Tree of Life School

"Wisdom is a tree of life to those to those who embrace her."
Proverbs 3:18

Physics
Course Outline

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Course Outline

Introduction

This course is a general introduction to physics, the study of the physical world of forces, motion, energy, sound, and light as created by God. The topics in physics are inescapable and applicable everywhere in real life as you walk down the street, play sports, use an Ipod, and sing in the choir. The variety of assignments and test will focus on factual information, skills in calculations, practical experiments, research, and writing. **This course carries a strong dependence on math skills because so many concepts in physics are quantified.** The goal of this course is to introduce the student to the language and the systematic study of physics as well as to instill an appreciation and wonder of God's creation.

How to Work Through The Course

This course has been divided into a **140 day schedule**. This will allow the student to follow a **four-day school week** and still complete the course in a normal academic year. The **fifth day** of each week can used to **catch up on assignments**, do **extra reading**, or simply **take the day off** from the course. If, however, a five-day school week is more desirable, the student is encouraged to pursue this course and will be rewarded by early completion of the material. Care has been taken to provide specific instructions for each day's work. Therefore, **all work is to be completed in the order presented in the daily schedule**.

Calculating Your Final Grade

Every module (chapter) of the course has either an assignment or a test to send for marking. **Please note that Tree of Life does not use the test package that comes with your textbook.** Your final mark in the course will be based on the following percentages:

7 Test - 50%

8 Assignments - 50%

Assignment Expectations

Tests

Short answer tests should be written in complete sentences. Rarely should answers be more than a few sentences or a brief paragraph unless otherwise indicated. In these cases a short (one page) essay may be required to expand on the material learned throughout the year.

Lab Reports

Submitted lab reports demonstrate the stages of thinking about a particular scientific idea (asking a question, giving a possible solution, devising an experiment, making observations/measurements, providing a conclusion/answer to the question). Every lab report contains this format. A sample lab report is found in the appendix to this guide.

1. Title of Lab/course/name/date

   The title of the lab should describe the experiment. Instead of "*Atmospheric Pressure,*" use "*The Effect of Atmospheric Pressure on Cans*".

2. Problem 1-2 sentences

   State the scientific question in the form of a question (ending in "?"). For example: "*What happens to the freezing point of water when salt is dissolved in the water?"* Depending on the experiment, you may also need to explain what the question means in connection with the experiment if it is not obvious.

3. Hypothesis 1-3 sentences

   The hypothesis is an educated guess or possible answer to the problem, and is written before doing the experiment. The hypothesis should imply or state a prediction for what *should* happen during the experiment (not what *did* happen already). Also, the hypothesis may state a theory or reason for the prediction. For example: *The freezing point of water will decrease after dissolving the salt. Therefore, the pure water will freeze before the salt water. This is because the salt interferes with the formation of a solid crystal structure*." Note the *"will"* prediction in my example. Do not use "I believe" or "We think" at the beginning. Do not use past tense either as that would imply you already did the experiment.

4. Summary of Procedure max. 5 sentences

   You do not need to give every detailed step of the experiment, nor every item you used. You should <u>not</u> copy the procedure from the textbook. This section should be at most 5 sentences. See sample lab report for example.

5. Observations and Results 1-2 paragraphs

The results section is an important part of the lab report because it describes what you discovered by doing the experiment. There are different kinds of results:

1. Sense observations (what you saw happening, smell, touch, sound, taste)
2. Measurements (numbers from measuring instruments)

Generally, you should always include some kind of sense observations in written form for every lab. Try to be as detailed as possible with your observations. Instead of saying "*The tablet reacted with the water",* you could say:

"*When the tablet was added to the glass of water, it began to bubble vigourously with a fizzing sound. Small bubbles came from the surface of the tablet. The tablet bounced around on the bottom of the glass. There was no smell from the reaction. The reaction lasted 22 seconds. After the reaction was done, the tablet was gone."*

Note that this example also has a measurement (22 seconds). Some experiments won't require any measurements, however. If the experiment involves many measurements, you should present these in a table. Note that the results section should **not** explain or interpret the results of the experiment (say what it means or why it happened). Save this for the conclusion. Just describe objectively what has occurred during the experiment.

