

AP Physics 1 Syllabus – Pickerington High School Central

“If you fail to plan you have planned to fail.” — John Wooden, 11-time national champion NCAA Basketball

Physics (the science discipline) is a very comprehensive and interesting field. Almost every advance in technology has been due to applications of physics principles in new and creative ways. We will not do much more than scratch the surface of the entire field of physics in this introductory class. Our main emphasis will be to ensure that you are well versed in mechanics (the study of motion and its causes) since a good mechanics background will be the most valuable thing that you can take from this class. We may also study electric circuits, waves, sound, light, and optics in some detail in the spring. You will not be an expert in physics by the end of the year, but you will if you try and work be better at physics.

Contact Information:

Email: kevin_mcchesney@plsd.us

Web Page: <http://www.tigerphysics.org>

Twitter: [@tigerphysics](https://twitter.com/tigerphysics)

Suggested Equipment:

1. 1 inch 3-ring binder
2. Scientific Calculator
3. Pencil and Eraser
4. Additional materials for projects as needed
5. A Growth Mindset
6. Willingness to try new things and work to the best of your ability.

Grading System:

“Genius is a talented person who does his homework.” (Thomas Edison)

The grading in this class is based on tests and quizzes, labs, projects, some pop quizzes over reading, and some homework checks. The main part of your grade will be based on, tests, quizzes and labs. The grade scale is the same as that used for all courses and is indicated in your student handbook.

Physics is truly a team effort, and if you need extra help, talk with your friendly teacher, use a physics guide for practice, do extra problems (ask me for the extra practice), or ***study with classmates***. (I'll pass around a list for us to make a "phone tree" of your fellow Physics students.)

Late work: It is important you try your best to do work when it is assigned, one reason is we will discuss assignments the day they are due and if you have not attempted the work you will not get as much out of the discussion as you should. To encourage you getting work done on time, late work can be penalized up to 20% each day it is late. If we have gone over the solutions in class then you cannot receive credit for doing work on time, but you can receive credit for fixing any mistakes. If a rare situation arises where you cannot complete the work it is your responsibility to contact me and discuss what can be done about the late assignment before it is due.

Homework:

Homework assignments need to be completed on time. On the due date, I will quickly grade for completeness while you are engaged in a group warm-up activity. You may receive 100% if you give quality efforts for all parts of all problems and then correct any mistakes as we go over them. This will sometimes require you to ask for help from your classmates, other physics students, or me in class, before school, after school or by emailing me at kevin_mcchesney@plsd.us, or messaging me via Remind or twitter. Just because you do not have to have the correct answer does not mean that you don't have to try hard. It is imperative that you have done a good faith attempt at the assignment when you are preparing your group solutions since you will have a time limit for completing your presentations.

Then, your group will be given a few of the homework problems to prepare and present solutions for your classmates. I may also prepare and present some of the solutions. You will have access to all of the correct solutions in class. You will be expected to fix your mistakes as we go over them. All homework assignments must be corrected by the day of the test in order to be eligible for test corrections. During the test I may choose a few of the problems from each assignment to grade for correctness. You will have a chance to correct you test and earn points back, **but in order for you to be eligible for test corrections you must have the homework attempted on time and then corrected after we go over it.**

Most assignments will also be available for download on my website or Google Classroom.

You will be required to collect all unit materials in a notebook, which maybe checked on the day of the test. This notebook check will count as an assignment.

Your participation in discussion will be vital to success in physics. You will support each other by analyzing each others work and suggesting room for improvement. In this class, you will act together as a group of scientists trying to figure out the laws of

physics. You will develop the basic concepts and principles from experiments that you design and carry out. Then you will use those lab results to help you understand other situations. Just like practicing scientists, you will have to rely on the discussion and debate of the entire class to help guide you to the best ideas.

My goal is for each of you to develop a complete understanding of the fundamental principles of physics. On every homework and test, you will have the opportunity to demonstrate your understanding using words, graphs, diagrams, and/or algebra.

Labs:

You will be submitting a lab write-up for some experiments. The basic format for a lab write-up will be discussed in class. On the lab report, you will be able to demonstrate your understanding of the purpose of the experiment, the variables involved, the format for conducting the experiment, the data, the data analysis, and the conclusion.

On occasion, you will be required to turn in a more thorough lab report. Your lab group will be responsible for turning in specified elements of the lab write-up and you will be individually responsible for turning in a hand-written "conclusion" section.

Curriculum:

There will be some time of assessment at the end of each unit. Here is the projected curriculum for the year. This schedule may change slightly depending on timing, interruptions, etc.

