SB2 – Cells and Control (Paper 1)

SB2e The Brain

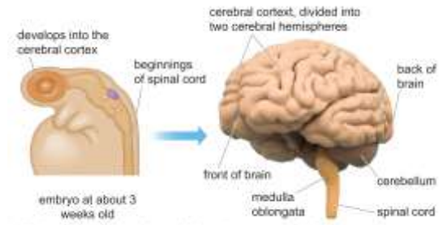
What cells are found in the brain?
Once an embryo is 3three weeks old the stem cells in the brain differentiate to produce neurones, which make up most of the brain.

How many neurons does an adult brain have?
An adult brain has about 86 billion neurones, which interconnect with one another to process information and control the body.

What is the spinal cord connected to?
The mass of neurones in the medulla oblongata connect the brain to the spinal cord. The spinal cord consists of many nerves. These carry information between the brain and the rest of the body.

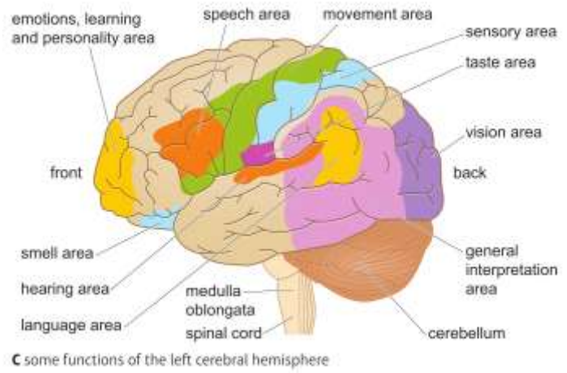
What is the role of the cerebral cortex?
It is used for most of our sense, language, memory, behaviour and consciousness.

What is the structure of the cerebral cortex?
It is divided into two cerebral hemispheres. The right hemisphere communicates with the left side of the body and vice versa.



A brain development and some of the major structures of the brain

What is the cerebellum?
At the base of the brain, it is divided into two halves and controls balance and posture.



C some functions of the left cerebral hemisphere

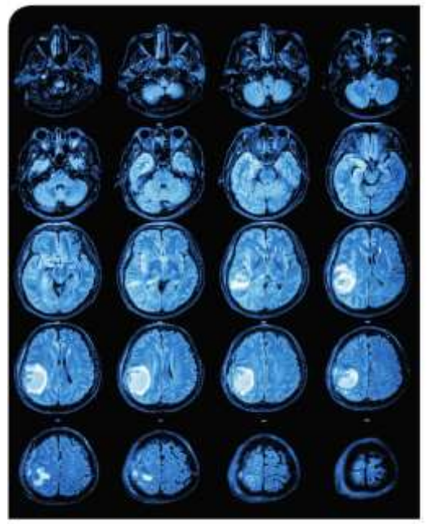
What is the medulla oblongata?
It controls your heart rate and your breathing rate. It is responsible for reflexes such as vomiting, sneezing and swallowing

SB2f Brain and Spinal Cord Problems

What is a CT scan?
This shows the shape and structure in the brain. An X-ray beam moves in a circle around the head, and detectors measure the absorption of the X-rays. A computer used this information to build up a view of the inside of the body as a series of slices. Differences in the shapes in the brain can be linked to differences in the way people think and act.

What is a PET scan?
This shows brains activity. The patient is injected with radioactive glucose. The more active the cells the more glucose they use (for respiration). The radioactive cause gamma rays, which the scanner detects. More gamma rays come from the more active brain cells.

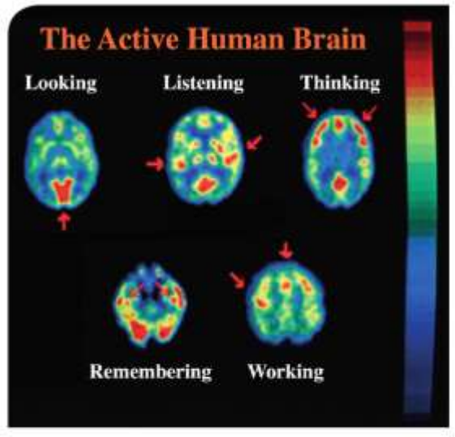
What is spinal cord damage?
Damage to the spinal cord reduces the flow of information between the brain and parts of the body. Nerve damage in the lower spinal cord can cause loss of feeling and use of the legs.


