LIGHT

2.1 Reflection, Refraction, and Diffraction

Diffraction

Diffraction is the spreading out of waves when they pass around the edge of an object.

Diffraction through a narrow gap: When the gap is narrow, the wavefronts curve around the edges of the gap producing circular wavefronts.

Diffraction through a wide gap: The wavefronts remain straight, except at the edge of the gap where some curvature occurs.

Light pipes and optical fibers

Light can be trapped by total internal reflection inside a bent glass rod and piped along a curved path.
For example: Doctors use an endoscope to obtain an image from the inside of the body.

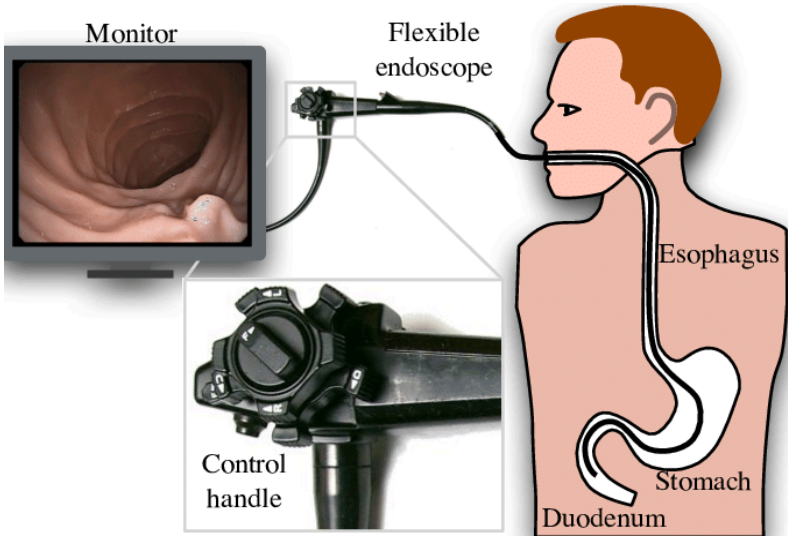
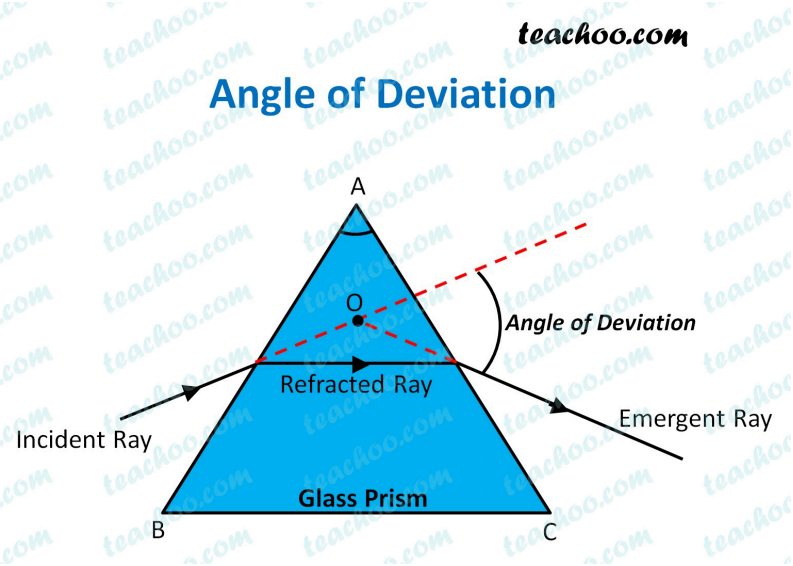


