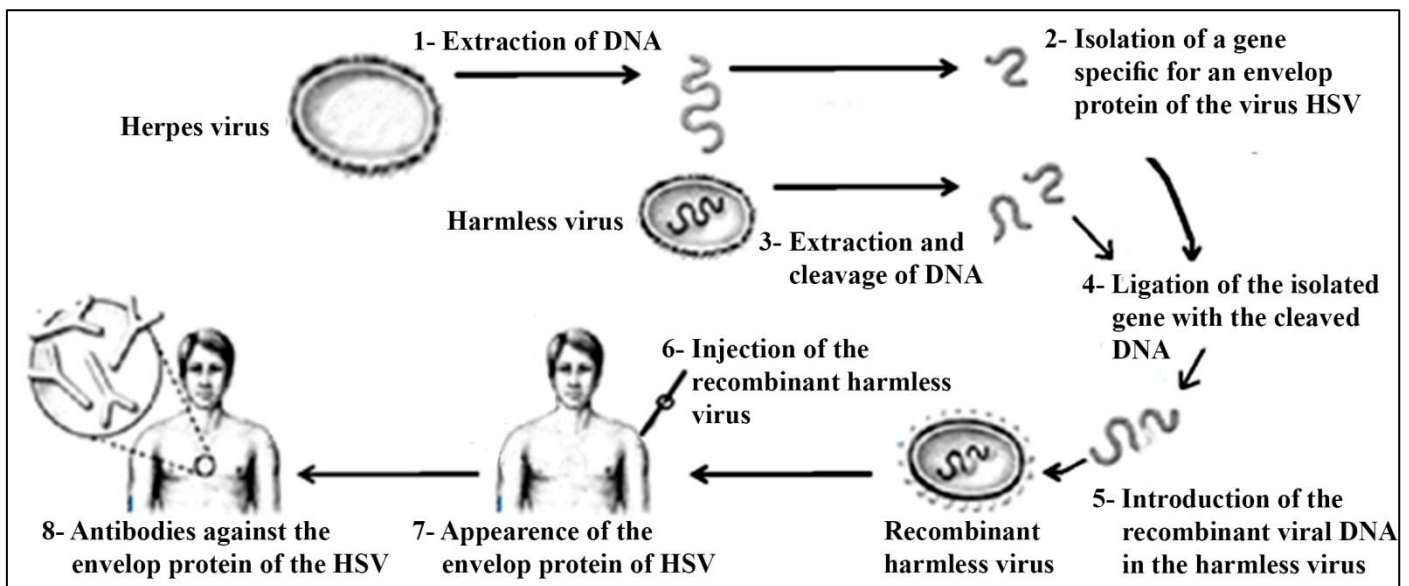
Production of a Vaccine

Herpes is a disease caused by a virus, HSV. This disease is characterized by skin lesions, eye lesions, genital ulcerations, and fatal encephalitis. Once infected by this virus, the organism develops a specific immune response, secreting antibodies against envelop proteins of the HSV virus.

1- Pick out:

- 1.1- the reaction of the organism against HSV.
- 1.2- the symptoms of herpes disease.

A biotechnological method permits the production of a vaccine against this harmful virus using a harmless virus. The steps and results of this technique are represented in the document below.



- 2- **Indicate** the donor and the receiver of the transferred gene.
- 3- **Name** the enzyme used to isolate the transferred gene.
- 4- **Show** that this biotechnological method is qualified as transgenesis.
- 5- **State** another application of transgenesis.

مسابقة في الثقافة العلمية – مادة علوم الحياة
اسس التصحيح

Exercise 1 (7points)

Atherosclerosis

Q.	Answer	Mark										
1	Atheroma plaque slows down the blood circulation.	1										
2	LDL transports lipids to the body cells. However, under abnormal conditions, it deposits cholesterol on the inner walls of arteries, where it accumulates causing the formation of atheroma plaque.	1										
3	<table border="1"> <thead> <tr> <th>Number of consumed cigarettes per day</th> <th>0</th> <th>1 to 9</th> <th>10 to19</th> <th>>20</th> </tr> </thead> <tbody> <tr> <td>Risk of atherosclerosis (%)</td> <td>1</td> <td>1.5</td> <td>2</td> <td>2.5</td> </tr> </tbody> </table> <p>Table showing the variation of the risk of atherosclerosis as a function of the number of consumed cigarettes per day.</p>	Number of consumed cigarettes per day	0	1 to 9	10 to19	>20	Risk of atherosclerosis (%)	1	1.5	2	2.5	2
Number of consumed cigarettes per day	0	1 to 9	10 to19	>20								
Risk of atherosclerosis (%)	1	1.5	2	2.5								
4-1	The risk of atherosclerosis increases from 1% in the absence of smoking, to 2.5% when the rate of smoking exceeds 20 cigarettes per day.	1										
4-2	Smoking favors the development of atherosclerosis.	0.5										
6	<ul style="list-style-type: none"> - Anti-smoking actions: taxes on tobacco, inhibition of smoking in public places... - Awareness campaigns for sensitizing healthy life style. 	1.5										

Exercise 2 (7 points)

Nerve Message

Q.	Answer	Mark
1	The threshold intensity is 3 mmol/L since it's the minimal intensity (concentration) that provokes a response at the level of the nerve fiber (1A.P)	1.5
2	The frequency of AP increases from 1 to 12 A.P while the amplitude stays constant, as the concentration of salt solution increases from 3 to 100 mmol/L. This shows that the nerve message is coded, at the level of the nerve fiber, in frequency of AP but not in amplitude.	2
3	This synapse is excitatory since a nerve message is recorded at the level of the postsynaptic fiber after the stimulation of the presynaptic neuron.	1.5

4	<p>The steps of the synaptic transmission:</p> <ul style="list-style-type: none"> - The nerve message arrives at the terminal buds. - It triggers the liberation (exocytosis) of neurotransmitters to the synaptic cleft. - The liberated neurotransmitters bind to the receptors. - This binding launches a nerve message. - The neurotransmitters are recaptured / degraded by the enzymes in the synaptic cleft. 	2
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Exercise 3 (6 points)

Production of a Vaccine

Q.	Answer	Mark
1.1	Once infected by this virus, the organism develops a specific immune response, secreting antibodies against envelope proteins of the HSV virus.	0.75
1.2	The symptoms are: skin lesions, eye lesions, genital ulcerations, and fatal encephalitis.	0.75
2	The donor of the gene is herpes virus. Le receiver of the gene is the harmless virus.	1
3	The restriction enzyme	0.5
4	This technique is qualified as transgenesis because it is involved in the transfer of a viral gene coding for the envelope protein of the herpes virus, to another virus, the harmless virus. This transferred gene is integrated in the genome of the receiver harmless virus. Then it is expressed in the human body since we observe the production of the envelope protein of the herpes virus.	2
5	Production of insulin. Production of the growth hormone.	1