

الاسم: مسابقة في الثقافة العلمية
الرقم: مادة علوم الحياة
المدة: ساعة واحدة

Answer the following exercises:

Exercise 1 (5 points)

Mental Anorexia

Mental anorexia in adolescent girls is less known but as much severe as obesity. This disease affects mainly young girls. Being of psychological origin, it reflects profound self dissatisfaction and is manifested by an obsession of being thin and by active refusal of food. For an anorexic girl, a meal triggers the anxiety of not being able to stop eating, and consequently gaining weight. This is the beginning of a vicious circle: as she loses more weight, her fear of eating grows up, and she gets even thinner! However, the consequences are terrible: muscle mass loss, disorders of heart rhythm, digestive troubles and greater susceptibility to microbial infection, which can lead to death.... If one of your friends suffers from an unjustified bad mood, becomes isolated, losses appetite and gets thinner, then alert her parents and encourage her to consult a physician.

- 1- Pick out from the text :
 - 1.1- The statement that shows the psychological origin of mental anorexia.
 - 1.2- The consequences of this disease on the health of the adolescent girl.
 - 1.3- The actions that you must adopt if one of your friends becomes anorexic.
- 2- Draw out the meaning of anorexia.
- 3- Bulimia is a food behavior opposed to anorexia. Specify the principle symptom of this behavior.

Exercise 2 (5 points)

Nutrition and Cardiovascular Diseases

To fight against cardiovascular diseases, nutritionists recommend eating fruits and vegetables and reducing the intake of animal fat, a source of cholesterol.

The consumption of 350 g of fruits and of 350 g of fresh vegetables per day is particularly recommended for preventing certain diseases that are related to very high cholesterol level.

- 1- List the consequences of high blood cholesterol level on health.

Numerous epidemiological surveys have proved the role of fruits and vegetables on nutritional prevention of major pathologies like cardiovascular diseases .The results of these surveys are presented in the following document.

		City 1	City 2	City 3
Diet (in g/ day)	Fruits	160	149	238
	Vegetables	212	217	306
	Butter (source of cholesterol)	20	22	13
Mortality due to cardio-vascular diseases (per 100 000 inhabitants and per one year)		300	280	180

- 2- Construct a histogram that translates the rate of mortality as a function of cities.
- 3- Justify, referring to the above document, the role of fruits and vegetables in preventing cardiovascular diseases.
- 4- Specify, based on the document, another factor which permits the prevention of cardiovascular diseases. Justify the answer.

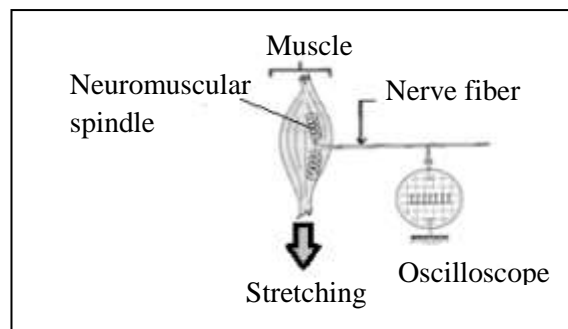
Exercise 3 (5 points)

The Encoding of the Nervous Message

In the middle of the contractile muscle fibers of a muscle, there exist spiral structures that are called: neuromuscular spindles. Each spindle is innervated by a myelinated afferent nerve fiber.

- 1- Specify the importance of the presence of myelin on the nerve fiber.

We implant a microelectrode of an oscilloscope in the nerve fiber (document 1) and we study the response of this fiber upon subjecting the muscle to stretching of increasing lengths.



Document 1

Document 2 represents the obtained results. Each vertical line represents an action potential.

Stretching length	50 mm	55 mm	60 mm	70 mm
The obtained recordings (in AP/ 1s)				

Document 2

- 2- Indicate the stimulus used in this experiment as well as its receptor.
- 3- Analyze the results of document 2. What can we draw out concerning the encoding of the nervous message?
- 4- Explain the absence of response for a stretching of 50 mm length.

Exercise 4 (5 points)

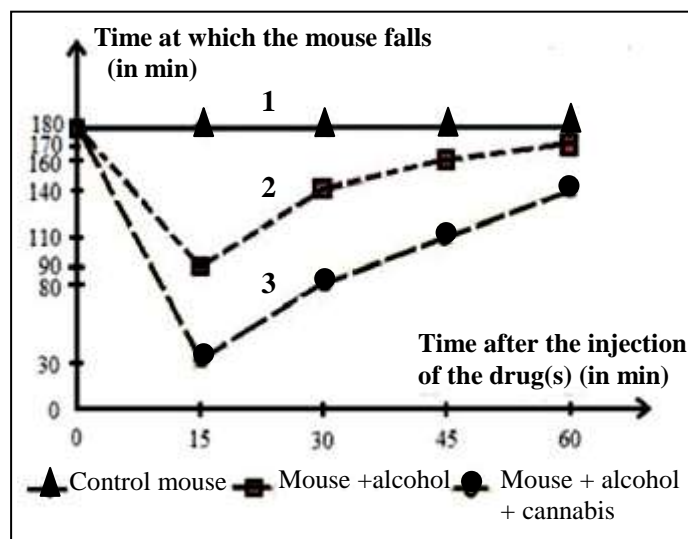
The Effects of Alcohol and Cannabis

Cannabis acts on the nervous system. As alcohol or other drugs, it perturbs the transmission of nerve messages at the level of synapses. This slows down reflexes, increases the time of reaction and decreases the mental concentration of the individual.

- 1- Define drugs.

Laboratory researchers can visualize the effects of alcohol and cannabis on the motor skills of a mouse using the experiment of the rotating bar. They place a mouse on a bar that rotates and measure the time at which the animal falls.

