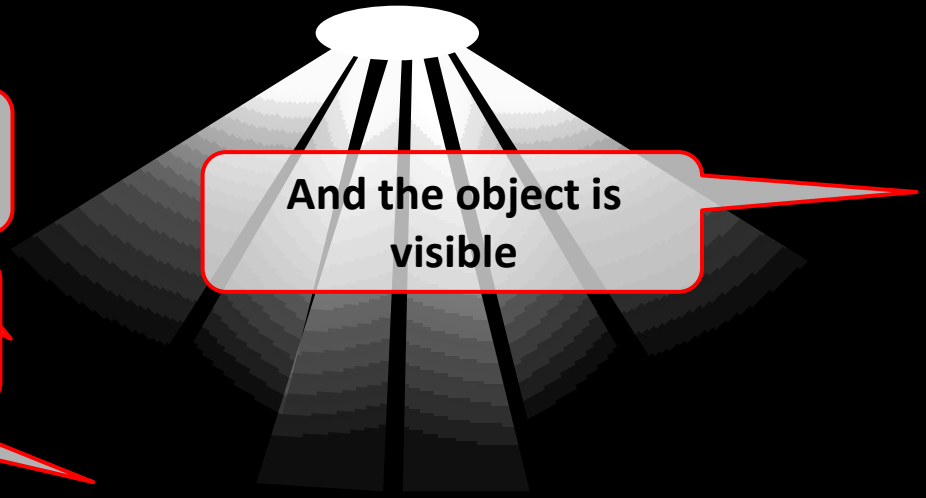
LIGHT

- Understanding Light
- Rectilinear Propogation And Reflection Of Light
- Making Of A Plane Mirror

Light is needed to make objects visible

Light from the source hits the object



And the object is visible

Gets reflected and enters our eyes

Ever tried to see in the dark

Light is a form of ENERGY that produces the sensation of vision.

Properties of Light

Rectilinear Propagation


Light is travelling
in a straight line

Light is a form of ENERGY that produces the sensation of vision.

Properties of Light

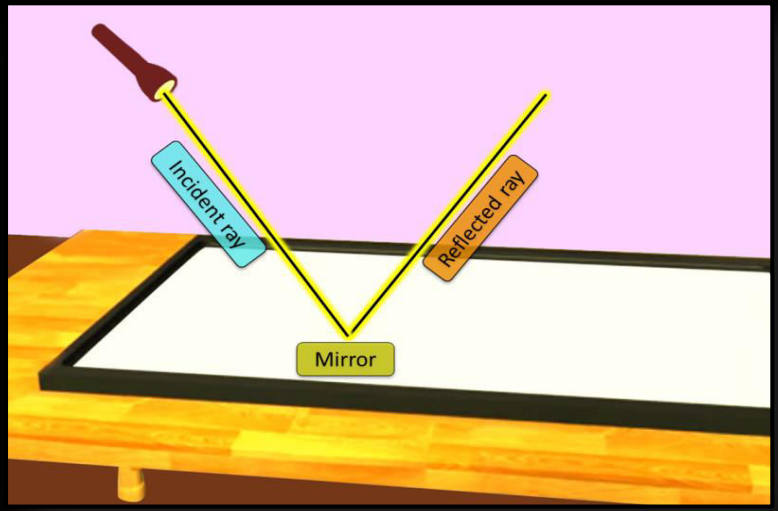
Rectilinear Propagation

Light is a form of ENERGY that produces the sensation of vision.

Properties of Light

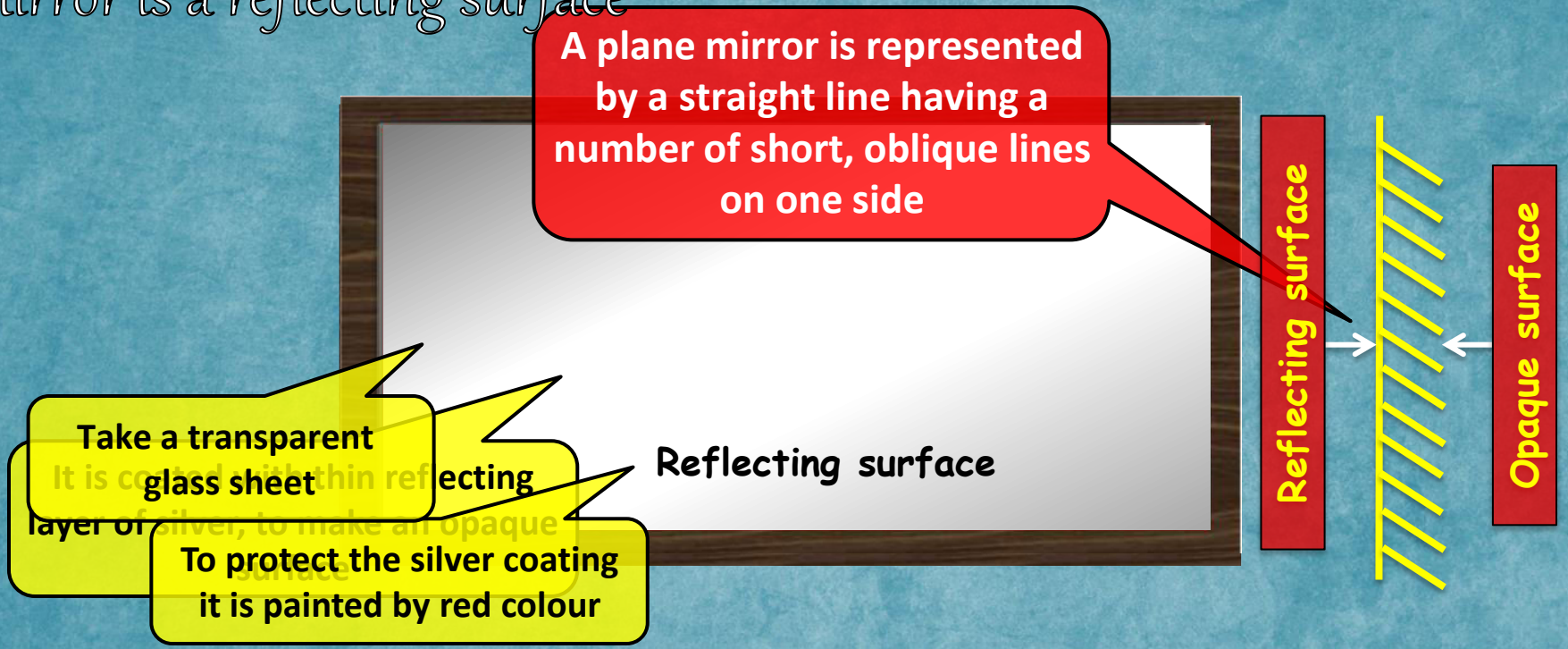
Rectilinear Propagation

Reflection of light



Making of a plane mirror

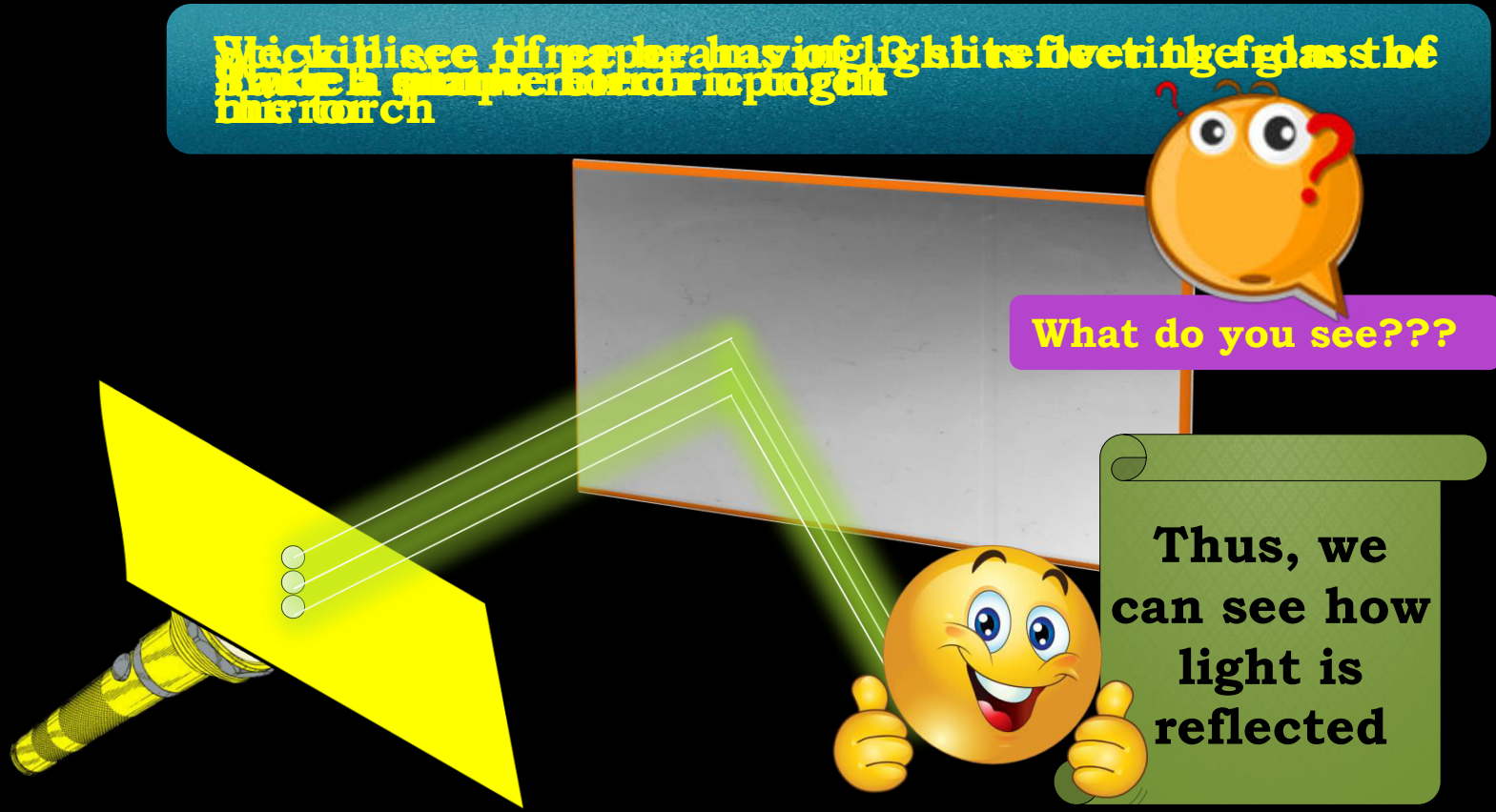
Mirror is a reflecting surface



LIGHT

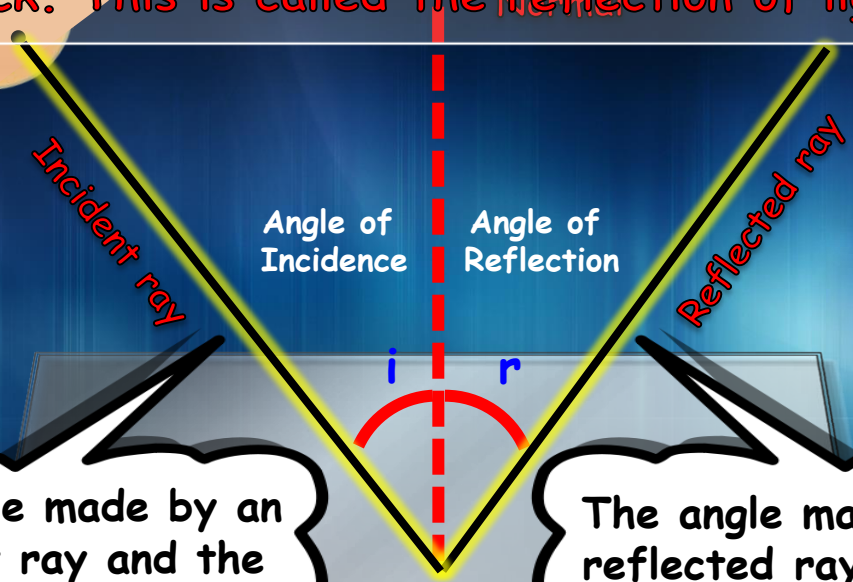
- **Laws Of Reflection**

Reflection of light



REFLECTION OF LIGHT

When rays of light fall on opaque surface they turn back. This is called the reflection of light.



The angle made by an incident ray and the normal is called angle of incidence.

The angle made by an reflected ray and the normal is called angle of reflection.

Laws of Reflection

The incident ray, the normal at the point of incidence and the reflected ray are all in the same plane.

The incident ray and the reflected ray lie on the opposite sides of the normal.

...e of incidence (i) is ... the angle of ... (r).

LIGHT

- **Characteristics Of Image Formed By Plane Mirror**

Characteristics of the image obtained in a plane mirror

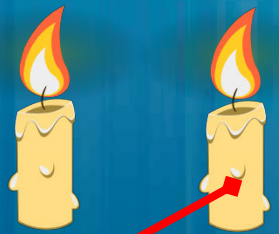
Place the lighted candle in front of the mirror.

We see a second candle in the mirror

The image formed in a plane mirror is upright

Erect

What do you see?



The candle in front of the mirror is called as the

Lighted candle

"Object"

Plane Mirror

This candle in the mirror is called an

"Image"

Characteristics of the image obtained in a plane mirror

Take a full length mirror and stand in front of the mirror

The image formed in a plane mirror is upright and of the same size as the object

What do you Notice?

Characteristics of the image obtained in a plane mirror

Now, raise your right hand.

Now raise your left hand.

Object

Image

What does this mean ?

This is called "lateral inversion". And such an image is said to be "laterally inverted image formed in a plane mirror.

It means that the right and left sides are interchanged in the

Characteristics of the image obtained in a plane mirror

The image too is at the end of the board.

move the queen at the end of the board square from the mirror

An image in a plane mirror is behind the mirror and at the same distance from it as the object

image now?

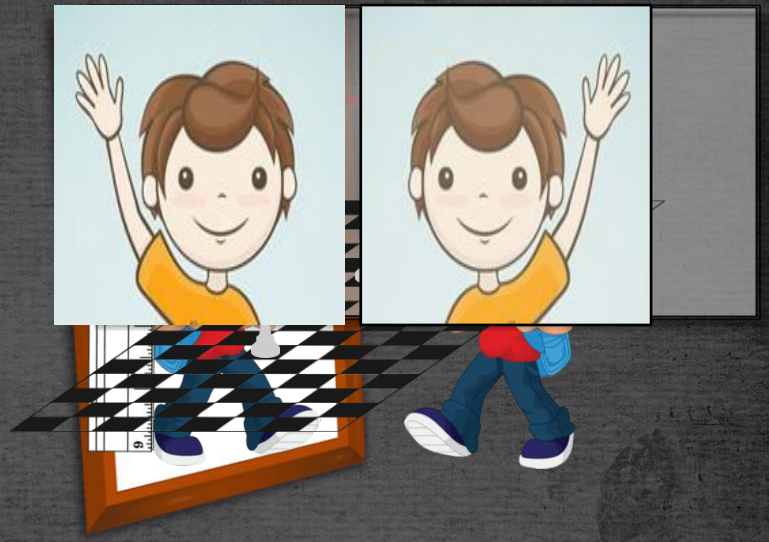
Characteristics of the image obtained in a plane mirror

1 The image formed in a plane mirror is upright (erect).

2 The image formed in a plane mirror is upright and of the same size as the object.

3 An image in a plane mirror is behind the mirror and at the same distance from it as the object.

4 The right and the left sides are interchanged in the image formed in a plane mirror. This is called “lateral inversion”.



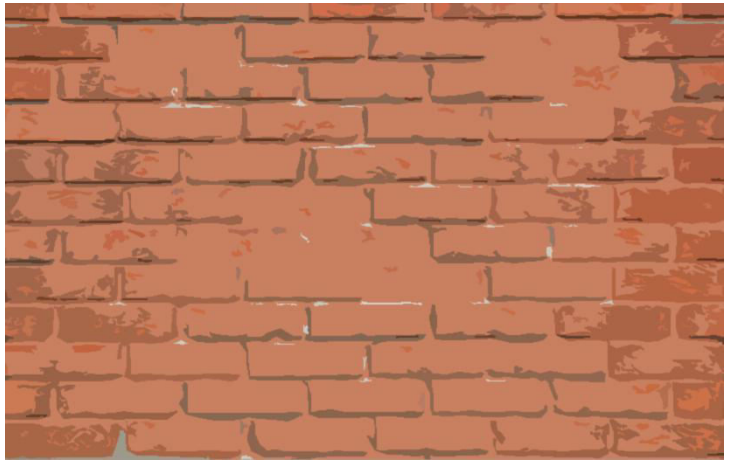
LIGHT

- **Regular And Irregular Reflection**
- **Reflected Light Can Be Reflected Again**

REFLECTION OF LIGHT i = r

When rays of light parallel to
inci
e, t
so r

Brick



Wall

MIRROR

Smooth Surface

Reflection from a regular (plane) surface

Rough Surface

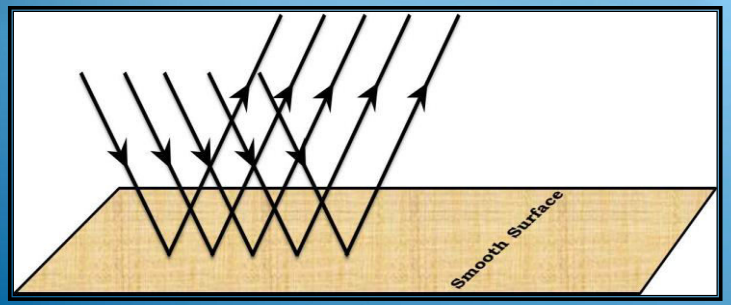
Reflection from an irregular (rough) surface

Distinguish between Regular reflection and Irregular reflection

Regular reflection

1. Regular reflection occurs when light is incident on a smooth surface such as that of a plane mirror.

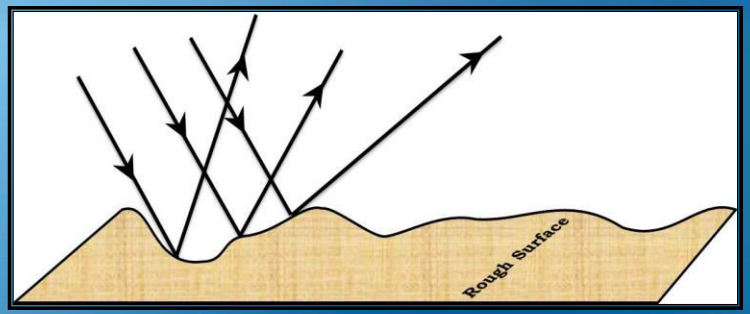
2. In this case, if the incident rays are parallel to each other, the reflected rays are also parallel to each other.

