

**Created June 2018 \*Please note that this is a copy and therefore has not been updated since its creation date. If you find a link issue or typo here, please check the actual course before bringing it to our attention. Thank you.\***

## **Physics with Lab 2018**

### **Honors Physics**

Please review the FAQs and [contact](#) us if you find a problem.

**Credits: 1**

**Prerequisite:** At the very least, you need to have taken algebra and know [basic trigonometry](#) which can be found at Khan Academy.

**Recommended:** 11th and 12th grade

**Test Prep:** AP Physics B (When I made this course, it was based on current AP topics. I don't know if they have changed since then. If you plan on taking the AP exam or CLEP, etc., please use a book made for the current test to review what you've learned and to make sure you have all the areas covered.)

**Course Description:** This honors course is based on Georgia Virtual Learning's AP physics course. Students use readings, videos and simulators to learn about Newtonian mechanics, fluid mechanics and thermal physics, electricity and magnetism, waves and optics, and atomic and nuclear physics. Students will complete eighteen labs using online simulators to collect their data. The course culminates with a hands-on lab created by the student and a final exam.

- The majority of the pdfs in this course are from that course (list [first unit](#) is linked here). They originally got most of them from other places. The course I used as a guideline from GVL is free to adapt and share but cannot be used for commercial purposes.

### **Notes:**

- This course runs on Java! Very often you will be running Java applications. Make sure you have it installed and it is up to date. If you are supposed to use a simulator and it's not there, check your Java updates! You may need to switch to another browser that supports Java.
- This is a tough course, but you can do it. I want you to think about how you best learn, how you best remember information. Can you just listen to something and remember it? Do you remember it best if you write it down? Do you need to read something to get it? Use those things while you take the course. If it's a video, and you are best at listening. Don't take notes. Just sit and listen. If you do best concentrating doing something, take notes; write down key words. Want something to read, take good notes to read afterwards.
- - Sometimes I'll say watch the video OR read to learn the information. Choose the way that is best for the way you learn.

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- Every day it would be great to sit down with a parent or someone and explain about what you read. Being able to recreate the information in your own words will cement it in your mind. It also shows you really understand it. As you learn the material, stop frequently to put it into your own words. Summarize the page to yourself before you exit.
- This course is based on an AP physics course. It will help you prepare for the AP Physics B test. Here's a link to learn more about [AP exams](#). Also, plan accordingly if you want to take the exam and try for college credit. They are usually offered in May.
- Your final exam will draw on questions from the tests and review pages from throughout the course. After you grade a test, stop and learn from any mistakes. You may see the question again in some form.
- When (source) is listed with a link, you don't need to click on it. It's just giving credit to where the resource or information originally came from. It's how I am citing the source.

### Day 1\*\*(\*)

If a link is not working to follow the steps on the FAQ page.

1. \*Print out this [equations sheet](#) to save. Your goal is to be able to read this sheet Physics will be easier when you learn to speak its language. Doesn't that equation sheet look like a different language? Take the time to learn the vocabulary. Whenever you come across a formula, an equation, stop and read it out loud in English words. Don't say, "d = v times t." Think, "Distance equals velocity times time." Then say, "You can find out how far you went by multiplying how fast you were going with how long it took you to get there." Then it's no longer a foreign language. Take the time to translate. And eventually, it might not seem so foreign any more. You will be able to use this equations sheet as you work and even when you take tests. My physics teacher always gave us the equations. You can always find an equation, but knowing which, when and how to use it is what you'll be learning.
2. (\*) Print out a [grading sheet](#) or use the [Excel](#) version.
3. Read through these lessons on [metric measurement and conversions \(source\)](#). On page 3 it has an error. 1 liter is 1000 milliliters. That's the beauty of the metric system.
4. \*Print out these pages of [worksheets](#) on metric conversions.
5.
  - Use the second page of the lesson materials to fill in the boxes at the top of the first worksheet.
  - Then complete the worksheets.
  - Check your [answers](#) when you are done.
1. Play [ice slide](#). Write your score in seven different measurements. (This is Flash. If you can't play it, it's not a big deal. It gives you a number in the hundreds. That is your meters measurement. Convert from there.)

## Day 2

1. Download this [graphical analysis program](#). Read through the page. There is a tutorial. This was used in chemistry if you've been through that.
2.
  - If you have a tablet you can use: Vernier Graphical Analysis. If the GVL program does not work for you, you can use these: for [Mac](#) and for [Chrome](#).
  - However, you could use any graphing program, even Excel, or just your hand and some [graph paper](#).
1. Here is your [scientific calculator](#). Yes, you get to use a calculator, so learn how to use it.
2. Read this [vocabulary list](#). Copy down any vocabulary you aren't already familiar with.
3. If you haven't had trigonometry, take the time to do the first ten things on this basic [trigonometry list](#) at Khan Academy.

## Day 3

1. \*Print out these two note taking guides to use while you watch the video below. [One](#) [Two](#)
2. Watch the videos on [conversions and using a scientific calculator](#). Follow the directions and practice. ([video script](#) – [source](#))

## Day 4

1. Try these activities to work on scientific notation and practice with your [calculator](#). The exponents are telling you how many times to move the decimal place and in what direction.
2.
  - [one](#)
  - [two](#)
1. If you need more practice with this, go to [Khan Academy](#).
2. Take the [quiz](#).
3. Record your score out of five.
4. Learn about [significant figures by watching a video](#) or by [reading](#) and then [practice the concept](#).

## Day 5

1. Read through these [examples](#) of conversion. Copy down each problem and work it through with the example.

## Day 6

1. Watch this [video](#) on finding the relationship between variables ([alternate](#).) Follow any directions it gives.
2. Explain the concept of the video to someone.

## Day 7\*\*

1. \*Print out some [graph paper](#) to have on hand. (If you are in America, leave the settings.)
  2. \*Print out these lab sheets. [Chart Questions](#)
  3. To find the force or weight (N, measured in Newtons) you multiply the mass by 9.8 (meters per seconds squared), which is gravity pulling down on the mass
  4. Use the [lab results notes](#) to fill in your lab worksheets.
  5. Check your [answers](#).
  6. Record your score.
  7.
    - Lab worksheets: 6 points for correctly filling in your chart; 1 point for correctly filling in the blanks (6 possible) , 8 points for your graph (make sure it's labeled)
    - Record your score out of 20.
1. Always save your written work. Keep it for your portfolio and your records.

## Day 8

1. Read the "[Who Done It](#)" assignment. Make the graph and answer the questions at the end of that section.
  2. Complete the following.
  3.
    - Write an example of a standard conversion problem converting from one unit to the next and solve it showing all of your work.
    - Write an example of a sample calculation. Express your answer using the correct number of significant digits. ([source](#))
1. Check your [answers](#).
  2. Record your scores.
  3.
    - Who Done It: 1 point for each correctly filled in blank (6 possible), 4 points for your graph (make sure it's labeled)
      - Record your score out of 10.
    - Question for Thought: 1 point for each of the two parts of the two questions (four possible—write, solve, write, express)
      - Record your score out of 4.

## Day 9

1. Complete this lab on [graphing scientific data](#). Follow the instructions. Use your graphing analysis program. (The link on the pdf to learn more about graphs is not working. If you need a refresher, you'll need to look up what you need.)
2. Read through these [lab report directions](#) and the [lab report rubric](#). (You don't have to include a photo.)

- Record the lab out of 30. This means there is a potential for three points extra credit.

### Day 10

- Work through the [review](#). Answer each question before scrolling over.
- Read the [key terms](#) to read their definitions. You don't have to really understand them yet.
- Read about [vectors](#). Make sure you click on all the buttons!
- If you feel like you need it, here's a [video introduction to vectors](#).
- Fill in the blanks to [check your understanding](#).

