

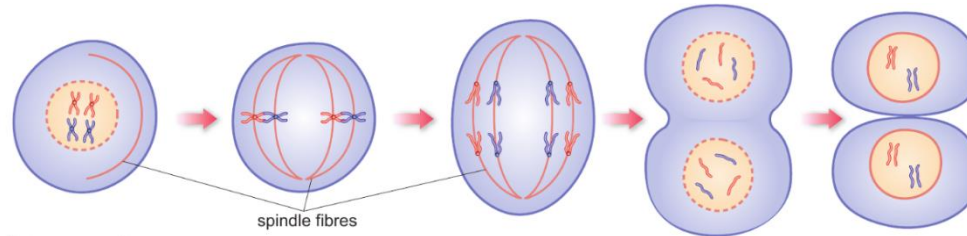
### B2: Cells and control

#### Lesson sequence

1. Mitosis
2. Growth in animals
3. Growth in plants
4. Stem cells
5. The brain
6. Brain and spinal cord problems
7. Nervous system
8. The eye
9. Neurotransmission
10. Controlling movement

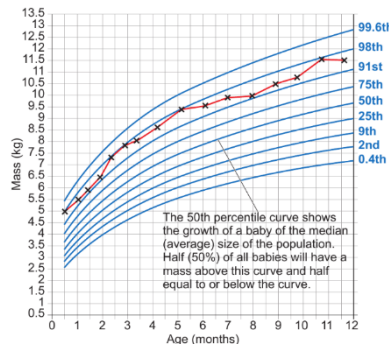
#### 1. Mitosis

<b>Cell cycle</b>	The life of a cell comprising interphase and mitosis.
<b>Interphase</b>	Preparation for mitosis in which extra cell parts are made and DNA chromosomes are replicated (copied).
<b>Mitosis</b>	When one cell divides into two genetically identical daughter cells.
<b>(I)PMATC</b>	The stages of mitosis: interphase (not mitosis), prophase, metaphase, anaphase, telophase, cytokinesis.
<b>Prophase</b>	The membrane of the nucleus breaks down and spindle fibres start to form.
<b>Metaphase</b>	Spindle fibres fully form and chromosomes line up across the middle of the cell.
<b>Anaphase</b>	Chromosome copies separate and move to each end of the cell.
<b>Telophase</b>	A new membrane forms around each set of chromosomes to form two nuclei.
<b>Cytokinesis</b>	The two new cells fully separate.
<b>Cancer</b>	When mitosis happens out of control forming large lumps of cells called tumours.



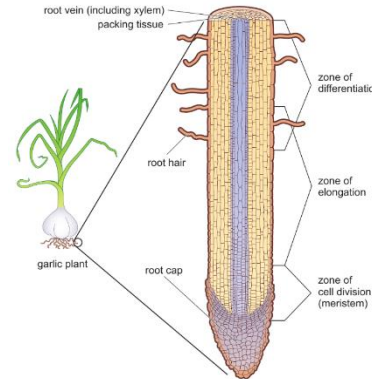
#### 2. Growth in animals

<b>Growth</b>	Increase in size due to increased numbers of cells.
<b>Percentile</b>	A measure of the growth of a child that compares them to other children of the same age.
<b>90<sup>th</sup> percentile</b>	A child is taller than 90% of children of the same age.
<b>50<sup>th</sup> percentile</b>	Average for height/mass for the age.
<b>Percentile graphs</b>	Graphs showing how height/mass change with age with different lines for each percentile.
<b>Cell differentiation</b>	When a cell divides by mitosis to produce two different types of cell (not two identical ones).
<b>Specialised cell</b>	A cell special features designed for a specific job.
<b>Importance of differentiation in animals</b>	To produce all the different types of cell the body needs such as red blood cells, fat cells, nerve cells and muscle cells.



#### 3. Growth in plants

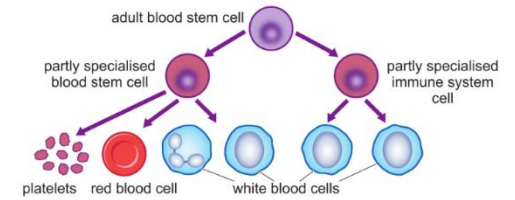
<b>Plant growth</b>	Cell division creates more cells, elongation makes these cells get bigger.
<b>Meristems</b>	Areas just behind the tips of roots and shoots where cell division and differentiation happens.
<b>Importance of differentiation in plants</b>	To produce all the different types of cell a plant needs such as root hair cells and xylem cells.
<b>Calculating percentage changes</b>	$\% \text{ change} = \frac{\text{final value} - \text{starting value}}{\text{starting value}} \times 100$



#### 4. Stem cells

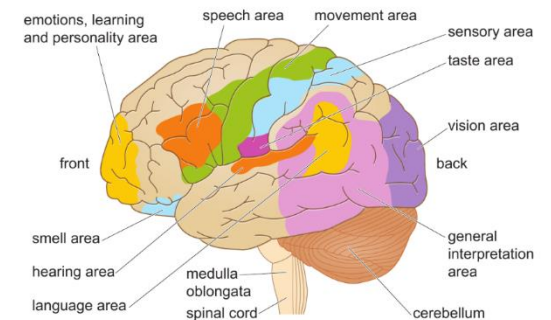
<b>Stem cell</b>	A cell that can differentiate when it divides, to produce two different cells.
<b>Embryonic stem cell</b>	A stem cell that can become any kind of cell. Found in developing embryos.