The opposite document shows, with respect to a control mouse (1), the results of this test applied on a mouse that is injected with alcohol alone (2) or with alcohol and cannabis (3).

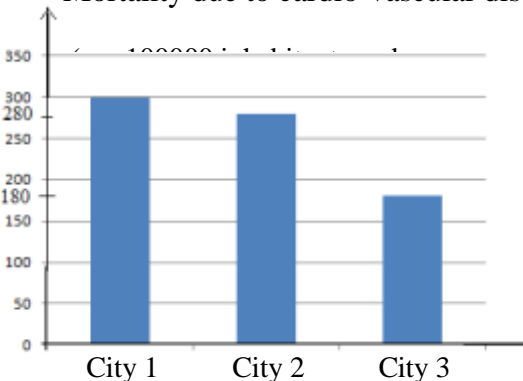


- 2- Compare, at 15 minutes after the injection of the drugs, the time at which the control mouse falls to the time at which the other mouse, injected with alcohol alone, falls. Draw out a relation concerning the action of alcohol.
- 3- Compare, at 15 minutes after the injection of the drugs, the time at which mouse 2 falls to the time at which mouse 3, injected with alcohol and cannabis, falls. Draw out a relation.

A recent campaign for road accident prevention states: "On the road, cannabis + alcohol is 15 times more risky for mortal accidents".

- 4- Justify referring to what precedes the statement of this campaign.

Part of ex	Answer key	Note
Exercise 1 (5 points)		
1-1	As she loses more weight, her fear of eating grows up, and she gets even thinner! Or For an anorexic girl, a meal triggers the anxiety of not being able to stop eating, and consequently gaining weight.	1
1-2	The consequences are terrible: muscle mass loss, disorders of heart rhythm, digestive troubles and greater susceptibility to microbial infection, which can lead to death....	11/4
1-3	Alert her parents and encourage her to consult a physician.	1
2	Anorexia is a disease of psychological origin, characterized by an active refusal of food in order to maintain slimness.	1
3	The principle symptom of Bulimia is obesity.	3/4

Part of ex	Answer key	Note								
Exercise 2 (5 points)										
1	Cholesterol deposits on the wall of the coronary arteries of the heart forming atheroma plaques. These latter narrow the diameter of the arteries. This may lead to cardiac infarction.	1								
2	Variation of the mortality rate as a function of cities Mortality due to cardio-vascular diseases  <table border="1" style="display: none;"> <caption>Mortality due to cardio-vascular diseases</caption> <thead> <tr> <th>City</th> <th>Mortality rate (per 100,000 inhabitants)</th> </tr> </thead> <tbody> <tr> <td>City 1</td> <td>300</td> </tr> <tr> <td>City 2</td> <td>280</td> </tr> <tr> <td>City 3</td> <td>180</td> </tr> </tbody> </table>	City	Mortality rate (per 100,000 inhabitants)	City 1	300	City 2	280	City 3	180	2
City	Mortality rate (per 100,000 inhabitants)									
City 1	300									
City 2	280									
City 3	180									
3	Mortality rate by cardiovascular diseases- decreases from 300 per 100,000 inhabitants per one year for city 1 to 180 for the city 3 when the quantities of fruits and vegetables in their diets increase respectively from 160 g per day in city 1 to 238 g per day in city 3. This verifies the role of fruits and vegetables in the nutritional prevention of cardiovascular diseases.	1								
4	The decrease in the consumption of butter (1/2 pt) because when the consumption of butter decreases from 20 g per day in city 1 to 13 g per day in city 3, the mortality rate decreases from 300 to 180 per 100,000 inhabitants per one year.(1/2 pt) Or A comparison between city 2 and city 3	1								

Parts of ex	Answer key	Note
	Exercise 3 (5 points)	
1	The presence of myelin speeds up the transmission of the nervous message.	1
2	The stimulus is the stretching of the muscle. (3/4 pt) The receptor is the neuromuscular spindle. (3/4 pt)	11/2
3	There is no response to a stretching of 50 mm length, however starting from a stretching of 55 mm of length a response is recorded, under the form of a series of action potentials whose frequency is 8 AP/s of constant amplitude. This frequency increases to reach a value of 15 AP/s having always the same amplitude when stretching length increases to 70 mm.(1 pt) This implies that, above a certain threshold of stimulation, the nervous message at the level of the fiber is coded by modulation of frequency of AP and not by amplitude.(1/2 pt)	11/2
4	The stretching of 50 mm is ineffective because it is less than the threshold intensity of stimulation. This explains the absence of response for this stretching.	1

Parts of ex	Answer key	Note
	Exercise 4 (5 points)	
1	Drug: chemical substance that alters the nervous communication and induces physical and psychic dependency as well as tolerance.	1
2	15 minutes after injection, the mouse injected with alcohol alone falls after a duration of 90 minutes which is less than that of the control mouse 180 minutes. (3/4 pt). Thus the alcohol weakens the motor skills of the mouse. (3/4 pt). Or Slows down the mouse reflexes	1 1/2
3	The mouse injected with cannabis and alcohol together falls after a duration of 30 minutes which is less than that of the mouse injected with alcohol alone 90 minutes. (3/4 pt) Thus the cannabis amplifies the effect of alcohol by increasing the weakening of its motor skills and slowing down more its reflexes. (3/4 pt) Or The cannabis and the alcohol are agonist.	1 1/2
4	The alcohol as well as the cannabis, alters the transmission of the nervous messages at the level of synapses. This slows down reflexes and reactions and also diminishes the mental concentration and the motor skills. Together, their effect is amplified, leading to 15 times more mortal road accidents.	1