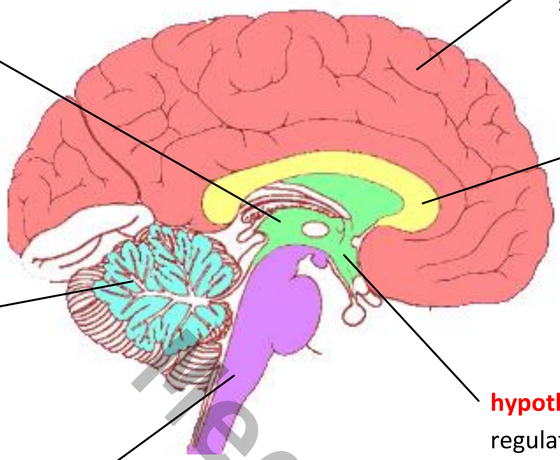
4.1 The Central Nervous System

The role of the CNS and its effect on human behaviour

The **central nervous system** (**CNS**) consists of two main parts: the brain and the spinal cord. Some of the main features of the brain which are studied for the biological approach are shown in the below diagram.



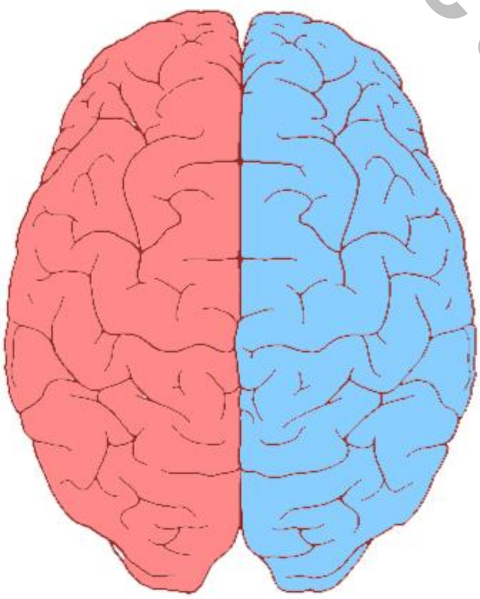
There are two **hemispheres** of the brain. Each side has different parts which control different things. Females are better at using both sides of the brain together. Males are better at using only one side (the right). By concentrating on this side, males tend to be better at the tasks which use the left side of the brain, than females.

Left hemisphere

Receives information from and controls the *right-hand side* of the body, and receives information from the *right visual field*

The right hemisphere controls:

- speech, language and comprehension
- analysis and calculations
- time and sequencing
- recognition of words, letters and numbers



Right hemisphere

Receives information from and controls the *left-hand side* of the body, and receives information from the *left visual field*

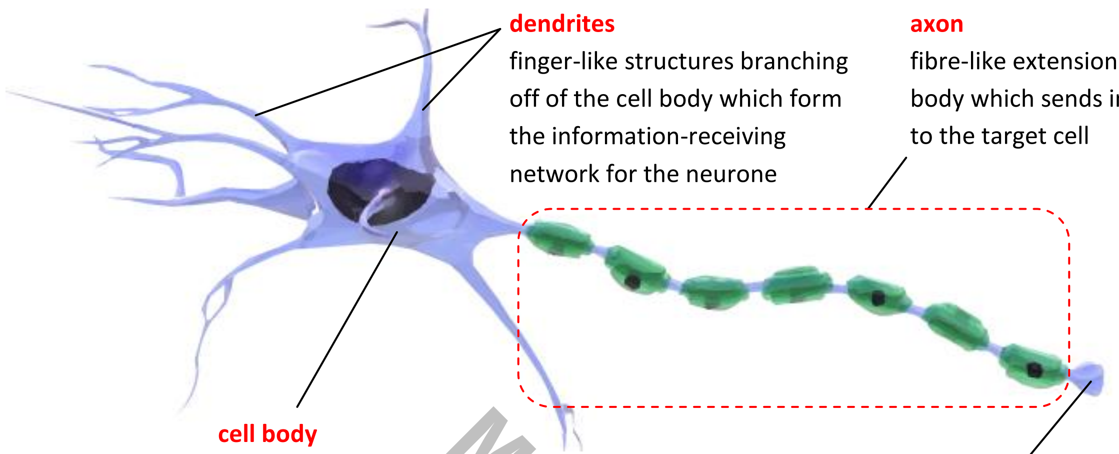
The right hemisphere controls:

- creativity
- spatial ability
- context/perception
- recognition of faces, places and objects

Because males use one size more efficiently than the other, male brains are said to be **lateralised**. Brain lateralisation occurs in males, and not females. This is one difference between male and female brains. The biological approach is particularly interested in studying the biological aspects of gender development.

