The Human Eye and the Colourful World
Topics

1. The Human Eye
2. Defects of Vision
3. Refraction of Light Through a Prism
4. Dispersion of Light
5. Atmospheric Refraction
6. Scattering of Light
1. Human Eye

1.1 Parts and Their Function

- **Cornea**: A thin membrane through which light enters the eye.
- **Iris**: A dark muscular diaphragm which controls the size of pupil.
- **Pupil**: Controls the amount of light entering the eye.
- **Aqueous Humour**: Forms an inverted real image on the retina.
- **Crystalline Lens**: Forms an inverted real image on the retina.
- **Ciliary Muscles**: A delicate membrane having light sensitive cells.
- **Retina**: A delicate membrane having light sensitive cells.
- **Optic Nerve**: Sends electrical signals to the brain.
- **Vitreous Humour**: Sends electrical signals to the brain.
1.2 Power of Accommodation

**Power of accommodation**

The ability of eye lens to adjust its focal length.

Ciliary muscles contract, lens becomes thick, focal length decreases.

For a normal eye

**Near Point = 25 cm**

Ciliary muscles are relaxed, lens becomes thin, focal length increases.

For a normal eye

**Far Point = infinity**
2. Defects of Vision

2.1 Myopia (Near-Sightedness)

Light focuses in front of retina
Corrected with Concave Lens

2.2 Hypermetropia (Far-Sightedness)

Light focuses behind retina
Corrected with Convex Lens
2.3 Presbyopia

- Gradual weakening of ciliary muscles due to ageing.
- The near point moves away.

3. Refraction of Light Through a Prism

- Angle of incidence
- Angle of deviation
- Angle of emergence
- Refracted Ray
- Incident Ray
- Emergent Ray
4. Dispersion of Light

4.1 Dispersion of Light Through a Prism

**Dispersion:** Splitting of white light into seven colours.

- **Red Light** bends the least
- **Violet Light** bends the most

4.2 Formation of Rainbow

- **Dispersion**
- **Total Internal Reflection**
- **Refraction**
5. Atmospheric Refraction

It happens due to difference in optical densities of different atmospheric layers.

5.1 Advanced Sunrise and Delayed Sunset

The Sun is visible to us about 2 minutes before sunrise and 2 minutes after sunset.

5.2 Twinkling of Stars

Continuous change in the apparent position of stars

Apparent star position → Star → Ray path → Refractive Index Increasing
6. Scattering of Light

When light interacts with particles, it gets scattered.

This scattering depends on the size of scattering particles:
- Very fine particles scatter mainly blue light.
- Particles of larger size scatter light of longer wavelengths.

6.1 Tyndall Effect

Scattering of light by colloidal particles gives rise to the Tyndall effect.

Path of light is visible through a colloid, but not through a solution.
6.2 Blue Colour of the Sky

Blue colour scatters the most

6.3 Reddening of the Sun at Sunrise and Sunset

Sun nearly Overhead

Less blue scattered

Blue scattered away
Sun appears reddish

Sun near horizon
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- Reddening of the Sun
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  - Incident, Refracted and Emergent Rays
  - Refraction of Light Through a Prism
- The Human Eye
  - Parts and Their Function
  - Defects of Vision
    - Myopia
    - Hypermetropia
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  - Atmospheric Refraction
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    - VIBGYOR
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