Reflection at the plane mirror

Physics > Light & Optics > Reflection & refraction of light

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/5f4db298ce572a000382d7bf

PHYWE
Robert-Bosch-Breite 10
37079 Göttingen
Tel.: 0551 604 - 0
Fax: 0551 604 - 107
info@phywe.de
www.phywe.de

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Teacher information

Application

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Reflection in the car mirror

We can look at ourselves in a mirror. But also water and smooth surfaces make objects visible which often remained hidden to us.

The reflection of light and in particular the law of reflection are among the fundamental laws of optics.

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Robert-Bosch-Breite 10
37079 Göttingen

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Other teacher information (1/4)

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Prior knowledge

The students should have learned the basics of linear propagation of light beforehand. In addition, they should be able to describe and measure angles. The concept of perpendiculars or mid-perpendiculars has a significant meaning.

Scientific principle

The experiment consists of two parts. In the first step, the angle dependence of the reflection at the plane mirror is investigated and the law of reflection with its statements about angle of incidence and angle of reflection is obtained.

The second partial test proves indirectly that the incident and reflected light beam and the incidence plummet are in one plane.

Other teacher information (2/4)

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Learning objective

It is the aim of this experiment to experimentally obtain the law of reflection.

Tasks

In this experiment, the relationship between the light beam incident on a plane mirror and the reflected light beam is investigated. It also examines how you have to hold a piece of paper to see the reflected beam of light in its entire length.

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Other teacher information (3/4)

At first, the terms angle of incidence, angle of reflection and angle of incidence are deliberately omitted. Only in the course of the implementation the students get to know these terms as useful. At the beginning of the experiment, however, it should be explained to the students that it is useful to measure and compare angles in order to investigate the relationship between the direction of the incident and reflected light beams.

By changing the position of one half of the leaf, it is shown that only when both halves of the leaf are in the same plane, the reflected light beam is visible in its entire length.

Other teacher information (4/4)

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Notes on construction and implementation

This experiment makes high demands on the experimental skills of the student.

It should be noted that errors can occur if the angles of incidence are set correctly, but especially if the angles of reflection are read, since the reference line represents the angle of incidence. For this reason, the horizontal line should be marked as a 0° line at the beginning of the test.

Even so, it must be ensured that the narrow light beam of the light box hits the mirror exactly in the centre of the optical disc and that the mirror is always in contact with the vertical line.

If the adjustment is done carefully, the deviations are smaller than 2° .

As the second part of the experiment is an unfamiliar path of knowledge for the students, this experiment is

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Safety instructions

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- Halogen lamps become warm during prolonged use
- Avoid looking directly into the light source

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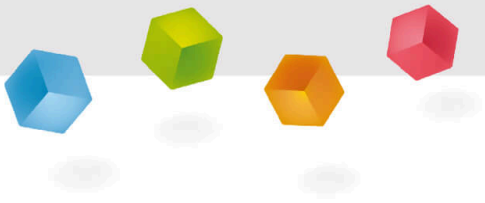

Student Information

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Motivation

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Image and mirror image

Reflections can be found in many different situations and on many different objects.

But why are image and reflection always the same distance apart? And how is such an image created?

This experiment deals with these and similar questions, as well as with the derivation of a physical law for reflection.

Tasks

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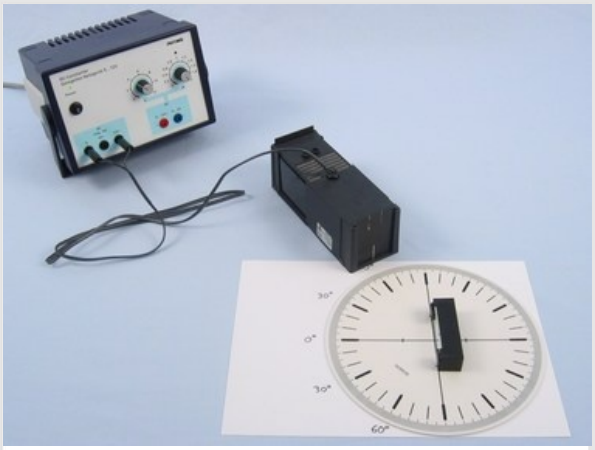

Experiment set-up

How can you see with a mirror around the corner of the house?