6. Discussion and Conclusion 1-2 paragraphs

The conclusion paragraph of the lab report is not quite the same thing as an essay conclusion. The science conclusion should include the following things:

- Restate the problem and your hypothesis
- Summarize the results (what happened)…yes, write it again
- Answer the question (problem) you wrote at the beginning of the lab
- Say if the hypothesis was supported or rejected (not correct/incorrect)
- Explain the results as best you can (*why* did it happen?)
- You may need to mention some background theory that helps explain the results.

If you write at least 1 sentence per item above, you will have at least one good conclusion paragraph.

Bibliography

If you have used the ideas of others to help you form your thoughts for your assignment, you need to cite them at the end of your assignment in the bibliography. The format for the bibliography is different than for footnotes; merely copying and pasting your information will not be adequate.

Following you will find some common examples to help you.

Book	Smith, Tom. Skating to the Music Hogtown: Ice Palace Publishers, 2010.
Work from Anthology	Clark, Jim. "Working the Judges." Anthology of Skating Poems. Editor John Doe. Boston: Ice Palace Publishers, 2001. 354.
Article from Reference Book	"Figure Skating," Big City Encyclopedia. 1988 ed. Reference on CD-ROM Macrotuff Multimedia Encyclopedia. Computer Software. Hogtown, ON: Macrotuff Software, 2001. CD-ROM.
Magazine	Smith, Sally, "Skating Is My Life," Skating Magazine 12 May 2009: 20-24.
Newspaper	Same basic format as that of magazine.
TV or Radio	"An Interview with Zeke," Skaters' Forum, CBC, Toronto, 12 March 2010.
Personal Interview	Bill Jones, personal interview, 23 August 2011.
Internet	Camelspin, Tom , "Jumping for Glory", www.skate.com, 10 January, 2010.
Oral Presentation	Champ, Ima. Speech. NB Figure Skating Convention, Fredericton, 21 May, 2002

Evaluative Comments and Grades

At the high school level, students are given numerical grades for each of their tests and assignments. We try to be as objective as we can be, but much of what we do is subjective by nature and with several people evaluating work, some will give higher grades than others. We make every effort to be on the same page (so to speak) so that there is not a wide disparity in grades from subject to subject (especially in those areas where much written work is submitted). We also make every effort to communicate to the student what was positive about the assignment and what needs work. If there is a question about a grade or comment on an assignment, we encourage you to communicate this to us. The best way is to send an e-mail or return the assignment with a note attached the next time you send work by mail. This way we can make sure that the evaluator who can best answer your question is notified and can have the opportunity to review the question and assignment and get back to you with what will hopefully be a satisfactory explanation.

Generally speaking, we employ the following percentages when marking work. We do not usually break down the mark to reflect this but hopefully the comments will reflect areas where the assignment may be improved.

Introduction 20%

Body 40%

Conclusion 20%

Style 10%

Mechanics 10%

Submitting Assignments for Evaluation

Email:

This is our highly preferred mode of submission, due to low cost and faster return rate of graded assignments.

1. **Most of the assignments and tests can be typed using the "*Physics lab form*" and Test forms, which are downloaded from the Tree of Life website. These files are pdf forms that you can type into and then email for marking. Save the proper pdf file onto your computer and then open it.**
2. Save each individual assignment as a Microsoft Word document (Word Perfect is also acceptable). Do not save a batch of assignments in one file; this will be returned ungraded to you. Study Guides for Great Ideas courses should also be sent as individual files.
3. Name the file with your name, the course, and the assignment number. For example, “John Doe_WH I_Essay 4” or “Sally Brown_GI I_ Confessions Study Guide”.
4. Attach each assignment in a **separate email to** evaluation@treeoflifeathome.com **The subject line of your e-mail should be the same as the file name of your assignment.** This helps us organise the work and be sure it gets to the proper evaluator.

Regular mail:

Be sure *all* work is clearly labeled with your full name, course name, and assignment. Also, be aware this mode of submission will have the longest turnaround time.

