Physics 141 Formal Report

Subject:

Unit 26: Activity 7, Electromagnetic Field in a Slinky and Determination of μ_0

Due Date:

August 14

The report should be ***no longer than 1000 words*** (figures, tables and short captions do not count). The report should be based on the data you took in the lab and include all the major results obtained from that data. You may submit a handwritten report, but if your handwriting is hard to read, a typewritten report would be better. Follow the format shown in the Sample Report.

You should write your own report. You may discuss with your lab partners and other classmates, but must use your own words and make your own diagrams. If two reports show enough similarity to appear that major portions have been copied then no credit will be granted for either report.

Most students prefer to use a word processor. For this purpose free software such as Google Docs, LaTex or Open Office is acceptable and economical. (See the sample report.) Google Docs includes a simple equation editor and drawing tool. A more advanced online equation editor is available at the CodeCogs Online Equation Editor website: http://www.codecogs.com/components/equationeditor/equationeditor.php.

Please submit the report by the due date. IYou should upload an electronic copy in *PDF format only*. There will be a WebCT assignment set up to accept uploads of your formal report. (Google Docs easily produces PDF files of the document.) Handwritten reports may be submitted on paper if the handwriting is neat, clearly written and legible.

Writing the Report

Make an Outline:

The outline's first level consists of the major divisions of the paper. Leave lots of space between these divisions. Under each division title, list the main things you want to say, point-by-point. On the lower levels, elaborate on these points as necessary to completely explain what you want to say. You may need to rewrite the outline a time or two as more points are added and you rearrange their order for clarity. When everything you want to say is noted in the outline, form the points into sentences and paragraphs. Your paper is complete!

The title page and abstract:

Put the title, your name, course, section and date on the top of the title page. The abstract should be placed underneath these items. The abstract should contain a brief summary of the purpose, methods and results of the experiment.

The sections:

1. Introduction

Say what you did and why: establish the goals and rationale. What has been done before? Put the project in a global context.

2. Theory

Present the simple theory necessary to understand the experiments. You may treat some or all of the theory as the hypotheses which your experiments are to test. Use your own words. Assume the reader has some background but refer to elementary texts in case he or she needs to brush up. Refer to a source for a more complete explanation of the theory.

3. Experiment

Clearly describe what you did. Do not over-use the passive. Clear and simple diagrams showing essential features of the apparatus are necessary.

4. Results

Show your results in graphical form if possible. A complete table of the raw data is usually not necessary. If calculated quantities are presented, refer to the relevant equation in the theory section but don't show the detailed steps in the calculation. Uncertainties on both the raw data and calculated quantities should be indicated, but don't show detailed error calculations or methods—these should be known by the reader.

5. Discussion or Conclusions (Could be combined with Results)

Indicate how nearly you achieved the goals mentioned in the introduction. Discuss the meaning of the results in terms of the theory presented. Do experimental results and theory agree within experimental error? If not, suggest why not and propose what further experiments may be needed. Make sure that your conclusions follow from your experimental results, **Treat your own data and results objectively and don't try slant the discussion to agree with your preconceived notions when the data do not support them.**

Equations:

Very simple equations may be written in-line. Complex equations with lots of subscripts, superscripts, compound fractions, integrals, or summations look clumsy in-line and should be displayed centred with a blank line above and below. Any equation that is referred to elsewhere in the text should be displayed and numbered at the right margin. Always define every symbol in all equations.

Figures:

Figures should usually have a short caption beneath them. A caption makes it easier to understand for someone browsing through the pages. If there is more than one figure, the captions should start with a figure number. The text of the paper should refer to every figure.

Points on style:

1. Use the active voice.

Passive	Active
Control of the furnace is provided by a thermostat.	A thermostat controls the furnace.
Dolphins were taught by researchers in Hawaii to learn new behaviour.	Researchers in Hawaii taught dolphins to learn new behaviour.

Use the passive when the doer of the action is unknown or unimportant.

2. Use simple rather than complex language.

Complex	Simple
Another very important consequence of Einstein's theory of relativity that does not follow from classical mechanics is the prediction that even when a body having mass is at rest, and hence has no kinetic energy, there still remains a fixed and constant quantity of energy within this body.	According to the theory of special relativity, even a body at rest contains energy.

3. Delete words, sentences, and phrases that do not add to your meaning.

Wordy	Concise
It is most useful to keep in mind that the term *diabetes mellitus* refers to a whole spectrum of disorders.	*Diabetes mellitus* refers to a whole spectrum of disorders
In the majority of cases, the data provided by direct examination of fresh material under the lens of the microscope are insufficient for the proper identification of bacteria.	Often, bacteria cannot be identified under the microscope.

