

## Structure and function of the human eye

### Principle and equipment

#### Principle

Demonstrate the principle of image formation of objects by the human eye, and show how the eye adapts to different object distances (accommodation).

#### Equipment

Position No.	Material	Order No.	Quantity
1	Demo Physics board with stand	02150-00	1
2	PHYWE Multitap transformer, DC: 2/4/6/8/10/12 V, 5 A / AC: 2/4/6/8/10/12/14 V, 5 A	13533-93	1
3	Lamp, halogen, mag. held, 12V/50W	08270-20	1
4	Opt. block, semicirc., magnet held	08270-01	1
5	Opt. block, planoconvex, magn. held	08270-02	1
6	Plane mirror, magnet held	08270-13	1
7	Diaphragm w. holder, magnet held	08270-10	2
Additional material:			
	Ruler		
	Water-soluble white board pen		

## Set-up and procedure

- Delimit the optical axis on the magnet optics panel.
- Place the semicircular optical block (thick convergent lens) onto the magnet optics panel.
- Complete the model eye (Place the back of the plane mirror behind the convergent lens as retina and add the diaphragms with holders as the iris diaphragm).
- Place the parts as shown in Fig. 1.
- Position the magnet-held lamp as shown in Fig. 1 and aim a divergent light beam at the "eye". If necessary, focus slightly so that a focused image of the point light source, which serves as the object, is generated on the "retina".
- Move the magnet-held lamp about 200 mm to the right.
- Illustrate the unfocused image of the object point, e.g. by moving the plane mirror, which serves as the retina, or removing it entirely.
- Return the plane mirror to its original position.
- Abut the planoconvex lens (Fig. 2) and thus increase the thickness of the eye's lens.

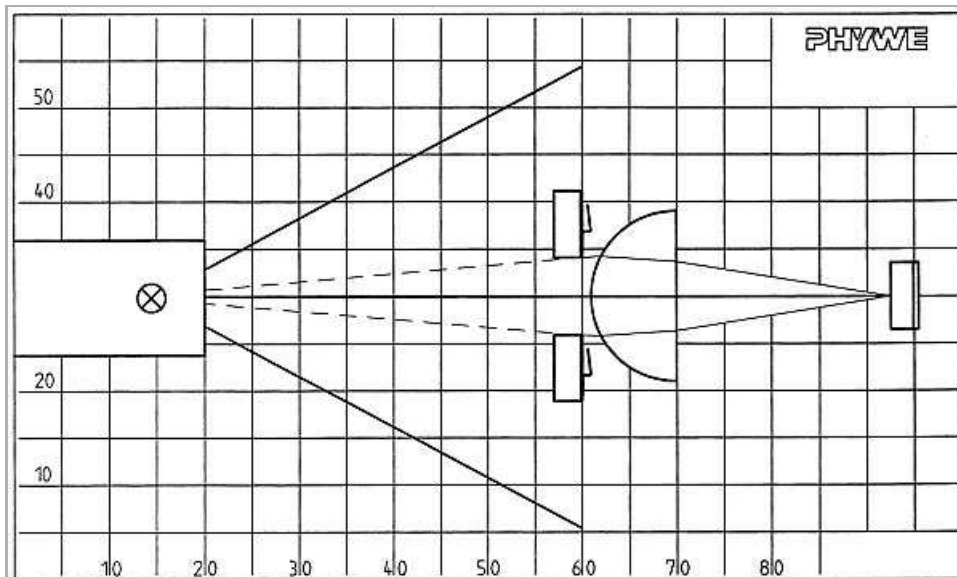


Fig. 1

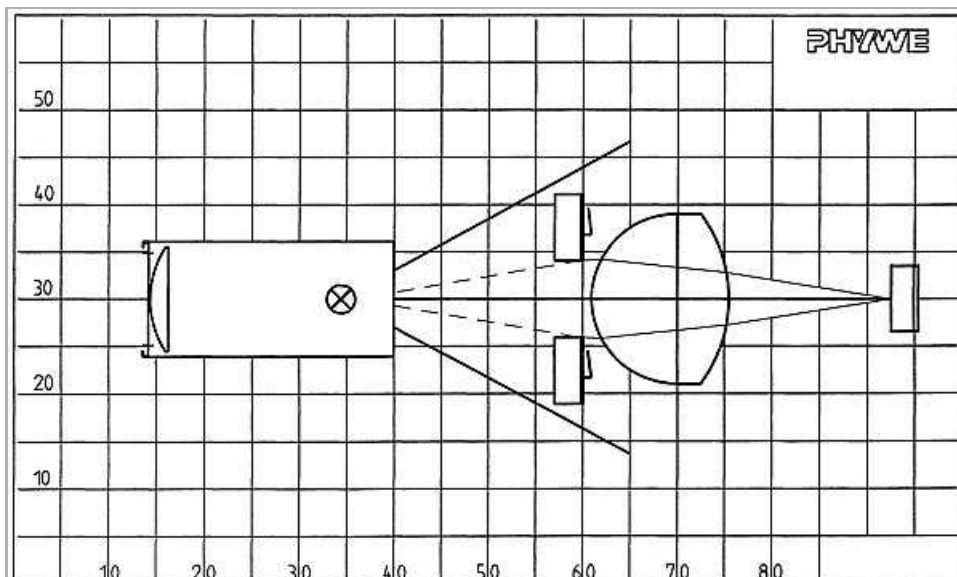


Fig. 2

## Observation and evaluation

### Observation

The image of the point light source becomes unfocused when the objects distance from the eye is changed. If the object moves closer to the "eye", its lens must become thicker so that a focused image can again be projected on to the retina.

### Evaluation

The eye must be able to form focused images of objects which are at different distances from it. As the image distance (the distance between the retina, on which the images are formed, and the eye's lens) cannot change, the focal length must be changed. This is done by changing the curvature of the eye's lens.

The eyes of a normal-sighted person are capable of this (if the object distance is not less than 250 mm). This adaptation is termed accommodation.

#### Remark

The diaphragms are not just there to complete the model eye, but also to prevent lens errors due to rays far from the axis (spherical and chromatic aberration)