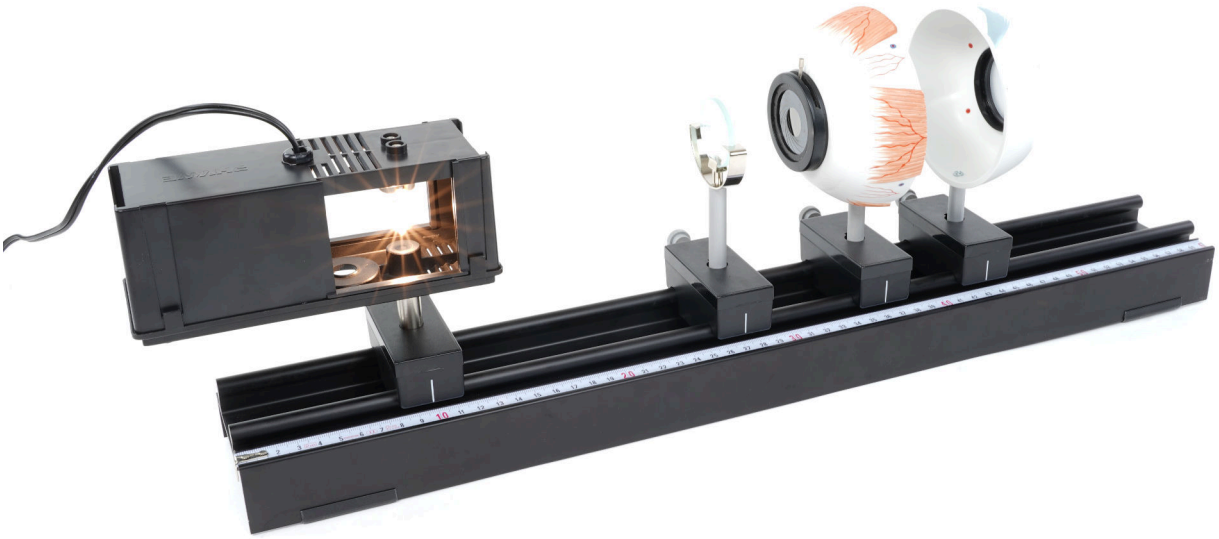
Nearsightedness with eye function model



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/671788e55a9eff000237aad1

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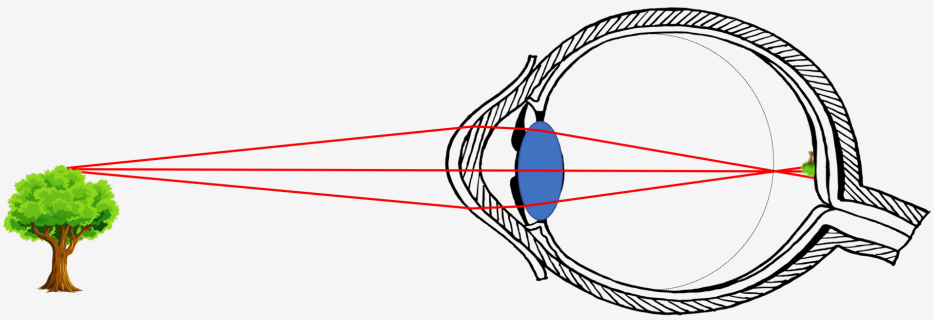
Teacher information

Application

The cause of short-sightedness is often an eyeball that is too long or the refractive power of the eye lens is too high. Both lead to the focal point of the incident light being in front of the retina and therefore the image of the object on the retina is blurred. Affected people therefore see objects in the distance out of focus.



Schematic representation of a short-sighted eye - blurred image on the retina

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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

To correct myopia due to an excessively long eyeball, a diverging lens (concave lens) is placed in front of the eye (spectacles).

Other teacher information (2/2)

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Learning objective

Pupils should develop an understanding of the eye defect of short-sightedness.

Tasks

Examine the visual defect of short-sightedness and correct it using a diverging lens.

