وزارة التربية والتعليم العالي
المديرية العامة للتربية
دائرة الامتحانات

امتحانات الشهادة الثانوية العامة
فرع الآداب والانسانيات

دورة سنة 2006 العادية

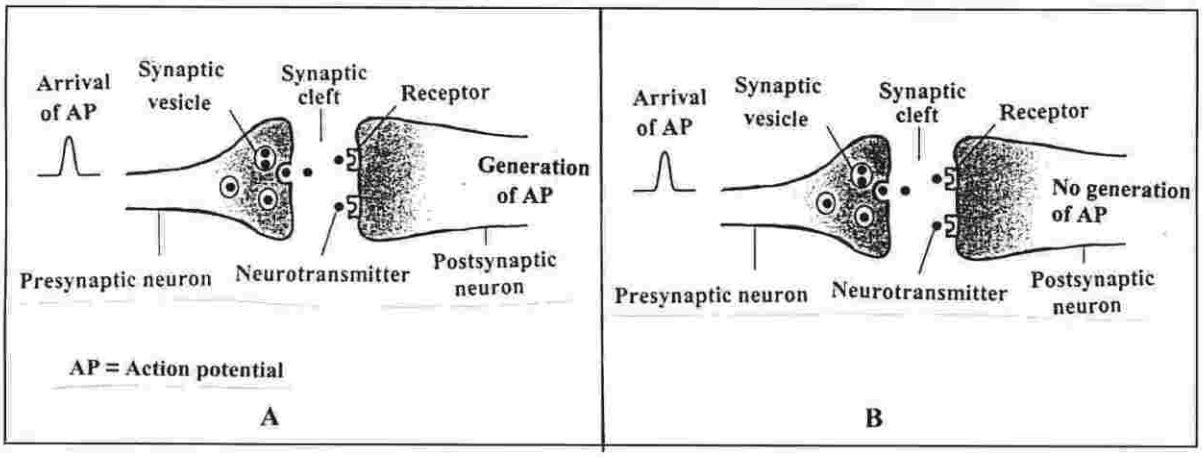
مسابقة في الثقافة العلمية
(علوم الحياة)
المدة: ساعة واحدة

الاسم:
الرقم:

Answer the following questions.

Question I (4 pts)

The following document reveals two neuroneuronic synapses, one is excitatory and the other is inhibitory.



a- Specify the nature of each of the two synapses **A** and **B**. Justify the answer.

b- Explain how the transmission of the nervous message is done at the level of a synapse upon giving an effective stimulus. Specify the fate of the liberated neurotransmitter after this transmission.

Question II (5 pts)

"The stimulating effect of coffee is due to its action on the membrane receptors of adenosine, a neuromodulator of the central nervous system that has specific receptors. When adenosine fixes on its receptors, the nervous activity slows down and the individual becomes sleepy. However, caffeine is antagonist to adenosine. It fixes on the same receptors, without reducing the neural activity. Thus, there will be less available receptors than the number necessary for the natural slowing of the activity, which leads to the activation of neurons and therefore to awakening.

The activation of several neuronal circuits by caffeine makes the pituitary synthesize hormones that make adrenal glands produce more adrenaline. Adrenaline causes an increase in the level of attention and ensures a peak of energy to the whole organism. This is an effect that all drinkers of coffee search for.

In general, each drunken cup of coffee is a stimulant, and the tolerance to coffee, if it exists, is not very important. However, a physical dependence exists. The symptoms of withdrawal appear one or two days after stopping coffee drinking. These symptoms are: headache, nausea, and sleepiness, in around one out of two individuals".

Neuromodulator: A neuropeptide liberated, at the same time and at the same place as a neurotransmitter .

a- Pick-up from the text:
   1. The effect searched for by coffee drinkers.
   2. The symptoms of withdrawal.

b- Justify, based on the text, the role of caffeine as an antagonist to adenosine.

c- Explain why caffeine is qualified as a drug.