### Day 11\*

- Read about [scalar and vector](#) and check your understanding at the bottom of the page. Answer everything out loud to yourself before you click on the answer spaces.
- Get at least [one correct](#) before you move onto the worksheet.
- \*Print out this worksheet on [vectors](#) and complete page 1. Save the second page for Day 12.
- Check your [answers](#).
- Record your score out of 15. 1 point for each blank and 6 answers for number seven. (potential for extra credit)
- Remember to hold onto your written work. Keep it nice for your portfolio and records.

### Day 12

- Read about [vector fundamentals](#).
- Complete the [second page](#) of the vector worksheets from Day 11.
- Check your [answers](#).
- Record your score out of 15.1 point for each blank and 6 points for number nine.

### Day 13

- Complete this project assignment on [flight and vectors](#). Stop at "Ready to Become a Pilot?"
- Check your [answers](#).
- Record 10 points for completing the assignment.

### Day 14\*

- Watch the [Khan Academy video](#) on displacement and vectors.
- Read this page on [distance and displacement](#).
- \*Print out these worksheets on [displacement and distance](#). Complete page 1 and save the second page for Day 15.

### Day 15

- Complete the second page of the worksheets from Day 14 on [displacement and distance](#).

2. Play with these [vector components](#). The pink lines show two different vectors. The red line shows them combined. Look at them and think about it. If you walked over two blocks and up three blocks, you'd end up in the same spot if you just walked diagonally there.
3. Learn about [adding and subtracting vectors graphically](#).
4. Try the [vector treasure hunt](#).

### Day 16

1. Read about [vector addition](#). Stop after practice A and practice B. Do them both BEFORE you look at the answers.
2. Try [five problems](#).

### Day 17

1. Complete this [project assignment on flight](#). Read and follow the directions. Only do numbers 1 and 2 under part D.
- 2.

### Day 18

1. Read about [resultants](#).
2. Play with the [resultant finder](#).
3. Try it. Answer the [questions](#).

### Day 19

1. Learn another method, the [parallelogram method](#), of finding a vector's components.
2. Click on "find out components."
1. Go through the [example of the parallelogram method](#) by clicking on the box to move through the steps. Then work through the example problems.
2. You can scroll up to read again about head to tail vectors and try examples if you need the practice.

### Day 20

1. Read about [adding vectors algebraically](#).
2. Read about using the [trigonometry method](#). Watch the [video](#) on the algebraic addition of vectors. Read the [additional page](#).
3. Answer the [questions](#). Score up to 2 points for the two parts of each answer.
4. Record your score out of 4. (potential for 4 points extra credit)
5. Remember that you have a [calculator](#).

### Day 21

1. Complete the [vocabulary review](#).
2. Read the [sample problem](#) and (solve the four problems at the end. I don't have answers for these. You can use the problems below instead if you like.)
3. Either use the sample problems on the worksheet, but I don't have the answers yet, or try some of the [three types of problems](#) using trigonometry at the bottom of the list.

### Day 22\*

1. \*Print out this test, [Vectors Test](#).
2. Check your [answers](#).
3. Record your score out of 30, 2 points for each question. (There are three parts: 9 questions, 4, 2.)
4. Take time to review, especially if you need practice on the math. Here are some links.
5.
  - [trigonometry and right triangles](#)
  - [overview](#) of scientific notation, metric, solving equations

### Day 23

1. Complete this [projectile simulation lab](#).
2.
  - Read the directions.
  - Use this link to go to the [simulator](#).
  - Go through the activity sheet to find what you need to write up your lab and answer the question posed.
  - Instead of writing up a report, follow the directions in the red.
  - Record your score out of 30. (potential for extra credit)

### Day 24

1. Copy the [definitions](#) about kinematics.
2. View the flicker page and read about the [types of motion](#) you'll be learning about.
3. Watch this presentation on [one-dimensional motion](#). Take notes.

### Day 25

1. Use the links to learn more about one-dimensional motion.
2.
  - [Distance and Displacement](#) ([demonstration](#))
  - [Speed and Velocity](#)
  - [Acceleration](#)
1. Answer the first three [kinematics](#) problems. Remember, you can use a [calculator](#).
2. Make sure you check your answers and understand how to get the right answer.

### Day 26

1. Use the links to learn more about one-dimensional motion.
2.
  - [Position vs. Time Graphs](#)
    1. Make sure you use the graphing applets. Also, make sure you check your understanding BEFORE looking at the answers.

- [Velocity vs. Time Graphs](#)

1. Play with the [car acceleration](#) applet. What does each graph show?
2. Apply the [brakes](#).

1. Remember these? Take a look again and read the [types of motion](#).
2. Now, [name that motion](#).

### Day 27

1. Use the links to learn more about one-dimensional motion.
- 2.

- [Kinematics Equations](#)

1. Copy down the kinematic equations. What are they talking about? Read the equations to someone in English. Use words, not letters and symbols.

- [Kinematics Equations and Problem Solving](#)

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1. Copy down the sample problems.
2. Do [problems 4-8](#). Remember, you can use a [calculator](#).
3. Try problem 9. It's blue because it's harder. Give yourself two points extra credit if you get it right.

### Day 28

1. Read the [tips and summaries](#). Actually, read them slowly out loud. Yes, I'm serious. Even better, find someone to teach them to. Make sure you know what they say.
2. Take the quiz. The three box questions and the one book question. Answer before you turn the page!
3. Record your score out of 4.
4. Answer the questions about "[Running in Circles](#)."

### Day 29

1. \*Print out these [questions](#) and answer numbers 1-14. Login: easypeasy allin1homeschool
2. Check your [answers](#) and give yourself two points for each correct answer.
3. Record your score out of 28.

### Day 30

1. Watch these videos and take note of the different types of motion in play.
2.
  - Watch the [physics of skateboards](#).
  - Watch [robofish](#) for a bit.

- Watch the [physics of flight](#).
1. Answer the [questions](#).
  2. Check your [answers](#).
  3. Answer [number 10](#).
  4. Record ten points for completing the questions for yourself.

### Day 31

1. Look at the [graphs and answer the questions](#) in this virtual lab. (You don't need to write out the answers.)
2. Match the [graphs](#) to the animations. You can click on the arrows in the corner to make it full screen. You'll click on the letters to see the graphs.
3. Draw your own three properly labeled graphs. Title it with what it shows.
4.
  - Here are some [examples of motion graphs](#), and [more](#).
  - Need [graph paper](#)?

### Day 32

1. Use these simulations and animations to learn about motion. Write a sentence about what each shows.
2.
  1. [Displacement and Distance](#) (Click on the play button.) You've seen this one before.
  2. [Constant Acceleration](#) (There is more than one play button on this one.)
  3. [Motion Animation](#)
  4. [Fan Car Simulation](#) (After you've played, do the "Concept Question.")

### Day 33

1. Watch the presentation on [2D motion](#).
  2. Play with projectile [motion](#). Choose vectors. On the page over on the right, click to show the vectors. Click on the cannon button to shoot it. Watch what is happening.
  3. Shoot the [coconut](#).
  4. Here are some other applets for projectile motion if you want to keep playing.
  5.
    - [hunter](#)
    - [gun](#)
1. Take the [quiz](#). There are three multiple choice and then the last question has three parts.
  2. Record your score out of 6.

### Day 34

1. Complete the [questions](#).

2. Make sure to label your answers. What did you find? m/s for instance
3. Check your [answers](#) and score each out of a total possible of two.
4. Record your score out of 14.

### Day 35

1. Use the [projectile motion simulator](#).
2. Create three graphs. They will show the height, range and time. (One graph will have height on the y axis. One will have range on the y axis. One will have time on the y axis.)
3. The range it travels along the horizontal before it reaches the same vertical position it started at.

