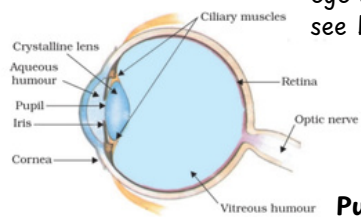


Human eye And The Colorful World

Sense organ for vision, located in the eye sockets of the skull; it helps us see by detecting light and colors.



Aqueous Humor: Clear fluid between cornea and lens; maintains eye pressure and nourishes cornea and lens.

Pupil: Small opening in the iris; controls light entry into the eye

Iris: Ring-like, muscular tissue behind the cornea; determines eye color and adjusts pupil size.

Lens: Fibrous, jelly-like, convex; focuses light on the retina, creating a real, inverted image.

Cornea: Outermost transparent part; provides most light refraction

Ciliary Muscles: Hold and adjust the lens curvature for focus.

Retina: Delicate membrane with light-sensitive cells.

- Rods: Detect light intensity.
- Cones: Detect primary colors

Vitreous Humor: Provides nutrients and maintains eye shape.

Optic Nerve: Transmits visual information from the retina to the brain.

Sclera: Tough, white outer covering of the eye; provides protection.

Power of Accommodation

The ability of the human eye to focus on objects at different distances by changing the focal length of the eye lens, controlled by ciliary muscles.

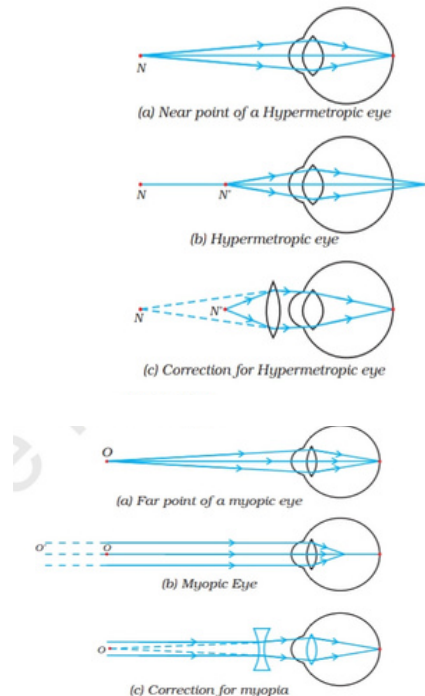
Near point: Minimum distance for clear vision without strain, typically 25 cm for a normal eye.

When looking at a nearby object, the ciliary muscles contract, making the lens thicker and decreasing its focal length.

Far point: Maximum distance seen clearly, normally at infinity.

When looking at a distant object, the ciliary muscles relax, making the lens thin and increasing its focal length.

Defects of Vision & their Correlation



cataract

↓
cloudy or blurry vision

↓
Causes: age related condition, weakening of eye muscles

↓
treatment: surgery.

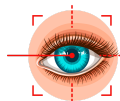
Defects of Vision & their Corrections

IMPORTANT

- Myopia (Nearsightedness)**
 - Cause: The eyeball is too long or the cornea is too curved, causing light to focus in front of the retina.
 - Effect: Distant objects appear blurry, while close objects are clear.
 - Correction: Concave (diverging) lenses spread out light rays so they focus on the retina.
- Hyperopia (Farsightedness)**
 - Cause: The eyeball is too short or the cornea is too flat, causing light to focus behind the retina.
 - Effect: Close objects appear blurry, while distant objects are clear.
 - Correction: Convex (converging) lenses bend light to focus it correctly on the retina.
- Astigmatism**
 - Cause: The cornea or lens has an irregular shape, leading to multiple focus points.
 - Effect: Blurred or distorted vision at all distances.
 - Correction: Cylindrical lenses or toric contact lenses adjust for the uneven curvature.
- Presbyopia**
 - Cause: Aging causes the lens to lose flexibility, making it harder to focus on close objects.
 - Effect: Difficulty reading or seeing nearby objects.
 - Correction: Bifocal or progressive lenses, and reading glasses.

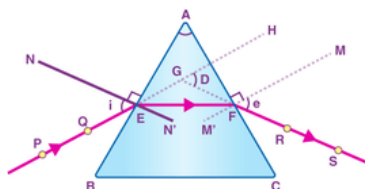
Advantages of having eyes in front of the face...

