

# Syllabus for Physics 205, fall 2009

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- prerequisites** The prerequisites are Math 141 (precalculus) and 142 (trigonometry).
- office hours** My office hours are in the classroom (not my office), M 1:30-2:30, Tu 11-12, W 10:30-11:30, Th 11-12, and Th 4:30-5:30. I urge you to pick at least one of these office hours to come to every week as part of your habitual schedule; if none of my office hours fits your weekly schedule, please give me a copy of your schedule written out on a grid, and we'll see what we can work out.
- web page** [www.lightandmatter.com/area3phys205.html](http://www.lightandmatter.com/area3phys205.html)  
To e-mail me, use your Spotter account.
- required materials** The texts are *Newtonian Physics*, *Conservation Laws*, *Vibrations and Waves*, and the lab manual. You'll also need a calculator, two bound lab notebooks (either  $10 \times 7\frac{3}{4}$ -inch or  $9\frac{3}{4} \times 7\frac{1}{2}$ -inch) with graph paper pages (near the calculators at the bookstore) a metric ruler, a protractor, and your own e-mail. If you need to review trig, I recommend the free book at <http://mecmath.net/trig/>.
- getting started** Here's a quick summary of the things you need to do by the second class meeting:
1. Get everything listed under "required materials" above. You can buy the books and the lab manual at the FC bookstore, or download them from my web page and print them out.
  2. Read this syllabus.
  3. Consult the schedule on page 4. Do the listed reading and the homework problems. Take notes on the reading, and print two copies of them.
  4. If you don't already have e-mail, get an account.

**grading** Grades will be determined as follows:

homework	121 problems @ 1 point each	121
reading quizzes	38 questions @ 1 point each	38
reading notes	19 @ 1 points each	19
prelabs	14 @ 2 point each	28
check-off labs	9 @ 6 points each	54
lab writeups	5 @ 12 points each	60
short exam	1 @ 120 points each	120
long exams	3 @ 180 points each	540

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points	grade
80%	A
70%	B
60%	C
50%	D

**reading notes** I'll maintain a folder for you containing your notes on the reading. These are the notes you get to use on the exams. You should do the notes on a computer (for ease of revision), and do them after you read, not while reading (so that you know what ended up being the main points).

On any date when reading is assigned, you should be prepared for an open-notes quiz, and print out an extra copy of your notes on the reading; you'll turn in the copy, and I'll add it to your folder. It has to be a copy, because you need the original for your own use in studying and problem solving. I expect you to bring your own copy of your notes to school so that, e.g., we can refer to them together if you're getting help in my office hours.

Your notes need to be entirely in your own words; stating everything in your own words is a good way to test and consolidate your own understanding. Cutting and pasting from the book would be a form of cheating on exams (because the exams are not open-book), and would also be plagiarism if the copied material wasn't properly attributed.

Shorter is better. The laws of physics are fundamentally simple. I would suggest limiting yourself to no more than half a page per chapter. By the end of the

semester, the simple underlying structure of the material will have become more and more obvious to you, and I think you should be able to go back over your notes and edit them down to no more than about a page *total*. It's not against the rules for your notes to be too long, but it's not smart, either; long notes usually indicate that you're not distinguishing fundamental principles from trivia, or that you're making futile efforts to write a cookbook of problem-solving techniques, which is a self-defeating way to approach problem solving. If it feels too scary to walk into an exam with short notes, I suggest making a separate long version as a security blanket, but sealing them shut with a big binder clip to remind yourself that using them is probably a mistake, indicating that you aren't working from basic principles.

#### OpenOffice for note-taking

For note-taking, I recommend that you use the free OpenOffice word-processor, which makes it easy to do equations. You can download it from [openoffice.org](http://openoffice.org). If you don't have a computer at home, you can use the ones in room 416 or 2000, which have OpenOffice installed. When you're writing equations, in most cases all you need in order to make them readable is a few superscripts. For example, suppose you want to write the equation  $v^2 = 2ax$  in your notes. Just type `v2=2ax`, then select the 2 with the mouse and do `Format>Character>Position>Superscript`.

