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| **Part 1 Sand** | |
| **Introduction**  Soil can be examined for a variety of chemical and physical properties. In this lab you will solve a “mini-mystery” by observing chemical and magnetic properties of sand. | |
| [http://school.cengage.com/forensicscience/#](http://school.cengage.com/forensicscience/)   1. Open the site listed above. 2. Click on launch…this will open a new window. 3. Select Chapter 12. 4. Click on “Interactivity” in the right hand corner. 5. Simply follow the directions and answer the questions. | |
| Scenario: A body has been found by a busy highway…investigators have determined that this is a secondary crime scene. Your task is to analyze sand found on the victim to determine which of two beaches may be the primary crime scene. | |
| Complete the data table. | |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Beach Sand Sample** | **Sulfate Test**  **(white ppt)** | **Chloride Test**  **(white ppt)** | **Carbonate Test (CO2 bubbles)** | **Magnetic Particles** | | **Beach 1** |  |  |  |  | | **Beach 2** |  |  |  |  | | **Victim’s Shoes** |  |  |  |  | |
| Which beach is the primary crime scene? |  |
| In the classroom there are samples of sand from around the world. Choose 6 samples, look at them under a stereo microscope (the two-eyed kind) and describe them in these boxes. |  |
| **Part 2 Glass** | |
| **Introduction**  Glass is commonly found at crime scenes. In this lab you will perform a submersion test on glass fragments to estimate the refractive index of a glass fragment. | |
| [http://school.cengage.com/forensicscience/#](http://school.cengage.com/forensicscience/)   1. Open the site listed above. 2. Click on launch…this will open a new window. If asked, allow Flash. 3. Select Chapter 14. 4. Click on “Interactivity” in the right hand corner. 5. Simply follow the directions and answer the questions. This is a very simplistic activity but it does a good job of letting you see how this is done. | |
| Scenario: A student at a local high school stole the basketball trophy from the locked display case. The guard spotted him and gave his description. The police caught the boy and found small particles of glass embedded in the soles of his sneakers. Test the glass fragments found from the boy and match them with the crime scene glass using the submersion test. | |
| Follow the on screen directions. |  |
| Click next and complete the data table provided for the crime scene glass. | |  |  |  | | --- | --- | --- | | **Test Tube** | **Refractive Index** | **Visibility** | | **Methanol** |  |  | | **Water** |  |  | | **Isopropyl Alcohol** |  |  | | **Olive Oil** |  |  | | **Castor Oil** |  |  | |
| **Could the student be involved in the theft? Explain.** |  |
| **In the classroom there is a set up similar to the virtual lab. Go look at it.**  **Do you understand what is going on? If not, talk to another student and see if they can help.** |  |

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| **Introduction**  Refraction is the change in the direction of light as it speeds up or slows down when moving from one medium (substance) to another. Refractive index is another commonly used technique in forensics labs to help match glass and mineral from suspects, victims, and crime scenes. | |
| Use the following link for this part of the assignment. Click play, not download.  <https://phet.colorado.edu/en/simulation/bending-light>  If this one does not seem to work, you can try the older flash version:  <https://phet.colorado.edu/en/simulation/legacy/bending-light> | |
| When the simulator window opens, you should notice a laser pointing at a **45o angle downwards to the right**.Look to the right of the window and notice that the two information boxes are explaining the mediums that are shown on the screen. As you proceed through the lab, you will be guided what to do so you may answer the questions. | |
| Before changing any settings, what **2 mediums** are shown in the simulation window? |  |
| Click on the **RED** button on the laser. What **TWO** things does the light do as it hits the surface of the water? |  |
| On the bottom left side of the simulator window, you should notice that you have two tools available for you to use. Select the bottom tool that looks a bit like a **magnifying glass**. Move the tool into the **general water area**.  Take the **LENS** and drag it directly over the light coming from the laser **BEFORE** it hits the surface of the water. Notice you can measure the intensity of the light when the lens is placed over the beam. Fill in the table. | |  |  | | --- | --- | | **Laser pointed @ 45o angle from vertical** | | | **Location of Lens** | **Intensity of Light** | | Beam of light BEFORE it hits the surface of the water |  | | Beam of light in the water |  | | Beam of light being reflected off of the surface |  | |
| Now, select the protractor from the toolbox and position it so the 0 degree mark is centered on the dashed vertical line. Move the laser pointer so that you ***change*** the angle of incoming light. Adjust the laser point so that it is only **10o to the left of the zero mark or vertical dotted line**. Once the laser pointer is in this location, move the protractor tool back to the tool box and fill in the table again below using the lens. | |  |  | | --- | --- | | **Laser pointed @ 10o angle from vertical** | | | **Location of Lens** | **Intensity of Light** | | Beam of light BEFORE it hits the surface of the water |  | | Beam of light in the water |  | | Beam of light being reflected off of the surface |  | |
| Now, move the laser pointer so that you ***change*** the angle of incoming light again. Adjust the laser point so that it is **80o to the left of the zero mark or vertical dotted line**. Once the laser pointer is in this location, move the protractor tool back to the tool box and fill in the table again. | |  |  | | --- | --- | | **Laser pointed @ 80o angle from vertical** | | | **Location of Lens** | **Intensity of Light** | | Beam of light BEFORE it hits the surface of the water |  | | Beam of light in the water |  | | Beam of light being reflected off of the surface |  | |
| Return the laser back to 45 degrees. Change the material at the top to water. Explain what happens when the laser is shone through the ***same medium*** for both the top and the bottom portions of the simulator window. |  |