

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.

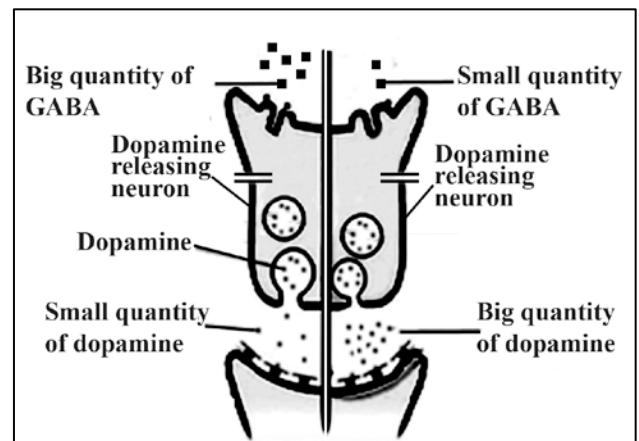
Study 1: THC acts in the cerebrum at the level of GABA releasing neurons. GABA is a neurotransmitter which acts on the dopamine releasing neurons. The quantity of released GABA is measured, before and after effectively stimulating the GABA releasing neurons, in the presence and absence of THC. The experimental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



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)

Deficiency in Vitamin B₁₂

The body needs a daily intake of 6 µg of vitamin B₁₂ in order to ensure good cell multiplication and to maintain a healthy state of the nervous system. This vitamin is absorbed at the level of the intestine but its absorption necessitates the presence of a substance called "Intrinsic factor" that is produced by the mucosa of the stomach. The deficiency in vitamin B₁₂ develops usually due to one of the following reasons: the stomach doesn't produce a sufficient amount of "Intrinsic factor", the intestine doesn't sufficiently absorb vitamin B₁₂ or food diet that doesn't contain a sufficient amount of this vitamin. A deficiency in vitamin B₁₂ reduces the number of red blood cells that should be produced in millions at each minute, hence provoking anemia. If this deficiency continues for a long time, the nervous system will be affected leading to muscular weakness.

Document 1

- 1- Pick out from the text :
 - 1-1- The role of vitamin B₁₂ in the body.
 - 1-2- The three causes of vitamin B₁₂ deficiency.
- 2- Draw out the role of the Intrinsic factor.
- 3- Justify, referring to document 1, the relation between vitamin B₁₂ deficiency and anemia.
- 4- Indicate if vitamin B₁₂ is liposoluble or hydrosoluble.

Document 2 shows the level of vitamin B₁₂ in certain foods.

- 5- Justify the following statement: "Individuals suffering from anemia are advised to consume chicken liver".

Vegans are individuals who consume only food of plant origin.

- 6- Explain, referring to document 2, why these vegans are at risk of developing vitamin B₁₂ deficiency.

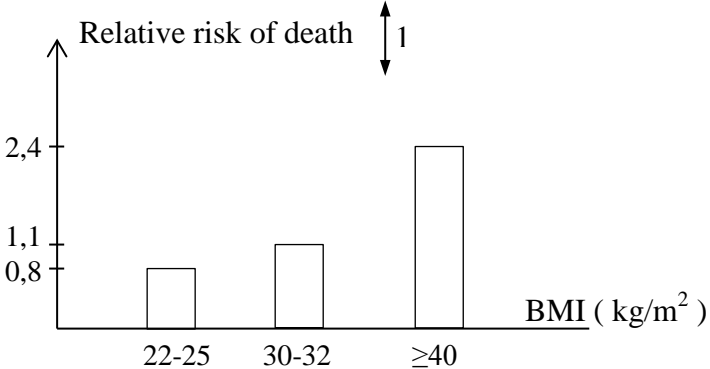
Food (per 100g)	Vitamin B ₁₂ (µg)
Walnut	0
Carrot	0
Black berries	0
Wheat	0
Cheese (cheddar)	0.85
Chicken liver	16.8
Egg	1.12
Fish	1.37
Lamb meat (low in fat)	2.64

Document 2

مسابقة في الثقافة العلمية 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.	3/4
1-2	Dopamine is the neurotransmitter responsible for the sensation of pleasure	3/4
2	<ul style="list-style-type: none">- 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.	2 1/2
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.	1 1/2
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: <ul style="list-style-type: none">- 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.	1/2

3	<p>Title : the variation of the relative risk of death as a function of BMI</p> 	2
4	<p>The relative risk of death is 0.8 for a BMI varying between 22 and 25 kg/m². This risk increases with the increase of BMI to attain 2.4 kg/m² in obese individuals having a BMI ≥ 40 kg/m². This means that obesity favors the relative risk of death.</p>	1
5	<p>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/m² corresponding to a state of obesity. Referring to these facts, the risk of death among Lebanese adolescents becomes important, which is alarming.</p>	1
6	<ul style="list-style-type: none"> - reduce the consumption of fats - Avoid sedentary life by practicing physical activities - Adopt a balanced food diet 	1½

Question	Exercise 3: (6 points) Deficiency in Vitamin B ₁₂	Note
1-1	Vitamin B ₁₂ ensures good cell multiplication and maintains a healthy state of the nervous system.	½
1-2	<p>The three factors are: the stomach doesn't produce a sufficient amount of "Intrinsic factor" the intestine doesn't sufficiently absorb vitamin B₁₂ Food diet that doesn't contain a sufficient amount of this vitamin.</p>	1½
2	Intrinsic factor allows the absorption of vitamin B ₁₂ by the intestine.	½
3	Anemia is due to a reduction in the number of red blood cells that should be produced in millions at each minute. And this production necessitates cell multiplication which vitamin B12 is responsible for. Thus, a deficiency in B12 leads to an absence of cell multiplication and hence a deficiency in red blood cell thus anemia.	1
4	Vitamin B12 is hydrosoluble.	½
5	The level of vitamin B12 in chicken liver is high 16.8µg. Therefore, anemic patients are advised to eat chicken liver in order to increase the cell multiplication and consequently increase the number of red blood cells.	1
6	Foods like (walnut, carrot, black berries, wheat) mentioned in document 2 do not contain vitamin B12. Since vegans only consume food of plant origin, they cannot cover the lack of this vitamin in their food that doesn't contain animal origin products, and consequently they risk developing a serious vitamin B12 deficiency.	1

