We don't like to emphasize grades, but many of you will be applying to medical schools and necessarily have to worry about them. The purpose of this handout is to fully explain our grading policies and criteria, so that you know exactly how you will be evaluated.

Your final grade in the course will be based on weekly homework assignments, five laboratories, one "mid-term" exam, and a final exam as follows:

- Homework: 15%
- Laboratory: 15
- Mid-term Exam: 30
- Final Exam: 40

Each of these components will be discussed in turn and we'll conclude with an explanation of the absolute grading scale that will be used in determining your final grade in the course.

**HOMEWORK**

There will be homework assignments due each week. The assignments are due on, or before, Thursday at 6:00 PM each week. They should be dropped into your Section TF’s locked mailbox, located on the 2nd floor near room 201. Homework assignments will not be due the week of Exams.

*Late assignments will not be accepted and receive zero credit.* We will, on the other hand, drop one of your homework assignments — the one with the lowest grade. Thus, if you miss one homework assignment deadline, we will simply not count that assignment. Subsequent late assignments will be given a grade of zero. If you know *in advance* that you will be unable to turn in the assignment on time, contact your section TF directly and explain the situation. At the discretion of your TF, extensions may be granted, but only if you contact her/him *before the assignment is due.*

*Purpose:* Homework assignments are meant to give you practice in problem solving and provide feedback on your problem solving skills. A short explanation should accompany each solution to make clear your reasoning — formulas and numbers alone won't do. How
you think about problems is important. This will also help you immensely when you review
the material for exams. You are encouraged to collaborate with classmates in deciding
how to approach homework problems, but the work which you turn in must be your own.
What does that mean in practice? First, working in groups is fine and even encouraged.
You must, however, submit individual and original solutions — when you sit down to write
up your answers for submission, you should do this without consulting notes copied from
someone else. Secondly, give yourself adequate opportunity to work on the homework
alone beforehand. Thinking about how to approach problems is a crucial part of your
training, so be sure you have made a genuine effort to solve the problems by yourself
before consulting others. Sometimes a solution will come to you a day or two after you
first thought about it — you'll experience the proverbial “aha!”. If you don’t take this
advice seriously, you will cheat yourself, not us. You may get higher homework marks, but
your exam grades will be lower — keep in mind that you won’t be able to discuss problems
and let others do the thinking for you on the exams!

We expect you to be conscientious concerning the timeliness of assignments and you can
expect the same from your TFs — corrected assignments should be returned to you the
following week so that you have important feedback on your performance. Contact the
head TF if this is not happening.
HOMESWORK GRADE BREAKDOWN

The grading scheme mirrors the review practice of professional scientific journals, indicated in the first column of the table below. This has been included to help put an overall perspective on the point scale. The second column is the equivalent qualitative rating – cues to help anchor the rating. The third column is yet another guide in thinking about the overall quality of the answer. Finally, the last column indicates the number of points to award that problem. As you might surmise from the grading scheme, we’re evaluating the work against our expectations for what constitutes an A, B, C, etc., the number of points roughly corresponding to the scale used in computing GPA. We shall use this table and the notes that follow as a guideline to rate each homework answer.

<table>
<thead>
<tr>
<th>Journal Review Rating</th>
<th>Qualitative Rating of Homework Answer</th>
<th>Rating</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>publish as is</td>
<td>perfect, or nearly perfect (note below)</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>publish after minor revision</td>
<td>almost right, but some small errors (like arithmetic mistakes); maybe one part of a multi-part problem missing</td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>needs major revision</td>
<td>substantial errors, usually fundamental in nature, but still made some progress on the problem</td>
<td>C</td>
<td>2</td>
</tr>
<tr>
<td>reject</td>
<td>a meager attempt with little relevance to the problem</td>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>no attempt at all</td>
<td>E</td>
<td>0</td>
</tr>
</tbody>
</table>

Solutions to problems (whether assigned as homework or as part of an exam) should not be merely numerical calculations. They also require sufficient narration so that the grader can understand the assumptions applied and follow the logical steps in the solution, and they must be presented in a neat, readable format. The following should give you a better idea what the qualitative ratings in the table encompass.
• **4** — The underlying conceptual base applied to the problem is appropriate, and the physical reasoning is correct. The solution is complete and mathematically correct. Narration provides the grader with all necessary background to understand the assumptions made, the principles applied, and the mathematical steps taken. In short, the work is exemplary in all respects.

