The projection of an object on the retina

Physics > Light & Optics > Dispersion of light

Biology > Human Physiology > Hearing & Seeing

Difficulty level	Group size	Preparation time	Execution time
easy	-	10 minutes	30 minutes

This content can also be found online at:

https://www.curriculab.de/c/671788c75a9eff000237aacb

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Teacher information

Application

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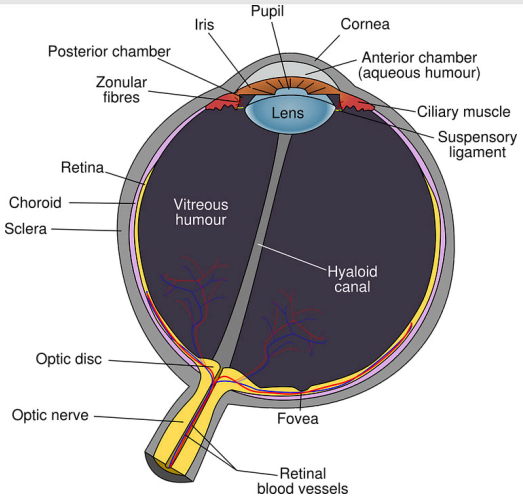

Schematic representation of an eye

The retina is the light-sensitive layer of the eye and is located at the back of the eyeball. It consists of four layers of cells lying one behind the other:

1. **Pigment epithelium:** The excess light is absorbed there and the photoreceptor layer is supplied with nutrients and oxygen.
2. **Photoreceptor layer:** This is where the light-sensing cells for light perception are located.
3. **Bipolar cell layer:** It connects the photoreceptor layer with the ganglion cell layer.
4. **Ganglion cell layer: L**ight stimuli are converted into electrical signals for transmission.

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Other teacher information (1/2)

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Prior knowledge

The structure of a human eye should be discussed in class beforehand.

Principle

The image of an object is projected onto the retina of the eye (frosted glass disc) through the lens of the eye. The image of the object is upside down.

Other teacher information (2/2)

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Learning objective

Pupils should develop an understanding of the projection of an object onto the retina.

Tasks

Examine the projection of an object through the lens of the eye onto the retina.

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Safety instructions

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The general instructions for safe experimentation in science lessons apply to this experiment.

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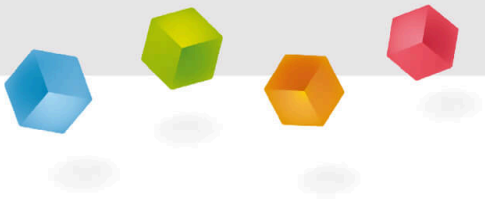

Student information

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Motivation

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Image of a human eye

The retina is the light-sensitive layer at the back of the eye. It receives light stimuli and transforms them into an electrical signal. The electrical signal is then transmitted to the brain where it is processed. The retina is also responsible for light-dark vision and colour perception.

Tasks

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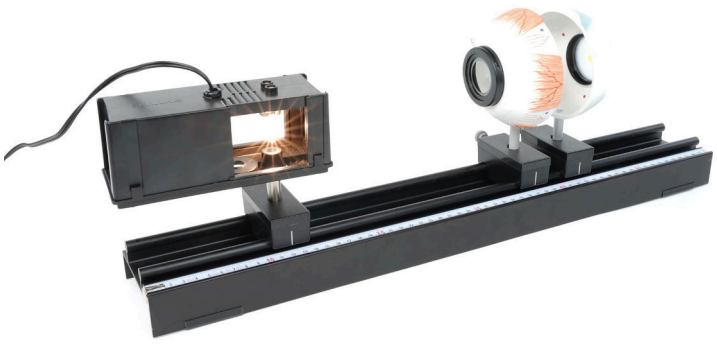
- Examine the projection of an object onto the retina.



Experimental setup

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Material

Position	Equipment	Item no.	Quantity
1	Optical profile bench for student experiments, l = 600 mm	08376-00	1
2	Rider for optical profile bench	09822-00	3
3	Light box, halogen 12 V/20 W	09801-00	1
4	Lenses made of glass for eye function model, set consisting of 4 lenses	64955-00	1
5	Base with stem for light box for optical profile bench	09802-20	1
6	Perl L , mapping object	11609-00	1
7	PHYWE power supply unit, RiSU 2023 DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1
8	Eye function model, consisting of two eye half shells	64960-00	1

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Set-up (1/3)

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Experimental setup

- Set up the experiment as shown on the left.
- The rods of the two eye half shells are each inserted into a rider and placed at the end of the optical profile bench at a distance of $2.5\ \mathrm{cm}$.