Quarter 1

Unit 1 Introduction: Scientific methodology, graphing and data analysis, uncertainty and error, precision, accuracy. (Estimated duration of 13 days; Lab quiz.)

Unit 2 Constant Velocity: Motion in 1-Dimension including kinematics graphs, motion maps (Estimated duration of 10 days)

Unit 3 Constant Acceleration: Motion in 1-Dimension including kinematics graphs, motion maps (Estimated duration of 17 days)

Quarter 2 –

Unit 4 Vectors: Using trigonometry to solve vectors (Estimated duration of 5 days - no unit test.)

Unit 5 Dynamics: Forces, Newton's Laws, free-body diagrams, and collisions and interactions (Estimated duration of 20 days)

Unit 6 Momentum and Impulse: (Estimated duration of 7 days.)

Unit 7 Projects: Motion in 2-D, including kinematics graphs (Estimated duration of 10 days)

Quarter 3 –

Unit 8 Circular Motion: Gravitational (Estimated duration of 10 days)

Unit 9 Energy: Energy conservation, power and work (Estimated duration of 15 days)

Unit 10 Rotational Motion: Torque, angular inertia, momentum, and acceleration (Estimated duration of 13 days)

Unit 11 Electrostatics and Charge: Comparing to Universal Gravitational Forces (Estimated duration of 5 days)

Quarter 4 –

*Days counted to AP test.

Unit 12 Electric DC Circuits: (Estimated duration of 10 days)

Unit 13 Oscillations: (Estimated duration of 5 days)

Unit 14 Waves: (Estimated duration of 15 days)

What I expect from you

1. DISCIPLINE AND GENERAL THINGS -

Review the student handbook and follow all rules and policies in the handbook. These rules really do help the year go smoothly and they apply to ALL of us. You are not to charge your devices at school. To leave the classroom you must sign out and have your ID badge with you. Any questions? Please ask me or someone in the office.

The four main rules I have in class are that everyone needs to:

I) SHOW UP FOR CLASS AND BE ON TIME READY TO LEARN.

II) HAVE MUTUAL RESPECT

III) BE FAIR IN WHAT YOU SAY AND HOW YOU ACT

IV) ALWAYS ACT IN A SAFE MANNER

These may look simple and limited, but in fact are not. For instance, I expect all of my students to do the following, and I consider all of these things to follow under one of the three rules.

- Listening attentively in class, and be in class/your seat on time - BEFORE the last bell rings or time for class to starts arrives.

Thank you.

- Check the assignment board as you enter class and check for and pick up papers.

- Following directions and procedures; absolutely no cheating.

- **Actively** participating in class.
- Coming prepared to class with your science stuff, textbook, calculator, and writing materials.
- ** Raising your hand to ask questions, and not interrupting other students or me. As far as talking goes, TEACHER FIRST, TEACHER DESIGNATED SPEAKER SECOND, and free communication for the most part besides that. This does not mean that every time the teacher breathes you are free to discuss weekend plans with your friend across the room. At the appropriate times, physics-related communication is encouraged. *Cerebral messages* are available upon request at the discretion of the teacher. Hey, remember, if Mr. M is happy, then odds are that everybody is happy.**

You are here to learn. I expect every student to work all year long. If you are a senior and you expect to shut down in the second semester - you will not be a happy person in this class and you should not be here. However, it's my job to make sure that what we are doing is interesting and relevant.

Self-discipline. You're young adults, you're busy people, you know what to do and how to act. If (in some unexplained fit of stupidity) you misbehave, then I will follow a series of disciplinary steps. Each student has the right to learn and be in a safe environment. "Misbehavior" is anything that infringes upon those rights.

Please note that the order of these disciplinary steps is subject to change!!!

- 1) A verbal warning. I'll let you know if you are being a problem. I WILL NEVER TRY TO HUMILIATE OR EMBARRASS YOU IN FRONT OF OTHERS.
- 2) A detention and a phone call home. All detentions will be accompanied by a phone call. If I need to send you out in the hall, that is most likely going to result in a detention. Detentions that are not served are doubled, and then sent to the main office for further action.
- 3) A conference with parent(s). Yes, even seniors. The student may be requested to attend this conference.
- 4) Sent to office for more severe disciplinary action.

Again, I anticipate no such problems, but these measures are in place as a precaution for both of us.

General

1. Be on time for class.
2. Be ready to learn: (checked for and pick up papers, and start of class assignment, pencils, erasers, rulers, books, notebooks, etc.)
3. Speak only when it is your turn.
4. Do not cheat or lie.
5. Do not disrupt your learning environment or the learning environment of another student.
6. Try your best.

