

الاسم:
الرقم:

مسابقة في مادة علوم الحياة
المدة: ساعة

Exercise 1 (7 points)

Cocaine , a Fake Paradise

Cocaine is a drug of plant origin. It acts at the level of dopamine synapses.

Dopamine is a neurotransmitter responsible for the sensation of pleasure.

Document 1 shows the functioning of a dopamine synapse without cocaine (Case A) and with cocaine (Case B).

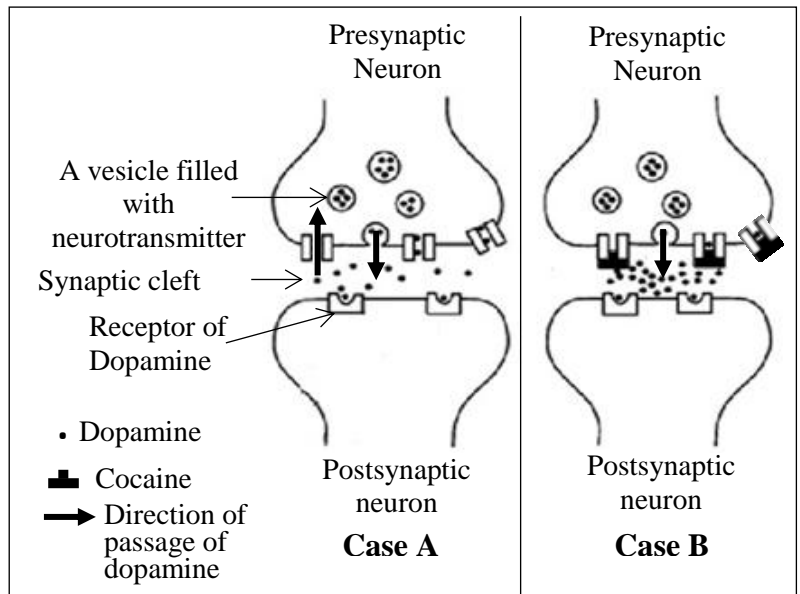
1. Draw out the step of synaptic transmission that is perturbed by cocaine.
2. Explain how cocaine leads to a stronger sensation of pleasure.

In an attempt to verify if cocaine provokes a quick occurrence of tolerance, researchers carried out the following experiment:

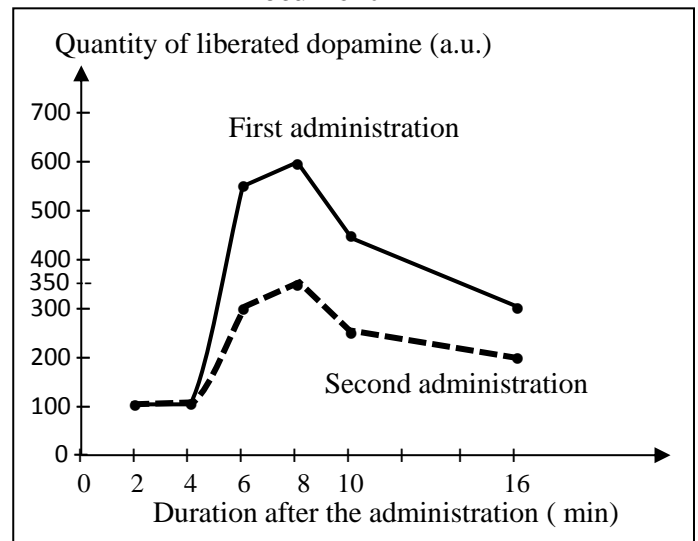
A monkey receives the first administration of cocaine followed by a second one of the same dose, several days later. The amount of dopamine liberated by the nerve cells of the brain is measured after each administration of cocaine. Document 2 presents the obtained results.

Tolerance to a drug corresponds to the reduction of the effect of this drug.

3. Show, by referring to document 2, that cocaine leads to a state of tolerance.
4. Name a consequence of the consumption of drugs other than tolerance.
5. Justify the following statement: "cocaine is an artificial paradise that leads quickly to hell".