Set-up (2/3)

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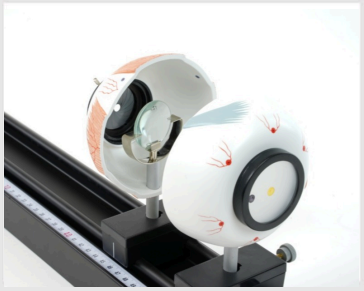

- Place the lens $S1\ (f\ = 65\ \mathrm{mm})$ in the lens holder inside the eye shell.
- Place the base with handle under the light box.

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Set-up (3/3)

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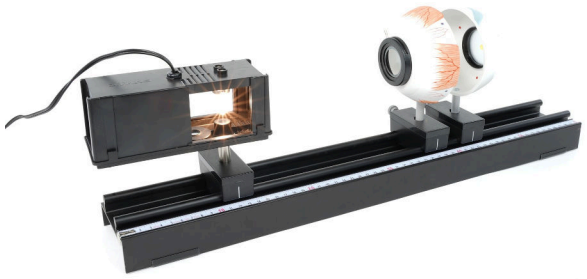
- Place the light box at a distance of approx. $27\ \mathrm{cm}$ to the eye lens on the optical bench.
- Pay attention to the orientation of the light box.



Experimental setup - normal eye

Procedure (1/2)

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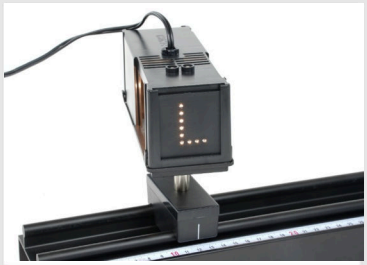

- Connect the light box to the power supply unit $(\sim 12\ \mathrm{V})$ and switch it on.
- Position the object in the slot of the light box.

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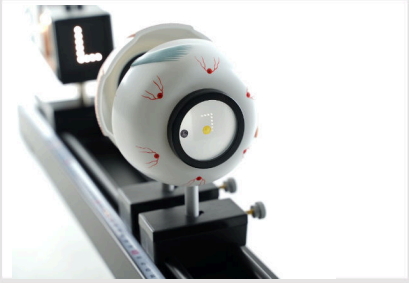
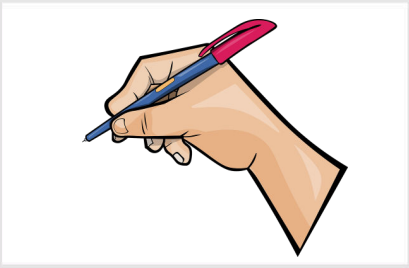
Procedure (2/2)

- Look at the image of the object on the frosted glass pane.



- Take notes of your observations.



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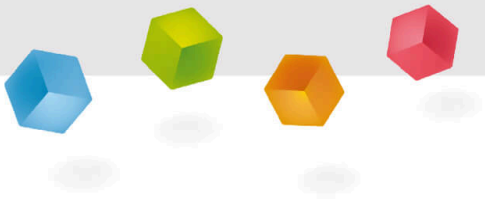

Report

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Task 1

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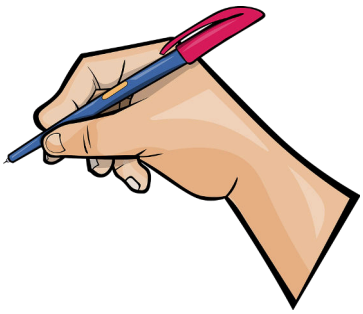

Fill in the blanks based on your observations.

The _____ of an _____ is projected through the _____ onto the _____ of the eye (_____). The image stands on the _____.

matt glass disc | head | eye lens | retina | object | image

Check

Task 2

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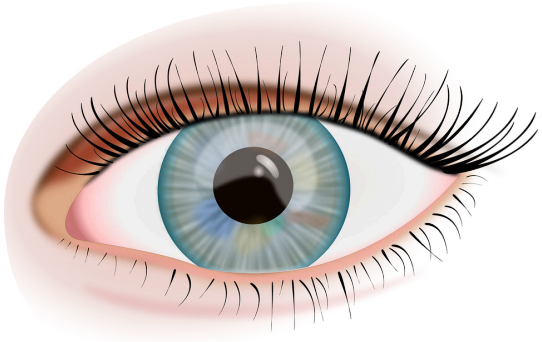
What functions does the retina have?

- [ ] Signal transmission to the brain
- [ ] Orientation of the image
- [ ] Processing light stimuli into an electrical signal
- [ ] Absorption of light stimuli

Check



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Task 3

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Is the following statement true?

The retina is the light-insensitive layer of the eye and is located at the back of the eyeball.

○ True ○ False

Check

Slide	Score / Total
Slide 16: Projection onto the retina	0/6
Slide 17: Iris function	0/3
Slide 18: Retina property	0/1

Total amount 0 / 10

Solutions Repeat

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