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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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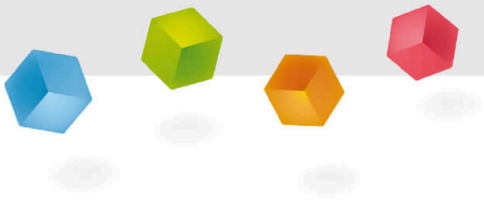

Student information

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Motivation

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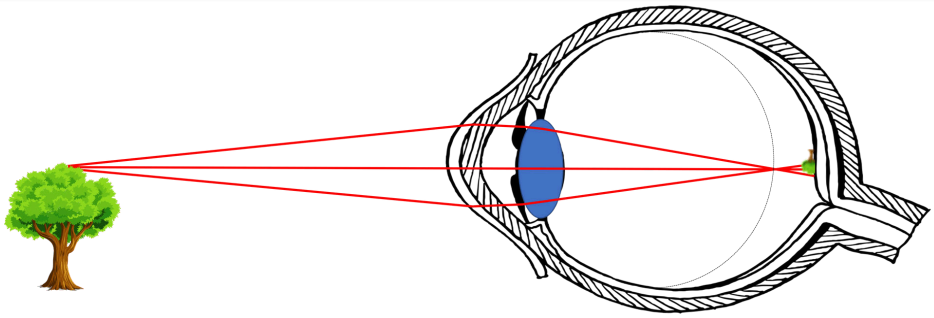
Some people can only see distant objects out of focus. This visual defect is called myopia. Due to the eyeball being too long, the focal point of the incident light rays lies in front of the retina and the image appears blurred.



Schematic representation of a short-sighted eye - blurred image on the retina

Tasks

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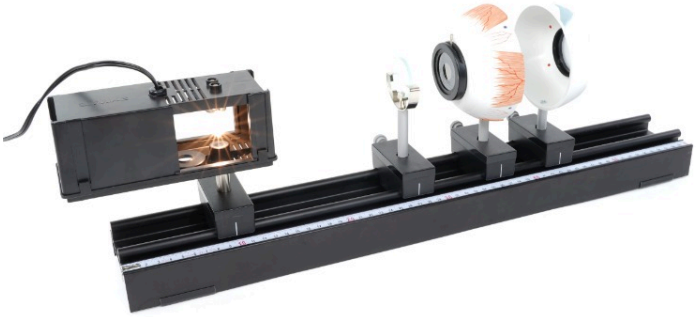
- Examine the image of the object on the retina of an elongated eyeball.
- Position a biconcave spectacle lens in front of the eye and observe the image of the object.



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
9	Lens holder for eye function model	64957-00	1

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Set-up (1/3)

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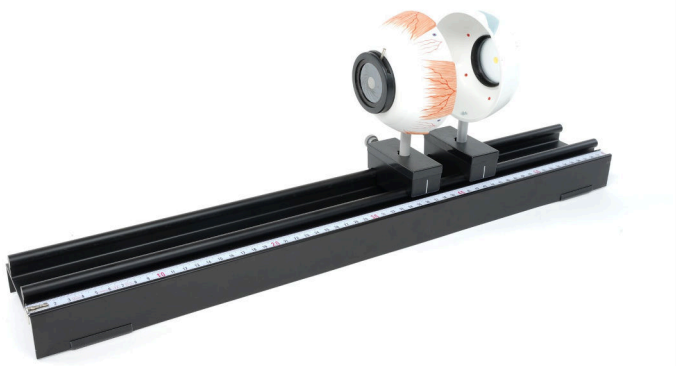

Experimental setup - eyeball too long

- 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 $4\ \mathrm{cm}$ placed.

Set-up (2/3)

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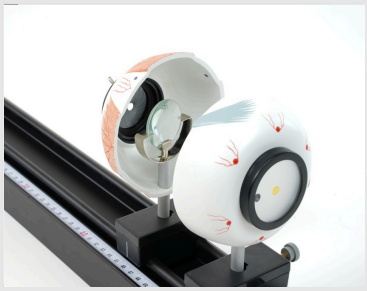

- Place the lens $S1\ (f\ = 65\ \mathrm{mm})$ in the lens holder inside the eye shell.
- Place the base with handle under the light box.

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Set-up (3/3)

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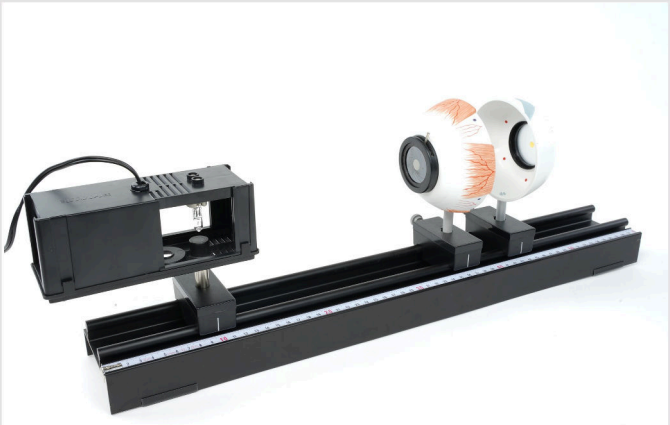
- Place the light box at a distance of approx. $25\ \mathrm{cm}$ to the eye lens on the optical bench.
- Pay attention to the orientation of the light box.
- This structure simulates an eye that is too long.



