# **Refraction Through A Lens**

#### SYLLABUS

Lenses (converging and diverging) including characteristics of the images formed (using ray diagrams only), magnifying glass, location of images using ray diagrams and thereby determining magnification.

Scope of syllabus: Types of lenses (converging and diverging), convex and concave action of a lens as a set of prism, technical terms: centre of curvature, radius of curvature, principal axis, foci, focal plane and focal length, detailed study of refraction of light in spherical lenses through ray diagrams, formation of images – principal rays or construction rays, location of images from ray diagrams for various positions of a small linear object on the principal axis, characteristics of images, sign convention and direct numerical problems using the lens formula are included (derivation of formula not required). Scale drawing or graphical representation of ray diagrams not required.

Power of a lens (concave and convex), simple direct numicrical problems. Magnifying glass or simple microscope, location of image and magnification from ray diagram only (formula and numerical problems nor included). Applications of lenses.

# (A) LENS AND REFRACTION OF LIGHT THROUGH A LENS

#### **5.1 LENS**

We are all familiar with the use of lenses in spectacles. We define a lens as follows:

A lens is a transparent refracting medium bounded by either the two spherical surfaces or one surface spherical and other surface plane.

A plane surface can be treated as a spherical surface of infinite radius of curvature.

Kind of lenses: Lenses are of two kind:

- (1) converging or convex lens, and
- (2) diverging or concave lens.

#### (1) Converging or convex lens

A convex lens is thick in its middle and thin at the periphery. In other words, a lens which bulges out in the middle, is the convex lens. A light beam converges on passing through such a lens, so it is also called the converging lens. A convex lens may be of the following three kinds:

- (i) bi-convex or double-convex or equi-convex,
- (ii) plano-convex, and
- (iii) concavo-convex.

Fig. 5.1 shows the shape of different kind of convex lenses.



Fig. 5.1 Convex lenses

A biconvex lens has both its surfaces convex, a plano-convex lens has one surface plane and the other surface convex, while a concavo-convex lens has one surface convex and the other surface concave such that it is thicker in the middle as compared to its periphery.

# **Lesson 5 Refraction And Lenses**

**Amar Nath Bhutani, RP Gupta** 

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