

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

Answer the following exercises.

Exercise 1 (5pts)

"Obesity is the resultant of endogenous factors, often hereditary (metabolic or endocrine disorders), and exogenous factors due to family environment (single child...), life style (bad food quality, irregular meal schedules ...), and socio-economic environment (obesity is four times higher in the children of laborers than in those of executives...).

The complications that this state generates have above all a psychological and social nature. The other risks are dominated by respiratory and cardiovascular complications, arterial hypertension, metabolic disturbances (excess cholesterol, diabetes)...

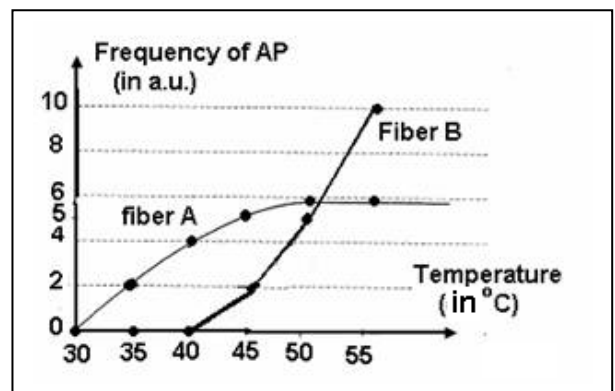
Confronted with this problem of obesity, the fear of size gaining often turns into obsession, particularly in teenagers. Their food behavior displays disturbances extending from anorexia to bulimia".

- Pick out from the text:
 - The exogenous and endogenous causes of obesity.
 - The consequences of obesity.
- Specify the differences between the two nutritional disturbances mentioned in the text and observed in teenagers.
- In reference to acquired knowledge, point out the basic principles of a balanced diet.
- Are the nutritional needs the same for all teenagers? Justify the answer.

Exercise 2 (6pts)

An individual places his hand very near to a lit electric bulb. The experimenter modifies progressively the power of light and hence the temperature of the bulb.

Tiny receiving electrodes inserted in the nerve of the forearm record the nervous messages that propagate on two types of fibers: fiber A, which transmits the signals emitted by one of the skin thermoreceptors implicated in thermal sensation; and fiber B, which is connected to a nociceptor implicated in the sensation of pain. The results of the recordings appear in the adjacent document.



- Present in a table the variation of the frequency of action potentials in each of fibers A and B as a function of temperature.
- Pick out the threshold temperature at which the sensation of pain starts in the hand. Justify the answer.
- Analyze the obtained results.
- How is the variation in the frequency of action potentials of nerve fiber B expressed in this individual?

Exercise 3 (5pts)

The regular consumption of sleeping pills or tranquilizers affects concentration, reasoning, and memorizing; it causes irritability and depression. These psychoactive medicines fix on all the receptors of GABA, which is an inhibitory neurotransmitter, and keep them activated. They consequently block the exchanges between the neurons and reduce anxiety, leading to a state of cerebral sedation*.

This relaxing action is expressed by deceleration of heartbeats, hypotension, lowering of vigilance and reflexes, and somnolence. It may also provoke alteration of sensory perception and delirium. In addition, those medicines cause the release of dopamine indirectly.

The brain adapts by reducing the number and the sensitivity of GABA receptors. In order to prevent the appearance of anxiety troubles, the user must increase the dose. Weaning is accompanied by acute symptoms: pain, hyperthermia, and psychic troubles, which are sometimes serious.

*Sedation: moderation of activity

- 1- Pick out from the text: **1.1-** Four consequences of the regular consumption of the mentioned medicines.
1.2- The symptoms of weaning.
- 2- Justify the relaxing action of these medicines.
- 3- Justify, in reference to the text and acquired knowledge, that these medicines act like a drug.

Exercise 4 (4pts)

Pellagra is a disease that has various clinical signs: cutaneous lesions, anorexia, loss of weight, dizziness, and slight tendency to depression. It is mostly found in India and South Africa, *i.e.* within the populations where food consists almost exclusively of certain cereals (sorghum and corn in Africa, and millet in India).

- 1- Pick out from the text the origin of the disease and its symptoms.

Pellagra is due to deficiency in vitamin PP. Document 1 shows the recommended daily intake of this vitamin, and document 2 shows the quantity of the same vitamin contained in certain foods.

