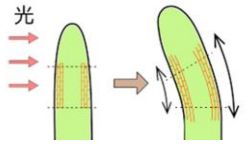
science biology

A-Level Organisms respond to changes P1- Survival and response

Responses

All multicellular organisms need to respond to changes in their environment (stimuli) in order to survive.

Tropisms are a directional growth response in plants, in which the direction of the response is determined by the direction of the external stimulus



- Plants respond to directional stimuli using specific growth factors, which move to regions where they are needed from growing regions
- Indoleacetic acid (IAA) causes elongation of shoot cells, while it also inhibits root cell elongation in order to cause positive geotropism & phototropism.

As **IAA** moves towards the **elongation region**, it attaches to protein receptors on the cells causing them to release hydrogen ions. These hydrogen ions break the bonds in the myofibrils of cellulose, making the **myofibrils more easily stretched** when turgor pressure in the cells is increased due to growth.

- **Taxis** is the movement of an animal towards or away from a stimulus
- In **kinesis** animals change the rate of movement (turning or speed) in order to move towards favourable conditions
- **Taxis & kinesis** are simple responses that can maintain a mobile organism in a favourable environment.

A taxis is a directional response to a stimulus.

Euglena is a single celled organism that moves towards light. It uses a flagellum for movement and has chloroplasts to photosynthesise. This is an example of **positive phototaxis.**

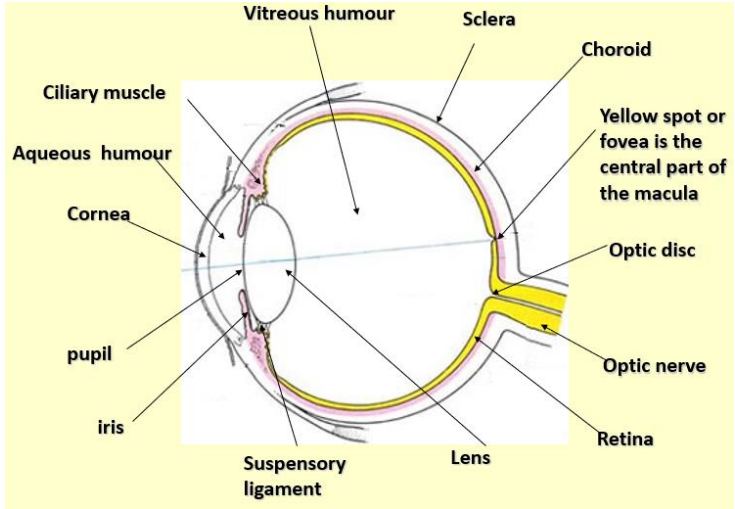
A kinesis is a non-directional movement in response to a stimulus.

Woodlice move to avoid dry and light conditions. The drier the atmosphere, the faster the rate of movement and frequency of turning.

Photoreceptors

The retina contains photoreceptors which detect light - rods and cones.

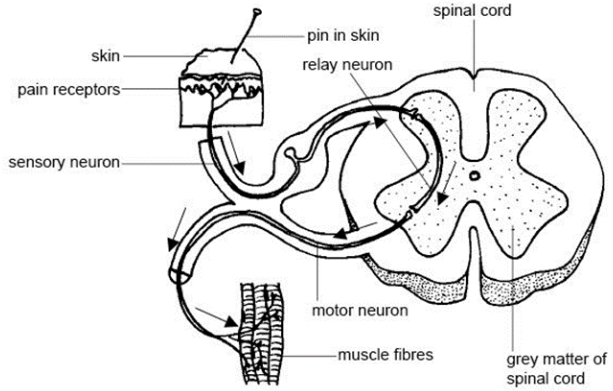
Rod cells	Cone cells
Detect light across the middle of the visible light spectrum	Three types of cone cells, which respond to red, green, and blue light
More sensitive to low light intensities than cones	Comparing the responses from each type of cone receptor allows for colour vision
Use the pigment rhodopsin to detect light	Use the pigment iodopsin to detect light
More abundant than cone cells	Fewer numbers than rod cells
Located more towards the periphery of the retina. Not present at the fovea	Concentrated at the fovea. Fewer at the periphery of the retina
Multiple rod cells connect to a single bipolar cell	Cone cells connect to their own bipolar cell
Provide poor visual acuity	Provide good visual acuity



Reflexes

Reflexes are rapid responses that don't require conscious thought.

- Reflexes can quickly protect the body from harm, as it does not involve many synapses, they use simple mechanisms and are localized to the part of the body where they occur.

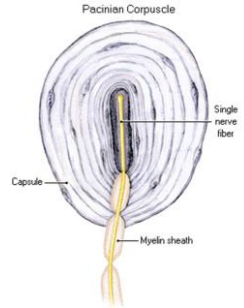


Receptors

Sensory receptors are specialised cells in the nervous system that detect physical stimuli and convert them into electrical signals (the generator potential)

- Sensory receptors tend to be specific to one type of stimulus because they have specialised structures that are specific to one type of physical property
- Pacinian corpuscles detect changes in pressure in the skin.
- Increases in pressure cause a deformation of the concentric rings of the Pacinian corpuscle, opening stretch-mediated sodium channels in the membrane.

Sodium ions enter the sensory neuron, causing a generator potential which can trigger an action potential.



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