

Notes on Wave

1. Wave Definition:

- A wave is a disturbance that travels through space, transferring energy without transporting matter. Light exhibits wave-like properties.

2. Optical Medium:

- An optical medium is a material through which light can travel. It can be transparent, translucent, or opaque.

3. Optics:

- Optics is the branch of physics that studies the behavior and properties of light. It includes the study of reflection, refraction, dispersion, and the nature of light.

4. Source of Light:

- Objects that emit light are sources of light. Examples include the Sun, stars, and light bulbs.

5. Self-Luminous Sources:

- Objects that produce their own light, like the Sun and stars.

6. Non-Luminous Source:

- Objects that do not produce their own light but can reflect light, like the Moon.

7. Refraction of Light:

- The bending of light as it passes from one medium to another.

8. Denser and Rarer Medium:

- Denser medium: A medium through which light travels more slowly.

- Rarer medium: A medium through which light travels faster.

9. Law of Refraction:

- The angle of incidence is related to the angle of refraction by Snell's Law $n_1 \sin \theta_1 = n_2 \sin \theta_2$

10. Causes of Refraction:

- Change in the speed of light when it passes from one medium to another.

11. Refractive Index:

- A measure of how much a medium can bend light. It is the ratio of the speed of light in a vacuum to the speed of light in the medium.

12. Lateral Shift:

- The lateral displacement of a ray of light when it passes through a transparent medium at an angle.

13. Real and Apparent Depth:

- Real depth is the actual distance, while apparent depth is the distance as perceived due to refraction.

14. Effect of Refraction of Light:

- Lens formation, magnification, and distortion of images.

15. Total Internal Reflection:

- The complete reflection of light at the boundary between two media when the angle of incidence exceeds the critical angle.

16. Conditions for Total Internal Reflection:

- Light must travel from a denser medium to a rarer medium, and the angle of incidence must be greater than the critical angle.

17. Critical Angle:

- The angle of incidence that produces an angle of refraction of 90 degrees.

18. Effect of Total Internal Reflection:

- Optical fiber communication, mirages.

19. Applications of Total Internal Reflection:

- Fiber optics, prism binoculars, and diamond sparkle.

20. Dispersion of Light:

- The separation of light into its constituent colors based on their different wavelengths.

21. Causes of Dispersion:

- Variation in the speed of light in a medium with different colors.

22. Recombination of Spectrum of Light:

- When dispersed light is passed through another prism, the original white light spectrum is reformed.

23. Effect of Dispersion:

- Rainbow formation, chromatic aberration correction in lenses.