



كلية المستقبل الجامعة
قسم الفيزياء الطبية
المرحلة الثالثة

Medical Physics

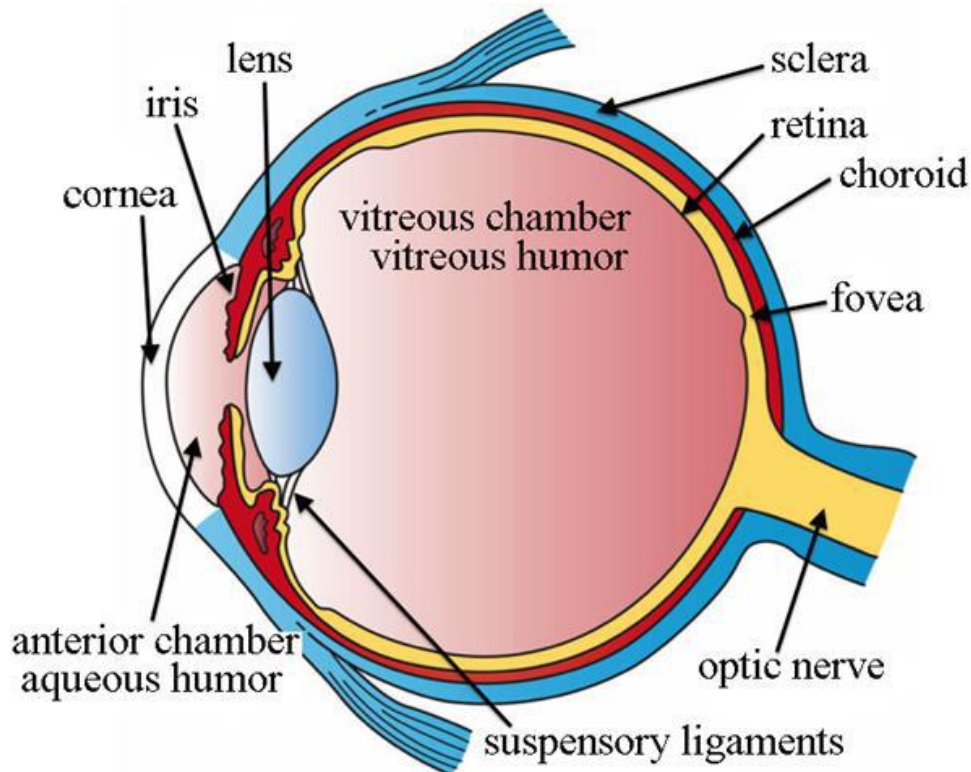
Lecture 3

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Difference Effects on The Eye :

Structure of Human Eye :

A human eye is roughly 2.3 cm in diameter and is almost a spherical ball filled with some fluid. It consists of the following parts :



1- Sclera : It is the outer covering, a protective tough white layer called the sclera (white part of the eye) .

2- Cornea : The front transparent part of the sclera is called cornea. Light enters the eye through the cornea .

3- Iris : A dark muscular tissue and ring-like structure behind the cornea is known as the iris. The color of the iris actually indicates the color of the eye. The iris also helps regulate or adjust exposure by adjusting the iris .

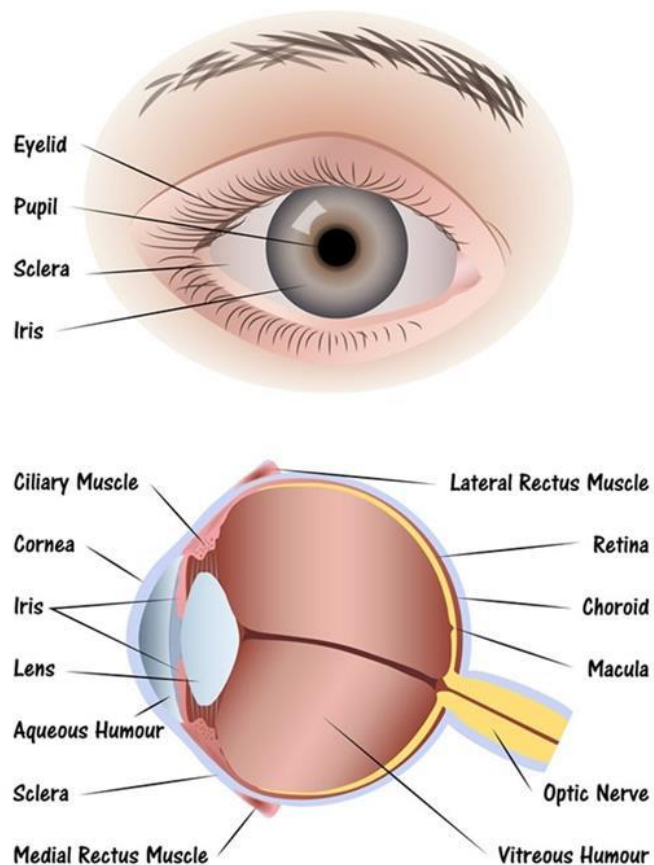
4- Pupil : A small opening in the iris is known as a pupil. Its size is controlled by the help of iris. It controls the amount of light that enters the eye .

