Structure and function of the human eye
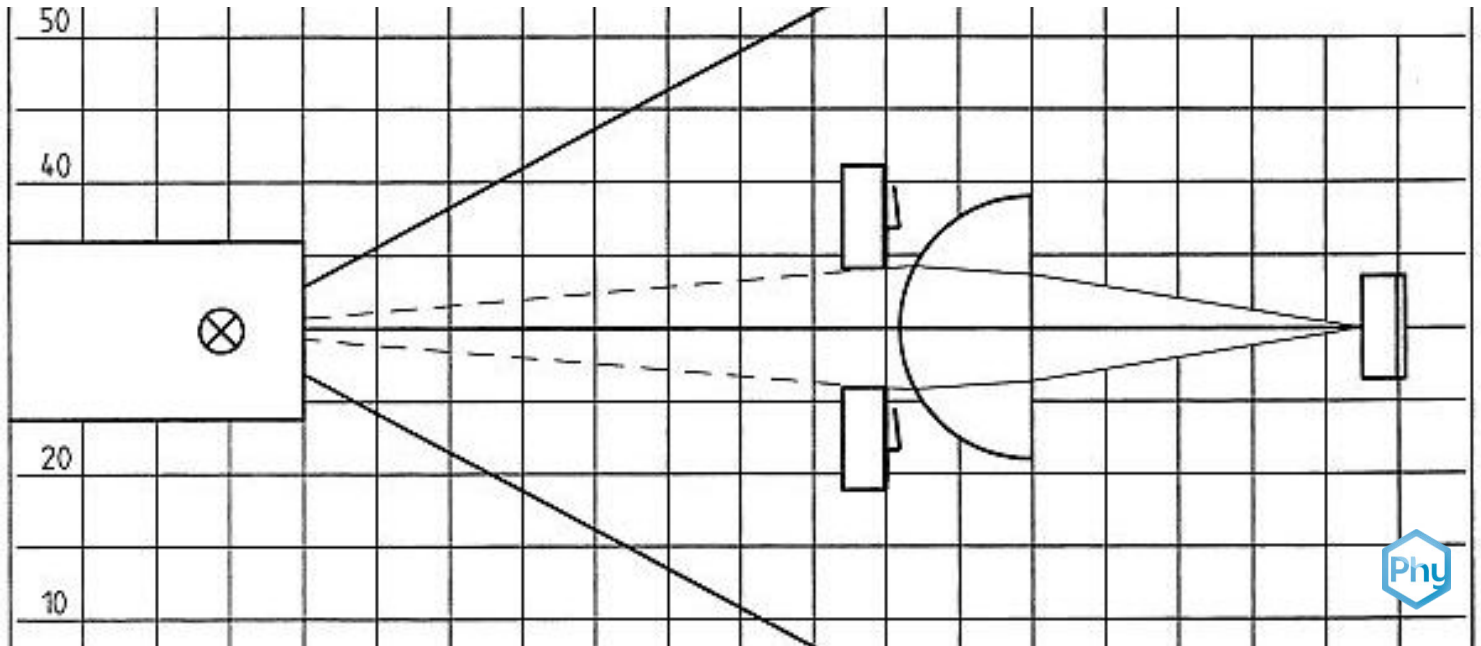

Structure and function of the eye

Physics	Light & Optics	Optical devices & lenses

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

This content can also be found online at:

http://localhost:1337/c/64724f80e1994e000281c7ad

PHYWE

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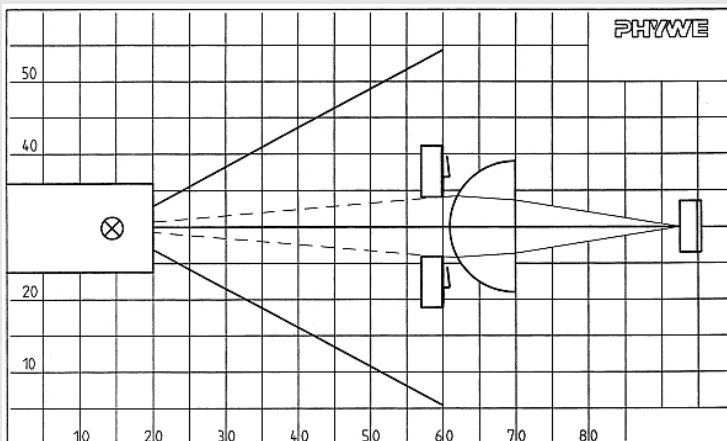
info@phywe.de
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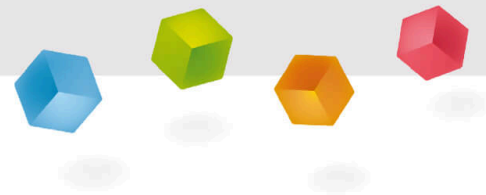
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Teacher information

Application

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Experimental set-up:

Divergent light with aperture and converging lens

The experiment is intended to explain the structure of the eye.

The eye is constructed in such a way that depending on the distance of an object to the eye, the "lens" of the eye curves more or less.

This behaviour is to be demonstrated with the experiment.

Other teacher information (1/2)   **PHYWE**

Prior knowledge

Students need prior knowledge of imaging optics, with conerging and diverging lenses and the spectral colours of light.

Principle

The principle of imaging objects by the human eye will be demonstrated and it will be shown how the eye adapts to different object widths (accommodation).

Other teacher information (2/2)   **PHYWE**

Learning objective

The students should recreate the natural functions of the human eye with the experimental set-ups.

Tasks

The students should make observations and gather knowledge about the experimental set-up.

Additional teacher information

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Note

The diaphragms not only serve to complete the eye model, but also to largely eliminate lens aberrations for off-axis rays (spherical and chromatic aberration).

