

Edexcel (B) Biology A-level

9.7 - Detection of light by mammals

Flashcards

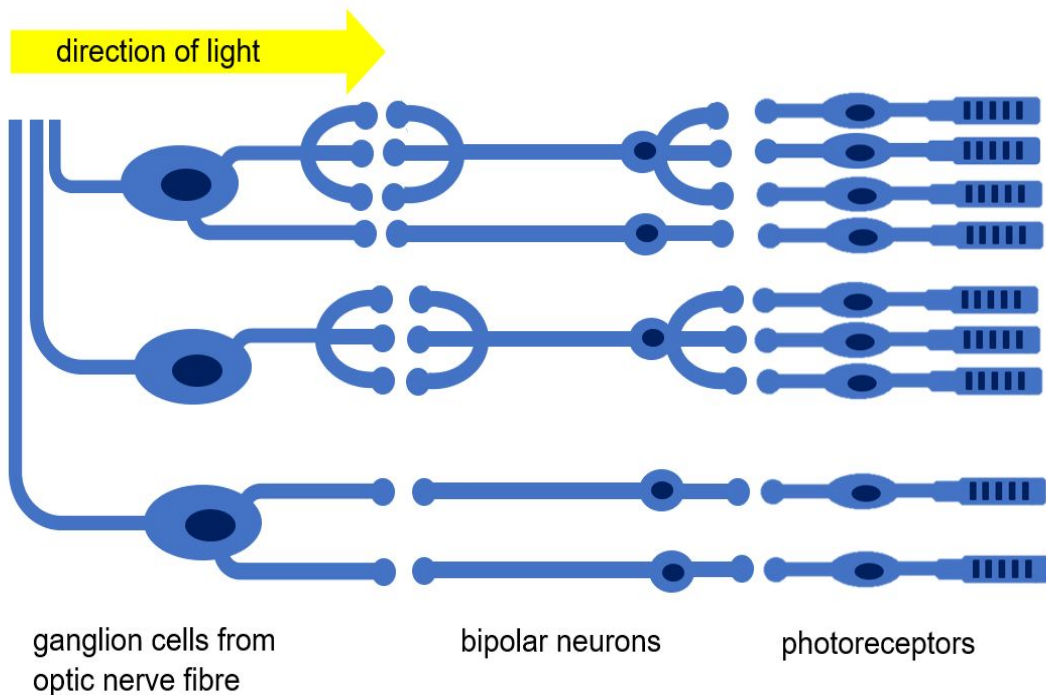
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Describe the structure of the human retina.



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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 where ganglion axon fibres form optic nerve.



Explain why rod cells do not generate action potentials in the dark.



Explain why rod cells do not generate action potentials in the dark.

1. Na^+ enters outer segment of rod cell via non-specific cation channels. Active transport of Na^+ out of inner segment = rod cell is slightly depolarised.
2. Action potential = voltage-gated Ca^{2+} channels open. Triggers exocytosis of glutamate.
3. Glutamate acts as inhibitory neurotransmitter to hyperpolarise bipolar neuron.



Explain how rod cells generate an action potential in the light.



Explain how rod cells generate an action potential in the light.

1. Rhodopsin pigment bleaches when it absorbs light & breaks down into opsin + retinal.
2. Opsin closes cation channels via a hydrolysis reaction. Active transport of Na^+ out of inner segment continues.
3. Rod cell becomes hyperpolarised. No glutamate is released, so no inhibitory signal.
4. Bipolar neuron depolarises.



Describe the pigments in rod and cone cells.



Describe the pigments in rod and cone cells.

Rod: rhodopsin absorbs all wavelengths of light = monochromatic vision.

Cone: 3 types of iodopsin which absorb red, blue or green wavelengths of light = tricolour vision.



Describe the visual acuity of rod and cone cells.



Describe the visual acuity of rod and cone cells.

Rod: many rod cells synapse with 1 bipolar neuron = low resolution.

Cone: 1 cone cell synapses with 1 bipolar neuron so there is no retinal convergence = high resolution.



Describe the light sensitivity of rod and cone cells.



Describe the light sensitivity of rod and cone cells.

Rod: very sensitive due to spatial summation of subthreshold impulses = vision in low-light conditions.

Cone: less sensitive = vision in bright light.

