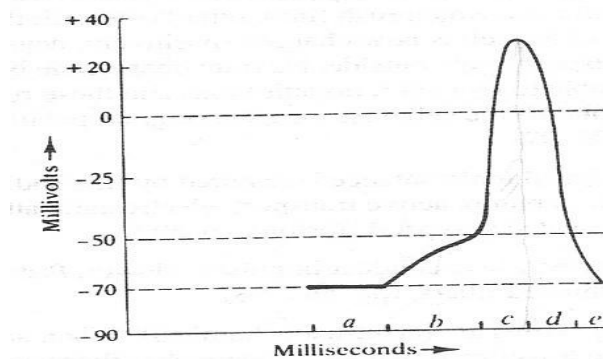


**Exercise one: Nervous and hormonal message**

**3pts**

1- The following diagram represents the effect of a transmitter substance on the membrane potential of a neuron.



**A-**In the diagram what is the resting potential?

- (a) +50 millivolts
- (b) 0 millivolts
- (c) -50 millivolts
- (d) -70 millivolts

**B-** Which of the following statements most accurately describes what is happening in part d of the diagram of the action potential?

- a-  $K^+$  ions are flowing out of the cell.
- b-  $K^+$  ions are flowing into the cell.
- c-  $Na^+$  ions are flowing out of the cell.
- d-  $Na^+$  ions are flowing into the cell.
- e- None of the above.

**C-** Part c in the graph stands for:

- a-  $K^+$  ions are flowing out of the cell.
- b-  $K^+$  ions are flowing into the cell.
- c-  $Na^+$  ions are flowing out of the cell.
- d-  $Na^+$  ions are flowing into the cell.

2- Where A stands for axon, D for dendrite, S for synapse, and CB for cell body, a typical sequence of structures between a receptor and an effector is:

- a- D-CB-A-S-D-CB-A
- b- A-D-CB-S-A-D-CB
- c- D-CB-A-S-A-CB-D
- d- D-A-S-CB-D-A-CB
- e- A-CB-D-S-D-CB-A

3- The thyroid gland secretes its hormone in response to:

- a- FSH
- b- Insulin
- c- TSH
- d- LH

### Exercise Two: Action potential and TTX

5pts

Practitioners in the Vodo in the carrebeans islands were reputed to feed a kind of fish called buffer fish to their enemies. The effect was dramatic: the individuals appeared to be dead and were buried. According to the legend, they were awaked days later as ‘zombies’ who could be easily enslaved by their poisoner. Bufferfish is now known to contain a poison called **Tetrodotoxin**. **Tetrodotoxin** is a potent neurotoxin . TTX blocks action potentials in nerves by binding to the pores of sodium channels in nerve cell membranes . The binding site of this toxin is located at the pore opening of the voltage-gated Na<sup>+</sup> channel.

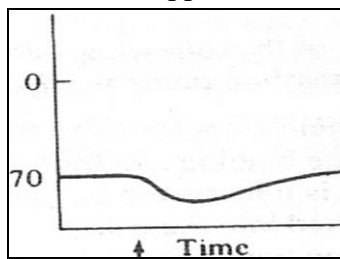
The toxin blocks the fast Na<sup>+</sup> current in human myocytes (the contractile cells of the muscles), thereby inhibiting their contraction. By contrast, the sodium channels in pacemaker cells of the heart are of the slow variety, so the compound does not inhibit action potentials in the cardiac nodes. The poisoned individual therefore dies not because the electrical activity of the heart is compromised, but because the muscles are effectively paralyzed.

- 1- Pick up from the text
  - a- The mode of action of TTX in nerves.
  - b- The mode of action of TTX on contractile muscles.
- 2- By referring to your acquired knowledge, explain which phase is blocked in an action potential under the effect of the poison.

