

Physics

Activity 4 – Total Internal Reflection

Chapter – Human Eye & the Colorful World

Class: X

Duration: 15 minutes

Nature of activity: Group

Learning Outcome: Students will be able to demonstrate the phenomenon of total internal reflection of light as it incidents at glass-water interface at a particular angle.

What we have to do?

To demonstrate that when a ray of light is incident at the glass-water surface at a particular angle, then it reflects within the medium rather getting transmitted.

What do we require?

A trough, green laser light, water.

What do we need to know?

Total internal reflection is the phenomenon which occurs when a propagated ray of light strikes a medium boundary at an angle larger than a particular critical angle with respect to the normal to the surface. If the refractive index is lower on the other side of the boundary and the incident angle is greater than the critical angle, the ray cannot pass through and is entirely reflected. The critical angle is the angle of incidence above which the total internal reflection occurs. This is particularly common as an optical phenomenon, where light waves are involved.

How will you proceed?

- **Teacher's Activity**

Teacher will ask students to recall the phenomenon of refraction and also guide students on how to perform the activity.

- **Student's Activity**

- Point green laser light towards the water solution.
- Now keep on changing the angle of incidence (with respect to vertical) slowly and observe what happens to the beam of light.

What have you observed?

S.No	Angle of incidence	Phenomenon taking place – Reflection/Refraction

What have you learned?

Total Internal Reflection of a ray of light is a phenomenon in which

What more can we do?

Extended activities/experiments : -

- Replace the water by some other transparent liquid (glycerine/vegetable oil)
 - i. find out the angle at which the total internal reflection takes place (critical angle).
 - ii. compare the value of this angle with the angle obtained at water-glass interface.
 - iii. hence conclude the dependance of critical angle on the relative refractive index.

Extended Worksheet

1. What is the importance of the angle of incidence to observe the phenomenon of total internal reflection?
2. How should the ray of light travel: - from rarer to denser or from denser to rarer in order to observe the phenomenon of total internal reflection?
3. Discuss how the phenomenon of total internal reflection contributed to sparkling of diamond.
4. In deserts mirage formation takes place on account of Total Internal Reflection. illustrate this statement with the help of a diagram.
5. Total Internal Reflection is a critical step in the formation of rainbow. Support the answer by giving reason.

