



AP[®] Physics 1: Algebra-Based

Course Overview

About the Advanced Placement Program[®] (AP[®])

The Advanced Placement Program[®] has enabled millions of students to take college-level courses and earn college credit, advanced placement, or both, while still in high school. AP Exams are given each year in May. Students who earn a qualifying score on an AP Exam are typically eligible, in college, to receive credit, placement into advanced courses, or both. Every aspect of AP course and exam development is the result of collaboration between AP teachers and college faculty. They work together to develop AP courses and exams, set scoring standards, and score the exams. College faculty review every AP teacher's course syllabus. We commit to supporting educators and communities in their efforts to make AP courses widely available, advancing students in their plans for college and careers.

AP Physics Program

The AP Program offers four physics courses:

AP Physics 1: Algebra-Based is a full-year course that is the equivalent of a first-semester introductory college course in algebra-based physics.

AP Physics 2: Algebra-Based is a full-year course, equivalent to a second-semester introductory college course in physics.

AP Physics C: Mechanics is a full-year course equivalent to a semester-long introductory calculus-based college course.

AP Physics C: Electricity and Magnetism is a full-year course following Physics C: Mechanics and is equivalent to a semester-long introductory calculus-based college course.

AP Physics 1 Course Overview

AP Physics 1 is an algebra-based, introductory college-level physics course. Students cultivate their understanding of physics through inquiry-based investigations as they explore these topics: kinematics, dynamics, circular motion and gravitation, energy, momentum, simple harmonic motion, torque, rotational motion, and fluids.

PREREQUISITES

Students should have completed Geometry and be concurrently taking Algebra II or an equivalent course. Although the Physics 1 course includes basic use of trigonometric functions, this understanding can be gained either in the concurrent math course or in the AP Physics 1 course itself.

LABORATORY REQUIREMENT

This course requires that 25% of instructional time be spent in hands-on laboratory work, with an emphasis on inquiry-based investigations that provide students with opportunities to demonstrate the foundational physics principles and apply the science practices. Colleges may require students to present their laboratory materials from AP science courses before granting college credit for laboratory work, so students are encouraged to retain their notebooks, reports, and other materials.

AP Physics 1 Course Content

The course content is organized into eight commonly taught units, which have been arranged in the following suggested sequence. These units comprise the content and conceptual understandings in which colleges and universities typically expect students to be proficient to qualify for college credit and/or placement.

- **Unit 1:** Kinematics
- **Unit 2:** Force and Translational Dynamics
- **Unit 3:** Work, Energy, and Power
- **Unit 4:** Linear Momentum
- **Unit 5:** Torque and Rotational Dynamics
- **Unit 6:** Energy and Momentum of Rotating Systems
- **Unit 7:** Oscillations
- **Unit 8:** Fluids

Each unit is broken down into teachable segments called topics.

AP Physics 1 Science Practices

The following science practices describe what skills students should develop during the course:

- **Creating Representations:** Create representations that depict physical phenomena.
- **Mathematical Routines:** Conduct analyses to derive, calculate, estimate, or predict.
- **Scientific Questioning and Argumentation:** Describe experimental procedures, analyze data, and support claims.

AP Physics 1 Exam Structure

AP PHYSICS 1 EXAM: 3 HOURS

Assessment Overview

The AP Physics 1 Exam assesses student application of the science practices and understanding of the learning objectives outlined in the course framework. The exam is 3 hours long and includes 42 multiple-choice questions and 4 free-response questions. The 4 free-response questions appear in the order listed in the table. A four-function, scientific, or graphing calculator is allowed on both sections of the exam.

Format of Assessment

Section I: Multiple Choice | 42 Questions | 85 Minutes | 50% of Exam Score

Section II: Free Response | 4 Questions | 95 Minutes | 50% of Exam Score

- **Question 1:** Mathematical Routines (10 points)
- **Question 2:** Translation Between Representations (12 points)
- **Question 3:** Experimental Design and Analysis (10 points)
- **Question 4:** Qualitative/Quantitative Translation (8 points)

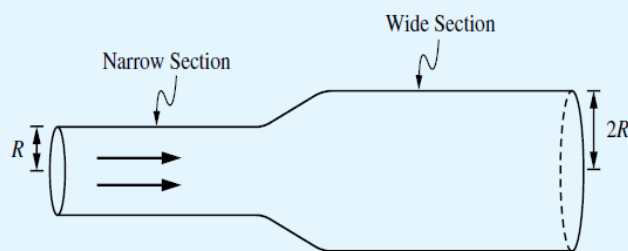
Exam Components

Sample Multiple-Choice Question

A fluid flows through the two sections of cylindrical pipe shown in the figure. The narrow section of the pipe has a radius of R and the wide section has a radius $2R$. What is the ratio of the fluid's speed in the wide section of pipe to its speed in the narrow section of pipe, $\frac{v_{\text{wide}}}{v_{\text{narrow}}}$?

- (A) $\frac{1}{4}$
- (B) $\frac{1}{2}$
- (C) 2
- (D) 4

Correct Answer: A



Sample Free-Response Question: Qualitative/Quantitative Translation



Block 1 of mass M_1 slides to the right along a horizontal surface with speed v_0 toward Block 2 of mass M_2 , which is initially at rest, as shown in Figure 1. When Block 1 collides with Block 2, the blocks stick together. Friction between the blocks and the surface is negligible.

- A. If Block 2 is much less massive than Block 1 ($M_1 \ll M_2$), **estimate** the approximate speed of the two-block system after the collision in terms of v_0 . **Justify** your estimate using qualitative reasoning beyond referencing equations.
- B. Starting with conservation of momentum, **derive** an equation for v_f , the speed of the two-block system after the collision, in terms of M_1 , M_2 , and v_0 . Begin your derivation by writing a fundamental physics principle or an equation from the reference information.
- C. **Justify** how your derived equation in part B is or is not consistent with your reasoning in part A.