The last unit of study is a project-based, independent study, learning unit. This grants students opportunity for guided creativity and interaction within the Physics course with the goal of learning something new.

Students must choose ONE project and complete the project during the final two weeks of this course. Students who do not choose a project for themselves will be assigned the “Simple Machine’s Project” during week 31 class.

There are TWO aspects of this project:

(1) performs a task, solves a problem or assesses a Physics topic with TWO kinds of measurements and calculations.

(2) Submit a lab report of the project that includes all elements of a formal lab report

Project ideas must be based on a topic that students have studied during the year (Motion, Newton’s Laws, Momentum, Work, Power, Efficiency, Simple Machines, Electricity, Magnetism, Sound, Light, Heat Transfer). Once the project idea is chosen, students should refer back to the particular unit that covered the concept of the project. Use class notes, labs, homework, textbook, internet, and other resources to research ideas. You may use similar ideas that were in those documents, just be sure to reference them in your resources.

Week 31-32 classes:

* Go over the project ideas in detail and allow students to ask questions, chose and work on their projects. All students must attend class.
* Students have opportunity to interact, communicate, with the teacher as well as peers.
* Students are expected to spend a minimum of 8-10 hours on this project.

The project report will be due 4 days after week 32’s class. Students who complete the project task portion (not the lab report) by week 32’s class may offer to share their projects with the class (share screen or give a short synopsis of their project via microphone) to receive bonus points.

Suggested projects are given on the following pages.

Simple Machines

1) Build a “Rube Goldberg” apparatus that contains all six types of simple machines that can accomplish an overall task (e.g. research the board game “Mousetrap”).

A. Come up with a title for your project report.

B. Include background information about major concepts in this project.

C. Create a hypothesis or expectation of what you expect in this project.

2) Keep track of your “procedures” all the way through this project. (What did you do step by step?) Write the procedures in your project report.

3) List all materials used and write them in your project report.

4) Calculations and Data Section

A. Take pictures or make drawings of the apparatus.

1) Clearly label each of the six simple machines incorporated into the apparatus.

2) Define each type of simple machine and explain how it is used to make work easier (be sure to define “work”). Be sure to give the type of lever, pulley, etc.

B. Choose TWO simple machines out of the six on the apparatus

1) Explain the TWO simple machine’s mechanical advantage in the context of the apparatus.

2) Calculate the TWO simple machine’s mechanical advantage in the context of the apparatus.

5) Conclusion Section:

* Create a minimum of THREE conclusion questions that cover major concepts related to simple machines, and provide fully explained and supported answers (use evidence from your project).

6) Resources … you need at least THREE (class notes, textbook, etc.)

Use the lab report format document provided on Study Place to complete a project report (Heading, Title, Purpose, Materials, Procedures, Calculations and Data, Conclusions, Resources).

<https://screencast-o-matic.com/watch/cFfhrTDKcB> (JW) [2:40]

Motion

1) Create your own experiment that demonstrates the principle of relative motion or velocity or acceleration or free fall.

A. Come up with a title for your project report.

B. Include background information about major concepts in this project.

C. Create a hypothesis or expectation of what you expect in this project.

2) Keep track of your “procedures” all the way through this project. (What did you do step by step?) Write the procedures in your project report.

3) List all materials used and write them in your project report.

4) Calculations and Data Section

A. Take pictures or make drawings for the project.

1) Clearly label variables used in the project (distance, time, vector, direction, etc.).

2) Define each variable and give its relevance to the project.

B. You must use measurements in the project, not just descriptions.

1) For instance, if you choose velocity, you would need to include measurements of distance, time, and give direction.

2) Show TWO major calculations for the concepts you choose to work with.

5) Conclusion Section:

* Create a minimum of THREE conclusion questions that cover major concepts related to motion (speed, acceleration, etc.), and provide fully explained and supported answers (use evidence from your project).

6) Resources … you need at least THREE (class notes, textbook, etc.)

Use the lab report format document provided on Study Place to complete a project report (Heading, Title, Purpose, Materials, Procedures, Calculations and Data, Conclusions, Resources).

Newton’s Laws of Motion

1) Use a sport you participate in or another activity that demonstrates Newton’s Laws of Motion.

A. Come up with a title for your project report.

B. Include background information about major concepts in this project.

C. Create a hypothesis or expectation of what you expect in this project.

2) Keep track of your “procedures” all the way through this project. (What did you do step by step?) Write the procedures in your project report.

3) List all materials used and write them in your project report.

4) Calculations and Data Section

A. Take pictures or make drawings for the project.

1) Clearly label variables used for the project.

1) Clearly label each of Newton’s three laws of motion involved in the sport or activity you chose.

2) Define each of Newton’s laws of motion and give its relevance to the sport or activity you chose.

