

AP[®] Physics 2 Syllabus

2020-2021

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Course Description:

AP Physics 2 is based on seven “Big Ideas” that form the basis of the course, as well as seven scientific practices. Specific learning objectives are derived from these big ideas and practices.

Big Ideas in AP Physics 2:

Big Idea 1: Properties. Objects and systems have properties such as mass and charge. Systems may have internal structure. In Unit 3. Electric Charge and Unit 7. Atomic Physics students explore the concepts of fundamental particles with no internal structure such as electrons, and systems built from fundamental particles such as protons and neutrons.

Big Idea 2: Fields. Fields existing in space can be used to explain interactions. In Unit 3. Electric Field and Unit 5. Magnetism students conduct experiments to investigate the nature of electric fields and magnetic fields

Big Idea 3: Force Interactions. The interactions of an object with other objects can be described by forces. In Unit 1. Fluids, Unit 3. Electric Force and Unit 5. Magnetism students use free body diagrams to represent the buoyant force, electric force, and magnetic force that result from interactions between particles or objects of a system.

Big Idea 4: Systems. Interactions between systems can result in changes in those systems. In Unit 2. Thermodynamics students learn examples of how the mechanisms of thermal energy transfer conduction, convection, and radiation work in our everyday lives.

Big Idea 5: Conservation. Changes that occur as a result of interactions are constrained by conservation laws. The students solve problems in Unit 1. Fluids, Unit 2. Thermodynamics, Unit 5. DC Circuits and Unit 7. Quantum Physics by applying Bernoulli’s equation, the first law of thermodynamics, Kirchhoff’s loop rule, and the photoelectric effect respectively, and realize the universal nature of conservation of energy across topics.

Big Idea 6: Waves. Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomena. In Unit 6. Geometric Optics students investigate applications of wave behavior like reflection and refraction through experiments in image formation in mirrors and lenses.

Big Idea 7: Probability. The mathematics of probability can be used to describe the behavior of complex systems and to interpret the behavior of quantum mechanical systems. In Unit 7. Atomic Physics students conduct research to investigate how energy transitions due to emission or absorption of photons provide the foundation of how lasers work.

Science Practices:

Science Practice 1: **Modeling.** The student can use representations and models to communicate scientific phenomena and solve scientific problems.

Science Practice 2: **Mathematical Routines.** The student can use mathematics appropriately.

Science Practice 3: **Scientific Questioning.** The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP Physics 2 course.

Science Practice 4: **Experimental Methods.** The student can plan and implement data collection strategies in relation to a particular scientific question.

Science Practice 5: **Data Analysis.** The student can perform data analysis and evaluation of evidence.

Science Practice 6: **Argumentation.** The student can work with scientific explanations and theories.

Science Practice 7: **Making Connections.** The student is able to connect and relate knowledge across various scales, concepts, and representations in and across domains.

Instructional Strategies:

The AP[®] Physics 2 course is conducted using inquiry-based instructional strategies that focus on experimentation to develop students' conceptual understanding of physics principles. The students begin studying a topic by making observations and discovering patterns of natural phenomena. The next steps involve developing, testing, and applying models. Throughout the course, the students construct and use multiple representations of physical processes, solve multistep problems, design investigations, and reflect on knowledge construction through self-assessment rubrics.

In the classroom, students use graphing calculators and digital devices for interactive simulations and collaborative activities.

Throughout each unit, Topic Questions will be provided to help students check their understanding. The Topic Questions are especially useful for confirming understanding of difficult or foundational topics before moving on to new content or skills that build upon prior topics. Topic Questions can be assigned before, during, or after a lesson, and as in-class work or homework. Students will get rationales for each Topic Question that will help them understand why an answer is correct or incorrect, and their results will reveal misunderstandings to help them target the content and skills needed for additional practice.

At key points within a unit, Personal Progress Checks will be provided in class or as homework assignments in AP Classroom. Students will get a personal report with feedback on every topic, skill, and question that they can use to chart their progress, and their results will come with rationales that explain every question's answer. One to two class periods are set aside to re-teach skills based on the results of the Personal Progress Checks.

