

# Day and night



Physics

Light &amp; Optics

Dispersion of light



Difficulty level

easy



Group size

1



Preparation time

10 minutes



Execution time

10 minutes

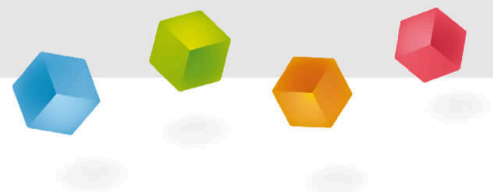
This content can also be found online at:



<http://localhost:1337/c/5f4d7b9cce572a000382d67b>

PHYWE

## Teacher information



## Application

PHYWE



day and night

Each day begins with a sunrise in the morning and ends with a sunset in the evening. But how does it come to this?

And why is this sunrise or sunset at any place at a different time?

This experiment deals with the physical background of the everyday phenomenon of the day and night cycle.

## Other teacher information (1/3)

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### Prior knowledge



The students should first know the basics of the linear propagation of light and be able to handle a light box.

### Scientific principle



A rotating earth-moon model is used on the optical profile bench. When the model is illuminated, the shadow formation on the Earth is observed.

## Other teacher information (2/3)

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### Learning objective



The aim of the experiment is to illustrate and understand the formation of the day-and-night cycle on Earth.

### Tasks



Investigation of the formation of day and night on Earth with the Earth-Moon model.

## Other teacher information (3/3)

This experiment does not cause any technical difficulties. But the students often have problems putting themselves in the position of an observer on Earth.



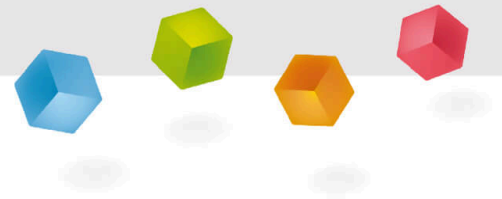
## Safety instructions

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

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## Student Information

### Motivation

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#### Day and night:

The eternal cycle. It is repeated within 24 hours.

But why is that? And why is there a sunrise every morning and a sunset every night? Is the sun really going down?

In this experiment you will find answers to these questions.

## Tasks

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Experiment set-up

### How are day and night created on earth?

1. Investigate with the Earth-Moon model how day and night are created on Earth.

## Equipment

Position	Material	Item No.	Quantity
1	Light box, halogen 12V/20 W	09801-00	1
2	Bottom with stem for light box	09802-20	1
3	Optical profile-bench for student experiments, l = 600 mm	08376-00	1
4	Diaphragm with hole, d=20mm	09816-01	1
5	Slide mount for optical bench	09822-00	1
6	Model earth/moon	09825-00	1
7	PHYWE Power supply, 230 V, DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1

## Set-up (1/4)

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Assembly of the optical bench

Build the optical bench from the two tripod rods and the variable tripod foot.

## Set-up (2/4)

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Using the light box with base and handle

- Place the base with handle under the light box.



## Set-up (3/4)

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Positioning of the light box

- Clamp it into the left part of the tripod base with the lens side facing away from the optical bench.
- Slide an opaque diaphragm in front of the lens and the pinhole diaphragm into the shaft at the other end of the lamp.

## Set-up (4/4)

PHYWE

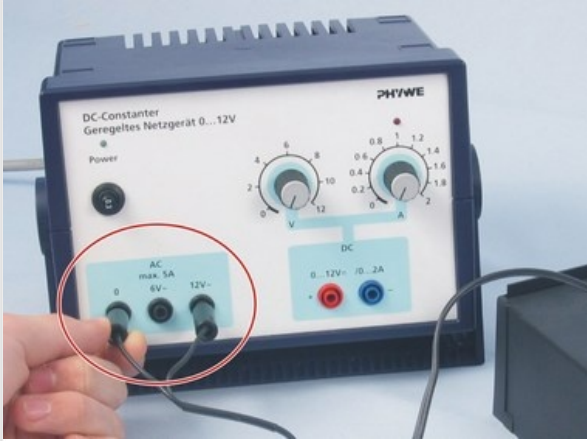


Positioning of the Earth-Moon model

- Mount the Earth-Moon model on the rider and place it on the optical bench about 20 cm from the lamp.
- Turn the moon to the back and ignore it in the following.

## Procedure (1/5)

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Connecting the light box

- Connect the lamp to the power supply unit (12 V~) and switch it on.

