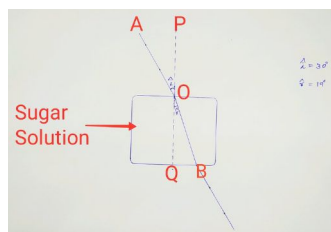


STEP 9 - CALCULATING REFRACTIVE INDEX OF SUGAR SOLUTION (80%)



Angle of Incidence $\hat{i} = 30^\circ$

Angle of Refraction $\hat{r} = 19^\circ$

$$\text{Snell's Law : } \frac{n_2}{n_1} = \frac{\sin i}{\sin r}$$
$$n_1 \approx \text{Air medium} = \frac{\sin 30^\circ}{\sin 19^\circ}$$
$$n_2 \text{ Sugar Solution (80\%)} = 1.53$$

The Refractive Index of Sugar Solution (80%) with Respect to Air is 1.53

1. Dissolve 80 g of sugar in 100 ml of water to get 80 % sugar solution.
2. Repeat the steps with sugar solution filled in the container.

TROUBLESHOOTING

1. Not getting required value (refractive index) - Ensure to draw the container's outline correctly and later, place the container containing water within the outline.
2. Difficulty in getting the angle of refraction - All 4 pins should be positioned, such that they are in straight line.
3. Noting the angles - While measuring the angle, count from the 0° line (OP) for incident angle and (OQ) for refractive angle.

For more information www.tactivity.in

ThinkTac

SNELL'S LAW

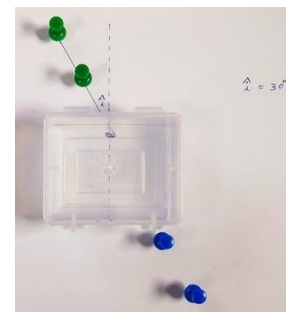


TOOLS

1. Ruler
2. Protractor
3. Pen

PARTS

1. A4 Size Sheet
2. Cardboard
3. Cup of Water
4. Board pin
5. Transparent Container
6. Cup of Glycerine
7. Cup of Sugar Solution



INTRODUCTION

Light experiences refraction or bending when it travels from one medium to another medium. In this TACTivity, we simulate the incident ray and the refracted ray through different mediums and calculate the refractive index of each medium, using Snell's law.

STEP 1 - PREPARING THE CARDBOARD



1. Take a piece of A4 sized cardboard and place it on a flat surface.
2. Take an A4 sized sheet of plain paper and attach it to the cardboard using clear tape.

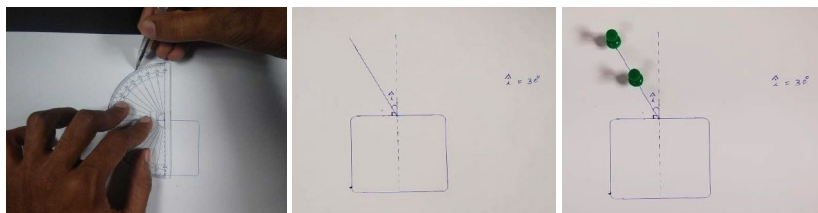
STEP 2 - TRACING THE CONTAINER'S OUTLINE



1. Take a transparent container having a rectangular shape.
[The dimension of the container used here is 5 cm X 6.5 cm]
2. Place the rectangular container at the centre of the cardboard and trace its outline.

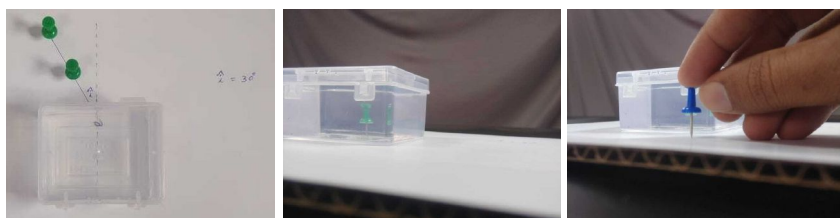
- Now, draw a line at the centre of the cardboard, perpendicular to the longer side and parallel to the shorter side of the traced outline. Let us call this line as normal line 'PQ' and the intersection point as the origin 'O'