1. Use three different colors and include on each graph lines for speed, mass and angle.
2. Record your score out of 30, up to ten points for each graph. Each graph should show three lines, plus should be labeled appropriately on the x and y axis and be titled.
3. You might want to include this in your portfolio.

### Day 36

1. Find an article from a well-respected internet source which shows current (this year) research in the area of kinematics (motion). Summarize your findings and prepare a two paragraph summary. Use at least one quote from the article. Make sure the article name and website address is listed under your paragraphs for your citation. ([source](#))
2. Score your assignment. 5 points for finding and reading an article on kinematics. 5 points for each paragraph. Take off a point for missing any of the following: introduction, conclusion, details, quote.
3. Record your score out of 15.
4. You might want to include this in your portfolio.

### Day 37 (\*)

1. Watch this video demonstrating [air resistance](#) in action.
2. Write a paragraph about air resistance, how it effects things in your world and how its impact can be limited. Give examples.
3. Record 5 points for a complete paragraph that follows the instructions.
4. (\*) These worksheets are preparation for the ACT, a test similar to the SAT except that it also tests science reasoning. This is the type of thing you would have to do, and it's on kinematics. Read the [passage](#) and answer the questions.
5. Check your [answers](#) and make sure you understand.

### Day 38

1. Review the [terms](#) of the unit.
2. Take the [test](#). Do numbers 1-19. (Skip the last problem.)
3. Check your [answers](#).
4. Add one point and record your score out of 20.
5. You might want to save this in your portfolio.

### Day 39

1. Do [problems 11 -16](#).
2. Give yourself one point extra credit for each one you got right. Record how many you got right.
3. Try [graphing motion](#).

### Day 40

1. Copy down the [key terms](#) for the new unit. For the second part of the page, write a short definition for each one.
2. Write down each [force](#) and a sentence that helps you remember what it is. (Or, you could draw a picture for each one, whatever helps you remember.)
3. Use all the parts of the [simulation](#). Click to turn on the free body diagrams.

### Day 41

1. Watch this presentation on the [Newton's first law](#) of motion.
2. Read about [Newton's first law](#).
3. Watch the [presentation](#) at the top of the page.
4. Explain Newton's first law to someone.
5. This is why we wear [seat belts](#).
6. Try problems using [Newton's First Law](#).

### Day 42

1. Remember your [calculator](#).
2. Read about [equilibrium](#) and check for understanding.
3. Even if I don't have you record a score for something like this, in the end you might receive points IF you complete your daily assignments. Even if you didn't, it's still smart to do all of your work to the best of your ability. You should always do your best because we are told to do all things to the glory of God. But it is smart to always try your best because then you will be at your best when it's time to test.

### Day 43

1. Watch this presentation on [Newton's second law](#) of motion.
2. Read about [Newton's second law](#).
3. Read about [the elephant and the feather](#).
4. Watch this example of [free falling objects](#) hitting the ground at the same time.
5. The astronaut didn't say Newton first made the observation. Who did he say? (answer: Galileo)

### Day 44

1. Complete the lab on [Newton's second law](#). Here is the [simulator](#).
2. Follow the lab instructions – jump down to “Procedure” and write a lab report.
3. Score your lab report. Record up to 33 points.

4. Read through these [lab report directions](#) and the [lab report rubric](#). (You don't have to include a photo.)

### Day 45(\*)

1. If the string of a swinging pendulum breaks, what path does the hanging weight take? You don't have to write anything. Just explain your answer to someone.
2. \*Complete this [worksheet](#) on Newton's second law.
3. Check your answers. (Check your answers. Click and drag to reveal: a, 16, 32, 4, 4, 2, 4, 16, 96, CADB)
4. Score your work and record your score out of 10.
5. Here are extra practice problems IF YOU WANT them, [Newton's second law](#). You could do five for extra credit if you need the points.
6. This is the end of the first quarter. If you are using a paper grading sheet, divide your total score by the total possible. It should be less than 1 (unless you have a perfect or better than perfect score.) Multiply your result by 100. (Just ignore decimals.) That's your grade percentage (eg. 87%). Your goal is 90% or better.
7. Remember to hold onto written work for your portfolio and records.

### Day 46(\*)

1. (\*)Print out the [grading sheet](#) for the second quarter or use the [Excel](#) version.
2. Watch this presentation on the [concepts of Newton's FIRST law](#) of motion.
3. Read about the [Atwood machine](#)
4. Read through the example and try the [two problems](#) given under the example.
5. When you have your answers, use this [simulator](#) to check your answers.

### Day 47

1. Read about the [Atwood machine](#) on a frictionless table.
2. \*Complete this [quiz](#) on the Atwood machine.
3. Check your [answers](#).
4. Record up to ten points.
5. Complete [problems 1-3](#).

### Day 48

1. Complete this [lab](#) on Newton's second law of motion.
2.
  - "This lab was designed to have students investigate the factors that affect the acceleration of an object on a frictionless horizontal surface. The simulation will give the students position vs. time data and they will have to determine the acceleration via graphical methods. Students will then vary parameters like driving force and total mass and see how the acceleration is affected by each change." ([source](#))
1. Create a lab report.
2. Score your lab and record the grade out of 33.

3. You might want to include this in your portfolio.

### Day 49

1. Watch this presentation on [Newton's third law of motion](#).
2. Look at this poster. Find [Newton's third law at work](#).
3. Read the top of page 2 to learn about the [poster](#).
4. What makes this [balloon](#) fly?
5. Read the bottom of [page 4](#) to find out and to read even more examples.
6. What's another example of Newton's third law in everyday life? (my answer: jumping)

### Day 50\*

1. Watch the episode 8 video, The Apple and the Moon, on [Newton's Laws](#).
2. \*Print this [worksheet](#) and answer the questions as you watch.

### Day 51\*

1. Use these pages to learn more.
2.
  - [Newton's third law](#)
  - [action-reaction](#)
1. \*Print out this [worksheet](#) and complete it.
2. Check your [answers](#).
3. Record your score out of 15. (16 possible)
4. You might to keep this in your portfolio.
5. Here are extra practice problems IF YOU WANT them, [Newton's Third Law of Motion](#).

### Day 52

1. Watch this presentation on [gravity and normal force](#). Here's a [written explanation](#).
2. Go through the [questions](#) to make sure you understand.
3. Review the [terms](#).

### Day 53

1. Here is another problem similar to what you'd find on the [ACT](#). This one is related to Newton's laws. Read the passage and answer the questions.
2. Check your [answers](#).
3. Copy the [key terms on forces](#).
4. Watch this presentation on [unbalanced forces](#).

### Day 54

1. Use the links on page two to learn more. Answer the questions on each page.
2.
  - [the meaning of force](#)
  - [balanced and unbalanced forces](#)
  - [inclined plane](#)

### Day 55

1. Try five problems on the [application of Newton's laws](#).
2. Read about [unbalanced forces](#) and answer the questions.

### Day 56

1. Watch this presentation on [friction](#) and balanced forces.
2. You can [read about it here](#).
3. Explain to someone what this [inclined plane simulator](#) shows.

### Day 57

1. Complete the [friction lab](#).
2. Use the [lab directions](#).
3. Score 10 points for 10 trials completed and recorded on a table, 10 points for a graph, 10 points for a conclusion.
4. Record up to 30 points.

### Day 58

1. Watch this presentation on [circular motion](#) and centripetal force.
2. Read about [speed and velocity](#).
3. Read about [acceleration](#) and answer the questions.