Document 1



Document 2

Exercise 2 (7 points)

Advantages of Dietary Fibers

Dietary fibers constitute an important part of all balanced food diets; even though they are neither digested nor absorbed by the body.

In the digestive tract, the intestinal transit has a normal duration that ranges between 30 and 40 hours. In case this duration exceeds 72 hours, the dietary fibers accelerate the intestinal transit, but in case this duration is less than 24 hours, the dietary fibers slow down this transit.

Moreover, a diet rich in dietary fibers provokes a decrease in cholesterol and triglycerides (lipids) levels in the blood.

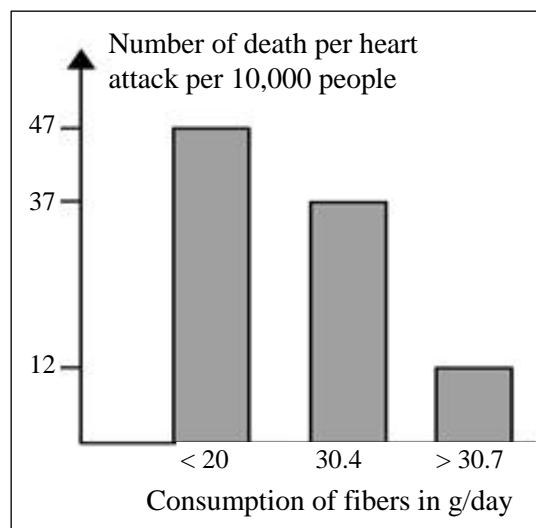
1. Justify the following statement: "dietary fibers control food transit".
2. Explain the mechanism which permits the formation of atheroma plaque due to high level of cholesterol in blood.

Document 1 represents the results of a study that shows the variation of the number of death by heart attack as a function of the daily consumption of dietary fibers.

3. Draw a table that represents the results illustrated in document 1.

4.1. Analyze the results represented in document 1.

4.2. What do you conclude?



Document 1

Europeans living in Africa are more affected than native people of Africa by diseases such as disruption of intestinal transit as well as cardiovascular diseases. The diet of these European immigrants provides less than 25 g of dietary fibers per day, while that of the African population provides up to 100 g of dietary fibers per day.

Document 2

5. Explain, based on all what preceded, why Europeans living in Africa suffer from cardiovascular diseases more than native African people.

Exercise 3 (6 points)

Lifestyle and Health

The Pimas Indians follow a particular lifestyle characterized by sedentary life and overconsumption of food. In this population, obesity is highly manifested. Moreover, the rate of occurrence of diabetes, a disease characterized by an elevated level of sugar in the blood, is so high that it exceeds the world record. On the other hand, other populations suffer from food deficiency.

1. Pick out the characteristics of the life style of the Pimas Indians.

In order to determine the relation between the rate of occurrence of diabetes among the Pimas Indians and their lifestyle, the exploitation of the results of the following studies is proposed.

Study 1: It reveals the relation between the rate of occurrence of diabetes and BMI, body mass index, in this population (doc.1). An adult individual is considered obese when his BMI is greater than 25.

BMI	20<BMI<25	25<BMI<30	30<BMI<35	BMI>35
Rate of occurrence of diabetes (%)	5	13	24	43

Document 1

2. Draw out from document 1 the relation between the rate of occurrence of diabetes and obesity.

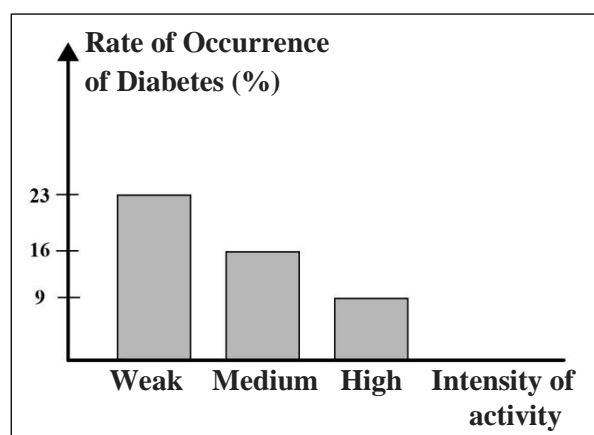
Study 2: It shows the relation between the rate of occurrence of diabetes and the intensity of physical activity in a population having the same BMI range as that prevailed in adult Indian Pimas (doc. 2).

