Mirror

A mirror is an <u>object</u> that reflects light or sound in a way that preserves much of its original quality subsequent to its contact with the mirror. Some mirrors also filter out some wavelengths, while preserving other wavelengths in the reflection. This is different from other light-reflecting objects that do not preserve much of the original wave signal other than color and diffuse reflected light. The most familiar type of mirror is the <u>plane mirror</u>, which has a flat surface. <u>Curved mirrors</u> are also used, to produce <u>magnified</u> or diminished images or focus light or simply distort the reflected image.

Shape of a mirror's surface

- In a plane mirror, a parallel beam of light changes its direction as a whole, while still remaining parallel; the images formed by a plane mirror are virtual images, of the same size as the original object (see mirror image).
- In a concave mirror, parallel beams of light become a convergent beam, whose rays intersect in the focus of the mirror. Also known as converging mirror
- In a convex mirror, parallel beams become divergent, with the rays appearing to diverge from a common point of intersection "behind" the mirror.
- Spherical concave and convex mirrors do not focus parallel rays to a single point due to spherical aberration. However, the ideal of focusing to a point is a commonly-used approximation. Parabolic reflectors resolve this, allowing incoming parallel rays (for example, light from a distant star) to be focused to a small spot; almost an ideal point. Parabolic reflectors are not suitable for imaging nearby objects because the light rays are not parallel.

Lens

A lens is an optical device which transmits and refracts light, converging or diverging the beam. A simple lens consists of a single optical element. A *compound lens* is an array of simple lenses (elements) with a common axis; the use of multiple elements allows more optical aberrations to be corrected than is possible with a single element. Lenses are typically made of glass or transparent plastic. Elements which refract electromagnetic radiation outside the visual spectrum are also called lenses: for instance, a microwave lens can be made from paraffin wax.



Types of simple lenses

Lenses are classified by the curvature of the two optical surfaces. A lens is *biconvex* (or *double convex*, or just *convex*) if both surfaces are **convex**. If both surfaces have the same radius of curvature, the lens is *equi convex*. A lens with two **concave** surfaces is *biconcave* (or just *concave*). If one of the surfaces is flat, the lens is *plano-convex* or *plano-concave* depending on the curvature of the other surface. A lens with one convex and one concave side is *convex-concave* or *meniscus*. It is this type of lens that is most commonly used in corrective lenses.

If the lens is biconvex or plano-convex, a collimated beam of light travelling parallel to the lens axis and passing through the lens will be converged (or *focused*) to a spot on the axis, at a certain distance behind the lens (known as the *focal length*). In this case, the lens is called a *positive* or *converging* lens.





Negative (diverging) lens