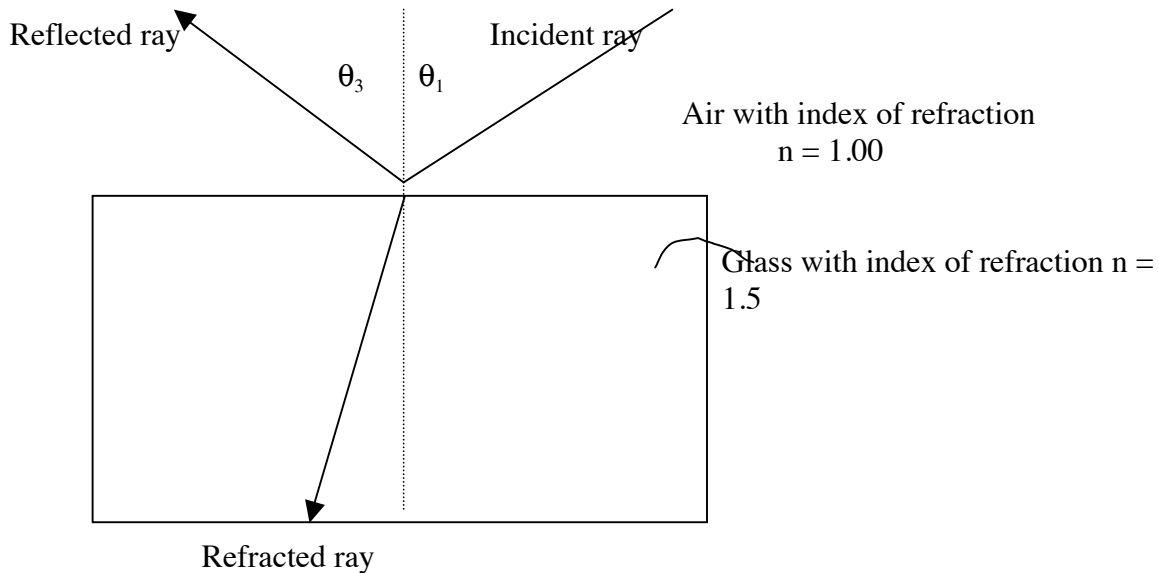


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Extra: Distinguish between reflection and refraction.



Ans. The reflected ray occurs when the incident ray bounces off the interface between the two media. The angle of incidence θ_1 equals the angle of reflection θ_3 . The refracted ray is the part of the wave that enters a medium that has a different index of refraction than the medium that it is coming from, and changes direction. The angle of refraction will be smaller than the angle of incidence if the second medium has a larger index of refraction than the first. All three ray paths in the diagram above are reversible.

4. What is the law of reflection?

Ans. When a wave reflects off of a smooth surface, the angle of incidence equals the angle of reflection.

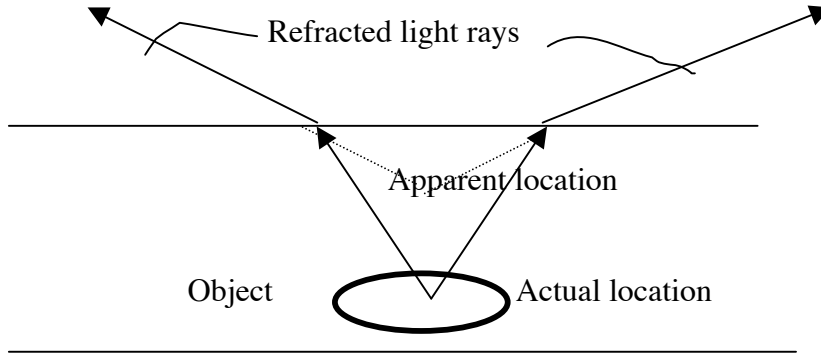
5. Relative to the distance of an object in front of a plane, flat mirror (like the one in your bathroom), how far behind the mirror is the virtual image?

Ans. The virtual image is as far behind the mirror as the object is in front of it.

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11. What is a mirage?

Ans. When light passes media having different indices of refraction it changes direction. The change in direction will make objects appear to be located someplace where they are not. The apparent dislocation of an object caused by the refraction of light is called a mirage.

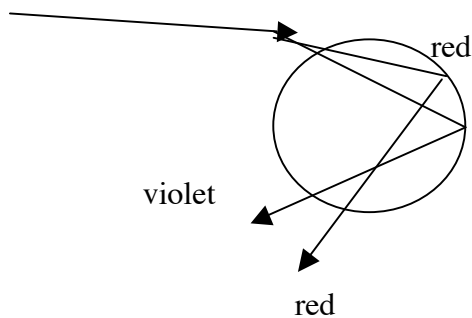


13. Does refraction make a swimming pool seem deeper or shallower than it really is?

Ans. Refraction makes objects appear closer to the surface than they actually are. The pool seems to be shallower than it really is. That can be dangerous for non-swimmers.

15. Does a single raindrop illuminated by sunlight deflect light of a single color or does it disperse a spectrum of colors?

Ans. A single raindrop disperses a rainbow of colors. Because the colors go in different directions, you only see one color at a time from a particular raindrop.

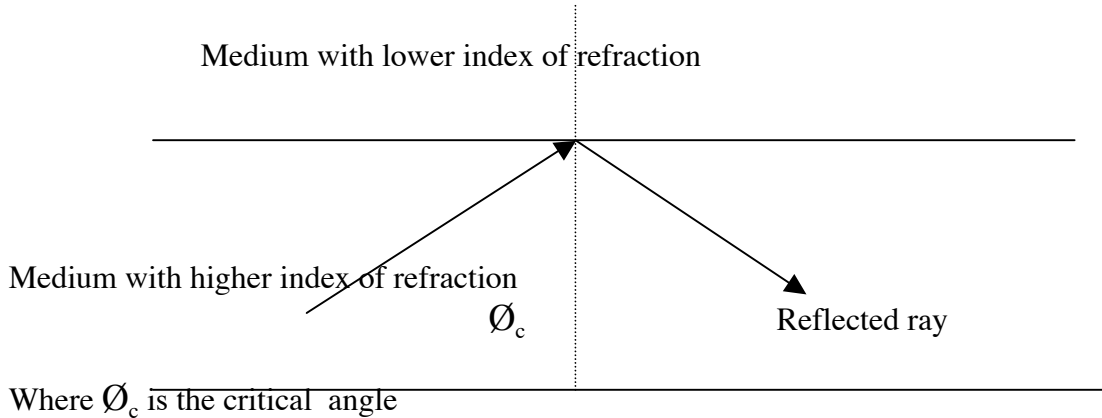


all other colors are in between the red and violet

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18. What is meant by critical angle?

Ans. The critical angle is the angle of incidence that results in an angle of refraction of 90° . When light moving from a medium of higher index of refraction to one of lower index of refraction strikes the interface at an angle equal to or larger than the critical angle, it will not exit in to new medium. Instead, all of the light is reflected back to the original medium. This is called total internal reflection.



20 Light normally travels in a straight line but it bends in an optical fiber. Explain why.

Ans. The fiber has a higher index of refraction than its surrounds. Light is sent down the fiber at an angle larger than the critical angle. The light then undergoes total internal reflection in the fiber as explained in question 24.

