

Study Tips: Physics

THE
UNIVERSITY
OF RHODE ISLAND

Ask a group of college seniors to list their easiest undergraduate courses, and it's unlikely anyone will mention physics. Physics demands that you understand difficult principles, know how to think critically and be able to apply mathematics to solve complex problems. The rewards, however, are many—if you master physics, you've mastered the science that explains how the world around you works. Read on for some tips on succeeding in one of college's more challenging courses...

Five Mistakes to Avoid

1. **The Calculator Trap:** Calculators crunch numbers; they don't solve problems. You need to understand the principles underlying a problem in order to know what equations and numbers to use. If you think your calculator will get you through the exam, think again.

2. **Procrastination:** Falling behind, even just a little, can be disastrous in a physics class. Every lesson builds on what came before. Slacking off in week three can turn the next 12 weeks into exercises in futility.

3. **Memorization:** You will need to memorize, but realize that memorization doesn't lead to success in physics. Put most of your effort into understanding the underlying principles that govern a problem—only then will the equations you memorize make sense.

4. **Passivity:** Passively reading examples in the book and watching your professor solve problems on the board have limited value. You need to do the problems yourself, as you will do on the exam, to learn the material.

5. **Isolation:** Physics is hard, so don't make the mistake of going it alone. You'll learn far more by working with classmates and seeking help when necessary.



Getting Over the Math Barrier

Whether you're taking an electromagnetism course for physics majors or an introductory course designed for liberal arts students, you're going to need to know some math. Non-major courses may require trigonometry and algebra, while more rigorous courses employ calculus.

If you're like many students and have math-phobia, you're going to need to get beyond that fear to do well in your physics class. Granted, we can't say that physics isn't rocket science—it is. However, mastery of multi-variable calculus doesn't always make the best physics students.

Rather, the students who earn the "A" are good problem solvers. They know how to think critically and creatively. They are good readers who can break down a problem and discover the relevant underlying principles. In short, the skills that make a good physicist are remarkably similar to those that make a good philosopher or sociologist.

Sure, you'll need to know some math. But applying the math is relatively easy once you truly understand a physics problem.

Study Tips: Physics



Don't Wait Until Exam Time...

To do well on a physics test, you can't wait until exam time to begin preparing. Physics requires constant effort. World-class physicists didn't master the laws of harmonic motion, Bernoulli's equation and Lenz's law in a night, nor should you try.

To succeed in physics—and reduce your stress levels—you need to be reading, writing and thinking physics on a daily basis. A general rule for college is that every hour of class time requires two to three hours of out-of-class effort. This guideline certainly holds true for physics. After each lecture, rewrite your notes in your own words. Every time you read the book, take notes and solve practice problems. And be sure to review frequently.

Getting the Most Out of Your Physics Book

Don't be deceived when you have 100 pages of *Wuthering Heights* due tomorrow and just 15 pages of your physics book. Chances are the physics reading will demand more of your time.

Why? For one, the reading is dense—every page is going to present important terms, concepts, illustrations or sample problems. Also, unlike a novel, there is no plot or narrative to engage you and pull you forward. A good physics book can be interesting, but it's certainly not light beach reading.

You need to approach your physics book differently than you would a novel. If you are going to get the most out of your reading and retain important information at exam time, try these strategies:

- Allow enough time.** You may need to read a page numerous times before it makes sense.
- **Read actively.** If you just run your eyes over the page, you're wasting your time. Read with a pencil in hand and record important terms and concepts in a notebook. Write down questions you have so you can seek answers from your professor or a tutor.
- **Keep up with the reading.** You'll get far more out of labs and lectures if you've already encountered the material in the textbook.
- **Don't skip or skim.** Physics is a cumulative subject—each new concept builds on what came before it. If you skip Tuesday's reading, you may find that Thursday's assignment makes no sense.
- **Work the problems.** Your physics textbook is filled with sample problems. Do them all, and try to avoid looking at the answer key. Nothing better prepares you for an exam than working lots of problems.
- **Work the problems.** Yes, it's important and worth saying twice.

Study Tips: Physics

All Those Pesky Equations

Physics is undeniably a subject rich in laws, formulae, rules and equations.

Understandably, many students equate studying for a physics test with memorizing equations. But it's important to realize that memorization is a low form of learning.

Being able to regurgitate Maxwell's equations or Newton's Law of gravity isn't the same thing as learning and truly understanding physics.

The best physics students don't merely memorize equations. They *understand* equations. Whenever you are presented with a new law or formula, make sure you can work through its derivation. Learn the underlying principles on which the equation is built.

Once you understand an equation at this level, the memorization comes easily. Also, should you forget an equation, you'll have the knowledge base to derive it during exam time. Finally, true mastery of an equation gives you the flexibility and problem-solving skills to deal with exam questions that present variations or combinations of the different laws you've learned.



Ten Tips for Success In Physics

1. **Go to every class.** Because physics is a cumulative subject, missing a single class can set you behind for the entire semester.
2. **Take good notes.** Lectures, not the book, give you a window into what your professor finds most important and, consequently, what is most likely to be on the exam. Write down everything covered in class. Later, test your understanding by rewriting key concepts in your own words and working the sample problems without looking at the solution. Remember, you learn by doing, not watching.
3. **Read ahead.** You won't be playing catch-up, and you'll get far more out of lectures.
4. **Give physics priority.** If physics is difficult for you, do your physics homework during a time of the day when you are most alert.
5. **Practice.** Work all the problems in your book and homework, and do so in test-like conditions. Find a quiet place and don't use answer keys.
6. **Quiz yourself regularly.** Use 3 x 5 cards to test your knowledge of terminology and important formulae.
7. **Work with classmates.** Study need not be a solitary activity. Form a study group with a few classmates—you'll retain information better by talking through the problems with others.
8. **Seek help.** If you've spent significant time on a problem but find that you're still confused, seek help. Talk to a classmate, make an appointment with a tutor or visit your professor during office hours.
9. **Partial credit.** Although physics problems usually have a right or wrong answer, you can often get partial credit if you show your work. On exams and homework, write down every step of your solution.
10. **Healthy body, healthy mind.** Be sure to eat and sleep well before an exam. An all-nighter and six Red Bulls isn't the recipe for success.