5- Lens : Behind the pupil, there is a transparent structure called a lens. By the action of ciliary muscles, it changes its shape to focus light on the retina. It becomes thinner to focus distant objects and becomes thicker to focus nearby objects .

6- Optic nerves: Optic nerves are of two types. These include cones and rods :

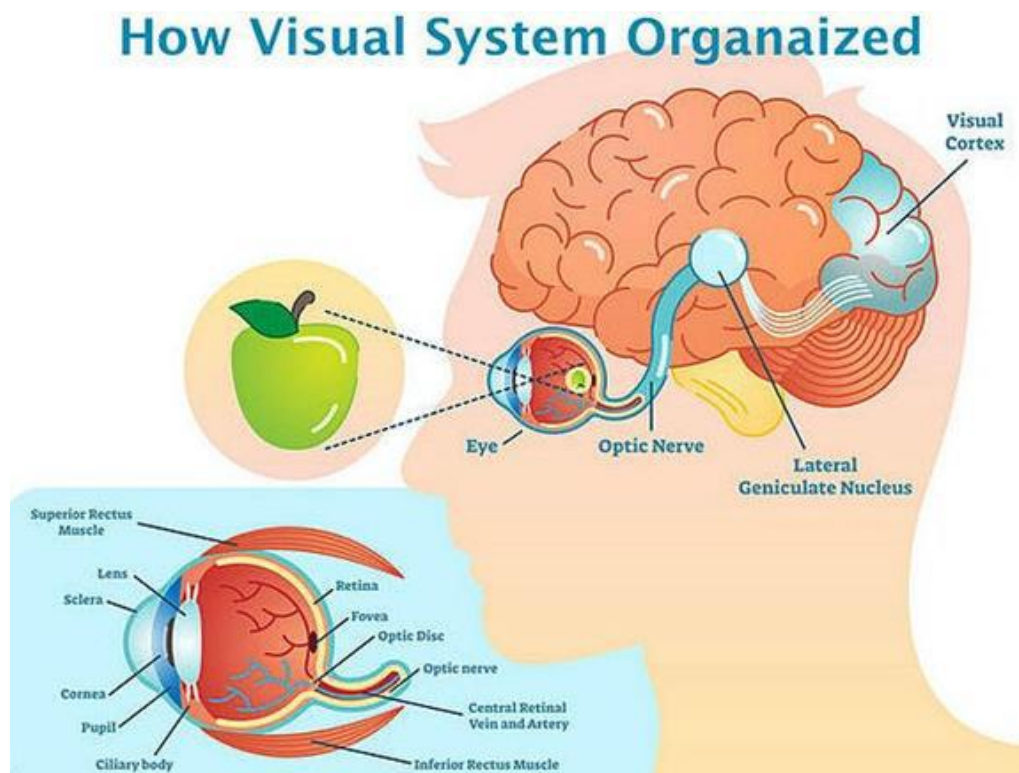
A- Cones : are the nerve cells that are more sensitive to bright light. They help in detailed central and color vision .

B- Rods: Rods are the optic nerve cells that are more sensitive to dim lights. They help in peripheral vision .



How Do Eyes Work :

- 1- The images we see are made up of light reflected from the objects we look at .
- 2- This light enters the eye through the cornea, which acts like a window at the front of the eye .
- 3- The amount of light entering the eye is controlled by the pupil, which is surrounded by the iris – the coloured part of the eye .
- 4- Because the front part of the eye is curved, it bends the light, creating an upside down image on the retina. The brain eventually turns the image the right way up .
- 5- When the light rays move through the various mediums, they experience refraction of light .
- 6- Refraction is change in direction of the rays of light as they pass between different mediums .



