

Optical instruments

The eye

Presbyopia -Structure of the eye with lens model and translucent screen

Object of the experiment

1. Demonstrating the presbyopia 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 62
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 until the lens has a medium radius of curvature.
- Light the candle, and adjust a short object distance (approx. 15 cm).
- Observe the image of the candle flame on the translucent screen.
- Increase the object distance by displacing the candle, and observe the image on the translucent screen.
- Reduce the object distance back to 15 cm.
- Place a converging lens ($f = + 100$ mm) between the candle and the lens model, and displace it until a sharp image forms on the translucent screen.

Observation

At a medium radius of curvature of the lens (aged eye), a nearby object can no longer be imaged sharply on the translucent screen.

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

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

Evaluation

In a presbyopic eye, the elasticity of the eye lens is limited.

The radius of curvature of a completely accommodated presbyopic eye is smaller than in the case of a completely accommodated emmetropic eye.

Accordingly, the focal length of the eye is too large for sharp imaging of a nearby object on the retina.

More distant objects can be imaged sharply on the retina.

By means of a converging lens, which is placed in front of the eye in the form of spectacles, a presbyopic eye can be corrected.

The focal length of the eye is increased by the converging lens so that the image of a nearby object forms exactly on the retina and thus is sharp.

Remark:

With the advance of aging the eye becomes unable to accommodate for distant objects as well.

As a diverging lens is required for the correction, spectacles with continuous vision lenses are used in this case.

These enable far and near vision through different areas of the lenses.