

The Brain Notes

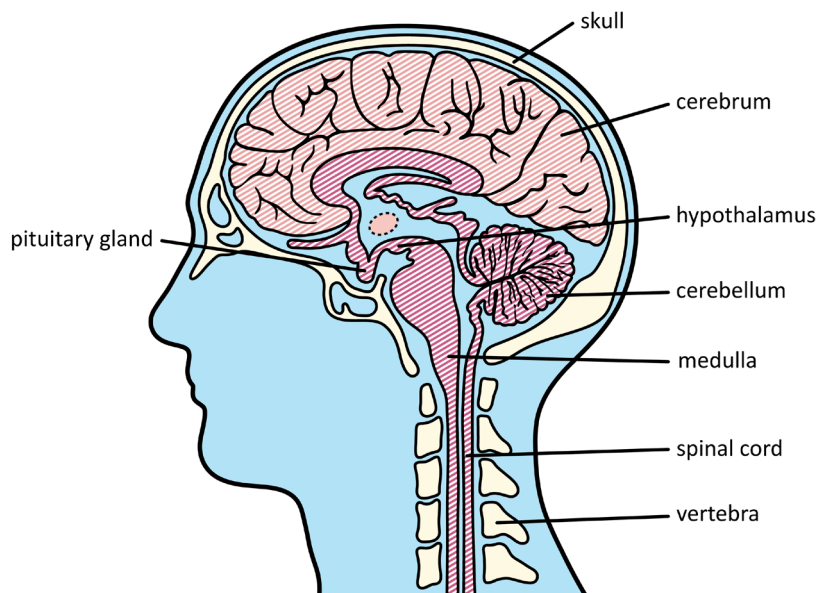
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The brain is quite literally where you live. Everything that makes you who you are, personality, memories, problem solving and of course all of the hundreds of millions of neurones which allow complex functions to run seamlessly in the background.

The brain is hugely complex but at GCSE we are only required to know what the four major regions are and what functions they have. Let's get cracking 😊 The diagram below shows a section through the brain of a human.



Structure	Function
Pituitary gland	Is a gland in the brain that produces many different hormones. Is often called the master gland . It produces various hormones into the bloodstream that regulate growth, metabolism, and stimulate other glands to release their own hormones.
Skull	The bone structure that protects the brain.
Cerebrum	It is divided into two hemispheres. It is responsible for our senses such as taste and smell, language, memory, consciousness and behaviours .
Hypothalamus	The region for <u>regulating temperature and water concentration (homeostasis) in the body</u> .
Cerebellum	It is divided into two halves and controls balance and posture .
Medulla	Controls your breathing and heart rate . It also controls reflexes such as sneezing, vomiting and swallowing .
Spinal cord	A major bundle of nerves running down the back. It carries electrical signals back and forth between the brain and the rest of the body, and it coordinates basic reflexes.

Looking at the brain from the outside it's quite hard to tell what each part does, it's even hard to tell some regions of the brain apart from one another. So how did we find out what each part does? Well... when people had accidents and damaged a region of their brain, that part would either stop working or it would work differently. This allowed scientists and doctors to know what the major areas of the brain do. The example that is mentioned at GCSE is Phineas Gage.

Phineas Gage

Phineas Gage was working laying some new track for a railway when an accidental explosion forced a very large metal spike into and through the front of Phineas's brain. **Amazingly** he didn't die and was awake and on his feet within minutes!

The spike damaged the front of the cerebrum. Before the accident Phineas was hardworking and friendly but after the accident, he changed, becoming lazy and aggressive (which is not unreasonable really given a massive spike had rammed through his head). From this it was determined that the cerebrum is involved with personality.

Treating The Brain

Treating the brain is incredibly difficult. Medical treatments and surgery on the brain and spinal cord carry massive risks. This is because:

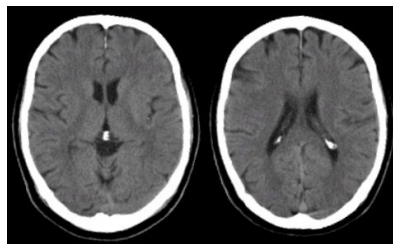
1. **Access is difficult:** the brain is protected by the hard skull and this has to be cut away to get to the brain.
2. **It is extremely delicate:** brain tissue is easily damaged, and any accidental damage caused during surgery is often permanent and irreversible.
3. **Complexity:** the brain is really very complex, and we still don't fully understand how all the parts of the brain are connected or work together.
4. **No stem cells:** the neurones in the central nervous system cannot repair themselves, and there are currently no treatments available to regrow them. There are no stem cells in the spinal cord. If a person damages their spinal cord that damage is permanent in most cases.

But what if we don't need surgery but we would like to need to have something checked?

There are scans that we can do 😊 Scanning can allow doctors to look deeper into the brain without surgery. Scanning can also be used to study the brain of a healthy individual. These are CT and PET scans.

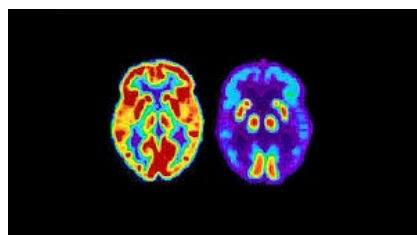
CT Scan

CT scans use X-ray beams, an emitter moves in circles around the head and the detector measures the absorption of X-rays. Differences in densities can be clearly seen. This can indicate the presence of a tumour.



PET Scan

A PET scan shows the activity of the brain. A radioactive version of glucose (completely harmless) is injected into a patient. The radioactive isotope emits gamma waves which are detected. A more active part of the brain respires more therefore using more glucose so appears red. This shows what regions of the are involved in what process.



Brain Tumours

Cancer can develop in the brain. If it does so it can take up space that is meant for the brain, and this can squeeze it against the skull. This can be fatal if untreated.

Tumours can be physically cut out of the brain. Additionally, they can be treated with radiotherapy, using high energy X-rays, and chemotherapy, using drugs and chemicals that kill actively dividing cells.