

الاسم:
الرقم:مسابقة في الثقافة العلمية
مادة "علوم الحياة"
المدة: ساعة واحدة**Answer the following questions.****Question I (5 pts)**

The document below reveals a study done to verify that dairy products prevent osteoporosis, and that milk is a good source of calcium for this prevention.

In countries where dairy products are generally not consumed, it has been noticed that there is less osteoporosis than in other countries where the consumption of dairy products is higher. Studies showed that milk does not protect from bone fracture. In fact, those who drink three glasses of milk per day had more fractures than those who rarely drink milk.

There are several good sources of calcium that is easily absorbed by the body, such as cabbage, broccoli and other green vegetables. In fact, a study revealed that the absorption of calcium found in cabbage is higher than that found in milk. Beans, which are rich in calcium, and fortified orange juice, provide great quantities of calcium...

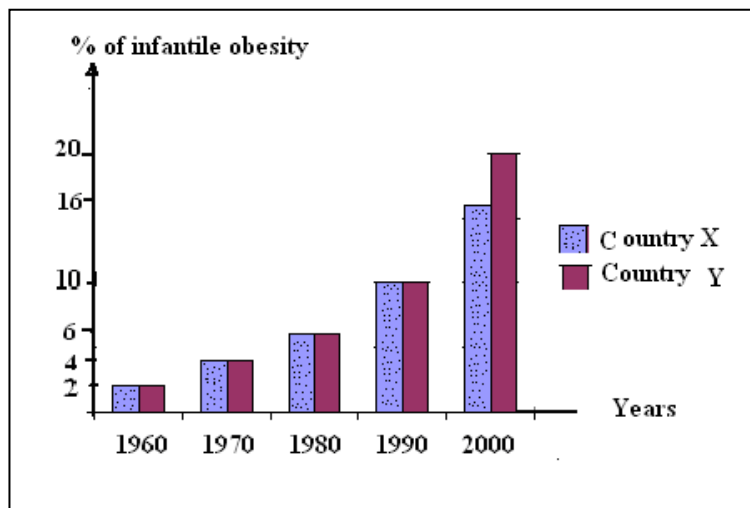
Calcium is only one of the many factors which affect the bones. The other factors include hormones, phosphorus, boron, exercise, smoking cigarettes, and the consumption of alcohol and medicines. Proteins are important also for the balance of calcium in the body.

- Are the two hypotheses that are at the origin of this study validated? Justify the answer, in reference to the text.
- Pick out from the text two dietary recommendations for preventing osteoporosis.
- Justify, by referring to the acquired knowledge, why phosphorus is considered a factor that affects bones. Name two foods rich in phosphorus.

Question II (6pts)

The progression of infantile obesity in certain countries is alarming. Of all overweight or obese children, 20% to 50% of them remain obese throughout adolescence. Of these obese adolescents, 50% to 70% remain obese throughout adulthood.

The opposite document reveals the variations of the percentage of obesity among children that are 5 to 11 years old, in 2 different countries X and Y.



- Construct a table that includes the data, which appear in this document.
- After analyzing the histogram, justify that infantile obesity is really alarming.
- Name 2 diseases related to obesity.

Question III (5 pts)

Once inhaled, cocaine reaches the brain in six or seven seconds: this is the "flash". The effects are first of all an increase in the arterial pressure, with an acceleration of heartbeats. Then, tremors, headaches with nausea, diarrhea, and also pulmonary disorders follow. All are accompanied with psychic symptoms such as the feeling of euphoria, absolute power, hyperexcitation, and finally hallucination. These symptoms last between fifteen and thirty minutes and disappear gradually in one or two hours. This mechanism can be explained by the neurobiological effects of cocaine, which disturbs the operation of the neurons of the brain, particularly those which produce dopamine, a neurotransmitter that is associated to the feeling of pleasure. Indeed, the consumption of cocaine inhibits the recapture of dopamine. Thus, the nerve impulse circulates continuously between the different neurons, creating, at the same time, an uninterrupted pleasure. However, when the blood concentration of cocaine decreases, dopamine is recaptured; the nerve impulse disappears, and the addict returns to life reality. He pushes, without hesitation, to take the drug in order to recover his state of continuous pleasure.

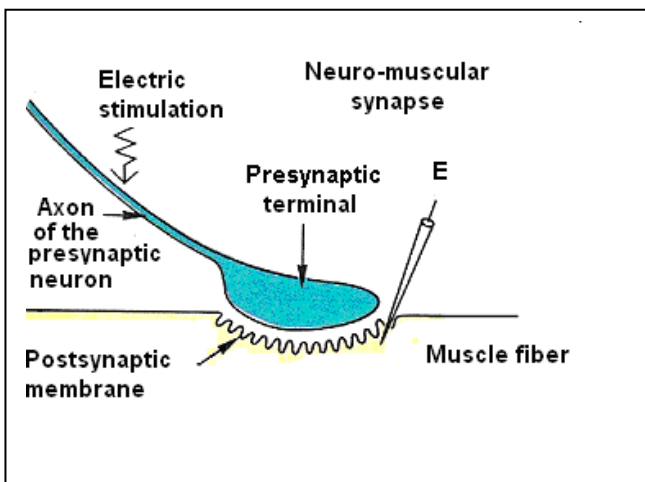
- Pick out from the text the symptoms provoked by the consumption of cocaine.
- Based on the text, justify the relation between cocaine and the feeling of uninterrupted pleasure in a drug addict.
- Mention two consequences common to the consumption of all drugs. Pick out from the text a sentence that justifies one of the two consequences.

