

THIN LENSES - Form 4 Physics Notes

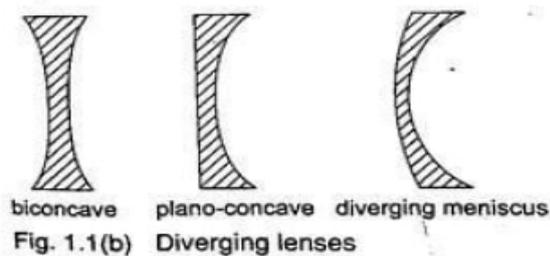
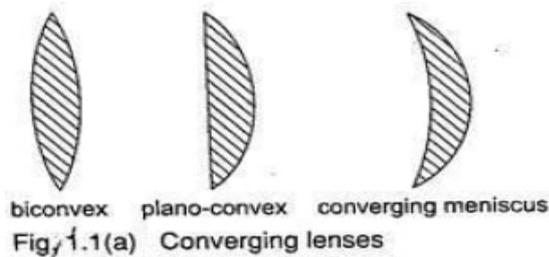
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[Introduction](#)

- **A lens** is conventionally defined as a *piece of glass which is used to focus or change the direction of a beam of light passing through it.*
- They are mainly made of glass or plastic.
- Lenses are used in making spectacles, cameras, cinema projectors, microscopes and telescopes.

[Types of Thin Lenses](#)

- A lens which is thicker at its centre than at its edges converges light and is called **convex** or **converging lens**
- A lens which is thicker at its edges than at its centre diverges light and is known as **concave** or **diverging lens**.



[Properties of Lenses](#)

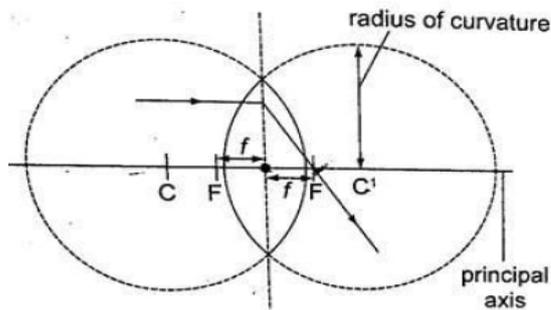
1. Optical centre
 - This is the geometric centre of a lens which is usually shown using a black dot in ray diagrams.
 - A ray travelling through the optical centre passes through in a straight line.
2. Centre of curvature
 - This is the geometric centre of the circle of which the lens surface is part of.
 - Since lenses have two surfaces there are two centres of curvature.
 - C is used to denote one centre while the other is denoted by C^1 .
3. Principal axis
 - This is an imaginary line which passes through the optical centre at right angle to the lens.

4. Principal focus

- this is a point through which all rays travelling parallel to the principal axis pass after refraction through the lens.
- A lens has a principal focus on both its sides.
- F is used to denote the principal focus

5. Focal length

- this is the distance between the optical centre and the principal focus. It is denoted by ' f ' .



Note:

- The principal focus for a converging lens is real and virtual for a diverging lens.
- The principal focus is not always halfway between the optical centre and the centre of curvature as it is in mirrors.

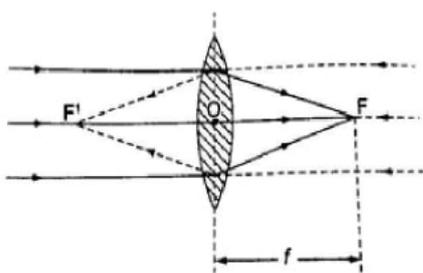
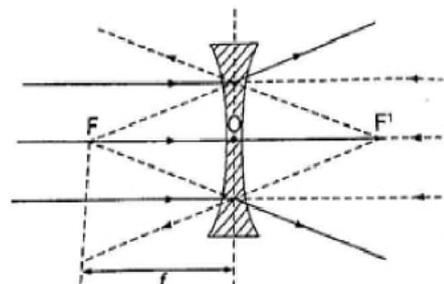


Fig. 1.4 (a) Principal foci of a converging lens



(b) Principal foci of a diverging lens

[Images Formed by Thin Lenses](#)

- The nature, size and position of the image formed by a particular lens depends on the position of the object in relation to the lens.

[Construction of Ray Diagrams](#)

Three rays are of particular importance in the construction of ray diagrams.

1. A ray of light travelling parallel to the principal axis passes through the principal focus on refraction through the lens. In case of a concave lens the ray is diverged in a way that it appears to come from the principal focus.
2. A ray of light travelling through the optical centre goes un-deviated along the same path.
3. A ray of light travelling through the principal focus is refracted parallel to the principal axis on passing through the lens. The construction of the rays is illustrated below.