

Optical instruments

The eye

Short-sightedness

Structure of the eye with lens model and translucent screen

Object of the experiment

1. Demonstrating the short-sightedness of an eye and its correction by means of a diverging lens

Setup



- Assemble the lens model according to the instruction sheet 662 402, and fill it with distilled water.
- Darken the room a little.

Apparatus

1 Optical bench, S1 profile, 1 m.....	460 310
2 Clamp riders with fixing column	460 313
2 Clamp riders with clamp.....	460 311
1 Candle holders, set of 2.....	459 31ET2
1 Candles, set of 20.....	459 32
1 Lens Model	662 402
1 Lens on rod, $f = -100$ mm.....	459 68
1 Screen, translucent.....	441 53
1 Water, pure, 1 l.....	675 3400

Carrying out the experiment

- Place the translucent screen on the back third of the optical bench.
- Position the lens model at a distance of 15 cm in front of the translucent screen and fill it with water so that the lens has its minimum radius of curvature (the foils have to be just taut when the syringe is relaxed).
- Light the candle, and adjust the object distance (approx. 40 cm) by displacing the candle until a sharp image is seen on the translucent screen (emmetropic eye).

- Increase the image distance by displacing the translucent screen by 2 cm (short-sighted eye), and observe the image.
- Reduce the object distance by displacing the candle, and observe the image on the translucent screen.
- Increase the object distance again to 40 cm.
- Place a diverging lens ($f = -100$ mm) between the candle and the lens model, and displace it until a sharp image forms again on the translucent screen.

Observation

If the image distance is increased by displacing the translucent screen, a distant object can no longer be imaged sharply on the translucent screen despite the complete relaxation of the eye.

If the object distance is reduced, a sharp image is again seen on the translucent screen.

If a diverging lens is placed in front of the lens model, a distant object can also be imaged sharply.

Evaluation

In a short-sighted eye, the distance between the lens and the retina is too long.

Despite the complete accommodation of the eye, the image of a distant object forms in front of the retina and, therefore, is unsharp.

Nearby objects can be imaged sharply on the retina.

By means of a diverging lens, which is placed in front of the eye in the form of spectacles, a short-sighted eye can be corrected.

The focal length of the eye is decreased by the diverging lens so that the image of a distant object forms exactly on the retina and thus is sharp.