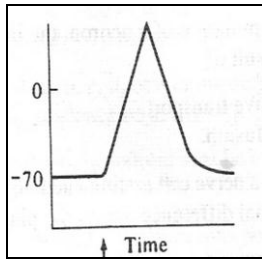
### Exercise Three : The effect of acetylcholine

4pts

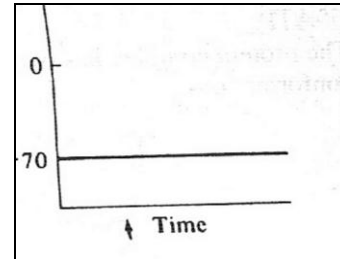
In order to know the effect of acetylcholine on two organs x and y experiments were done in which acetylcholine was applied to both structures. The following results were recorded. (The arrow indicates the time of application of acetylcholine).



Document 1 : Organ X



Document 2: Organ Y



Document 3: Organ Y+Enzyme 1

- 1- Formulate a hypothesis
  - a- Indicating the nature of X and Y knowing that both are muscles.
  - b- Explaining the effect of enzyme 1 on acetylcholine.
- 2- Analyze the results of documents 1 and 2, what can you deduce with respect to the role of acetylcholine in both cases?

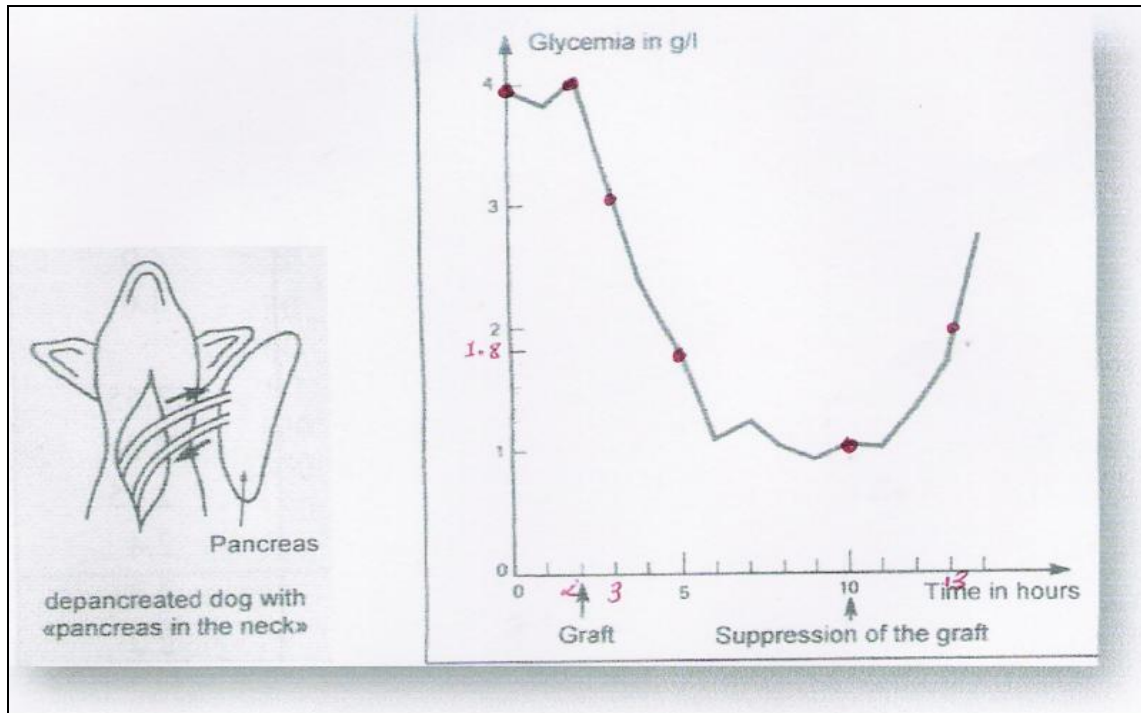
### Exercise Four: the hormonal message.

8pts

In order to study precisely the function of the pancreas , the following experiment was performed.

A dog was subjected to pancreas ablation followed by grafting at the level of the neck (document 1) then measuring the level of glycemia (concentration of glucose in blood) before and after the graft, and

after the suppression of the graft. The following results were observed (document 2)



*Document 1*

*document 2*

*Note: suppression of graft means stoppage of graft.*

- 1- Analyze the curve of document 2 and deduce the role of the pancreas.
- 2- By referring to your acquired knowledge, explain the mode of action of pancreas in response to hyperglycemia (increasing of glucose in the blood).
- 3- Change the data given in the graph into a table.