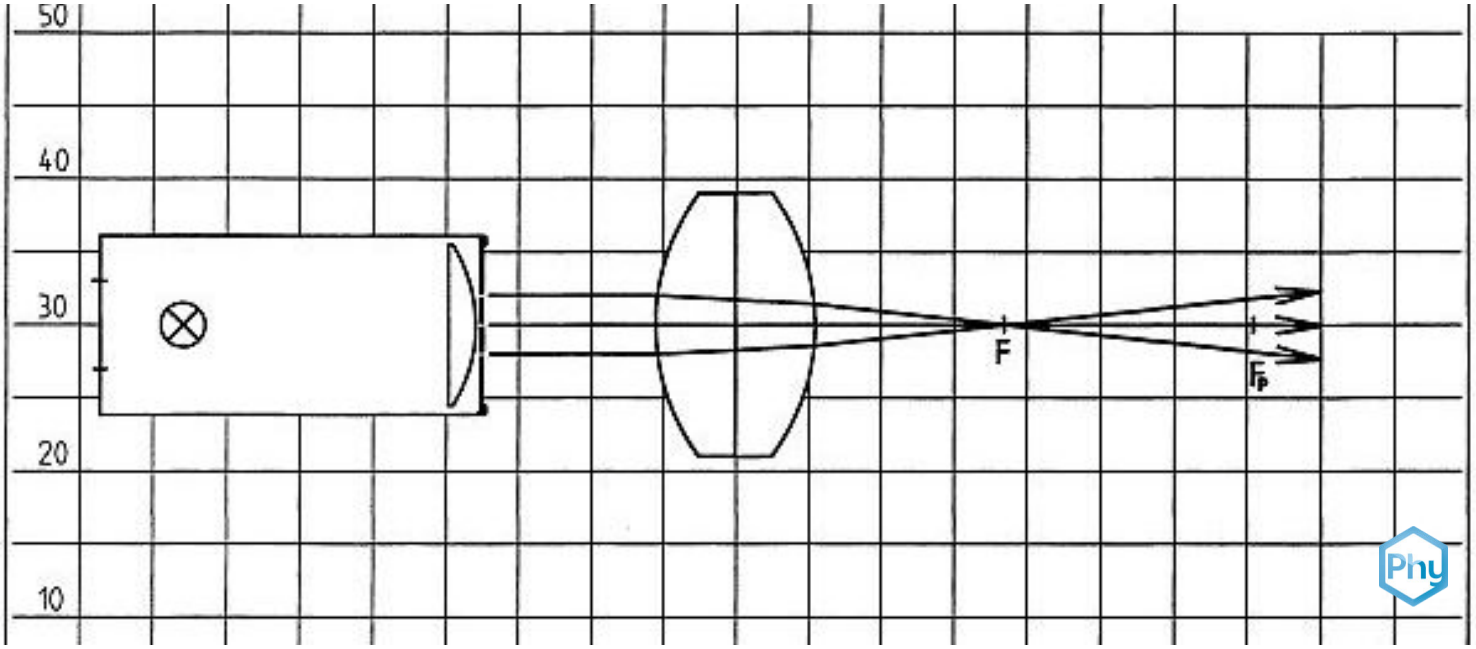
Lens combination consisting of two convergent lenses



Lens combination of two converging lenses

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/6472135ee1994e000281c768

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Teacher information

Application

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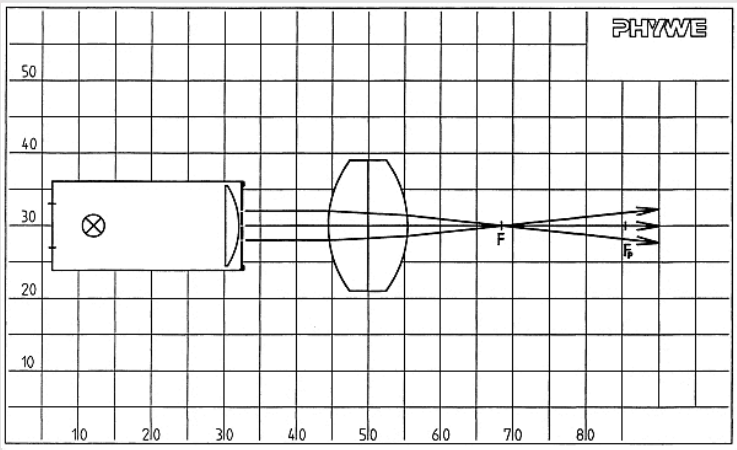

Experimental set-up:

Beam path with a converging lens

The experiment below is designed to explain the construction of two converging lenses in combination.

The students should understand what effect a converging lens in combination has on the overall result.

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Other teacher information (1/2)

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Prior knowledge

Students need prior theoretical knowledge about the straight-line, ray-shaped propagation of light. They should have gained experience about light refraction and refractive indices.

