**HPS – Reflection/Refraction Lab**

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period\_\_\_\_\_\_\_\_\_\_

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| I can… |
| *Define wave behavior.**Calculate Index of refraction.**Describe interactions of light at wave boundaries.* |

* ***Go to shakerscience.weebly.com***
* ***Mouseover “Honors” then click “Unit 6”***
* ***Scroll down all the way to Week 5***
* ***Click “Reflection Refraction Phet Lab”***


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| ***Part A – Speed of Light*** |
| 1. Select “Wave” in the top left corner. Move the light source to make an angle of incidence between 50° & 60°. Press the laser’s button. Sketch an outline of what occurs.
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| 1. Select “Angles”. What is the **incident angle** (original laser), the **reflected angle** (the lighter beam bouncing off the water) and the **refracted angle** (the bent beam going into the water)?
 | Incident\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Reflected\_\_\_\_\_\_\_\_\_\_\_\_\_\_Refracted\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1. What do you notice about the reflected and the incident angles? Explain why this occurs.
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| 1. Describe how the **refracted** angle differs and explain WHY.
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| 1. Grab the **green Intensity** tool.

Place the viewer over the incident ray and record the value, then record the intensity of the refracted ray.WHY do you think they differthe way they do? | Incident:\_\_\_\_\_\_\_\_\_\_\_%Refracted:\_\_\_\_\_\_\_\_\_\_\_%They differ this way because… |
| 1. Now, place the intensity reader on the reflected ray. WHY do you think they differthe way they do?
 | Incident:\_\_\_\_\_\_\_\_\_\_\_%Reflected:\_\_\_\_\_\_\_\_\_\_\_%They differ this way because… |
| 1. Check your notes: what part of the wave (frequency, amplitude, or wavelength) is the intensity **AND** what does that mean for a light wave?
 |  |
| 1. Move the **green Intensity** tool away. Grab the blue **Graphing** tool. Place one viewer on the incident ray and one on the **reflected** ray.

SKETCH what you see.  |  |
| 1. Does the frequency differ, if so how?
 |  |
| 1. Does the amplitude differ, if so how?
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| 1. Leave one viewer on the incident ray and move the other to the **refracted** ray. SKETCH what you see.
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| 1. Describe what you notice.
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| 1. Take the **orange Speed** tool. Record the speed of the incident, reflected, and refracted ray.
 | Incident:\_\_\_\_\_\_\_\_\_\_\_c (m/s)Reflected:\_\_\_\_\_\_\_\_\_\_\_c (m/s)Refracted:\_\_\_\_\_\_\_\_\_\_\_c (m/s) |
| 1. Using c as 300,000,000m/s, calculate the speed of light of each ray.
 | Incident:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m/sReflected:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m/sRefracted:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m/s |
| 1. Why is the speed of the incident and reflected ray the same?
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| 1. Why is the speed of the refracted ray in water is less?
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| 1. Leave everything the same, but change the Material to “Water”. Describe what you notice and give an explanation.
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| 1. Change the second medium to Mystery A. Write a procedure to solve for the *n*, index of refraction.
 |  |
| 1. What is the index of refraction (*n)?* Use the internet to look up what Mystery A could be.
 | n = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Mystery A is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1. Do the same for Mystery B.
 | n = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Mystery B is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1. Look up the refractive index of sapphire. Then, solve for the speed of light in a sapphire. Use the formula from your notes.
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| 1. Click the “Prisms” tab.  Select a triangle glass prism.Select the multiple beam laser. Turn on the laser and allow it to refract through the prism. Describe your observations of the 2 instances of refraction.
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| 1. Toggle to orange, then yellow, then green, blue, then violet. What do you notice about the refraction?
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| 1. Seeing this, what relationship can you draw between wavelength of light and refraction?
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| 1. Select the white light. Why can you produce a rainbow?
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