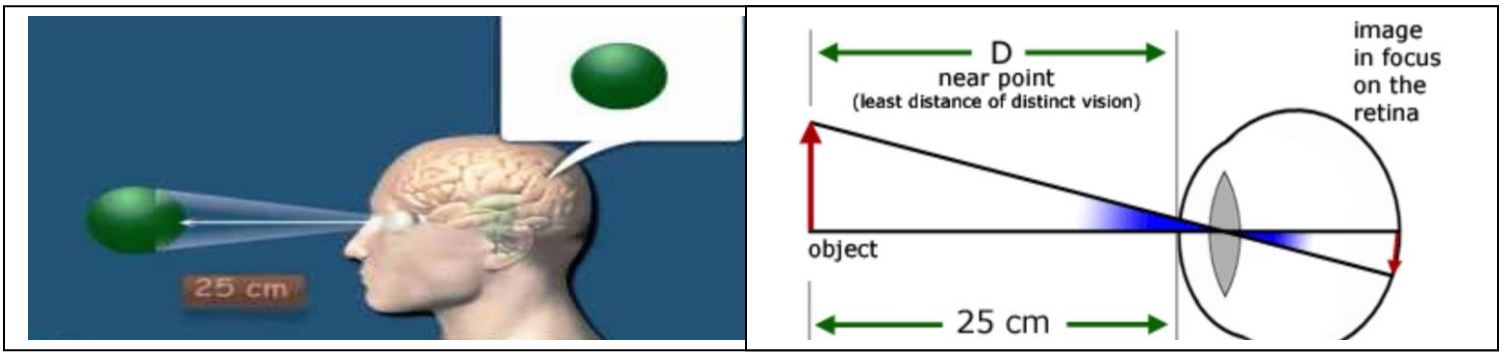
Chapter – 5

HUMAN EYE AND COLOURFUL WORLD

Least distance of distinct vision(LDDV) : The minimum distance of an object from eye to see comfortably and clear is called "Least distance of distinct vision"

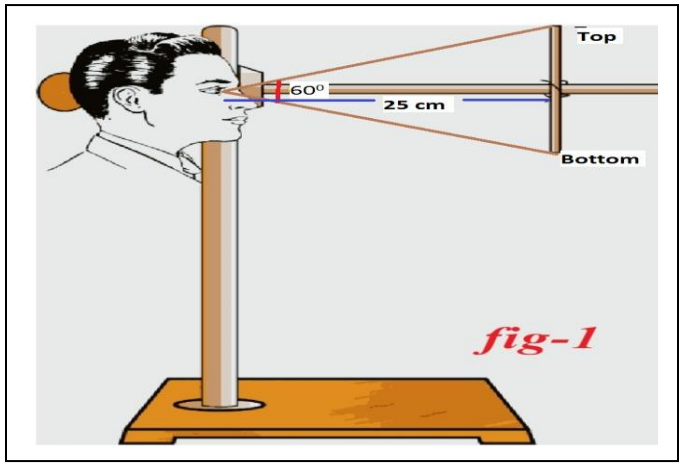


- This value varies from person to person and with age
- LDDV at healthy human being is 25 cm
- LDDV at young age(below 10 years) is 7 to 8 cm
- LDDV at old age is 1 to 2 m or even more

Angle of Vision :

The maximum angle at which we are able to see the whole object is called "Angle of vision"

- This value varies from person to person and with age
- The angle of vision for a healthy human being is about 60^0
- If this angle is below 60^0, we can see the whole object.
- If this angle is above 60^0, then we can see only the part of the object.



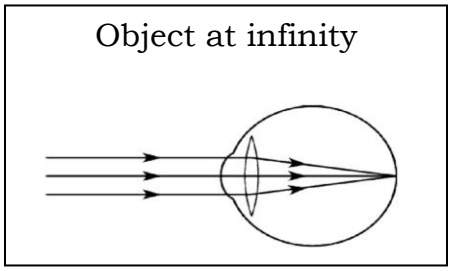
How to find the maximum focal length of the eye lens is 2.5 cm

u= -∞ v = 2.5cm f = ?

Using formula $1/f = 1/v - 1/u$

$1/f_{max} = ½.5 + 0$

$f_{max} = 2.5$ cm



How to find the minimum focal length of the eye lens is 2.27cm

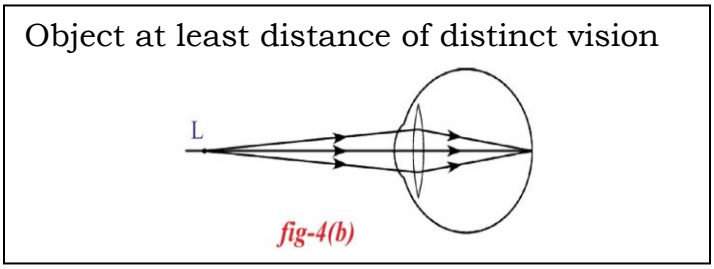
u = - 25 cm v = 2.5 cm f = ?

