

Real World Invisibility Demo Outline

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In this document, we will outline the steps necessary to set up a truly mind-blowing optics demo. Despite being very easy to set up and perform, this demonstration can be used to discuss several different topics relating to optics. To perform this demo, you will need:

- Vegetable Oil
- Pyrex Glass (most beakers in any Chemistry Lab)
 - Large, Clear container (any material)

Note: not all types of glass and not all types of oil will exhibit the same behavior. For the most consistent results, use the items listed here.

Begin by placing the Pyrex glass object in the large container. Have your students notice that we can still see the Pyrex glass within our larger container. This may seem like a trivial observation, however it will become important later on. Then, all that is left to do is begin pouring vegetable oil into the container until the Pyrex glass is completely submerged in vegetable oil. As you pour the vegetable oil into the container, the Pyrex glass appears to become invisible. When it is completely submerged, we cannot see the Pyrex glass at all!

This is because the two materials: Pyrex glass and Vegetable oil, have the same index of refraction (approximately $n=1.47$). In other words, light does not “notice” the fact that it is travelling through two different mediums, therefore light does not reflect back towards us or refract when it encounters the Pyrex glass. This is why we are not able to see the Pyrex glass. By Snell’s Law.

$$n_1 \sin(\theta_1) = n_2 \sin(\theta_2)$$

So, the index of refraction will cancel out on both sides and we conclude that the light leaves the medium at the same angle it enters the medium. The angle of incidence and angle of refraction are equal.

Use this demonstration to have conversations with students about reflection, refraction, and the nature of light. Ask students if they know what it means to “see” things (light travelling from an object to our eyes). See if they can explain what is going on using their knowledge of optics!

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Enjoy!