**COMET BAY COLLEGE**

**Physics - Unit 2 - Task 6**

**Laboratory Test**

**Name: Total Marks /49**

**10 minutes Reading and Writing time.**

**15 minutes to Collect Data from the Experiment**

**20 minutes to Finish the Report**

**Important:**

It is advisable that the Hypothesis, Variables, and Method Diagram, plus an idea on how to record your results be completed before starting your experiments. Also it is recommended that you read all the material on this sheet before beginning.

**Background**

Light slows down when passing through different transparent materials. The more it slows down, the more it bends when it hits a **medium** made of that material. **Snell’s Law of Refraction** shows the relationship between incidence and refraction angles and the **phase** velocities of the materials involved.

**Pre-Lab**

* Many materials have a well-characterised refractive index.
* Water is known to have a refractive index of 1.333, whereas Glycerol and Gelatine have refractive indices of 1.473 and 1.21, respectively. While air has a refractive index of 1.00277.
* The speed of light remains constant, but constant relative to the material it is passing through. In a vacuum this is 2.99792458 × 108 m s-1.
* The densities of Water, Glycerol and Gelatine are, 1.00 × 103 kg/m3, 1.26 × 103 kg/m3, 0.98 × 103 kg/m3, respectively
* **5 minutes to Run the Experiment**

**Aim:**

To determine the validity of Snell’s Law by comparing the relative angles of incidence and refraction of two different substances?

**Hypothesis: (5 marks)**

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**Variable: (3 marks)**

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**Apparatus (per group)**

|  |  |
| --- | --- |
| * Sheets of grid paper * Protractor * Ruler * Light Box | * Power Pack and Chords * Petri dish filled with Gelatine * Petri dish filled with Glycerol |

**Method (2 marks)**

1. Using the results sheet, place it flat in front of the light box.
2. Adjust the light in the light box until the sides of the light beam exit parallel.
3. Place the single slit cover over the light source.
4. Place one of the test materials on the sheet of paper, positioned in the circle.
5. Line up the light ray so it enters the petri dish at 20o, 35o and 50o to the normal.
6. Trace the outline of the beam of light onto the paper, starting from the light source and indicating the point where it enters and exits the petri dish. (Note: The entry point should be constant)
7. Measure the angle of incidence with the angle of refraction (see Figure 1).
8. Repeat for other test materials

Figure 1: Laboratory equipment set up

**Results: (16 marks)**

Refractive index of air is 1.00277

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Material | Practical θi | ±uncertainty | Practical θr | ±uncertainty | Theoretical θi | Refractive Index of Air | Refractive Index of Material | Theoretical θr |
| Gelatine | 20 |  | 13 |  | 20 | 1.00277 |  |  |
| Gelatine | 35 |  | 23 |  | 35 | 1.00277 |  |  |
| Gelatine | 50 |  |  |  | 50 | 1.00277 |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Material | Practical θi | ±uncertainty | Practical θr | ±uncertainty | Theoretical θi | Refractive Index of Air | Refractive Index of Material | Theoretical θr |
| Glycerol | 20 |  |  |  | 20 | 1.00277 |  |  |
| Glycerol | 35 |  |  |  | 35 | 1.00277 |  |  |
| Glycerol | 50 |  |  |  | 50 | 1.00277 |  |  |

Show working here for calculating the Theoretical Refractive Angle (θr)

**Results (this can be taken to the bench) Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Position front of Light Box somewhere in this region. Ensure the light beam intersects where the “Centre Line” meets the “Normal Line”.

Centre Line

Normal Line

**Graph:** (use the graph paper to graph all the practical data and the theoretical lines) **(8 marks)**

**Discussion: (10 marks)**

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**Conclusion: (5 marks)**

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