مسابقة في الثقافة العلمية "علوم الحياة"
المدة : ساعة واحدة

الاسم :
الرقم :

Answer the following questions.

Question I (4 pts.)

Indicate the true statements and correct the false ones.

a- The production of thyroid hormone necessitates the presence of calcium.
b- HDL favors the accumulation of cholesterol in the blood.
c- The resting potential of a nerve fiber is around –70 mV.
d- An efferent nervous message passes from the periphery toward the nervous center.

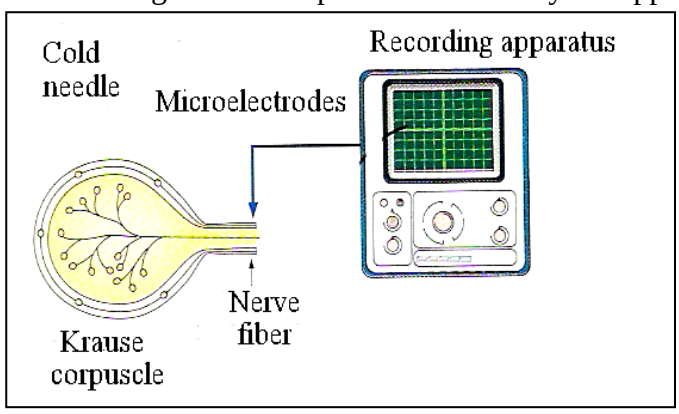
Question II (3 ½ pts.)

"In an attempt to know the reason that makes smokers continue smoking, doctors put rats in a cage having two holes. When the rats put their heads into one hole, nothing happens. When they put their heads into the second hole, they receive a nicotine dose.
At the beginning of the experiment, rats move toward the two holes in the same way, then gradually, they start going toward the hole where they receive nicotine.
Cerebral tissue analysis of the rats at the end of the experiment shows that certain modifications appear: The links between the neurons are weakened, a number of neurons are degenerated, and a number of neurons are not renewed."

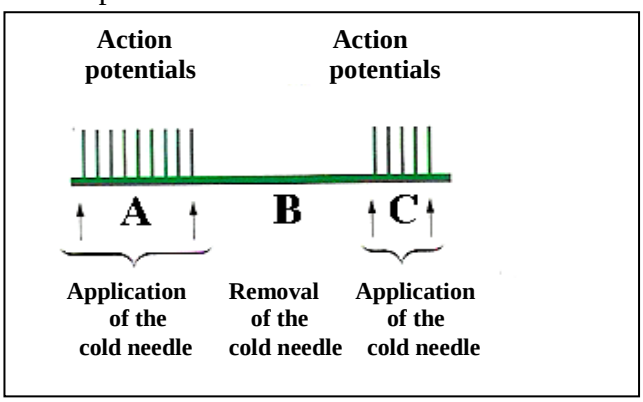
a- Pick up from the text: 1- The statement that shows the existence of dependence.
2- The cerebral modifications that appeared after the consumption of nicotine.
b- Can we say that nicotine found in tobacco is a drug? In reference to the acquired knowledge, justify the answer.

Question III (4 ½ pts.)

In the skin, there are nerve fibers linked to corpuscles called Krause corpuscles that are sensitive only to a certain temperature variation.
We isolate one of these Krause corpuscles, and we place on its nerve fiber microelectrodes connected to a recording apparatus that allows us to see, on a screen, the responses obtained when the temperature is changed, document 1.
We apply a cold needle to the corpuscle, then we remove the cold needle, and finally we apply the cold needle again. The responses recorded by the apparatus are presented in document 2.



