

AQA Biology A-level

6.1 - Internal and external stimuli are detected and lead to a response

Flashcards



What are plant growth factors and where are they produced?



What are plant growth factors and where are they produced?

- Chemicals that regulate plant growth response to directional stimuli.
- Produced in plant growing regions (apical meristems).
- Diffuse from cell to cell/ phloem mass transport.



Explain why shoots show positive phototropism.



Explain why shoots show positive phototropism.

1. Indoleacetic acid (IAA) diffuses to shaded side of shoot tip.
2. As IAA diffuses down shaded side, it causes active transport of H^+ ions into cell wall.
3. Disruption to H-bonds between cellulose molecules & action of expansins make cell more permeable to water. (acid growth hypothesis).
4. Cells on shaded side elongate faster due to higher turgor pressure.
5. Shoot bends towards light.



Explain why roots show positive gravitropism.



Explain why roots show positive gravitropism.

1. Gravity causes IAA to accumulate on lower side of the root.
2. IAA inhibits elongation of root cells.
3. Cells on the upper side of the root elongate faster, so the root tip bends downwards.



Contrast mammalian hormones and plant growth factors. (CASTS)



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Feature	Mammalian hormone	Plant growth factor
Concentration	response not always dependent on concentration	response proportional to concentration
Action	bind to complementary proteins in/ on target cells	can affect all cells
Synthesis	specialised glands	various tissues in growing regions
Transport	circulatory system	diffusion or phloem translocation
Speed	faster-acting (homeostasis)	slower-acting (plant growth)



Define taxis and kinesis. State their advantage.



Define taxis and kinesis. State their advantage.

- **Taxis:** directional movement in response to external stimulus.
- **Kinesis:** non-directional response to presence and intensity of external stimulus.
- Maintain mobile organism in optimum environment e.g. to prevent desiccation.



Many organisms respond to temperature and humidity via kinesis rather than taxis. Why?



Many organisms respond to temperature and humidity via kinesis rather than taxis. Why?

Less directional stimuli; often no clear gradient from one extreme to the other.



How could a student recognise kinesis in an organism's movement?



How could a student recognise kinesis in an organism's movement?

1. Organism crosses sharp division between favourable & unfavourable environment: turning increases (return to the original favourable environment).
2. If organism moves considerable distance into unfavourable environment: turning slowly decreases; begins to move in long, straight lines; sharper turns (lead organism to new environment).



Outline what happens in a simple reflex arc.



Outline what happens in a simple reflex arc.

receptor detects stimulus → sensory

neuron → relay neuron in CNS

coordinates response → motor neuron

→ response by effector



Give the advantages of a simple reflex.



Give the advantages of a simple reflex.

1. Rapid response to potentially dangerous stimuli since only 3 neurons involved
2. Instinctive



Suggest a suitable statistical test to determine whether a factor has a significant effect on the movement of an animal in a choice chamber.



Suggest a suitable statistical test to determine whether a factor has a significant effect on the movement of an animal in a choice chamber.

Chi squared



What features are common to all sensory receptors?



What features are common to all sensory receptors?

- Act as energy transducers which establish a generator potential.
- Respond to specific stimuli.



Describe the basic structure of a
Pacinian corpuscle.



Describe the basic structure of a Pacinian corpuscle.

- Single nerve fibre surrounded by layers of connective tissue which are separated by viscous gel and contained by a capsule.
- Stretch-mediated Na^+ channels on plasma membrane.
- Capillary runs along base layer of tissue.



What stimulus does a Pacinian corpuscle respond to? How?



What stimulus does a Pacinian corpuscle respond to? How?

1. **Pressure** deforms membrane, causing **stretch-mediated Na^+ ion channels** to open.
2. If influx of Na^+ raises membrane to threshold potential, a **generator potential** is produced.
3. Action potential moves along sensory neuron.



Name the 2 types of photoreceptor cell located in the retina.



Name the 2 types of photoreceptor cell located in the retina.

