The Retina

Note: In OneNote, set this worksheet as background. Use the simulation's "Export" button to save an image and insert it at the marked place in the worksheet.

Part A - Structure of the Retina

The retina is the light-sensitive inner layer of the eye. It contains light-sensitive sensory cells and other nerve cells that process the information received. Especially important are rods and cones. Rods mainly respond to differences in brightness and help us see in low light. Cones are responsible for colour vision and work especially well when there is enough light.

The stimuli received by the sensory cells are not sent directly to the brain. First, they are passed on within the retina through downstream nerve cells. At the end, the information converges toward the optic nerve and is sent from there to the brain. In this way, a light stimulus gradually becomes information that our brain can evaluate.

Task 1: Label the structures of the retina

Export the image from the "Structure of the Retina" mode and insert it below.

Insert here

Task 2: Functions of the retinal structures

Using the information text and the simulation, explain the function of each retinal structure. Export the table from Task 2 and insert it below.

Insert here

Part B - Signal Conversion in the Retina

The retina is the light-sensitive inner layer of the eye. It contains different cell types that work together in processing light stimuli. The visual sensory cells are especially important. These include rods and cones. Other nerve cells are also involved and pass cones. Other nerve cells are also involved and pass
the received information on within the retina.

Rods are especially important for light-dark vision. They react very sensitively to low brightness and therefore help us mainly at dusk or in darkness. Rods cannot distinguish colours. Cones are responsible for colour vision. They work especially well when there is enough light. The retina contains different cone types that respond especially strongly to different colour components of light. Only through the interaction of these cones can different colours be perceived.

When light hits the visual sensory cells, the light stimulus is converted into an electrical signal. This conversion is called stimulus conversion. The resulting electrical impulses are then passed on through further nerve cells in the retina. In this way the information moves step by step toward the optic nerve region. From there, the electrical signals are sent to the brain through the optic nerve. Only in the brain does conscious visual perception arise.

Task 1: Colour vision with cones

a) Investigate two different colours, for example red and turquoise. Export two suitable states and insert them into the table. Then describe which cones react especially strongly in each case and explain how different colour impressions arise.

Colour 1	Colour 2
Insert here	Insert here

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b) Activate the "White light" mode and change the brightness slider. Pay attention to the activity of the individual light receptors. Develop a hypothesis about the composition of white light.

Task 2: Influence of brightness

Set a low brightness once and a high brightness once. Export both states and insert them. Then compare how the activity of rods and cones changes in the model.

Low brightness	High brightness
Insert here	Insert here

Task 3: Stimulus conversion and transmission

Describe in your own words the path from the light stimulus to transmission toward the optic nerve. Use the terms visual sensory cells, electrical signal, bipolar cells, ganglion cells and nerve fibres.

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