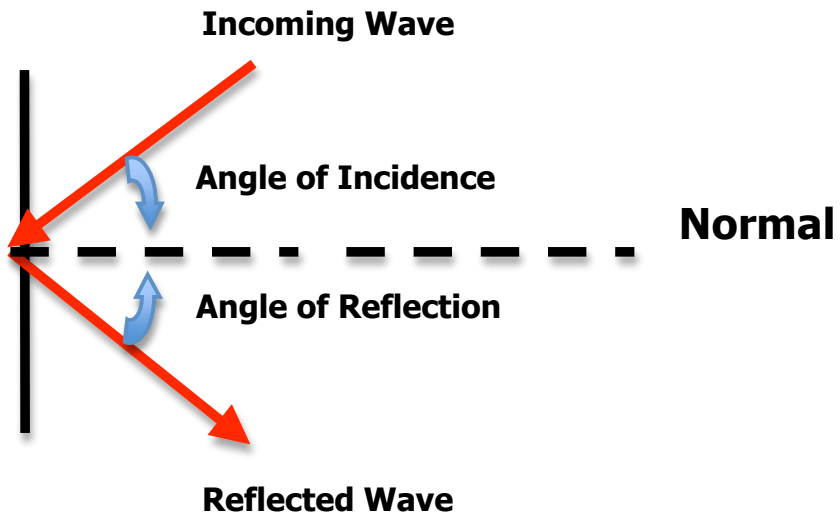
Chapter 2 Lesson 3 Notes: Reflection and Refraction

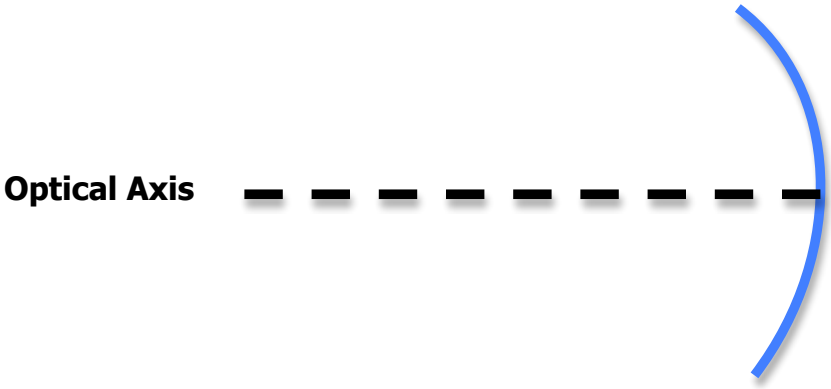
1. **Reflection**: occurs when an object or wave bounces back off a surface through which it cannot pass.
    a. **Law of Reflection**: all waves obey this law that states that the angle of incidence (between incoming wave and normal point) equals the angle of reflection.



2. **Mirrors**: the kind of images you see depends of the type of mirror.
    a. **Plane**: a flat sheet of glass that has a smooth, silver-colored coating on one side.
        - The coating reflects the light.
        - A clear image forms.
        - **Image**: a copy of an object formed by reflected or refracted rays of light.
        - **Virtual Image**: an upright image that forms where light seems to come from (ex. behind a plane mirror).
        - Image is the same size, upright, but reversed.
        - Light rays are reflected, but our brain interprets them as if they had come from behind the mirror.
    b. **Concave Mirrors**: a mirror with a surface that curves inward like the inside of a bowl.
        - Reflects parallel rays of light which meet at a point
        - **Optical Axis**: an imaginary line that divides a mirror in half.
        - **Focal Point**: the point at which rays parallel to the optical axis meet or converge.
        - The more curved the mirror is, the closer the focal point is to the mirror.
        - Can form virtual or real images.

- If the object is **farther away** from the mirror than the **focal point**, then the reflected rays form a **real image** (image forms when rays of light meet and appear to look upside down).
- If the object is **between the mirror and the focal point**, the reflected rays form a **virtual image** behind the mirror, but the image is **larger** than the object (magnified).

Focal Point of a Concave Mirror



c. **Convex Mirrors**: a mirror with a surface that curves outward.
   - Parallel rays of light appear to come from a focal point behind the mirror, but they don't meet.
   - Because the rays never meet, **images** are always **virtual** and **smaller** than the object.
   - They can **never** create a **real image**.
   - Example: sideway mirror of a car

3. Refraction: bending of light waves due to a change in speed.

a. When light rays enter a medium at an angle, the change in speed causes the rays to bend, or change direction.
b. Example: when light passes from air into water, the light slows down because the water is denser.
c. **Prism**: each color (wavelength) of visible light has a different angle of refraction, so the prism separates these colors by bending each wavelength of light.
d. The longer the wavelength, the less the wave is bent.
e. Example: Red light has the longest wavelength, so it refracts the least.
   - Visible Light Spectrum: ROY G BIV

4. **Lens**: a curved piece of glass or other transparent material.
    a. A lens forms an image by refracting light rays that pass through it.
    b. The type of image depends on the shape of the lens.
    c. **Convex Lens**: magnifying glass that is thicker in the center than the edges.
        - Convex lens focuses the rays of light.
        - The type of image, real or virtual depends on the distance of the object from the focal point and lens.
        - Farther from the focal point = real image (upside down)
        - Closer to lens than focal point = virtual image
    d. **Concave Lens**: lens that's thinner in the center than the edges,
        - Can produce **only virtual images** because parallel light rays passing through the lens never meets.