B. Include measurements for Newton’s second law of motion, but you can use descriptions for Newton’s first and third laws.

1) For Newton’s Second Law of Motion, you need to include measurements of distance, time, mass, force. Show TWO major calculations for the concepts you choose to work with.

2) For Newton’s first and third laws of motion clearly show how they work in the sport or activity you chose.

5) Conclusion Section:

* Create a minimum of THREE conclusion questions that cover major concepts related to Newton’s Laws, and provide fully explained and supported answers (use evidence from your project).

6) Resources … you need at least THREE (class notes, textbook, etc.)

Use the lab report format document provided on Study Place to complete a project report (Heading, Title, Purpose, Materials, Procedures, Calculations and Data, Conclusions, Resources).

<http://somup.com/cFhjrZVGCT> Newton's Laws in Volleyball JS Newton's Laws (1:49)

Electricity

1) Pick an appliance or other electrical object (car, computer, etc.) and explain the circuitry OR build circuits.

A. Come up with a title for your project report.

B. Include background information about major concepts in this project.

C. Create a hypothesis or expectation of what you expect in this project.

2) Keep track of your “procedures” all the way through this project. (What did you do step by step?) Write the procedures in your project report.

3) List all materials used and write them in your project report.

4) Calculations and Data Section

A. Take pictures or make drawings for the project.

1) Clearly label variables used of the appliance or other electrical object.

1) Clearly label the types of circuits and how they work.

2) Define different types of circuits.

B. Choose ONE type of circuit in your appliance or other electrical object

1) Explain aspects of that circuit (switch, power source, resistors, current, etc.).

2) Show TWO major calculations including the voltage, current, and/or resistance in one circuit. Show units for each variable.

5) Conclusion Section:

* Create a minimum of THREE conclusion questions that cover major concepts related to electricity, and provide fully explained and supported answers (use evidence from your project).

6) Resources … you need at least THREE (class notes, textbook, etc.)

Use the lab report format document provided on Study Place to complete a project report (Heading, Title, Purpose, Materials, Procedures, Calculations and Data, Conclusions, Resources).

<https://screencast-o-matic.com/watch/cFhibFbOgb> Electric Circuits LR Electricity (3:09)

Sound

1) Create an experiment showing how sound is affected or changed by temperature or position or type of medium it passes through.

A. Come up with a title for your project report.

B. Include background information about major concepts in this project.

C. Create a hypothesis or expectation of what you expect in this project.

2) Keep track of your “procedures” all the way through this project. (What did you do step by step?) Write the procedures in your project report.

3) List all materials used and write them in your project report.

4) Calculations and Data Section

A. Take pictures or make drawings for the project.

1) Clearly label variables used for the project.

1) Clearly label any parameter of your project (e.g. temperature, source, change in speed).

2) Define aspects of sound including frequency, amplitude, velocity, and medium.

B. Show an understanding of sound

1) Explain how each variable of sound is involved in your project.

2) Show TWO major calculations involving some aspect of sound in your project (velocity, frequency, amplitude, density of the medium, etc.).

5) Conclusion Section:

* Create a minimum of THREE conclusion questions that cover major concepts related to sound, and provide fully explained and supported answers (use evidence from your project).

6) Resources … you need at least THREE (class notes, textbook, etc.)

Use the lab report format document provided on Study Place to complete a project report (Heading, Title, Purpose, Materials, Procedures, Calculations and Data, Conclusions, Resources).

<http://somup.com/cFXD2KnjFR> Wonderful, Wonderful Grace BR Song Sound (3:17)

Light

1) Create an experiment involving the photoelectric effect or reflection or refraction or color. You may also pick the rainbow or special effects in movies, etc. related to Light and explain how things work.

A. Come up with a title for your project report.

B. Include background information about major concepts in this project.

C. Create a hypothesis or expectation of what you expect in this project.

2) Keep track of your “procedures” all the way through this project. (What did you do step by step?) Write the procedures in your project report.

3) List all materials used and write them in your project report.

4) Calculations and Data Section

A. Take pictures or make drawings for the project.

1) Clearly label variables used for the project.

B. Show an understanding of Light principles

1) Explain how the special effect or concept of light works in detail.

2) Show TWO major calculations involving some aspect involved with light in your project (e.g. for reflection, refraction give angles and an appropriate drawing).

5) Conclusion Section:

* Create a minimum of THREE conclusion questions that cover major concepts related to light, and provide fully explained and supported answers (use evidence from your project).

6) Resources … you need at least THREE (class notes, textbook, etc.)

Use the lab report format document provided on Study Place to complete a project report (Heading, Title, Purpose, Materials, Procedures, Calculations and Data, Conclusions, Resources).