• **3** — The underlying conceptual base applied to the problem is appropriate, but the physical reasoning is not completely correct. The solution is essentially complete, but contains minor mathematical errors. Narration provides the grader with most necessary background to understand the assumptions made, the principles applied, and the mathematical steps taken. However, logical gaps leave the grader uncertain of how or why certain steps were taken. Caveats: How do we distinguish between "nearly perfect" and "small errors." The criteria are necessarily subjective and here the grader must use some judgement — a lengthy complicated problem with a minor mistake in the final answer (such as sig figs or units) should be given 4 pts with a warning comment. You might not receive such a generous grade for a relatively simple problem — more likely only 3 pts.

• **2** — The underlying conceptual base applied to the problem is appropriate, but the physical reasoning is either incorrect or incomplete. [To help you differentiate this statement from the previous criterion for 3 points, let's take an example. Suppose the problem can be solved using conservation of momentum — this would be the underlying conceptual base. But if momentum conservation was applied to the wrong objects, or applied incorrectly in some manner, then only 2 points might be allotted.] The solution is essentially complete, but contains mathematical errors which render the final result incorrect. In other words, the work is missing some important components or has some important errors. The narration may be incomplete, leaving the grader to guess at the assumptions made, the principles applied, and the mathematical steps taken.

• **1** — The underlying conceptual base applied to the problem is inappropriate. Physical reasoning is not correct but may be plausible. The solution may appear complete, but contains mathematical errors which render the final result incorrect. Narration is incomplete, leaving the grader to guess at the assumptions made, the principles applied, and the mathematical steps taken.

• **0** — The solution is unacceptable or no solution is presented.
Keep in mind what these points really mean. Students are often inclined to convert the score into a percentage grade and say, “Hey, why did I get a 3 out of 4 on this problem when I essentially did it right? That’s 75% and a C!” That’s not the way it works — all the points earned count toward the grand total and the cutoffs on that total (last page of this document) determines the final grade.

Two more things to note: (1) The conceptual multiple-choice questions are worth only 2 points each. Answers without any explanation or math receive no credit, even if correct. (2) With four multiple-choice questions and eight problems, the maximum number of points for each homework set will be 40.

LABORATORY ASSESSMENT

Each lab is worth 40 points. There are five labs per semester and together they count 15% towards your final grade. In order to receive 40 points for performing the experiment, a student must:

**Pre-lab completed**

10 pts

Each experiment write-up has a number of pre-lab questions to be answered in writing before your lab session. Your answers to these questions are to be handed in to your lab TF at the beginning of the lab session.

**Lab work**

15 pts

Arrive in a timely fashion
Take an active part in experimentation
Work hard
Demonstrate a competent technical approach with a reasonable level of skill
Collect all appropriate data and recorded it correctly

**Post-lab questions**

15 pts

Throughout the lab experiment write-up you will encounter questions which appear in bold type. These are questions you and your lab partners should answer as you do the experiment. Depending on the particular experiment, some or all of these questions will appear on a questionnaire that you must
complete before you leave the lab — towards the end of the lab session you
will be given time to answer these questions about your experiment.

Like the homework assignments, the maximum total number of points for each lab is 40.
Thus you could consider a total of 40 points to correspond to an A, 30 → B, 20 → C, 10 →
D, and 0 → E. Use these letter grades only as a rough guide to monitor your progress.
The lab reports should be returned to you in a timely fashion, and the feedback you get
from the comments of your TF will be a more useful evaluation. Don’t think of these
letter grades as your course grades — what counts in the end is the total number of
points from all components (homework, lab, and exams). Typically the homework and lab
grades are better than the exam grades. More about that later.

**Missed Lab Policy**

You must attend each of your assigned lab sections. We reserve the right to allow certain
exceptions to this rule: see sections 1a) and 1b) below.

1a) If you must travel for professional reasons or there are compelling personal or family
matters that will cause you to be away during your assigned lab, then you may appeal to
the Head TF for permission to attend a lab other than the one to which you are assigned.
Your appeal must be submitted in writing (not e-mail) at least two weeks before the date
of your assigned lab and include original documentation that explains the reason for
missing the lab. Documentation must be on official letterhead and include specific dates.

1b) Students who miss their scheduled lab because of serious illness or circumstances of
an unexpected nature must appeal for permission to attend a different lab within two
days of the missed lab. The appeal must be submitted in writing (not e-mail) to the head
TF and include the reason for missing the lab. The reason must be compelling and
extenuating. Lack of preparation, negligence, misinformation, or an exam on the same
night or during the same week as their lab will not be considered as valid excuses.
Original documentation such as, but not limited to, a doctor’s note or an accident report
must accompany the appeal. Documentation must be on official letterhead and include
specific dates.
2) Once you have permission to make up the lab, contact (by e-mail) the TF whose lab you would like to attend and include a copy of the head TF’s response to your request. You need to do this well in advance of the lab date as there is limited space and equipment in the lab; even with the Head TF’s permission, you may not be able to make up the missed experiment in a lab section that’s filled to capacity.

