وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات الرسميّة	امتحانات الشهادة الثانوية العامّة فرع: الاجتماع والاقتصاد	دورة العام ٢٠١٧ العاديّة الاثنين ١٩ حزيران ٢٠١٧

مسابقة في الثقافة العلميّة مادة علوم الحياة — الاسم:
المدة: ساعة — الرقم:

Exercise 1 (7points) Mode of Action of THC

Tetrahydrocannabinol (THC) is an active substance of a drug, the cannabis. The consumption of THC increases the sensation of pleasure by increasing the quantity of released dopamine at the level of certain synapses in the cerebrum. Its regular intake induces dependence, and when taken at high doses it triggers hallucinations.

1- Pick out:
1-1- The consequence of the utilization of high dose of THC.
1-2- The neurotransmitter responsible for the sensation of pleasure.
2- List the steps of synaptic transmission of the nerve message.

In order to determine the mode of action of THC the following studies are performed.

Study 1: THC acts in the cerebrum at the level of GABA releasing neurons. GABA is a neurotransmitter which acts on the dopamine releasing neurons. The quantity of released GABA is measured, before and after effectively stimulating the GABA releasing neurons, in the presence and absence of THC. The experimental conditions as well as the obtained results are presented in document 1.

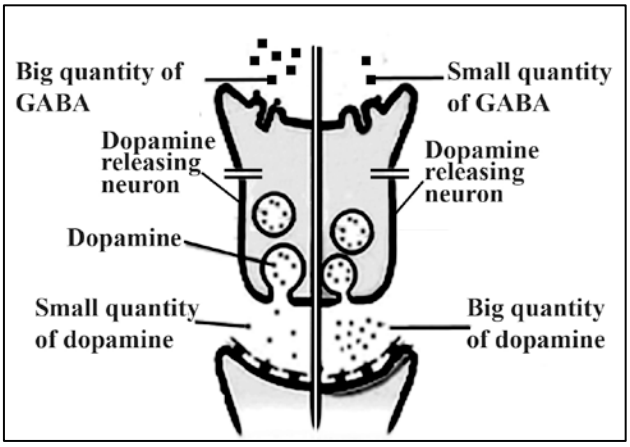
	Quantity of released GABA(a.u)	
	before the stimulation	after the stimulation
Without THC	Null	Big
With THC	Null	Small

Document 1

3- Interpret the results presented in document 1.

Study 2: This study shows the effects of two different quantities of GABA on a dopamine releasing neuron. The results are schematized in document 2.

4- Determine the effect of GABA on the release of dopamine.
5- Explain how THC increases the sensation of pleasure.



Document 2

Exercise 2: (7 points) Obesity in Lebanon

A study conducted by the faculty of Medicine and the faculty of Agriculture and Food Sciences at the American University of Beirut, between the years 1997 and 2008, showed that the percentage of overweight Lebanese adolescents, was 20% in 1997 and became 35% in 2008. This study declares that if this variation continues at the same rate, Lebanon would face high occurrence of diseases related to obesity. It also showed that this obesity is due to food rich in fat, excessive consumption of soft drinks and less practice of physical activities.

Document 1

1- Pick out from document 1 two factors that favor obesity.
2- How does the percentage of overweight Lebanese adolescents vary between the years 1997 and 2008?

BMI or body mass index permits the classification of individuals: an individual is considered thin when his BMI is less than 18; he is normal when his BMI is between 20 and 25; he is considered overweight when his BMI is between 26 and 29; and he is obese when his BMI is greater than 29.
Document 2 shows the variation of the relative risk of death as a function of BMI.

Individual	Normal	Obese	
BMI (kg/m^2)	22 - 25	30 - 32	≥ 40
Relative risk of death	0.8	1.1	2.4

Document 2

3- Draw a histogram showing the variation of the relative risk of death as a function of BMI.
4- Interpret the results in document 2.
5- Justify why the results of this study are alarming for Lebanon.
6- Suggest two advices to reduce obesity in Lebanese adolescents.

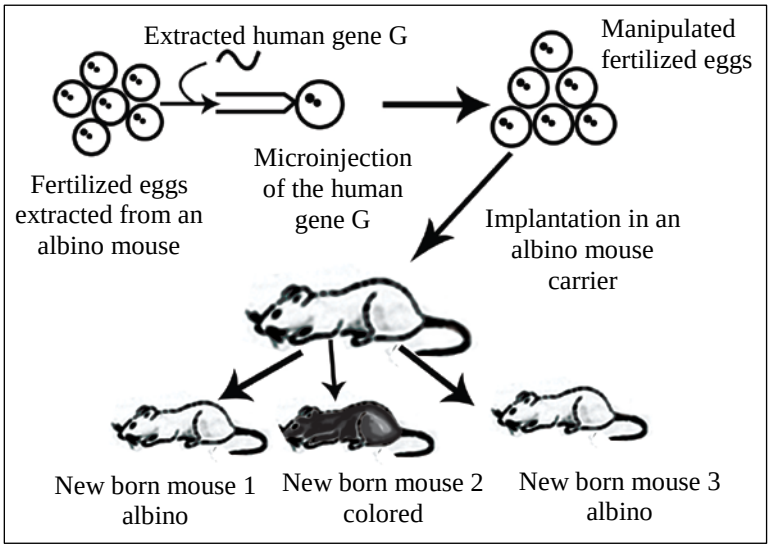
Exercise 3 (6 points) A Possible Therapy

Albinism is a hereditary disease due to the absence of melanin, a pigment responsible for the color of skin, hair and eyes. Albino individuals cannot synthesize melanin due to the absence of the enzyme that allows the transformation of the amino acid tyrosine into melanin.