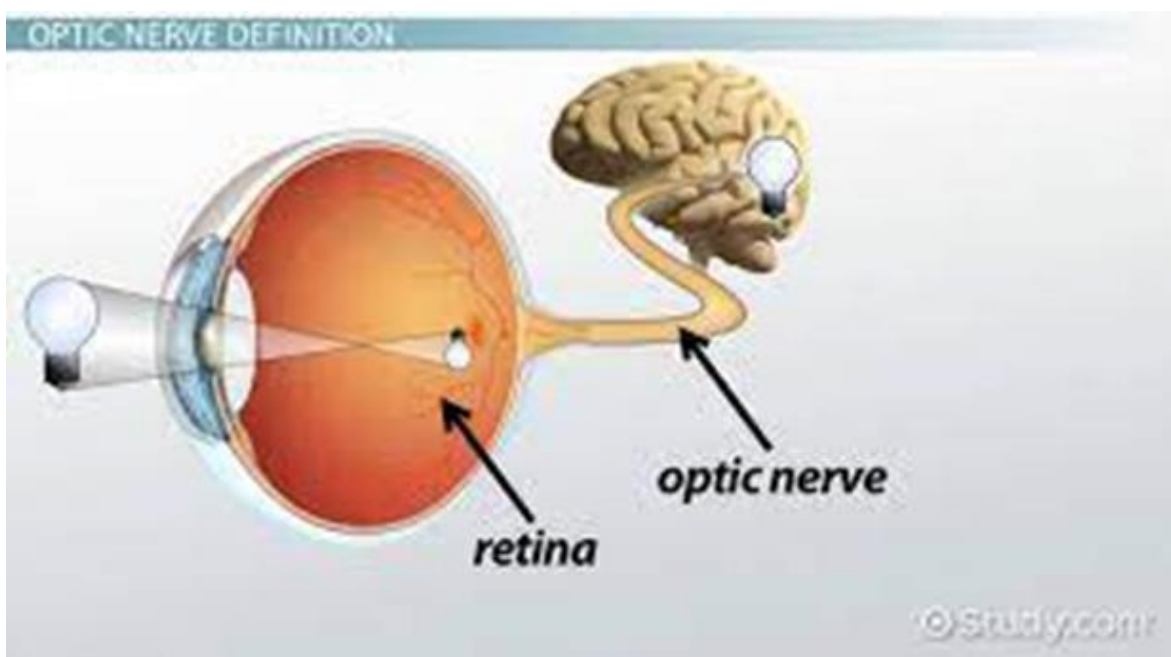
The table below shows the refractive indices of the various parts of the eye :

Medium	Refractive Index
Air	1.000
Cornea	1.376
Aqueous Humor	1.336
Lens	1.42
Vitreous Humor	1.336

7- The light rays finally are received and focused on the retina .

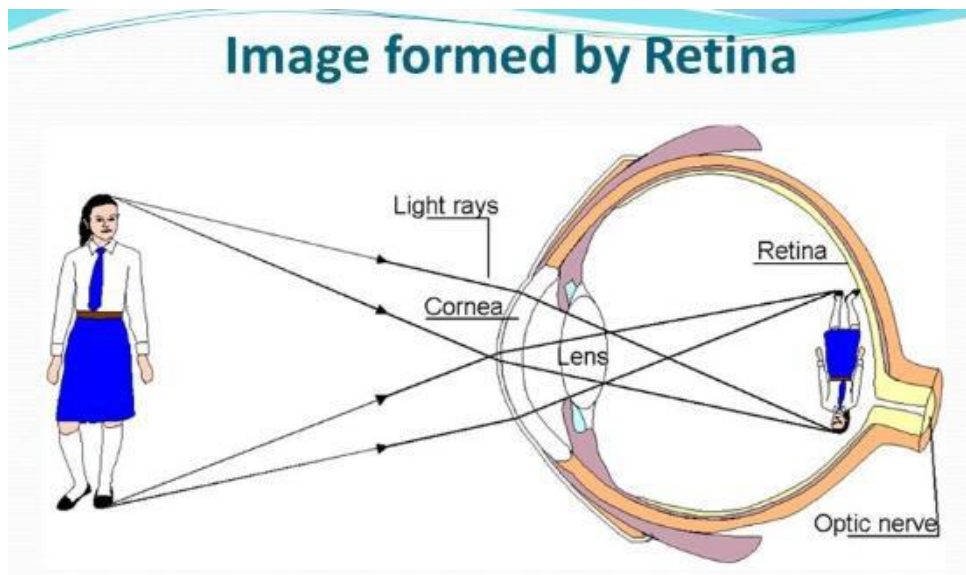
8- The retina contains photoreceptor cells called rods and cones and these basically detect the intensity and the frequency of the light .

9- Further, the image that is formed is processed by millions of these cells, and they also relay the signal or nerve impulses to the brain via the optic nerve.