### Day 59

1. Read about [circular motion](#).
2. Read about [centripetal force](#). Watch the animation and answer the questions.

### Day 60

1. Read about [centrifugal force](#).
2. Read about the [mathematics](#) behind circular motion.
3. Complete [problems 11-15](#). Give yourself one point extra credit for each one you got correct.

### Day 61

1. Read through three pages on [circular motion](#). The last is on vertical motion. Copy down example problems.
2. Use the [circular motion applet](#). Explain to someone what you are looking at.
3. Read this [sample ACT passage](#) and answer the questions.
4. Make sure you understand by [checking your answers](#). On the ACT there are no points deducted for wrong answers, so it's better to guess than to leave an answer blank.
5. Complete [problems 16-20](#).
6. Check your answers.
7. Record your score out of 10, up to two points per answer.

## Day 62

1. Complete this circular motion lab.
2.
  - Use the [simulator](#).
  - 
  - Use the simulator linked above and [answer the questions](#). Write a paragraph for your summary.
1. Record your score.
2.
  - 15 points for numbers 2-8
  - 5 points for a summary paragraph if it meets the given guidelines

## Day 63\*

1. Work through the [example problems](#).
2. \*Print out this [worksheet](#) and complete it. Remember your [calculator](#)
3. Check your [answers](#).
4. Take the [self test](#).

## Day 64

1. Watch this presentation on [torque](#).
2. Read about [torque](#).
3. Read this page with an example of [static equilibrium](#).
4. Find a sports example that uses circular motion. Explain it to someone.

## Day 65

1. Test your [torque](#) understanding.
2. Make sure you know your [vocabulary](#).
3. Review some [previous vocabulary](#).
4. Review [forces](#).
5. For more [review](#) answer the questions.

## Day 66

1. Take this [test](#) on using Newton's laws.
2. Check your [answers](#). (Add 2 points to your total.)
3. Record your score out of 15.
4. Complete the questions, [free response test](#).
5. Check your [answers](#).
6. Record your score out of 3. (potential for extra credit)

## Day 67

1. Work on the [key terms](#) on work and momentum. You might learn best by copying them down, saying them out loud, or by doing all the different activities.

2. Watch this [presentation](#) on work.
3. Read about [work](#).
4. Read this page on [work](#). The example demonstrations aren't working. Answer the three problems at the bottom of the page.
5. Test your understanding.
6.
  - Consider a tug-of-war in which two teams are pulling on a rope. They are evenly matched and no motion takes place. Is work done on the rope? On the pullers? On the ground?
  - - Answer: No
  - Roads going up mountains are constructed with switchbacks with the road weaving back and forth along the face of the slope such that there is only a gentle rise on any portion of the roadway. Does this require any less work to be done by a car climbing the mountain compared to driving on a roadway that is straight up the slope? Why are switchbacks used?
    - Answer: Ignoring  $F_f$  the same amount of work is done. Including  $F_f$  more work is done (longer period of contact with surface)

### Day 68

1. Read about [work](#). Answer the questions before you look at the answers. Watch the animations.
2. Complete these problems on [work](#).
3. Look at and read about [work and energy](#) in our lives.

### Day 69\*

1. \*Print out and complete these worksheets on [work](#).
2. Check your [answers](#).

### Day 70

1. Watch this presentation on [potential energy](#).
2. Read about work and [potential energy](#).
3. Read the page about the [mass on a spring](#).

### Day 71

1. Run the [energy skate park simulation](#). Explore.
2. Answer the [questions](#).
3. Read this page on the [work-energy relationship](#) and answer the questions.

### Day 72

1. Read about [potential energy](#) and check your understanding.

2. Read about [kinetic energy](#) and check your understanding.
3. Here's a game introducing [particle physics](#).

### Day 73\*

1. Read about [mechanical energy](#).
2. Read about [power](#) and check your understanding.
3. \*Print out this [worksheet](#) and answer the questions about power.
4. Check your [answers](#).
5. Record your score out of 10. (A few have two blanks.)

### Day 74\*

1. Read [power and machines](#).
2. Here's a reminder about the [simple machines](#).
3. \*Print this data table and complete a [lab](#) on pulleys. Use your directions for writing and scoring a lab.
4. Use this [simulation](#) to complete the lab. If you want help using the simulation, here are [two videos](#).
5. Record you score out of 33.
6. Include the lab in your portfolio.

### Day 75

1. Watch this presentation on [mechanical advantage](#).
2. Read about [mass spring systems](#).
3. Use the simulators. [First](#) [Second](#)
4. Answer the [questions](#).
5. Check you [answers](#) and record your score out of 6.
6. Read the [passage](#) example from the ACT test on mass spring systems and answer the questions.
7. Check your [answers](#).

### Day 76

1. Watch the presentation on [pendulums](#).
2. Read about [pendulums](#).
3. Use the [simulation](#).
4. Take the [quiz](#).
5. Check your answers and record your score out of three.
6. Read this ACT example [passage](#) on energy and answer the questions.
7. Check your [answers](#).
8. Try problems 21 and 22 for [extra credit](#). You get 1 point for 21 and 2 for 22.

### Day 77

1. Watch the [presentation](#) on momentum.
2. Read about [momentum](#).

3. Read about [angular momentum](#).
4. Answer the [questions](#).
5. Read about [momentum](#) and check your understanding.
6. Look at/read about [momentum in pictures](#).

### Day 78

1. Watch the presentation with a [momentum](#) example.
2. Read about the [momentum-impulse connection](#) and answer the questions.
3. Read about [collisions](#).
4. Use the [simulator](#).

### Day 79

1. Do the [elastic and inelastic labs](#) (#s M7 and M8). You can write them up as one lab.
2. Use this [simulator](#). (uses flash – If you can't do this, you can use [this lab](#) but you'll have to make up your own directions.)
3. Create a data chart.

### Day 80

1. Read the [review](#).
2. Complete the [crossword](#).
3. Answer [review exercises](#) as a quiz.
4. Check each answer. Give yourself 1 point for each correct answer. The crossword answers each count as one.
5. Record your score out of 15.
6. Complete this [test](#) on circular motion.
7. Check your [answers](#).
8. Record your score out of 3. (potential for extra credit)

### Day 81

1. Copy the key terms on the [heat and energy](#) chapter.
2. Watch this presentation on the [mechanical equivalent of heat](#).
3. Read about [heat exchange](#).
4. Learn about [heat exchange applications](#).
5. Watch the presentation on [specific heat](#).
6. Try this question for thought, the [cold water diet plan](#). Find your answer and then explain it to someone.

### Day 82

1. Watch this presentation on [thermal expansion](#).
2. Look at the [thermal expansion equations](#).
3. Here are the [thermal expansion coefficients](#).
4. Read through this [lab](#). Use all of the “click me” buttons. You can't stream the video. One of the buttons is for reading the video script.

### Day 83(\*)

1. Complete the lab on [thermal conductivity](#). (This is Flash. I had to click on the i next to the address in the browser address bar and allow Flash on the page.)
2. Then complete the self evaluation (one of the tabs).
3. If you can't use the Flash lab, create your own lab with this [simulator](#).
4. Record up to 30 points for completion.