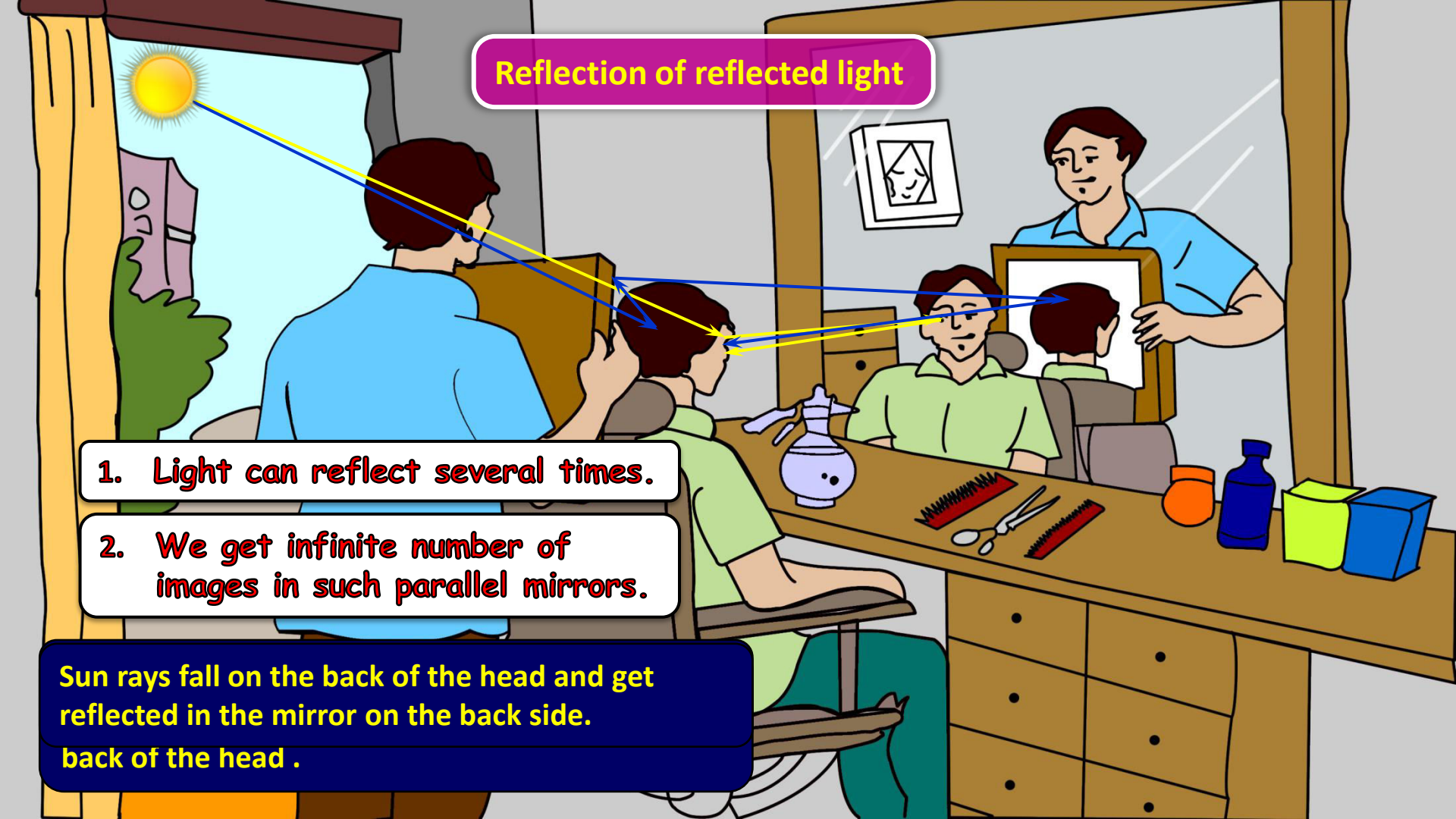


Irregular reflection

1. Irregular reflection occurs when light is incident on a rough surface.

2. In this case, even if the incident rays are parallel to each other, the reflected rays are not parallel to each other.




Reflection of reflected light
1. Light can reflect several times.
2. We get infinite number of images in such parallel mirrors.
Sun rays fall on the back of the head and get reflected in the mirror on the back side.
back of the head .

We get infinite number of images when mirrors are parallel.

We can see three images when two mirrors are perpendicular to each other

LIGHT

- **Periscope**
- **Kaleidoscope**

Periscope

A periscope is useful on a submarine for keeping a watch on things above even while the submarine is below the surface of the sea.

Periscope

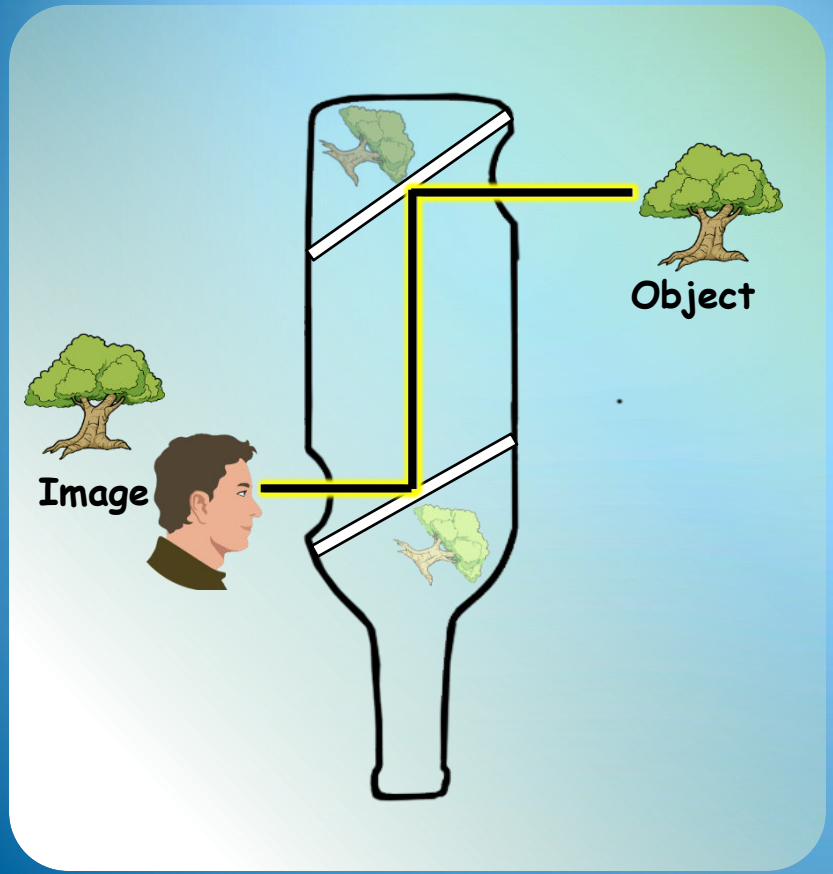
Ship above the sea

Let’s perform a small activity

Man watching from a submarine

A periscope is useful on a submarine for keeping a watch on things above even while the submarine is below the surface of the sea.

Activity to understand working of a periscope



When you look through the lower ject that mirror

How this happens ??

1. Image is found upper mirror.

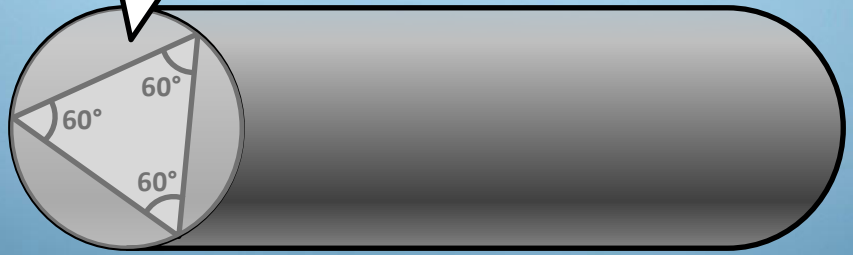
2. It gets reflected into the lower mirror and can be seen through the lower opening.

KALEIDOSCOPE

Take three r
plane mirrors

rrange them as
own in the picture

Join them with
the tape tightly



Cut of

Put 4 or 5 pieces of coloured glass into the case.

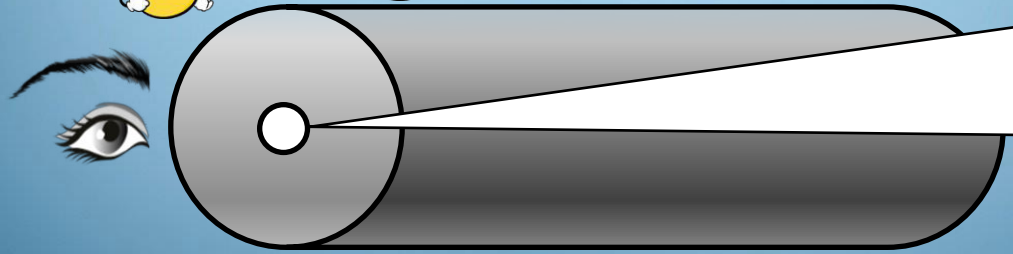
paper.

KALEIDOSCOPE

Three mirrors reflects the objects several time and we see several images. That is why we see these many patterns.

What do you see ?

What makes this happens



Boy seeing through KALEIDOSCOPE

LIGHT

- **Refraction of light**
- **Dispersion of Light**

Lets us understand refraction phenomenon

Refraction

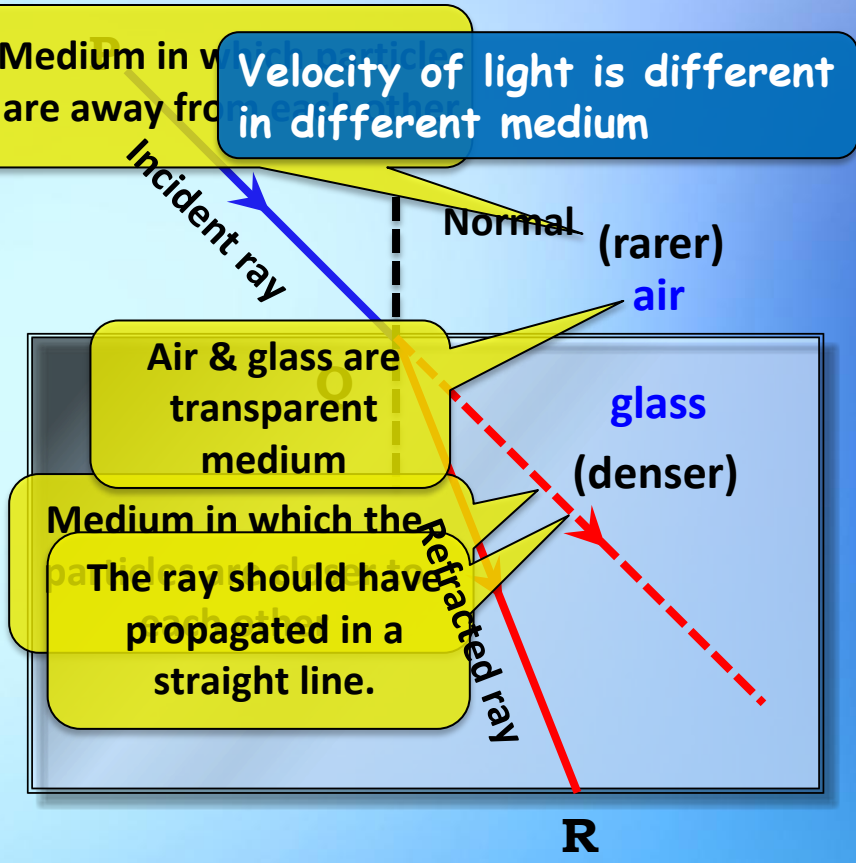
Refraction is the phenomenon in which a ray of light, travelling in one medium, changes its direction of propagation when it goes into another transparent medium.

travelling

Surface through which light can pass

Medium in which particles are away from each other

Velocity of light is different in different medium



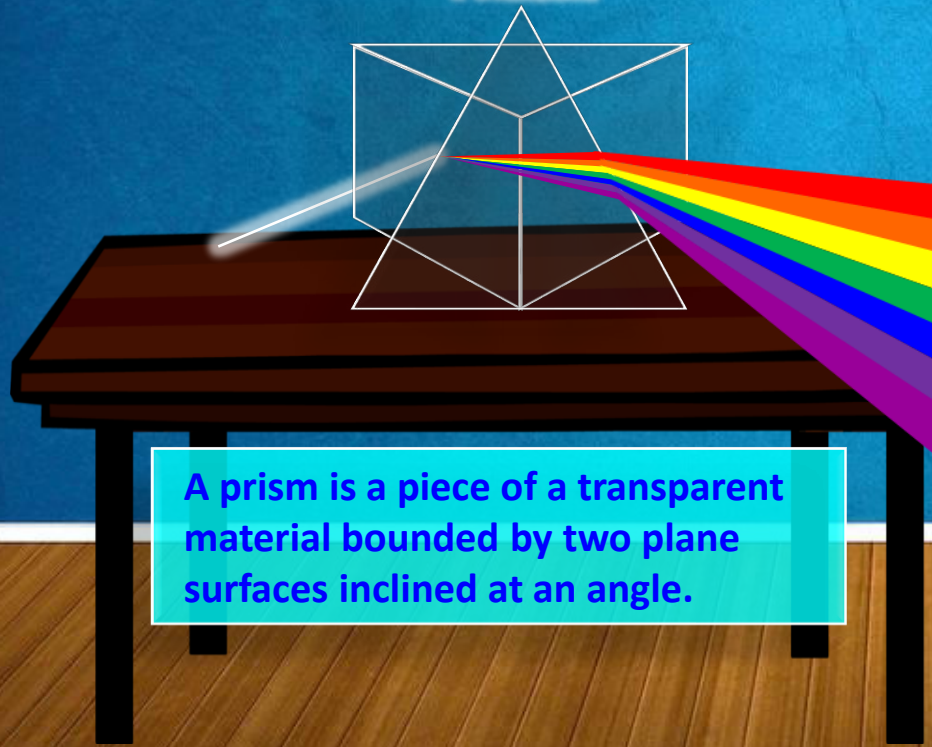
DISPERSION OF WHITE LIGHT (SIR ISAAC NEWTON)

Splitting light is a combination of seven different colours

Discovered by

into seven colours on p... glass prism is called dispersion of light.

PRISM



A prism is a piece of a transparent material bounded by two plane surfaces inclined at an angle.

White light is a combination of many colours

Every colour has a different refractive

Red

Orange

Yellow

Green

Blue

Indigo

Violet

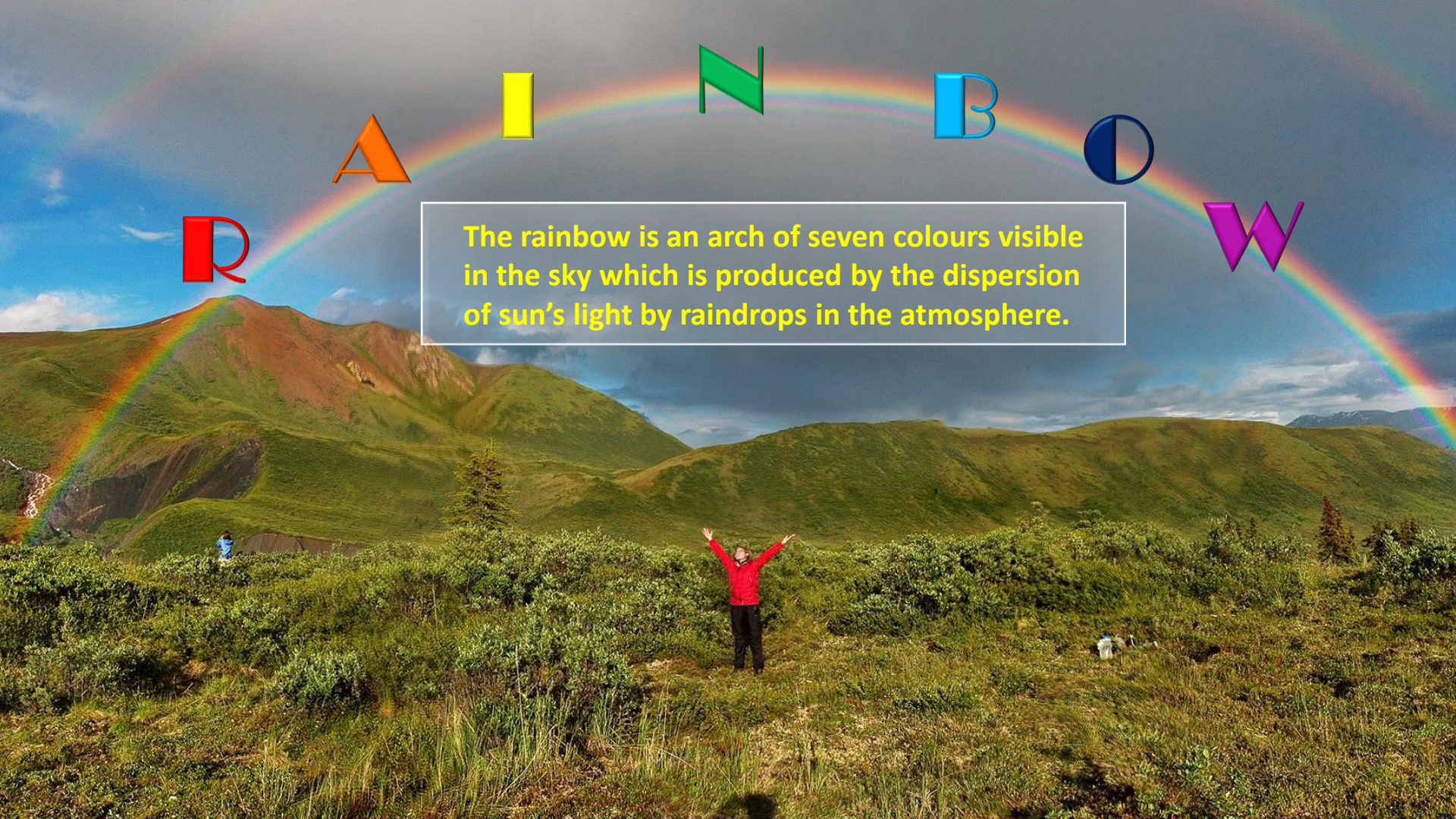
Red colours deviates the least

Bending capacity of light

It turns white.

