

Projected image with a concave mirror

Task and equipment

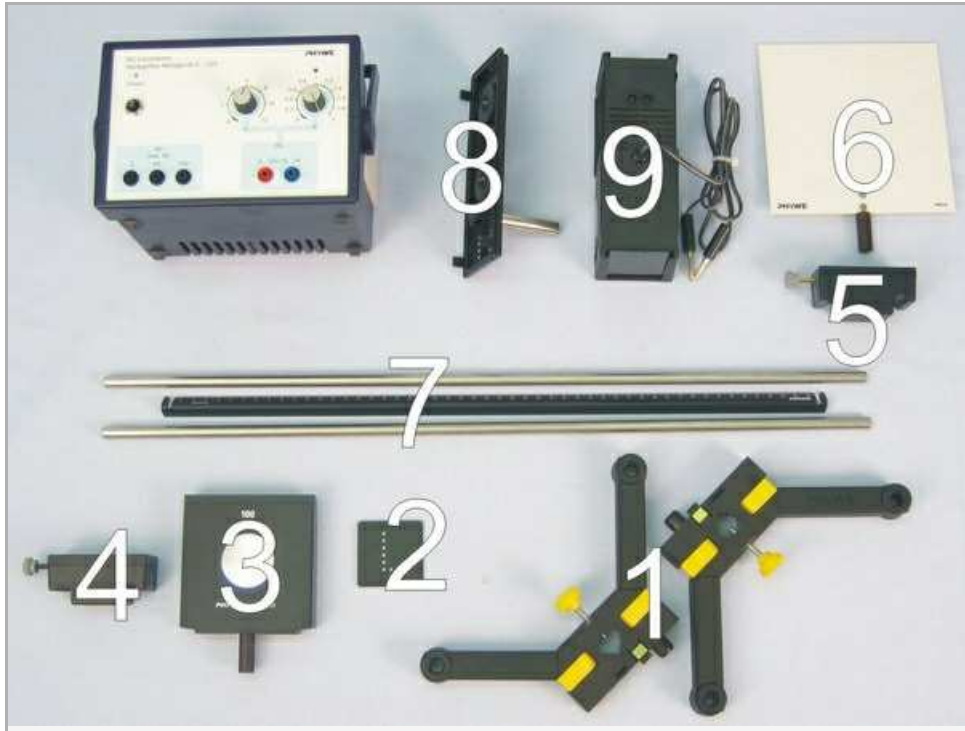
Information for teachers

Projected image with a concave mirror

Task and equipment

Task

Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Object -L-, glass bead	11609-00	1
3	Concave/convex mirror with rod	09821-00	1
4/5	Slide mount for optical bench	09822-00	2
6	Screen, white, 150x150mm	09826-00	1
7	Support rod, stainless steel, l = 600 mm, d = 10 mm	02037-00	2
7	Meter scale for optical bench	09800-00	1
8	Bottom with stem for light box	09802-10	1
9	Light box, halogen 12V/20 W	09801-00	1
	PHYWE power supply DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1
Additional material			
	Ruler (approx. 30 cm)		

Set-up and procedure

Set-up

Using the two support rods and the variable support base assemble the optical bench and place the scale for the optical bench against the front support rod.



Fig. 1



Fig. 2

Place the bottom with stem under the light box.



Fig. 3



Fig. 4

Clamp it in the left part of the support base so that the lens end points away from the optical bench.



Fig. 5

Insert a light-tight cover in front of the lens and the diaphragm with the square opening into the well at the other side of the light box.



Fig. 6

Complete the experimental setup by placing the concave mirror and the screen as shown in the picture. (The concave mirror is at a slight angle to the optical bench so that the light which is reflected by it shines on the screen.)

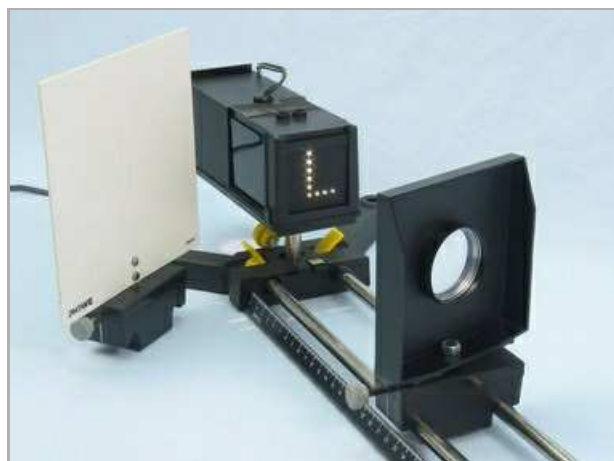


Fig. 7

Procedure

Connect the light box to the power supply (12 V AC) and switch it on.