STEP 3 - DRAWING THE INCIDENT RAY



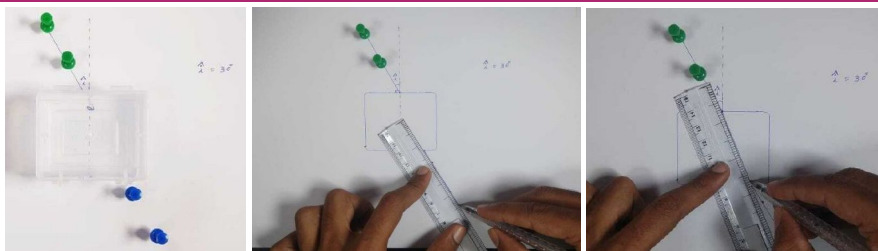
- Place a protractor on the normal line and draw a line at an angle of your choice. This will be the incident line.
[Here we have drawn a line at an angle of 30 degrees from the normal]
- So, the angle of incidence is 30 degrees.
- Now, pierce two board pins on the incident line.

STEP 4 - DRAWING THE REFRACTED RAY I



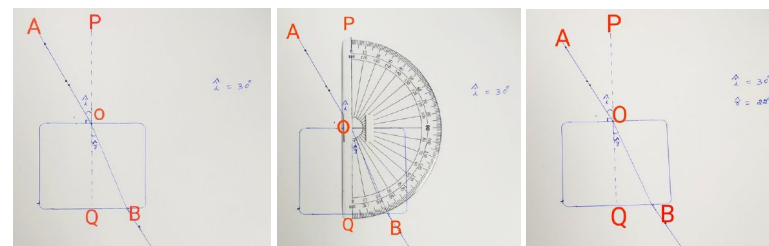
- Fill the container with water and place it within the outline.
[Make sure that the container is placed within the outline, else it may create some errors]
- Look through the container such that the image of the two board pins merge into one.
[While aligning the pins ensure that your eyes are at the level of the pins]
- Take two more board pins and pierce them in the cardboard such that all 4 pins are in straight line.

STEP 5 - DRAWING THE REFRACTED RAY II



- Remove the container and board pins from the cardboard.
- Draw a line with the help of a ruler by joining the two marks made by the board pins.
- Extend the line to the lower outline of the container. Mark the intersection as 'B'.
- Now, join the two intersection points on either side of the outline.

STEP 6 - MEASURING THE ANGLE OF REFRACTION



- Now, the angle of incidence 'AOP' is 30 degrees.
- Measure the angle of refraction 'BOQ' with the help of a protractor.
- The angle of refraction 'BOQ' is 22 degrees.

STEP 7 - CALCULATING REFRACTIVE INDEX OF WATER

$$\text{Angle of Incidence } \hat{i} = 30^\circ$$

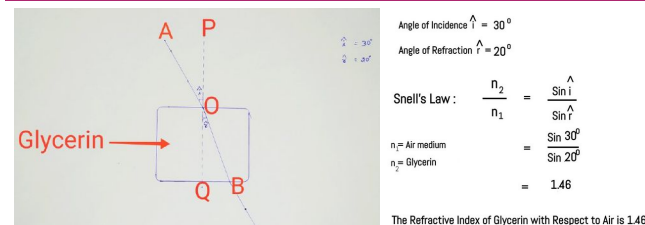
$$\text{Angle of Refraction } \hat{r} = 22^\circ$$

$$\begin{aligned} \text{Snell's Law : } \frac{n_2}{n_1} &= \frac{\sin \hat{i}}{\sin \hat{r}} \\ n_1 &= \text{Air medium} \\ n_2 &= \text{Water medium} \\ &= \frac{\sin 30^\circ}{\sin 22^\circ} \\ &= 1.334 \end{aligned}$$

The Refractive Index of Water with Respect to Air is 1.334

- Calculating refractive index of water using Snell's Law.

STEP 8 - CALCULATING REFRACTIVE INDEX OF GLYCERIN



- Use glycerin instead of water to calculate refractive index of glycerin.
- Repeat the steps with Glycerin filled in the container.