1. Cone cells
2. Rod cells



Where are rod and cone cells located in the retina?



Where are rod and cone cells located in the retina?

Rod: evenly distributed around periphery
but NOT in central fovea

Cone: mainly central fovea no
photoreceptors at blind spot



Compare and contrast rod and cone cells. (PACL)



Compare and contrast rod and cone cells. (PACL)

Property	ROD	CONE
Pigment	rhodopsin	3 types of iodopsin
Visual Acuity	Low res: many rod cells synapse with 1 bipolar neuron	High res: 1 cone cell synapses with 1 bipolar neuron= no retinal convergence
Colour sensitivity	Monochromatic: all wavelengths of light detected	Tricolour: red, blue, green wavelengths absorbed by different types of iodopsin
Light sensitivity	V.sensitive: spatial summation of subthreshold impulses	Less sensitive= not involved in night vision



Outline the pathway of light from a photoreceptor to the brain.



Outline the pathway of light from a photoreceptor to the brain.

photoreceptor → bipolar neuron →
ganglion cell of optic nerve → brain



Define myogenic.



Define myogenic.

Contraction of heart is initiated within the muscle itself rather than by nerve impulses.



State the name and location of the 2 nodes involved in heart contraction.



State the name and location of the 2 nodes involved in heart contraction.

- Sinoatrial node (SAN): within the wall of the right atrium.
- Atrioventricular node (AVN): near lower end of right atrium in the wall that separates the 2 atria.



Describe how heartbeats are initiated and coordinated.



Describe how heartbeats are initiated and coordinated.

1. SAN initiates wave of depolarisation (WOD).
2. WOD spreads across both atria= atrial systole.
3. Layer of fibrous, non-conducting tissue delays impulse while ventricles fill & valves close.
4. AVN conveys WOD down septum via Bundle of His, which branches into Purkinje fibres along ventricles.
5. Causes ventricles to contract from apex upwards.



State the formula for cardiac output.



State the formula for cardiac output.

cardiac output (CO)

=

stroke volume (V) x heart rate (R)



What is the autonomic nervous system?



What is the autonomic nervous system?

- System that controls involuntary actions of glands and muscles.
- 2 subdivisions: sympathetic & parasympathetic.



State the difference between the sympathetic and parasympathetic nervous system.



State the difference between the sympathetic and parasympathetic nervous system.

Sympathetic involved in 'fight or flight' response: stimulates effectors to speed up activity.

Parasympathetic involved in normal resting conditions: inhibits effectors to slow down activity.



Name the receptors involved in changing heart rate and state their location.



Name the receptors involved in changing heart rate and state their location.

Baroreceptors (detect changes in blood pressure): carotid body.

Chemoreceptors (detect changes in pH e.g. due to increase in CO_2 concentration): carotid body & aortic body.



How does the body respond to an increase in blood pressure?



How does the body respond to an increase in blood pressure?

1. **Baroreceptors** send more impulses to **cardioinhibitory centre** in the **medulla oblongata**.
2. More impulses to SAN down vagus nerve via **parasympathetic nervous system**.
3. Stimulates release of **acetylcholine**, which decreases heart rate.



How does the body respond to a decrease in blood pressure?



How does the body respond to a decrease in blood pressure?

1. **Baroreceptors** send **more impulses** to **cardioacceleratory centre** in the **medulla oblongata**.
2. More impulses to SAN via **sympathetic nervous system**.
3. Stimulates release of **noradrenaline**, which increases heart rate and strength of contraction.



How does the body respond to an increase in CO_2 concentration?



How does the body respond to an increase in CO₂ concentration?

1. **Chemoreceptors** detect **pH decrease** and **send more impulses to cardioacceleratory centre of medulla oblongata.**
2. More impulses to SAN via **sympathetic nervous system.**
3. **Heart rate** increases, so rate of blood flow to lungs increases = rate of **gas exchange** and **ventilation** rate increase.