If you want to get fancier, you can use OpenOffice's built-in equation editor. Do `Insert>Object>Formula`, and an empty gray box for the equation is inserted in your document. An equation editor window pops up at the bottom of the screen, and a toolbox of mathematical symbols at the top. Although the toolbox is supposed to make it easier to find and enter the symbols you want, I found it to be more confusing; the most straightforward way to do it, in my opinion, is to type directly into the equation editor. You have to learn the codes for the things you want to type, but there are only three codes you'll typically ever need: `^` for superscripts, `_` for subscripts, and `over` for fractions. Enter a Greek letter as, e.g., `%theta`, making sure to put a space after it. As an example, to make

$$\Delta x = \frac{1}{2}at^2 + v_0t \quad ,$$

you would do `%DELTA x = 1 over 2 at^2 + v.o t`. Note that the spaces after DELTA, both 2's, and o are mandatory. It understands parentheses, so, e.g., `1 over (2+3)` gives  $\frac{1}{(2+3)}$ . For invisible parentheses use curly brackets, e.g., `1 over {2+3}` produces  $\frac{1}{2+3}$ .

#### Spotter

Spotter is computer software I've written to help you check your answers to homework problems. It can check both numerical answers and symbolic ones. Having Spotter helps you more than having answers in the back of the book, because it is programmed to give you helpful pointers. If you put in an wrong answer that I've anticipated, it will explain why it's wrong. If your answer doesn't make sense in terms of units, it will tell you that. If you get a wrong answer, you can redo the problem and put in the right answer later for full credit.

Problems that are underlined on page 12 of the syllabus have purely mathematical answers, and are in Spotter. To get credit for an online homework problem, you need to enter a correct answer in Spotter, and also turn in your written calculations and explanations along with the rest of the homework. What I'm really trying to do here is get you to come to my office hours and get help if you can't get the right answer — Spotter helps you by letting you know whether you have the problem right *before* you turn it in.

You don't need to install the software; you just use it through a web browser. Start from the class's web page, then click on the link to the class's Spotter page. Once you're in Spotter, make sure to log in, or else you won't get credit for your work! Once you're logged in, all your answers will be recorded.

When using Spotter, you have to be careful about the notation you use for inputting mathematical expressions. Spotter is designed to allow you to use something resembling normal human mathematical notation, as opposed to the notation used in computer programs. However, human math notation is designed for humans, not computers, and you need to learn a few things about how to type your expressions in a form that Spotter will interpret correctly.

First, everything you type will be smashed down to one line of text, eliminating the superscripts and subscripts. For example, a variable name with a subscript, like  $x_1$ , is entered as `x1`. Since there are no superscripts, you have to enter exponents using the `^` symbol (shift-6), e.g.,  $x^2$  becomes `x^2`. You can enter a square root as either `sqrt(x)` or `x^.5`. There is no way to enter the times symbol,  $\times$ , without confusing the computer and making it think you meant the variable  $x$ , so in scientific notation you should simply leave a space where you would normally put the times symbol, e.g.,  $5 \times 10^6$  becomes `5 10^6`. Don't try to enter this as `5e+6`; that's what a lot of computer software would want, but Spotter is trying to interpret everything as normal human notation, so it will think you meant  $5e + 6$ , where  $e$  is a variable.

Another thing to keep in mind is that human languages, including human math notation, are ambiguous. Use parentheses liberally to make your meaning clear. There are two main situations where you need to watch out. First, arguments to functions: `sin 2x` will be interpreted as  $(\sin 2)(x)$ ; if you intended  $\sin(2x)$ , you should have entered `sin(2x)`. Second, the bottom of fractions: `1/3c` will be interpreted as  $(1/3)c$ , so if you want  $\frac{1}{3c}$ , you need to enter `1/(3c)`.

An advantage of using Spotter in the free Firefox web browser ([firefox.com](http://firefox.com)) is that, unlike Internet Explorer, Firefox can display mathematical equations. As you type in the equation, it will show you, "on the fly," its interpretation of what you're typing. This makes it much easier to avoid confusion about how to enter your answers.

**academic honesty  
policy**

If a student cheats on an exam, I will assign a zero on the exam, and I will also pursue action at the college level, which may result in penalties such as suspension or expulsion. I will also assign a zero in cases where two students turn in homework or lab reports that contain identical or nearly identical work.

**labs**

At the end of the first lab in the lab manual, there is information about the organization of labs. Note that most labs have prelab questions, which you're expected to turn in on a piece of paper (not in a lab notebook) at the beginning of lab.

If you miss a lab, you can only make it up in one of my other lab classes over the rest of the week, and it is still due at the same time it's due for everyone else. If you want to make up a lab, you should leave a note for Hanh Pham, the physics technician, in the physics stockroom in room 417T.

**drops**

I will drop you under any of the following conditions:

- You miss any lab or lecture during the first two weeks without contacting me in advance by e-mail.
- You miss an exam without contacting me in advance by e-mail.
- Over a period of seven consecutive days, you don't turn in any written work (homework and quizzes) on time and don't participate in lab.