Document 1. Experimental set up

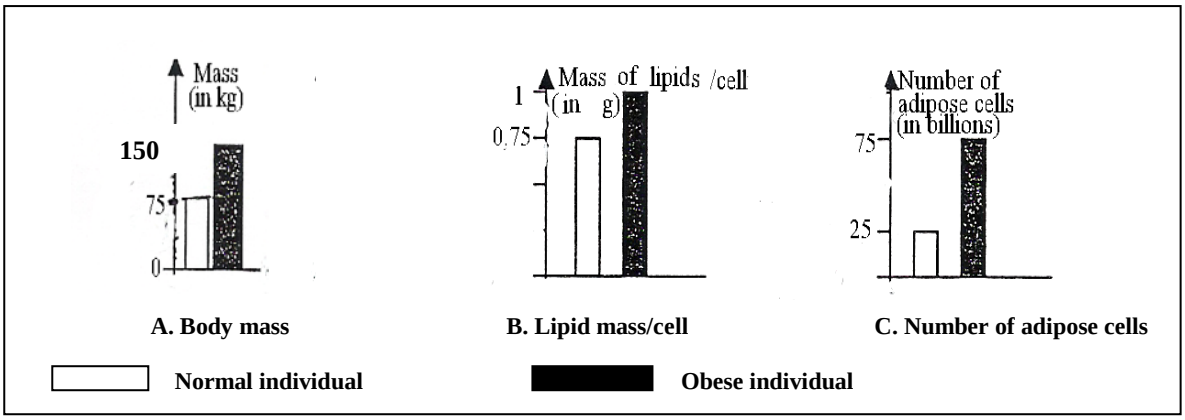


Document 2. Obtained recordings

a- Pick up from the text the name of the receptor that is sensitive to variation in temperature.
b- The nerve fiber is a part of a specialized cell. Name this cell.
c- Interpret the obtained recordings.
d- How will the recording A vary if we increase the intensity of the stimulus by making the needle colder?

Question IV (8 pts.)

Clinically, we consider an individual to be obese if he is 20% overweight with respect to the theoretical ideal mass that corresponds to his gender, age, and height. Document 1 presents comparison of certain aspects between a normal individual and an obese individual.



Document 1. Comparison between a normal individual and an obese individual

a- Present, in the same table, the different values shown in the histograms A, B, and C that differentiate between a normal individual and an obese individual.
b- In reference to document 1, to what can you attribute the increase in body mass in an obese individual? Justify the answer
c- Name four factors that favor obesity.

An obese individual is following a slimming program. The results of the treatment are presented in document 2.

Obese individual	Before treatment	After treatment
Body mass (in kg)	150	75
Mass of lipids (in µg/cell)	1	0.7
Number of adipose cells (in billions)	75	75

Document 2

d- Analyze the obtained results. What can you say concerning the effectiveness of this treatment?

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اسس التصحيح

الاسم :
الرقم :

Question I (4 pts.)

a- The production of thyroid hormone necessitates the presence of iodine. **(1 pt.)**
b- HDL hinders the accumulation of cholesterol in the blood. **(1 pt.)**
c- True **(1pt)**
d- An efferent nervous message passes from the nervous center toward the periphery. **(1pt)**

Question II (3 ½ pts.)

a- 1- At the beginning of the experiment, rats move toward the two holes in the same way, then gradually, they start going toward the hole where they receive nicotine. **(1 pt.)**
2- The links between the neurons are weakened, a number of neurons are degenerated, and a number of neurons are not renewed. **(1 pt)**
b- Yes **(½ pt)** because nicotine affects the functioning of the neurons and modifies the behavior of an individual by inducing a state of dependence, habitual usage, and tolerance. **(1 pt)**

Question III (4 ½ pts.)

a- Krause corpuscle **(½ pt)**
b- The neuron or the nerve cell. **(1 pt.)**
c- The application of the cold needle on the corpuscle provokes a nervous message that is expressed by a series of action potentials, of the same amplitude, recorded at the level of the nerve fiber at A and C. However, upon removing the needle, no recordings are obtained at B. This implies that the Krause corpuscle is sensitive to cold temperature. **(1 ½ pt.)**
d- The frequency of action potential increases while the amplitude remains constant. **(1 ½ pts.)**

Question IV (8 pts.)

a- **(3 pts.)**

	Normal individual	**Obese individual**
Body mass (in kg)	75	150
Mass of lipids per cell (in µg)	0.75	1
Number of adipose cells (in billions)	25	75

Comparative values between a normal individual and an obese one.

b- The increase in body mass in an obese individual is attributed to the increase in the mass of cellular lipids and the increase in the number of adipose cells, at the same time. **(1 pt.)**
The mass of lipids per cell (0.75 µg) and the number of adipose cells (25 billions) in a normal individual have increased to become in an obese individual 1 µg for the mass of lipids/cell and 75 billions for the number of adipose cells. **(1 pt.)**

c- Unhealthy eating habits acquired since childhood, nibbling, overeating, meals rich in carbohydrates and lipids, laziness, hormonal disequilibrium, genetic factor… **(1 pt.)**

d- The body mass decreases during the treatment, it is 150 kg before the treatment and 75 kg after the treatment. This is paralleled with the mass of lipids/cell that decreases from 1 µg to 0.7 µg after the treatment where as the number of adipose cells remained constant 75 billions. **(1 pt.)**
This implies that this treatment is only effective on the mass but has no effect on the number of adipose cells. **(1 pt.)**