

Formal Lab Assignment

Optical Spectroscopy

(Dated: April 8, 2008)

I. FORMAL LAB ASSIGNMENT

Below is the assigned topics to be covered in your formal lab report with the general point break down. Your lab report must cover each item else a significant portion of your points will be taken away.

There should be at least 2 citations in this paper covering the material at hand. Wikipedia is allowed but please be very careful in citing the web page. Please use MLA citation when doing this report.

HINT: your professor is a spectroscoper.

1. Abstract. (10 points)

2. Introduction: (20 points)

- (a) Give an introduction to waves that covers a basic description of what a wave is, and includes several different examples of waves (e.g. what are a few *different* kinds of waves that you can find?).
- (b) What is interference? Where can you see interference in every day life?

3. Theory: (30 points)

- (a) Reproduce the derivation of the interference equation done in class. Can you think of a better or different way to solve it?
- (b) It is clear that sound is a density wave traveling through air. This can be seen by different experiments other than interference (can you list any?). Based on the experiments from the interference of sound lab, what would the expected results for light then be if:
 - a): light was a particle.
 - b): light was a wave.
- (c) If we know that the speed of sound changes depending on what it is traveling through, what can we infer then about light traveling through some other material?
- (d) Ocean waves bend when they come across a change in the depth of the ocean floor (only within a few dozen meters of the ocean surface). What can you say about light when it enters a different material then?

4. Experiment: (30 points)

- (a) From your data taken during the interference of sound experiment, how good of an agreement does the interference equation $d \sin \theta = m\lambda$ have with your single slit and double slit data?
- (b) Based on the knowledge that sound is a wave and the fact that waves interfere in a slit type experiment, what can you say now about the nature of light? Why.
- (c) From your data in the interference of light experiment, do the same analysis as before on how good the agreement is between the interference equation and your single and double slit experiment.

5. Conclusions. (10 points) Is light a particle or wave?