### Day 84

1. Review the [vocabulary](#).
2. Try some questions.
3.
  1. A can of gasoline has a rectangular base with dimensions of 13.5 cm by 13 cm. If there are 3 liters of gasoline in the can, how much does the surface of the gasoline rise (in mm) in the can when the temperature is raised by 45°C? The coefficient for volume expansion of gasoline is  $9.5 \times 10^{-4}/^{\circ}\text{C}$ . (Answer: 7.29mm)The cavity within a copper [  $\alpha = 51 \times 10^{-6} /^{\circ}\text{C}$  ] sphere has a volume of  $1.20 \times 10^{-3} \text{ m}^3$ . Into this cavity is placed  $1.10 \times 10^{-3} \text{ m}^3$  of benzene [  $\alpha = 1240 \times 10^{-6} /^{\circ}\text{C}$  ]. Both the copper and the benzene have the same temperature. By what amount  $T$  should the temperature of the sphere and the benzene within it be increased, so that the liquid just begins to spill out. (Answer: 77 degrees)
1. Take the [heat and energy test](#).
2. Answer each question and check your answer. You get one point for each correct answer.
3. Record your score out of 12. (potential for extra credit)

### Day 85

1. Read the ACT practice passage on [collisions](#) and answer the questions.
2. Check your [answers](#).
3. Copy the key terms in [fluids and pressure](#).
4. Complete the first five problems on [collisions](#).
5. Check your answers and use the guide to help you understand.
6. Complete the first five problems on [circular motion](#).
7. Check your answers and use the guide to help you understand.

### Day 86

1. Read about the [states of matter](#) and take notes.
2. Watch this [plasma video](#). I don't think the first way will hurt your microwave. We've done it several times. I've not tried the plastic container way.
3. Use the [simulator](#).
4. The [diagram](#) on the page is hard to see. Here it is large.
5. Can you answer the [questions](#)?

### Day 87

1. Watch the presentation on [hydrostatic pressure](#).
2. Read about [hydrostatic pressure](#).
3. Use the [simulation](#). You have to drag the pressure gauge to the water to measure the pressure. The hydrostatic pressure of water increases by about 1 hPa for each cm of depth.
4. Answer the questions under [respond](#). Login: easypeasy allin1homeschool
5. Check your [answers](#).

### Day 88

1. Watch the [presentation](#) on buoyancy.
2. Read about [buoyancy](#). Click on mechanics, fluids off to the right, and buoyancy in the middle. Scroll down to keep reading. (There are two scroll bars.)
3. Read about [buoyancy](#).
4. Use the [simulator](#).
5. Do the [question for thought](#).

### Day 89

1. Complete this [lab](#) on buoyancy (parts 1 – 3).
2. Use the [simulation](#).
3. Record your score out of 20. (potential for extra credit)
4. You might want to save this for your portfolio.

### Day 90

1. More review today. Do at least three problems from each of the [mechanics problem sets](#). Click on the top and scroll to the bottom to find the problem set.
2. If you want to challenge yourself, use the blue numbered problems.
3. Check your answers and use the explanations.
4. This is the end of the second quarter. See Day 45 if you need a reminder of how to find your grade. Remember to be saving written work for your portfolio.

### Day 91(\*)

1. (\*) The third quarter starts today. Print out your new [grading sheet](#) or use the [Excel](#) version.
2. Watch this presentation on [fluid flow continuity](#).
3. Read about the flow of fluid and copy down the [equation of continuity](#).
4. Explain to someone what the equation says.
5. Watch this presentation on [Bernoulli's equation](#).
6. Read about and copy [Bernoulli's equation](#).
7. Explain to someone what the equation is saying.
8. Use this fluid simulator to make observations about [how the viscosity and density of a liquid affect its flow](#).

9.
  - Write or tell someone to state and explain your observations.

### Day 92\*

1. How does Pascal's Principle apply to the eyeball and possible damage? How does Pascal's Principle apply to a tumor? (Use the links below.)
  - [Pascal's principle](#)
  - [another example](#)
1. Play with [Pascal's Principle](#). Create a chart and record your data. Make sure you can always predict what's going to happen. Do at least ten trials.
2. Record up to 30 points, 2 for each of the questions, and a point for each data point up to 26 points for recorded data.

### Day 93

1. Play with the [vocabulary](#) from this unit and make sure you know the terms.
2. Study for your test on Day 94. Use the links from previous days to look at the examples and simulators. Make sure you understand the equations. Read them out loud in English, not symbols. Explain to someone what they are used to find.

### Day 94

1. Take the [test](#) on fluids and pressure.
- 2.
3. Check your [answers](#).
- 4.
5. Record your score out of 20.
- 6.
7. You might want to save this for your portfolio.
- 8.

### Day 95

1. Copy the [key terms on thermodynamics](#).
2. Watch this presentation on [ideal gases and kinetic theory](#).
3. Read and take notes on the different [laws](#).
4. Use these links to practice.
5.
  - [Charles' Law practice](#) This version [walks through the solution](#) if you need help in figuring out the answers.
  - [Boyle's Law calculator](#) You can try some of these as well. Try to solve them without reading the solutions.

**Day 96 (Materials: straw, zip lock bag** If you don't have it, you can use a balloon or your imagination; it's a simple activity.)

1. Use the [Boyle's law](#) page and...

2. Use the [lab](#) as a simulation. ([Alternative](#))
3.
  - Record measurements of volume and pressure. (8 points for 8 data points)
  - Work to be able to predict what was happening.
1. Then [answer questions](#) 17 to 23. (2 points each – 14 points)
2. Record your score out of 20. (potential for extra credit)

### Day 97

1. Watch this presentation on the [laws of thermodynamics](#). (Oh, [just for fun](#), if you like, because I like Joplin and musical theater.)
2. Read about [thermodynamics](#).
3. Use the links on the page.
4.
  - [First law](#)
  - [Thermodynamics](#)
1. Explain to someone the first law of thermodynamics. Be the teacher and make them get it. Draw a diagram if you need to.

### Day 98\*

1. \*Use the [simulator](#) to answer the four questions. ([Alternative](#))
2. Record 15 points for completion.

### Day 99

1. Read about the [second law of thermodynamics](#).
2. Watch "the virtual gaseous mixture reaching thermodynamic equilibrium" by observing the output of a [Carnot engine](#).
3. Go through this page on the [second law of thermodynamics](#) and do the first practice question.
4. Read the EXAMPLE section and do the first practice question on [Carnot's Heat Engine](#).
5. Scroll down to read about the [Heat Death of the Universe](#). What is the theory? What do you think?

### Day 100

1. Review your [vocabulary](#).
2. Review the [unit](#).
3. Complete the [thermodynamics](#) test. Label your answers.
4. Check your answers. There are 10 questions and 19 answers. Score up to 2 points each. Take a point off for any missing label! That's 38 possible points.
5. Record your score out of 35. (potential for extra credit)

### Day 101

1. Here are the key terms of [electrostatics](#).

2. Watch this [lecture](#) from MIT on electric charges and Coulomb's law. This is long. If you can't handle it, here's a [shorter video](#), but I thought some of you might enjoy sitting in at MIT.
3. Use the [simulator](#) by dragging the charges into the empty space and using the sensors to see what direction they are being pulled.

### Day 102

1. Read about the [structure of matter](#) and check your understanding.
2. Read about [neutral vs. charged objects](#) and answer the questions.
3. Look at the [photos](#) and read about static electricity.
4. Can you answer [number 1](#)?
5. Check you [answer](#) and use the solution guide if necessary.

### Day 103

1. Read about [charged interactions](#) and check your understanding.
2. Read about [conductors and insulators](#) and check your understanding.
3. One more page on [charged interactions](#).
4. Answer [questions 1 and 2](#).

### Day 104

1. Read the [ACT practice passage on heat](#) and answer the questions
2. Check your [answer](#) and make sure you understand the solution.
3. Read about the [inverse square law](#). Copy the equations. What do they mean?
4. Do the [problems](#) at the bottom of the page.

### Day 105

1. Read about [multiple charges](#). Take notes. I suggest copying the example problems to help you follow them.
2. Answer the questions.
3. Then check the [answers](#).