Experimental setup - eyeball too long

Procedure (1/4)

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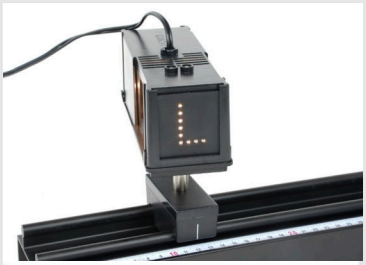

- Connect the light box to the power supply unit $(\sim 12\ \mathrm{V})$ and switch it on.
- Position the object in the slot of the light box.

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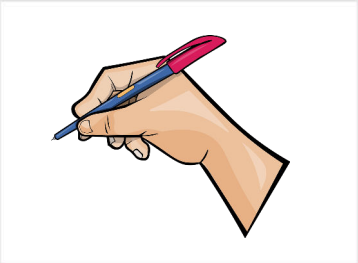
Procedure (2/4)

- Examine the image of the object on the retina.



- Take notes of your observations.

Procedure (3/4)

- Now clamp the biconcave spectacle lens $B1\ (f = -200\,\mathrm{mm})$ into the lens holder and place it approx. $4\,\mathrm{cm}$ in front of the eye lens on the optical bench.

- Examine the image on the retina (frosted glass disc).
- Take notes of your observations.

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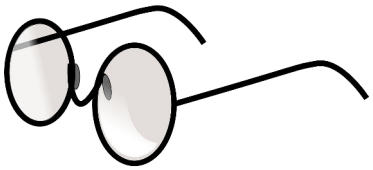
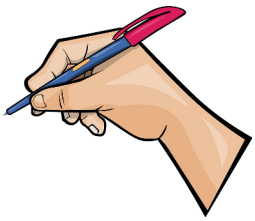
Procedure (4/4)

- If you have a short-sighted pupil or a short-sighted teacher in the class, you can replace the lens $B1$ with a pair of glasses which you hold between the object and the lens of the eye.
- Observe the image of the object on the retina (frosted glass disc) and note down your observations.





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Report

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Task 1

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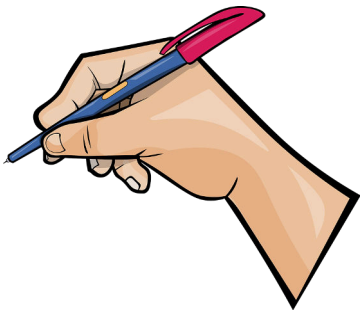

Fill in the blanks based on your observations.

If a person's eyeball is too large, the focal point of the light rays is in front of the _____, resulting in a blurred image. This defective vision is called _____. This visual defect can be corrected with the help of a _____ lens (_____) in the form of spectacles.

short-sightedness | concave | diffusing lens | retina

Check

Task 2

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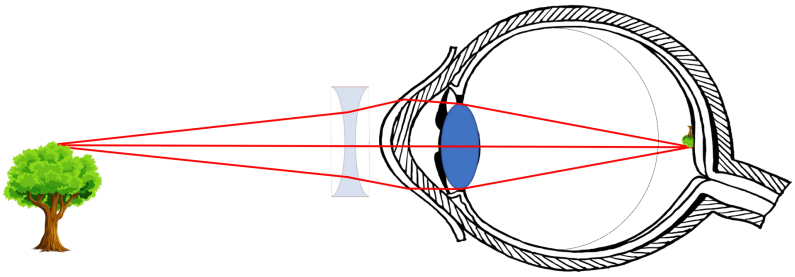

Correction of a short-sighted eye - the focal point of the incident light rays lies on the retina and a sharp image is produced.

How do you correct myopia?

- [ ] With a concave lens in front of the eye lens.
- [ ] With a converging lens in front of the eye lens.
- [ ] With a diverging lens in front of the eye lens.

Check

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Task 3

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Is the following statement true?

Short-sighted people see objects in the distance out of focus and close up in focus.

○ True ○ False

Check

Slide	Score / Total
Slide 18: Myopia of the eye	0/4
Slide 19: Myopia correction	0/2
Slide 20: The short-sighted eye	0/1

Total amount 0 / 7

Solutions Repeat

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