B CT 'slices' through the brain. Denser materials absorb more X-rays, causing whiter areas. The very white area is a brain tumour.

What is a brain tumour?
A brain tumour may squash parts of the brain and stop them working.

How can brain tumours be treated?
Tumours can be cut out or the cells can be killed using radiotherapy and chemotherapy. All these methods can damage the body and brain, chemotherapy may not work due to the blood-brain barrier.

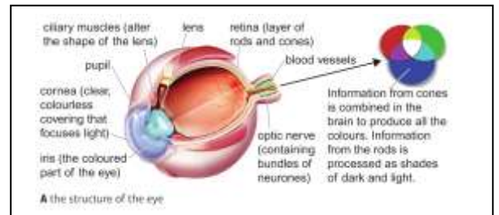
Why is it difficult for patients to regain full movement or feeling after spinal cord damage?
There are no adult stem cells that can differentiate into neurones in the spinal cord, so new neurones cannot be made to repair damage.



C PET scans allow scientists to match activities with certain areas of the brain.

SB2f The Eye

What is the eye?
A sense organ that contains receptor cells found in a layer called the retina.

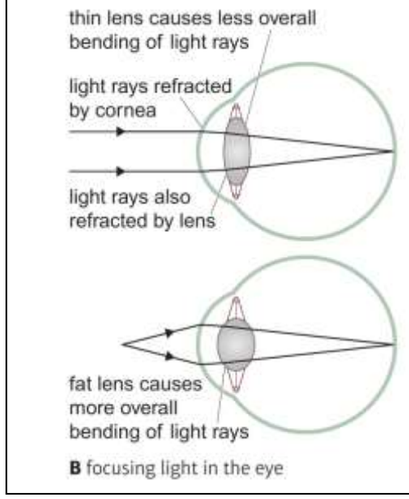


A the structure of the eye

What are cones?
Cones are receptor cells that are sensitive to the colour of light. Cones detect red, green or blue light. Cones generate impulses in sensory neurones which lead to the brain through the optic nerve. This information is processed into full colour vision.

What are rods?
Are receptor cells that detect differences in light intensity. Rods work very well in very dim light situations.

What is the pupil?
The dark area in the middle of your eye where light enters. The amount of light entering the eye is controlled by muscles in the iris which can constrict the pupil or dilate it.



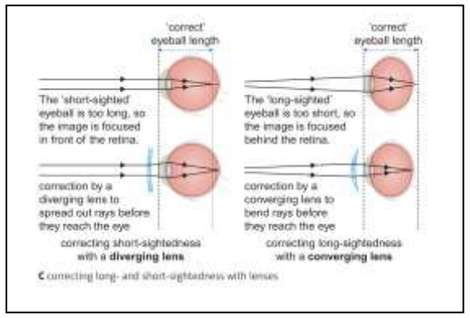
B focusing light in the eye

What is the role of the cornea?
Light rays entering the eye need to be focused onto a point in the retina. Most focussing is done by the cornea which bends light rays to bring them together.

What is the role of the lens?
The lens fine tunes and focuses the image. Ciliary muscles make the lens fatter to focus light from near objects and thinner to focus light from distant objects.

What is a cataract?
Sometimes a protein builds up inside the lens and makes it cloudy. This is a cataract. Full vision can be restored by replacing the clouded lens with a plastic one.

What is colour-blindness?
Where some cones do not work properly. The most common form is red-green colour-blindness. Cones that detect green light are faulty making it difficult to tell the difference between red, green and brown. Colour-blindness cannot be corrected.



C correcting long- and short-sightedness with lenses

Key Vocabulary Definitions

Blood-brain barrier – a natural filter that only allows certain substances to get from the blood to the brain (mainly due to cells in the capillary wall in the brain fitting together very closely).

Chemotherapy – use of drugs to treat a disease such as in the treatment of cancer.

Ciliary muscles – a muscle that relaxes or contracts to change the shape of the lens in the eye.

Converging lens – a lens that brings light rays together.

Diverging lens – a lens that causes light rays to spread apart.

Gamma rays – a high-frequency electromagnetic wave emitted from the nucleus of a radioactive atom. Gamma rays have the highest frequencies in the electromagnetic spectrum.

Radioactive – a substance is radioactive if it emits ionising particles or radiation.

Radiotherapy – use of ionising radiation to treat diseases, such as to kill cancer cells.

Tumour – a lump formed of cancer cells.