

AP Physics B covers material from 28 of the 31 chapters in our textbook (Physics Algebra/Trig by Hecht). The only way we can cover this amount of material is for you to be well prepared for the first day of class. I will treat this as a second year of physics. This means that I assume that you have covered the key parts of the Physics 1 (regular or honors) course. Namely, you should have a good foundation in:

- Kinematics – how to describe the motion of objects in one and two dimensions
- Dynamics – the concept of force as described in Newton’s Three Laws of Motion
- Momentum and the concept of conservation of momentum
- Energy and the concept of conservation of energy
- The fundamental forces between masses (Gravity) and charges (the Electric Force)

Our class time on these subjects will be focused on building on your current understanding and developing problem solving skills. If you don’t yet know the basics, you will have to work especially hard to catch up.

If you feel inadequately prepared in these areas, I suggest you discuss this with me as soon as possible. I also recommend purchasing an AP Physics B review book. Any of them will be helpful. Cracking the AP Physics B Exam (latest edition) from Princeton Review is a great choice. The core topics you should have covered are in Chapters 1-6, and 10 of this book.

All students, even those considering themselves well prepared, should do the following tasks before the first day of class:

1. Go to <http://library.thinkquest.org/10796/index.html> and study the tutorial for Chapters 1-4. Take the quizzes for Chapters 1, 2, 3, and 4 until you earn an “A” (90% or better) on each. Print out your best scoring quiz for each, sign your name on it, and bring it to class on day 1 as evidence of your work. Late submittals will be accepted for half credit.
2. Learn about one and two dimensional vectors, vector addition, and vector subtraction. Please read below for some suggestions.
3. After learning about vectors, email me at joseph.davis@fcps.edu. Ask me to send you the “vector problem set.” Please do not wait until the day before school to request your copy. Print out the problem set and work out the solutions. Bring this with you for the first day of class.

Vectors are used extensively in this class for velocity, acceleration, momentum, force, electric fields, magnetic fields, etc. You must know how to add and subtract vectors both graphically and mathematically. The math method requires you to use trig. Learning this after class begins will make the course very difficult for you. You will be given a quiz on this material during the first week of school. I have not planned any class time for teaching vectors, but I will assist students with remedial work outside of class hours as needed.

Scalars and Vectors

In physics, we are primarily concerned with two kinds of physical quantities: scalars and vectors.

- A scalar is a quantity that has a magnitude in some physical units
- A vector is a quantity that has both a scalar magnitude and a direction

Scalars are fairly straightforward to work with. The main concern is to learn how to convert scalars given in one set of units to another. Most scalars can take on any real positive or negative number. You should learn how to express scalars in scientific numbers when necessary and to correctly report the final value of a scalar to the appropriate number of significant digits and with the correct amount of measurement uncertainty.

Examples of scalars:

- Mass in kilograms
- Length in meters
- Time in seconds
- Energy in Joules
- Temperature in $^{\circ}\text{K}$

Vectors are much more difficult to work with. For one thing, each vector contains a scalar; all the issues concerning units and sig figs need to be dealt with. In addition, the direction part of a vector is not an independent issue that can be dealt with simply. For instance, you cannot find the final direction by adding the directions. Direction is part of the quantity and affects all the math operations that we do on the vector. For example, the addition of two vectors that both have a magnitude of 2 could result in a vector with a length from 0 to 4 depending on the directions. In vector math, $2 + 2$ does not always equal 4!

In this course, we will limit our study of vectors to two-dimensions. Three dimensional vectors can be tackled in some future course if need be.

Examples of vectors:

- Position
- Displacement
- Velocity
- Acceleration
- Momentum
- Force
- Electric field
- Magnetic field
- Gravitational field

Vector Representations

We will use three ways to represent vector quantities.

- Graphically using directed line segments
- In component form using a scalar magnitude and a direction in degrees
- In component form using orthogonal “X” and “Y” components

Tutorials on the Web

A good set of lecture notes is available at the following link at Eastern Illinois University.

<http://www.ux1.eiu.edu/~cfadd/1150/03Vct2D/ToC.html>

You should study the material in the first 5 topics:

- Coordinate Systems and Reference Frames
- Vectors and Scalars
- Properties of Scalars
- Vector Components
- Unit Vectors

Another excellent reference is HyperPhysics at

<http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html>. Search for the frame on “Basic Vector Operations” and work from there. This site should be bookmarked for use throughout the course. It is outstanding.

One of the best web sites for general information about AP Physics B is at

<http://apphysicsb.homestead.com/index.html>

Dolores Gende is an experienced APB teacher in Florida. She has lots of useful information at the site. Bookmark this site also.

You may also select other resources on this topic. After learning about vectors using the above resources or others at your disposal, email me to ask for the “vector problem set.” I will send it to you by reply email. Please do not wait until the day before school to request your copy. The completed solution should be brought with you to our first class.

Please do not hesitate to contact me about this summer assignment or other concerns and questions you may have. Also know that I will make myself available to help you throughout the year. My goal is to give every student the opportunity to pass the AP exam with 3 or higher.

Joe Davis

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