Using formula $1/f = 1/v - 1/u$

$1/f_{min} = 1/2.5 + 1/25$

$1/f_{min} = 11/25$

$f_{min} = 2.27$ cm



Types of defects of vision

There are mainly three common defects of vision

1. Myopia
2. Hypermetropia
3. Presbyopia

Reason for the defects of vision

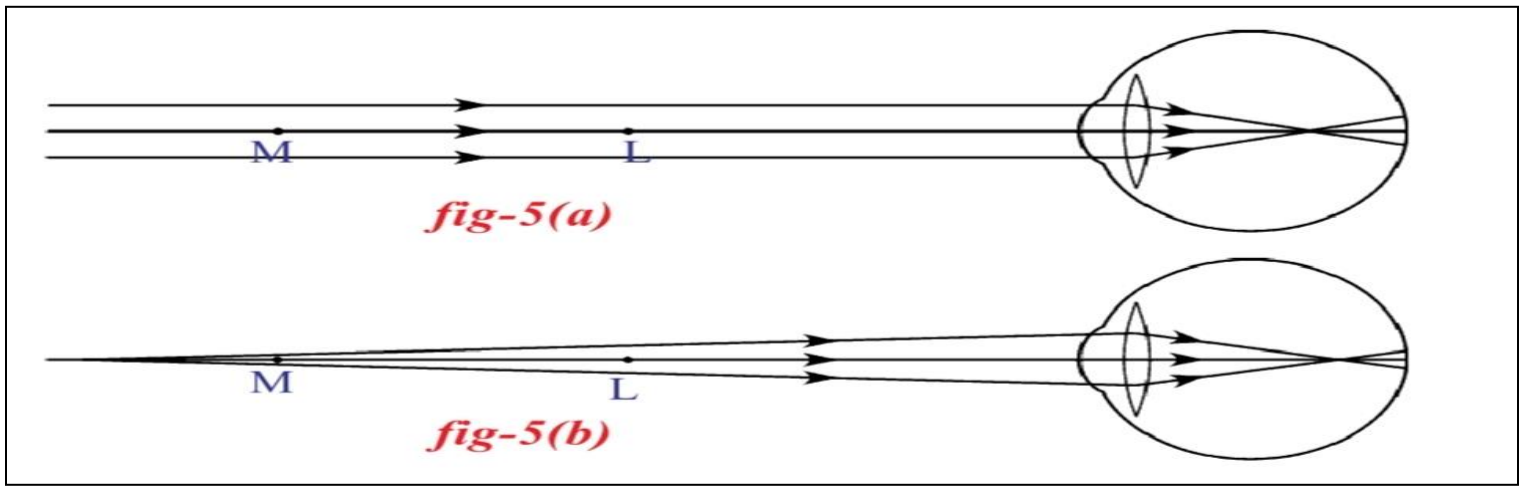
Sometimes the eye may gradually lose its ability for accommodation.

In such conditions the person cannot see an object clearly and comfortably

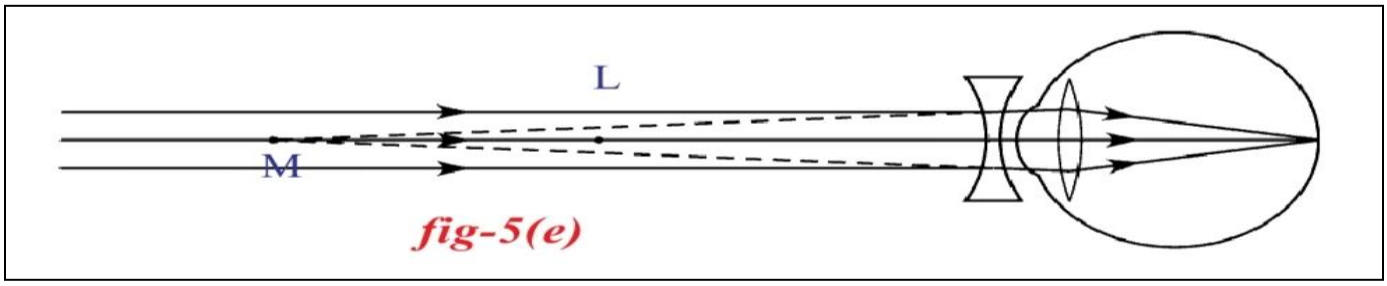
Myopia

Definition: Some people cannot see objects at long distances but can see nearby objects clearly. This type of defect in vision is called "Myopia"

