امتحانات الشهادة الثانوية العامة فرع الآداب والانسانيات

مسابقة في الثقافة العلمية

مادة علوم الحياة المدة: ساعة وإحدة

وزارة التربية والتعليم المديرية العامة لل دائرة الامتحانات

30%

12%

Sugar

10 %

Starch

45%

الاسم: الرقم:

Answer the following exercises : **Exercise 1 (5 points)**

Good and Bad Carbohydrates

Facing the increase in obesity cases, a team established by the agency of food safety recommends that a consumer should be able to distinguish between "good" and "bad" carbohydrates. For this consumer to manage properly his meal and that of his family, it is necessary to be aware of the large quantities of sugars hidden in foods, especially the sugars in beverages. We should consume a larger amount of complex carbohydrates such as: bread, potatoes, cereals and legumes and also consume simple carbohydrates found in fruits. On the other hand, we should consume less amount of food to which simple carbohydrates are added by the food industry such as: chocolate bars, filled biscuits and soda; especially that these foods are highly consumed by children and adults. These added carbohydrates do not contain vitamins or essential micronutrients and they favour cardiovascular diseases and obesity.



Document 2 shows the food consumption in a population.

3 - Compare the current consumption to the desirable one presented in document 2, and draw out the nutritional problem in the diet of this population.

4 - Determine the consequences on the health of the considered population in case the current consumption persists.

Exercise 2 (5 points)

carbohydrate ".

Salt intake and arterial pressure

Protein

12%

Certain complications of untreated arterial hypertension are cerebral vascular accidents, heart failure, kidney damage and retinopathy (a disease that affects the retina of the eye).

A study done on more than 3000 individuals showed that consuming less salt permits to reduce, on the long term, the risk of developing cardiovascular diseases. Some of these individuals were obliged to reduce their consumptions of salty products by 25 to 30% and were followed for 10 to 15 years. We observed that cardiovascular diseases decreased by one quarter in individuals adopting less salty diet.

Document 1

- 1- Pick out from document 1 the complications of arterial hypertension. Document 2 shows the results of a lab experiment done on rats which received food to which NaCl is either added or not.
- 2- Analyze the results of document 2 and draw out an adequate relation.
- 3- Justify, by referring to documents 1 and 2, the conclusion of the study: "Eating less salt permits reducing the risk of cardiovascular diseases on the long term".



Document 2

(starch) 28%

Document 2

Alzheimer's disease, the disease of the century, is an enormous public health problem. It encompasses dementia and cerebral lesions (loss of neurons) that begin in the innermost region of the temporal lobe of the cerebrum which is involved in memory processing. This disease is manifested by a set of symptoms which includes loss of short-term memory, behavioral modifications and loss of judgmental abilities and reasoning.

Yet, little is known about the cause of the progressive destruction of neurons responsible for the loss of cognitive functions. Several risk factors including environmental and genetic factors are currently under study.

Document 1

70 -

60 50

40

30

20

10

1-Pick out from document1:

1.1-The symptoms of the disease.

1.2- The region presenting cerebral lesions.

An experiment was performed to determine the cause of this disease: different neurons were placed in three media A, B and C containing increasing concentrations of aluminum. We measured the percentages of damaged neurons; the results are shown in document 2.

2 - Construct a table that translates the obtained results.

3 - Indicate which risk factor, environmental or

genetic, is validated by the results of document 2. Justify the answer.

4 - Name the neurotransmitter whose deficiency is at the origin of the disease.

Exercise 4 (5 points)

Synaptic functioning

We apply two effective stimulations of increasing intensities I_1 and I_2 on a sensory receptor. We record, by the help of two oscilloscopes O_1 and O_2 , the electrical activities of the pre-and post-synaptic neurons during time t (document 1). Results are shown in document 2.



Document 3

Document 1

1 -Specify whether the studied synapse is excitatory or inhibitory. Justify the answer.

2 - Analyze the recordings obtained at the level of the presynaptic neuron (in O1) and draw out the type of coding of nerve message.

Document 3 reveals a detailed diagram of area (S) shown in document 1.

3 – Name the steps of the synaptic functioning numbered 1-2-3-4-5.