Safety instructions

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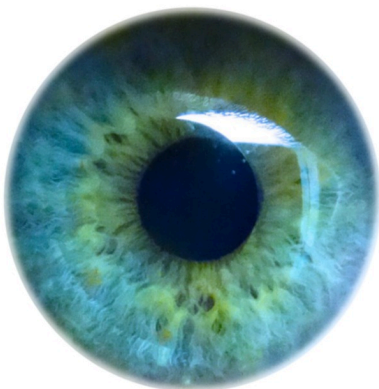
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Student information

Motivation

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human eye (iris)

In the last experiments, you learned a lot about refraction and the colour spectra of light.

It soon became clear that the focal length of lenses is decisive for the sharpness of objects.

But how does the human eye manage to see and focus both distant and close objects sharply?

The experiment is intended to shed light on this question.

Equipment

| Position	Material	Item No.	Quantity
1	PHYWE Demo Physics board with stand	02150-00	1
2	Halogen lamp for experiments, 12V/50W, with magnetic base	08270-20	1
3	Optical block, semicircular, magnet held	08270-01	1
4	Opt. block,planoconvex, magn.held	08270-02	1
5	Diaphragm w. holder, magnet held	08270-10	2
6	Plane mirror, magnet held	08270-13	1
7	PHYWE Multitap transformer DC: 2/4/6/8/10/12 V, 5 A / AC: 2/4/6/8/10/12/14 V, 5 A	13533-93	1
8	G-clamp	02014-01	2

Set-up and Procedure (1/2)

PHYWE
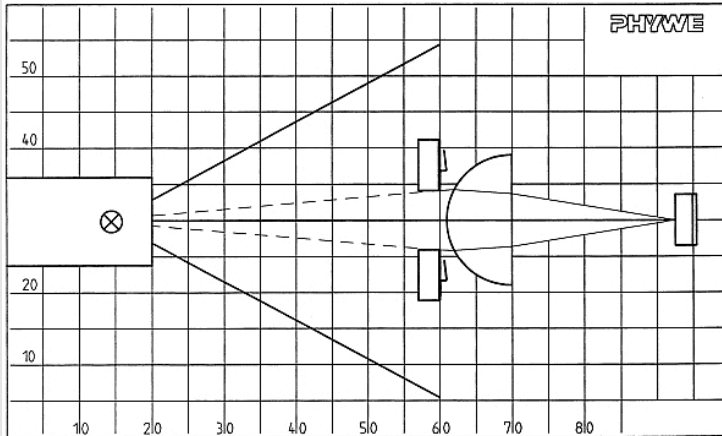
Divergent light source with aperture and converging lens

- Set optical axis on the adhesive panel

- Put on model body semicircle (thick converging lens)

- Complete the eye model (add to the converging lens as eye lens back of the plane mirror as retina, apertures with holder as iris diaphragm); place these parts as shown in the picture.

- With the adhesive luminaire in the position according to the picture, direct a divergent light beam onto the "eye"; if necessary, readjust slightly so that a sharp image of the point-shaped light source acting as an object is created on the "retina".

Set-up and Procedure (2/2)

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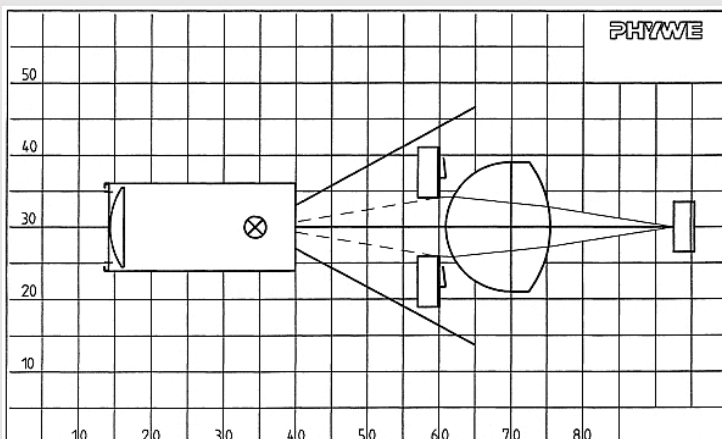
Divergent light source with aperture and converging lens

- Move the light fixture approx. 200 mm to the right

- Clarify the blurred image of the object point, e.g. by approaching or removing the plane mirror acting as a retina.

- Return the plane mirror to its original position

- Apply a plano-convex lens to increase the thickness of the "eye lens".
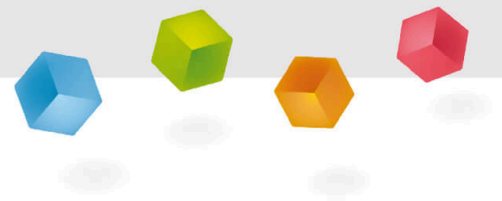
Report

Task 1

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Put the correct words into the gaps!

The image of the point-like [_____] becomes [_____] when the object [_____] its distance from the "eye".

If the object moves closer to the "eye", then the lens of the "eye" must become [_____] so that a sharp image is formed again on the "[_____]".

| retina |
| blurred |
| thicker |
| object |
| changes |

✓ Check

Task 2

PHYWE

The eye cannot focus on objects at different distances.

○ True   ○ False

✓ Check

The image width of the eye is adjusted depending on the distance.

○ True   ○ False

✓ Check

Task 3

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The adjustment of the focal length in the eye is

only achieved through glasses.

achieved through variable curvature.

achieved by varying the spacing of the retina.

Slide	Score / Total
Slide 13: Image on retina	**0/5**
Slide 14: Multiple tasks	**0/2**
Slide 15: Focal length adjustment	**0/2**

Total **0 / 9**

Solutions   Repeat