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Exercises and Complements for the Introduction to Physics II  
for Students  
of Biology, Pharmacy and Geoscience

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Sheet 8 / 20.04.2022

Discussion: **26.04.2022 / 27.04.2022**

**Exercise 29.**

A thin layer of oil ( $n = 1.6$ ) floats on a puddle of water ( $n = 1.3$ ), on which the reflected sunlight appears green ( $\lambda = 500$  nm) with oblique lighting ( $\alpha = 45^\circ$ ). How thick is the oil layer?

**Exercise 30.**

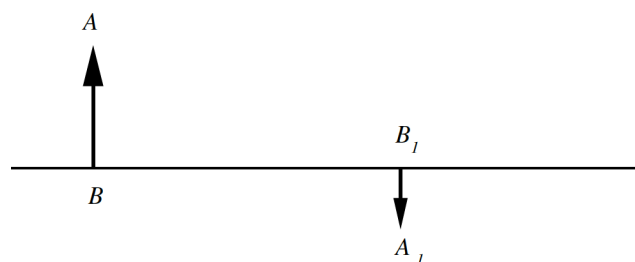
Consider a converging lens with a focal length of  $f = 30$  mm. What kind of image is generated by an object that is placed:

- a) at the focus point,
- b) 40 mm away from the lens,
- c) 20 mm away from the lens?

Sketch the light path for each of the cases.

**Exercise 31.**

The image  $A_1B_1$  of the object  $AB$  is generated with the aid of a spherical mirror. Sketch the mirror position and its focus with the help of the template provided below.



### Exercise 32.

A slide projector has a lens with a focal length of 120.0 mm. The projector is positioned at the back wall of an auditorium. The projector is supposed to sharply project small slides ( $36 \text{ mm} \times 24 \text{ mm}$ ) onto the canvas ( $2.0 \text{ m} \times 2.0 \text{ m}$ ) located 8.0 m away.

(a) Show that the canvas is too small under these conditions.

(b) To make sure the image from the projector can be fully viewed, the screen is pulled up and the image is now projected onto the wall, 30 cm further behind where the screen used to be. The image however is initially out of focus. Do you have to increase or decrease the distance between the slide and the lens in order to focus the image? Explain your answer.

(c) In order to avoid the cumbersome slide changing method used by the old projectors, a new projector is acquired. With a projection distance of 3.0 m, the existing canvas should be illuminated as efficiently as possible. The manufacturer offers three different lenses, each with different focal lengths: 45 mm, 60 mm and 90 mm. Which lens would you choose? Justify the answer with a calculation.

