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### Exp.7 - TOTAL INTERNAL REFLECTION- B

**Aim:** To determine the refractive index of a given mystery material medium using a simulation tool through gradient method.

**Online simulation link:** [https://phet.colorado.edu/sims/html/bending-light/latest/bending-light\\_en.html](https://phet.colorado.edu/sims/html/bending-light/latest/bending-light_en.html)

#### PROCEDURE:

1. Go to simulation, Choose 'Intro'. Change the material of the first (incident) medium to 'Mystery B' and the second medium to Glass ( $n=1.50$ ).
2. Change the angle of incident  $\theta_i$  and record six sets of angles of refraction  $\theta_r$ , calculate  $\sin(\theta_i)$  and  $\sin(\theta_r)$  in the below table.
3. Plot a graph of  $\sin(\theta_i)$  on the y-axis and  $\sin(\theta_r)$  on the x-axis.
4. Find the slope (gradient) of the plotted graph.
5. Calculate the refractive index of mystery material ( $n_1$ ) using the given formula.

$\theta_i (^{\circ})$	$\theta_r (^{\circ})$	$\sin(\theta_i)$	$\sin(\theta_r)$
10	11	0.17364	0.19080
15	12	0.25881	0.207911
20	16	0.342020	0.275637
25	22	0.42261	0.37460
30	27	0.5	0.45399
35	31	0.57357	0.51503

**Calculations:**

$$n_1 = \frac{n_2}{\text{Slope (Gradient)}} = \dots \dots \frac{1.5}{1.108839} = 1.35276593$$

**Result:** The refractive index of the mystery material B is found to be = 1.35276593

The name of the mystery material B is (refer the below table) =

**Note:** Students are instructed to use excel or Python for calculations and graph plotting. Submit the filled (manually) worksheet along with Excel/Python file in LMS for evaluation.