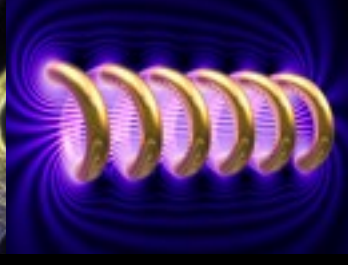


Integrative Activity



Electricity and Magnetism



Physics 203-NYB

Integrative Activity (IA)

One of the requirements of the Science program involves a concept known as integration. This means that a student is required to apply what he or she has learned in one discipline to solving a problem in another discipline in science and mathematics.

The subject of the IA must be selected from the list of available subjects presented in **Table 1**.

When an appropriate topic has been chosen, students should narrow the focus of the investigation and formulate a **specific research question**. For many Integrative Activities this will be phrased in the form of a question, but alternatives such as launching the investigation with a hypothesis are acceptable.

The subjects must be discussed with physics as a point of view. In order to do so, the students should **discuss quantitatively in their IA at least two physics concepts** such as the ones listed in Table 2, relevant to the research question.

The students must do their research before writing the IA. On the day of the write-up, students are allowed to bring **3 to 5 references (max 10 pages)** which they will use to write the IA, as an essay. References may be printed from websites or photocopied from books or articles.

All references used in class must be clearly labeled and numbered as the examples shown below.

(book)

[1] A.P. French. *Special Relativity*. The M.I.T. Introductory Series. W. W. Norton & Company. New York, 1968.

(web)

[2] NRC Institute for Aerospace Research (IAR). Flight Research. [online]. 2008 [cited 2008-03-02]. <URL:http://iar-ira.nrc-cnrc.gc.ca/main_e.html>

(article)

[3] R. Poirier, S. Roorda, F. Schiettekatte, M. Lalancette, J. Zikovskiy. *Divacancies in*

The IA in Electricity and Magnetism, must integrate the Physics concepts discussed in this class with concepts related to Chemistry or Biology.

proton irradiated silicon: Characterization and annealing mechanisms. Physica B, Vol. 308-310 (2001) pp. 462-464.

The students can then simply use the bracketed numbers as a reference in the text of the IA. For example, [1], [2-3]. All references will be submitted with the IA at the end of the period.

Students may also bring a **one page plan** that outlines the structure and organization of their essay. The only part left in class will be the writing of the essay (110 minutes in lab period).

Organizing the IA

The IA should follow a structure similar to that described below.

Introduction

The introduction should include:

- an indication of why the topic chosen is interesting, important or worthy of study
- some background information and an attempt to place the topic in an appropriate context
- an indication of whether the topic has been narrowed to a focus of more manageable proportions
- a clearly and precisely stated research question
- a clear concluding statement of the thesis and argument, i.e. the response to the research question that will

subsequently be developed in the body of the essay.

Body/Development

The essential feature of the major section, or body, of the essay is the systematic development of a convincing answer to the research question. The different sections in the body should be clearly identified with sub-headings.

Conclusion

The requirements of the conclusion are that it is

- clearly stated
- is relevant to the research question being investigated
- is substantiated by the evidence presented
- indicates issues, unresolved questions and new questions that have emerged from the research.

Title of the IA:

The title should provide a clear indication of the focus of the essay. It should be precise and not necessarily phrased in the form of a question.

The length of the IA:

The IA should be 750 to 1000 words, in length.

Table 3: Assessment Criteria

The following criteria will be used to assess the Integrative Activity

Table 1: List of Topics

The subject of the IA must be selected from one of the following topics

- Biological production of electricity
- Biological production of light
- Electromagnetism of migratory species
- Influence of electromagnetic waves on the brain
- The physics of nerve impulses
- Electroencephalography
- Electrocardiogram
- Electrochemical plating
- Rechargeable batteries
- Fuel Cells
- Taser Gun
- Incandescent versus Fluorescent bulbs
- Earth Magnetic Field
- Aurora Borealis

- *You have another idea?*
Discuss it with me before starting your research

Table 2: Physics Concepts

The IA should discuss quantitatively **at least two** of the following physics concepts

- Charge
- Force
- Electric Field
- Electric Potential
- Electric Potential Energy
- Corona Discharge
- Breakdown Electric Field
- Current
- Resistance
- Capacitance
- Inductance
- Magnetic Field
- Magnetic Induction
- Electromagnetic Wave
- Energy
- Power
- Work
- Heat
- Kinetic Energy
- Efficiency
- Intensity

Assessment Criteria	Achievement Level	
A: Research Question	0	The research question is not stated in the early part of the essay or does not lend itself to systematic investigation in the context of an extended essay.
	1	The research question is stated in the early part of the essay but not in a precise manner or the research question is clearly and precisely stated but is too broad in scope to be treated effectively within the word limit.
	2	The research question is clearly and precisely stated in the early part of the essay and is sharply focused, making it susceptible to effective treatment within the word limit.
B: Research	0	The research is completely inappropriate to the research question.
	1	The research is generally inappropriate to the research question.
	2	The research is generally appropriate to the research question.
	3	The research is well done and highly appropriate to the research question.
C: Argument/ evaluation	0	There is no argument relevant to the research question.
	1	There is a limited or superficial attempt to formulate an argument relevant to the research question.
	2	An argument is developed which addresses the research question but which is incomplete. Where an evaluation is appropriate, it is likely to be subjective, with little attempt at substantiation.
	3	An argument which addresses the research question is competently developed. Where an evaluation is appropriate, some attempt has been made to substantiate it.
	4	A convincing argument, which addresses the research question, is well developed, well organized and clearly expressed. Where an evaluation is appropriate, it is fully substantiated.
D: Conclusion	0	Little or no attempt has been made to provide a conclusion which is consistent with the argument presented in the essay.
	1	Some conclusion is attempted which is consistent with the argument presented in the essay.
	2	A conclusion is clearly stated, is relevant to the research question and is consistent with the argument or explanation presented in the essay. Where appropriate, the conclusion clearly indicates unresolved questions and new questions that have emerged from the research.
E: Principles of physics	0	There is no evidence of an understanding or knowledge of the principles of physics relating to the IA.
	1	There is minimal knowledge and understanding of the principles of physics relating to the IA.
	2	There is some knowledge and understanding of the principles of physics relating to the IA.
	3	There is good knowledge and understanding of the principles of physics relating to the IA.
	4	There is excellent knowledge and understanding of the principles of physics relating to the IA.