curricuLAB<sup>®</sup> PHYWE

# **Transparent and opaque materials**



Physics	Light & Optics	Dispersion	n of light
Difficulty level	<b>RR</b> Group size	D Preparation time	Execution time
easy	2	10 minutes	10 minutes
This content can also be found online at:	回惑者		



http://localhost:1337/c/5f4da0b5ce572a000382d755







# **Teacher information**

# **Application**

#### **PHYWE**



Transparent or opaque

Objects can be transparent, i.e. they let light through. One speaks then also of the fact that they are transparent. Other objects are exactly the opposite: they do not let light through. They are then called opaque.





# Other teacher information (3/3)

Since the students look into the light source during this experiment in order to be able to subjectively assess the light transmission of various materials, it is essential to ensure that the specified voltage of 4 V for the light box is maintained.

# **Safety instructions**

#### **PHYWE**



- $\,\circ\,$  Halogen lamps become warm during prolonged use
- Avoid looking directly into the light source







# **Student Information**

# **Motivation**

#### **PHYWE**



Hourglass

Why is the hourglass transparent, but the sand in there is not? What does it take to not be transparent, opaque?

Water vapour is translucent, i.e. transparent. However, if you have too much of it, fog will appear, for example, and in heavy fog you can no longer see through it easily. This behaviour will be examined more closely in the following experiment.



## Tasks

#### **PHYWE**



1. examine the light transmission of various solid materials.

2. investigation of what the light transmission of tracing paper depends on

Experiment set-up



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## Equipment

Position	Material	Item No.	Quantity
1	Light box, halogen 12V/20 W	09801-00	1
2	Block, trapezoidal	09810-02	1
3	PHYWE Power supply, 230 V, DC: 012 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1

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**PHYWE** 

# Additional equipment

#### **Position Equipment** Quantity 1 Different bodies (e.g. triangle made of plastic, eraser, etc.) 1 Various types of paper or foil (e.g. transparent paper, silhouette paper, transparent foil 2 1 - size 8 cm x 8 cm) 3 Transparent paper (DIN A4) 1 4 White paper (DIN A4) 1 5 Scissors 1

### Set-up

#### **PHYWE**

Place the light box with the lamp side on a sheet of paper close to the edge of the table and place the bodies to be examined at the ready.

Setting up the light box



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#### **PHYWE**



Connecting the light box

# 1. dependence of the light transmission on the type of solid material

• Connect the light box to the DC output of the power supply unit. Set a voltage of 4 V.

## **Procedure (2/7)**

#### **PHYWE**



Follow the path of the light

- Hold the trapezoidal model body at a distance of about 15 cm horizontally in front of the opening of the light box. Look through the body to the light source (filament).
- $\circ\;$  Enter your observations in the results table in the protocol.



Procedure (3/7)

#### **PHYWE**



Follow the path of the light

- Repeat this experiment by holding the body in front of the opening of the light box so that the light falls through the roughened surface.
- Enter your observations in the table on the results page.
- Repeat the experiment for all prepared solids and paper grades. Complete the table with your observations.

## Procedure (4/7)

#### **PHYWE**



# 2. dependence of the light transmission on the layer thickness

 Cut the sheet of tracing paper into about 8 pieces of equal size and sketch a small figure on one of these pieces.



Procedure (5/7)

#### **PHYWE**



- First hold the piece of transparent paper with the figure directly in front of the light box.
- Then hold 2, 3, 4 to 8 sheets in front of the lamp one after the other. Observe the light transmission and the visibility of the figure. Note your observations in the protocol.

# Procedure (6/7)

#### **PHYWE**



Connection of the 12 V output voltage

#### Additional task

• Now apply a voltage of 12 V ~ to the light box.



Procedure (7/7)

#### **PHYWE**



Connection of the 12 V output voltage

- Carefully shake out a chalk rag about 20 cm in front of the light box. Observe the light path.
- Note your observations in the minutes.





# Report



# Table 1 PHYWE

#### Write down your observations for the first part of the

Body	Observations	
Trapezoidal body (flat lying)		
Trapezoidal body (standing up		
Colour filter (red)		
Eraser		
Slide		
Transparent paper		

# Task 1

#### **PHYWE**

# Write down your observations on the dependence of the light transmission on the layer thickness:

(a) Observation as the number of transparency sheets increases

Fill in the text gaps.

With a sheet of transparent paper, you can see a bright glow, t	he filament is		visible. The more
sheets of transparent paper are put on top of each other, the	th	e light shine	25.



**PHYWE** 

Task 2	PHYWE
Write down your observations on the dependence of the light transmon the layer thickness:	nission
b) Visibility of the figure Fill in the text gaps.	
The figure can be seen on a sheet of tracing paper. The more sheets of transparent pa laid on top of each other, the the sketch becomes.	aper are
Check	

Task 3			PHYWE	
Compare your observations on the light transmission of different bodies.				
Which three groups of light transmission can be specified?				
There are bodies that let the light the	nrough,	, other bodies	transparent	
do not let light through,	. But there are also	bodies that the	transparent bodies	
light can only partially penetrate,	or		transparent bodies	
			opaque bodies	
Check				



**PHYWE** 

# Table 2

# Assign more items to your environment:

, , , , , , , , , , , , , , , , , , ,	

# Task 4 What does the light transmission of transparent paper depend on? Formulate a sentence! Fill the text gap. The light transmission of transparent paper depends on the \_\_\_\_\_\_. Check

Additional ta	sk	PHYWE
What conclusion ca transmission of air? What could be the o	an you draw from your observations in the additional expe ? cause of the phenomenon you observed?	riment on the light
Since the path of the light of the	is not normally visible, it follows that air is in a similar way to glass. The chalk grains are illuminated by the and thus mark the	light box light transparent
(	).	diffusion of light light path
Check		

Slide		Score / Total
Slide 22: Light transmission Layer thickness		0/2
Slide 23: Light transmission Layer thickness		0/2
Slide 24: Light transmission of different bodies		0/4
Slide 26: Light transmission Transparent paper		0/1
Slide 27: The light path		0/5
	Total amount	0/14





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