5.2.1 [The human nervous system] Structure and function

AQA GCSE Biology (Higher)
Question and answer notes

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How to use these notes

These notes cover everything you need to know for this part of the specification. They have been written in question-answer format to make them easier for you to study from.

In order to study successfully, I recommend you do the following for each question and answer:

- Read it carefully and make sure you **understand** it.
- **Memorise** the answer.
- **Practice** applying your understanding to past exam questions.

A good way to memorise information is to use **retrieval practice**. This is when you practise retrieving information from your memory. You could do this by making a flashcard for each question with the question on one side and the answer on the other. Or you could use a flashcard app. Alternatively, use a sheet of paper to cover up the answer so you can only see the question. Try to answer the question and then check how you did.

You should practise retrieving each answer from your memory until you can do it perfectly. Even once you can retrieve the answer perfectly, your ability to retrieve it will probably fade as time passes without practising. Therefore you will need to keep going back to the questions that you have previously mastered and practising them again. However, each time you re-learn the answer, the memory will be stronger and will last longer than the time before.

What is the function of the human nervous system?
The human nervous system enables humans to react to their surroundings and coordinate their behaviour.

What are the two parts of the human nervous system?
The two parts of the human nervous system are:

- The central nervous system (CNS)
- The peripheral nervous system (PNS)

What is the central nervous system made up of?
The central nervous system is made up of the brain and the spinal cord.

What is the spinal cord?
The spinal cord is a long column of nervous tissue that starts at the base of the brain and goes all the way down the inside of the spine. It connects the brain to most of the rest of the nervous system.

What is a neurone?
A neurone is a type of cell found in the nervous system. Neurones are also known as ‘nerve cells’. An important feature of neurones is that electrical impulses can pass along them. These electrical impulses are essential to the functioning of the nervous system.

What are the different types of neurones?
The different types of neurones are:

- Sensory neurones
- Motor neurones
- Relay neurones

What do sensory neurones do?
Sensory neurones carry information, as electrical impulses, from receptors to the central nervous system.

What do motor neurones do?
Motor neurones carry information, as electrical impulses, from the central nervous system to effectors.

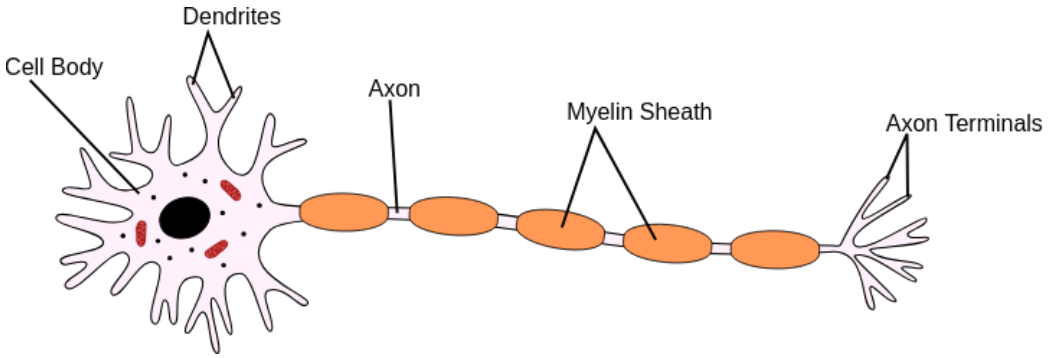
What do relay neurones do?
Relay neurones are only involved a specific type of response called a reflex. During a reflex, relay neurones carry information, as electrical impulses, directly from sensory neurones to motor neurones.

Where are relay neurones located?
Relay neurones are located within the spinal cord.

What is the structure of a neurone?
The different types of neurones all have slightly different structures, however there are certain features that they all have in common, including a cell body, dendrites, an axon, and axon terminals.

These features are shown in the diagram below. The diagram is of a motor neurone. The arrangement of the features would be different in a sensory or relay neurone.

(The myelin sheath is a feature that is only present in some neurones).



What is the function of dendrites within a neurone?
Dendrites receive electrical impulses from other neurones or from receptors.

What is the function of the axon within a neurone?
The axon carries electrical impulses from the dendrites to the axon terminals. In some neurones this is a very long distance.

What is the function of the axon terminals within a neurone?
The axon terminals pass electrical impulses to other neurones or to effectors.

What is a synapse?
A synapse is the small gap between two neurones. Neurones are never directly connected to each other, there is always a synapse.

How does information cross a synapse from one neurone to another?
When an electrical impulse reaches the end of one neurone's axon terminal, this causes a chemical called a neurotransmitter to be released into the synapse from the end of the axon terminal. This neurotransmitter then diffuses across the synapse and binds to receptor proteins on the surface of the second neurone. This then causes an electrical impulse to travel through the second neurone.

What is the overall process that happens whenever the human nervous system responds to a stimulus?
Whenever the human nervous system responds to a stimulus, the following process happens:

- The stimulus is detected by a receptor.
- The receptor sends electrical impulses through a sensory neurone to the CNS.
- The CNS coordinates a response by sending out electrical impulses through motor neurones to effectors.
- The effectors carry out a response.

This process can be summarised as:

Stimulus → Receptor → Sensory neurone → CNS → Motor neurone → Effector → Response

How do effectors respond to stimuli?
There are two types of effectors: muscles and glands. Muscles respond to stimuli by contracting. Glands respond to stimuli by secreting hormones into the bloodstream.

What are reflexes?
Reflexes are responses which the nervous system carries out without using the brain. Because the information does not have to go via the brain, the response is able to take place very quickly. This is used by the body to achieve quick responses to dangerous stimuli (e.g. quickly moving a hand away when it touches something hot). Reflexes are described as 'automatic' because they do not involve thinking.

Do reflexes involve the central nervous system?
Reflexes do involve the central nervous system, because the electrical impulses go via the spinal cord.

What is the name for the path that the electrical impulses take during a reflex?
The path that the electrical impulses take during a reflex is called a 'reflex arc'.

What are the stages of a reflex arc?
The stages of a reflex arc are as follows:

- The stimulus is detected by a receptor.
- The receptor sends electrical impulses through a sensory neurone to the spinal cord.
- In the spinal cord, the electrical impulses pass from the sensory neurone to a relay neurone and then to a motor neurone.
- The motor neurone carries the electrical impulses out of the spinal cord and to an effector.
- The effector carries out a response.