- It is also called "Near sightedness"
- If person with myopia ,his maximum focal length is less than 2.5 cm
- If person with myopia , form an image before the retina



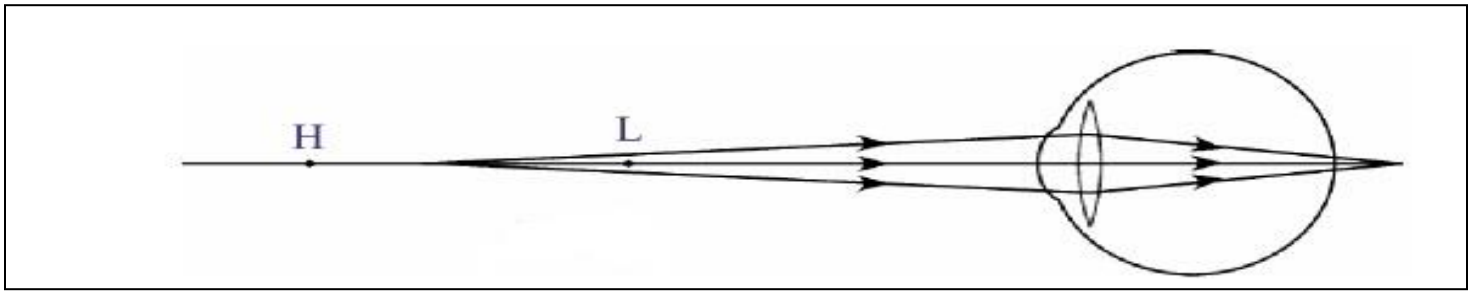
- The point of maximum distance at which the eye lens can form an image on the retina is called "far point(M)"
- A person with myopia can see objects clearly up to far point. After far point cannot see the objects clearly
- To correct this myopia by using bi-concave lens
- Focal length of bi-concave lens is f = -D



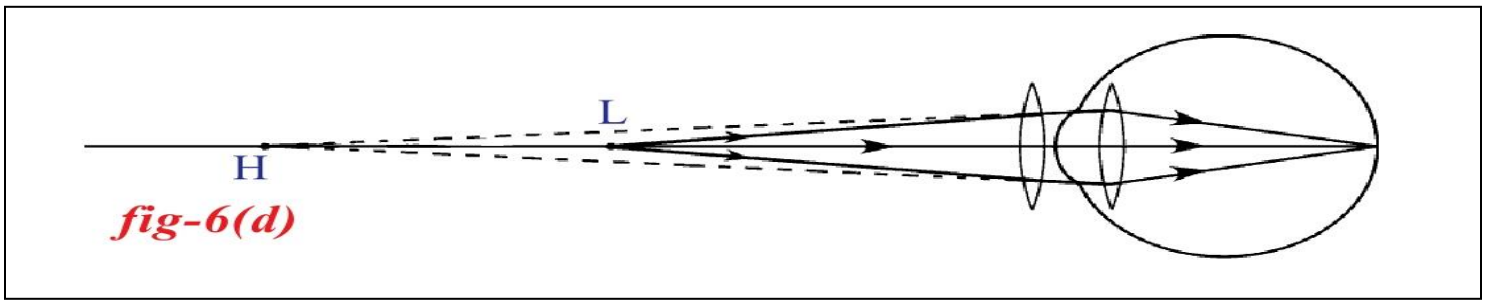
Hypermetropia

Definition: Some people cannot see objects at near distances but can see distant objects clearly. This type of defect in vision is called"Hypermetropia"

- It is also called "Far sightedness"
- If person suffering from hypermetropia ,his maximum focal length is more than 2.27 cm
- If person suffering from hypermetropia , form an image beyond the retina



- The point of minimum distance at which the eye lens can form an image on the retina is called “near point(H)”
- A person with hypermetropia can see objects clearly after near point. Cannot see the objects clearly between Least distance of distinct vision(L) and near point(H)
- To correct this myopia by using bi-convex lens
- Focal length of bi-concave lens is f = 25d/(d-25)



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Presbyopia

- Presbyopia is vision defect when the ability of accommodation of the eye usually decreases with ageing.
- To correct this type of defect of vision we need bi-focal lenses with are formed using both concave and convex lenses.
- Its upper portion consists of the concave lens and lower portion consists of the convex lens

Power of lens

- The reciprocal of focal length is called ‘power of lens’
- The degree of convergence or divergence of light rays that can be achieved by a lens is expressed in terms if its power
- The unit of power of lens is dioptre (D)

Formula: Power of lens P=1/f (f in m)

(OR)

Power of lens P=100/f (f in cm)

Example: Doctor advised to use 2D lens. What is its focal length?

Solution: Given that power of lens P = 2D

Using, P = 100 / f (in cm)

2 = 100 / f

f = 100/2 = 50 cm.

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