Midterm Exam 1

Solutions here

Wednesday, January 30 – 8:30 p.m.

MT 1 Exam Locations, based on the first letter of your last name, are as follows.

A – F: LINC 210
G – O: LINC 228
P – Z: GLFN AUD

Check your campus maps and allow plenty of time to find your location and get there!

Bring:

-- Your OSU photo ID
-- Several pencils (and eraser).
-- Your notes sheet (one standard 8.5 x 11” sheet, two sides OK, handwritten only)
-- A calculator (no cellphone calculators or PDA’s, or palmtops or laptops).

Frequently Asked Questions:

“Will the questions mix materials from different chapters?” Yes, and this will be true all term and all year. Any sections of the reading that have been covered, and any topics covered in lecture or lab, are all fair game.

“What physical data will we be given?” Anything you will need—physical or universal constants (such as $g$, etc.). There is no need to memorize or use space on your notes sheets for constants like that.

“What geometry are we expected to know (or have on our notes sheet)?” I’ll expect you to know basic trigonometry and these 2-D forms: circles (area, circumference); rectangles (area, angles and perimeter); triangles (area, angles and perimeter). If you need any 3-D forms, such as spheres (volume and surface area); cubes (volume, surface area), those will be given on the exam. You will also be given any derived formulas for moments of inertia (such as those from page 300) that you may need.

“What other math are we expected to know or have on our notes sheet?” I’ll expect you to know the basics of ratios—fractions, decimals and percents, including percentage changes—and algebra, including solving simultaneous equations and separating (“factoring”) out a variable from more than one term. Also, you should be able to take simple derivatives and integrals of polynomials.

“What’s the best way to study and prepare?” Go over the following items: The Prep problem sets (1, 2 and 3), the Before Class and Class notes, any Mastering Physics items you found useful, the assigned reading (including the Stop To Think exercises, the summaries and suggested conceptual questions and other end-of chapter items), the take-home lab exercises, Study Midterm 1 (SMT1), which was last year’s midterm, and HW 1.
The Exam Format

The exam will be worth 250 points, with four questions. Each question will have 1-2 parts (and the point values for each part will be given). The exam questions will be printed right on the answer form—no separate sheet will be needed.

Some parts may be T/F/N items. For those, remember (and you will be reminded on the exam, too): No response will be accepted as fully correct without the accompanying explanation of your reasoning. That explanation can be any valid mix of words, equations and diagrams/graphs, and it is worth 90% of the credit; the answer itself is worth just 10%.

Most of the items will be of the free-response variety. These may involve numerical calculations and/or require other sorts of symbolic solutions, statements or word answers of some kind. You will not be required to use any particular problem-solving protocol, but you must show valid physics reasoning in your solutions; very little credit is given for answers without showing work to support them.

There may also be items that ask you to create a symbolic solutions (either an algebraic expression or a description of how to create it), using only variable names that represent known values. Much of the credit here—just as with numeric problems—will be for how you “diagnose” the problem via labels and sketches.

On the back side of the exam’s cover sheet, you’ll be given general instructions and reminders. You’ll also be given any necessary physical constants pertaining to the problems you’re asked to solve, plus any geometry or math facts you may need. Other than those, the only information you will be allowed to use is your own Notes page. That’s one (1) standard sheet of paper (8.5” x 11”), on which you have handwritten (both sides OK) any information you have decided might be useful. You can also use the calculator of your choice, so long as it is not also a cell phone, palmtop, laptop, or PDA—nothing that can transmit signals wirelessly. Note also that all other electronics (e.g. iPods, etc.) are forbidden for use during the exam.

The exam will be 80 minutes long and will cover the assigned sections of Chapters 4, 8 and 12, including the Stop To Think exercises, the summaries, the conceptual questions, multiple-choice questions; also the Prep problems, the HW problems, plus anything you did/heard/saw before or in class. It’s all fair game. You need to use your judgement as to how to distill that down onto one sheet of notes.

Here is a breakdown of the textbook sections/topics we have covered that could be on this exam:

CH. 4:  
Sections 4.4 - 4.6.

CH. 8:  
Sections 8.2, 8.4 (except “Gravity on a Rotating Earth”), and 8.5.

CH. 12:  
All sections except 12.12 (and 12.10 only for background on the cross-product nature of rotational vectors).
Exam Tips

First of all, keep in mind that this course is about physics—which necessarily includes logical thinking and math-based problem-solving—but there is very little to memorize. We cover relatively few general equations and principles of physics, and you don’t have to memorize the equations themselves anyway—that’s what your notes sheet is for. But you do need to know what they mean and when they apply.

Prepare your notes page well. This is a very effective way to study and summarize the course, restating all ideas in way that best help you. Being limited to one sheet of paper (2 sides), you’ll probably need to do several drafts. That way you’ll get very familiar with the material, particularly if you are including notes as to what the formulas mean and when they apply. This will also mean you know how/where to find things quickly on the sheet—if you organize it well. Do not try to include too many solved problem examples on your notes sheet. First of all, it is highly unlikely that you will encounter a problem on the exam that is exactly like one you have in your notes. But more importantly, you will waste too much time looking for a match. (A generic example or two might help—but then you would still need to be able to recognize when an exam problem has variations on your examples.)