What you can expect from me

1. **The same rules that apply to you apply to me.** This means that as long as you act in a manner that deserves respect, I will gladly give it to you. You are young adults, and I won't treat you like a child. In this class I think we can all act responsibly, (even I will try to act grown up).
2. **I'll try my best.** I always try to make sure that class is interesting and relevant, but there are some materials that may seem abstract when you are first exposed to them. Paying attention is *very important* when this occurs.
3. **I will be here to help you.** I will give you time during my lunch period, before school, and after school. If you are having trouble, please try to let me know in advance when you want to work so that I know when to expect you. I guarantee that coming in for help sessions will improve your grade. However, many students find that working through difficulties with a "study group" of peers is their most effective way of understanding physics.

***** If you are in extracurriculars, work, or have an odd schedule, let me know. I am usually at school by 6:55 A.M. and here until at least 4 P.M., but I have stayed later if a student needs extra help. *****

Also my e-mail address is **kevin_mcchesney@plsd.us** and my syllabus (and other important readings, copies of w.s., etc.) are found at the class webpage **<http://www.tigerphysics.org>** password "tigers" or Google

Classroom @tigerphysics

Also, check here weekly for a physics question! The first person who gives me a correct written answer earns a bonus!

4. **I will challenge you.** If you are good at playing the "game" of school by memorizing a lot of facts but not understanding what they mean, you may find this course very difficult and frustrating because:

A) I almost always give essay and problem based tests, with questions that ask you to apply what you learn in class to new situations.

B) Many projects and labs aren't "cookbook", and they require thought to answer the questions. If you don't think about the answers during the labs (and just copy them from someone else) and don't make an effort to understand the labs, you will almost surely fail the tests.

C) I don't give the easy answer to questions, which frustrates students at times (**NOTE THAT THIS IS A TECHNIQUE RECOMMENDED BY COLLEGE PROFESSORS**). My job is to help you learn about physics and the world around you, not to tell you what I think is important. Some students who are not used to thinking for themselves may get frustrated, but I will try to help you think for *yourself*. It's better to go through some challenges now when you have the support of your family, friends, and teachers than to face the difficulties alone during your first year of college or work.

D) I rarely write down notes on the board, for at this level you need to be able to take down information as you see fit. I will be happy to clarify any questions, but I won't speak in slow motion so that you can duplicate every word. Your textbook is much better than the one we used to use, and it is a great resource of physics information. I will not waste your time by repeating information that is in your textbook (even though you will be tested on this information) unless a student asks for clarification about a particular passage or problem.

5. **The good news!** I am not set in my ways - if something doesn't help you learn, we'll figure out what will. I WILL WORK AT LEAST AS HARD AS YOU - physics can be a lot of work, but I'll never ask more of you than I do of myself. I like science, I like teaching, and I like students. I know we are going to have a fun and stimulating class this year!

Helpful hints:

1) I can almost guarantee an "A" or a "B" in this class if you

- listen and read.
- form a study group.
- complete all assignments on time.
- arrange a specific study time each day for physics, even if it's only a few minutes.
- are an active and positive participant in class - mentally, verbally, and physically.

2) The better your attendance is, the better your grades will be - guaranteed.

**A LETTER TO PARENTS AND STUDENTS - PLEASE READ,
SIGN ON THE BACK, AND RETURN TO MR. MCCHESENEY**

Student name print

Welcome to Physics! I want to take a few minutes of your time to give you an idea of what this course will be like for your son or daughter. A letter from *The Physics Teacher* by Dr. Karl Mamola, one of the nation's leading educators in college physics. I think his essay summarizes how I feel a physics course should be taught, but I'd like to make a few additions that better explain my view of this course.

First of all, I agree with Dr. Mamola that the concepts of physics are the most important ideas to get across to students. There will be quite a lot of math in AP Physics 1, but it is to be used as a tool to better understand physics concepts and how they relate to each other. Some interpret this stress on concepts to be less rigorous than the traditional way in which physics is taught. In fact it is quite the opposite. It is far more difficult for most students to understand a physics concept and apply it in a novel situation than it is for them to "plug and chug" using a large number of memorized formulas. In addition, stress on physics concepts as a way to teach has gained a lot of momentum (hey, there's a physics concept!) in the teaching of college physics as well. In fact, Dr. Alan Van Heuvelen who's taught physics to honors engineering and pre-med students at Ohio State is one of the leaders of movement.