### Day 106

1. Read on [methods of charging](#).
2. Play with the [balloon](#).
3. Make sure you understand this topic. You don't have to do every question. You can read the questions and then read the answers. Try what you need to, though, to make sure you understand.
4.
  - [charging by friction](#)
  - [charging by induction](#)
  - [charging by conduction](#)
  - [grounding](#)

### Day 107

1. Watch this presentation on [electric fields](#).
2. Read about [electric fields](#).
3. Play [hockey](#). Drag charges onto the field. Then click on reset charge and then go. Score.
4. Watch the presentation on [conductors](#).
5. Try to answer the [questions](#).
6. Check your [answers](#).

### Day 108\*

1. Read about [electric field lines](#) and check your understanding.

1. Play with the interactive. Can you predict the lines?

1. [Electric Field Lines](#)

2. Record 9 points for completion.
3. Watch this presentation on [electric potential](#).

### Day 109\*

1. Read about [electric potential](#). Take notes; I suggest copying the example problems.
2. Answer the [questions](#).
3. Read about the [electric potential difference](#).
4. \*Print out these [worksheets](#) and complete them
5. You might want to save this in your portfolio.

### Day 110

1. Watch this [presentation](#) on capacitors and then on the [energy of a capacitor](#).
2. Read about capacitors.
3.
  - [How Stuff Works](#)
  - [capacitors](#)
  - You can skim through material like this if you feel like you have it already from the video.
1. Watch the second [presentation](#) on capacitors in a circuit.

### Day 111

1. Do the [example problems](#).
2. Use the [simulator](#).
3. Try the [problems](#) to check your understanding.
4. Review your [vocabulary](#).
5. Review the different pages of questions. I'm telling you what to study. If a teacher tells you what to study, that means it's going to be on the test. Know it.

6.
  - [charges \(105\)](#)
  - [electric fields \(107\)](#)
  - [electric potential \(109\)](#)
  - [capacitors \(111\)](#)
  - [answer page](#)

### Day 112

1. Take the electrostatics [test](#). Open it on your computer and NO OTHER PAGES. Once you open the test page, you can no longer study. You must close your notebook and any other windows. In school you would have no other paper on your desk and would have to keep your eyes on your own paper.
2. Click and drag to highlight the area below AFTER you are done with the test: (Go to Day 111 and use the four practice question links in order. The questions are numbered and in order. Teachers will often take test questions right off of homework or quizzes. They are great study tools.)
3. Record your score out of 20. (If there is an A and B, both parts are one point.) There is a potential for extra credit.

### Day 113\*

1. Copy the [key terms on electric currents](#).
2. Watch this presentation on [current, resistance and power](#). This does not open full screen. You can click to maximize to make it a bit bigger.
3. Play around with this [circuit](#) to learn about current and resistance. Double click at a point to be able to break a connection.
4. \*Complete this voltage simulator [worksheet](#) as you play around. (Note: This was originally written for another simulator. You can still answer the questions, but its reference to "Try This Circuit" is no longer valid.)
5. Read [current, voltage and resistance](#).

### Day 114

1. Do [problem 6](#). I don't want you to forget. Check your answer and use the guide if needed.
2. Read on [currents](#).
3. Copy the equations. Take notes.
4. Try the [problems](#) before you look at the answers!

### Day 115 (materials: drinking straw)

1. Use the simulators to complete this [lab](#).
2.
  - [Ohm's law](#)
  - [resistance in a wire](#)

1. Complete the worksheet for the lab. One of problems you will have to calculate on your own and not use the sliders.
2. Score yourself 11 points for completion plus 1 point for each correct answer for the four questions at the bottom of the page.
3. Record your score out of 15.
4. You can check your conclusion answers using this [site](#). (Final answer: The extension cord's resistance increases over the distance traveled. If the extension cord is only designed to carry the current 50 feet, the resistance over several cords may prove too great to carry the needed power.)

### Day 116

1. Read about [electric current](#).
2. Read about [Ohm's law](#) and answer the questions to check your understanding.
3. Take this [Ohm's Law quiz](#).
4. Record your score out of 8. (potential for extra credit)

### Day 117

1. Watch this presentation on [series circuits](#).
2. Read about [series circuits](#).
3. Teach someone about what you just read.
4. Read about [circuit diagrams](#).
5. Complete the online [ammeter activity](#) through the questions at the end.
6. Now the online [voltmeter](#)...

### Day 118

1. Read about [parallel circuits](#). Read up to equivalent resistance.
2. Read through [combination circuits](#) and check your understanding.
3. Read about [circuits](#). Take notes, copy an example problem, use the simulator.
4.
  - [combination of resistors](#)
  - You can click on the letters to read the meters.

### Day 119\*

1. \*Complete this [circuit lab](#) by following the directions on this worksheet. This is the [simulator link](#). Choose the lab.
2. Record 10 points for completing this lab.

### Day 120

1. Read the [energy laws](#).
2. Use the Wheatstone's Bridge [simulator](#).
3. Use the link to the [electric current simulator](#). Choose different types of circuits from the menu. There are too many to see them all. Spend five minutes observing different circuits. What are your observations?
4. Complete the [water heater question for thought](#). Explain your thoughts to someone.

5. Give yourself 5 points for COMPLETING the question for thought, IF you answered each part.

### Day 121

1. Watch this presentation on [capacitance](#) and RC capacitors.
2. Read about the [RC Circuit Problem](#). Take notes.
3. [Resistors and inductors](#) together.
4. Review the [vocabulary](#).

### Day 122

1. Click on the [unit titles](#) in the list and then the unit challenge at the top of the new page. Work until you get 25 questions right. Record 25 points.
2. Try one or all of problems 11-13 for [extra credit](#). (1 point for each right answer)
3. Record any extra points.

### Day 123

1. Start learning the [key terms](#). (on the [site](#))
2. Read about [magnetism](#) and take notes.
3. View the [magnetic pole lines](#) and read the explanation. (Wait for it to load in the blank space.)
4. Watch this presentation on the [forces on moving charges](#).
5. Read on [charged particles in a magnetic field](#) and take notes. You won't watch the video.

### Day 124

1. Read these slides on [magnetic forces and charged particles](#) and do the check your understanding and example problems. Stop and pay attention to each diagram and equation. What are they showing? What are they saying?
2. Watch this short video of a [charged particle moving in a magnetic field](#).
3. Try the [right hand rule](#).
4. Explain to someone what the simulators show.
5.
  - [Magnet and compass](#) Drag the compass around. The line will stay if you stop in a place and then start again.
  - [Magnetic field of a bar magnet](#)
  -
1. See if you can answer questions 1-14. (Skip the ones on Gauss' law 3 and 7.)

### Day 125

1. Watch this presentation on [current-carrying wires in a magnetic field](#).
2. Read on the [same topic](#).
3. Watch the presentation on [fields of long current-carrying wires](#).
4. Finish [reading](#). Take notes. The top half of the page is an image. Sorry about that. Double click, scroll, zoom to be able to read it better.

5. Use the [simulator](#). What does it show?

### Day 126

1. Read about magnetic fields and [current-carrying wires](#).
2. Check out the [thumb](#) in the diagram and read the page.
3. Read these slides on the topic and [answer the questions](#).
4. Answer all of the [odd problems](#).

### Day 127

1. Take this [magnetic fields quiz](#).
2. Check your [answers](#).
3. Record your score out of 6.
4. Watch the presentation on [electromagnetic induction](#).
5. Read on [electromagnetism](#).

### Day 128 (optional materials: pencil, masking or other tape)

1. Use the [electromagnet simulator](#). Pick up the filings.
2. Read page six on [electromagnetic induction](#) and take notes.
- 3.
4. Read about [Michael Faraday](#) and [Lenz's Law](#).
5. Here is a video on [Eddy Currents](#). Make it full screen. I love his accent. It reminds me of our very good friends. On day 129 you will watch a video on the applications of electromagnetic induction.
6. Do this [question for thought](#). Explain your thoughts to someone.

