Name:_____

Refraction Phenomena including Total Internal Reflection

SNC2D

Figure 2

Refraction effects produce a number of interesting observable phenomena. . . .

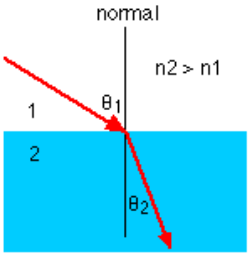
E.g. objects in water may appear to be _____:

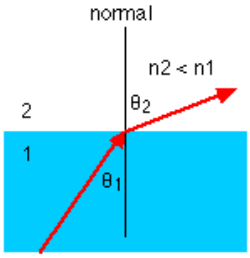
If we look at an object in a different medium, we will see an _____ of the object along the _____ of the rays that are _____ to us.

Similarly, an object underwater will appear to be at a different depth than its actual depth:

But more interesting than the refraction of light rays is the _____ of light rays to refract. . . .

Recall that if a ray is travelling from a less dense material to a more-dense material, it will bend _____ the normal and if travelling from a more-dense material to a less-dense material it will bend _____:





Snell's law : $n_1 \sin\theta_1 = n_2 \sin\theta_2$ or, equivalently, $\sin\theta_1 / \sin\theta_2 = v_1 / v_2$

So for the case of the ray travelling from the _____-dense material to the _____-dense material, there must exist some _____ incident angle θ_c such that the ray will refract at _____ from the normal (along the boundary).

Sketch:

If the light is incident at an angle larger than this critical angle θ_c, _____

will occur.

Example: When light is travelling through glass into air, the total internal reflection will occur at a critical angle of 42°. Find the index of refraction of the glass.

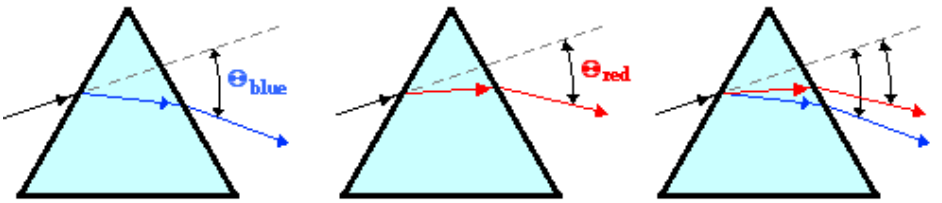
Applications:

_____ are based entirely on the principle of TIR. These are flexible strands of _____. With a straight or smoothly bending fibre, the light will hit the wall at an angle higher than the critical angle and will all be reflected back into the fibre so that no light will be lost.

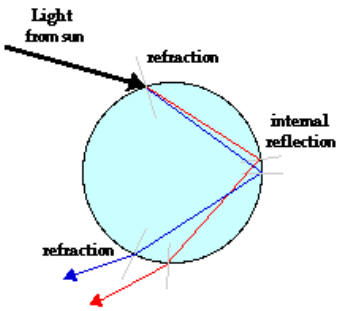
Air of different _____ will have different *n*s and light rays can reflect within the air, resulting in _____ and _____.

Different frequencies (_____) of light actually refract at different _____.

This is called _____ and is especially apparent when white light is passed through a _____.



Blue light refracts more than red light due to the difference in wavelength. This causes blue light to deviate from its original path by a greater angle than the red light.



Dispersion *and* _____ can occur in _____,

which may result in _____.