Age categories	Quantity of vitamin PP (in mg/day)
Children less than 1 year	6
Children from 1 to 3 years	9
Children from 4 to 9 years	12
Children from 10 to 12 years	14
Adolescents, adult men	18
Adolescents, adult women	15

Document 1

Food	Quantity of vitamin PP (in mg/100g)
Yeast	28-60
Liver	5-25
Meat, fish	2-15
Cereals (sorghum, corn, millet)	0.9-1.7
Beans, lentils	0.6-1.7
Fruits	0.1-0.6

Document 2

- 2- In reference to documents 1 and 2, justify the appearance of pellagra in an adolescent who consumes only 500g of cereals per day.
- 3- Suggest a food supplement that reduces the symptoms of the disease in this adolescent person.

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Exercise 1 (5pts)

- 1- 1.1- The exogenous causes are: The family environment (single child...), life style (bad quality of the food, irregular schedules of meals...), and socio-economic environment (obesity is four times higher in the children of laborers than those of executives...). (0.5 pt)
The endogenous causes: The hereditary factors (metabolic or endocrine disorders). (0.5 pt)
- 1.2- The consequences of obesity: The complications that this state generates have above all a psychological and social nature. The other risks are dominated by respiratory and cardiovascular complications, arterial hypertension, metabolic disturbances (excess cholesterol, diabetes), anorexia and bulimia. (1pt)
- 2- Bulimia: bulimia is a pathological need to absorb big quantities of food. (0.5pt)
Anorexia: anorexia is the refuse to eat; it is a food auto-deprivation disease. (0.5pt)
- 3- The basic principles of a balanced diet: the diet should supply the quantitative and the qualitative needs of the body. (1pt)
- 4- No. The needs vary from one individual to another; they depend on gender, size, and activity. (1pt)

Exercise 2 (6pts)

1- (2pt)

Temperature (in °C)	30	35	40	45	50	55	
Frequency of AP (in a.u)	Fiber A	0	2	4	5	6	6
	Fiber B	0	0	0	2	5	10

Variation of the frequency of AP at the level of two fibers, as a function of temperature

- 2- Threshold temperature: 41°C or > 40°C since starting from this temperature, AP were recorded on fiber B. (1pt)
- 3- The frequency of AP increases in fiber A along with the bulb's temperature from 0a.u at 30°C and reaches a frequency of 6a.u at 50°C. Beyond this temperature, the frequency of AP remains constant. On the contrary, no AP was recorded on fiber B before 40 °C. Beyond this temperature, AP were recorded in such a way that their frequencies increased with temperature to reach 10 a.u at 55 °C. (2pt)
- 4- The increase in the frequency of AP in fiber B is expressed by increasing painful sensation. (1pt)

Exercise 3 (5pts)

- 1- 1.1- The regular consumption affects concentration, reasoning and memorizing; it causes irritability and depression. **(1pt)**
- 1.2 - Weaning is accompanied by pain, hyperthermia, and psychic troubles that are sometimes serious. **(1pt)**
- 2- The relaxing action of the given medicines is due to the activation of the receptors of GABA, an inhibitory neurotransmitter of the nervous message. The messages are not transmitted anymore between the neurons, which reduces anxiety and leads to a state of cerebral sedation. **(1pt)**
- 3- The regular consumption of these medicines as well as weaning cause symptoms. They act at the level of the cerebrum and disturb the functioning of neurons, and indirectly release dopamine. In the same way, the individual is obliged to increase the dose in order to prevent the appearance of troubles. All these symptoms are similar to drug consumption. **(2pts)**

Exercise 4 (4pts)

- 1- Origin: Food origin. **(0.5pt)**
Symptoms: cutaneous lesions, anorexia, loss of weight, dizziness, and slight tendency to depression. **(1pt)**
- 2- The 500g of cereal will provide between (0.9×5) 4.5 mg and $(1.7\text{mg} \times 5)$ 8.5 mg of vitamin PP. But this quantity is lower than that the need of an adolescent, which is 18mg/day. Then the deficiency of vitamin PP has allowed the appearance of pellagra in this adolescent person. **(1.5pt)**
- 3- To reduce the symptoms of the disease, it is necessary to modify the food ration of this adolescent person by giving him foods rich in vitamin PP, such as the products containing yeasts, liver, meat and fish. **(1pt)**