Address: Tree of Life
443 Weston Road
Weston, NB
E7K 1B1

How To Study Physics

Reading and Note-Taking

The backbone of the course is the textbook, which poses questions and provides scientific information and discussion in a very understandable and conversational tone. However, simply reading the textbook will yield little learning if there is no critical interaction with the material. One does not read science as one read novels of fiction, for example. Some people can read novels very quickly. But for science, you must slow down and sometimes read every word in the sentence to understand the concept. You might need to look back and forth five times between a diagram and a paragraph you are reading in order to "connect the dots". This type of careful reading is necessary for learning science.

One very important learning method you should employ for this and following science courses is **note-taking** or **reading notes**. When reading a section of the textbook, you should always have at your side a notebook used for recording important terminology, definitions, explanations, facts, diagrams, and illustrations. The best time to write down notes is the moment your mind is on them. The purpose of reading notes is threefold. First, the act of note-taking forces you to think about what are the most important things in what is being said – that's what to write down. Second, good notes give you a quick reference to the most important information from the textbook. You can find the main points more easily when studying for the test. Thirdly, as in the case of copying diagrams, note-taking causes you to look carefully and think harder about what you are looking at. If you take good notes while reading, you might accumulate 2-3 pages per module (not including practice questions).

How to use this Study Guide

This study guide is intended to provide a sequence of learning steps to pace you through the course. Each day gives a suggested number of pages for reading, practice questions, experiments, and tips. Some days will require more time and work; in this case, take an extra day if you need. If you are able to move faster, that's fine too. However, good study habits are still important to develop, so following every lesson step is recommended. A good memory for terminology and concepts in science only goes so far, and a failure to develop study methods will eventually make learning harder or less enjoyable.

A few other tips and notes…

- Try to **follow the example calculations as closely as possible** - this includes numbers, units, chemical names/formulas, and equations. While different people have different ways of working out problems on paper, you should always follow a set procedure when you first learn things. Once you become comfortable and successful at the type of math in this physics course, then you can "skip" steps a bit.

- You should always check the **answers to the Practice Questions** ("On Your Own" questions); the answers are at the end of the module. Don't "peek" if you aren't sure of an answer; give your honest effort first, then check afterward.

- Keep up to date with the **Review Questions and Practise Problems at the end of each module**. If you wait until the day before the test, they will be of little value in preparation. Perhaps doing about 3 study guide questions per day will help keep the material fresh in your mind.

- It is a good idea to **review the lab supplies required for different experiments** *before* the day of the lab. That way, you can be prepared. It is very important to pre-read the entire procedure for the experiment before you start.

Why should we do the experiments?

The experiments in this course are very important to do for several reasons. First, many experiments can help turn abstract scientific concepts into observable events and memorable pictures in your mind that help develop understanding. Another reason for the experiments is that they are fun and sometimes entertaining! They give variety to the course. Thirdly, experiments are an important activity of working scientists who make hypotheses about their observations in nature, and then set out to test their predictions within controlled conditions. Although you must learn the foundations of science before practicing like real scientists, the kind of experiments in this course emulate the same thinking processes in natural science. **You should do as many of the experiments in this course as possible, regardless of whether it needs to be evaluated.**

Daily Schedule

Module #1: Motion in One Dimension

DAY 1 - _____ (<write the date here)

- Welcome to this study of Physics! This course guide will help you through the course and the evaluated assignments and tests. Before starting the learning material, you should read the introductory pages in this course outline (pages 9-10) so that you understand what is expected. You can also read the student notes in the textbook (pages i-iv) **but remember that the requirements to complete this course with Tree of Life are contained in this course outline, not the textbook.**

- Read pages 1-4. This is a summary of basic mathematical skills necessary for the course. For example, you should be able to convert the following quantity using the factor label method and metric conversions. Try it now (Answer = 2016.18 kL/decade):

$$\frac{23\ \text{L}}{\text{hour}} = \frac{??\ \text{kL}}{\text{decade}}$$

DAY 2 - _____

- Read pages 5-8. Carefully work through the first example in your notebook. It is recommended that you copy out examples as you study them to make sure you understand each mathematical step.

