

Chapter 6: Spectrum

◆ 1. Deviation by a Prism

- When light enters a prism, it **deviates** due to different speeds in different media.
 - **Total deviation** (δ) = $\delta_1 + \delta_2$.
 - Depends on:
 - **Angle of incidence**
 - **Angle of prism (A)**
 - **Refractive index (μ)**
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◆ 2. Dependence of Deviation on Colour

- Light of **shorter wavelength (violet)** deviates **more**.
 - **Red light** ($\lambda \approx 8000 \text{ \AA}$) deviates **least**, **violet** ($\lambda \approx 4000 \text{ \AA}$) deviates **most**.
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◆ 3. Dispersion and Spectrum

- **Dispersion:** Splitting of white light into 7 colours.
 - **Spectrum:** Band of colours (VIBGYOR).
 - Caused due to different refractive indices for different wavelengths.
 - **Takes place only at the first surface** of the prism.
 - **Refraction occurs at both surfaces**, but separation increases at the second.
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◆ 4. Recombination of Colours

- Using two prisms, dispersed light can be recombined to form **white light** again.
 - Proves colours come **from white light**, not from the prism.
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◆ 5. Electromagnetic Spectrum

- **Visible light** is only a small part of the **EM spectrum**.
 - **Invisible spectrum:**
 - **Beyond red:** Infrared → Microwaves → Radio waves (increasing wavelength)
 - **Beyond violet:** Ultraviolet → X-rays → Gamma rays (decreasing wavelength)
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◆ 6. Properties of EM Waves

- Travel at 3×10^8 m/s in vacuum.
 - **Transverse**, can reflect and refract.
 - Not affected by **electric or magnetic fields**.
 - Relation: $c = v\lambda$
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◆ 7. Ultraviolet (UV) Radiations

- Source: Sunlight, arc lamps.
 - **Absorbed by glass, pass through quartz.**
 - Causes **fluorescence** and **skin hazards**.
 - **Uses:**
 - Sterilization
 - Detecting purity
 - Vitamin D production
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◆ 8. Infrared (IR) Radiations

- Source: Hot bodies, filament lamps.
 - Detected via **heat sensors**.
 - **Penetrates fog**, used in **night photography**.
 - **Uses:**
 - Therapeutic applications
 - Remote controls
 - Military communication
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◆ 9. Scattering of Light

- Discovered by **Rayleigh**.
 - **Scattering**: Light absorbed and re-emitted by particles in the atmosphere.
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◆ 10. Applications of Scattering

1. **Red Sun** at sunrise/sunset: Red scattered least.
 2. **White sky at noon**: Minimal scattering.
 3. **Blue sky**: Blue scattered more.
 4. **Black sky on Moon**: No atmosphere → no scattering.
 5. **White clouds**: All colours scattered equally.
 6. **Red light in signals**: Least scattering → longest visibility.
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