3. Deduce, based on document 2, a second risk factor of diabetes.

4. Explain, based on the results of these studies, the occurrence of diabetes among Indian Pimas.

5. Name two other risk factors of obesity.

6. State two diseases due to food deficiency.



Document 2

الاسم:
الرقم:

مسابقة في مادة علوم الحياة
اسس التصحيح

Q.	Exercise 1 (7 points)	Cocaine, a Fake Paradise	Mark
	Answers	Remarks	
1	The step of synaptic transmission perturbed by cocaine is the recapture of the neurotransmitter.	Without mentioning the neurotransmitter →0.25.	0.5
2	Cocaine prevents the reuptake of dopamine, therefore the molecules of dopamine released persist in the synaptic cleft,. Thus a larger amount of dopamine molecules will be bound to their specific receptors (for a longer time). Since dopamine is a neurotransmitter responsible for the pleasure sensation, a stronger pleasure sensation is induced.	Blockage of the recapture Increase in the concentration of dopamine More molecules fixed on receptors Dopamine responsible for the sensation de plaisir	2
3	5 min after the first administration, the quantity of liberated dopamine increases from 100 to 600 a.u while it increases up to 350 a.u after the second administration (almost the half) which means that the liberation of dopamine is reduced (the effect of the cocaine). And since tolerance to a drug induces a reduction of its effect , this shows that cocaine induces a tolerance.	Comparative analysis of the two curves without connectors -1/4 without values → 0 without correlation between the variation of x and y → 0 without the comparative analysis of the two curves → 0 without the sentence in bold → -1/2	2
4	Physical dependence, psychic dependence...		1
5	According to document 1, cocaine increases the concentration of dopamine, the neurotransmitter responsible for the pleasure sensation, which amplifies the sensation of pleasure in the consumer: this is why it is considered as "a paradise". However, tolerance occurs rapidly reducing of the pleasure sensation, which leads to the consumption of a higher amount of cocaine (dependence.....) this is why it leads to hell.	Paradise : Increase of the concentration of dopamine → amplification of the pleasure sensation Hell: tolerance - reduction of the pleasure sensation → a need to a massive consumption of cocaine - or dependence → Depression...	1.5

Exercise 2		Advantages of Dietary Fibers											
Q.	Answers	Remarks			mark								
1	The dietary fibers control the intestinal transit having as a normal duration ranging between 30 and 40 hours. In case this duration exceeds 72 hours, the dietary fibers accelerate the intestinal transit, but in case this duration is less than 24 hours, the dietary fibers slow down this transit.	Mentioning acceleration and slowing down is obligatory			1								
2	Cholesterol is transported into the cells by LDL. When its level in the blood is in excess, it is deposited by the LDL on the internal wall of the artery where it is accumulated in the form of atheroma plaque.	4 ideas : Transport in the blood by LDL Cholesterol in excess Deposit on the internal walls accumulation and formation of plaques			1								
3	Title: The variation of the number of death by heart attack as a function of the daily consumption of dietary fibers. <table border="1" data-bbox="168 694 1079 861"> <tr> <td>Consumption of fibers in g/day</td> <td>< 20</td> <td>30,4</td> <td>> 30,7</td> </tr> <tr> <td>Number of death per heart attack per 10,000 people</td> <td>47</td> <td>37</td> <td>12</td> </tr> </table>	Consumption of fibers in g/day	< 20	30,4	> 30,7	Number of death per heart attack per 10,000 people	47	37	12	Without title → -0,25 A missing value or an incorrect value → - 0.5 If 2 missing or incorrect values → -1 If 3 or above → 0 In case of 2 missing or incorrect values and without title → 0			2
Consumption of fibers in g/day	< 20	30,4	> 30,7										
Number of death per heart attack per 10,000 people	47	37	12										
4.1	The number of deaths by heart attack per 10,000 people is the highest (47) when the fiber consumption is <20 g/d. This number decreases to 12 when fiber consumption increases to > 30.7g/d.	Without mentioning the correlation between the variation of x and that of y → 0 Without values → 0			1								
4.2	Fiber consumption prevents heart attacks and reduces the resulting mortality rate.	Possible answers: - Reduction of heart attacks. - Reduction of the resulting mortality rate.			0.5								
5	The quantity of the ingested fibers by the Europeans living in Africa is 25 g/day; that is to say 4 times less than that of the native African which is 100 g. Thus, the fibers facilitate the intestinal transit. Based on document 2, the increase in the consumption of fibers prevents the occurrence cardiac attack, also it decreases the level of cholesterol in blood (doc. 1), thus preventing cardiovascular diseases.	3 elements : <ul style="list-style-type: none"> • Complete and correct comparison between the European and Africans (with values and units, comparison between values) 0,5 • The fibers → prevent the occurrence cardiac attack (doc.1) relation 1 • Fibers → reduction of cholesterolemia relation 2 			1.5								

