

Interactive Notes-“Light and Water”

Materials (per group of 2 students):

Demo 1	1-opaque or other cup that cannot be seen through 1-penny 1-large beaker (600-ml ideal) ½ full of water
Demo 2	<i>(penny & beaker again)</i>
Demo 3	1-pen or pencil
Demo 4	1-“Physics!” sign with red and green letters 1-small Erlenmeyer flask with just enough red-colored water to cover the bottom of it 1-red and green colored pencil (optional)
...and	4-note sheets Towels to clean up spills with

*red food coloring for demo #4

Additionally- PowerPoint

Normally these demonstrations are done in groups of 4 students. But today’s demonstrations are all so simple and quick they can be done in pairs. This also gives each student more opportunity to do more hands-on learning.

Beforehand:

- Put the red colored water in the Erlenmeyer flasks.
- Set out all materials *the day before*. Leave yourself time to realize you’re missing something, and to practice a new demonstration, research something or even make a change. In the morning, read through the slides and notes one last time. Relax and have fun along with your students. Remember- you’re only as effective as your plan.
- Insert page and paragraph numbers from relevant pages in your textbook at the bottom of slides 1 and 2 if you choose to have the class read from it together. This is a good way to connect with your textbook as well as transition into the next demo. You can also delete these page inserts, or Copy and Paste them onto later slides if needed.
- Print extra copies of the notes pages on paper for yourself, students that are slow writers or can’t see well, and for absentees. Click “File” → “Print” → then where it says “Print what:” select “Handouts” → and then “OK”.
- As with any other demonstration, try these out ahead of time for yourself so you know how they work best and so you know what to expect.

Interactive Notes: Light & Water



Do: Placed a coin in bottom of cup just out of view. Added water.

See: The coin appeared slowly until it was completely visible!

What's Happening: Light bends (*refracts*) as it moves between water and air because it's changing speeds. Light moves through air at 186,000 mi/sec and through water at 140,000 mi/sec.

Read p. 1 together

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Students will do this in pairs. Student #1 is the “sitter” and the other the “pourer”. Tell the sitter to put the penny in the bottom of the cup and then, without moving their head, push the cup away until the penny is just barely out of sight. Then, while the sitter stays perfectly still, have the pourer pour water from a beaker *very slowly* into the cup, being careful not to slosh the penny around. As the cup fills, the penny will slowly appear!

Redo until it works. After it's successful, have them switch so the other can see the effect.

To help students understand refraction, have a volunteer walk across the classroom in a straight line. That represents a light ray moving through just one type of medium- like air, water, or glass. Then have the volunteer start across again, except this time when they're halfway across tell them to suddenly change direction, angling off. When they changed course it was like a light ray moving between 2 mediums of different densities, which causes bending of the light. Light bends when the medium it's going through changes. In this demonstration the person's head didn't move, but the light bent when it left the water and entered air.


A fun thought to go along with this- imagine yourself standing above a clear stream looking at fish. Are they really there, or are they ahead of or behind where they appear to be? If you were spear fishing, where would you throw the spear?

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Do: Placed a coin beneath a beaker. Added water. Looked through the side then across the top.

See: At first the penny disappeared. Then there were two.

What's Happening: Light is bending, and this time some of it *reflects* back into the water since it has a higher density than air.

Read p. 1 together



Do: Placed a pencil into water.

See: It separated and enlarged.

What's Happening: *Density* is a measure of how much "stuff" there is in a given space. Higher density slows light. The light is bending twice on its journey through the water, glass, and air.

Read p. 1 together




Do: Decoded a top-secret message with a red spyglass.

See: The red letters disappeared, and the green letters turned black.

What's Happening: The red letters blended in with the red water. The green was also absorbed into the red water, leaving behind a black silhouette.

Read p. 1 together

Clean Up



- Person 1** •Make sure all water is in the beakers
- Person 2** •Take pennies out of cups
- Person 3** •Count 4 new note sheets
- Person 4** •Do you materials look like they did at the beginning of class?

Blank space for notes or observations.

◆ Student Handout

Name: _____ Date: ____/____/____

Do: _____

See: _____


What's happening: _____

Do: _____

See: _____

What's happening: _____

◆ Drawings & Pictures

 Drawing-Decoder	 Drawing-Hidden Penny	 Drawing-Pencil In Water
 Drawing-Reflecting Penny	 Pic-Decoder	 Pic-Hidden Penny
 Pic-Pencil In Water	 Pic-Reflecting Penny	 Student Materials

◆ Sign for demo #4

PHYSICS!
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