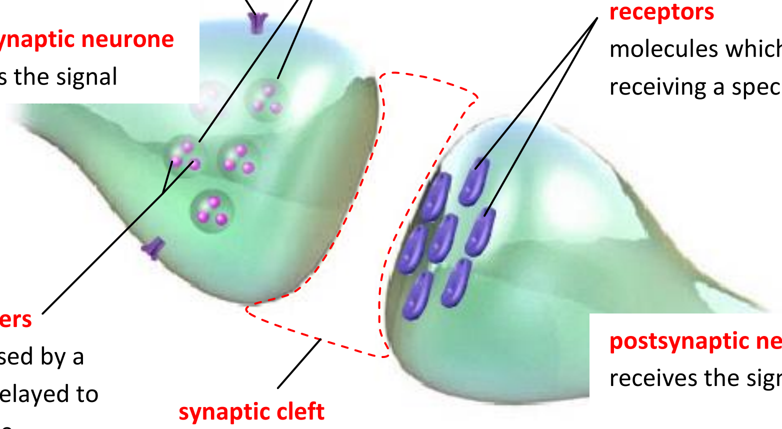
Neurotransmitter - chemical messengers which act between neurones in the brain at synaptic junctions

A **neurotransmitter** is a chemical messenger which acts between **neurones** in the brain. This allows the brain to process thoughts and memories. These neurones are cells which both transmit and receive messages. One end of a neurone has **dendrites**, finger-like extensions from the cell.

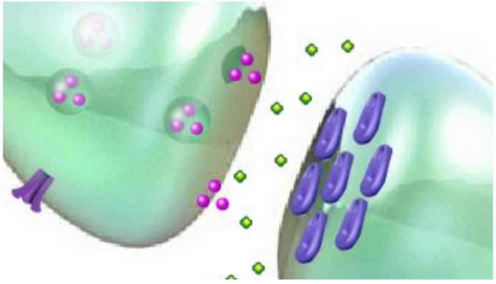


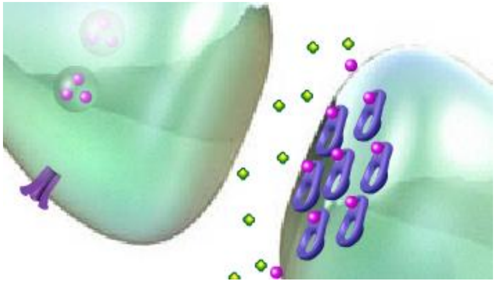
The **axon terminal** reaches other nerve cells and effector cells at the dendrites of those other cells. There is a small gap between the dendrites and axon terminal, called a **synapse**. On the *dendrite* side of a synaptic gap there are **receptors** which can receive neurotransmitters sent by the neighbouring neurone.

Much like the **lock and key theory** which applies to enzymes in Biology, each receptor is made to fit one type of neurotransmitter only. When a neurotransmitter is successfully bound to a receptor, a response is triggered.



In order to communicate between two neurones, an electrical message must be passed on. An electrical impulse is generated at the head of the axon and travels down the neurone. When it reaches the terminal, it causes the **channel proteins** to open, which allow **calcium ions** through the cell membrane and into the neurone itself.





When the calcium ions enter the neurone, they bind with the vesicles. This causes the vesicles (which are currently carrying the neurotransmitters) to rush to the cell membrane at the very end of the axon terminal of the presynaptic neurone.

When the vesicles meet the membrane, they **fuse** ("pinch off") and the contents – the neurotransmitters – are released into the synaptic cleft.

The neurotransmitters then **diffuse** across the synaptic junction and bind with the receptors which lay on the postsynaptic neurone.

As they bind together, a response is triggered. In the case of the synapse shown in the diagrams to the left, this would mean allowing the entry of the sodium (green dots) ions into the postsynaptic neurone. The electrical impulse continues its way down the neurone. The neurotransmitters are released back into the cleft. The presynaptic neurone manufactures more vesicles to store them in again – this way they are recycled for future neurone actions.