ACTIVITY NO. 2: Reflection and Refraction of light

1. Objective: To verify laws of reflection and refraction of light.
2. Materials:

PhET Simulation on Resonance

Laptop

Activity sheet

Pen

1. Procedure:
	1. Open the PhET Simulation on “Bending Light” distributed last week.
	2. Click the tab “More Tools”. Explore the sim and play around with its functionalities.



* 1. Activity proper:

PART I. ***Definitions***

* + 1. Turn on the light source. Refer to Figure 1 below and identify the rays based on the definitions below:
1. Incident ray – is the light ray coming directly from the source.
2. Reflected ray – is the light ray that bounces back to the 1st material once it hits the boundary of the 2nd material.
3. Refracted ray – is the light ray that passes through and bends towards the Normal line as it hits the 2nd material.



Figure 1. Light rays

PART II. ***Law of Reflection***

1. Place the center of the protractor at the intersection of the Normal line and boundary of the two materials.
2. Set material #1 as air and material #2 as water. Record the index of refraction of the two (2) materials below.

Table . Index of Refraction of different materials

|  |  |  |
| --- | --- | --- |
| Material | Name | Index of refraction (*n*) |
| 1 |  |  |
| 2 |  |  |

1. Turn on the light source and move it so that the incident ray will have a reading of 300 from the Normal line.
2. Identify the angle of *reflected ray* from the Normal line and record it in Table #2.
3. Now, move the light source to change the angle of incidence of your own choice. Record the angle of incident ray and reflected ray in Table #2 along reading #2.

Table 2. Angle of reflected ray

|  |  |  |
| --- | --- | --- |
| Readings | Angle of incident ray | Angle of reflected ray |
| 1 | 300 |  |
| 2 |  |  |

1. *Guide Question:* From Table #2, what do you notice about the angle of incident ray and angle of reflected ray from the two (2) readings?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. *Guided conclusion:* The Law of Reflection states that the angle of incident ray is \_\_\_\_\_\_\_\_\_\_\_\_ to the angle of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

PART III. ***Law of Refraction (Snell’s Law)***

1. Place the center of the protractor at the intersection of the Normal line and boundary of the two materials.
2. Set material #1 as air and material #2 as water. Record the index of refraction of the two (2) materials below.

Table 3. Index of refraction of different materials

|  |  |  |
| --- | --- | --- |
| Material | Name | Index of refraction (*n*) |
| 1 |  | *nA* =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 2 |  | *nB* =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

1. Turn on the light source and move it so that the incident ray will have a reading of 300 from the Normal line.
2. Identify the angle of *refracted ray* from the Normal line and record it in Table #4.
3. Now, move the light source to change the angle of incidence of your own choice. Record the angle of incident ray and refracted ray in Table #4 along reading #2.

Table 4. Angle of refracted ray

|  |  |  |
| --- | --- | --- |
| Readings | Angle of incident ray | Angle of refracted ray |
| 1 | *θA* = 300 | *θB* = |
| 2 | *θB* = | *θB* = |

1. From your results in Table 3, compute the inverse ratio of the indexes of refraction and record it on Table #5 below.
2. From your results in Table #4, compute the ratio of the sines of the angles *θA* and *θB* and record it on Table #5 below.

Table 5. Ratio of indexes of refraction and sines of the angles *θA* and *θB.*

|  |  |  |
| --- | --- | --- |
| Readings | $$\frac{n\_{B}}{n\_{A}}$$ | $$\frac{sinθ\_{A}}{sinθ\_{B}}$$ |
| 1 |  |  |
| 2 |  |  |

1. *Guide Question:* From your results in Table 5, what do you notice about inverse ratio of the indexes of refraction and ratio of the sines of the angles *θA and θB*? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. *Guided Conclusion:* Snell’s Law states that inverse ratio of the indexes of refraction is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the ratio of the sines of the angles *θA and θB*.