4. Use specific, concrete terms rather than vague generalities.

Vague	Specific
Our new scrubber means big savings for Samson Power.	Aircom's scrubbing system saves Samson $7,000 every day.
The sun is hot.	The sun is hot—almost 10,000°F at its surface.
The expedition was delayed for a time because of unfavourable conditions.	The expedition was delayed one week because of snowstorms.

5. Use the past tense to describe your experimental work and results.

6. In most other writings, use the present tense.

Hypotheses, principles, theories, facts and other general truths are expressed in the present tense.

7. Avoid needlessly technical language.

Too technical	Clearer
The moon was in syzygy.	The moon was aligned with the sun and the earth
Maximize the decibel level.	Turn up the sound.

8. Keep ideas in writing parallel.

Not parallel	Parallel
The tube runs into the chest cavity, across the lungs and plunges down into the stomach.	The tube runs into the chest cavity, across the lungs and down into the stomach.

References:

Robert W. Bly and Gary Blake, *Technical Writing,* (McGraw Hill, New York) 1982. Library call no. T11 B63.

William Strunk Jr. and E.B. White, *The Elements of Style, 3rd ed.,* (Macmillan, New York) 1979 Library call no. PE1408 S772 1979 (Reference)

The Elements of Style, 1st ed. is available at

http://www.bartleby.com/141/

Editing your writing

The following shows how to edit your text to for conciseness and clarity. The "original abstract" is typical for a first draft and is taken from a student's report in a previous semester. Comparing the original with the edited version should help you to learn how to edit your own writing.

Original Abstract

First, I made qualitative observations investigating the nature of images produced by concave lenses and convex lenses of various focal lengths. I found that convex lenses with small focal lengths magnified a printed page the most. The object appeared smaller through the concave lens. Distant objects observed through both concave and convex lenses are smaller but are inverted when observed through the convex lens. These observations agree with the ray approximation methods (see figures two to four) of studying geometric optics as presented by Serway [1].

Three different methods were used to determine the focal length of various lenses: the image of a distant object method; object image methods; and the autocollimation method. Using these methods, I determined the focal length of two convex lenses to within various degrees of the rated value of the lens. The autocollimation method was the most accurate with a percentage difference of 1.3% from the rated value. Object image methods were within 2.6% of the rated focal length. The first method was the least accurate with a percentage difference of 7.0%. These uncertainties are due to systematic errors in the method and different amounts of random error.

Finally, a basic microscope was constructed and its magnification measured. The magnification was approximately 100 times. Due to the very large degree of uncertainty in the apparatus, we were interested chiefly in the order of magnitude of this value. The calculated magnification was 66.

Revised Abstract

In this paper, I discuss qualitative observations of images through lenses, compare three methods of measuring focal lengths and describe a compound microscope made from thin lenses.

Objects always appear upright, but smaller, when observed through a concave lens. When one observes an object through a convex lens, the image is magnified and upright if the lens–object distance is less than the focal length—the magnification being larger for shorter focal-length lenses. If the convex-lens-to-object distance is greater than the focal-length, the virtual image is smaller and inverted. These observations agree with the ray model of geometric optics.

I measured the focal lengths of two calibrated convex lenses using three methods: the distant-object image method; the near-object image method; and the autocollimation method. The deviations of the measurements from the nominal values were 7%, 2.6%, and 1.3% respectively for the three methods. The origins of the systematic and random errors in the three methods are discussed.

Finally I designed a compound microscope to have an angular magnification of 66. When built, the magnification was approximately 100.

A Few Basic DOs and DON'Ts

DO	DON'T
Do use relatively large font and generous line spacing, e.g., 12 pt Times and 18 pt line spacing or typewriter elite (10 pt Courier) and 1.5 or double space.	Don't use very small typeface with cramped line spacing., e.g., 10 pt Times and 11 pt line spacing. (There is no room to write comments.)
Do put your name, section, student number and all of the abstract on the title page.	Don't omit your name, start the introduction on the title page, or put all of or a part of the abstract inside.
Do staple your paper in the upper left-hand corner.	Don't put the report in a presentation cover or folder. Don't just crimp the corner and hope the pages will not fall apart.
Do use your own words to describe the experiment.	Don't copy large sections of the lab manual or other book.
Do use the affirmative: "We adjusted the string's length to 1 m."	Don't use the imperative: "Adjust the string's length to 1 m."
Do make your own simple but complete line drawings of the apparatus with labels of parts. Identify mathematical variables on the drawings if possible.	Don't scan in or photocopy fancy pictures from the lab manual or other books.
Do prepare neat publication-quality graphs of data which fit in with the text and are easily legible.	Don't tear out or photocopy graphs from your lab book and stick them in your formal report.