

# AP Physics

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Nearly all students at MIT begin their freshman year by enrolling in Physics 8.01, Classical Mechanics. They spend the fall term learning how and why stuff in our universe moves. They see things drop, fly, collide, spin, and occasionally explode. Then, in the spring, most freshmen continue with Physics 8.02, Electricity and Magnetism, a course which builds an understanding of circuits, batteries, motors, generators, static, and probably a little bit of lightning. By the end of their freshman year, a student at MIT has received a meaningful introduction to the laws that govern how our world works.

Not bad, MIT. But, at CHS, we like to take things to the next level. And that might be a pretty good way to summarize my intentions for the 2010-2011 year of AP Physics: all the stuff that MIT does, plus some.

For starters, let's talk about how our year will resemble that of a freshman at MIT. Just like an MIT student, we will spend the first semester studying classical mechanics. By January, we will be experts in vectors, kinematics, work, energy, momentum, rotation, gravity, and harmonics. And, just like an MIT student, we will use calculus throughout. They call their class Physics 8.01; we call ours AP Physics C: Classical Mechanics.

Then, like an MIT student, we will spend our second semester focused on that part of our physical world that is less visible but perhaps more consequential – electromagnetism. We will become experts in voltage, capacitance, resistance, inductance, alternating current, direct current, and electromotive force. They call their class Physics 8.02; we call ours AP Physics C: Electricity and Magnetism.

And, just like an MIT student, you will be expected to dedicate a significant amount of time outside of class to your studies. Professionally produced lab reports and thoroughly written problem sets will require several hours of independent work each week.

Now, let's talk about why you should consider yourself lucky that you go to CHS, not MIT. For starters, have you been to Boston in the winter? Brrr. But, more importantly, we will have smaller classes and more time, thus enabling more hands-on work, more discussion, and more field trips. Basically a more active, less passive experience. In college, a physics student will probably see things drop, fly, collide, etc. At CHS, *you* will do most of the dropping and colliding. We don't have quite the budget that MIT has, but fortunately physics is all around us and all you need to experience the magic of electromagnetism is a fork and a 120-Volt wall socket.

## Summer Work

### 1. Review Problems

AP Physics is a college-level second year science course. Among other things, that means it's hard. And it requires a lot of math, including a fair amount of calculus. It is intended to follow a full year of introductory physics. If you have already taken physics, the review problems below should serve as a

means to show me and yourself that you have acquired the necessary foundational understandings for the AP course. If you have not taken a first year physics course, you will probably have to do some reading and studying. Work out each problem carefully, neatly, and completely, showing all work. The problems will be due on the first day of school for a grade. A quiz on the material will follow shortly thereafter. You will need to check out a textbook from me. And, no offense, but if these problems seem very tough, then AP Physics will probably be exceptionally difficult for you.

Chapter 3 – 23, 35, 51, 55, 63

Chapter 4 – 11, 27, 47, 53, 59

Chapter 5 – 9, 25, 33, 39, 43

Chapter 6 – 13, 15, 31, 39, 41

Chapter 7 – 11, 21, 25, 43, 45

Chapter 8 – 9, 21, 27, 35, 49

Chapter 17 – 19, 21, 23, 43, 59

Chapter 19 – 29, 41, 45, 47, 49

Chapter 20 – 17, 19, 23, 33, 35

## 2. Reading Assignment

Do at least one of the following:

- Read [A Short History of Nearly Everything](#) by Bill Bryson.
- Read [Surely You're Joking, Mr. Feynman](#) by Richard P. Feynman.
- Read [The Fabric of the Cosmos](#) by Brian Greene.
- Read [Why Does  \$E=mc^2\$](#)  by Brian Cox and Jeff Forshaw
- Read [Sophie's World](#) by Jostein Gaarder.
- Read a book of your choosing which explores the nature or origin of our world or the current state of scientific inquiry.
- Stay on top of the Science section of the New York Times. Read a few articles per week.
- Stay on top of a science-related website like nature.com or space.com.

Be prepared to share what you read and what you thought about it with the rest of the class.

## 3. Bio

In approximately one page, introduce yourself to me and the rest of the class. Tell us about your interests and hobbies. Why are you taking physics? What are you going to be doing in five years? Email your bio to me (mattshields@gmail.com) *before* the first day of school. These biographies will be posted on the class website for all to read.

Enjoy your summer. I am looking forward to an exciting and eventful year. Please feel free to contact me if you have any questions.

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