## Schedule for Physics 205, fall 2009

		read ch.	hw	topics	lab
Aug. 18	Tu				1 interactions
	Th	0,1*	1	Scaling. Order-of-magnitude estimates.	
25	Tu	2	2	Velocity and relative motion.	2 kinematics
	Th	3	3	Acceleration and free fall.	
Sep. 1	Tu		4		3 free fall
	Th		5		
8	Tu	4	6	Force and motion.	4 the Earth's gravitational field
	Th	5	7	Analysis of forces.	
15	Tu			<i>exam 1</i> †	5 Newton's second law
	Th	6	8	Newton's laws in three dimensions.	
22	Tu	7.1-3	9	Vectors.	7 vector addition of forces
	Th		10		
29	Tu	8	11	Vectors and motion.	9 accel. in 2 dimensions
	Th		12		
Oct. 6	Tu				<i>exam 2</i> †
	Th	9	13	Circular motion.	
13	Tu	10	14	Gravity.	10 conservation laws
	Th		15		
20	Tu	1**	16	Conservation of energy.	<i>problem solving</i>
	Th	2	17	Simplifying the energy zoo.	
27	Tu	3	18	Work.	11 cons. of energy
	Th		19	<i>problem solving</i>	
Nov. 3	Tu	4	20	Conservation of momentum.	12 cons. of momentum
	Th		21	<i>problem solving</i>	
10	Tu	5		Cons. of ang. mom.	<i>exam 3</i> †
	Th		22		
17	Tu	1***	23	Vibrations.	14 torque
	Th	2	24	Resonance.	
24	Tu	3	25	Free waves.	19 resonance
	Th			<i>Thanksgiving</i>	
Dec. 1	Tu	4	26	Bounded waves.	21 standing waves
	Th		27	<i>problem solving</i>	
8	Tu		28		22 resonances of sound
10	Th			<i>exam 4, 11-1</i> †	

†All exams are cumulative. Each exam will concentrate on the material that you haven't yet been tested on. The last date to add notes to your folder for use on an exam is the preceding lecture.

Exam 1 covers all the reading through ch. 4 of *Newtonian Physics*. Exam 2 is through ch. 7 of *Newtonian Physics*. Exam 3 is through ch. 2 of *Conservation Laws*. Exam 4 covers everything.

\* Begin reading from *Newtonian Physics*. Whenever reading is assigned, you should bring a copy of your notes to class.

\*\* Begin reading from *Conservation Laws*.

\*\*\* Begin reading from *Vibrations and Waves*.

### Homework

Underlined problems are in Spotter (see page 2). The full statement of each problem is in the book, not in Spotter.

Note that in many of the homework problems, you need to look up data in the back of the book.

Sometimes different problems are assigned randomly to different students. Each student has his or her own page of homework problems in this syllabus. If you don't have a copy of your own page, you can download the syllabus from [lightandmatter.com/area3phys205.html](http://lightandmatter.com/area3phys205.html). If you download the latest syllabus and it doesn't have a page for you, please email me via your Spotter account and remind me to update it.

## Homework Assignments for Ashley Caro

These assignments are all from *Newtonian Physics*:

- hw 1: Ch. 0, #11 4  
hw 2: Ch. 1, #6,11,16,20 1  
hw 3: Ch. 1, #9 3 Ch. 2, #4 1,2 Ch. 3, #7,15  
hw 4: Ch. 1, #challenge: 15 Ch. 2, #9 3 Ch. 3, #2,16,20 9  
Ch. 3, #31 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book1.html](http://lightandmatter.com/area1book1.html).  
hw 5: Ch. 3, #11,18,19 1  
hw 6: Ch. 3, #12 27 Ch. 4, #7  
Problem 27 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 7: Ch. 4, #1,10 3 Ch. 5, #4,20 10  
Ch. 5, #10 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 8: Ch. 5, #2,7 9  
hw 9: Ch. 5, #11 Ch. 6, #3  
hw 10: Ch. 6, #2 1 Ch. 7, #1  
hw 11: Ch. 6, #4 Ch. 7, #2,3 Ch. 8, #12ab  
Problem 12 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 12: Ch. 8, #2 1  
hw 13: Ch. 8, #8 3,4 Ch. 9, #2  
hw 14: Ch. 8, #11 14 Ch. 9, #6 3,8 Ch. 10, #10  
hw 15: Ch. 9, #13 10 Ch. 10, #1,21  
hw 16: Ch. 9, #12 Ch. 10, #6 20,22

These problems are from *Conservation Laws*, except when marked "NP:"

