

Physics

Activity 3 – Refractive Index

Chapter – Light

Class: X

Duration: 15 minutes

Nature of activity: Group

Learning Outcome: Students will be able to illustrate that there is no refraction taking place when a ray of light passes from one medium to another having similar refractive indices.

What we have to do?

To demonstrate that a ray of light passes straight through two media having similar refractive indices making one of the media invisible.

What do we require?

Vegetable oil, large borosil beaker, smaller borosil beaker.

What do we need to know?

Refraction is the phenomenon of bending of light as it passes through one medium to another where both the media have different optical densities which is measured in terms of Refractive index. A ray of light bends towards the normal as it passes from a medium of low refractive index (rarer) to a medium of higher refractive index (denser). It further means that if two media have similar or equal refractive indices then the light ray will pass straight through them. Hence the media will seemingly merge or one of the medium will actually become invisible!!

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**

- Place the smaller beaker inside the larger beaker and observe if both the beakers are visible.
- Now remove the smaller beaker and fill the larger beaker with vegetable oil up to $\frac{3}{4}$ th of its height.
- Immerse the smaller beaker inside the larger beaker filled with vegetable oil and observe if the smaller beaker is visible.

What have you observed?

S.No	Smaller beaker is visible when oil was not filled in larger beaker (YES/NO)	Smaller beaker when oil was filled in larger beaker (YES/NO)
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What have you learned?

Refraction of a ray of light is due to the difference in _____ of two media and if this difference is negligible then the ray of light passes _____ through both the media.

What more can we do?

1. Suggest an experiment to find out the refractive index of vegetable oil as well as glass beaker.
2. Experimentally find out "if vegetable oil is replaced by glycerin then will you see the same result as in the above activity"?

Extended Worksheet

1. Define absolute refractive index of a medium.
2. How is refractive index of a medium related to optical density of that medium?
3. Is optical density same as mass density? Support your answer by giving example.
4. If the speed of light is 2×10^8 m/s in a medium then calculate the absolute refractive index of that medium. Given that speed of light in vacuum/air is 3×10^8 m/s.
5. Draw the path of a ray of light as it passes from AIR – WATER- DIAMOND- GLASS-AIR.