Document 2





B

C

30

Degeneration of neurons (in %)



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وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات

مسابقة في الثقافة العلمية مادة علوم الحياة اسس التصحيح

		1
Part	Exercise 1 (5 points)	Mark
of Ex		
1	Foods rich in simple carbohydrates: chocolate bar, filled biscuits, soda.	1
	Foods rich in complex carbohydrates: bread, potatoes, cereals and legumes.	
2	Starch is qualified as "good" carbohydrate, because it is considered as a slow sugar which has a slow absorption and is not immediately available. It is stored as glycogen in the liver. Sucrose or sugar hidden in beverages is qualified as "bad" carbohydrate, because it is considered as a fast sugar, releasing its energy immediately. If this energy is not directly used, the fast sugars will be stored as lipids.	1.5
3	The percentages of simple carbohydrates 20% and lipid 40% in the current consumption which are respectively higher than those of simple carbohydrate 10% and lipid 30% in the desirable consumption, while the percentage of complex carbohydrates in the current consumption is 28% which is less than that in the desirable consumption 48%. The consumption of protein 12% is identical in both cases. Thus, the current consumption of this population is rich in simple carbohydrates and lipids.	1.5
4	In case the current consumption persists, there would be serious health consequences: an increase in the proportion of obese persons and in the cardiovascular diseases due to the consumption of "bad" carbohydrates which are simple carbohydrates added by food industries to foods consumed by children and adults.	1

Part	Exercise 2 (5 points)	Mark
of Ex		
1	Cerebral vascular accident, heart failure, kidney damage and retinopathy.	1
2	The maximum mean of arterial pressure is 120 mmHg for a diet completely deprived of added salt ($\%$ NaCl = 0), this pressure increases to 160 mmHg as the percentage of added NaCl salt in the diet increases to 10%. This shows that arterial hypertension and the amount of added salt varies in the same sense or a diet rich in salt is responsible for arterial hypertension.	2
3	The text shows that untreated hypertension is a risk factor for cardiovascular accidents and the study done on rats shows that hypertension is favored by the consumption of a too much salty diet, thus one of the means to reduce cardiovascular diseases is to decrease salt consumption in the diet.	2

Part of Ex	Exercise 3 (5 points)	Mark
1		
1.1	Loss of short-term memory, behavioral modifications and loss of judgmental abilities and reasoning.	1
1.2	Innermost region of the temporal lobe of the cerebrum which is involved in memory processing.	0.5
2	The variation of the percentages of neuron degenerationas a function of aluminum quantity in the three media: A, B and C.MediumABCQuantity of Aluminium (in au)102030Degeneration of neurons (in%)52060	1.5
3	The validated risk factor of Alzheimer's disease is the environmental factor because the histogram shows that the percentage of the degeneration of neurons increases from 5% (medium A) to 60% (medium C) with the increase in the quantity of aluminum from10 a.u (medium A) to 30 a.u.(medium C). Thus, aluminum seems to be an environmental factor that favors the destruction of neurons and consequently it represents a risk factor for Alzheimer's.	1.5
4	Acetylcholine	0.5

Part of Ex	Exercise 4 (5 points)	Mark
1	The synapse is excitatory because for intensity I_1 , 4 AP /t are recorded by oscilloscope O_1 connected to the pre-synaptic neuron and a train of 14 AP/t are recorded by oscilloscope O_2 which is connected to the post-synaptic neuron.	1.5
	OR	
	For intensity I ₂ ,	
2	The frequency of nerve message recorded by O_1 increases from 4 AP / t to 8 AP / t of	1
	the same amplitude when the intensity of stimulation increases from I_1 to I_2 ; thus, the	
	nerve message along a nerve fiber is coded by modulation of frequency of AP and not	
	by amplitude.	
3	1. Arrival of action potentials to the pre-synaptic terminal buds.	2.5
	2. Release of the neurotransmitter into the synaptic cleft, or exocytosis.	
	3. Recapturing of the neurotransmitter.	
	4. Fixation of neurotransmitter on specific receptors on the post-synaptic membrane.	
	5. Generation of action potential by the post-synaptic neuron.	