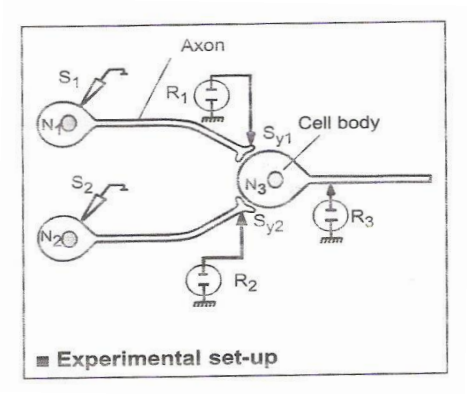
Class: 3 rd. Secondary (Socio.-Eco.) **Mid-Year Exam** **Points:** 20 pts.

Subject: Biology **Duration:** 60 min.

Question I: **The function of the synapse (3.5 pts.)**

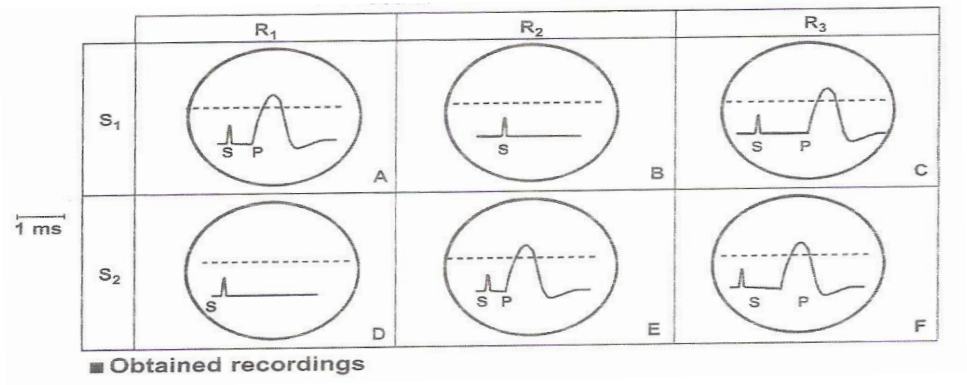
In order to know the structure and the functioning of the synapses, neurons of mollusks of small number and size are used. The following set –up is performed: Neurons N1 and N2.

We stimulate independently N1 and N2, using the stimulating electrodes S1 and S2. The oscilloscopes R1, R2 and R3 record the responses. Stimulations in S1 and S2 are greater than the thresholds of response of neurons N1 and N2).



■ Experimental set-up

The table below summarizes the results:



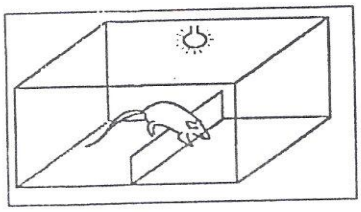
■ Obtained recordings

1- Analyze the results of the experiments and deduce the presynaptic element(s) and the postsynaptic one.

2- By referring to your acquired knowledge, indicate how the transmission of nervous message is emitted from presynaptic neuron to postsynaptic neuron.

Question II : **Nervous reflexes (6 pts.)**

A rat is placed in a soundproof box containing a lamp, the floor of this box is electrified and a barrier of 5 cm height is found in the middle.



1- Every time when a current of 30 volts passes, the rat jumps above the barrier to the other non electrified compartment.

a- Identify the type of behavior that appeared in this experiment.
b- Indicate the characteristics of this behavior.
c- By a labelled figure, represent the pathway of the nervous message in this reflex.

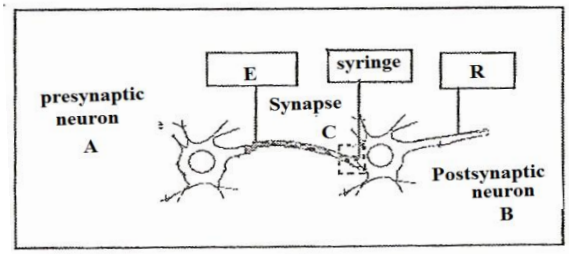
2- Every day, 10 consecutive trials are done separated by an interval of 1 minute; each trial is done with the following sequence: the lamp is lighted for 5 seconds then an electric shock is applied. From the first day and till the 5^{th} trial, then till the 8^{th} and 9^{th} the rat jumps the barrier when the lamp is lighted. During experimentation, the jumps become more numerous and in 15 days the rat starts to jump the barrier systematically just when the lamp is lighted, although the floor is not electrified.
After one month without doing the experiment, the animal doesn't jump when lighting the lamp.

a- Identify the kind of the behavior that appeared during these experiments.
b- Pick up from the text the necessary conditions for the release behavior.
c- By a labeled figure, represent the pathway of the nervous message in this reflex.