- Answer On Your Own problem 1.1 in your notebook.

DAY 3 - _____

- Read pages 8-13. Work through the examples.

- Answer Problems 1.2 and 1.3 in your notebook.

DAY 4-5 - _____

- Prepare for and complete Experiment 1.1 today. Record measurements in your notebook and write 2 sentences to summarize your conclusions about measuring average velocity. Although this experiment is not for evaluation, you should complete it to experience the concept and anchor it in your memory.

- Read pages 13-21 (up to "Velocity is Relative").
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- Answer Problems 1.4-1.6.

DAY 6 - _____

- Read pages 21-23 (top) including the example.
- Begin working on Assignment #1 (see the end of this course outline).
- Preview Experiment 1.2 for tomorrow.

DAY 7 - _____

- Complete Experiment 1.2 and record measurements in your notebook.
- Read pages 23-27.

DAY 8 - _____

- Answer On Your Own problems 1.8-1.10.
- Read pages 27-29.
- Check your answers to the On Your Own problems at the end of the module.

DAY 9 - _____

- Complete Assignment #1 and submit for evaluation by mail (or scan + email). Assignment #1 is a practice of important calculations. Remember that you must show all steps and work in each answer.

  Note: the textbook contains plenty of Review Questions and Practice Problems at the end of modules and Extra Practice Problems at the end of the textbook. Although this course guide doesn't say to answer all of them, it is recommended that you complete most or all of these questions in your notebook at some point while learning. This will depend on your level of understanding and available time. If you reach the end of this module and are still having trouble with questions or concepts, then you need to spend more time with the review and practice questions. As well, these questions and problems will be useful when preparing for the tests that generally cover 2-3 modules.

Assignment 1 - 1-Dimensional Motion

Complete the following questions and submit by mail (or scan and email). Show all calculations and use the factor-label method. Write your calculations and answers on a blank page (not this page).

1. Convert the following quantities to the specified units.

   a) 4.8 g/mL ----> mg/L
   b) 300 m/s ----> km/year
   c) 1.8 lb/in^2 ----> kg/m^2

2. Complete the following operations expressing your answer in the correct number of significant digits.

   a) 7.6 cm + 3.45 cm + 43 mm
   b) 123.5 m/s x 360 s

3. Express the following numbers in scientific notation.

   a) 123 456 790
   b) 0.00002005

4. A jogger runs through a straight park trail system in on direction for 4.2 km over 22 minutes. He then turns around to go back by the same way for 1.8 km over 9 minutes until he stops along a pond. Calculate the distance of his run and final displacement. Also calculate the average speed and velocity from start to finish.

5. A cyclist is traveling along a straight road at 5.8 m/sec. If he travels for 138 minutes, what is the distance covered?

6. A car is traveling with a velocity of 22 m/sec. To avoid a moose the driver must brake until fully stopped. a) If the car comes to a complete stop in 1.9 seconds, what was the car's acceleration? b) Suppose the car only 1.1 seconds to brake reaching the moose. What would be the car's velocity at impact?

Assignment 2 - Vectors - Lab Report

Complete Experiment 3.2 on Vector Addition. Show all your work and submit by paper or scan and email. Send this assignment for evaluation.

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Physics

Assignment #	Test #	Description	Mark
1		Module 1: Calculations Assignment	
	1	Test 1 (Modules 1-2)	
2		Module 3: Lab Report	
	2	Test 2 (Modules 3-4)	
3		Module 5: Lab Report	
4		Module 6: Calculations Assignment	
	3	Test 3 (Modules 5-7)	
5		Module 8: Lab Report	
6		Module 9: Lab Report	
	4	Test 4 (Modules 8-10)	
7		Module 11: Lab Report	
	5	Test 5 (Modules 11-12)	
8		Research Assignment	
	6	Test 6 (Modules 13-14)	
	7	Test 7 (Modules 15-16	
		7 Tests (50%)	
		8 Assignments (50%)	
		Final Mark	