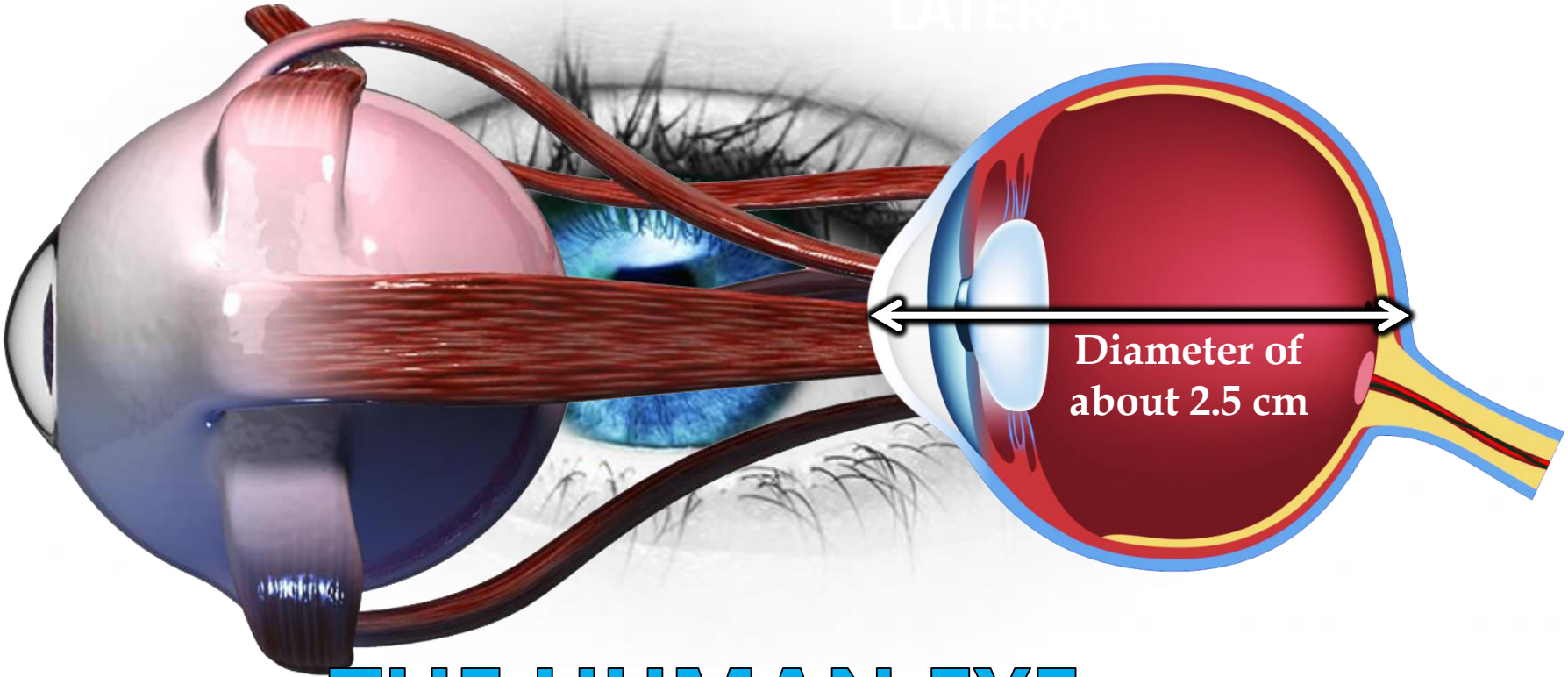
...olours ...otate the disc as fast as you can

Voilet colour deviates the most


RAINBOW
The rainbow is an arch of seven colours visible in the sky which is produced by the dispersion of sun's light by raindrops in the atmosphere.

LIGHT

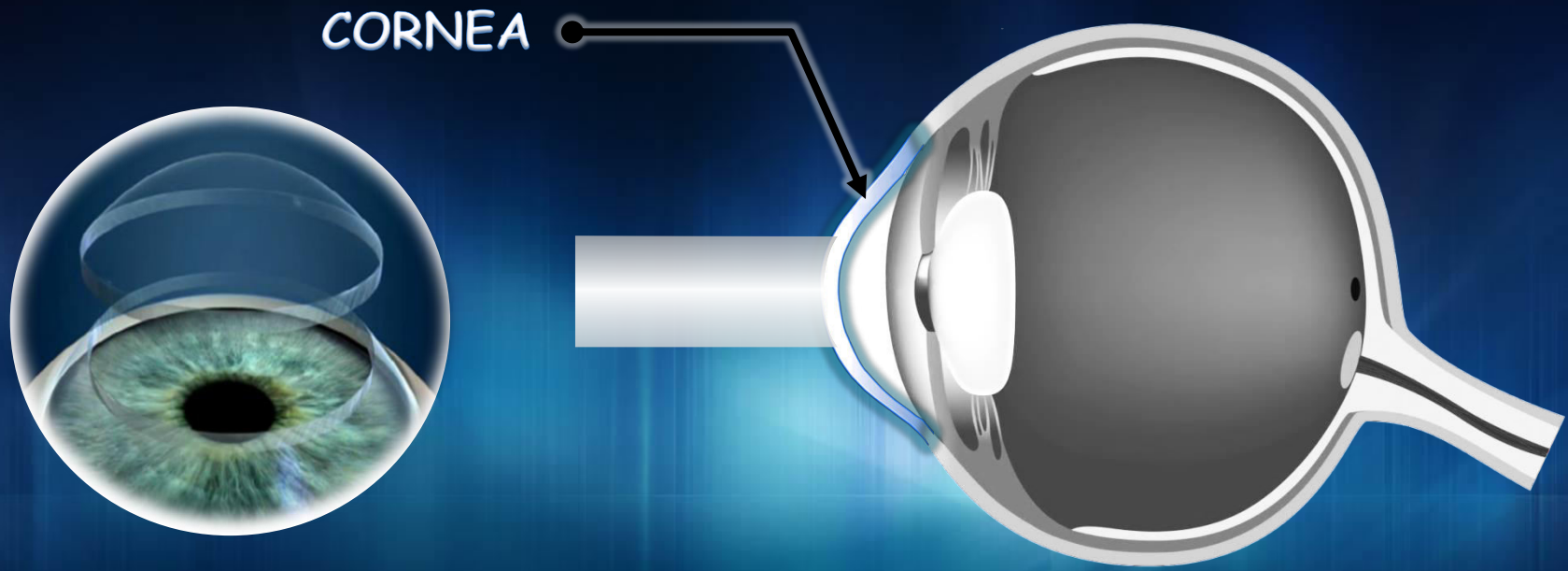
- **Human Eye Structure And Function - I**



THE HUMAN EYE

Human Eye

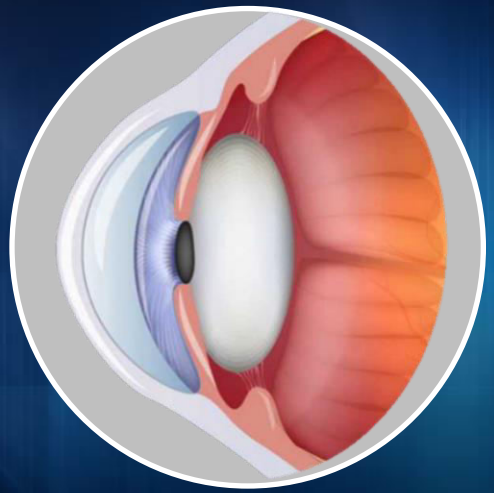
Cornea is curved front surface through which light enters the eye.



It is whitish in colour. (The 'white' of the eye)

Its main function is to act as a protective layer for the eye.

Human Eye



The space behind cornea is filled with a liquid called aqueous humor.

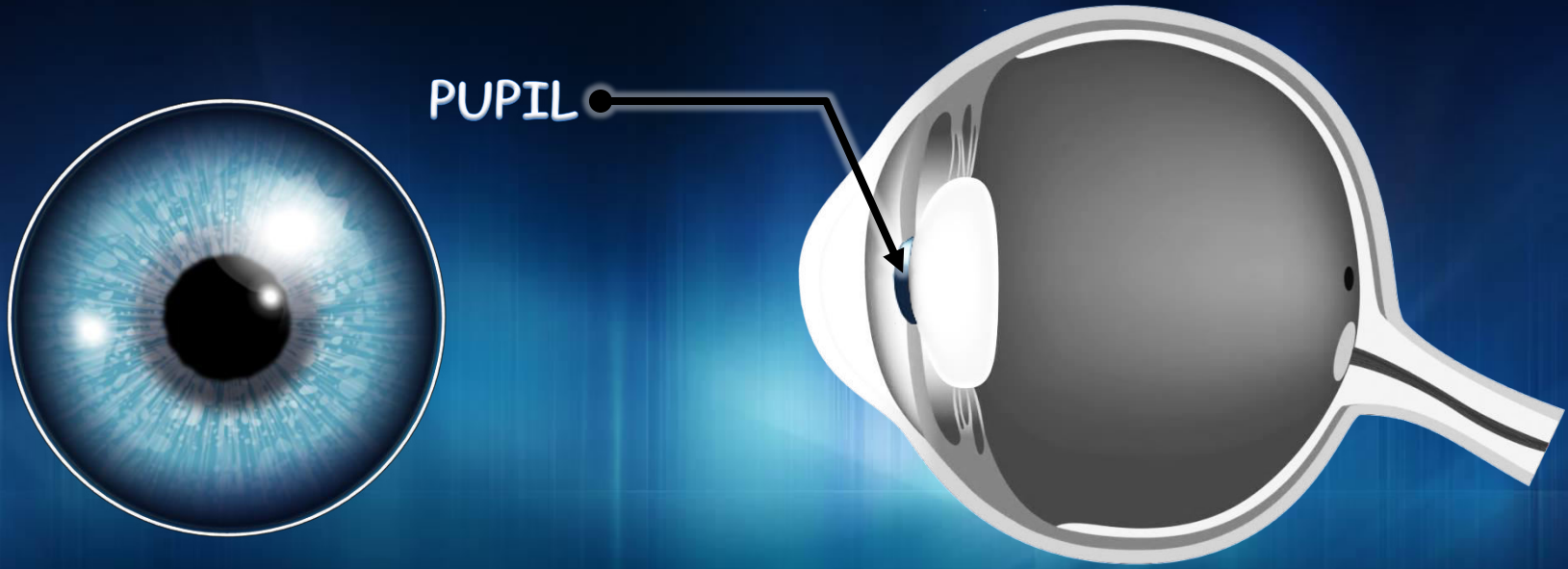
Human Eye

Behind the cornea is a dark coloured muscular diaphragm called the **iris**.

The iris may be pigmented and is responsible for the characteristic colour of the eye of a person.

Human Eye

A small circular aperture (opening) is present in the centre of iris called **pupil**.



The size of pupil is variable and self-adjustable.

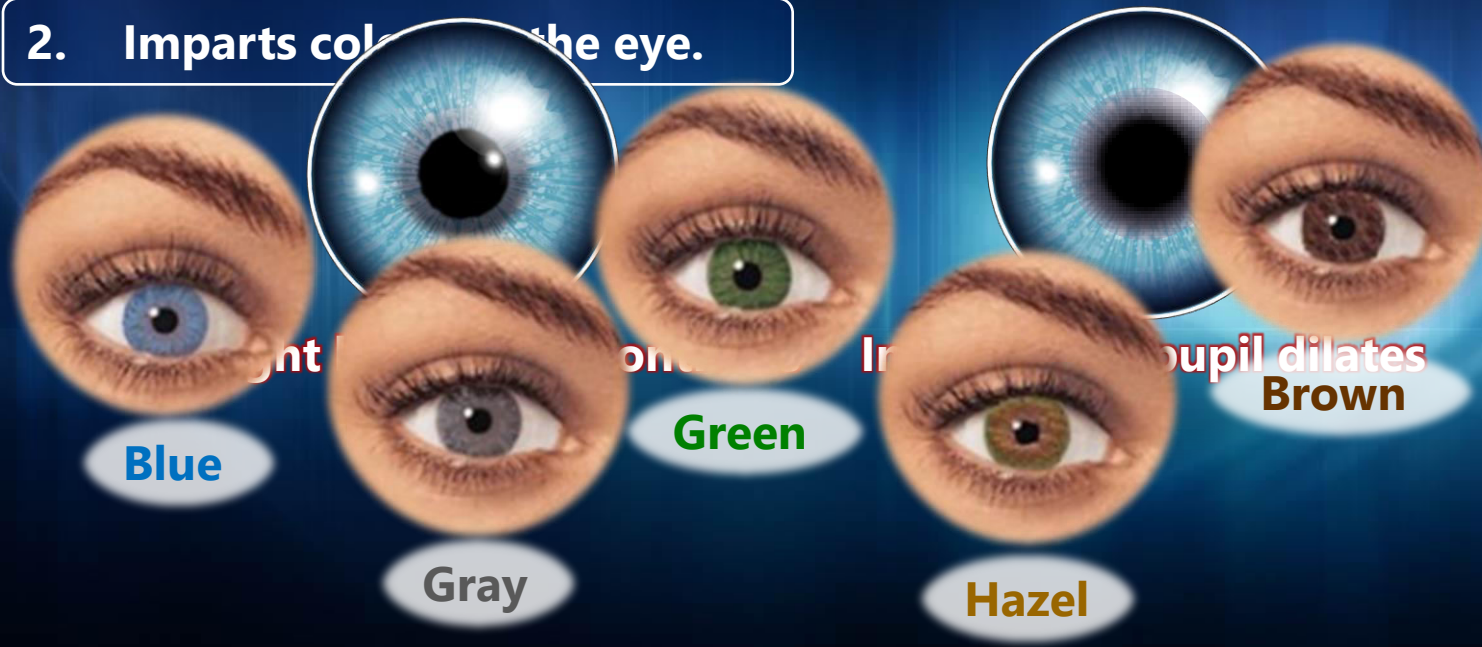
The pupil appears black as no light is reflected from it.

Human Eye

FUNCTION OF IRIS

1. The iris regulates the amount of light entering the eye by adjusting the size of pupil.

2. Imparts col… …he eye.

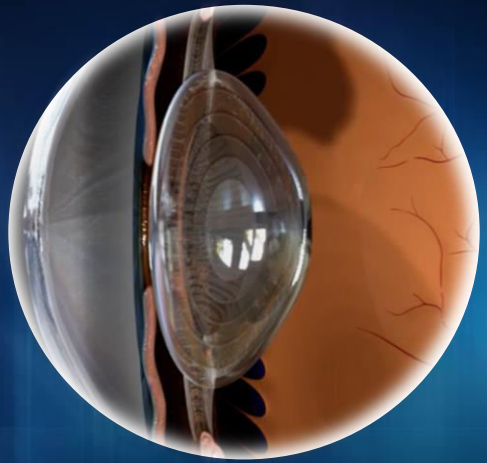


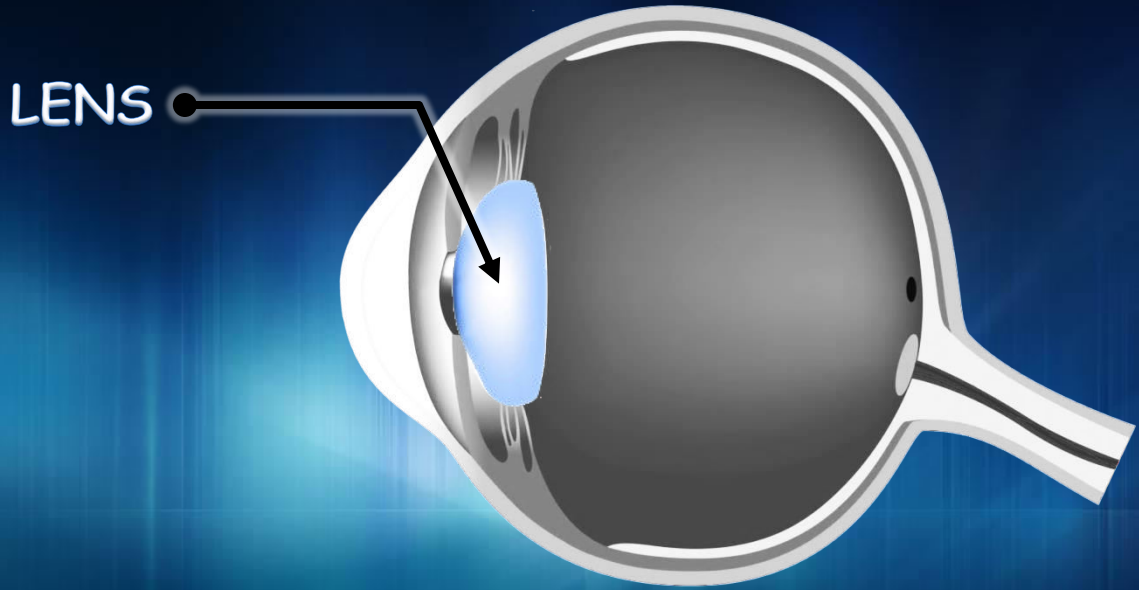
LIGHT

- **Human Eye Structure And Function II**

Human Eye

The light entering the eye is focused by the eye lens.