Question IV (4pts)

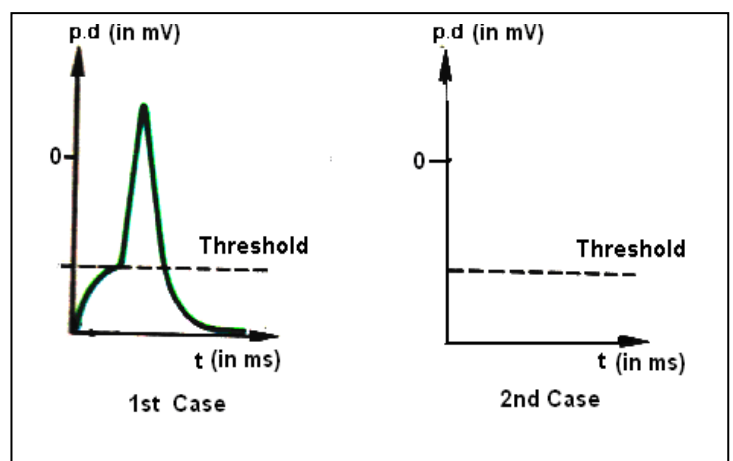
In the framework of studying the transmission of a nervous message at the level of a synapse, we prepare the experimental setup shown in document 1. We stimulate the presynaptic axon and do the recordings by an electrode E placed at the level of the postsynaptic membrane. Document 2 reveals the results obtained in two different cases:

1st case: Effective stimulation of the presynaptic neuron.

2nd case: Effective stimulation of the presynaptic neuron, preceded by an injection of a chemical substance, curare, in the synaptic cleft. This substance has a high affinity to acetylcholine receptors. Acetylcholine is a neurotransmitter that intervenes in a neuromuscular synapse.



Document 1



Document 2

- What does the obtained recording reveal in each case?
- Explain the obtained results.
- Determine the role of acetylcholine and the action of curare at the level of this synapse.

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Question I (5pts)

- a- No, because the studies showed that there is less osteoporosis in the countries where dairy products are not consumed than the countries where the consumption of dairy products is higher. **(1pt)** The good sources of calcium that is more easily absorbed by the body than the calcium of milk are cabbage, broccoli... **(1 pt)**
- b- 1- Eat cabbage, beans and broccoli.
2- Follow a food diet rich in proteins.
3- Drink fortified orange juice. **(1 pt)**
- c- Phosphorus is an essential constituent of bones. **(1pt)**
Foods: meat, fish, poultry, bananas. **(1pt)**

Question II (6pts)a- **(3pts)**

	Year	1960	1970	1980	1990	2000
% of infantile obesity	Country X	2	4	6	10	16
	Country Y	2	4	6	10	20

Variation of the percentages of infantile obesity as a function of years in two countries

- b- Infantile obesity is alarming because, from 1960 till 1980, the percentage of this obesity increased from 2% to 6% in the two countries X and Y. Whereas, from 1980 to 2000, the increase in the percentage was faster, from 6% to 16% in country X, and from 6% to 20% in country Y. **(2pts)**
- c- - Cardio-vascular diseases (hypertension, atherosclerosis)
- Diabetes **(1pt)**

Question III (5 pts)

- a- The symptoms are: increase in the arterial pressure, acceleration of heartbeats, tremors, headache with nausea, diarrhea, and pulmonary disorders. **(1 pt)** All are accompanied with psychic symptoms such as the feeling of euphoria, absolute power, hyperexcitation, hallucination. **(1pt)**

- b- Cocaine prevents the recapture of dopamine, a neurotransmitter that is related to the feeling of pleasure. Thus dopamine causes nervous messages to circulate continuously between the different neurons, which leads to an uninterrupted pleasure. **(1pt)**

- c- Dependence and tolerance or addiction. **(1pt)**
He pushes, without hesitation, to take the drug in order to recover his state of continuous pleasure. **(1 pt)**

Question IV (4pts)

- a- In the 1st case an action potential has been recorded (**½ pt**). In the 2nd case a resting potential is recorded or no action potential is recorded. (**½ pt**)

- b- In the 1st case, and after the stimulation of the presynaptic neuron, acetylcholine has been released into the synaptic cleft. It fixes itself on the postsynaptic receptors and provokes an AP. **(1pt)**
In the 2nd case curare fixes itself on acetylcholine receptors and prevents this latter from intervening in synaptic transmission. That is why no AP has been provoked. **(1pt)**

- c- Acetylcholine has an excitatory role (**½ pt**) and curare has an inhibitory action. (**½ pt**)