In this experiment, the relationship between the light beam incident on a plane mirror and the reflected light beam is investigated. It also examines how you have to hold a piece of paper to see the reflected beam of light in its entire length.

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Equipment

Position	Material	Item No.	Quantity
1	Light box, halogen 12V/20 W	09801-00	1
2	Mirror on block, 50 mm x 20 mm	08318-00	1
3	Optical disk	09811-00	1
4	PHYWE Power supply, 230 V, DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1

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Additional equipment

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Position	Material	Quantity
1	White paper (DIN A4)	1
2	spine-bound book	1

Set-up

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Experiment set-up

Connect the light box to the power supply unit (12 V ~)

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Procedure (1/3)

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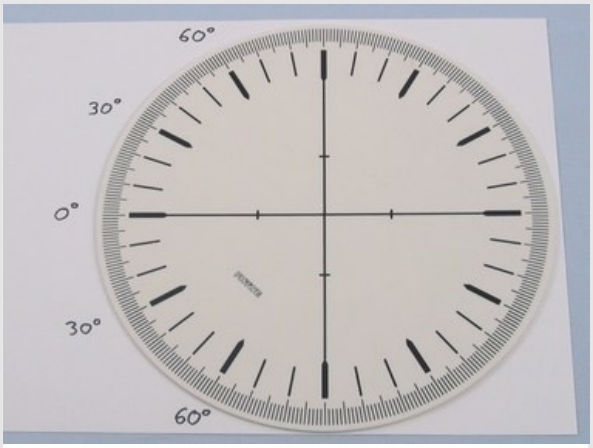

Use of the circular disc

1. direction of incident and reflected light beam

- Place the circular disc with the graduation on the right half of a sheet of paper. Write "0°" next to the horizontal line and write other angles on your sheet of paper as shown in the illustration.
- Place the mirror exactly on the vertical line in the middle of the disc. Insert the slit diaphragm into the light box on the lens side.

Procedure (2/3)

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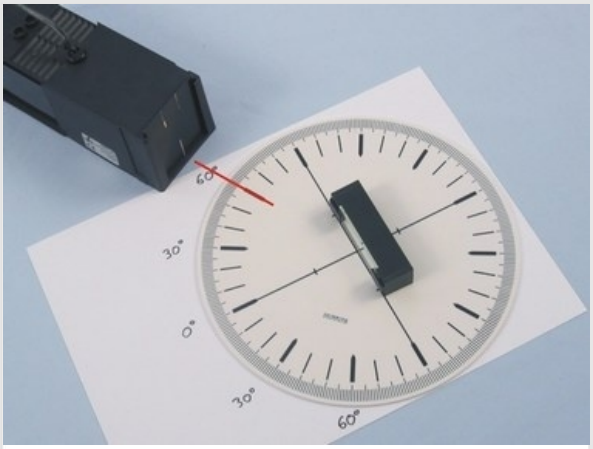

Positioning of the mirror

- Place the light box in such a way that the light beam hits the mirror exactly at the angle α of 60°. The light beam should hit the line cross on the optical disc very precisely.
- Read the corresponding angle β, this is the angle of reflection. Enter your measured value into the table in the protocol. Repeat this experiment for all angles of incidence given in the table α and three more angles of your choice. Finally let the light enter along the 0° line. The angle of incidence is now α = 0°. Observe the reflected light beam. How big is the angle now β ? Enter also this value in the protocol into the table.

