

# EYES AND VISION DEFECTS

## The different parts of the eye

Our entire view of the world is the result of the optical images formed on our retinas by the lenses in our eyes.

One of the most complicated optical systems is the human eye. Our eyes have an almost spherical shape, about 2.5 cm in diameter. The front part of the eye is covered with a clear membrane called *cornea*. The back part is covered by the *retina* with its light-sensitive cells. The pupil, iris and lens are between the cornea and the retina (Figure 1).

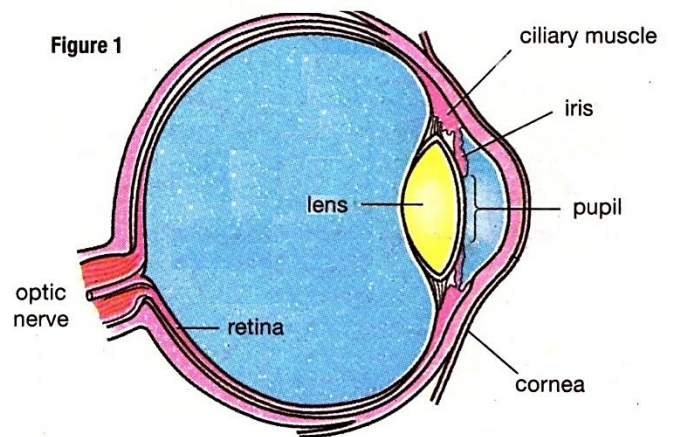
The *pupil* is the part of the eye that looks black. It is actually a hole formed by the iris and covered by the clear cornea in front.

The *iris* is a ring of muscle that controls the opening of the pupil and regulates the amount of light that enters the eye. The iris gives the eye its color. In dim light, the iris contracts and the pupil gets bigger. This increases the amount of light that enters the eye. In very bright light, the pupil becomes smaller and the amount of light that enters the eye decreases.

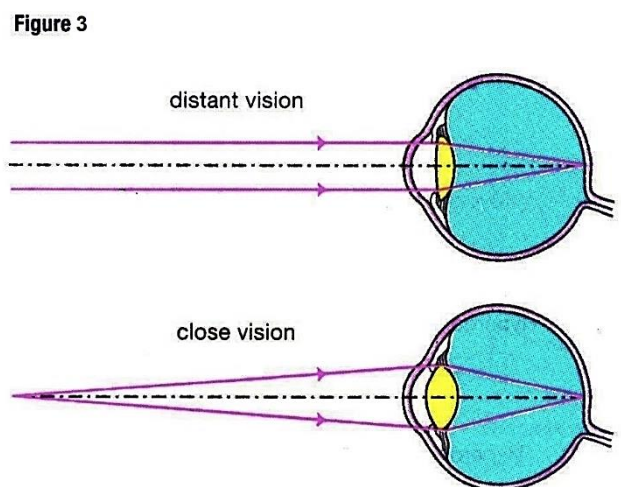
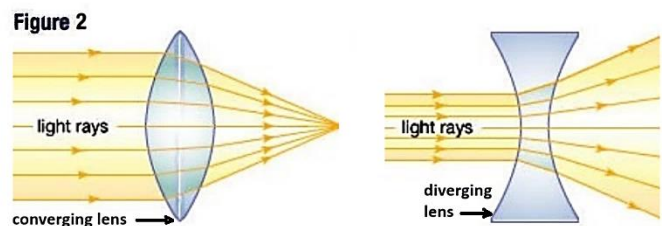
## Accommodation of the eye

The eye can change the shape and size of its lens to enable the eye to focus sharply. This ability of the eye to focus on objects at different distances is called *accommodation*. When the normal eye looks at distant objects, the muscles surrounding the lens relax and make the lens thinner (Figure 3).

When the normal eye focuses on a near object, the muscles contract and make the lens thicker. The eye can focus clearly within a distance of 25 cm. If the normal eye looks at objects held nearer than 25 cm, the muscles contract too much. This makes your eyes tired.



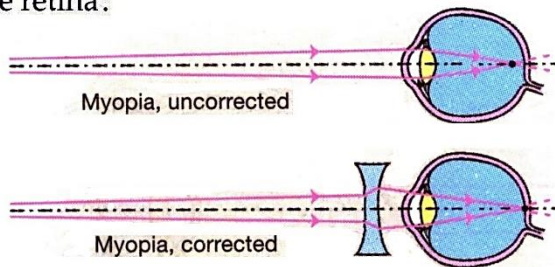
The cornea is a transparent surface that protects the eye from dust. The cornea and lens together act as a converging lens that refracts light as it enters the eye (Figure 2):



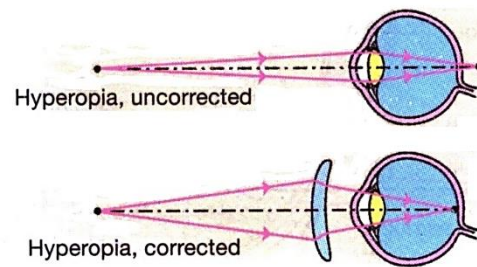
1. Name all the parts crossed by rays of light when they travel through the eye.
2. What is the role of the iris?
3. Explain what is the accommodation of the eye. Which situation makes your eyes tired?

## Defects of vision

Nearsightedness or short-sightedness is also known as *myopia*. A myopic person can see near objects clearly but cannot focus distant objects. This is because the eyeball is a bit too long, or the lens is thick even though the ciliary muscles are relaxed. Distant objects appear blurred because the image gets focused in front of the retina. Myopia is corrected by using diverging lenses. The correcting lens spreads the light rays before they enter the eye so that the image is formed on the retina:



Farsightedness or long-sightedness is also known as *hyperopia*. A hyperopic person can only clearly see distant objects. Near objects appear blurred because the image gets focused at the back of the retina. This is because the eyeball is a bit too short, or the lens is too thin. Hyperopia is corrected by using converging lenses. The correcting lens makes the rays bend toward each other a little before they enter the eye so that the image is formed on the retina:



4. Where are the image formed in uncorrected myopic and hyperopic eyes? How can we explain those vision's defects ?
5. How can we correct myopia and hyperopia?

## Other eye defects

As people grow older, their eye lenses become thicker, more rigid and less able to change shape. This results in a lack of accommodation called *presbyopia*, or difficulty in focusing both near and far objects. This is corrected by using *bifocal glasses*. Bifocal means that the lenses are constructed so that they have two different focuses. The part of the glasses for near vision is the lower portion because the eyes tend to look down at close objects. The part of the glasses for distant viewing is the upper section.

Another common eye defect is called *astigmatism*. This is caused by irregularities in the shape of the cornea, lens or the eyeball. An astigmatic person may see blurred horizontal lines instead of clear vertical lines, or *vice versa*. A special lens that curves more in one direction than in another can correct this defect.

6. How can we correct presbyopia?
7. Eyes defects can also be corrected by surgery. Watch this [video](#) and explain how does work.
8. Imagine a role-play with your groupmate : one is a doctor and the other the patient that needs to correct its vision ...