Question III (8 pts)

Calcium plays an important role at the level of the skin, it is essential for the cohesion and the integrity of the epidermis. Reaching the age of 60 years the organism does not completely assimilate the calcium, which is manifested on the skin: the epidermis becomes thin, the skin structure becomes fragile and collapses.
To restructure and reinforce itself, the fragile epidermis needs a form of calcium that can be completely assimilated, such as Hydroxy-a-calcium, used in microsurgery of bones. This molecule spreads continuously close to the cells permitting the absorption of calcium and its optimal fixation. Irrigated with calcium, the skin restructures and recovers its form.

Document 1

a- Pick-up from the text:
   1. The role of calcium at the level of the skin.
   2. The consequences of the lack of calcium on the skin.

Document 2 reveals the loss of calcium by an organism as a function of age.

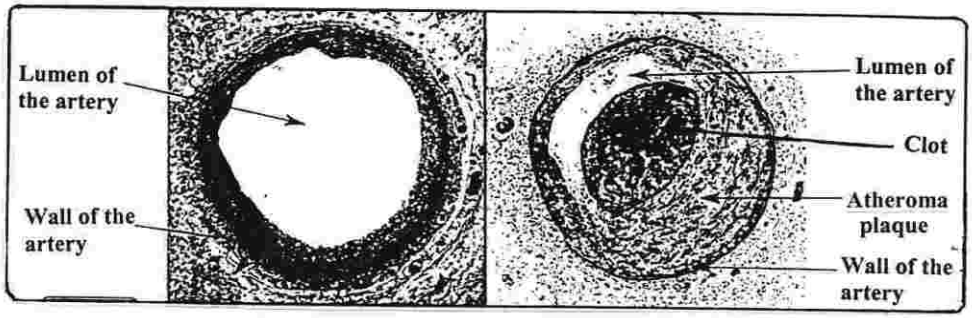
Age (in yrs)	Loss of calcium by an organism (in a.u.)
25 to 34	50
35 to 44	100
55 to 64	300
65 to 75	400

Document 2

b- Construct a histogram showing the variation of the loss of calcium as a function of age.
c- Draw out from the two documents the cause of the fragility of the epidermis in an individual starting from age 60 years and how it is remedied.
d- Calcium plays two other important roles at the level of the organism. What are they?

Question IV (3 pts)

A correlation has been established between the consumption of saturated fatty acids, taken from lipids of animal origin, and atherosclerosis. Over eating provokes hypercholesterolemia (increased cholesterol concentration in the blood), which is the origin of cardiovascular diseases.
The following document represents a microscopic section of two arteries of two different individuals, one of whom is sick.



a- Which of the two arteries belongs to the sick individual? Justify the answer.
b- Which category of lipoprotein is linked to cardiovascular diseases? Justify the answer.
c- Mention two other risk factors of cardiovascular diseases.

مسابقة في الثقافة العلمية
(علوم الحياة)
أسس التصحيح

الاسم:
الرقم:

Question I (4 pts)

a- Synapse **A** is excitatory because the arrival of action potential at the presynaptic neuron generates an action potential in the postsynaptic neuron. Thus, the nervous message has been transmitted. **(1 pt)**
Synapse **B** is inhibitory because the arrival of action potential at the presynaptic neuron does not generate an action potential in the postsynaptic neuron. Thus, the nervous message has not been transmitted**. (1 pt)**

b- The transmission of the nervous message is done by neurotransmitters stored in the vesicles at the level of the presynaptic axon terminal. Once liberated in the synaptic cleft, these neurotransmitters fix on their specific postsynaptic receptors and change the potential of this membrane. **(1 pt)**
The neurotransmitter is degraded by enzymes and recaptured by the presynaptic neuron. **(1 pt)**

Question II (5 pts)

a- 1- The effect that all drinkers of coffee search for is the increase in the level of attention and having a peak of energy in their organism. **(1pt)**
2- The symptoms are: headache, nausea, and sleepiness. **(1 pt)**