- hw 17: Ch. 1, #3,7,9 NP 10, #3  
hw 18: Ch. 1, #12 4,14 Ch. 2, #1,2 NP 10, #8,9  
hw 19: Ch. 1, #5 Ch. 2, #3,5,13 Ch. 3, #1,2  
hw 20: Ch. 2, #10a 10b Ch. 3, #22 NP 10, #7  
Ch. 3, #22 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book2.html](http://lightandmatter.com/area1book2.html).  
hw 21: Ch. 2, #10c 6 Ch. 3, #4 21 Ch. 4, #14 1  
For ch. 2, #6, you may want to reuse the result of NP 9, #3.  
hw 22: Ch. 2, #challenge: 7 Ch. 3, #19 Ch. 4, #3-5 Ch. 5, #2  
hw 23: Ch. 5, #21,24 7,23 VW 1, #1,2

From *Vibrations and Waves*, except when marked "NP" or "CL:"

- hw 24: Ch. 1, #3 4  
hw 25: Ch. 2, #4 Ch. 3, #1 6  
hw 26: Ch. 3, #2,3,5,8 4,7  
hw 27: Ch. 4, #3,4,7 2  
An older version of ch. 4, #3 referred to a clarinet, and had a mistake in it. Here is the new version: A concert flute produces its lowest note, at about 262 Hz, when half of a wavelength fits inside its tube. Compute the length of the flute. Answer: 65 cm. Ch. 4, #7 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).  
hw 28: Ch. 4, #1,5,6  
Ch. 4, #6 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).

## Homework Assignments for Carliana Hawkins

These assignments are all from *Newtonian Physics*:

- hw 1: Ch. 0, #11 4  
hw 2: Ch. 1, #5,11,16,20 18  
hw 3: Ch. 1, #9 3 Ch. 2, #4 1,2 Ch. 3, #7,15  
hw 4: Ch. 1, #challenge: 15 Ch. 2, #9 3 Ch. 3, #4,16,20 9  
Ch. 3, #31 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book1.html](http://lightandmatter.com/area1book1.html).  
hw 5: Ch. 3, #11,19,29 1  
hw 6: Ch. 3, #12 27 Ch. 4, #7  
Problem 27 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 7: Ch. 4, #2,10 9 Ch. 5, #5,20 10  
Ch. 5, #10 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 8: Ch. 5, #2,7 9  
hw 9: Ch. 5, #11 Ch. 6, #3  
hw 10: Ch. 6, #2 1 Ch. 7, #1  
hw 11: Ch. 6, #4 Ch. 7, #2,4 Ch. 8, #12ab  
Problem 12 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 12: Ch. 8, #2 1  
hw 13: Ch. 8, #9 3,4 Ch. 9, #2  
hw 14: Ch. 8, #11 5 Ch. 9, #6 3,8 Ch. 10, #10  
hw 15: Ch. 9, #13 9 Ch. 10, #1,4  
hw 16: Ch. 9, #12 Ch. 10, #6 20,22

These problems are from *Conservation Laws*, except when marked "NP:"

- hw 17: Ch. 1, #3,7,8 NP 10, #3  
hw 18: Ch. 1, #12 4,14 Ch. 2, #1,2 NP 10, #8,9  
hw 19: Ch. 1, #5 Ch. 2, #3,5,13 Ch. 3, #1,2  
hw 20: Ch. 2, #10a 10b Ch. 3, #22 NP 10, #7  
Ch. 3, #22 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book2.html](http://lightandmatter.com/area1book2.html).  
hw 21: Ch. 2, #10c 6 Ch. 3, #4 21 Ch. 4, #14 1  
For ch. 2, #6, you may want to reuse the result of NP 9, #3.  
hw 22: Ch. 2, #challenge: 7 Ch. 3, #19 Ch. 4, #3-5 Ch. 5, #1  
hw 23: Ch. 5, #21,24 5,7 VW 1, #1,2

From *Vibrations and Waves*, except when marked "NP" or "CL:"

- hw 24: Ch. 1, #3 4  
hw 25: Ch. 2, #4 Ch. 3, #1 6  
hw 26: Ch. 3, #2,3,5,8 4,7  
hw 27: Ch. 4, #3,4,7 2  
An older version of ch. 4, #3 referred to a clarinet, and had a mistake in it. Here is the new version: A concert flute produces its lowest note, at about 262 Hz, when half of a wavelength fits inside its tube. Compute the length of the flute. Answer: 65 cm. Ch. 4, #7 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).  
hw 28: Ch. 4, #1,5,6  
Ch. 4, #6 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).