- Gives a wider field of view.
- Enhances the ability to detect faint objects.
- Provides three dimensional view.



Refraction through a glass prism

- Prism: Transparent refracting medium. Structure: Two triangular bases, three rectangular lateral surfaces.
- Angle of Prism: Angle between two lateral faces.
- Angle of Deviation: Angle between incident and emergent rays.



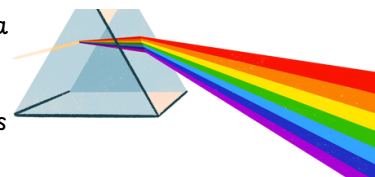
Dispersion of White Light: Splitting of white light into seven colors when passing through a prism.

Spectrum: The band of seven colors formed.

- Color Sequence: VIBGYOR (Violet, Indigo, Blue, Green, Yellow, Orange, Red).

Causes:

- Varying refraction indices of different colours.
- wavelength of light when passing through transparent medium like prism.
- **Newton's Experiment:** Used a second inverted prism to recombine the spectrum into white light, proving sunlight is made up of seven colors.
- **White Light:** Any light producing a similar spectrum to sunlight is called white light.



Red is the least deviated colour as it has largest/longest wavelength.

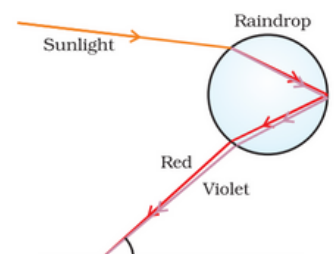
Violet is the most deviated colour as it has smallest wavelength in visible spectrum.

Natural spectrum: Rainbow :

Refraction of Sunlight -- Dispersion into Colors -- Internal Reflection -- Refraction Again

IMPORTANT

Rainbow: A natural spectrum appearing in the sky after a rain shower, caused by the dispersion of sunlight by tiny water droplets in the atmosphere.



Mechanism: Water droplets act like prisms, refracting and dispersing sunlight, reflecting it internally, and refracting it again.

Color Sequence: Red at the top, violet at the bottom.

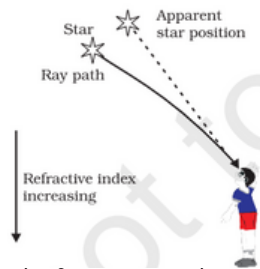
Formation Direction: Always opposite to the sun.

Atmospheric Refraction

The refraction of light caused by the Earth's atmosphere (having air layers of varying optical densities)

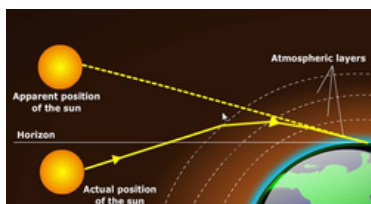
Stars Twinkle

Caused by atmospheric refraction; starlight bends as it enters Earth's atmosphere, causing stars to appear to change position and flicker.



Advanced Sunrise & Delayed Sunset:

Sun appears ~2 minutes before sunrise and after sunset due to atmospheric refraction. The Sun's disc also appears flattened at these times.



Why Planets Don't Twinkle

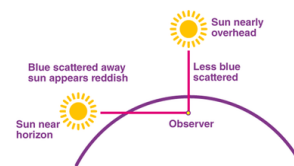
Planets are closer and seen as extended sources, averaging out the light variations and reducing the twinkling effect.

Scattering of Light

Scattering of light occurs when light is absorbed by particles and then re-emitted in different directions.

Red Sun at Sunrise/Sunset

During sunrise and sunset, sunlight travels a longer distance through the atmosphere. Blue light is scattered away, while red light, with a longer wavelength, reaches the observer's eyes, making the sun appear red.



Blue Sky

due to the scattering of sunlight by small air molecules and fine particles. Blue light, having a shorter wavelength, scatters more than red light, making the sky appear blue.

Tyndall Effect:

- Light scatters when it strikes particles in a colloid, making the light path visible.
- Seen in sunlight passing through mist or a dense forest canopy.
- Smaller particles scatter blue light, while larger particles scatter red light.

Chapter ka KAZAANA:

- Human Eye (Diagram)
- Defects (Myopia and Hypermetropia)
- Prism (Diagram + Concept)