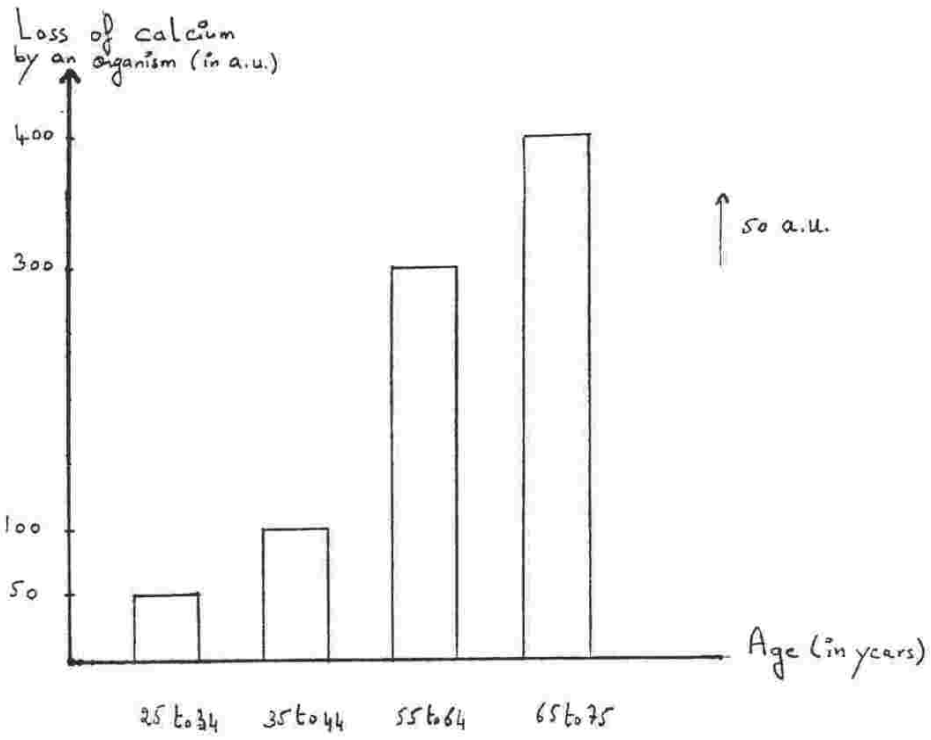
b- Caffeine fixes on the same receptors of adenosine, which decreases the number of the available adenosine receptors. Since the role of adenosine is to slow down the nervous activity and to provoke sleepiness, and its effect is reduced, this leads to the activation of the neurons, and therefore, to an awakening provoked by the presence of caffeine. **(2 pts)**

c- Caffeine is a drug because it leads to physical dependence. Withdrawal might lead to health troubles such as headache, nausea, and sleepiness. **(1 pt)**

Question III (8 pts)

a- 1. Calcium is essential for the cohesion and the integrity of the epidermis. **(1 pt)**
2. The epidermis becomes thin, the skin structure becomes fragile and collapses. **(1 pt)**

b- (3 pts)



Variation of the Loss of calcium as a function of age.

c- Document 1 reveals that reaching 60 years the organism does not assimilate calcium, and document 2 reveals that the loss of calcium by an organism increases with age and becomes very high after 60 years. This results in the lack of calcium, which provokes fragility of the skin. **(1 ½ pts)**
The remedy is done by a calcium molecule completely assimilable such as Hydroxy-a-calcium. **(½ pt)**

d- An essential role at the level of bones, teeth, and muscle contraction. **(1 pt)**

Question IV (3 pts)

a- Artery B **(½ pt)**, because an atheroma plaque forms and provokes the constriction of the artery, or atherosclerosis, and a blood clot also forms. **(½ pt)**

b- LDL **(½ pt)** because when it transports cholesterol to the cells it favors its deposition on the artery walls. **(½ pt)**

c- Diabetes, stress, anxiety, tobacco, obesity, hypertension, genetic factors, sedentary life, low HDL. **(1 pt)**