## Homework Assignments for Adrienne Jan

These assignments are all from *Newtonian Physics*:

- hw 1: Ch. 0, #11 4  
hw 2: Ch. 1, #5,16,17,20 18  
hw 3: Ch. 1, #8 3 Ch. 2, #4 1,2 Ch. 3, #7,15  
hw 4: Ch. 1, #challenge: 15 Ch. 2, #9 3 Ch. 3, #4,16,21 10  
Ch. 3, #31 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book1.html](http://lightandmatter.com/area1book1.html).  
hw 5: Ch. 3, #11,19,28 1  
hw 6: Ch. 3, #12 27 Ch. 4, #7  
Problem 27 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 7: Ch. 4, #1,10 4 Ch. 5, #5,18 10  
Ch. 5, #10 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 8: Ch. 5, #1,7 23  
hw 9: Ch. 5, #11 Ch. 6, #3  
hw 10: Ch. 6, #2 1 Ch. 7, #1  
hw 11: Ch. 6, #4 Ch. 7, #2,4 Ch. 8, #12ab  
Problem 12 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 12: Ch. 8, #2 1  
hw 13: Ch. 8, #9 3,4 Ch. 9, #2  
hw 14: Ch. 8, #11 5 Ch. 9, #7 3,8 Ch. 10, #10  
hw 15: Ch. 9, #13 9 Ch. 10, #1,21  
hw 16: Ch. 9, #12 Ch. 10, #6 2,22

These problems are from *Conservation Laws*, except when marked "NP:"

- hw 17: Ch. 1, #3,7,9 NP 10, #3  
hw 18: Ch. 1, #12 4,14 Ch. 2, #1,2 NP 10, #8,9  
hw 19: Ch. 1, #5 Ch. 2, #3,5,13 Ch. 3, #1,2  
hw 20: Ch. 2, #10a 10b Ch. 3, #22 NP 10, #7  
Ch. 3, #22 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book2.html](http://lightandmatter.com/area1book2.html).  
hw 21: Ch. 2, #10c 6 Ch. 3, #4 8 Ch. 4, #14 1  
For ch. 2, #6, you may want to reuse the result of NP 9, #3.  
hw 22: Ch. 2, #challenge: 7 Ch. 3, #19 Ch. 4, #3-5 Ch. 5, #1  
hw 23: Ch. 5, #21,24 5,7 VW 1, #1,2

From *Vibrations and Waves*, except when marked "NP" or "CL:"

- hw 24: Ch. 1, #3 4  
hw 25: Ch. 2, #4 Ch. 3, #1 6  
hw 26: Ch. 3, #2,3,5,8 4,7  
hw 27: Ch. 4, #3,4,7 2  
An older version of ch. 4, #3 referred to a clarinet, and had a mistake in it. Here is the new version: A concert flute produces its lowest note, at about 262 Hz, when half of a wavelength fits inside its tube. Compute the length of the flute. Answer: 65 cm. Ch. 4, #7 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).  
hw 28: Ch. 4, #1,5,6  
Ch. 4, #6 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).

## Homework Assignments for Eileen Nguyen

These assignments are all from *Newtonian Physics*:

- hw 1: Ch. 0, #11 5  
hw 2: Ch. 1, #7,10,16,20 18  
hw 3: Ch. 1, #8 3 Ch. 2, #4 1,2 Ch. 3, #7,15  
hw 4: Ch. 1, #challenge: 15 Ch. 2, #9 3 Ch. 3, #3,16,20 10  
Ch. 3, #31 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book1.html](http://lightandmatter.com/area1book1.html).  
hw 5: Ch. 3, #11,19,28 1  
hw 6: Ch. 3, #12 27 Ch. 4, #7  
Problem 27 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 7: Ch. 4, #2,10 11 Ch. 5, #4,20 10  
Ch. 5, #10 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 8: Ch. 5, #3,6 27  
hw 9: Ch. 5, #11 Ch. 6, #3  
hw 10: Ch. 6, #2 1 Ch. 7, #1  
hw 11: Ch. 6, #4 Ch. 7, #2,3 Ch. 8, #12ab  
Problem 12 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 12: Ch. 8, #2 1  
hw 13: Ch. 8, #9 3,6 Ch. 9, #2  
hw 14: Ch. 8, #11 14 Ch. 9, #6 3,8 Ch. 10, #10  
hw 15: Ch. 9, #1 9 Ch. 10, #1,21 Ch. 10, #1,21  
hw 16: Ch. 9, #12 Ch. 10, #6 2,14

These problems are from *Conservation Laws*, except when marked "NP:"