The eye lens is convex lens made up of transparent crystalline layers.
It is harder at its middle and gradually becomes softer towards its edges.

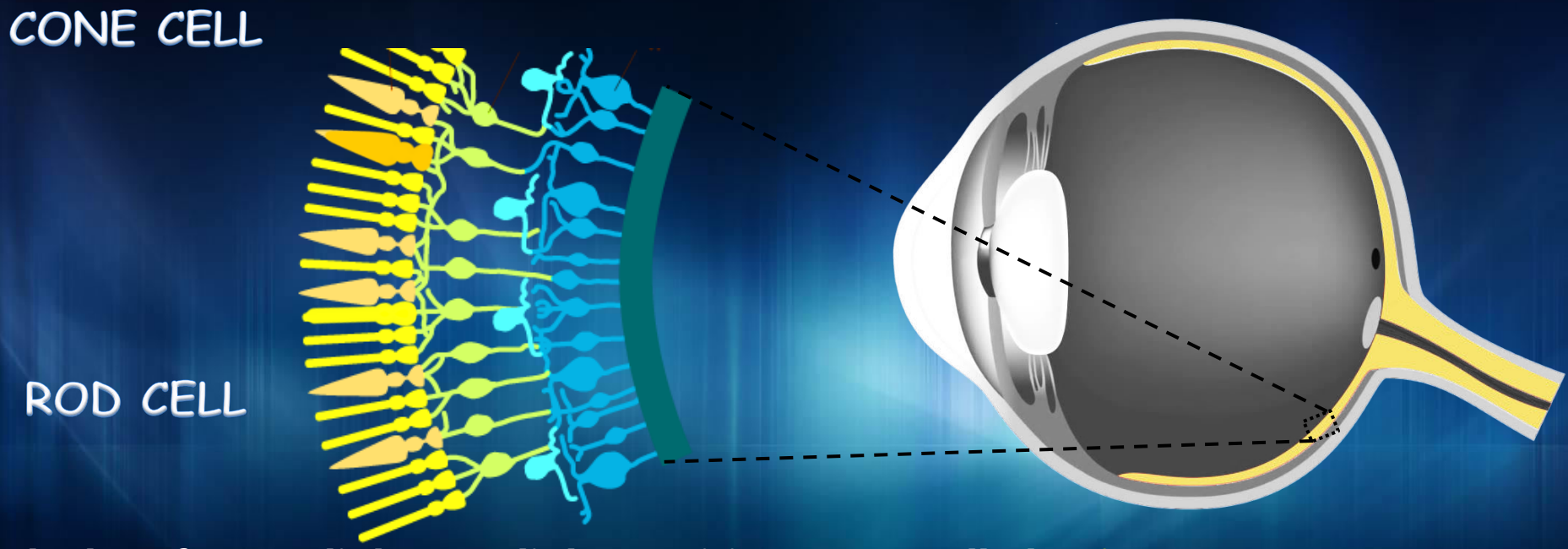
Human Eye

The eye lens is held in its position by **ciliary muscles.**

These muscles help in changing the curvature and hence, the focal length, of the eye lens.

Human Eye

It is a delicate membrane having enormous number of light sensitive cells or photoreceptors.



The lens focuses light on a light sensitive screen called retina.

A real, inverted image of the object is formed on the retina.

Human Eye

CONE CELL

The cones help us in colour vision and gets activated only in bright light conditions.

The rods are responsible for the vision in dim conditions.

ROD CELL

The rods and cones respond, respectively, to the amount of light energy and to the colours present in it.

Human Eye

CONE CELL

Cone cells defective

⬇

Cannot distinguish between colours

⬇

COLOUR BLIND

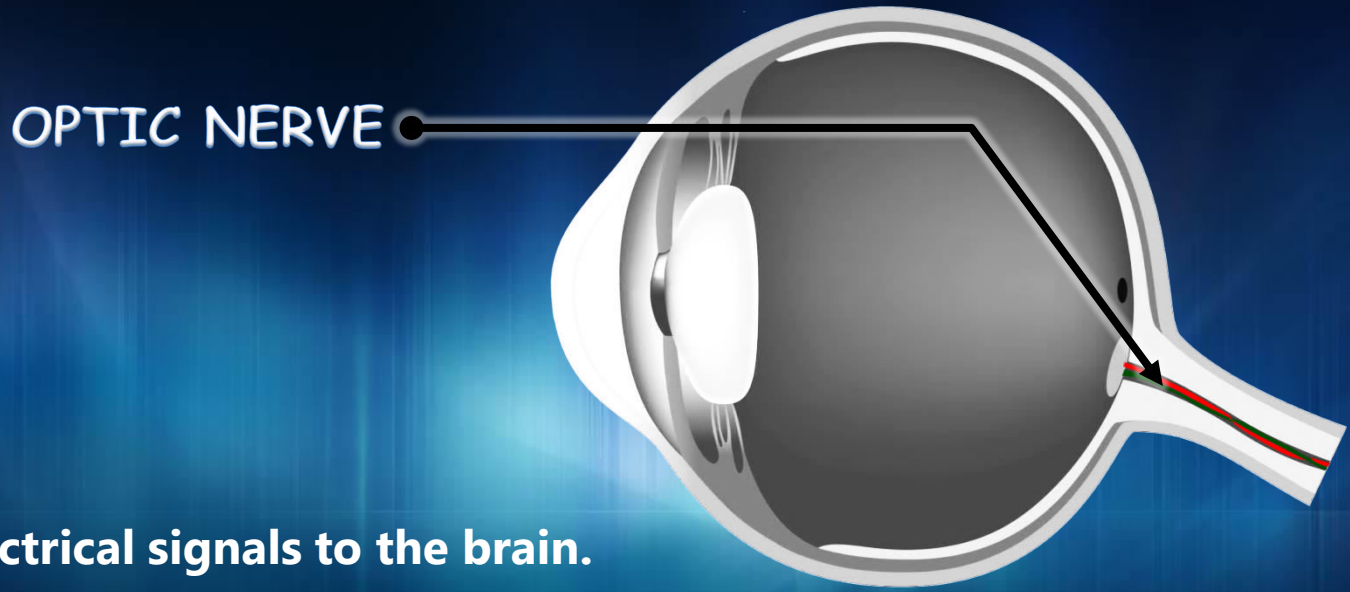
NIGHT BLINDNESS


Eagle
More cone cells compared to rods.
They can see very well during the day.

LIGHT

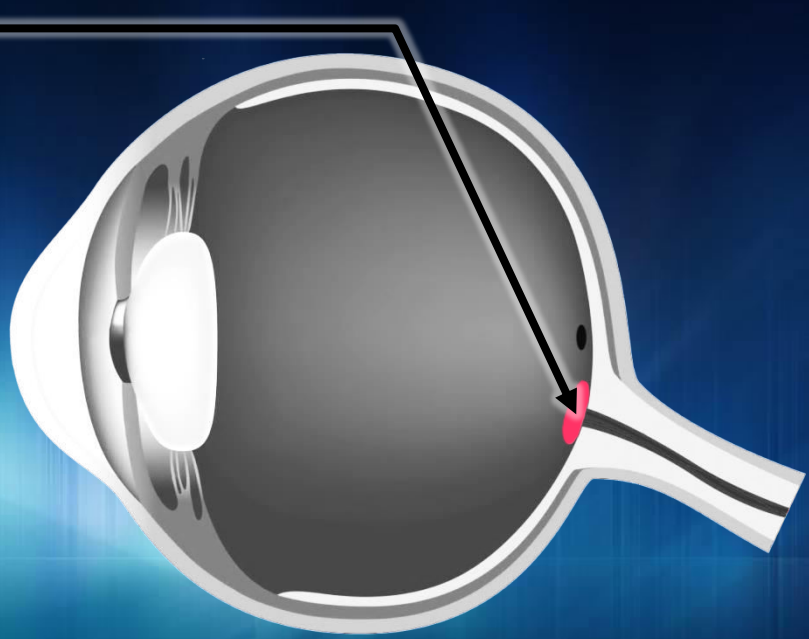
- **Human Eye Structure And Function III**

Human Eye



Optic nerve carries electrical signals to the brain.

Human Eye



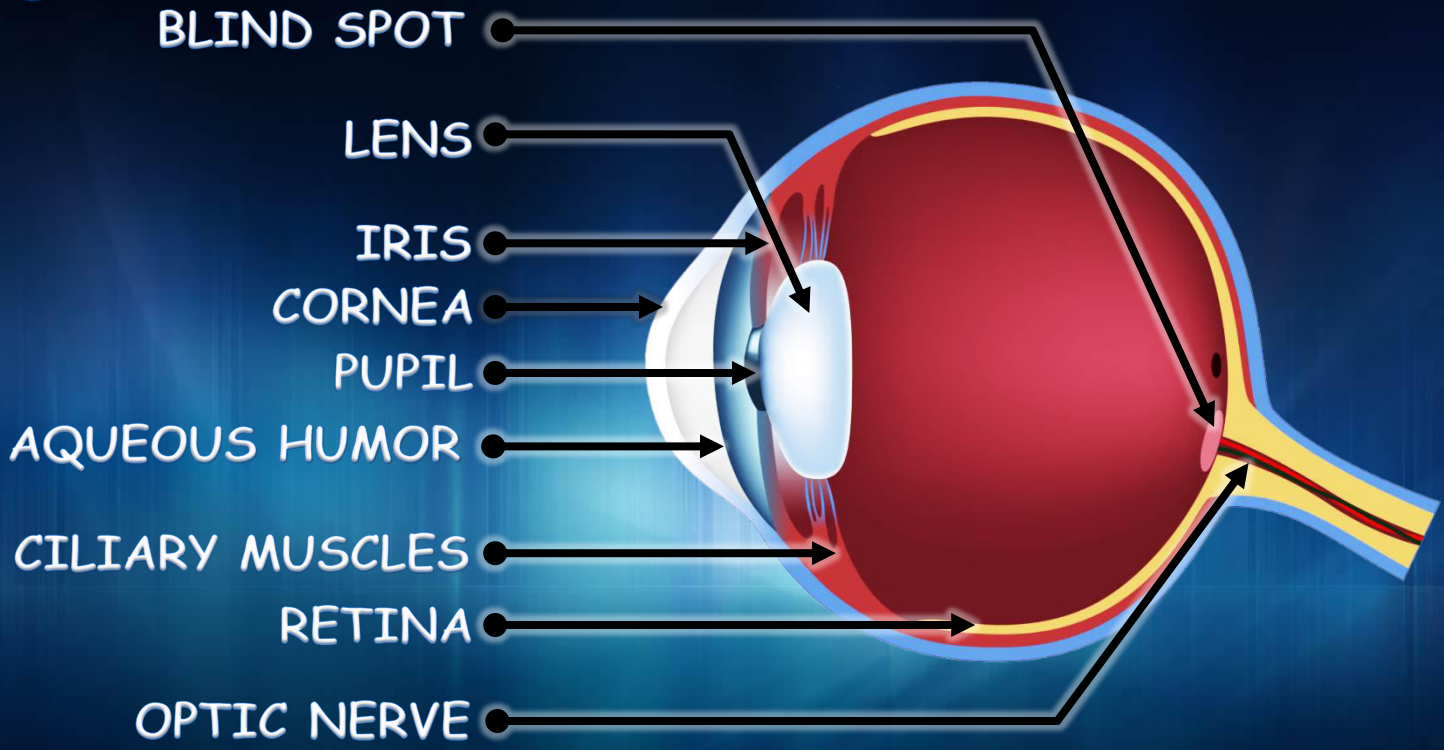
At the junction of the optic nerve and the retina, there are no rods and cones (sensory cells).

No image gets formed at this point as it is insensitive to light. This point is called **blind spot** of the eye.

Human Eye

The octopus does not have a blind spot. The photoreceptors in the octopus retina are located in the inner part of the eye while the cells, that carry information to its brain, are in the outer portion of its eye, Its optic nerve, therefore, does not cross any point of its retina.

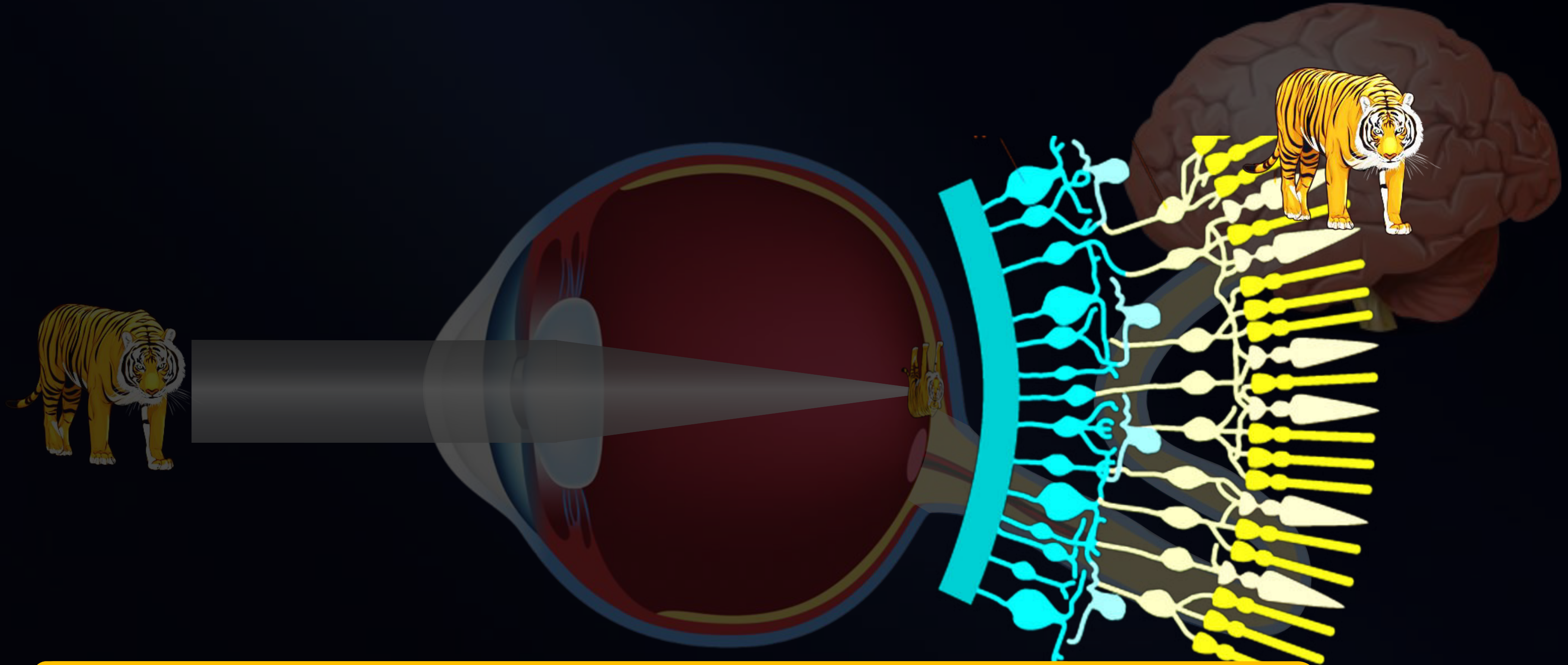
Human Eye


BLIND SPOT
LENS
IRIS
CORNEA
PUPIL
AQUEOUS HUMOR
CILIARY MUSCLES
RETINA
OPTIC NERVE

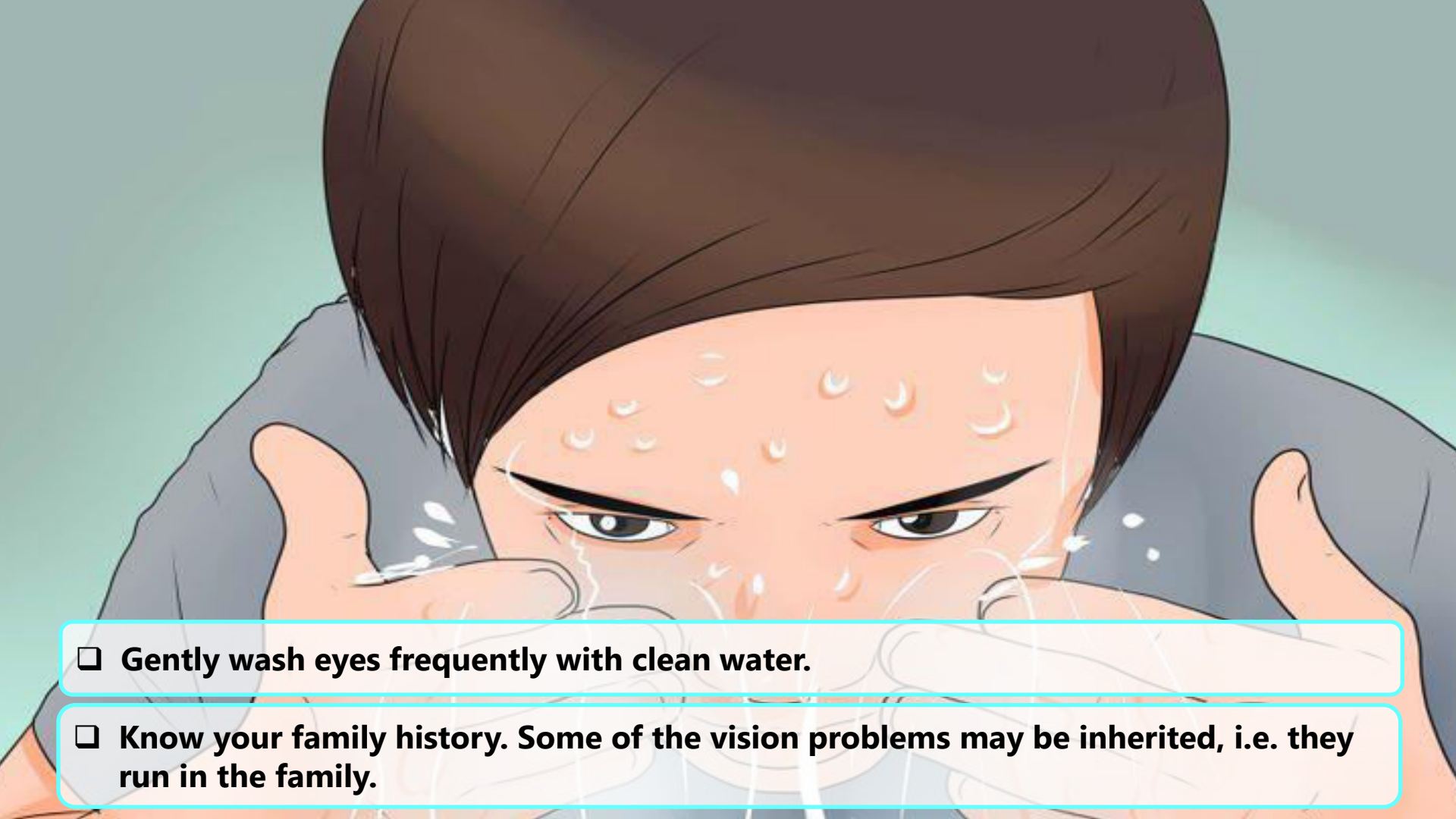
LIGHT

- **Working Of Human Eye**
- **Care Of the Eye**

WORKING OF HUMAN EYE



… a way that
… as the object.