Text: Giancoli, D. Physics: Principles with Applications. 6th Edition. Upper Saddle River, NJ: Prentice Hall/Pearson Education, 2005. ISBN 0-13-184661-2.

COURSE OUTLINE:

Unit	Textbook Chapter	Science Practices
Unit 1: Fluids (Big Ideas 1, 3, 5) Density * Pressure * Pascal's principle * Buoyant force/Archimedes' principle * Fluid flow/continuity * Bernoulli's Equation	Chapter 10	1.E.1.1, 1.E.1.2, 3.A.2.1, 3.A.3.3, 3.A.4.1, 3.A.4.2, 3.A.4.3, 3.B.1.4, 3.B.2.1, 3.C.4.1, 3.C.4.2, 5.B.10.1, 5.B.10.2, 5.B.10.3, 5.B.10.4, 5.F.1.1
Unit 2: Thermodynamics (Big Ideas 1, 3, 4, 5) * Kinetic Theory * Ideal Gases * 1st Law of thermodynamics * Thermodynamic Processes * PV Diagrams * 2nd Law of thermodynamics * Heat engines; Carnot cycle	Chapters 13, 14, 15	1.E.3.1, 4.C.3.1, 5.B.2.1, 5.B.4.1, 5.B.4.2, 5.B.5.4, 5.B.5.5, 5.B.5.6, 5.B.6.1, 5.B.7.1, 5.B.7.2, 5.B.7.3, 7.A.1.1, 7.A.1.2, 7.A.2.1, 7.A.2.2, 7.A.3.1, 7.A.3.2, 7.A.3.3, 7.B.1.1, 7.B.2.1
Unit 3: Electrostatics (Big Ideas 1, 2, 3, 4, 5) * Coulomb's Law * Electric Field * Electric Potential	Chapters 16, 17	1.B.1.1, 1.B.1.2, 1.B.2.1, 1.B.2.2, 1.B.2.3, 1.B.3.1, 2.C.1.1, 2.C.1.2, 2.C.2.1, 2.C.3.1, 2.C.4.1, 2.C.4.2, 2.C.5.1, 2.C.5.2, 2.C.5.3, 2.E.2.1, 2.E.2.2, 2.E.2.3, 2.E.3.1, 2.E.3.2, 3.A.2.1, 3.A.3.2, 3.A.3.3, 3.A.3.4, 3.A.4.1, 3.A.4.2, 3.A.4.3, 3.B.1.3, 3.B.1.4, 3.B.2.1, 3.C.2.1, 3.C.2.2, 3.C.2.3, 3.G.1.2, 3.G.2.1, 3.G.3.1, 4.E.3.1, 4.E.3.2, 4.E.3.3, 4.E.3.4, 4.E.3.5, 5.C.2.1, 5.C.2.2, 5.C.2.3
Unit 4: Electric Circuits (Big Ideas 1, 2, 4, 5) * Resistance * Ohm's Law * DC Circuits (schematics, series, parallel, compound) * Kirchhoff's Laws * Capacitance * RC circuits	Chapters 18, 19	1.E.2.1, 4.E.4.1, 4.E.4.2, 4.E.4.3, 4.E.5.1, 4.E.5.2, 4.E.5.3, 5.B.9.4, 5.B.9.5, 5.B.9.6, 5.B.9.7, 5.B.9.8, 5.C.3.4, 5.C.3.5, 5.C.3.6, 5.C.3.7
Unit 5: Magnetism & Electromagnetic Induction (Big Ideas 1, 2, 3, 4) * Magnetic Field * Magnetic Force (on charged particles; on current carrying wires) * Magnetic Flux * Faraday's Law * Lenz's Law * Motional emf	Chapters 20, 21	2.C.4.1, 2.D.1.1, 2.D.2.1, 2.D.3.1, 2.D.4.1, 3.A.2.1, 3.A.3.2, 3.A.3.3, 3.A.4.1, 3.A.4.2, 3.A.4.3, 3.B.1.4, 3.B.2.1, 3.C.3.1, 3.C.3.2, 3.G.1.2, 3.G.2.1, 4.E.1.1, 4.E.2.1
Unit 6: Optics (Big Idea 6) * Electromagnetic spectrum *	Chapters 22, 23, 24	6.A.1.2, 6.A.1.3, 6.A.2.2, 6.B.3.1, 6.C.1.1, 6.C.1.2, 6.C.2.1, 6.C.3.1,

