

الاسم:
الرقم:مسابقة في الثقافة العلمية (علوم الحياة)
المدة: ساعة واحدة**Answer the following questions.****Question I (3 pts)**

Correct the following expressions.

- a- When enkephaline fixes on the receptor of the presynaptic neuron it accelerates the liberation of substance P.
- b- The formula 4, 2, 1 signifies 4 portions of proteins, 2 portions of lipids, and 1 portion of carbohydrates.
- c- Hydrosoluble vitamins are stored in the body while liposoluble vitamins are eliminated in the urine.

Question II (4 pts)**Multiple Sclerosis**

“Multiple sclerosis is a neurological disease, which reveals the critical role of myelin in the transmission of information at the level of the nervous system. Persons who suffer from multiple sclerosis complain mainly of weakness, lack of coordination, discomfort in vision and language... Although the exact origin of this disease is not really known, the cause of motor and sensory troubles is very clear since multiple sclerosis affects the myelin sheath of a group of axons of the cerebrum, the medulla oblongata, and the optic nerves. The word sclerosis is of Greek origin that means to become hard, which corresponds to the effect of lesions that develop on the groups of axons, and we talk about multiple sclerosis because the disease affects several sites of the nervous system simultaneously.”

Neurosciences, Pradel 1999

- a- Pick up from the text the cause of sensory and motor troubles and the symptoms of the disease.
- b- Knowing that in this disease the speed of a nervous message considerably decreases, explain in reference to the text and acquired knowledge how the structure of the nervous fiber intervenes in the conduction of the nervous message.

Question III (6 pts)

We inject, with a micropipette a certain quantity of the neurotransmitter acetylcholine, at the level of two categories of neurons A and B that are in different activity. We measure, at the same time, the frequency of action potentials of these neurons. The results are presented in the table below.

Time (in seconds)	10	15	20	30	50
Frequency of AP					
Neurons A	3	10	14	14	3
Neurons B	40	30	20	20	40

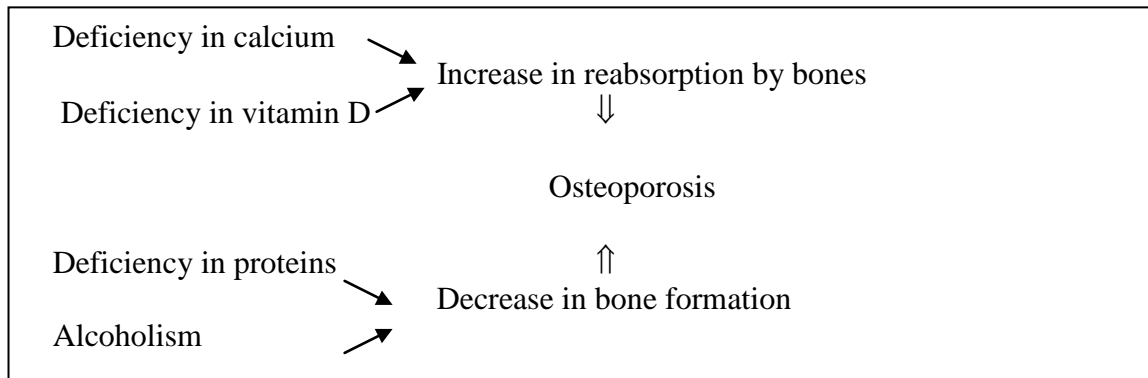
← Injection of acetylcholine →

- a- Analyze the obtained results. What can you deduce concerning the action of acetylcholine?
- b- How can you explain, ionically, the action of acetylcholine at the level of neurons A?
- c- Explain the fate of acetylcholine after its release in the synaptic cleft.

Question IV (7 pts)

Osteoporosis is a major problem of public health. Among 100 women reaching the age of menopause, 40 suffer before the end of their lives, of one or many fractures due to fragility of bones.

To know the probable causes of osteoporosis, studies are done and the results are shown in document 1.



Document 1

- a- Pick up from document 1, the probable causes that are at the origin of osteoporosis.

Calcium is a bone component. The recommended average values of calcium needs are shown in document 2.

Range of age	Calcium needs (mg/ day)
Infants	500
1 to 5 yrs.	800
6 to 10 yrs.	1100
Adolescent	1200
Adult	1000
Women at menopause and old aged persons	1500

Document 2

- b- Construct a histogram representing the calcium needs that correspond to each age range.
- c- What information this table reveals concerning calcium needs?
- d- Propose two foods that should be consumed to prevent osteoporosis at menopause. Justify the answer.

الاسم :
الرقم :اسس التصحيح
المادة : علوم الحياة
المدة : ساعة واحدة**Question I (3 pts)**

- a- When enkephaline fixes on the receptor of the presynaptic neuron it inhibits the liberation of substance P. (1 pt)
- b- The formula 4, 2, 1 signifies 4 portions of carbohydrates, 2 portions of proteins, and 1 portion of lipids. (1 pt)
- c- Liposoluble vitamins are stored by the body while hydrosoluble vitamins are eliminated in the urine. (1pt)

Question II (4 pts)

- a- The cause of motor and sensory troubles: Multiple sclerosis affects the myelin sheath of a group of axons of the cerebrum, the medulla oblongata, and the optic nerves. (1 pt)
The symptoms of the disease: weakness, lack of coordination, discomfort in vision and language, motor and sensory troubles. (1 pt)
- b- Myelin sheath facilitates and accelerates the propagation of nervous messages. Since multiple sclerosis is a disease due to the demyelination of the nerve fibers, this explains the slowing down of the propagation of the nervous message. (2 pts)

Question III (6 pts)

- a- At time 10 seconds the frequency of AP is 3 at the level of neurons A and 40 at the level of neurons B. After the injection of acetylcholine at time 15 seconds, the frequency of AP has increased at the level of neurons A to become 14. On the other hand, it has decreased at neurons B to become 20 at time 20 seconds. Frequencies at the level of these two categories of neurons remain constant as long as the injection continues till 30 seconds. Later, the frequency at the level of each of these groups of neurons returned to their initial states: 3 for neurons A and 40 for neurons B. (2 pts)
This implies that acetylcholine has an excitatory action on neurons A and an inhibitory action on neurons B. Thus, acetylcholine has a double effect: excitatory and inhibitory. (1 pt)
- b- Acetylcholine provokes a depolarization at the level of the membrane of neurons A, which is due to the massive entry of Na^+ ions. (1 pts)
- c- Acetylcholine, once liberated in the synaptic cleft, fixes on their specific receptors on the postsynaptic membrane. Then this neurotransmitter degrades by specific enzymes and is reabsorbed by the axon terminals, stopping the transmission of a nervous message. (2 pts)

Question IV (7 pts)

a- Osteoporosis is due to the increase in reabsorption by bones, due to the deficiency in calcium and vitamin D on one hand and on the other hand, to a decrease in bone formation due to a deficiency in proteins, and alcoholism.

(2 pts)

c- **(3 pts)**

Variation of calcium needs in function of age

c- Calcium needs increase with age.

(1 pt)

d- Egg yolk, meat, liver, fatty fish. Because these foods are rich in vitamin D

and

Milk, cheese, egg. Because these foods are rich in calcium...

Or

Meat, cheese. Because these are foods rich in proteins...

(1 pt)