### Day 129

1. Watch the video on applications of [electromagnetic induction](#). Make it full screen. Take notes.
2. Tell someone about what you learned.

### Day 130

1. Read today. This is Michael Faraday's own lecture, in written form, on [magnetism and electricity](#).

### Day 131\*

1. Use [the simulator Faraday's law](#).
2.
  1. Make discoveries about induction. Make a list of ways to cause induction.
  2. What made you think that induction had occurred?
  3. Describe what induction means.
  4. Can you design an [experiment](#) to determine how the size and direction of the induced current will change when the conditions are varied. Collect data, make observations and record your information in a table.

1. Write up your lab.
2. Record up to 33 points for completion, if you have a complete lab report.
3. You might want to include this in your portfolio.

### Day 132

1. Read about [motional emf](#).
2. Answer the [questions](#).
3. Explain to someone what motional emf is.
4. Use the [activities](#) and study for your test.

### Day 133

1. This is the first part of your test, on [electromagnetic induction](#).
2. Write down your [score](#) out of five, a half point for each.
3. Take this [quiz](#).
4. Write down your score out of 20.
5. Answer the following two questions:
6.
  - 5) A 150 turn solenoid carries a current of 12 A. The radius of the solenoid is 0.050 m and its length is 0.18 m. Determine the magnetic flux through the circular cross-sectional area at the center of the solenoid.
  - 
  - 6) A flat coil with radius 8.0 mm has 50 loops of wire. It is placed in a magnetic field  $B = 0.30$  T in such a way that the maximum flux goes through it. Later, it is rotated in 0.02s to a position such that no flux goes through it. Find the average emf induced between the terminals of the coil.
  -
1. Check your answers. Give yourself two points for each correct answer.
2. Record your total score out of 30. 5+20+4+1 point if you completed the test and wrote your scores without any cheating or lying. If you did lie, write down your true scores. If you did cheat, give yourself a zero! Cheaters never win!

### Day 134

1. Today you will be doing review problems from the [mechanical and electricity sections](#).
- 2.
3. Work for 30-40 minutes on problems. You need to get through at least one problem in each category.

### Day 135

1. Today work for another 40 minutes on review problems. Start on this page with review of [heat energy](#).
2. Review [induction](#).
3. Please review [thermodynamics](#) and [questions](#).
4. Please review [fluids and pressure](#). [Answers](#) are on Day 94.

5. This is the end of the third quarter. See Day 45 if you need a reminder of how to find your grade. Remember to be saving written work for your portfolio.

### Day 136(\*)

1. (\*) The fourth and final quarter starts today. Print out your new [grading sheet](#) or use the [Excel](#) version.
2. Start learning the [key terms](#). [Copy them down](#) if that helps you.
3. Watch the presentation on [wave basics](#). Take notes.
4. “The electromagnetic spectrum consists of seven different types of waves which are all electromagnetic waves. An electromagnetic wave is a periodic oscillation of reversing electric and magnetic fields which are at right angles to each other. These waves are all transverse and do NOT need a medium to propagate, which is why they can travel in outer space (literally, a vacuum). They all travel at the same speed, the speed of light,  $c = 3 \times 10^8$  m/s. Since their speeds are all the same, but the properties of the waves are different, they must have different frequencies and wavelengths. Remember that  $v = \text{frequency} \times \text{wavelength}$  and if the frequency increases, the wavelength must decrease proportionately. The following websites will give you information about the seven different regions of the electromagnetic spectrum.” ([source](#))
5.
  - [NASA: Electromagnetic Spectrum](#)
  - [MicroWorlds](#)
  - [UT](#)
  - [Hyperphysics](#)
  - [Nigel Purchon](#)
  - [GSCE Physics](#)

### Day 137

1. Watch this class on [electromagnetic waves](#).
2. Tell someone about his experiments.

### Day 138

1. Watch this presentation on waves and the [Doppler effect](#).
2. [Sound is a Mechanical Wave](#) — Read and check your understanding. Make sure you watch the animation.
- 3.
4. [Sound is a Longitudinal Wave](#) — Make sure you watch the animation.

### Day 139

1. [Sound is a Pressure Wave](#) — Read and check your understanding. Make sure you watch the animation.
- 2.
3. Read this page on [sound](#). Take notes.
4. In regular words, tell someone what this quote says. “Sound is a longitudinal or compressional mechanical wave. It needs a medium to propagate and the motion of its particles is parallel to the direction of the propagation of the energy of the wave.”  
([source](#))
5. Just take a look at these [sound animations](#).
6. Use the [sound simulator](#).

#### Day 140

1. Use the following websites (as listed on page 4) to complete this sounds and waves [activity](#). (not the websites on the handout)
2.
  - [Kettering EDU: Wave Motion Questions 1-11](#)
  - 
  - [Kettering EDU: Doppler Effect Questions 12-21](#)
  - 
  - [Kettering EDU: Reflection Questions 22-33](#)
  - 
  - [Kettering EDU: Superposition Questions 34-38](#)
  -
1. Record up to 35 points for completion.

#### Day 141

1. Read about the [pitch of sound](#).
2. Read about [pitch and frequency](#). Try the activities and question on the page.
3. Read about [infrasonic sound](#).
4. Read about [ultrasonic sound](#).

#### Day 142

1. Read about [sound intensity](#) and check your understanding.
2. Complete this page on [sound intensity](#). Use the chart and answer the questions. The H is for Help/Hint. The Arrow gives the answer.
3. Read this ACT practice section on [sound intensity](#). Check your [answers](#).

#### Day 143

1. Read about the [speed of sound](#).
2. Use the following links on the page:
3.
  - [speed of sound calculator](#)
  - Read about the [speed of sound](#) and check your understanding.
  - Explain to someone [what a equals](#).
1. Look at these [sound photographs](#).

### Day 144

1. Watch this interesting video on [sound waves](#).
2. Answer the following questions from the video. Why are two ears better than one? What is the difference in the sound between the two rooms he played in and what caused the difference?
3. Complete sound [problems 1-6](#). Use the solution guides as needed.

### Day 145

1. Read about the [Doppler effect](#). Use the physics classroom link from the page, also linked below.
2. Read about it in the [physics classroom](#) and check your understanding.
3. Take a look at these [Doppler effect animations](#).
4. Check out this [sonic boom video](#).
5. Complete [problems 8-13](#). Use the solution guides if needed.

### Day 146

1. Use the [Doppler Effect simulator](#). What does it show?
2. Why do they [sound different](#)?
3. Play with the [speed of sound](#). What affects it?
4. What's the [relationship](#) between the speed of a wave, the frequency of the wave and the wavelength of the wave?
5. Record up to 20 points, five points for each simulator/animation if you took the time to answer the question posed.

### Day 147

1. Read on [standing waves](#).
2. Read on [standing waves](#) and take notes.
3. Use the [standing longitudinal waves simulator](#).
4. Write a paragraph discussing the [pipe organ](#).
5. Record up to five points for a complete paragraph with a purpose.

### Day 148

1. Try the ACT test prep question on the "[sound of music](#)."
2. Check your [answers](#).
3. Read about [standing waves](#).
4. Read about [harmonics](#) and check your understanding.

### Day 149

1. Read about [open-air columns](#) and check your understanding.
2. Read about [closed-air columns](#) and check your understanding.
3. There is a test on sound waves on Day 150. It will test conceptual understanding, not mathematics.