3) Contact your assigned lab TF in writing (e-mail) to tell him/her which make-up lab section you will be attending. Again, include a copy of the head TF’s response in this email.

4) Turn in your Pre-lab and Post-lab questionnaire to the TF in charge of the make-up lab. That TF will, in turn, give your work to your regular lab TF for grading.

5) Each semester the first lab is a take-home experiment and the lab write-up for this experiment has the same due date/time for everyone in the class. Late write-ups for the first lab will not be accepted unless you are ill or have a compelling emergency to deal with (see paragraph 1b above). If you must travel for professional reasons or there are personal or family matters that will cause you to be away on the 1st lab due date, then you must turn in the lab write-up before the due date.

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EXAMS

Note that two mid-term exams will be given during the semester and the exam with the lowest grade will not be counted. The purpose of this is to accommodate emergencies, illnesses, or any other situation that forces you to miss an exam. Therefore, no make-up mid-term exams will be given — no exceptions. Don’t ask. A missed exam will count as your lowest grade (and be dropped).

Homework and lab grades are typically better than exam grades because the former are the fruits of collaborative efforts and you have a lot of time to think about the assignments. In an exam situation you are strictly on your own and you have more severe time constraints. The best advice I can give you to help overcome these obstacles is to log in the time and practice doing as many problems as possible. Don’t be fooled into thinking you don’t need to practice because you have good homework grades — make sure you practice new problems in which the thinking is all your own (no collaboration!). The
best students often do all of the end-of-chapter problems. By practicing many problems, your reasoning starts to flow more quickly and naturally — lack of time on exams will not be as much of an issue. Previous years' exams are published on our web site and are a good resource in preparing for current exams.

Although the nominal weighting of the mid-term and final exam is 30% and 40%, respectively, adjustments to these weighting factors will be made (to the student's benefit) if there is an improvement in your final examination score over the mid-term score. In other words, the exam weighting rewards learning over the course of the semester in a manner described below.

The Improvement Factor

As summarized in the beginning of this handout, your grade \((G)\) in this course is based 15% on homework \((H)\), 15% laboratory \((L)\), 30% midterm exam \((M)\), and 40% on the final exam \((F)\). Translating this into an equation, your grade is computed by

\[
G = (0.15)H + (0.15)L + (0.30)M + (0.40)F
\]

where both \(H\) and \(L\) are normalized to 100 points. We additionally take into consideration any improvement in your final exam score over your midterm, represented by \((F - M)\). This will be done with a correction to the midterm and final exam weighting factors as follows:

\[
G = (0.15)H + (0.15)L + \left[0.30 - 0.0030(F - M)\right]M + \left[0.40 + 0.0030(F - M)\right]F
\]

Lets take a possible (but unlikely) example: in the extreme case of someone who did very poorly on both midterms \((M = 0)\) but aced the final \((F = 100)\), then \((F - M) = 100\) and the final will count 70% towards the grade. Thus the poor showing on the midterms will be totally ignored.

For the student who is absolutely consistent on exams (whether always below average, always average, or always above average), the midterm and final will still count 30% and 40%, respectively, because \((F - M) = 0\).
Between these two examples, any improvement will be rewarded proportionately so that the final will count somewhere between 40 and 70% and the midterm between 0 and 30%. The weighting factors are directly proportional to the improvement.

A negative improvement \((F - M) < 0\) will be ignored ... anyone scoring less on the final than the midterm will still have the midterm and final count 30% and 40%, respectively. Thus, the additional improvement factor can only help you, and the amount of help will be determined strictly by the increase in the final exam grade over the midterm grade.

The mid-term exams are 2 hours in length and will be held during lecture time on October 6 and November 17. The final exam is 3 hours in length and will be given on December 15.

**YOUR FINAL COURSE GRADE**

It is my belief that any grading scheme that normalizes a class distribution to some arbitrary mean, whether it be an A, B, C, D, or E (although I doubt if anyone ever uses the last couple), regardless of performance, has got to be flawed. What your neighbor gets on an exam should have no bearing on your grade. Accordingly, we use an absolute grading scheme. With this scheme, any and all of you can get A’s. You are responsible for your performance in the course, and you alone. If you screw up a midterm, you can redeem yourself on the next exam if you take the responsibility to learn the material. Cooperation and productive work with fellow students is the most likely route to a high grade. Your homework and lab grades offer you a very buoyant and readily obtained life preserver if you are worried about just passing the course, but there is no substitute for a high level of achievement on exams if your goal is an A.

The total points required for a given letter grade (the prescribed "cut-offs") are indicated on the scale below. Note that we reserve the right to lower any given cutoff, but it will not be higher.