The Retina :

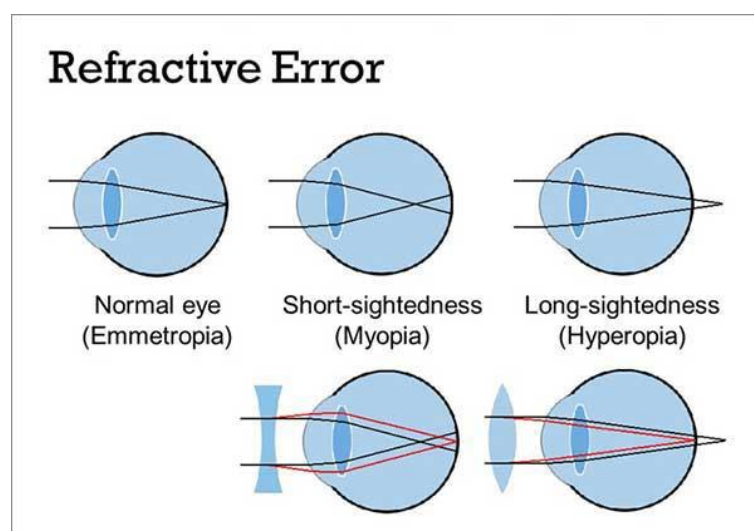
The retina is a complex part of the eye, and its job is to turn light into signals about images that the brain can understand. Only the very back of it is light sensitive: this part of the retina is roughly the area of a 10p coin, and is packed with photosensitive cells called rods and cones .



How Sharp and Defect are Your Eyes :

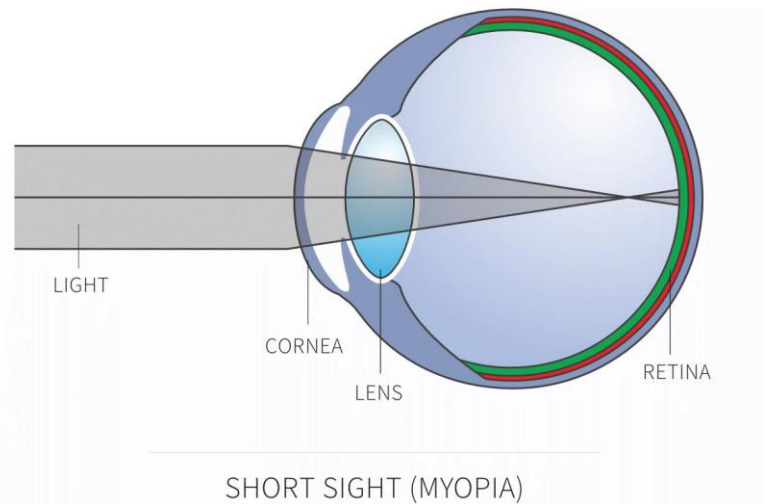
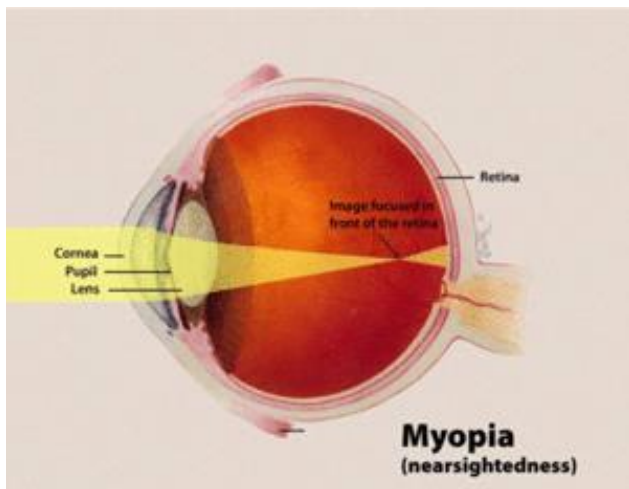
Refractive Error :

Refractive errors are eye disorders caused by irregularity in the shape of the eye. This makes it difficult for the eyes to focus images clearly, and vision can become blurred and impaired .



Short-Sightedness (Myopia) :

Also known as nearsightedness, is a condition where far away objects are not clear but nearby objects can be seen clearly. Due to the elongated shape of the eyeball, the image is formed in front of the retina causing far away objects to seem blurred. Myopia may increase up to the ages of 18 to 21. The symptoms include difficulty in seeing distant objects



Long-Sightedness (Hyperopia) :

Also known as farsightedness, is caused when light rays focus behind the retina because of a shorter eyeball. Patients who are affected by this condition have difficulty in seeing nearby objects but objects far away remain clear. The signs and symptoms usually noted are difficulty in reading, headaches, eyestrain, and fatigue .

