□ Chapter: Refraction of Light

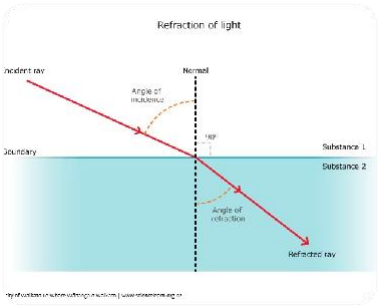
□ 1□ What is Refraction of Light?

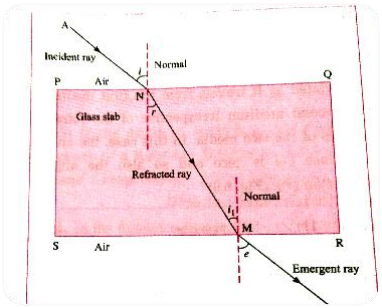
Refraction is the bending of light when it travels from one medium to another due to change in speed.

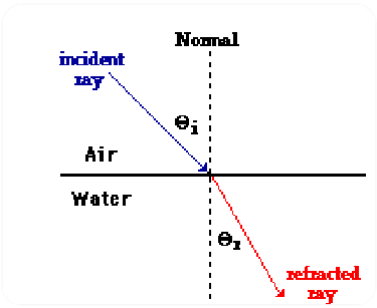
Example:

- Light bending in water
- Pencil appearing bent in water
- Swimming pool appearing shallow

□ Refraction Diagram (Concept Understanding)







✨ 2□ Why Refraction Happens?

Refraction happens because:

- Speed of light changes in different media
- Light travels fastest in vacuum
- Slower in water and glass

When speed changes → direction changes → bending occurs.

3 Laws of Refraction (Very Important ⭐)

Law 1:

The incident ray, refracted ray, and normal lie in the same plane.

Law 2 (Snell's Law):

$$\frac{\sin i}{\sin r} = constant$$

This constant is called **Refractive Index**.

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4 Refractive Index

Definition:

Refractive index of a medium is the ratio of speed of light in vacuum to speed of light in that medium.

Formula:

$$n = \frac{c}{v}$$

Where:

- n = refractive index
- c = speed of light in vacuum
- v = speed of light in medium

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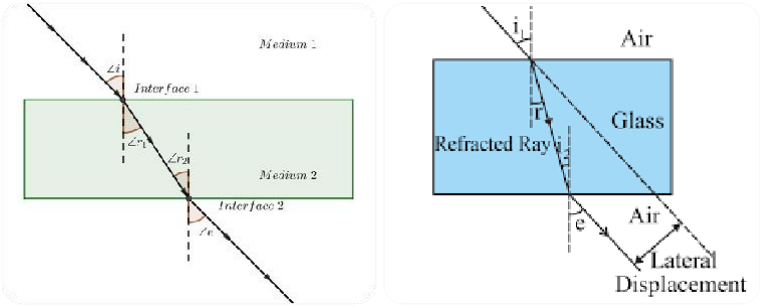
5 Refraction Through Glass Slab

Observations:

- Light bends when entering glass
- Travels straight inside
- Bends again when leaving
- Emergent ray parallel to incident ray

□ Glass Slab Diagram



□ 6□ Lateral Displacement

Definition:

Sideways shift of light when passing through glass slab.

Depends on:

- Thickness of slab
- Angle of incidence
- Refractive index

□ 7□ Refraction in Daily Life (Applications)

Examples:

- Spectacles
- Cameras
- Microscopes
- Telescopes
- Human eye

□ 8□ Real Life Phenomena Due to Refraction

☆ Twinkling of Stars

Due to refraction in atmosphere.

☆ Pool Appears Shallow

Due to bending of light from water to air.

☆ Sunrise Seen Earlier

Due to atmospheric refraction.

□ 9□ Important Concepts to Remember

✔ Light bends **towards normal** → When entering denser medium

✔ Refractive index decides bending amount

□ □ Important 2 Mark Questions

1. Define refraction of light.
2. State laws of refraction.
3. Define refractive index.
4. What is lateral displacement?

□ Important 3 Mark Questions

1. Explain refraction through glass slab.
2. Explain refractive index with formula.
3. Why does swimming pool appear shallow?

Q -Explain laws of refraction of light.

Refraction is bending of light when it travels from one medium to another.

First Law:

Incident ray, refracted ray and normal lie in same plane.

Second Law:

Ratio of sine of angle of incidence to sine of angle of refraction is constant.

$$\frac{\sin i}{\sin r} = constant$$

This constant is refractive index of medium.

Thus laws of refraction explain bending of light.

□ Numerical Concept (Basic Level)

If refractive index = 1.5

Speed of light = 3×10^8 m/s

Find speed in medium:

$$v = \frac{c}{n} = \frac{3 \times 10^8}{1.5} = 2 \times 10^8 \ m/s$$

☆ Exam Tips

✔ Draw neat ray diagrams

✔ Write laws word-to-word

✔ Use formula box in numericals

✔ Mention units in answers

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