Experiment Design: Refraction of Acrylic In Water

1 Goal

Design an experiment to measure the angle of incidence and refraction for a beam of laser passing through the acrylic lens in water. (1) Use your data to deduce the refractive index of acrylic. (2) Find the critical angle for total internal reflection for the lens in water.

Try to go beyond the obvious method and create ways you can achieve as high precision and accuracy as possible.

2 Equipment

- Laser pointer
- Acrylic lens
- Transparent beakers
- Dyed water
- Any other items of your choosing from the physics stockroom

3 Setup

Describe your setup in details, preferably with diagrams.

4 Procedure

Describe (step by step, not in one big paragraph) how you collect the data. Specifically what physical quantities do you measure, and how? How many trials are there?

5 Data

Typically you organize all your data in the form of a table. Design a table based on the data your are planning to measure.

6 Analysis

How do your results compare with earlier experiments you did in air? Is the answer what you expect theoretically? How do you calculate the theoretical value? What is the percentage error? What additional ideas can you learn from the experiment?

7 Experimental Errors

Describe any possible experimental errors.

8 Improvements

If you have more sophisticated equipment or more time, how would you improve the experiment? Justify your answer by explaining how your suggestion could improve the precision.