**BASICS OF NEUROBIOLOGY**

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3. NERVOUS TISSUE

THE NEURON

NERVE FIBERS

Brief summary:

The first lecture characterises the nervous tissue, in which neurons and glial cells exist in structural and functional symbioses. The second lecture demonstrates the unique morphology and the excitability of neurons and some basic networks established by them. The third lecture explains how information is conveyed via nerve fibers between distant locations in the human body.

One has gained sufficient knowledge, if understand and can explain the followings:

1) The structural and functional symbioses of neurons and glial cells.

2) The morphological and functional diversity of neurons. Mutual definiteness of morphology and function.

3) Resting potential and action potential.

4) Electrotonic potential, conductance.

5) The role of somatodendritic region in information processing.

6) The structure of neuropil and events, which take place in the neuropil.

Test the knowledge you gained:

1. *These schematic drawings demonstrate electrotonic changes in response to stimuli. There are three electrodes in the cell, each of those measure potential changes in response to the stimulus. Evaluate the following sentences for correctness! (5 points)*

The stimulus evoked electrotonic potential is weakened towards the axon initial segment in both **A** and **B** cases. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In the case of **B,** the electrotonic potential is higher than the threshold potential next to the axon initial segment. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

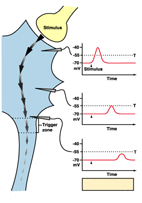
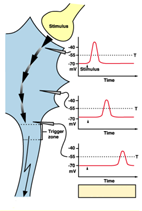
In the case of **A**, the electrotonic potentialcan induce action potentials, if it is summed with another electronic potential deriving from another synaptic stimulus.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Action potential is generated if the electrotonic potential

reaches the axon initial segment.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

** **

B

A

In the case of **A**, the cell is hyperpolarized, in the case of **B**, the cell is depolarized. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. *Nerve fibers. Supplement the text with the missing words. (8 points)*

The filament-like structure composed of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is called a nerve fiber. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is part of the neuron; the larger its diameter, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is its conductance speed. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is produced by glial cells. The glial cells with this function in the peripheral nervous system are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, whereas the name of the cells with similar function in the central nervous system is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The glial cells in the peripheral nervous system are capable to embed several neuronal processes (named above). The latter type of nerve fibers is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. *Evaluate the following sentences for correctness! If you think that the statement is true, give the name of the labeled structure. If you think, that the statement is false, then provide a brief explanation why!**(10 points)*

****

4

2

3

1

5

1. This is an axon, because it is thin and establishes branches. \_\_\_\_\_\_\_\_\_\_\_\_

Name/Why?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. This is a 25 nm-thick tube, which has transport functions. \_\_\_\_\_\_\_\_\_\_\_\_

Name/Why?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Membrane of glial cells, which envelopes structure 2 in multiple layers. \_\_\_\_\_\_\_\_\_\_\_\_

Name/Why?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. This is a glial cell, the nucleus of which is not in the plane of the section. \_\_\_\_\_\_\_\_\_\_\_\_\_

Name/Why?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. In response to action potential, some of the vesicles inside open up and release transmitters

into the synaptic cleft. \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name/Why?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. *Identify the numbered structures! 5 points*

1.

1.

5.

1.

4.

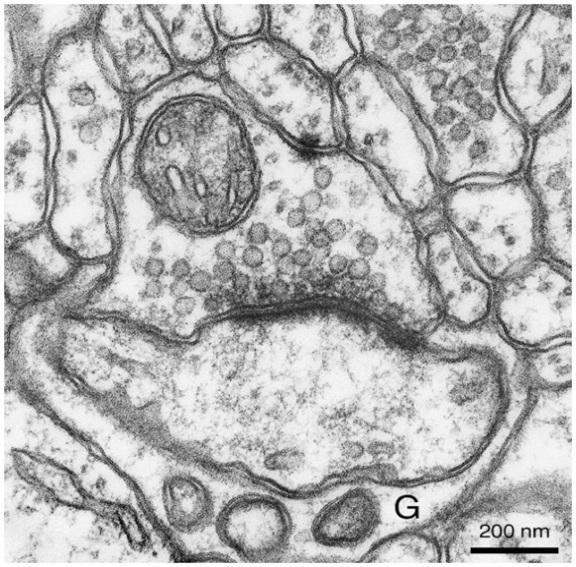
1.

3.

1.

2.

1.



1. …………………………………………………………………………

2. ………………………………………………………………………..

3. ……………………………………………………………………….

4. ………………………………………………………………………..

5. ………………………………………………………………………..

1.