- hw 17: Ch. 1, #3,7,8 NP 10, #3  
hw 18: Ch. 1, #12 4,14 Ch. 2, #1,2 NP 10, #8,9  
hw 19: Ch. 1, #5 Ch. 2, #3,5,13 Ch. 3, #1,2  
hw 20: Ch. 2, #10a 10b Ch. 3, #22 NP 10, #7  
Ch. 3, #22 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book2.html](http://lightandmatter.com/area1book2.html).  
hw 21: Ch. 2, #10c 6 Ch. 3, #4 8 Ch. 4, #14 1  
For ch. 2, #6, you may want to reuse the result of NP 9, #3.  
hw 22: Ch. 2, #challenge: 7 Ch. 3, #19 Ch. 4, #3-5 Ch. 5, #2  
hw 23: Ch. 5, #21,24 5,7 VW 1, #1,2

From *Vibrations and Waves*, except when marked "NP" or "CL:"

- hw 24: Ch. 1, #3 4  
hw 25: Ch. 2, #4 Ch. 3, #1 6  
hw 26: Ch. 3, #2,3,5,8 4,7  
hw 27: Ch. 4, #3,4,7 2  
An older version of ch. 4, #3 referred to a clarinet, and had a mistake in it. Here is the new version: A concert flute produces its lowest note, at about 262 Hz, when half of a wavelength fits inside its tube. Compute the length of the flute. Answer: 65 cm. Ch. 4, #7 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).  
hw 28: Ch. 4, #1,5,6  
Ch. 4, #6 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).

## Homework Assignments for Victoria Scott

These assignments are all from *Newtonian Physics*:

- hw 1: Ch. 0, #11 7  
hw 2: Ch. 1, #7,16,17,20 18  
hw 3: Ch. 1, #8 3 Ch. 2, #4 1,2 Ch. 3, #7,15  
hw 4: Ch. 1, #challenge: 15 Ch. 2, #9 3 Ch. 3, #2,16,20 31  
Ch. 3, #31 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book1.html](http://lightandmatter.com/area1book1.html).  
hw 5: Ch. 3, #11,18,19 1  
hw 6: Ch. 3, #12 27 Ch. 4, #7  
Problem 27 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 7: Ch. 4, #2,10 3 Ch. 5, #5,20 10  
Ch. 5, #10 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 8: Ch. 5, #2,8 27  
hw 9: Ch. 5, #11 Ch. 6, #3  
hw 10: Ch. 6, #2 7 Ch. 7, #1  
hw 11: Ch. 6, #4 Ch. 7, #2,4 Ch. 8, #12ab  
Problem 12 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 12: Ch. 8, #2 1  
hw 13: Ch. 8, #8 3,4 Ch. 9, #2  
hw 14: Ch. 8, #11 5 Ch. 9, #7 3,8 Ch. 10, #10  
hw 15: Ch. 9, #1 9 Ch. 10, #1,5 Ch. 10, #1,5  
hw 16: Ch. 9, #12 Ch. 10, #6 8,20

These problems are from *Conservation Laws*, except when marked "NP:"

- hw 17: Ch. 1, #3,7,8 NP 10, #3  
hw 18: Ch. 1, #12 4,14 Ch. 2, #1,2 NP 10, #8,9  
hw 19: Ch. 1, #5 Ch. 2, #3,5,13 Ch. 3, #1,2  
hw 20: Ch. 2, #10a 10b Ch. 3, #22 NP 10, #7  
Ch. 3, #22 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book2.html](http://lightandmatter.com/area1book2.html).  
hw 21: Ch. 2, #10c 6 Ch. 3, #4 8 Ch. 4, #14 1  
For ch. 2, #6, you may want to reuse the result of NP 9, #3.  
hw 22: Ch. 2, #challenge: 7 Ch. 3, #19 Ch. 4, #3-5 Ch. 5, #2  
hw 23: Ch. 5, #21,24 5,7 VW 1, #1,2

From *Vibrations and Waves*, except when marked "NP" or "CL:"

- hw 24: Ch. 1, #3 4  
hw 25: Ch. 2, #4 Ch. 3, #1 6  
hw 26: Ch. 3, #2,3,5,8 4,7  
hw 27: Ch. 4, #3,4,7 2  
An older version of ch. 4, #3 referred to a clarinet, and had a mistake in it. Here is the new version: A concert flute produces its lowest note, at about 262 Hz, when half of a wavelength fits inside its tube. Compute the length of the flute. Answer: 65 cm. Ch. 4, #7 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).  
hw 28: Ch. 4, #1,5,6  
Ch. 4, #6 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).

