Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**RI of Glass by Submersion Lab**

**Directions:**

Determine the refractive index of glass by submersion in different liquids. The following tables are included as a reference.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Source of glass** |  |  | **Refractive Index** |  |  |
|  |  |  |  |  |
| Borosilicate glass |  | 1.47 |  |  |
| Automotive headlight glass |  | 1.47 – 1.49 |  |  |
| Television glass |  | 1.49 – 1.51 |  |  |
| Pane window glass |  | 1.49 – 1.51 |  |  |
| Bottle glass |  | 1.51 – 1.52 |  |  |
| Eyeglass lenses |  | 1.52 – 1.53 |  |  |
| Quartz glass |  | 1.54 – 1.55 |  |  |
| Lead glass |  | 1.56 – 1.61 |  |  |
| Cubic zirconium |  | 2.14 |  |  |
| Diamond |  | 2.42 |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Liquid** |  |  | **Refractive Index** |  |  |
|  |  |  |  |  |
| Cinnamon oil |  | 1.62 |  |  |
| Clove oil |  | 1.54 |  |  |
| Castor oil |  | 1.48 |  |  |
| Vegetable oil |  | 1.474 |  |  |
| Olive oil or glycerin |  | 1.47 |  |  |
| Isopropyl alcohol |  | 1.37 |  |  |
| Water or methanol |  | 1.33 |  |  |

**Materials:**

* 5 – 7 test tubes
* Test tube rack
* Test tube brush
* Tweezers
* Soap
* 25ml graduated cylinder

**Evidence Bags:**

Three evidence bags containing glass should be ready for your use.

**Instructions:**

1. Prepare the test tubes with about 10ml of the each of the above liquids (your teacher may have other liquids and you will be given their refractive indexes).
2. Test each piece of glass in each type of fluid with tweezers. The glass will seemingly disappear in the fluid that has a matching RI.
3. Use the matching RI to determine what type of glass your evidence is.

**Questions:**

1. Based on the results of your submersion test, record the estimated refractive indices for each of the glass fragments.

The Refractive Index (RI) of the Crime scene glass = \_\_\_\_\_\_\_\_

The Refractive Index (RI) of the glass from Suspect 1 = \_\_\_\_\_\_\_\_

The Refractive Index (RI) of the glass from Suspect 2 = \_\_\_\_\_\_\_\_

1. What would you consider to be some experimental errors using this method?
2. What could you do to improve the reliability of this experiment?
3. Is your match conclusive? Why or why not?
4. Why would glass from the crime scene matched to a suspect be considered class evidence?
5. Explain the refraction of light. Include in your answer the following:
	* Two different mediums
	* Light velocity
	* Density
6. A refractive index of olive oil is equal to 1.47. It is calculated as a ratio between what two numbers?