- Gently wash eyes frequently with clean water.
- Know your family history. Some of the vision problems may be inherited, i.e. they run in the family.

LIGHT

- **Persistence Of Vision**
- **Range Of Vision**

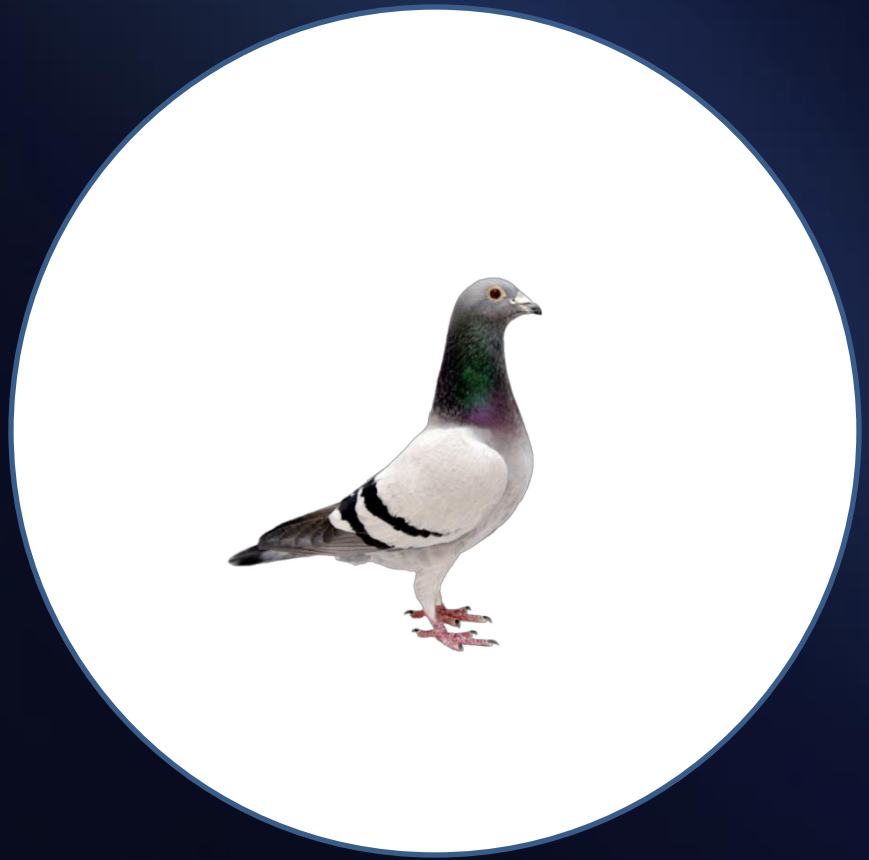
Persistence Of Vision

The image formed on the retina of the eye does not fade away instantaneously but its impression remains on the retina for about 1/16 th of a second, even after the removal of the object.

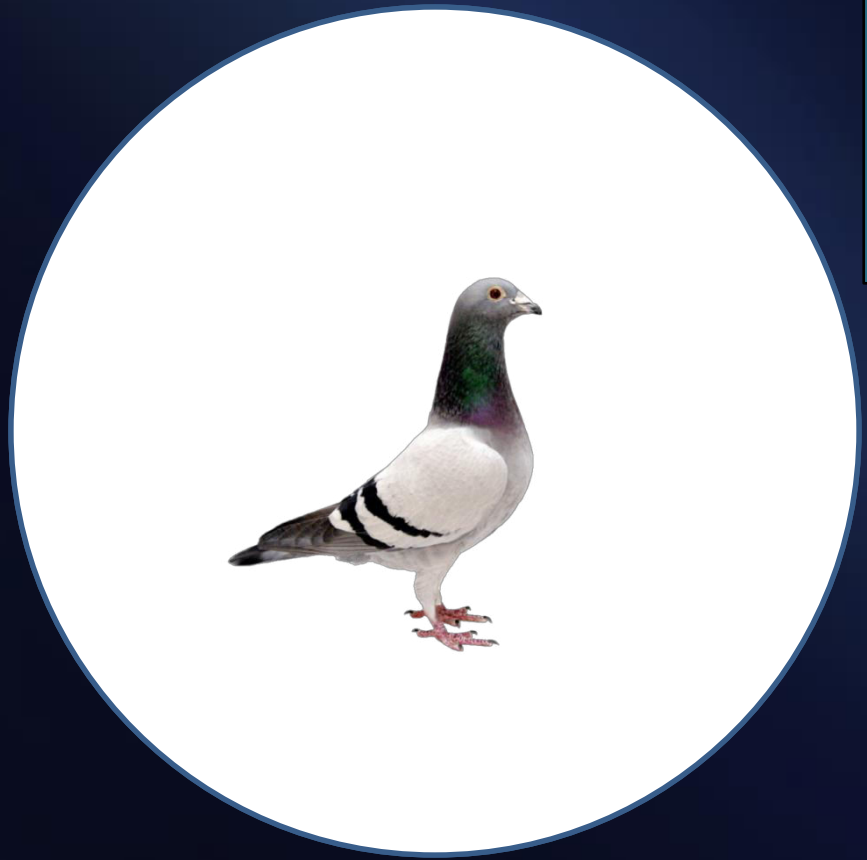
This Continuence of sensation of vision is called as PERSISTANCE OF VISION

Persistence Of Vision

Persistence Of Vision

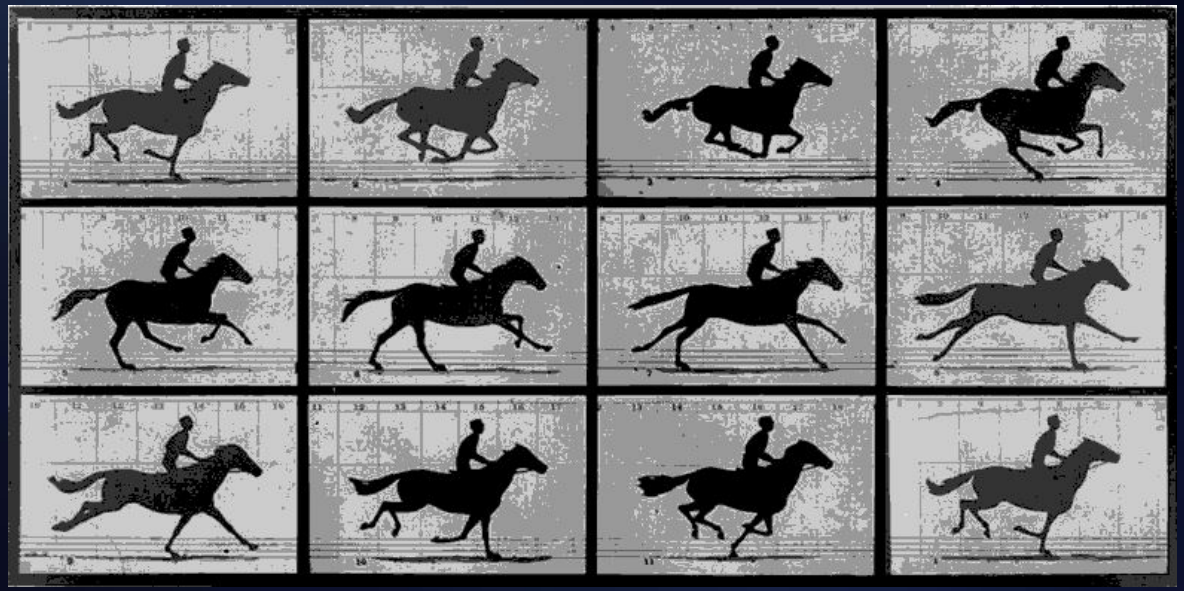


Persistence Of Vision



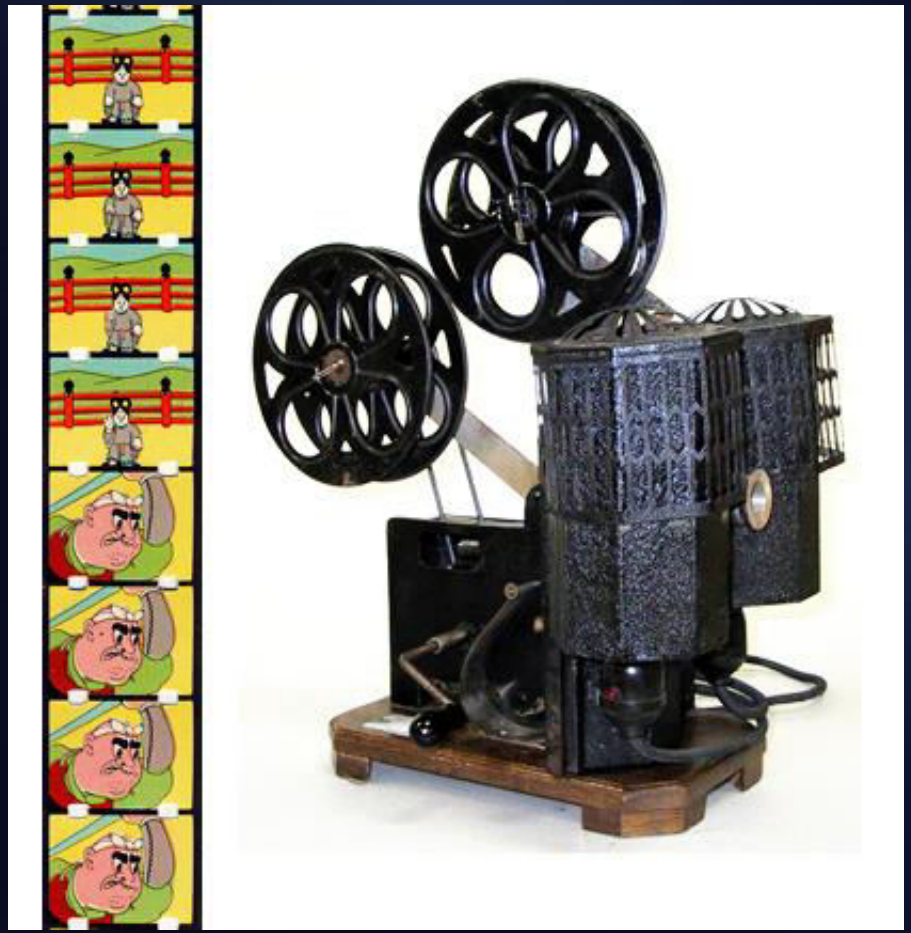
It is because of the persistence of vision that when still images of a moving object are flashed on the eye, at a rate faster than 16 per second , the eye perceives this object as moving.

Persistence Of Vision



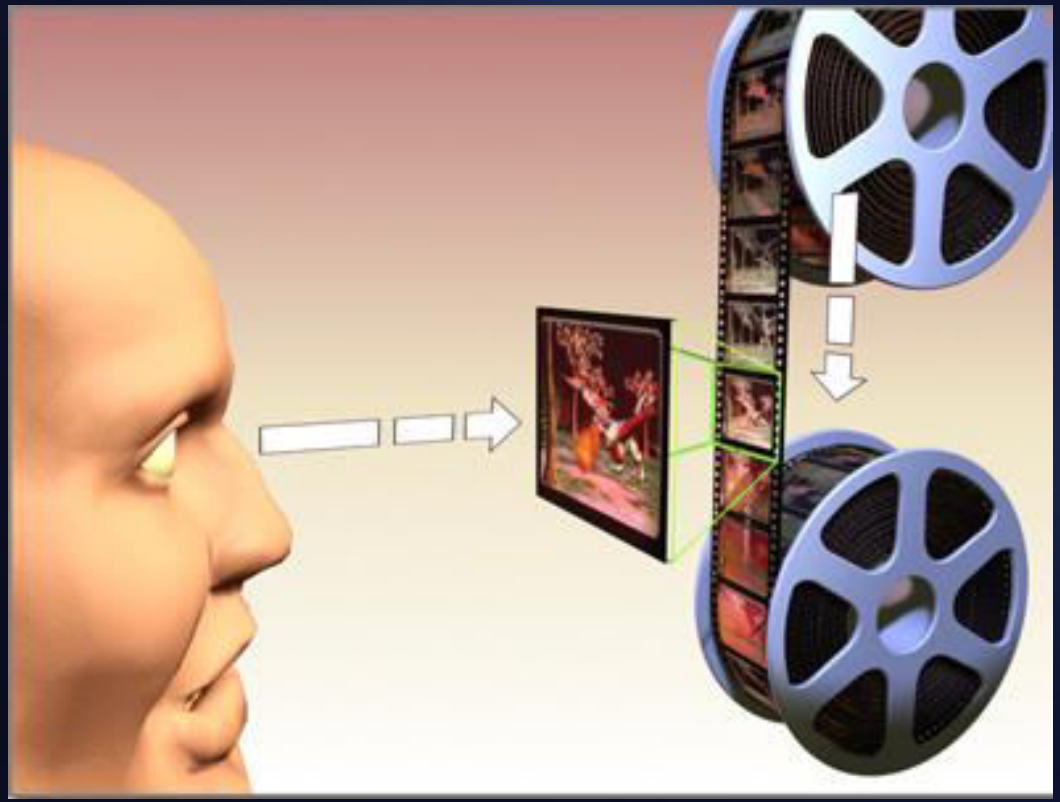
The movie or programme that we see are actually a number of separate still pictures in proper sequence

Persistence Of Vision



It is sequence of still pictures taken by a movie camera that is projected on the screen at the rate of 24 images or more per second.

Persistence Of Vision



The successive impression of the image on the retina appear to
We therefore see a moving picture.

This principle is used in cinematography or motion picture projection.

RANGE OF VISION

The distance between the nearest point and far point of a normal eye is called the **RANGE OF VISION**.

It, thus, varies from 25 cm to infinity for the normal eye.

The farthest point, upto which the eye can see objects clearly, is called the far point of the eye.

The nearest point upto which objects can be seen most distinctly is called the least distance of distinct vision or near point of the eye.

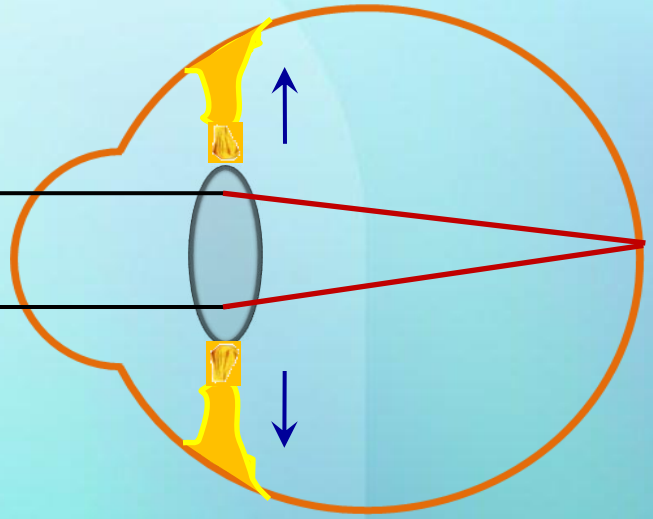
infinity

It is at infinity (very very far away) for a normal eye.

25 cm

For a young adult with normal eye, this normal near point distance equals (almost) 25 cm.