Reflection * Mirrors (diagram & eqn) * Refraction & Snell's Law * Interference * Diffraction * Thin film interference		6.C.4.1, 6.E.1.1, 6.E.2.1, 6.E.3.1, 6.E.3.2, 6.E.3.3, 6.E.4.1, 6.E.4.2, 6.E.5.1, 6.E.5.2, 6.F.1.1, 6.F.2.1
Unit 7: Atomic, Nuclear, & Modern (Big Ideas 1, 3, 4, 5, 6, 7) * Atomic structure & isotopes * Fundamental Forces * Photons * Photoelectric Effect * Compton Scattering / Photon Momentum & Photon-Particle Collisions * Wave-particle duality/ DeBroglie Wavelength * Atomic Energy levels * Absorption & emission spectra * Quantum Mechanics, Wave Functions & Probability * Electron Diffraction * Mass-energy equivalence * Radioactive Decay (α , β , γ decay & half life) * Fission & Fusion	Chapters 26, 27, 28, 30, 31	1.A.2.1, 1.A.4.1, 1.C.4.1, 1.D.1.1, 1.D.3.1, 3.G.1.2, 3.G.3.1, 4.C.4.1, 5.B.8.1, 5.B.11.1, 5.C.1.1, 5.D.1.6, 5.D.1.7, 5.D.2.5, 5.D.2.6, 5.D.3.2, 5.D.3.3, 5.G.1.1, 6.F.3.1, 6.F.4.1, 6.G.1.1, 6.G.2.1, 6.G.2.2, 7.C.1.1, 7.C.2.1, 7.C.3.1, 7.C.4.1

Real-World Applications:

Throughout the course the students engage in a variety of activities designed to build the students' reasoning skills and deepen their conceptual understanding of physics principles. Students conduct activities and projects that enable them to connect the concepts learned in class to real world applications.

Laboratory Investigations:

The AP Physics 2 course devotes over 25% of the time to laboratory investigations. The laboratory component of the course allows the students to demonstrate the seven science practices through a variety of hands-on investigations in all of the units of study.

Lab Report:

Students report all of the lab investigations in a laboratory journal. For each lab, students are expected to record an investigation question, list of equipment, step-by-step procedure, data, data analysis, error analysis, and conclusions. Data analyses include identification of the sources and effects of experimental uncertainty, calculations, results and conclusions, and suggestions for further refinement of the experiment as appropriate.

Identification badges are required for entry into the classroom. Per school policy, all students must be professionally attired (see dress code) and have a current CSHS ID badge on a lanyard around their neck in plain view.

Grading Policy:

Grades will be based on lab experiments, skill checks, tests, homework, projects, and daily class work. Grades are located on-line and it is the student's responsibility to check grades frequently in case of error. Teachers are the final decision-makers for all grades.

Grade Changes:

We will provide many opportunities for students to demonstrate learning throughout the grading period. I have worked diligently to assure that each student is treated equitably. In order to maintain the integrity of grades, requests to change or "bump up" grades will not be considered. It is important to remember that a student's grade is a snapshot of content mastery during a relatively small (semester long) time frame; it certainly does not represent future potential.

If I have made a clerical error in calculating semester grades, I am able to make the appropriate changes in the following semester.

Grade Categories and Percentages:

Grades will be calculated based upon a weighted system.