<u>Question III</u>: Nervous message (7 pts.)

We intended to search how is the nervous information coded at the level of a nerve fiber and at the level of a synapse (document 1), this is why we placed:

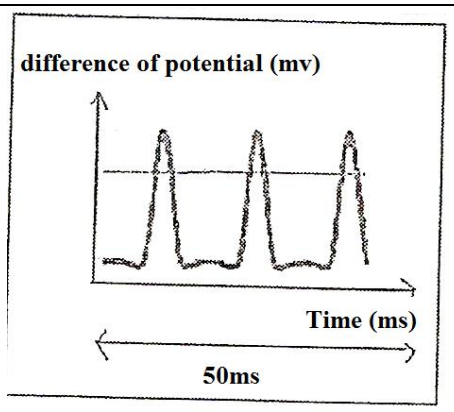
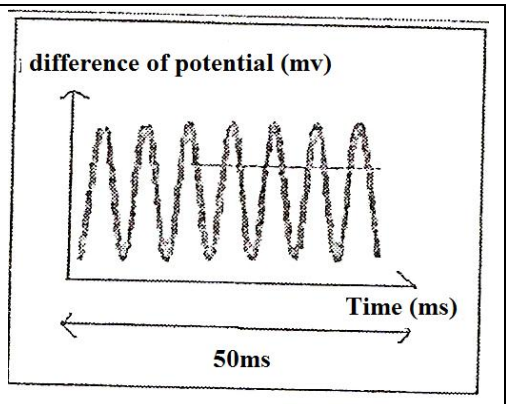
- Stimulating micro-electrodes (E) at the level of a nerve fiber A.
- A micro syringe used for the extraction of the liquid found in the synaptic cleft (C).
- Receptor micro-electrodes (R) at the level of the nerve fiber (B).



Document 1

The table of document 2 represents the experiments performed and the results obtained:

	Case 1	Case 2
Stimulation exerted at the level of E	**Weak**	**Strong**

Electric signals Recorded at the level of the fiber B		
Percentage of Glutamate (chemical substance extracted from the synaptic cleft (C))	**30%**	**90%**

Document 2

1. What does each electric signal of the nervous message represent?
2. Pick up the problem searched in this experiment.
3. Analyze the recordings obtained in the 2 cases, and deduce the mode of coding of the nervous message along the nerve fiber.
4. Compare the % of glutamate in the two cases and deduce the mode of coding of the nervous message at the level of a synapse.
5. Formulate a hypothesis explaining the relation between the frequency of action potentials along the postsynaptic neuron and the concentration of the chemical substances at the level of the synapse.

<u>Question IV</u>: The Epilepsy (3.5 pts.)

A-Epilepsy is a common chronic neurological disorder that is characterized by recurrent uprovoked crisis which are due to excessive neural activity in the brain .

We distinguish two big types of epilepsy crisis :

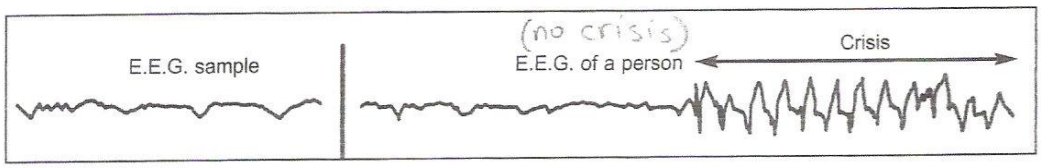
- Generalized crisis: affect all the brain .
- Partial crisis: affect only a part of the brain.

Persons with epilepsy show crisis in a different manners: a loss of awareness, stiff muscles, severe and long lasting convulsions.
The diagnostic of the epilepsy cause is performed using the neuro- radiologic techniques such as EEG, scanner and MRI.
The majority of the epilepsies are medically treated.
The antiepileptic drugs: Phenobarbital, sodium valproate , Benzodiazepine , carbamazepine and phenitoine act by decreasing the excitability of the membrane of neurons . Other new drugs could be efficient for anterior treatment: vigabatrin , tiagabine , gabapentine ,…

Pick up from the text:

1- The definition of epilepsy.
2- The symptoms of epilepsy.
3- The treatment of epilepsy.

B- The document below represent s the EEG recordings of a person affected by a generalized crisis



.

A normal person B epileptic person

d- Compare the EEG of the normal person and the epileptic one.

Good Work