RANGE OF VISION

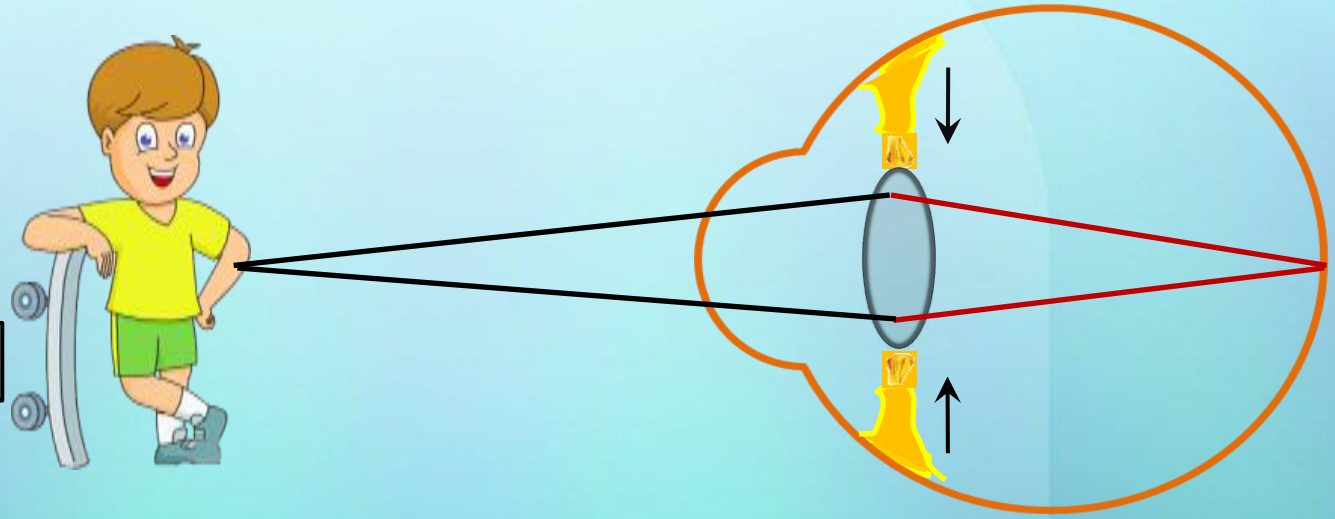


FAR AWAY OBJECTS

To focus on distant objects the ciliary muscles relax making the eye lens thin.

As a result the focal length of the eye lens increases and we see the distant objects.

RANGE OF VISION



NEARBY OBJECTS

To focus on nearby objects the ciliary muscles contracts making the eye lens thick.

As a result, the focal length of the eye lens decreases and we see the nearby objects.

The ability of the lens of adjusting focal length is known as power of accommodation.

LIGHT

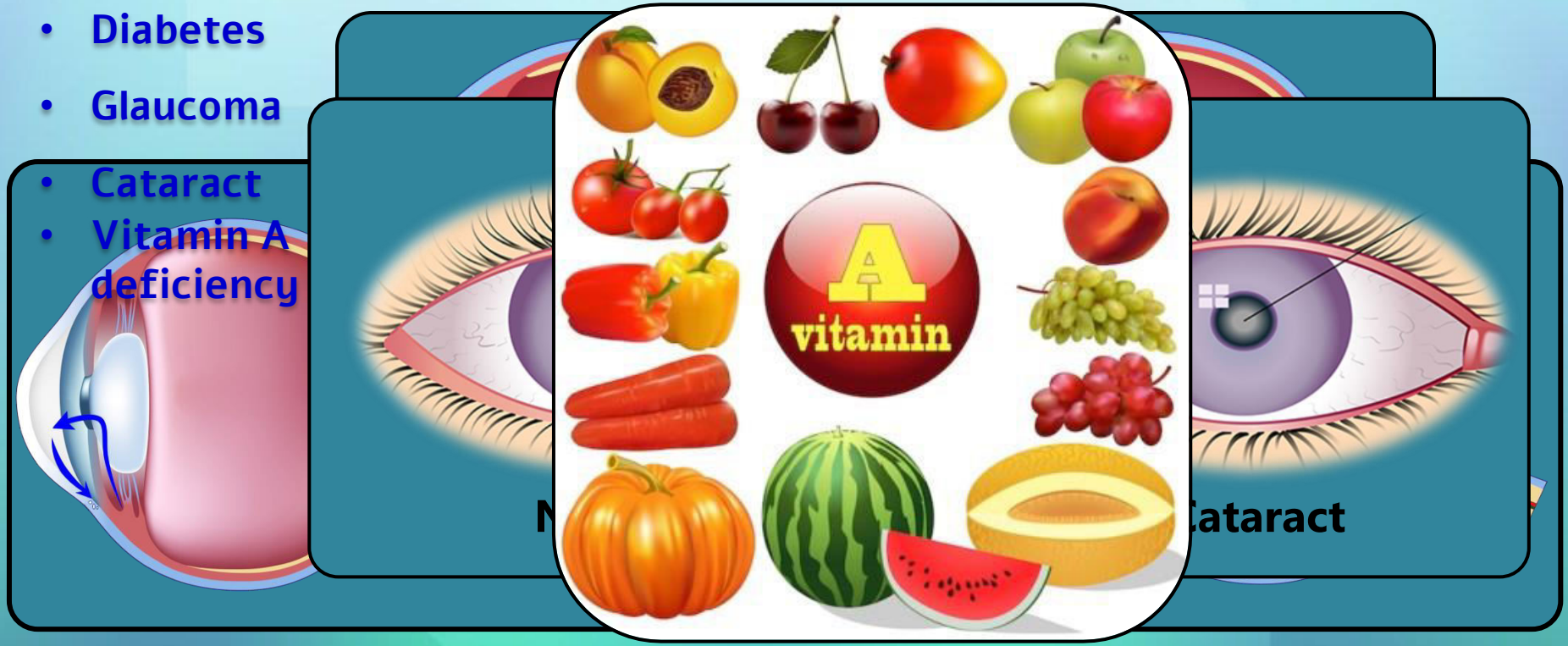
- Visually Challenged Persons
- Help For Visually Challenged Persons
- Braille


ISN’T THIS BEAUTIFUL!

VISUALLY CHALLENGED persons

Vision problem can be due to some illness, like:

- Diabetes
- Glaucoma
- Cataract
- Vitamin A deficiency




In some unfortunate cases, some persons lose their vision due to some accident

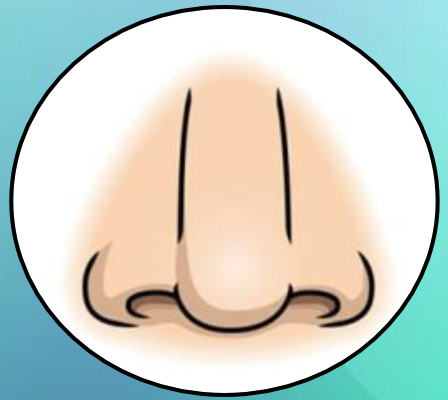
VISUALLY CHALLENGED persons

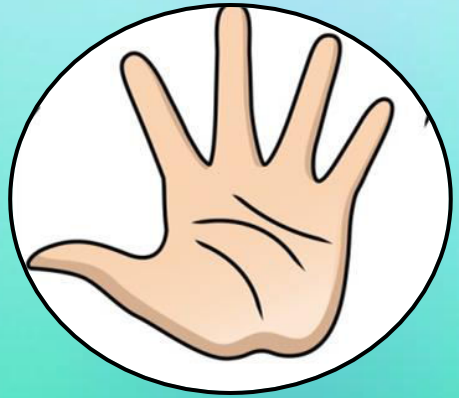
Partial Loss of Vision

Complete Loss of Vision

Most persons categorized as visually challenged have a better sense of touch, smell or hearing than normal people

sharply and putting them to effective use.

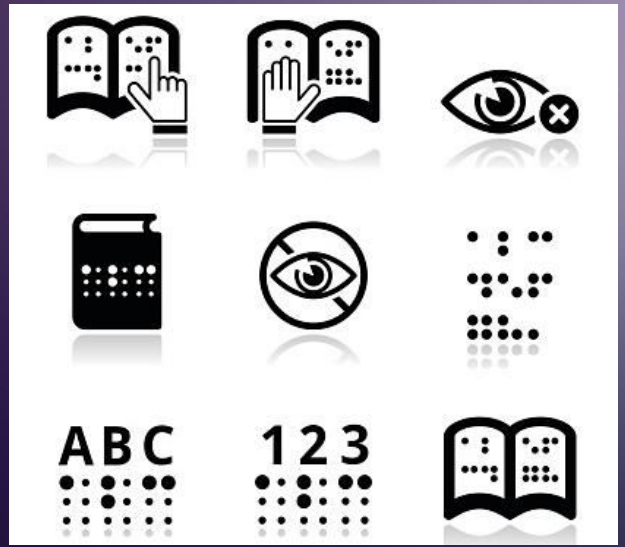




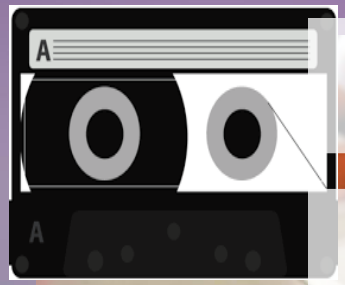
HELP FOR VISUALLY CHALLENGED PERSONS

Non-Optical Aids

Tactual Aids
(Using sense of touch)



Optical Aids



Audio casettes

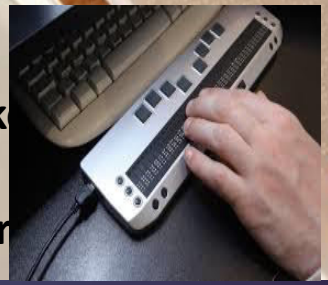
Lenses

Telescopic aids

Tape recorders

Audio CD's

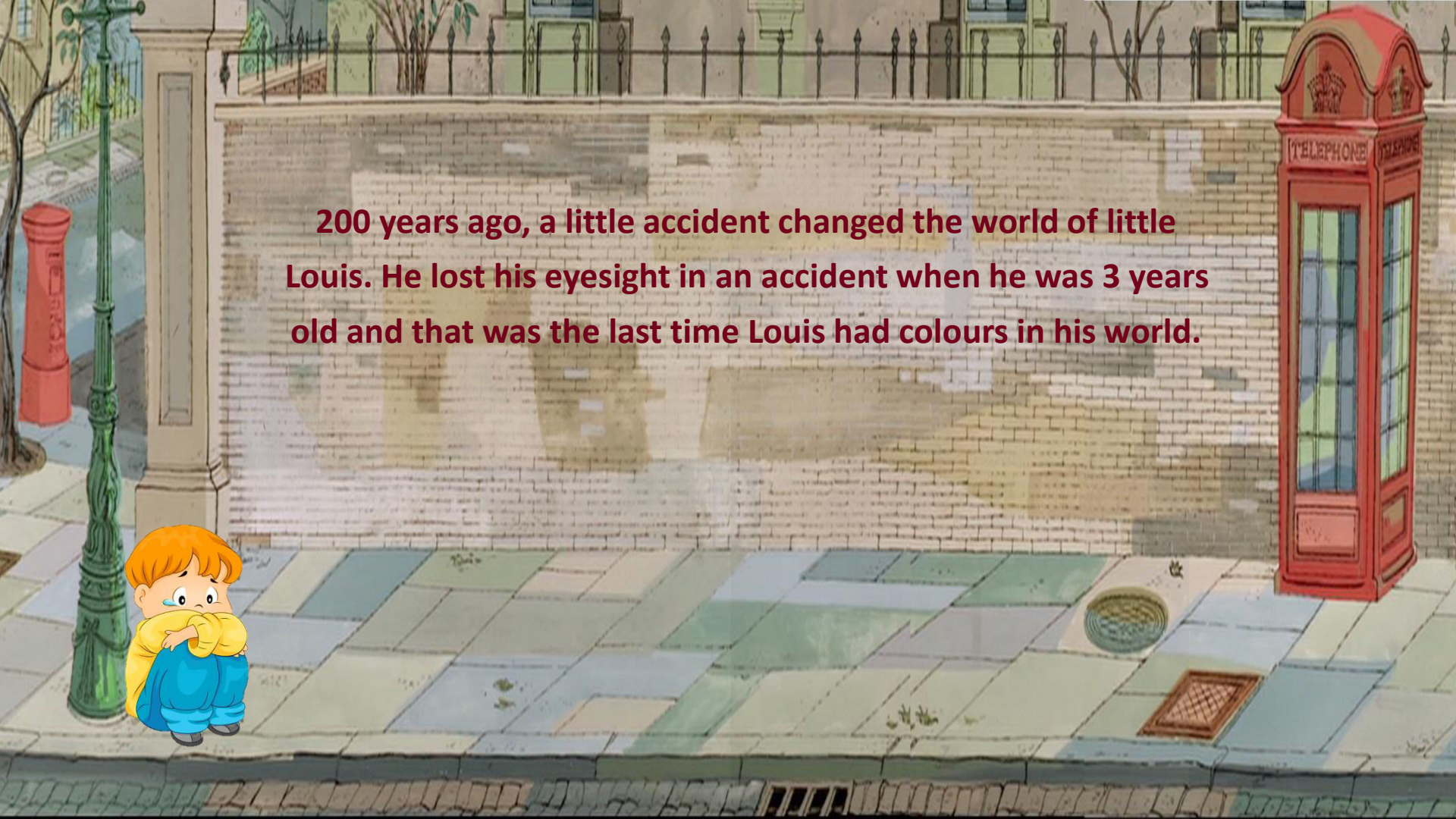
Audio casettes



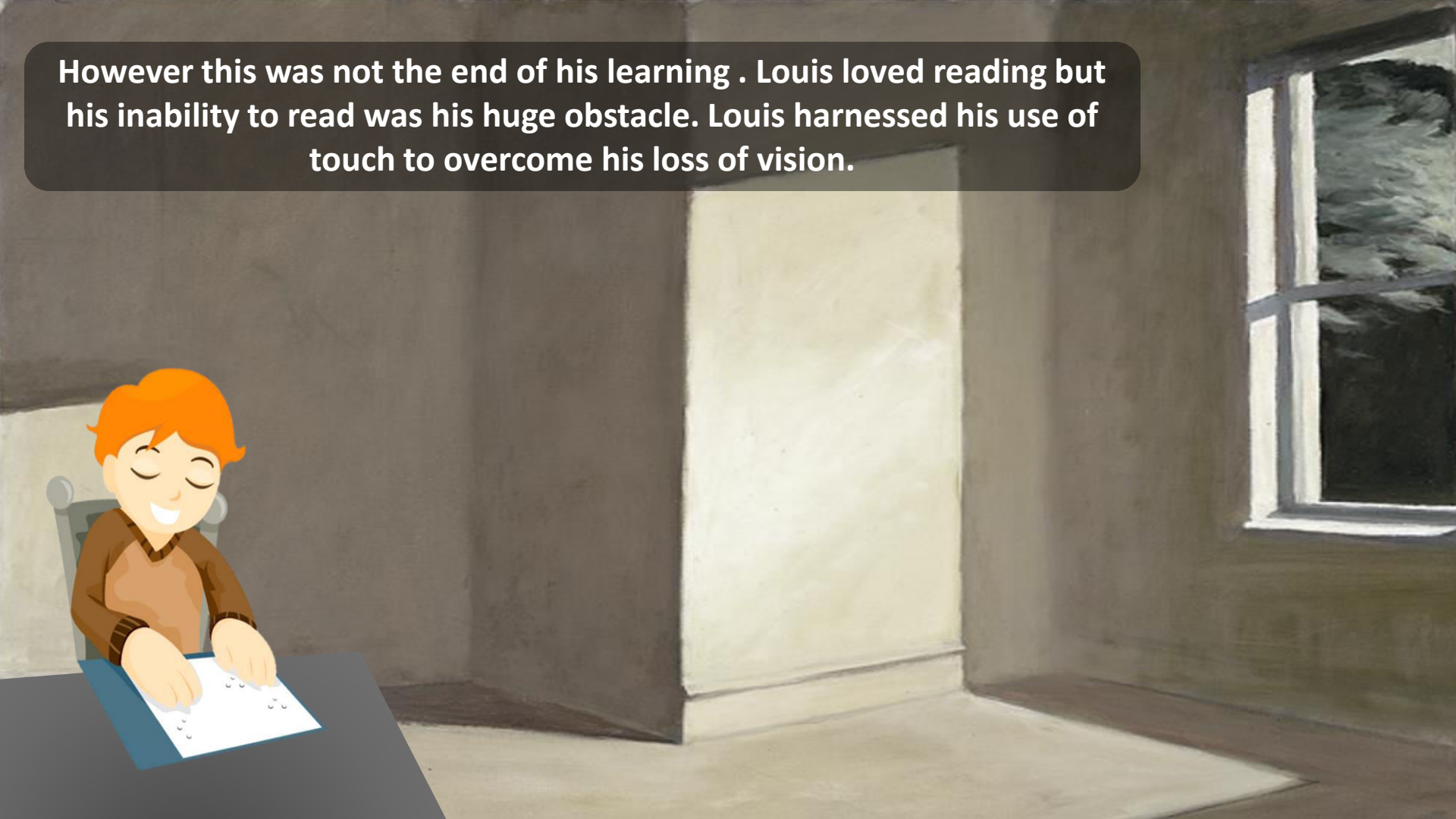
Tape recorders

Audio CD's


But
Around
Ten
Million
People
Across
The
Globe
Can
Read
These
Lines



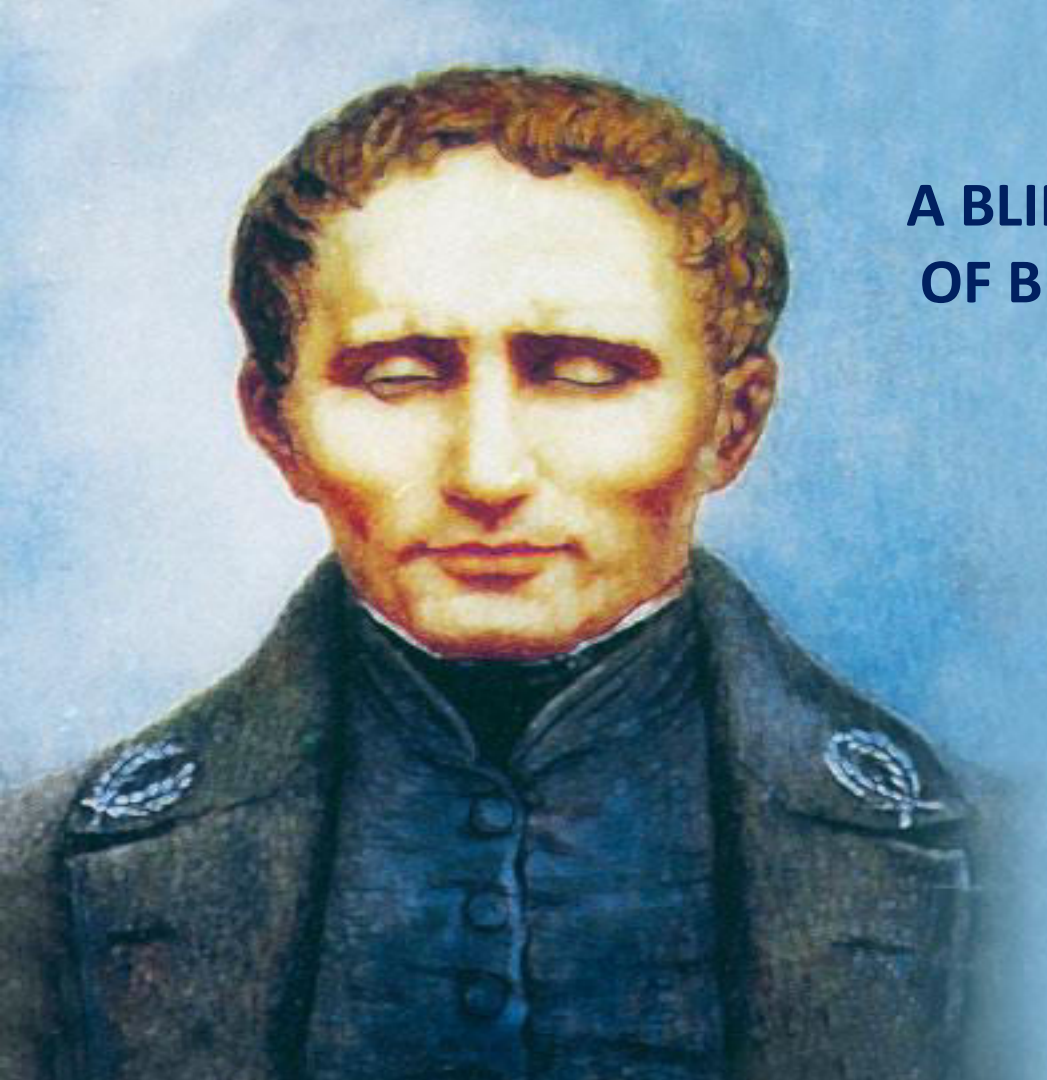
200 years ago, a little accident changed the world of little Louis. He lost his eyesight in an accident when he was 3 years old and that was the last time Louis had colours in his world.