### Day 150(\*)

1. (\*) Complete these worksheets for your sound test.
2.
  - nature of sound [waves](#)
  - properties of [sound waves](#)
  - [Doppler effect](#)
1. Check your [answers](#), 1 point each, and record out of 25. (potential for extra credit)

### Day 151\*

1. Practice the [key terms](#). Copy down the [terms](#) if that helps you. It might!
2. \*Complete the [properties of light worksheet](#) using the sites listed on the printed page. (You may not be able to use the Java simulator on the last linked page. Here's another [light simulator](#) that may help you, but you can read what's on the page still.)
3. Record your score out of 15.

### Day 152

1. Watch this presentation on [reflection and refraction](#).
2. Read on [reflection](#)
3. Copy the "math of image formation" formulas down. Now write them with words as an English sentence.
4. Explain to someone the rules for the mirror equations. Don't read them. Explain them with regular words.

### Day 153\*\*\*

1. Watch this video on [optics](#).
2. \*Print and complete this [note taking guide](#) while you watch.
3. \*Print and complete the [mirror lab](#) sheet when directed to.
4. \*Print and complete the [ray diagrams](#), "problem set one". You can refer to this page for [help](#).
5. Can you [define](#): Incident Wave, Reflected Wave, State the Law of Reflection, Specular Reflection, Diffuse Reflection?
6. Record up to 25 points for completing the worksheets.

### Day 154

1. Read about [reflection and refraction](#).
- 2.
3. Use the simulators on the page.
4.
  - [bending light](#) (click on more tools)
  - [refraction simulation](#)
  - [reflection and refraction light waves simulator](#)
1. Explain to someone what you are looking at.
2. Read about [Snell's law](#).

### Day 155\*

1. Watch this [video](#) on lenses.
2. Complete this [note taking guide](#) while you watch.
3. Complete the problem sets and [lab](#) as directed. Problem sets: [one](#) [two](#) [three](#)

### Day 156

1. Read about the [anatomy of a lens](#).
2. Read about [lenses](#).
3. Watch this [presentation on converging lenses](#) (and the [second part](#)). Now, watch this first video on [diverging lenses](#) (and the [second part](#)).
4. Use the [simulator](#) on the page. Explain what you are looking at.

### Day 157

1. Solve these [mirrors and lens](#) problems. Do two problems from each set. There are 8 sets of questions. 2 for concave, 2 for convex, 4 under "General Optics 4," all found on the side menu to the left. Keep track of your score.
2. Record your score out of 15. (potential for extra credit)

### Day 158

1. Watch this presentation on [interference and diffraction](#).
2. Read on [thin film interference](#).
3. Copy the equations in the middle of the page, BUT also either write out that whole thing in plain English or tell what it says to someone. "Since...Then..." etc.
4. Read this [ACT prep passage](#) and answer the questions about cell phone dangers.
5. Check your [answers](#).

### Day 159

1. Read about [diffraction](#) and try Young's two-slit experiment on the page. Remember to read equations with REAL WORDS.
2. Complete five [diffraction problems](#).
3. Record your score out of 4.
4. Complete the [ACT practice](#) questions related to refraction.
5. Check your [answers](#).

### Day 160\*

1. Read about [diffraction](#) and the [diffraction simulators](#) on the page.
2. \*Print this [lab](#) and complete the introduction and part 5—You may need to be creative to make this work in your circumstances.
3. You might want to include this in your portfolio.

### Day 161

1. Review your [vocabulary](#) from the course that you've learned so far.

### Day 162

1. Read about [polarization](#). Take notes.
2. Follow the directions on the page and use the links.

### Day 163\*

1. Watch the video on [color](#).
2. \*\*Use the two note taking guides as you watch. [One](#) [Two](#)

### Day 164

1. Read about [color](#).
2. Read the pages on [color addition](#) and [color subtraction](#) and check your understanding.

### Day 165

1. Complete the [review](#).
2. Play with your [vocabulary](#) until you know it.
3. Try the first two [problems](#). You will be doing more of these on your test.
4. Try the first two [problems](#). You will be doing more of these on your test.

### Day 166

1. Test day: Complete [numbers 3-8](#). Show your work.
2. Also complete [numbers 3-8](#). Show your work.
3. Check your answers and score two points for each problem: one point for the answer and one point for showing your work.
4. Record your score out of 20. (potential for extra credit)

### Day 167

1. Practice [key terms](#). Write down the [terms](#) if that helps.
2. Watch this presentation on the [photoelectric effect](#).
3. Read on the [photoelectric effect](#).
4. Watch this video on the [photoelectric effect](#).

### Day 168

1. Complete this [lab](#) with the photoelectric simulator.
2. Check your answers. Scroll.
3. Record your score out of 19 (3 points each for each question in the assignment and 1 point for each in the self-evaluation.)

### Day 169

1. Watch this presentation on [atomic energy levels](#).
2. Read about [atomic models](#). Take notes.
3. Learn about [Bohr's model](#).

### Day 170

1. Complete this page on [quantum mechanics](#) including the inquiry using the simulation. Don't skip the intro.
2. Answer the questions at the end of the page.
3. Record your score of 20 for completing the directions.

### Day 171

1. Take this [Bohr model quiz](#).
2. Record your score. All bonus points!
3. Duality means having two parts.
4. Watch this presentation on [wave particle duality \(part 2\)](#).
5. Watch the first 16 minutes of this [video](#) from MIT on wave-particle duality with a little history.

### Day 172

1. Watch this presentation on [nuclear reactions](#).
2. Learn about the [types of radiation](#).
3. Learn about [half life](#).
4. Check out [radioactive decay series](#).

### Day 173\*

1. Watch this video on [nuclear science](#).
2. \*Use this [note-taking guide](#).

### Day 174 STOPPED HERE

1. Watch this presentation on [mass energy equivalence](#).
2. Learn about [nuclear reactions](#). Use the new simulation.
3. Learn about the [curve of binding energy](#).

### Day 175

1. Use the activities to [review your vocabulary](#).
2. Go to the [amusement park](#).
3. Go on...read below.

### Day 175-179

1. On 180 you will be taking a final exam, a big test on all that you have learned. You have five days to review the material and to write up one final lab.
2. Here's your [physics vocabulary for review](#).
3. To review go through your notes and especially through the tests from the different units.
4. To complete your lab, you will use your [lab directions](#) from the beginning of the course. Choose one physics concept, create a question and lab to test it. It can be simple like [this lab](#), but it must be complete.

### Day 180

1. Turn in your lab if you haven't already. It should be scored by your [lab rubric](#). Record your score out of 33.
2. Take your [final](#). You can use your equation sheet and a calculator.
3. [Score](#) your final.
4. Record your score out of 100.
5. Congratulations on a huge accomplishment!
6. If you are planning on taking the AP exam. You'll find study help below.
7. Please take the polls below. Answer honestly to help others choose the best courses for themselves.

Figure your course grade. Enter on your fourth quarter grading sheet your total score for each quarter. Divide by the total score from all four quarters. That can be your grade, but I also think you can award up to half of the grade for completing the daily assignments. Then you would take the grade you just calculated, divide it in half and add it to 50, or whatever grade you deem appropriate for completing the readings, watching videos, etc... Example of the scoring calculation: (the numbers aren't from the physics course)

- four quarters total:  $126 + 115 + 110 + 233 = 584$
- 
- dividing by total possible  $584 / 669 = .87 * 100 = 87\%$
- 
- dividing in half for being worth half the grade:  $44\%$
- 
- 100% completion of daily assignments, readings, homework, etc.
- 
- Half of that 100% for being worth half of the final grade:  $50\%$
- 
- Final grade would be:  $50 + 44 = 94\%$ , A
- 

If you plan on taking the AP exam, take a [practice test](#) and go over your mistakes. Take another [part of an AP test](#) and go over your mistakes. Retake the first test and go over your mistakes. Go over your mistakes. Retake the second exam and go over your mistakes. Look for a third... Here is a good place for [review](#) if you need it.