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Procedure (3/3)

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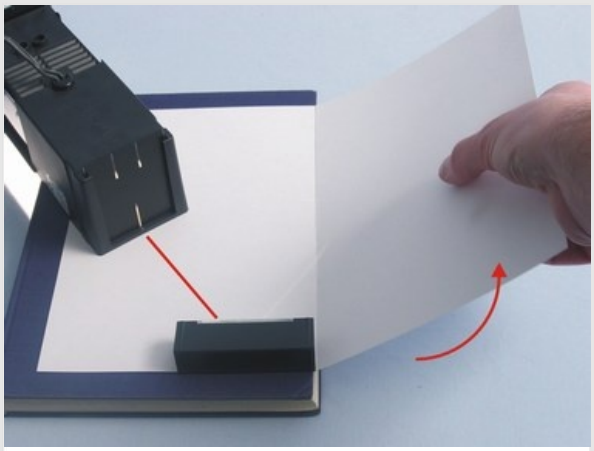

Reflection at a mirror

2. position of incident and reflected light beam

- Fold a sheet of paper in the middle and place it on a book with a wide spine. Place the mirror at the bottom edge of the sheet so that the mirror is connected to the fold line and book edge. Let the light beam from the light box (with the single slit diaphragm) fall on the mirror as shown in the picture.
- Move a free half of the sheet carefully up and down. What can you find out about the position of the reflected light beam along the entire length in this half of the sheet? Write down your observations in the protocol.

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Report

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Table

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Note your measured values in the table.

Angle of incidence α in °	Angle of reflection β in °
15	
20	
30	
45	
60	
75	

Observation

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Write down your observations for trial part 2.

Paper\horizontal:

The reflected light beam is _____ and can be seen along its entire length.

Second half folded up:

The reflected light beam is _____, only a bright light spot on the edge of the fold.

Second half folded down:

The reflected light beam is _____.

not seen
good
not seen

Check

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37079 Göttingen
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info@phywe.de
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Task 1

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Compare your readings for the angle of reflection $\beta$with the angle of incidence $\alpha$of the light beams impinging on the flat mirror. What can you determine?

Formulate a sentence.

The angle between _____ light beam and the 0° line (angle of incidence α) is equal to the angle between the _____ light beam and the 0° line (angle of reflection β).

incident

reflected

Check

Task 2

PHYWE

How is a beam of light reflected when it hits the mirror on the 0° line (the "angle of incidence")? How large are the angles of incidence in this case $\alpha$and the angle of reflection β?

A beam of light hitting the mirror along the _____ (0° line) is reflected into itself. The _____ in this case is _____, the _____ is _____.

angle of reflection

slot of incidence

0°

the same (0°)

angle of incidence

Check

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Task 3

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In which position of the movable paper half (2nd partial test) is the reflected light beam most clearly visible and in its entire length.

The _____ _____ is only visible clearly and in its entire length if the _____ is _____ in total.

horizontal
reflected
sheet of paper
light beam

Check

Task 4

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What conclusion can you draw from this about the mutual position of the incident and reflected light beam (and incidence slot)?

The _____ and _____ light beam (and _____) are in one and the same _____ when reflected by the flat _____.

reflected
mirror
incident
incidence plummet
plane

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Task 5

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Describe on the basis of the learned how it is possible to see with a mirror around a house corner.

House corner spy

Task 6

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At what time of day and in what position of the sun you can see the windows of a distant building glittering. Why not at other times?

When the sun is very low above the horizon ( ), there is a high probability that sunlight will be from the window surfaces of a distant building and can be perceived as glitter. The on the window and the are then in a .

mornings or evenings
plane
observer
flatly reflected
sun and the angle of incidence

Check

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Slide	Score / Total
Slide 19: Reflected light beams	0/3
Slide 20: Angle of the light beams	0/2
Slide 21: Angle of incidence and reflection	0/5
Slide 22: Length of the light beam	0/4
Slide 23: Incident and reflected light beam	0/5
Slide 25: Position of the sun	0/5

Total amount 0 / 24

Solutions | Repeat | Exporting text

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