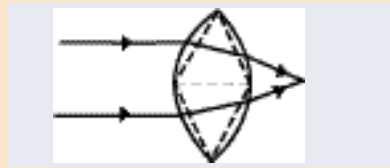


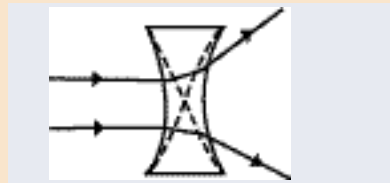
## REFRACTION IN CONVEX AND CONCAVE SPHERES

**Fig. 1: Refraction in a convex lens**



A *convex lens* (plus lens) is like two prisms placed base to base. Light passing through a convex lens is converged. Convex lenses are used to treat presbyopia, hypermetropia and aphakia. If parallel light is brought to a focus at 1 metre the lens is said to have 1 dioptriof power. If the focus is at 1/2 metre, 2 dioptriof, and at 1/3 metre, 3 dioptriof (Fig. 1).

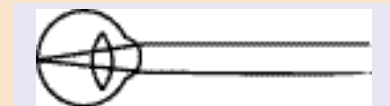
**Fig. 2: Refraction in a concave lens**



A *concave lens* (minus lens) is like two prisms placed apex to apex. Light passing through a concave lens is diverged. Concave lenses are used to treat myopia (Fig. 2).

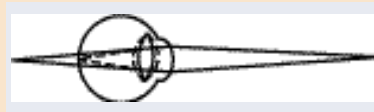
## REFRACTION OF THE EYE

**Fig. 3: Refraction of the eye**



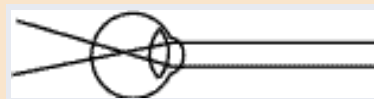
Light entering the eye is converged at the cornea and then the lens acts as a focusing mechanism to converge the light to a point on the retina, so that the object is seen clearly (Fig. 3).

**Fig. 4: Refraction of the eye when the object is close: accommodation**



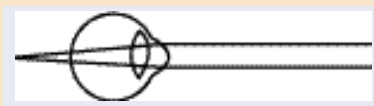
If the object is close to the eye then the lens changes shape so that the light rays can still be focused on the retina. This is called accommodation. (The ability to accommodate begins to fail after the age of 40, so that spectacles are needed for close work). (Fig. 4).

**Fig. 5: Refraction in the eye: myopia**



In myopia light rays are focused in front of the retina, so that a *minus* concave lens is needed to diverge the rays (Fig. 5).

**Fig. 6: Refraction in the eye: hypermetropia (hyperopia)**



In hypermetropia, it is the opposite, the rays are focused behind the retina so that a *plus* convex lens is needed (Fig. 6).

## REFRACTION IN CYLINDERS

A cylindrical lens has different powers in the vertical and horizontal axes. Thus, light passing through a cylindrical lens does not focus at one point, but forms two foci, one for the horizontal and the other for the vertical. Cylindrical lenses may be convex, concave or mixed. They are used to treat astigmatism.

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Erika Sutter, Allen Foster,  
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