Tests 30%

Skill Checks (Quizzes) 15%

Classwork/Homework 10%

Labs/Activities/ Projects 25%

Final Exam 20%

Your final grade is determined using the traditional grading scale:

100% to 89.5% = A

89.4% to 79.5% = B

79.4% to 69.5% = C

69.4% to 59.5% = D

Below 59.5% = F

Assessments:

There will be no retakes or test corrections on any assessment. If a test or quiz is missed the day the student returns to class, the teacher can have them make up the test or quiz in class. They will then need to come after school to get the material they missed that day while they were taking their test/quizzes. There will be no makeup quizzes administered after the next scheduled assessment has taken place. Labs will need to be made up after school by appointment within the 2 day district policy. Alternative assignments may be given for some missed assignments – the same concept will be covered. Written assignments and homework can be made up at home. If the make-up work is not turned in on time, a grade of zero will be earned.

Skill Checks:

Students have a chance to demonstrate their comprehension of previous material twice a week with Skill Checks. On Skill Check days, a question will be posed that can be in the form of a problem to be solved or a conceptual question that requires an answer written in complete sentences. Most of these will be graded immediately. They will be graded as described below:

- 4-point scale:
- 1 ----> No real attempt to give a coherent answer.
 - 2 ----> Some attempt, but skill/concept not understood.
 - 3 ----> Generally correct process/concept; 1 or 2 small errors.
 - 4 ----> Completely correct answer; showing work and appropriate units.

Unit Tests:

The standard written tests (mix of short answer problems and multiple choice problems) will be announced at least one week in advance so that students have time to organize and review the concepts.

Homework Policy:

Students receive assignments on a regular basis. Assignments may consist of readings, worksheets, or online activities/reflections.

Assignments are due at the start of class. Students are expected to genuinely attempt every problem and show legible, written evidence of this. "I don't get it" is not an acceptable excuse for not attempting the homework. Students with questions about the homework should plan to attend office hours, consult a classmate, or consult the textbook or internet resource for additional help. In general, unless otherwise indicated, on-time, completed assignments will get 5 pts, late but complete will get 3 pts, and incomplete get 1 pt. Missing assignments will be labeled with 0 pts.

Attendance:

Good attendance is a critical part of being a proactive, engaged learner. I understand that some absences are inevitable and beyond our control, and in those cases it is important to take responsibility to compensate for missed learning experiences (see absence policy below).

School Absence Policy:

If you are absent, you are responsible for finding out about any make-up work, assignments, notes, or labs. You can e-mail teachers to request homework to pick up during an absence. For every day of excused absence, a student has two days to make up homework, classwork, quizzes, and tests (parents have 24 hours to contact the school to excuse the absence). All make up work from an excused absence is eligible to receive full credit if completed and turned in within the 2 day window. Some courses such as Honors, Advanced Placement, International Baccalaureate and Dual Enrollment courses have numerous long-term projects or portfolios, which may have absolute deadlines. Students will be advised of these project/portfolio deadlines in the course syllabus or on grading outlines and will be expected to turn in projects/portfolios prior to the designated date for credit regardless of days absent.

Assignments, tests, quizzes not completed within the 2 day window will receive a zero. (Ref: Board Policy JH-R)

Unexcused absences will result in no credit for the work done in class that day (including assessments). If a student is absent more than ten days during the semester, they may lose credit for the course, per CCUSD policy.

Tardiness:

Tardiness to class is disrespectful and unacceptable. You are tardy if you are not in your seat at the bell. The consequences for being tardy are assigned detentions, parent contact and finally a referral to administration.

Quality and Timeliness of Work:

Work is considered late if it is not turned in at the beginning of class, the day it is due.

Illegible work will not be graded. I will accept assignments one day late at 50% credit. After one day NO late work will be accepted! Some assignments cannot be accepted for late credit if answers were discussed in class.

Your teacher will be assigning some long-term and internet based assignments. Ample time will be given to complete these assignments, so the due date is firm. Be sure to complete each assignment well before the due date to avoid any unexpected problems (illness, computer problems, etc). If a serious problem arises, you are expected to communicate with your instructor well before the due date so that the problem can be remedied. Remember that computers are available in the school library and at other local libraries. You must keep all assignments as they will be going into your notebook. These assignments will be crucial for helping you prepare for the Final Exam.