<b>Adult stem cell</b>	A stem cell that can only become a few types of cell. Found in animals after birth.
<b>Stem cells in medicine</b>	It is hoped they can be used to replace damaged cells in diseases like type 1 diabetes or leukaemia, or to grow new organs for transplant.
<b>Problems with stem cells</b>	They may potentially cause cancer; stem cells can only be used in the person they have come from.



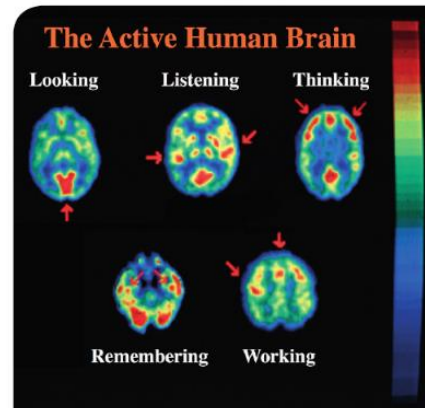
#### 5. The brain

<b>Cerebral cortex</b>	It plays a key role in attention, perception, awareness, thought, memory, language, and consciousness.
<b>Cerebellum</b>	Coordinates voluntary movements such as posture, balance, coordination, and speech, resulting in smooth and balanced muscular activity.
<b>Medulla oblongata</b>	Helps regulate breathing, heart and blood vessel function, digestion, sneezing, and swallowing.



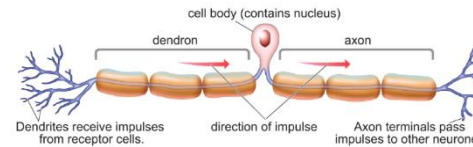
### 6. Brain and spinal cord problems

<b>Neurons</b>	Cells within the nervous system that transmit information to other nerve cells, muscle, or gland cells.
<b>Spinal cord</b>	A long, thin, tubular structure made up of nervous tissue.
<b>Reflexes</b>	An action that is performed without conscious thought as a response to a stimulus.
<b>CT Scan</b>	Uses x-rays and a computer to create detailed pictures of the inside of your body.
<b>PET Scan</b>	Positron emission tomography (PET) scan is an imaging test that uses a special dye containing radioactive tracers.
<b>Radioactive glucose</b>	A radioactive form of glucose often used during a PET scan.
<b>Quadriplegia</b>	Paralysis caused by illness or injury that results in the partial or total loss of use of all four limbs and torso.
<b>Tumour</b>	A groups of abnormal cells that form lumps or growths.
<b>Chemotherapy</b>	An aggressive form of chemical drug therapy meant to destroy rapidly growing cells in the body.
<b>Radiotherapy</b>	A cancer treatment that uses high doses of radiation to kill cancer cells and shrink tumours.
<b>Blood-brain barrier</b>	A natural filter that only allows certain substances to get from the blood into the brain.



### 7. Nervous system

<b>Nervous system</b>	All the nerves in your body working together to gather information, make decisions and control responses.
<b>Central nervous system</b>	The brain and spinal cord – makes decisions (aka CNS).
<b>Peripheral nervous system</b>	All your other nerves – gathers information from your sense and carries messages from the CNS to your muscles.
<b>Neurone</b>	A nerve cell.
<b>Impulse</b>	Electrical message carried by a neuron.
<b>Cell body</b>	The central part of a nerve cell containing its nucleus.
<b>Dendron and axon</b>	The long parts of a nerve cell carrying impulses towards the cell body (dendron) and away from it (axon).
<b>Myelin sheath</b>	A fatty layer around the axon and dendron that insulates it to prevent the impulse from escaping and speeds the impulse up.