Principle

The focal length of a combination of two converging lenses is to be investigated (qualitatively).

Other teacher information (2/2)

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Learning objective

Students should develop a sound knowledge of image construction.

Tasks

The students should observe the experiment and learn which concepts and properties are of high importance for the construction of the image.

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Additional teacher information

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Note

This experiment is also suitable for a quantitative evaluation, but the lens thickness would have to be taken into account.

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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Simple telescope

A simple telescope was already used in early times by seafarers to orientate themselves on the high seas.

But telescopes were also used in astronomy, where with technical extensions and advances they became telescopes that are indispensable today.

A simple telescope is based on the combination of two converging lenses to magnify the image sought at a distance for the human eye.

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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	2
5	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
6	G-clamp	02014-01	2

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Set-up and Procedure (1/2)

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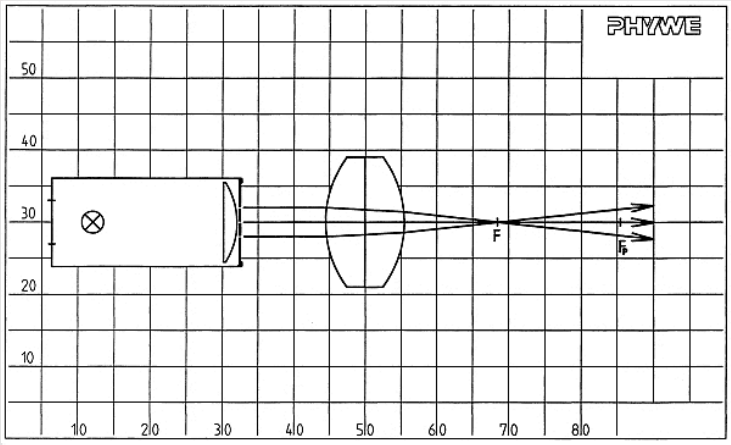

3-slit diaphragm directed at two converging lenses

- Set optical axis on the centre of the adhesive panel
- Position the luminaire with the 3-slit aperture so that the centre beam runs along the optical axis.
- First adjust the rear plano-convex lens on the optical axis; mark the focal point FP.
- Apply the second plano-convex lens and mark the focal point of the lens combination F.

Set-up and Procedure (2/2)

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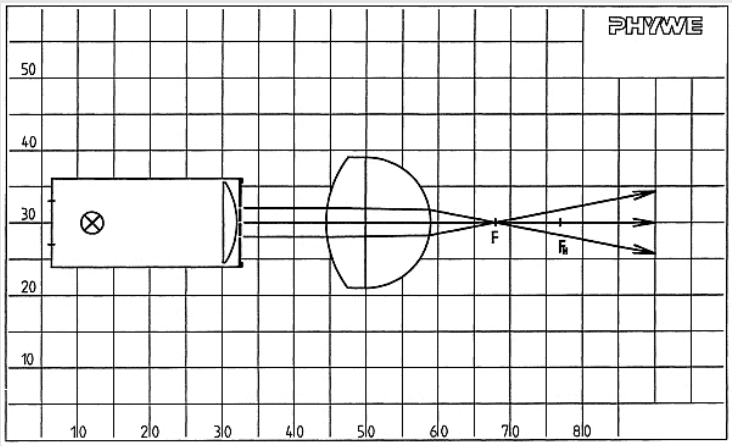

3-slit diaphragm directed at two different converging lenses

- Move one of the lenses on the optical axis and observe focal point
- Remove lenses and adjust semicircle body on optical axis; demonstrate that it is the model of a (thicker) converging lens; mark focal point FP
- Create a plano-convex lens and mark the focal point F of the combination.
- Move one of the lens bodies on the optical axis

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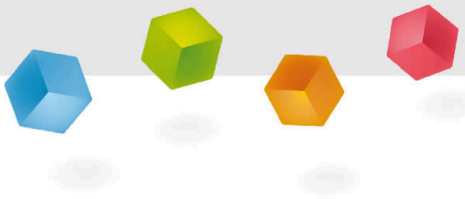

Report

Task 1

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Put the correct words into the gaps!

Two [ ] complement each other to form a collective lens in which both [ ] and lens thicknesses of the individual lenses are [ ]. The resulting focal length of two lenses is smaller than that of only one [ ]. However, it is [ ] when the [ ] lenses are adjacent to each other.

- single
- lens
- focal lengths
- smallest
- collective lenses
- united

Check

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Task 2

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The focal length is independent of the distance between the lenses.

○ True ○ False

Check

The rays behave like a single converging lens.

○ True ○ False

Check

Slide	Score / Total
Slide 13: Collective lenses	0/6
Slide 14: Multiple tasks	0/2
Total	**0 / 8**

Solutions Repeat

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