Also, refer to your own notes and the posted slides from class to glean added insights and summarized concepts. Then practice, practice, practice! Do as many different sorts problems out of the book as you can—use the odd-numbered ones to verify answers and/or solutions. Start with the 1-bar (|) and 2-bar (||) problems. Even if you’re stuck on the algebra, you should be able to correctly set up (diagram and label) and identify the relevant physics (equations, etc.) for any problem.

Get better with your “math-language” skills—and your ability to diagram and label every quantity with a meaningful letter or name (no data values), including the proper subscripts, as necessary. Keep in mind that you will often need to label and use quantities that will not appear in the final solution—they’ll “cancel out” or otherwise melt away. If you’re asked for a ratio (a fraction), don’t try to solve numerically for the numerator or denominator alone. Solve algebraically for the fraction in its entirety. The HW problems I assign are usually harder (and/or more extensive/numerous) than exam problems—because the time pressure of an exam tends to make even easier problems seem harder. So if you’re used to working on harder problems (where you’re a little more stressed), this can pay off in the exam—like preparing in baseball by swinging two heavy bats more slowly before you step up to the plate, ready to swing one lighter bat more quickly.

GO TO THE RIGHT LOCATION! There are not enough exams or seats for everyone if you show up at a room other than where you’re expected. And be there at the right hour! The midterm starts at 8:30 p.m.! Don’t be late to the exam—allow plenty of time to get there early (and check a campus map if you’re unfamiliar with the location), so that you can get settled, hear the instructions, fill out the form, then take a deep breath and focus on the physics. BRING: Photo ID, pencils, your notes sheet and a calculator.

Budget your time so that you don’t rush or mis-read: It’s amazing how many points are lost by simply overlooking or misreading something stated in the problem. As always with timed exams, you should budget your time by the point values and by your confidence level; do the ones you’re surer of first, spending time proportional to the item’s value. It’s your call, of course.

Use your own exam smarts. Don’t dwell on any one item long; no doubt there are other points you could get elsewhere. In fact, you should probably glance through the problems to see if something clicks right away—even part of it (and if so, go for it)—get some confidence and momentum. It will also warm up your mind as to the physics principles we have covered, thus preparing you for the other problems. Then believe in yourself and your abilities. And you’ll get lots of partial credit if you do happen to goof (we all do) IF you show your work and reasoning! We all draw a blank now and then—and the time pressure of a test can trigger this more easily than at other times. If this happens to you, don’t panic. Even if you’re completely baffled as to how to solve a problem, you can get parts of it. Often if you just concentrate on that (giving up for a moment on the algebraic hassles ahead)—and use your own words to express your reasoning—this can often help you relax enough to see your way farther than you thought—and it doesn’t take that much time.
Exam scoring and reporting

After you take the exam, we will be scoring them over the weekend--returning them no later than Wednesday morning, February 6 (maybe sooner). I will try to post solutions sooner than that, however—check for a link at the top of this page.

Note: When you get your exam back, your total exam score will NOT be indicated anywhere. Rather, on the cover sheet, you will see four sub-totals in the gray box at lower right—one for each of the four questions. At that point, you can, of course, sum those subtotals. But even when you know that raw total, do NOT mentally assign a letter grade to that—for several reasons:

• Your exam scores aren’t the whole story; it’s all just points until the end of the term, anyway, and you will be pleasantly surprised by what your good, complete work in the other parts of the course (clicker and lab) can do for your overall average. (See the Syllabus for more on how to monitor your progress.)

• If the exam turns out to be over-long for an 80-minute period, I will adjust it (add points)—for everyone. In other words, your raw score may not necessarily be your final score—notice the additional space provided in the gray box for “Adjustment.” Read more about that below.

• You still need to look over your exam to see that the scoring judgments were correct (and that those points were added up correctly in each subtotal). This which means that you will need to compare the scoring of your exam to the solutions I post, noting any discrepancies—**but do not write on your scored exam**. If you see anything amiss, there is a procedure for appealing your score—see pages 9-10 of the online Course Syllabus.

You exam should be available for pick-up in Wngr 309 no later than Wednesday morning, February 6, at 9:00 a.m. **You will always need to show your OSU ID in order to pick up your exam.** (If you can’t pick it up that morning, plan to pick it up at my office sometime during my regular office hours.)

Again: It’s very important that you review your exam—not only to check for scoring errors but also to see what you did well and/or not so well—future exams are cumulative and could re-visit those topics! If you have any issues with the scoring, you will need to raise those issues with me, via a written appeal—**see the online Course Syllabus under Exam Policies (pages 9-10) for details on making an exam appeal.** DO NOT MARK ON YOUR EXAM.

One other note: When exams are returned to you, I will also summarize the class results of the test and explain any adjustments I have made. For example, I might throw out a question if I discover that I worded it poorly or misleadingly. Or, if the exam’s problems turn out to be too lengthy or difficult, I may choose to add a few points to everyone’s score to compensate. Such point adjustments, if they happen (not always), will be explained on the web site in an Announcement. **Just bear in mind that when you pick up your exam, the adjustment (if any) will not appear on the paper (you can pencil whatever adjustment I announce into the space provided in the gray box)—but I have already made that adjustment on my grade sheet**—you will not need to appeal to receive that adjustment (everybody gets the same number of adjustment points). Your only reason for appealing would be that you believe the raw scoring for your exam does not accurately or fairly reflect the raw scoring that appears on my posted exam solutions.