Secondly, I really try and focus on problem solving and thinking in Physics, which certainly goes along with the increased understanding promoted by Dr. Mamola. You might think of a physics problem as..... $s = 1/2 (a)(t)^2$ or $p = mv$. While these sorts of calculations are a part of the course, I interpret problem solving to mean the creative solution of real-world or realistic problems using whatever means possible, and I will often pose such problems to students as part of this course. For example, I could ask students to determine the height of an object, say Pickerington High School Central's Flagpole, indirectly - three different ways. It's a real problem, there's a real solution, and there are a bunch of different ways for students to get an answer, but there's a lot of honest to goodness physics involved for them to solve the problem three different ways. So, yes, your son or daughter will spend a lot of time solving physics problems at school and at home, so watch out for it!

Some of the problems I will pose will be extremely challenging, and hopefully your son or daughter will develop a good support network of students to work with. I've spent a lot of time in recent years talking with professionals in the fields of research, engineering, medical areas, and other sciences. When asked what things students need to learn to do better by the time they get out of high school, I heard a variety of responses depending on the profession of the person, but one theme was stated by every person I've met. STUDENTS NEED TO LEARN HOW TO THINK "3-Dimensionally" AND SOLVE PROBLEMS WITH MORE THAN ONE APPROACH. This is tough, but together we're going to do it.

Finally, most students enrolling in Physics intend to go on into a professional field, and although few will ever be physicists, there are a large number of students who indicate an interest in engineering, architecture, and medicine. These fields all have something in common. They all require the use of one's hands to build (or repair) very important things. These days, much of the architect's and engineer's work is done on the computer, but they often still need to build physical models of what they are trying to do. It is for this reason that I want students to get some practice "engineering" things in physics class. Several projects will allow students to engineer objects (such as bridges and rockets) and test their designs. I will always tell students well in advance exactly how they will be graded on these projects, and I will try to keep the expense as low as possible, partly by allowing students to work with a partner.

In summary, Physics may well be the most challenging non-A.P. course in the school, but it can also be the most rewarding and useful course they take in high school. Getting good grades will not be easy, but I pledge to offer as much help as I can so that your son or daughter does well. I am usually at school at 6:45 A.M. and am here until at least 4 P.M. in the evening on most nights. My cell phone number is 264-9816 if your son or daughter needs help and cannot get it from another student. You should be aware, however, that Physics is a much more independent course than any of the other science courses your son or daughter has taken, and there may be considerable stress. It is the responsibility of the student, the teacher, and the parents to overcome these times of stress as best we can.

As a parent or student, by signing this form I want you to agree to contact me directly if the student appears to be having major problems with the course. The PHS-Central's phone number is 614-548-1800. But the best way to reach me is through e-mail at kevin_mcchesney@plsd.us

Many of our labs and projects will make use of potentially hazardous equipment, such as high voltage power sources, slingshots, trebuchets, and rockets. I pledge to you that I will thoroughly go over safety procedures before any such equipment is used and do my best to ensure the safety of your child. If your child, or any other, fails to act in a safe and responsible manner, that student will be removed with a loss of any graded work until we all feel he or she can safely return to the classroom. I don't expect this to happen, but your child deserves to learn in a safe environment. **By signing below, I want the parent(s) and student to agree that the student will act in a safe and responsible manner.**

What, as a parent, can you do to help your son or daughter? First of all, ask him or her what was done in class each day - I guarantee you it wasn't "Nothing". Next, try and make sure you see that your child has a regular study area away from the TV and other distractions. It's great to set aside study time each night; even if there isn't homework, students get a lot out of looking over notes and labs. Third, take a look and see what we're doing in class. Parent interest and involvement is great! If there's something you as a parent are interested in, let me know. You might also want to check your child's syllabus every week - I'll hand one out each Monday and I'll have them on my home page. (<http://www.tigerphysics.org> or <http://twitter.com/tigerphysics>) Finally, make sure that your child uses the physics phone tree and me as a resource.

To the student: You can expect (dare I say it?) to enjoy class and have fun. A lot of this is up to you. You need to come in with a positive attitude and be willing to learn. If you do this, I'll try my best to make physics phun.

PHYSICS WAS MY MOST INTERESTING AND (BY FAR) MOST FUN SCIENCE CLASS IN HIGH SCHOOL, AND COLLEGE AND GRADUATE SCHOOL, AND IT CAN BE FOR YOU, TOO!

This page is part of an *six* page handout given to my students on the first day of class. By signing this form you indicate that you have read at least this page and the one on the back (all 6 pages for students) and understand what was said. Once signed, the student will tear off this page and return it to me. **If you have any questions or comments, please write them down on the space below.** *Thank you* for your time and interest.



Kevin C. McChesney, PHSC Physics teacher

Parental signature

Print Student's Name

Student's signature

PARENTS: If you were not able to come to open house and you would like to talk with me, please let me know in the space above how and when I can best contact you. I truly appreciate your interest and involvement!