I. **Options For Your Final Project**

Your final test grade (besides the final exam) in this class will be an independent project you pursue on your own or with one other person. The requirements for this project vary somewhat depending on which option you choose from the following:

A. **Research Project**
If you select this option, you will need to select, research, and present a short lecture on a topic in physics (or possibly some other field of science) that is of interest to you. If you choose this option, you will need to:
   1. Choose a topic
   2. Prepare a written proposal for your topic of study and get approval from the instructor
   3. Collect information and references (consult with Ms. Winslow)
   4. Prepare and deliver a presentation for the class, including:
      a. a handout (maximum one page, double-sided) with an outline of your study, a graphic, and references
      b. multimedia resource (computer presentation, PowerPoint, or webpage, etc.)
      c. 15-20 minutes of oral presentation (25-30 minutes total if working as a pair)

B. **Experiment**
If you select this option, you will need to design and conduct your own scientific experiment in order to determine the answer to a question that you do not yet know the answer to. (You may have a hypothesis, but you must not know the answer!) If you choose this option, you will need to:
   1. Choose an appropriate question to be answered by your experiment
   2. Prepare a written proposal for your experiment and get approval from the instructor
   3. Follow the guidelines given in class for organizing, designing, and conducting a series of experiments that will answer your question (These will be given to you if you choose the Experiment option)
   4. Prepare and deliver a presentation for the class, including:
      a. a handout with an outline of your experiment, a graphic, data summary, and conclusions
      b. multimedia resource (computer presentation, PowerPoint, or webpage, etc.)
      c. 10-15 minutes of oral presentation (20-25 minutes total if working as a pair)

C. **Rube Goldberg Project**
If you select this option, you will need to design, build, and demonstrate a Rube Goldberg device, a machine designed to perform a simple action in an excessively complicated way. Your machine might pour a cup of coffee, make hot chocolate, open a door, light a stick of incense, put out a candle, make grape juice, etc. If you choose this option, you will need to:
   1. Design a Rube Goldberg device and prepare a detailed plan of how it will work, noting applications of Newton’s Laws, Conservation of Energy, Conservation of Momentum, Electricity, etc.
   2. Prepare a written proposal for your device and get approval from the instructor
   3. Build your device. (One piece of advice: START EARLY!) The device may not use any explosives and all potentially hazardous components must be cleared with the instructor EARLY in the process.
   4. Your device must be portable and you will bring it to class for demonstration purposes on the day of your presentation, or you may videotape it at home and show the video in class.
   5. Your device should have 8-10 energy transfers.
   6. Prepare and deliver a presentation for the class, including:
      a. a handout with a diagram of your device and a written description of how it works and what physics principles govern its operation, including all energy transfers that occur
      b. 10-15 minutes of oral presentation (20 minutes total if working as a pair)

Whichever option you choose, you should appreciate the fact that your work and your presentation should reflect approximately two weeks worth of work/study invested in a freshman-level physics course. This is an independent project to be done on your own time; we will continue studying new topics in class up until the week of project presentations. If you see it as something to blow off, your project and presentation will surely get the grade they deserve (i.e. less than satisfactory). This is an opportunity for you to pursue a topic of interest that we have not yet had the chance to discuss in class, or a chance to perform actual scientific experimental research, or a chance to get your hands dirty and really BUILD something cool. Make the most of this assignment!
II. Timeline and Requirements

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DATE DUE</th>
<th>POINTS</th>
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<tbody>
<tr>
<td>Project Proposal</td>
<td>4/6/16</td>
<td>10</td>
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<tr>
<td>Progress Reports (2 – worth 5 points each)</td>
<td>4/22/16 and 5/3/16</td>
<td>10</td>
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<tr>
<td>Presentation</td>
<td>5/10/16 – 5/20/16</td>
<td>10</td>
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1. Introduction (Names, Title of Project) | 5 |
2. Body (Partners share presentation)    | 10 |
3. Quality of Presentation (Does device work? Are explanations correct, and sufficiently in-depth?) | 20 |
4. Handout (Appropriate? Names of students on handouts? References given?) | 10 |
5. Multimedia component                  | 10 |
6. Questions (Asks audience for questions? Are questions answered appropriately? Do answers reflect knowledge of subject?) | 10 |
7. Timing (Length appropriate?)           | 10 |
8. Conclusions (Summarize, “Thank You”)  | 5 |

III. Description of Requirements

A. Project Proposal
   Your project proposal should include:
   1. The name of the people in your group
   2. Your topic of interest
   3. A more-or-less detailed description of the components of your project. (Research Project -- indicate what topic ideas will be discussed; Experiment -- describe your problem, hypothesis, and initial experiment design; Rube Goldberg -- draw a preliminary diagram and describe some of the principles of physics and energy transfers you will be applying in your machine
   4. Weekly Action Plan describing what steps you will take to complete your project in a five-week time period.

B. Progress Reports
   I will email you two days before each progress report is due regarding the information I want to know about your progress. One person must respond to the email with the details of the progress report, but you must cc your partner if you have one. If one partner sends the first progress report, the other partner must send the second progress report.

C. Presentation
   Your presentation will take place in class sometime during the last two weeks before dead week. The duration and method of presentation will vary somewhat depending on the option you’ve chosen, your project, and your creativity. Keep in mind that the presentation you deliver will be the primary means of communicating the value and worth of your final project, and will be practically the only means the instructor has of assessing your work. Hints as to what your presentation should include may be found in the description of requirements for the different options and in the timetable above. We will be going over other important points regarding your presentation in class.

You or you and your partner will sign up for a presentation date on the signup sheet your teacher has. It is generally recommended that you sign up to present earlier, rather than later, in the presentation week for the following reasons. Presenting earlier is an advantage for you if you’ve done a good job because people are immediately impressed by your level of work -- you help to set the standard by which others will be judged (rather than being judged later by someone else’s standards). If you are concerned that your final project isn’t as good as it should be, it is still an advantage to present earlier -- the audience, including the instructor who grades your presentation, tends to be more forgiving of earlier presentations because we haven’t yet seen many presentations to compare yours with. In any event, going earlier means that you get the hard part over with -- after that you can sit back and enjoy others’ presentations.

While presenting at a later date does give you the advantage of having a few extra days to work on the project, in reality this doesn’t help as much as you might think. For most people, the extra time doesn’t contribute noticeably to the quality of the project -- it only gives you more time to worry about the impending presentation. To make matters worse, by the time we get around to seeing your work we’ve probably already seen some pretty impressive presentations -- for better or worse, this means that your presentation will probably be judged a little more critically!