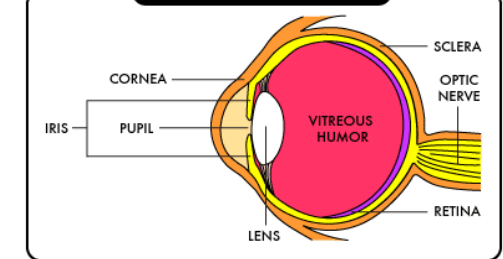


### 8. The eye

<b>Pupil</b>	A hole located in the centre of the iris of the eye that allows light to strike the retina.
<b>Iris</b>	Controls the diameter and size of the pupil and thus the amount of light reaching the retina.
<b>Cornea</b>	The transparent front part of the eye that covers the iris and pupil.
<b>Lens</b>	A transparent biconvex structure in the eye that, along with the cornea, helps to refract light to be focused on the retina.
<b>Retina</b>	is to receive light that the lens has focused, convert the light into neural signals, and send these signals on to the brain for visual recognition.
<b>Optic Nerve</b>	transfer visual information from the retina to the vision centres of the brain via electrical impulses.
<b>Ciliary muscle</b>	Muscles capable of modifying the curvature of the lens and thereby affecting the focal length of the lens.
<b>Cones</b>	Photoreceptor cells in the retinas. They respond differently to light of different or colour vision and function best in relatively bright light.
<b>Rods</b>	Photoreceptor cells in the retina of the eye that can function in lower light.
<b>Dilate</b>	Make or become wider, larger, or more open.
<b>Short-sighted</b>	Unable to see things clearly unless they are relatively close to the eyes.

<b>Long-sighted</b>	Unable to see things clearly, especially if they are relatively close to the eyes.
<b>Cataract</b>	The lens of the eye becomes progressively opaque (due to a protein building up in the lens), resulting in blurred vision.
<b>Colour-blindness</b>	The inability to distinguish the differences between certain colours. This condition results from an absence of colour-sensitive pigment in the cone cells of the retina.

### DIAGRAM OF THE EYE



### 9. Neurotransmission

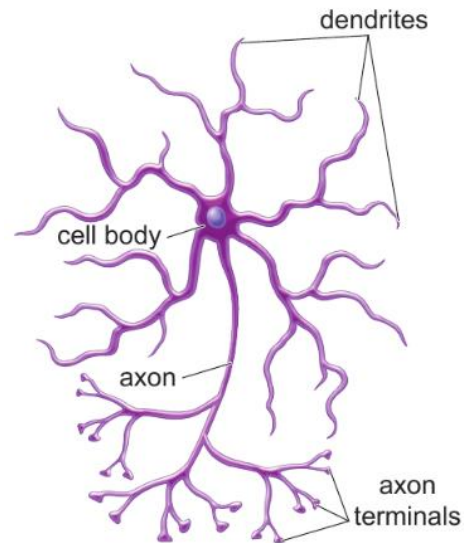
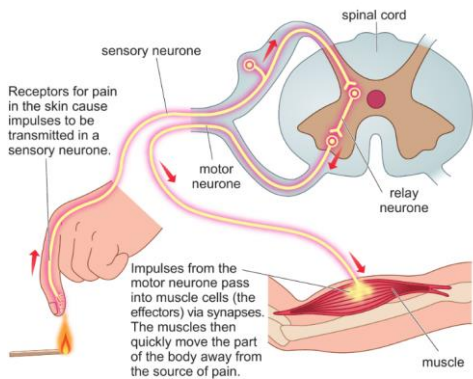
<b>Neurotransmission</b>	The travelling of an impulse along a neuron and into another.
<b>Dendrites</b>	Branches at the beginning of a dendron that connect to receptor cells or another neuron.
<b>Axon terminals</b>	Branches at the end of an axon that connect to a muscle or another neuron.
<b>Synapse</b>	Small gap between two neurons where the axon terminals of one meet the dendrites of another.
<b>Neurotransmitter</b>	Chemicals released by axon terminals that diffuse across the synapse to trigger a new impulse the dendrite of another neuron.

#### Exam-style question

Suggest an explanation for why the person in photo B lost sight in one eye when the tumour was removed. (2 marks)

<b>Sensory neuron</b>	Nerve cell that carries impulses from sense organs to the CNS. Has a long dendron and a long axon.
<b>Relay neuron</b>	Nerve cell in the CNS that makes decisions. Dendrites join onto cell body, short axon.
<b>Motor neuron</b>	Nerve cell that carries impulses from the CNS to muscles. Dendrites join onto cell body, long axon.

<b>Reflexes</b>	Automatic responses that happen very quickly without conscious thought to keep the body safe.
<b>Reflex arc</b>	Movement is caused in the same way as for voluntary movement, except the spinal cord makes the decision without needing the brain to think.



10. Controlling movement	
<b>Stimulus</b>	A piece of information detected by the nervous system.
<b>Receptor</b>	Cells that detect a stimulus.
<b>Response</b>	The action that the nervous system makes happen.
<b>Effector</b>	The body part that produces the response, often a muscle.
<b>Voluntary movement</b>	A stimulus is detected by a receptor, causing an impulse to be carried by a sensory neuron to the brain. Relay neurones in the brain decide what to do and send another impulse down a motor neuron to the effector (muscle) to cause a response.