## Homework Assignments for Jordan Seiersen

These assignments are all from *Newtonian Physics*:

- hw 1: Ch. 0, #11 5  
hw 2: Ch. 1, #7,11,16,20 18  
hw 3: Ch. 1, #9 3 Ch. 2, #4 1,2 Ch. 3, #7,15  
hw 4: Ch. 1, #challenge: 15 Ch. 2, #9 3 Ch. 3, #3,16,21 10  
Ch. 3, #31 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book1.html](http://lightandmatter.com/area1book1.html).  
hw 5: Ch. 3, #11,19,29 1  
hw 6: Ch. 3, #12 27 Ch. 4, #7  
Problem 27 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 7: Ch. 4, #2,10 3 Ch. 5, #4,20 10  
Ch. 5, #10 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 8: Ch. 5, #1,7 27  
hw 9: Ch. 5, #11 Ch. 6, #3  
hw 10: Ch. 6, #2 1 Ch. 7, #1  
hw 11: Ch. 6, #4 Ch. 7, #2,4 Ch. 8, #12ab  
Problem 12 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 12: Ch. 8, #2 1  
hw 13: Ch. 8, #8 3,4 Ch. 9, #2  
hw 14: Ch. 8, #11 14 Ch. 9, #6 3,8 Ch. 10, #10  
hw 15: Ch. 9, #13 10 Ch. 10, #1,4  
hw 16: Ch. 9, #12 Ch. 10, #6 20,22

These problems are from *Conservation Laws*, except when marked "NP:"

- hw 17: Ch. 1, #3,7,8 NP 10, #3  
hw 18: Ch. 1, #12 4,14 Ch. 2, #1,2 NP 10, #8,9  
hw 19: Ch. 1, #5 Ch. 2, #3,5,13 Ch. 3, #1,2  
hw 20: Ch. 2, #10a 10b Ch. 3, #22 NP 10, #7  
Ch. 3, #22 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book2.html](http://lightandmatter.com/area1book2.html).  
hw 21: Ch. 2, #10c 6 Ch. 3, #4 21 Ch. 4, #14 1  
For ch. 2, #6, you may want to reuse the result of NP 9, #3.  
hw 22: Ch. 2, #challenge: 7 Ch. 3, #19 Ch. 4, #3-5 Ch. 5, #1  
hw 23: Ch. 5, #21,24 5,7 VW 1, #1,2

From *Vibrations and Waves*, except when marked "NP" or "CL:"

- hw 24: Ch. 1, #3 4  
hw 25: Ch. 2, #4 Ch. 3, #1 6  
hw 26: Ch. 3, #2,3,5,8 4,7  
hw 27: Ch. 4, #3,4,7 2  
An older version of ch. 4, #3 referred to a clarinet, and had a mistake in it. Here is the new version: A concert flute produces its lowest note, at about 262 Hz, when half of a wavelength fits inside its tube. Compute the length of the flute. Answer: 65 cm. Ch. 4, #7 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).  
hw 28: Ch. 4, #1,5,6  
Ch. 4, #6 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).

## Homework Assignments for Natalie Swanson

These assignments are all from *Newtonian Physics*:

- hw 1: Ch. 0, #11 4  
hw 2: Ch. 1, #7,16,17,20 18  
hw 3: Ch. 1, #9 3 Ch. 2, #4 1,2 Ch. 3, #7,15  
hw 4: Ch. 1, #challenge: 15 Ch. 2, #9 3 Ch. 3, #4,16,21 9  
Ch. 3, #31 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book1.html](http://lightandmatter.com/area1book1.html).  
hw 5: Ch. 3, #11,19,28 1  
hw 6: Ch. 3, #12 27 Ch. 4, #7  
Problem 27 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 7: Ch. 4, #2,10 4 Ch. 5, #5,20 10  
Ch. 5, #10 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 8: Ch. 5, #3,7 27  
hw 9: Ch. 5, #19 Ch. 6, #3  
hw 10: Ch. 6, #2 1 Ch. 7, #1  
hw 11: Ch. 6, #4 Ch. 7, #2,4 Ch. 8, #12ab  
Problem 12 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 12: Ch. 8, #2 1  
hw 13: Ch. 8, #8 3,4 Ch. 9, #2  
hw 14: Ch. 8, #11 14 Ch. 9, #7 3,8 Ch. 10, #10  
hw 15: Ch. 9, #1 10 Ch. 10, #1,21  
hw 16: Ch. 9, #12 Ch. 10, #6 14,20

These problems are from *Conservation Laws*, except when marked "NP:"