However this was not the end of his learning . Louis loved reading but his inability to read was his huge obstacle. Louis harnessed his use of touch to overcome his loss of vision.


One day Louis touched a piece of paper which felt different from all the other paper he had felt. It had bumps.

This led to the invention of BRAILLE.

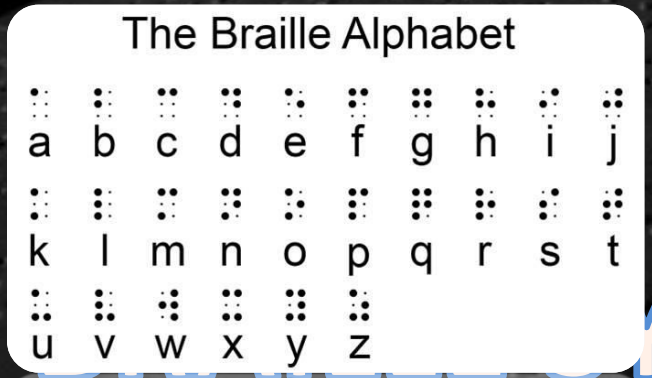
Braille is a system of raised dots that can be read with the fingers by people who are blind or who have low vision.

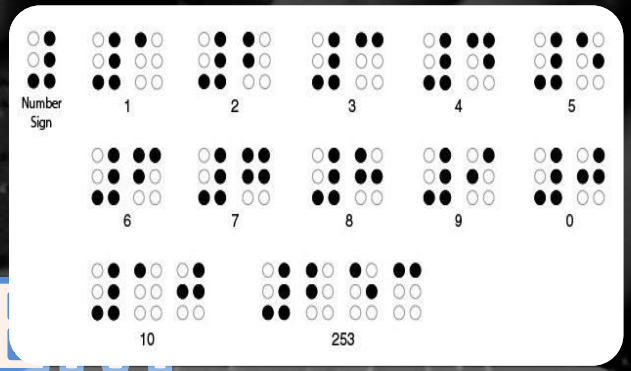


A BLIND PERSON WHO LET A LOT OF BLIND PEOPLE TO READ AND WRITE

It is a coded language, based on a logical system

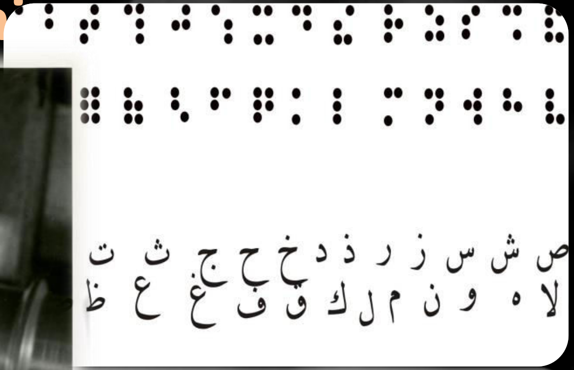
There is Braille code for common languages, mathematics and scientific notations.





type writer)

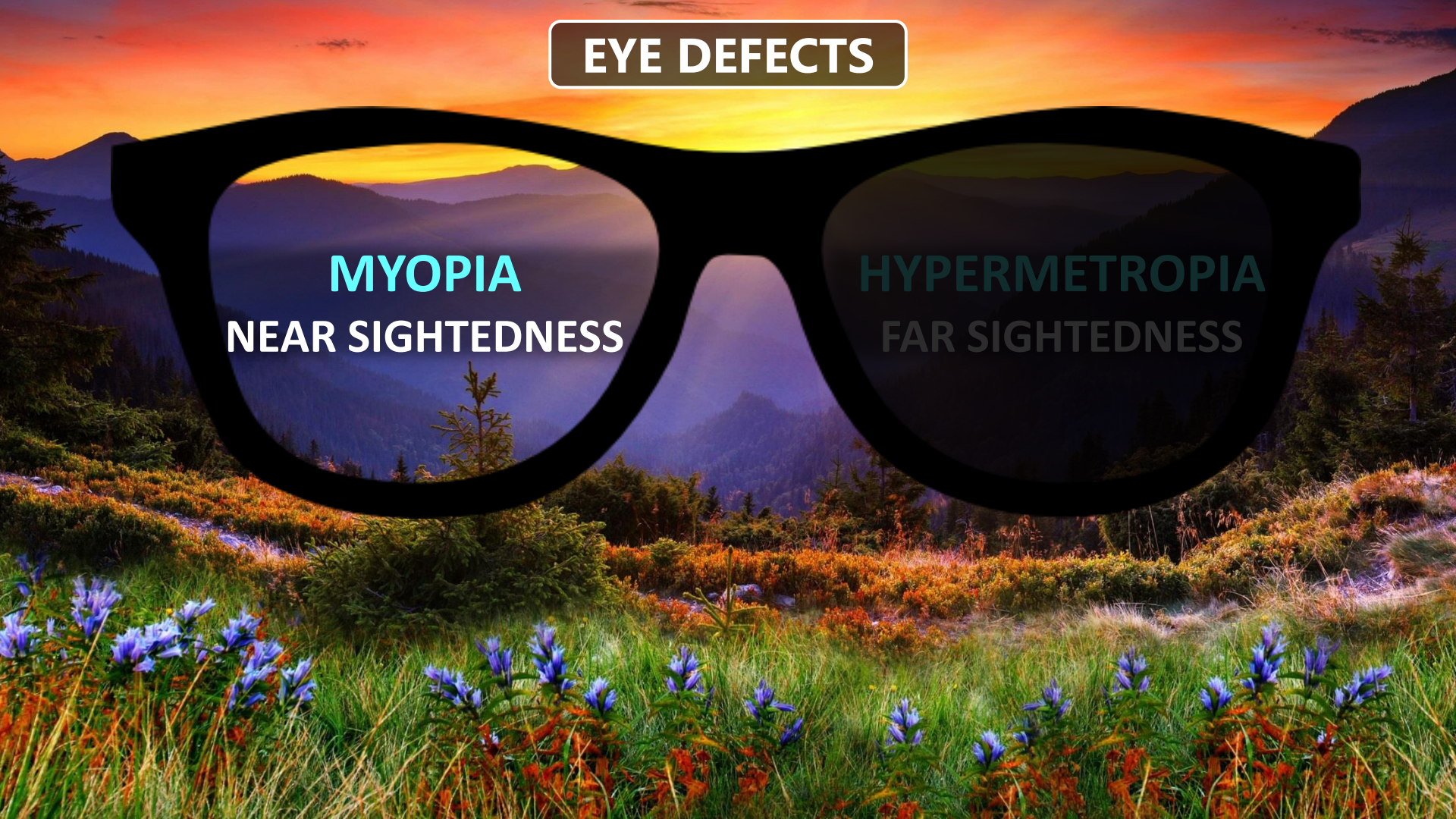
These patterns, when embossed on Braille sheets, help visually



LIGHT

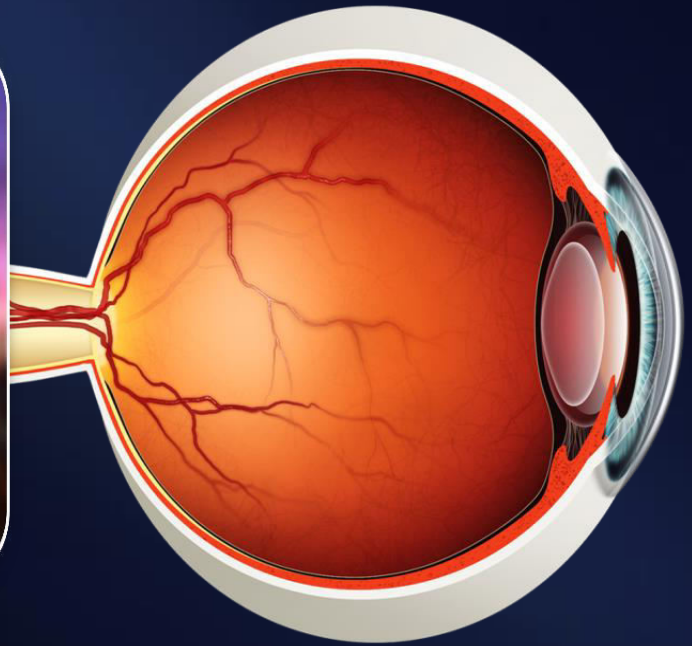
- **Eye Defect - Myopia**

EYE DEFECTS



Myopia (Near sightedness)

Patient view



Nearby object

Faraway object

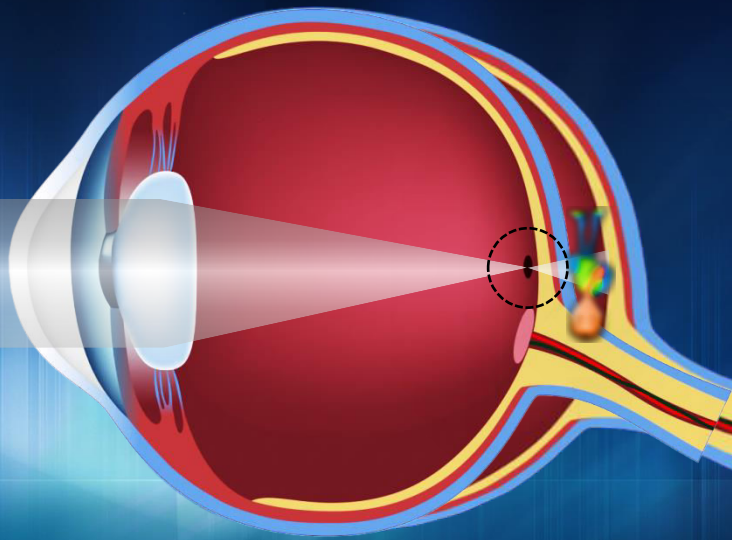
Myopia (Near sightedness)

Normal Eye

Myopia (Near sightedness)

Defected Eye

This defect may arise due to elongation of the eyeball.



The light rays from a distant object arriving at the eye lens, get converged at a point in front of the retina

Myopia (Near sightedness)

Correction

This defect can be corrected by using a concave (diverging) lens of appropriate focal length.

Myopia (Near sightedness)

Nearby objects ⟶ Clear

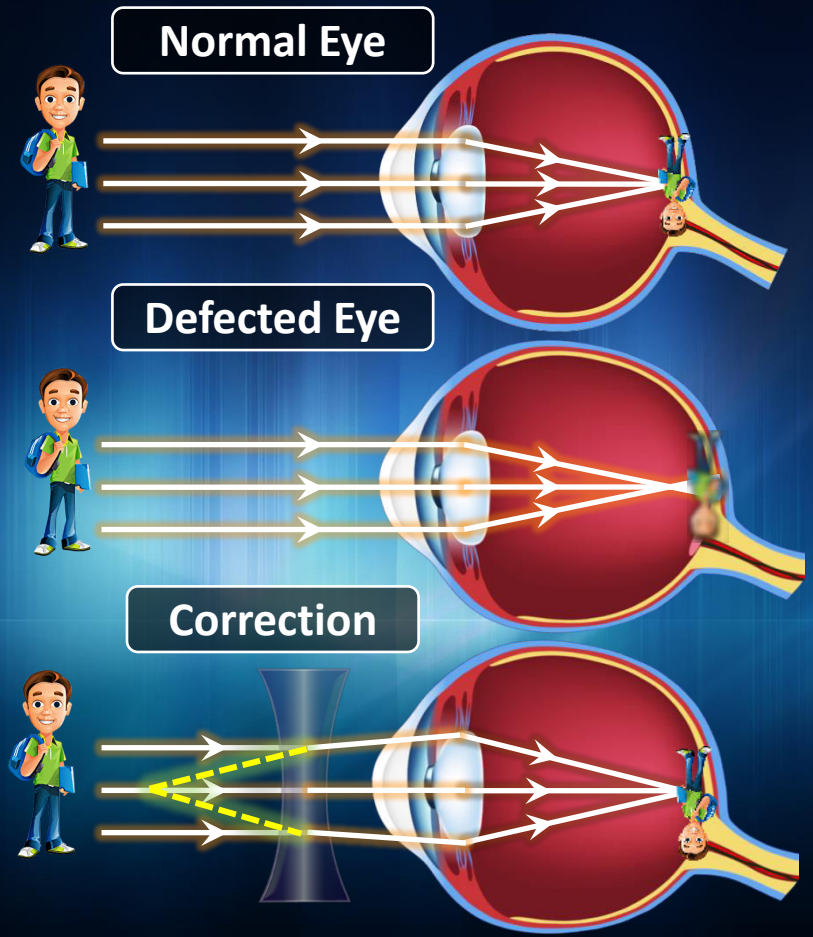
Faraway objects ⟶ Unclear

The light rays from a distant object, get converged at a point in front of the retina

This defect may arise due to

1. Elongation of the eyeball.
2. Excessive curvature of the cornea.

This defect can be corrected by using a concave (diverging) lens of appropriate focal length.

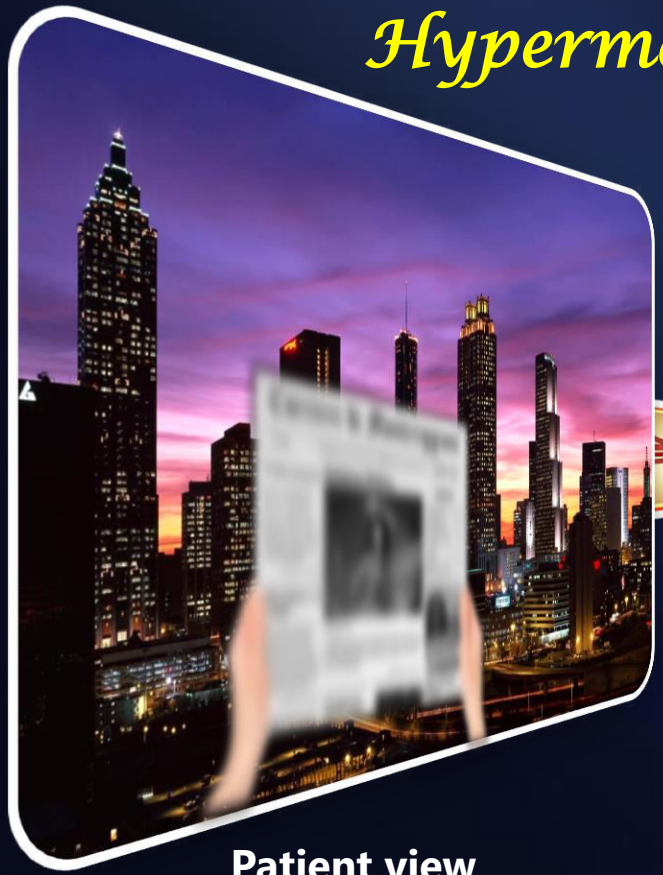


LIGHT

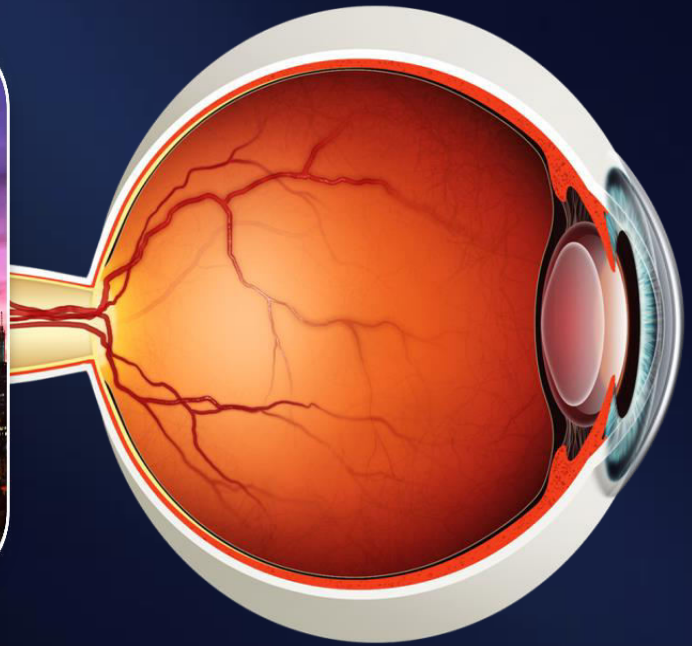
- **Eye Defect - Hypermetropia**


MYOPIA
NEAR SIGHTEDNESS
HYPERMETROPIA
FAR SIGHTEDNESS

Hypermetropia (Far sightedness)



