Team Physics 312
Activity 8B
Date: ___________

Name: ___________________________

Table/Team: _________________________

Reflection and Refraction Applets

1. Reflection:
Go to: `http://micro.magnet.fsu.edu/primer/java/scienceopticsu/reflection/`

What do you notice about what happens when you change the angle of incidence?

What do you notice about what happens when you change the wavelength?

2. Refraction:
(a) Go to: `http://micro.magnet.fsu.edu/primer/java/scienceopticsu/refraction/`

When the applet begins, it shows white light passing through a prism. **Begin by switching to monochromatic light** = light of one color (one wavelength).

What do you notice about what happens when you change the angle of incidence?

What do you notice about what happens when you change the wavelength? Pay attention to the numbers too!

What do you notice about what happens when you change materials? How does refraction (the amount the light is bent) vary with n?

Now change back to **white light**, and explore **dispersion**. Note the dispersion = different angles for different colors (or wavelengths or frequencies).

How does the dispersion change if you switch from ice --> crown glass --> diamond --> lead sulfide? [Each material has a number next to it which is its value of n = the index of refraction.] How does dispersion seem to vary with n?

What do you notice about what happens to the dispersion when you change the angle of incidence? Be certain to look at 0˚.

(b) Go to: `http://www.phy.ntnu.edu.tw/ntnujava/index.php?topic=16`

How does the speed of the wave front vary from one material to the other? How does it depend on the index of refraction? Note: $n_{air} = 1$.

How must the frequency of the light in one medium compare to its frequency in another?

Slow the animation down enough so you can see the individual wavefronts being emitted as the light hits the boundary. This is Huygen's model of how light propagates. How does the wavelength in air compare to the wavelength in diamond (or glass or water)?

Why does the wavelength change in this way?

Index of refraction, n, is defined as the ratio of the speed of light in vacuum, c, to the speed of light in the material, v: $n = c / v$

Does this help explain why light does not change angle on reflection, but does change angle on refraction (= transmission)?

TIR = total internal reflection

Choose one of the situations where n2/n1 < 1. What happens to the angle of refraction?

Change the angle of incidence and look for the "critical angle" of incidence, the first angle at which there is no transmitted light. How does this change as you change the ratio of n2/n1? What is the refracted angle when the incident angle is the critical angle?

You have encountered Snell's law:

$n_1 \sin \theta_1 = n_2 \sin \theta_2$ where 1 = incident and 2 = transmitted.

What should the value of the critical angle be for one case you looked at above?

Go to: `http://fysikk.hfk.vgs.no/Refleksj/flashLight.htm` for a look at T.I.R.

Everybody likes rainbows: http://www.atoptics.co.uk/bows.htm