Student's Sheet

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Fig. 8

Choose the distance of the concave mirror from the glass-bead-L, i.e. the object distance g so that $g = 2f$: the mirror has a focal length $f = 100$ mm.

Then move the screen until the projection of the -L- on it is well-focused.

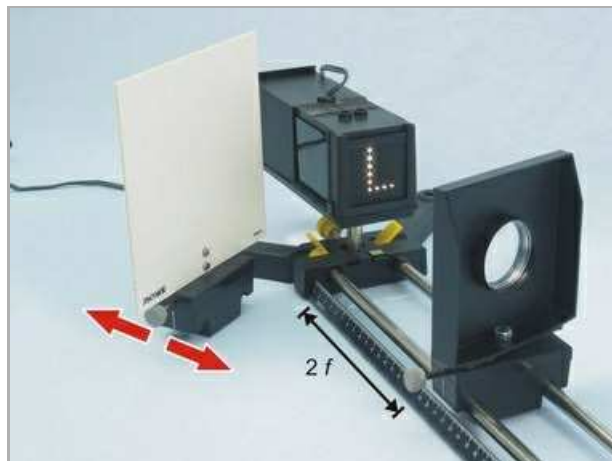


Fig. 9

Measure the image distance b and compare it with the focal length f ; examine the image.

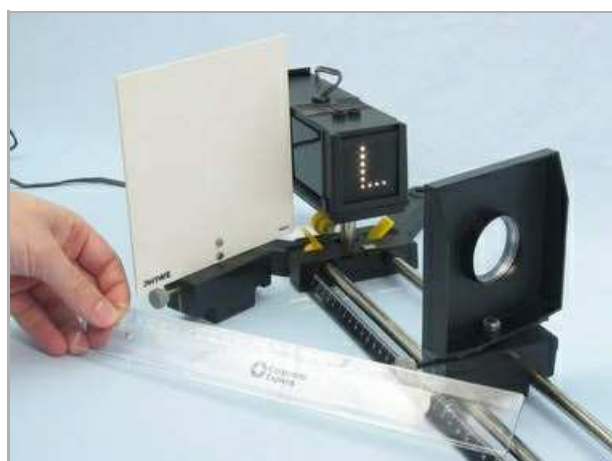


Fig. 10

Record the results in table 1 in the report. To characterise the 3 main characteristics of the image use the words: "upright" or "inverted"; "enlarged", "reduced" or "same size"; "real" or "virtual".

Repeat the same steps with $g > 2f$, $f < g < 2f$ and $g < f$. Record your results.

Student's Sheet

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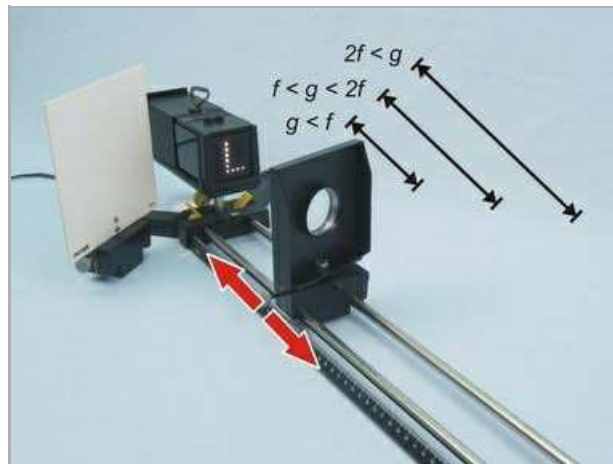


Fig. 11

Switch off the power supply.

Report: Projected image with a concave mirror

Result - Table 1

Record the result in the table.

Object distance	Image distance	Properties of the image			
$g > 2f$	$\frac{1}{\pm 0}$	inverted	1	1	
$g = 2f$	$\frac{1}{\pm 0}$	1	1	real	
$2f > g > f$	$\frac{1}{\pm 0}$	1	enlarged	1	1
$g < f$	negative	1	1	virtual	

Evaluation - Question 1

Under what condition is a real image always formed by a concave mirror?

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Evaluation - Question 2

Under what condition is a virtual image always formed by a concave mirror?

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Evaluation - Question 3

What happens when the object is at the focal point of the concave mirror ($g = f$)?

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Evaluation - Question 4

Name at least one example for the use of concave mirrors to form pictures.

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Evaluation - Question 5

In everyday life there are many examples of metal concave objects which function as concave mirrors, such as a polished metal spoon. Look attentively into such a spoon and examine your mirror image. What do you notice?

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Evaluation - Question 6

Name further examples with which you are familiar.

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