Image credit:https://www.researchgate.net/

Refraction by a prism

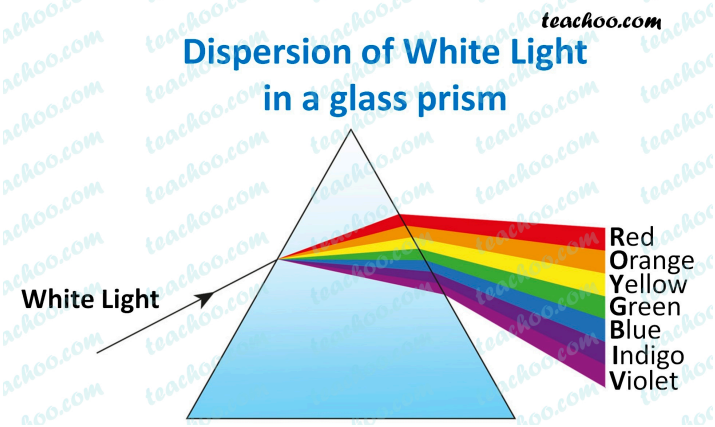
Refraction is the bending of light or any other wave as it passes from one medium to another with a different density, causing a change in its speed. This change in speed results in the wave changing direction.

The **deviation** is the total change in the ray's direction.



Dispersion

A **spectrum** is a band of colors that are displayed when sunlight (white light) falls on a triangular glass prism.



Dispersion is the property of light that causes it to spread out according to its color when it passes through an object.
It occurs because white light is a mixture of many colors, and the prism separates the colors because the refractive index of glass varies with each color.

- Red light is the least refracted by the prism, the longest wavelength, and the lowest lowest frequency.
- Violet light is the most refracted by the prism, the shortest wavelength, and the highest frequency.

2.2 Lens and Mirror Properties

Ray Diagrams

Information about the images formed by the lens can be obtained by drawing two of the following rays:

- The ray parallel to the principal axis is refracted through the principal focus, F.
- A ray through the optical center, C, which is undeviated for a thin lens.
- A ray through the principal focus, F, which is refracted parallel to the principal axis.

Magnification

The linear magnification M is:

$$\text{Linear magnification} = \frac{Image\ Size}{Object\ Size}$$

$$\text{Linear magnification} = \frac{Distance\ of\ image\ from\ lens}{Distance\ of\ object\ from\ lens}$$

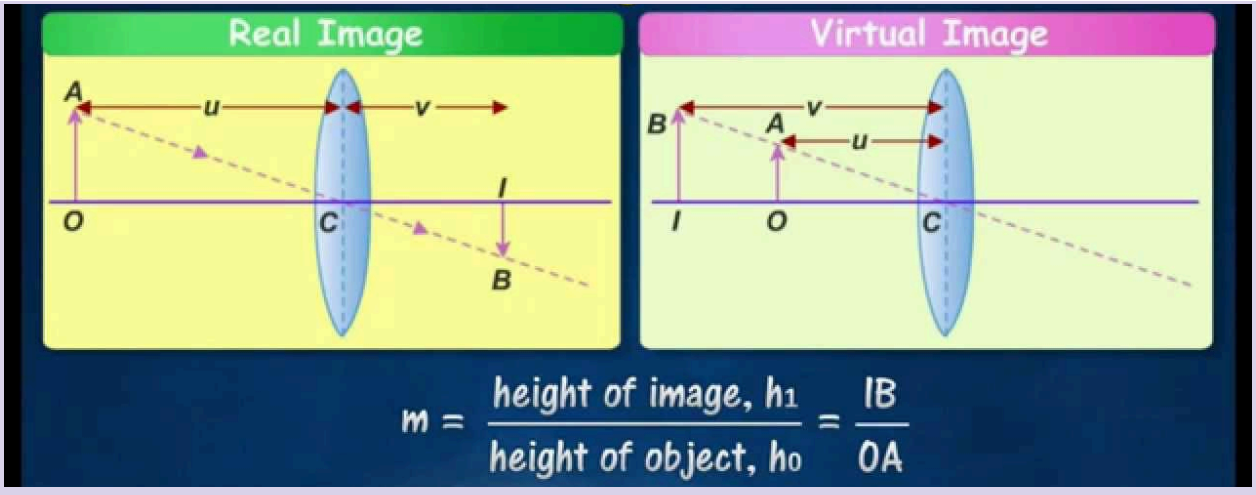


Image credit: https://www.youtube.com/watch?v=IMDfLJL3qEY