Exercise 3 ES		The « Aquadvantage » Salmon (6 points)	
Q.	Answers	Remarks	Mark
1	The gene of interest is that of the growth hormone of S. chinook.	Without S.chinook → -1/4	1
2	The enzyme used for cutting the gene is the restriction enzyme.	If restriction → 0	1
3	The mass of the standard salmon increases from 0.1 kg to 1.8 kg when the duration of the diet increases from 0 to 700 days. On the contrary, that of « Aquadvantage » salmon increases 3 times more, from 0 to 6 kg during the same duration of feeding. This shows that this transgenesis allows obtaining salmons which development is almost 3 times more rapid.	Analysis without values → 0 If without the control → 0 If a value is missing or incorrect → - If without increase of X or decrease of Y → 0	1.5
4	The salmon « Aquadvantage » is qualified as transgenic because : the transferred gene is taken from another species, s. chinook. It is integrated into the genome and it is phenotypically expressed in the salmon its growth is much more amplified than the non-transgenic salmon.	If general without relation with the document → half of the deserved grade	1.5
5	The application of this transgenesis allows: - to produce and the sell a greater quantity of salmon during a short period of time (<i>since these transgenic salmon are developed more rapidly (document 2)</i>), - to raise of salmon throughout the year (continuously) - to reduce the cost of raising theses salmons fish. (20% less food, without the need for antibiotics)	- Very rapid development - Reduction of cost (Consuming less nutrition) - No need for antibiotic → Reduction of cost And absence of residues in the tissues → this is not a direct advantage for the farmer	1

Exercise 3 LH		Life Style and Health	
Q.	Answers	Remarks	mark
1	Sedentary life and overconsumption of food.	0.25 + 0.25	0.5
2	The increase of the body mass is a risk factor for diabetes.	A significance in term of proportionality $\rightarrow 0$	0.75
3	Since the rate of occurrence of diabetes is maximal, 23%, when the activity is low, but it decreases to 8% when the activity becomes important, sedentary lifestyle is a second risk factor for diabetes.	Analysis or reasoning $\rightarrow \frac{1}{2}$ determining of the second risk factor $\rightarrow \frac{1}{2}$ Analysis without values $\rightarrow 0$ out of $\frac{1}{2}$	1
4	Pima Indians are characterized by their sedentary and overconsumption of foods causing a high BMI. These two habits are two risk factors for diabetes (documents 1 and 2 respectively). This justifies the fact that they have such a high rate of occurrence of diabetes.	Pima Indians \rightarrow Sedentary life \rightarrow risk factor.. (2 relations) Pima Indians \rightarrow overconsumption or obesity \rightarrow high BMI \rightarrow risk factor (3 relations)	1.25
5	pregnancy – Menopause – quitting smoking – medical treatments – social habits	2 factors	1
6	<ul style="list-style-type: none"> • Marasmus • Kwashiorkor • Rachitis • Anorexia 	2 diseases	1.5