

Prelab: Light and optics

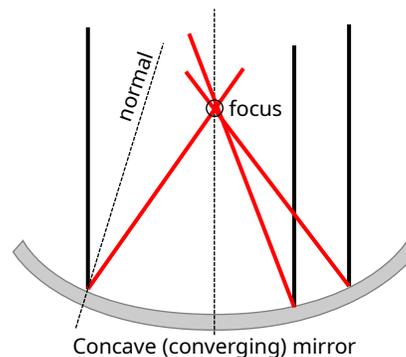
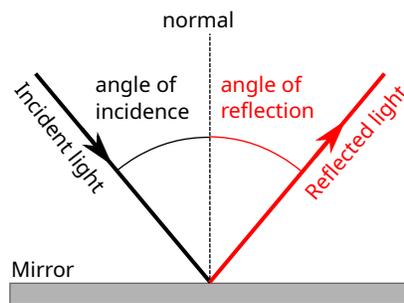
Everyday thing: Your glasses, a camera, a microscope, a telescope.

It is physics (and mathematics): Light “bends” (is “refracted”) while entering a different medium, and by cleverly arranging different objects one can have it magnify objects. Light is also reflected from certain surfaces, allowing the construction of mirrors.

Reflection

A wave is **reflected** when it is incident upon a material that redirects it outward. Reflected waves are redirected according to the law of reflection: the angle of incidence is equal to the angle of reflection. The angles of incidence and reflection are defined with respect to the direction normal (perpendicular) to the mirror surface as shown below.

The law of reflection holds for every type of mirror, but the result it produces is different for each. The plane mirror creates an actual-size virtual image of the object which appears to be behind the mirror. Concave mirrors make incident plane waves converge, and convex mirrors cause incident plane waves to diverge. Both of these contribute to the distorted images of faces and bodies you see in carnival mirrors which often have both convex and concave regions on the same mirror.

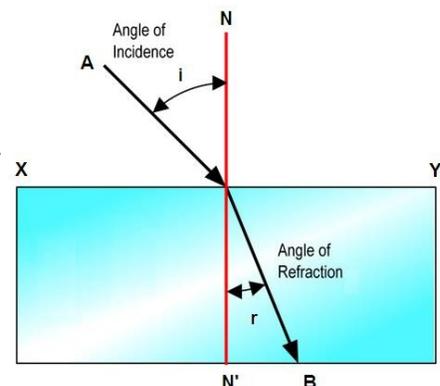


Refraction

Refraction occurs when light travels from one material into another for example from air into water, plastic or glass.

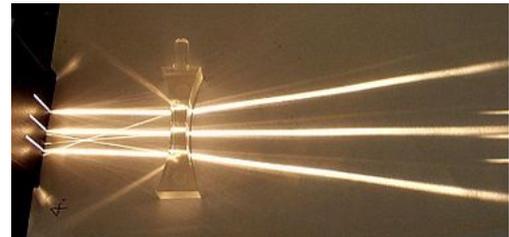
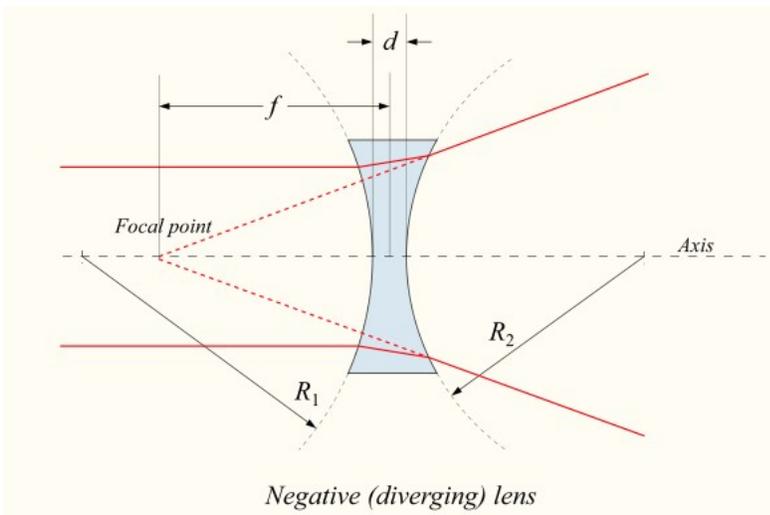
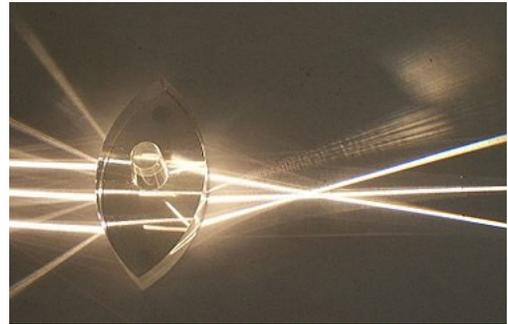
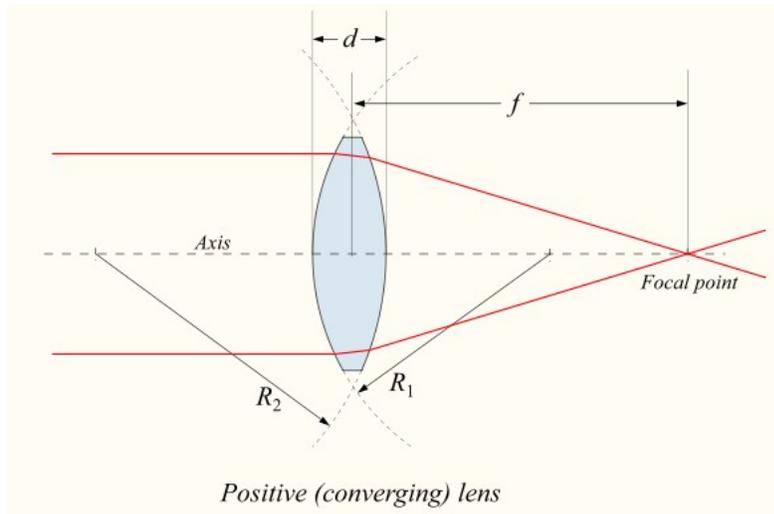
When light reaches the boundary of a thinner to a thicker medium, for instance when it travels from air into water, it will “bend” inwards towards the thicker medium (towards the normal).

Similarly, when light travels from a thicker to a thinner medium, it will bend away from the thinner medium (away from the normal).



Lenses

Lenses make use of refraction to focus or defocus light.



Play around with this simulation:

https://phet.colorado.edu/sims/html/bending-light/latest/bending-light_en.html