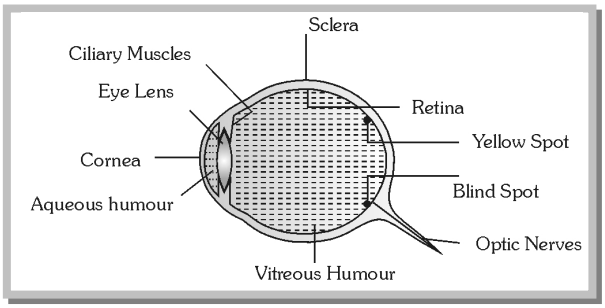
Human Eye.



(1) Eye lens: Over all behaves as a convex lens of $\mu = 1.437$

(2) Retina: Real and inverted image of an object, obtained at retina, brain sense it erect.

(3) Yellow spot: It is the most sensitive part, the image formed at yellow spot is brightest.

(4) Blind spot: Optic nerves goes to brain through blind spot. It is not sensitive for light.

(5) Ciliary muscles – Eye lens is fixed between these muscles. It's both radius of curvature can be changed by applying pressure on it through ciliary muscles.

(6) Power of accommodation: The ability of eye to see near objects as well as far objects is called power of accommodation.

Note: When we look distant objects, the eye is relaxed and its focal length is largest.

(7) Range of vision: For healthy eye it is 25 cm (near point) to ∞ (far point).

A normal eye can see the objects clearly, only if they are at a distance greater than 25 cm. This distance is called least distance of distinct vision and is represented by D.

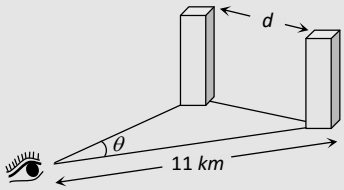
(8) Persistence of vision: Is 1/10 sec. i.e. if time interval between two consecutive light pulses is lesser than 0.1 sec., eye cannot distinguish them separately.

(9) Binocular vision: The seeing with two eyes is called binocular vision.

(10) Resolving limit: The minimum angular displacement between two objects, so that they are just resolved is called resolving limit. For eye it is $1' = \left(\frac{1}{60}\right)^o$.

Specific Example

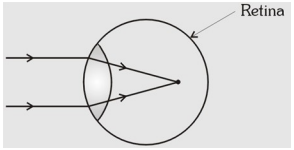
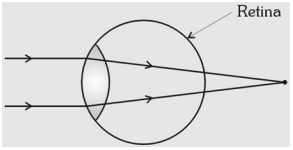
A person wishes to distinguish between two pillars located at a distances of 11 Km. What should be the minimum distance between the pillars.



Solution : As the limit of resolution of eye is $\left(\frac{1}{60}\right)^o$

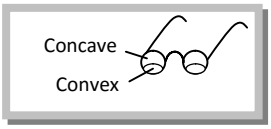
So $\theta > \left(\frac{1}{60}\right)^o \Rightarrow \frac{d}{11\times10^3} > \left(\frac{1}{60}\right)\times\frac{\pi}{180} \Rightarrow d > 3.2\,m$

(11) Defects in eye

Myopia (short sightness)	Hypermetropia (long sightness)
(i) Distant objects are not seen clearly but nearer objects are clearly visible.	(i) Distant objects are seen clearly but nearer object are not clearly visible.
(ii) Image formed before the retina. 	(ii) Image formed behind the retina. 
(iii) Far point comes closer.	(iii) Near point moves away
(iv) Reasons : (a) Focal length or radii of curvature of lens reduced or power of lens increases. (b) Distance between eye lens and retina increases.	(iv) Reasons : (a) Focal length or radii of curvature of lens increases or power of lens decreases. (b) Distance between eye lens and retina decreases.
(v) Removal: By using a concave lens of suitable focal length.	(v) Removal: By using a convex lens.
(vi) Focal length :	(vi) Focal length :

(a) A person can see up to distance → x wants to see →∞, so focal length of used lens $f = -x$ = – (defected far point) (b) A person can see up to distance → x wants to see distance → y (y > x) so $f = \frac{xy}{x - y}$	(a) A person cannot see before distance → d wants to see the object place at distance → D so $f = \frac{dD}{d - D}$

Presbyopia: In this defect both near and far objects are not clearly visible. It is an old age disease and it is due to the loosing power of accommodation. It can be removed by using bifocal lens.



Astigmatism: In this defect eye cannot see horizontal and vertical lines clearly, simultaneously. It is due to imperfect spherical nature of eye lens. This defect can be removed by using cylindrical lens (Torric lenses).