Lecture 1 Review

This review is intended as a brief summary of the lecture. I hope it will help you to focus your studies. It is not intended to provide you with an exhaustive review of the material that was covered. It is also not intended to provide a review of everything you will need to know for the exam. If a topic that was covered in lecture is not mentioned on this review, you should not take that to mean that you do not need to know that material.

The nervous system has been studied for thousands of years, but we have probably learned more about its anatomy and physiology during the last 100 years than we learned during the previous millenia combined. Nevertheless, the basic function of the nervous system has been understood since ancient times and it can be summarized fairly simply as:

1) **To gather information from both the external and internal environments.**
2) **To process and integrate the information that it gathers.**
3) **To produce a coordinated response to the integrated information**

On the gross level the nervous system is generally divided into two anatomical divisions: the **central nervous system** (**CNS**), and the **peripheral nervous system** (**PNS**). Functionally, the nervous system can also be divided into three major divisions: **sensory**, **motor,** and **integrative**. The sensory division receives sensory information, the integrative division puts the information from multiple sensory inputs together, applies meaning to that information, and determines motor responses, and the motor division produces the motor response. The motor division can be further divided into two subdivisions: the **somatic motor** and the **visceral motor**. The visceral motor subdivision is also known as the **autonomic nervous system**. You should know what each to these divisions control as described in lecture.

In terms of cellular structure, all neural tissue is composed of two cell types: **neurons** and **glia**. The neuron is the basic functional unit of the nervous system. Neurons are specialized for transferring information from one part of the nervous system to another. This transfer is achieved by the conversion of an electrical signal into a chemical signal and then back again into an electrical signal. On a basic level, this is functionally what neurons do. The basic structural components of a neuron were discussed in lecture and you should be prepared to answer questions on these components. The two types of **synapses** were also introduced and briefly discussed.

Glia serves a support function. Glia is found in both the PNS and CNS, and in terms of cell numbers the glia far out number the neurons. In the CNS there are four types of glial cells: **astrocytes**, **oligodendrocytes**, **microglia**, and **eppendymal cells**. The functions of each of these types of glia were listed and discussed and you will be expected to know this information for the exam. In the PNS there are two types of glia: **satellite cells**, and **Schwann cells**. You will be expected to know the functions of each of these cell types as described in lecture.

The phenomenon of **axoplasmic transport** was first described in the axon, and it is more commonly know as **axonal transport**. However, it also occurs in the dendrites and is also seen in non-neural cells, like astrocytes. Axonal transport is necessary because nearly all of the metabolic machinery (with the exception of mitochondria) of the neuron

is located in the cell body. Any enzymes and other proteins or biomolecules that are needed along the neurites must be synthesized in the soma and transported down the neurite. The cytoplasm of the axon and dendrites has **cytoskeletal elements** that include **neurofilaments**, **microfilaments**, and **microtubules**. As discussed in lecture, each of these has an important function. In terms of axonal transport, the microtubules are most important. The microtubules act as the 'roads' along which axonal transport occurs. There are two types of axonal transport: **slow axonal transport** and **fast axonal transport**. Both require the expenditure of energy in the form of ATP. You should know the details of each of these types of transport as discussed in lecture. Fast axonal transport utilizes two different families of **motor proteins: dyenins** and **kinesins**. Dyenins are responsible for **retrograde** transport (transport back to the soma) and kinesins are responsible for **anterograde** transport (transport away from the soma). The working of these motor proteins is not well understood and is an area of intense research in neuroscience.