District Policy JK-R:

A student may be subject to disciplinary action when the student engages in any of the following forms of academic misconduct

- Lateness** - For missing or leaving school or class without permission or excuse.
- Cheating** - Including but not limited to copying, using unauthorized help sheets and the like, illegally obtaining tests in advance, substituting for a test-taker, and other forms of unauthorized collusion.
- Plagiarism** - Representation of the ideas or work of another person as his/her own.
- Collusion** - Supporting malpractice by another student as in allowing one's work to be copied or submitted for assessment by another.
- Duplication of work** - Presentation of the same work for different assessment components and/or requirements.
- Fabrication of Data** - Manufacturing data for a table, survey, or other such requirement.
- Any behavior that gains an unfair advantage for a student and/or affects the results of another student.**

Under **NO** circumstance are students allowed to "share" answers on assignments, warm ups (bellwork), labs, quizzes, or tests. Submitting a lab report without laboratory completion (i.e., a "dry lab"), is

fabrication of data and will be considered cheating. Additionally, students should not be in possession of other students' papers. The use of textbooks, "cheat sheets," cell phones or any other digital resources during tests or quizzes is also not permitted. Whenever two people are involved in a cheating episode, BOTH the person providing the answer and the person receiving the answer will earn a zero.

Cactus Shadows High School takes academic dishonesty seriously. Any violation of this policy will result in a zero for the assignment/assessment for a first offense, a zero for the assignment/assessment and short term suspension for a second offense, and a loss of credit for the semester course (.5) and short term suspension for a third offense.

Students who share assignment/assessment information with other students via pictures, paper or electronics will receive a zero on the assignment/assessment and a short term to long term suspension (prior academic misconduct referrals from any other school or CCUSD grade level will be considered).

Behavior, Self-Discipline, Respect:

Our goal is to maintain an effective and safe learning environment for every student. Students are expected to manage their behavior and abide by the posted classroom rules outlined in the student handbook. The science department has a "zero tolerance" policy for distracting and unsafe behavior in the laboratory! Unsafe behavior will result in immediate removal from the lab, loss of points, and possibly other disciplinary action. Students are strictly prohibited from removing any materials from the classroom.

Students Leaving Class:

Students will be provided with a limited number of passes that can be used to leave the classroom in order to take care of personal matters. When using a pass you should be gone no longer than 10 minutes. The passes cannot be used during the first ten minutes or the last ten minutes of the class period. Please use your passing time between classes wisely and take care of personal matters at that time.

Electronic Devices:

Classrooms are designated as 'No Phone Zones'. Cellphones, ear buds, Airpods, or any other electronic devices are not to be seen or used in classrooms for any reason other than teacher-requested academic activities. Upon entry into the classroom, students should turn off and stow all devices in their backpacks. If you bring your cellphone, earbuds, or Airpods to school and they are damaged or lost, the school and teacher cannot be held responsible. Recording any activities in class without the express permission of the teacher and other students is prohibited and subject to a discipline referral.

Guest Teachers:

We value our Guest Teachers. The expectation is that our students treat our guests with the highest level of respect and support. Students who do not exhibit FALCON PRIDE while in the classroom with a guest teacher will receive appropriate discipline.

I am here for YOU!!! If you do not understand something, need extra help, or want to review, please come to me. The best way to reach me is by email. I will make every effort to help you.

Disclaimer: Course information listed in this syllabus is subject to change at the discretion of the instructor. The instructor will explain the rationale for any variance as it occurs.

CSHS AP Physics 2 Syllabus for 2020-2021

Return this Page with Signatures

I have read all pages of the CSHS Physics Syllabus for 2020-2021, and I understand and accept the policies and procedures outlined therein.

Student Name (please print)

Student Signature

Date

Parent(s) name(s) (please print)

Email

Parent(s) signature(s)

Date

Place for parent comment: