

# Optics - The Study of Light

## Refraction

Light refracts when passing between two substances at an angle.

Light does not bend as glass that is not yet within from surrounding air/light or from water.



Light travels faster in glass than in air, so it bends towards the light in faster medium.

The refractive index (n) is the ratio of the speed of light in a vacuum to the speed of light in a medium.



## Reflection

Light reflects when it hits a surface and bounces back.

Normal - an imaginary line 90° perpendicular to a surface.

Angle of Incidence - the angle between the incident ray and the normal.

Angle of Reflection - the angle between the reflected ray and the normal.



## Focus

Point at which all incident rays pass when all rays parallel that will meet. Focus is the focal point of object.



## Ray Diagrams

Minors and majors can make objects look bigger or smaller. Ray diagrams show how light rays travel through lenses, mirrors, etc. They show how objects are reflected or refracted.



## Image vs. Object

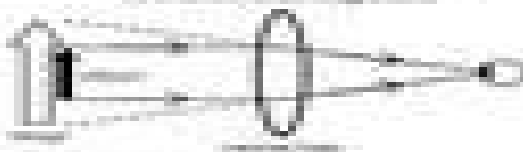
The object is what you are looking at. The image is what you see.

The image is what you see when you look at the object. It can be real or virtual.

## Lenses

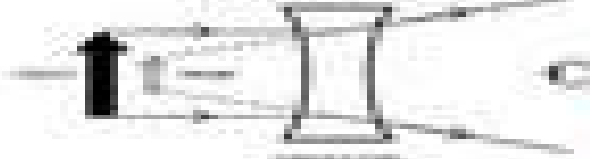
Lenses work by refraction, by the light bending when passing between two mediums.

A converging lens focuses light.



A converging lens is thicker in the middle than at the edges.

A converging lens focuses light.



A converging lens is thicker in the middle than at the edges.

Image is inverted (upside down).

Concave and convex lenses depend on how light rays are refracted. If a converging lens refracts light, it is a converging lens.

## Concave Lenses



## Optical Systems



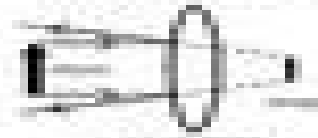
Optical systems are used to focus light rays and create images. They are used in many applications, including telescopes, microscopes, and cameras.

## Images

Images are formed by refraction, by the bending of light rays. They can be real or virtual. Real images are formed by converging lenses and mirrors. Virtual images are formed by diverging lenses and mirrors.

The image formed by a converging lens is real and inverted. The image formed by a diverging lens is virtual and upright.

A converging lens focuses light.



A converging lens is thicker in the middle than at the edges.

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A converging lens is thicker in the middle than at the edges.

Image is inverted (upside down).

# Optics Basics Key

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