- hw 17: Ch. 1, #3,7,8 NP 10, #3  
hw 18: Ch. 1, #12 4,14 Ch. 2, #1,2 NP 10, #8,9  
hw 19: Ch. 1, #5 Ch. 2, #3,5,13 Ch. 3, #1,2  
hw 20: Ch. 2, #10a 10b Ch. 3, #22 NP 10, #7  
Ch. 3, #22 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book2.html](http://lightandmatter.com/area1book2.html).  
hw 21: Ch. 2, #10c 6 Ch. 3, #4 8 Ch. 4, #14 1  
For ch. 2, #6, you may want to reuse the result of NP 9, #3.  
hw 22: Ch. 2, #challenge: 7 Ch. 3, #19 Ch. 4, #3-5 Ch. 5, #1  
hw 23: Ch. 5, #21,24 7,23 VW 1, #1,2

From *Vibrations and Waves*, except when marked "NP" or "CL:"

- hw 24: Ch. 1, #3 4  
hw 25: Ch. 2, #4 Ch. 3, #1 6  
hw 26: Ch. 3, #2,3,5,8 4,7  
hw 27: Ch. 4, #3,4,7 2  
An older version of ch. 4, #3 referred to a clarinet, and had a mistake in it. Here is the new version: A concert flute produces its lowest note, at about 262 Hz, when half of a wavelength fits inside its tube. Compute the length of the flute. Answer: 65 cm. Ch. 4, #7 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).  
hw 28: Ch. 4, #1,5,6  
Ch. 4, #6 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).

## Homework Assignments for Sharon Widjaja

These assignments are all from *Newtonian Physics*:

- hw 1: Ch. 0, #11 4  
hw 2: Ch. 1, #5,16,17,20 18  
hw 3: Ch. 1, #8 3 Ch. 2, #4 1,2 Ch. 3, #7,15  
hw 4: Ch. 1, #challenge: 15 Ch. 2, #9 3 Ch. 3, #2,14,16 9  
Ch. 3, #31 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book1.html](http://lightandmatter.com/area1book1.html).  
hw 5: Ch. 3, #11,18,19 1  
hw 6: Ch. 3, #12 27 Ch. 4, #7  
Problem 27 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 7: Ch. 4, #1,10 4 Ch. 5, #5,18 10  
Ch. 5, #10 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 8: Ch. 5, #3,7 9  
hw 9: Ch. 5, #19 Ch. 6, #3  
hw 10: Ch. 6, #2 7 Ch. 7, #1  
hw 11: Ch. 6, #4 Ch. 7, #2,3 Ch. 8, #12ab  
Problem 12 is the algebra that's needed in order to analyze this week's lab. If you have trouble with it, please come and get help in my office hours.  
hw 12: Ch. 8, #2 1  
hw 13: Ch. 8, #8 3,6 Ch. 9, #2  
hw 14: Ch. 8, #11 14 Ch. 9, #6 3,8 Ch. 10, #10  
hw 15: Ch. 9, #1 10 Ch. 10, #1,5  
hw 16: Ch. 9, #12 Ch. 10, #6 8,20

These problems are from *Conservation Laws*, except when marked "NP:"

- hw 17: Ch. 1, #3,7,9 NP 10, #3  
hw 18: Ch. 1, #12 4,14 Ch. 2, #1,2 NP 10, #8,9  
hw 19: Ch. 1, #5 Ch. 2, #3,5,13 Ch. 3, #1,2  
hw 20: Ch. 2, #10a 10b Ch. 3, #22 NP 10, #7  
Ch. 3, #22 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book2.html](http://lightandmatter.com/area1book2.html).  
hw 21: Ch. 2, #10c 6 Ch. 3, #4 8 Ch. 4, #14 1  
For ch. 2, #6, you may want to reuse the result of NP 9, #3.  
hw 22: Ch. 2, #challenge: 7 Ch. 3, #19 Ch. 4, #3-5 Ch. 5, #2  
hw 23: Ch. 5, #21,24 7,23 VW 1, #1,2

From *Vibrations and Waves*, except when marked "NP" or "CL:"

- hw 24: Ch. 1, #3 4  
hw 25: Ch. 2, #4 Ch. 3, #1 6  
hw 26: Ch. 3, #2,3,5,8 4,7  
hw 27: Ch. 4, #3,4,7 2  
An older version of ch. 4, #3 referred to a clarinet, and had a mistake in it. Here is the new version: A concert flute produces its lowest note, at about 262 Hz, when half of a wavelength fits inside its tube. Compute the length of the flute. Answer: 65 cm. Ch. 4, #7 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).  
hw 28: Ch. 4, #1,5,6  
Ch. 4, #6 is not in older versions of the printed book. You can get it online at [lightandmatter.com/area1book3.html](http://lightandmatter.com/area1book3.html).