In order to adjust the genetic defect responsible for albinism in humans, the following experiment is performed on mice before being applied on humans.

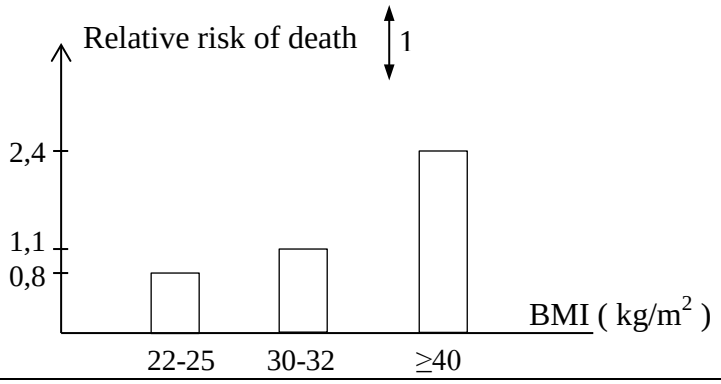
The human gene, G, which codes for the enzyme involved in the synthesis of melanin is injected into fertilized eggs of an albino female mouse crossed with an albino male mouse. The experimental setup and the obtained results are presented in the following document.

1- Pick out:
1-1- The cause of the absence of melanin.
1-2- The role of melanin.
2- Name the enzyme that allows the isolation of the human gene involved in the synthesis of melanin.
3- Indicate, by referring to the document, the donor and the receiver of the gene G.
4- Specify which of the young mice 1, 2 or 3 is qualified as "transgenic".
5- State two other applications of transgenesis in the medical field.



مسابقة في الثقافة العلميّة مادة علوم الحياة
اسس التصحيح

Question	Exercise 1 (7points) **Mode of Action of THC**	Note
1-1	When taken at high doses it triggers hallucinations.	¾
1-2	Dopamine is the neurotransmitter responsible for the sensation of pleasure	¾
2	- Arrival of the nervous message at the level of the terminal buds of the presynaptic neuron. - Liberation of the neurotransmitter by exocytosis into the synaptic cleft. - Fixation of the neurotransmitters to the postsynaptic membrane receptor. - Generation of a postsynaptic membrane potential or transmission of the nervous message onto the postsynaptic membrane. - Elimination of the neurotransmitter molecules by enzymatic degradation or by recapture of the neurotransmitters by the presynaptic membrane.	**2½**
3	Before the stimulation, the quantity of released GABA is null with and without THC. However, after the stimulation, this quantity increases in both media, but the increase is more significant in the medium with THC compared to that without THC. This means that THC inhibits the release of GABA.	**1½**
4	When the quantity of the released GABA is big, the quantity of the released dopamine is small, vice versa, when the quantity of the released GABA is small, the quantity of the released dopamine is big. Therefore, GABA inhibits the release of dopamine.	**1**
5	THC reduces the release of GABA, which increases the release of dopamine. Since Dopamine is the neurotransmitter responsible for the sensation of pleasure, Thus, in the presence of THC, this pleasure sensation is going to increase.	**1**

Question	Exercise 2: (7 points) Obesity in Lebanon	Note
1	The two factors are: - food rich in fat - excessive consumption of soft drinks - less practice of physical activities.	**1**
2	The percentage of overweight Lebanese adolescents increases from 20% in 1997 to 35% in 2008.	**½**
3	Title : the variation of the relative risk of death as a function of BMI  	**2**
4	The relative risk of death is 0.8 for a BMI varying between 22 and 25 kg/m^2. This risk increases with the increase of BMI to attain 2.4 kg/m^{2}in obese individuals having a BMI ≥ 40 kg/m^2. This means that obesity favors the relative risk of death.	**1**
5	Based on document 1, the percentage of overweight Lebanese adolescents increases as a function of years, and these adolescents have the risk to be obese. Also, document 2 shows that the relative risk of death is high for a BMI ≥ 30 kg/m^2 corresponding to a state of obesity. Referring to these facts, the risk of death among Lebanese adolescents becomes important, which is alarming.	**1**
6	- reduce the consumption of fats - Avoid sedentary life by practicing physical activities - Adopt a balanced food diet	**1½**

Question	Exercise 3 (6 points) A Possible Therapy	Note
1-1	Albino individuals cannot synthesize melanin due to the absence of the enzyme that allows the transformation of the amino acid tyrosine into melanin.	**½**
1-2	Melanin is a pigment responsible for the color of skin, hair and eyes.	**½**
2	Restriction enzyme	**½**
3	The donor: Non-albino human The receiver: Fertilized eggs extracted from an albino mouse	**1**
4	Mouse 2 is transgenic since it is colored, since it has integrated in its genome a new human gene coding for the enzyme involved in the synthesis of melanin and this gene is expressed in the birth of a colored mouse.	**1½**
5	Production of antibodies. Production of insulin.	**2**