Patient view



Nearby object

Faraway object

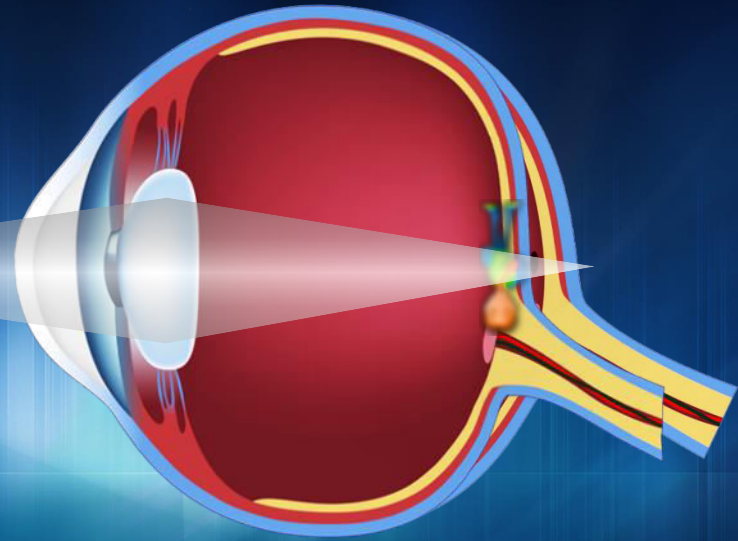
Hypermetropia (Far sightedness)

Normal Eye

Hypermetropia (Far sightedness)

Defected Eye

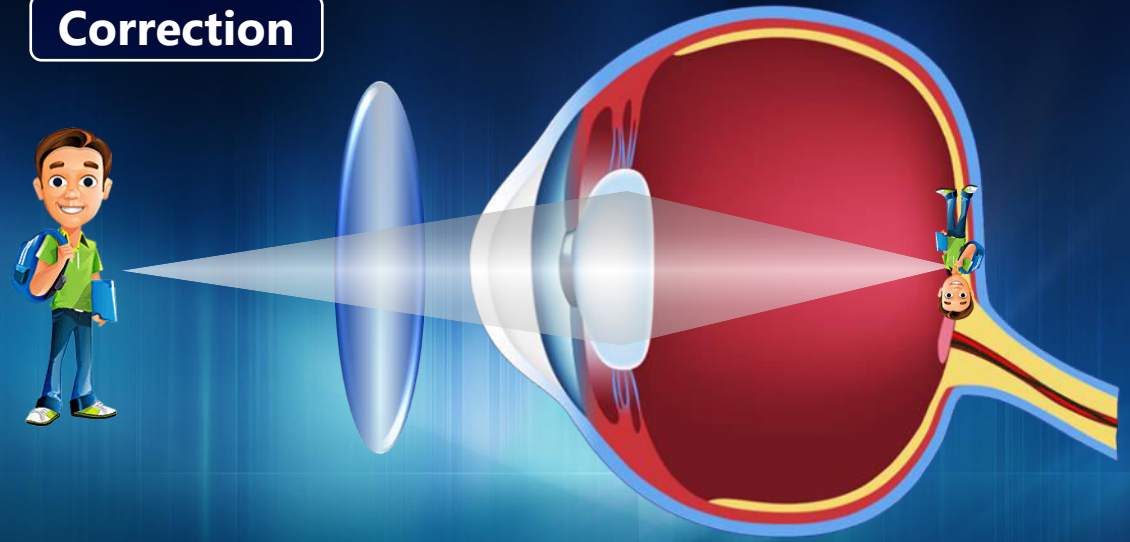
This defect may arise due to shortening of the eyeball.



The light rays from a nearby object arriving at the eye lens, get converged at a point behind the retina

Hypermetropia (Far sightedness)

Correction



This defect can be corrected by using a convex (converging) lens of appropriate focal length.

Hypermetropia (Far sightedness)

Faraway objects ⟶ Unclear

Nearby objects ⟶ Clear

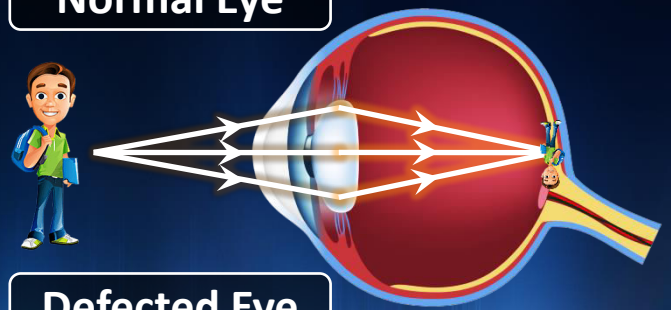
The light rays from a nearby object arriving at the eye lens, get converged at a point behind the retina

This defect may arise due to

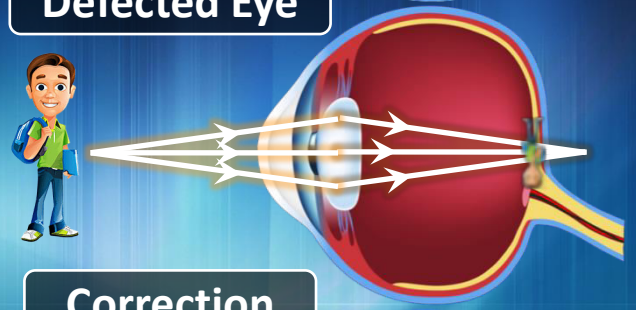
1. The focal length of eye lens becoming too large.
2. Eyeball getting shortened.

This defect can be corrected by using a convex (converging) lens of appropriate focal length.

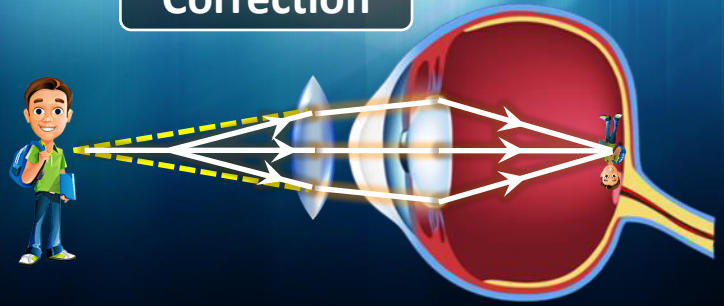
Normal Eye



Defected Eye

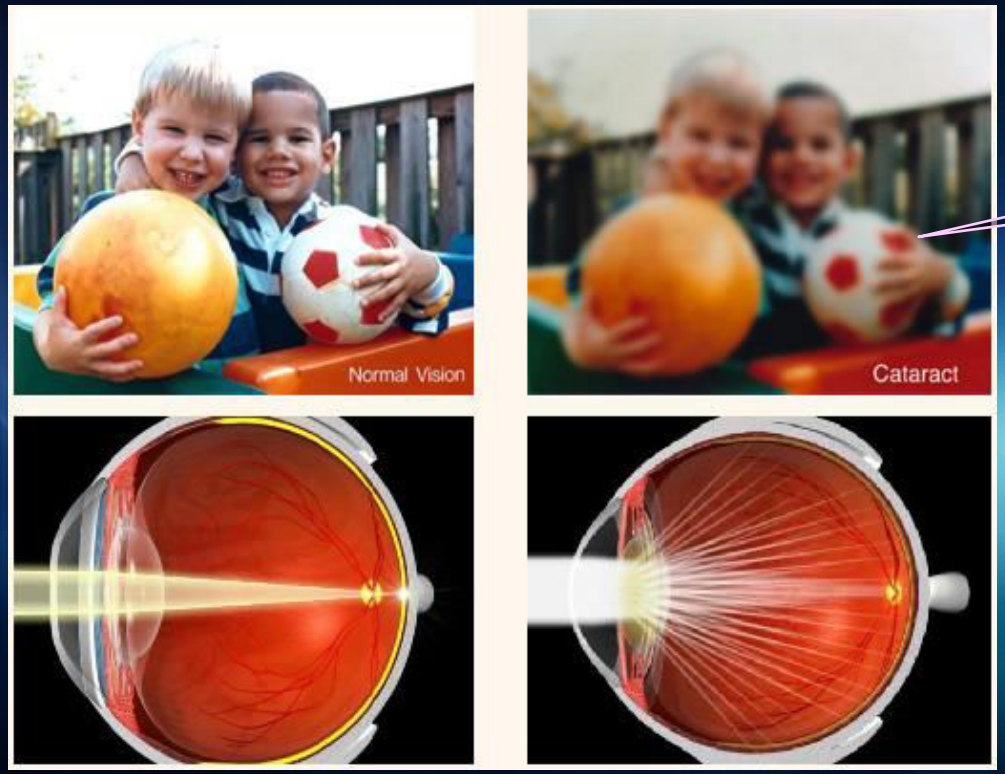


Correction



EYE DEFECTS

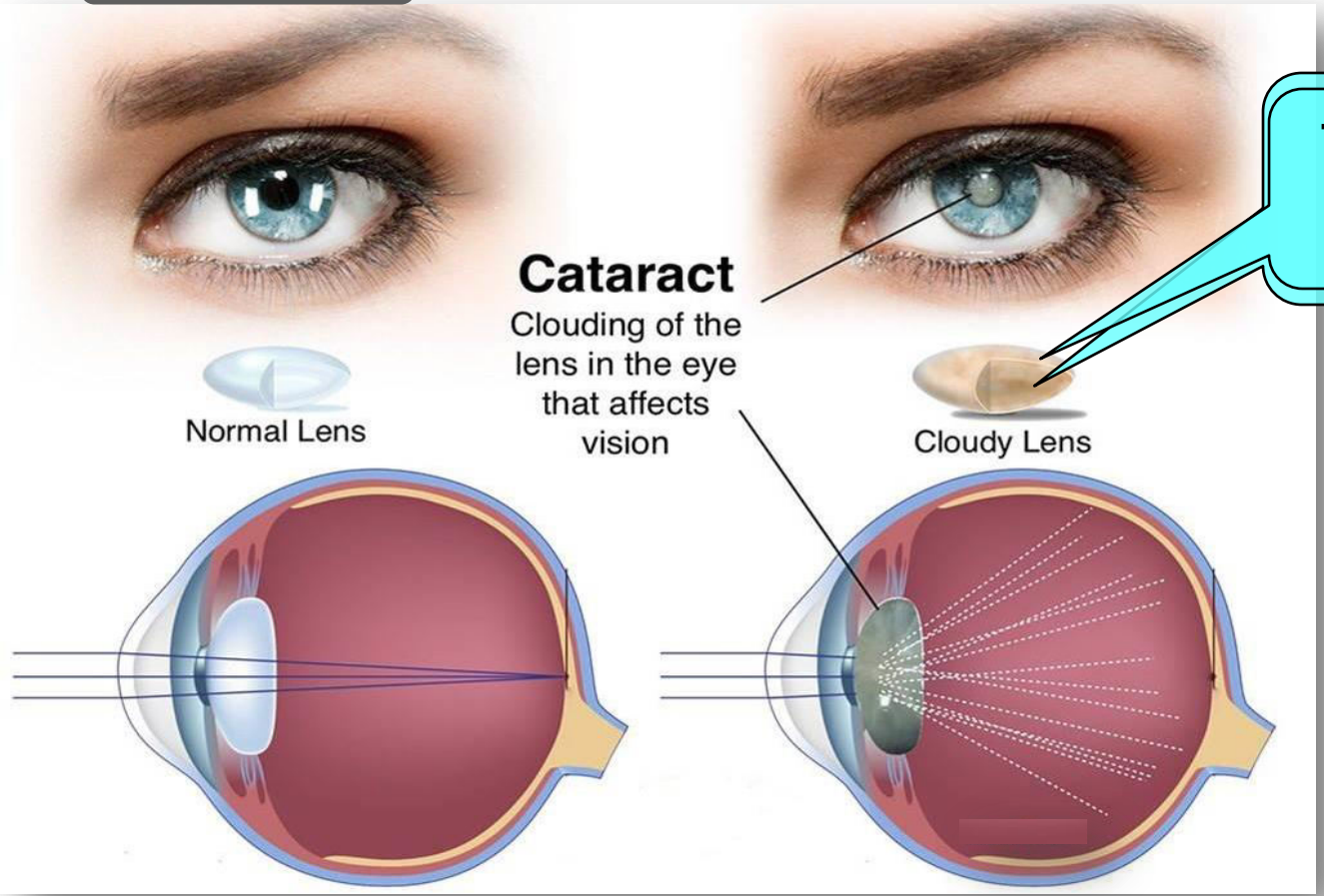
Cataract



It leads to decrease or loss of vision of the eye.

EYE DEFECTS

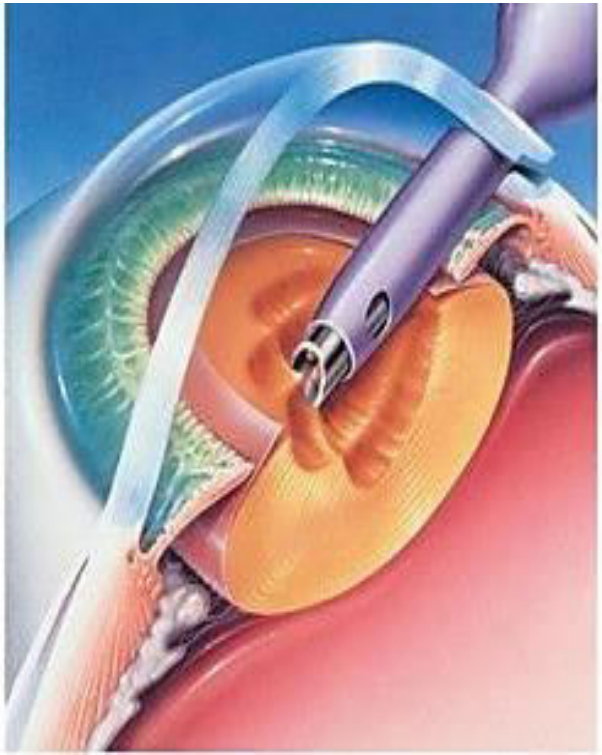
Cataract

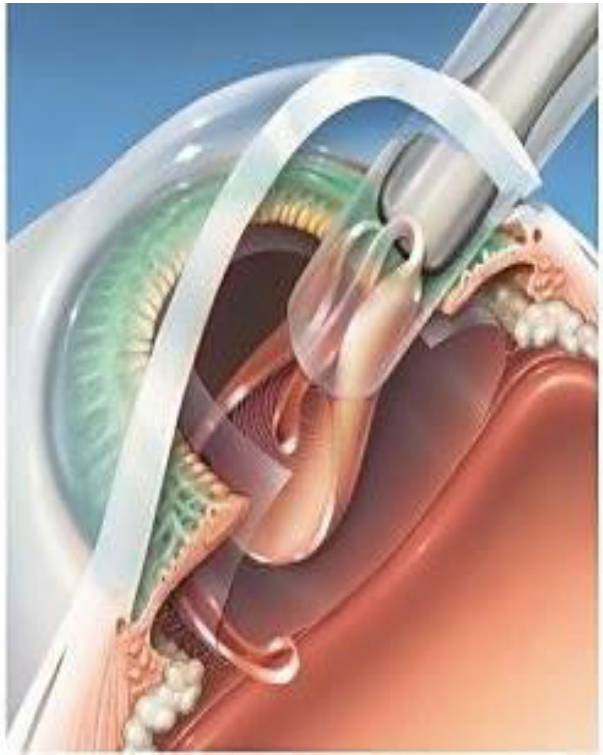


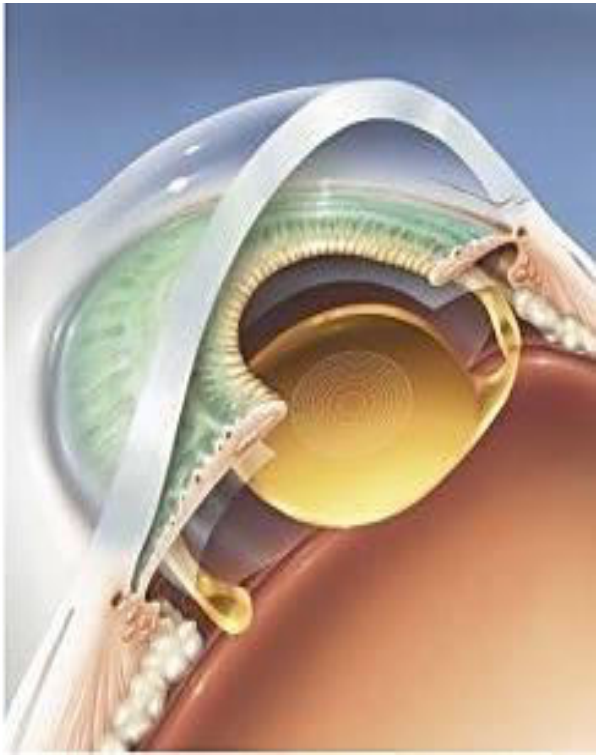
This happens because of the development of a membrane over it.

EYE DEFECTS

Cataract







It is possible to restore the vision by replacing the opaque lens with a new artificial lens.

Thank You