## Procedure (2/5)

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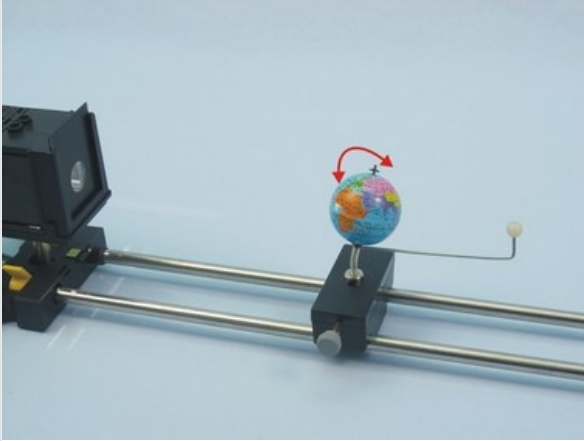
day and night

### 1. Experiment

Look at the globe. Note in the protocol on which half of the earth it is now day or night.

## Implementation (3/5)

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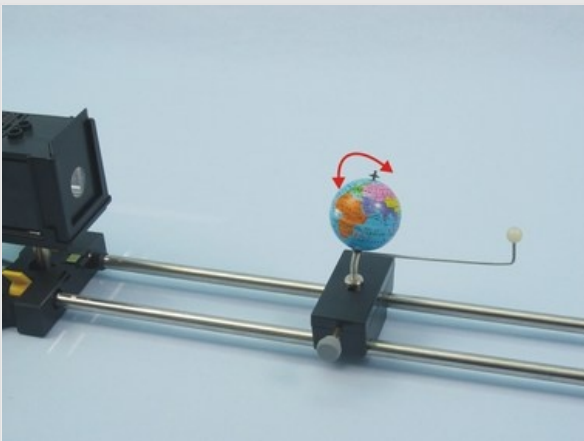
Orientation on the globe

### 2. Experiment

- Find the place on the globe where your hometown is located and rotate the globe so that this place is facing the sun.
- Write down in the log what time of day it is in your home town at the moment and in which direction - seen from there - the sun is shining.

## Procedure (4/5)

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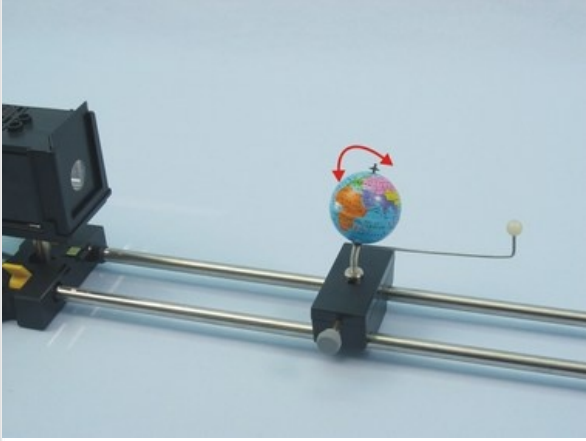
cardinal points

### 3. Experiment

- Now consider where on the globe east and west lie.
- Turn the globe slowly so that it finally turns night in your home town. (Note the direction in which the sun rises and sets).
- In which direction must the globe be turned, counterclockwise or clockwise?
- Note the answer in the protocol.

## Procedure (5/5)

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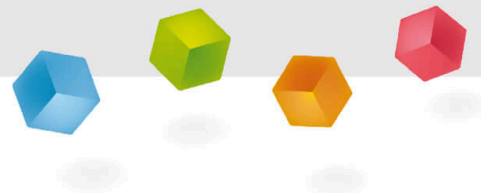
Sunrise and sunset

### 4. Experiment

- Keep turning the globe until it is midnight in your hometown, then it is morning (the sun is rising) and finally it is noon again.
- Note in the protocol some countries where it is now day, night or twilight.
- Switch off the power supply unit.

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## Report



## Task 1

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Write down your observations from the first experiment.

Day: On half of the  that is  the sun.

ight: On half of the Earth  from the .

earth

turned away

sun

facing

☒ Check

## Task 2

PHYWE

Write down your observations from the second experiment.

Time of day: It is now noon (about 12 o'clock)  
the direction in which the sun is located:

The sun is located in the  of the northern hemisphere. In the southern hemisphere, the sun is in the .

north

south

☒ Check

Write down your observations from the third experiment

Complete the text.

The globe must be turned \*counterclockwise

☒ Check

## Task 3

PHYWE

Write down your observations from the fourth attempt.

Day: e.g. in , .

ight: e.g. in , .

Dusk: e.g. in , .

Germany

parts of Brazil

Japan

Australia

India

Egypt

☒ Check

## Task 3

PHYWE

Write down your observations from the fourth attempt.

Day: e.g. in , .

ight: e.g. in , .

Dusk: e.g. in , .

Germany

parts of Brazil

Japan

Australia

India

Egypt

☒ Check

## Task 4

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How do day and night arise?

Complete the sentence.

Day and night are created by the  of  
the  around its .

✓ Check

How many hours does it take until the  
earth has rotated once around its axis?

Complete the sentence.

It takes  hours for the earth to  
rotate  time around its .

✓ Check