

AP Physics B is a non-calculus survey course covering five general areas: Newtonian mechanics, thermal physics, electricity and magnetism, waves and optics, and atomic and nuclear physics. Students will gain an understanding of physics' core principles and then apply them to problem-solving exercises. They will learn how to measure the mass of a planet without weighing it, find out how electricity makes a motor turn, and learn how opticians know how to shape the lenses for glasses. The equivalent of an introductory college-level course, AP Physics B prepares students for the AP exam and for further study in science or engineering.

This course requires that students complete hands-on lab activities that do not depend on access to a supervised laboratory facility. It is appropriate for distance-learning students as well as those in a school setting.

This course has been authorized by the College Board to use the AP* designation and has been approved as meeting all requirements for a laboratory science course.

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Length: Two Semesters

UNIT 1: WELCOME TO PHYSICS

LESSON 1: WHY STUDY PHYSICS?

Practice: Math and Science Pretest

An AP physics course is extremely challenging and requires a strong background in math and science. This Assessment will help you assess your math and science skills.

Duration: 2 hr 30 min

Study: Welcome to Physics

Learn what physics is, and see what you'll learn in this course.

Duration: 0 hr 20 min

Discuss: Why Study Physics?

Introduce yourself to other students and discuss why you're taking this course.

Duration:

0 hr 30 min Scoring: 10 points

LESSON 2: MATH TOOLS

Discuss: Systems of Measurement

Should the United States convert to the metric system? What are the elements of an ideal system of measurement?

Duration: 0 hr 30 min Scoring: 10 points

Study: Math Tools

Refresh your memory and practice with units of measurement, significant figures, and unit conversion.

Duration: 1 hr

Study: Problem Solving

Learn a strategy for solving problems that can help you throughout the course.

Duration: 0 hr

50 min

Practice: Problem Solving and Unit Conversion

Use what you've learned about problem solving and unit conversion.

Duration: 0 hr 50 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer true-false questions about problem solving and unit conversion.

Duration: 0 hr 30 min Scoring:

8 points

Quiz: Check-Up

Apply what you know about problem solving and unit conversion as you answer computer-scored questions.

Duration: 1 hr 30 min Scoring: 21 points

Practice: Problem Solving

Practice using problem-solving techniques on dimensional analysis, and send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 3: WRAP-UP**Discuss: What is Interesting? What is Confusing?**

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Welcome to Physics

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Prepare for the test by reviewing what you've covered.

Duration: 3 hr 30 min

Test (CS): Welcome to Physics

Take a computer-scored test to check what you have learned in this unit.

Duration: 0 hr

15 min Scoring: 40 points

Test (TS): Welcome to Physics

Take a teacher-scored test to check what you have learned in this unit.

Duration: 0 hr

35 min Scoring: 60 points

LESSON 4: DIAGNOSTIC

Diagnostic: Welcome to Physics

Test your understanding of the key concepts covered.

Duration: 0 hr 45 min Scoring:

20 points

UNIT 2: KINEMATICS: DESCRIBING MOTION

LESSON 1: MOTION IN ONE DIMENSION

Study: Displacement, Velocity, and Acceleration

Take a detailed look at the basics of how scientists describe motion in one dimension.

Duration: 1 hr

Study: Kinematic Equations

Learn about and derive equations that describe motion in one dimension under uniform acceleration.

Duration: 1 hr

Lab: Gravitational Free Fall

Calculate the acceleration of gravity on earth, or the rate at which objects near sea level accelerate under the influence of earth's gravity.

Duration: 1 hr 30 min Scoring: 25 points

Study: Gravitational Free Fall

Learn how gravity accelerates objects and how to apply kinematic equations to gravitational free fall.

Duration: 0 hr 50 min

Practice: Acceleration and Free Fall

Practice using kinematic equations to solve problems involving acceleration (including free fall).

Duration: 0 hr 50 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer computer-scored true-false questions about motion in one dimension.

Duration: 0 hr 30 min

Scoring: 8 points

Quiz: Check-Up

Answer computer-scored numerical questions about motion in one dimension.

Duration: 1 hr 30 min

Scoring: 24 points

LESSON 2: MOTION IN TWO DIMENSIONS**Discuss: Drawing Toy**

Discuss how a drawing device uses two components (up-down and side-to-side) to create any kind of motion in two dimensions.

Duration: 0 hr 30 min Scoring: 10 points

Study: Motion in Two Dimensions, Graphical Method for Vector Addition

Learn the basics of how to describe motion in two dimensions (up-down and side-to-side), and learn how to visualize vector addition.

Duration: 1 hr 30 min

Study: Vector Addition: Analytical Method

Learn the details of how to use the analytical or component method to add vectors.

Duration: 0 hr 50 min

Practice: Vector Addition

Practice what you've learned and solve vector addition problems.

Duration: 0 hr 50 min

Study: Projectile Motion

Learn the formulas for describing projectile motion.

Duration: 1 hr

Practice: Projectile Motion

Practice what you've learned and solve projectile motion problems.

Duration: 0 hr 50 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer computer-scored true-false questions that require you to apply what you know about motion in two dimensions.

Duration: 0 hr 30 min Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions that require you to apply what you've learned about motion in two dimensions.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Motion in One and Two Dimensions

Practice what you've learned about kinematics, and send your work to your online instructor.

Duration: 1 hr Scoring: 25 points

LESSON 3: WRAP-UP**Discuss: What is Interesting? What is Confusing?**

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Kinematics: Describing Motion

Prepare for the test by reviewing what you've covered.

Duration: 3 hr 30 min

Test (CS): Kinematics: Describing Motion

Take a computer-scored test to check what you have learned in this unit.

Duration: 0 hr 15 min Scoring: 40 points

Test (TS): Kinematics: Describing Motion

Take a teacher-scored test to check what you have learned in this unit.

Duration: 0 hr 35 min Scoring: 60 points

LESSON 4: DIAGNOSTIC**Diagnostic: Kinematics: Describing Motion**

Test your understanding of the key concepts covered.

Duration: 0 hr 45
min Scoring: 33 points

UNIT 3: DYNAMICS, KINETIC ENERGY, AND WORK

LESSON 1: NEWTON: THREE LAWS OF MOTION

Study: Forces

Prepare to use Newton's three laws by learning to do calculations with forces and force vectors.

Duration:
0 hr 45 min

Study: Newton: Laws

Take a detailed look at Newton's first law, also known as the "law of inertia."

Duration: 1 hr 30 min

Lab: Inclined Plane

Use an interactive simulation to see how Newton's laws apply to a simple situation where a box slides on a sloping surface without friction.

Duration: 1 hr 30 min Scoring: 25 points

Study: Atwood Machine

Use an interactive simulation to see how Newton's laws apply to objects on pulleys.

Duration: 0
hr 40 min

Practice: Newton: Three Laws

Practice what you've learned and solve problems using Newton's three laws of motion.

Duration: 0 hr 50 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Use what you've learned by answering computer-scored true-false questions.

Duration: 0 hr 30 min
Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions on Newton's laws of motion.

Duration: 1 hr 30 min Scoring: 24
points

Practice: Newton: Three Laws

Practice with problems that review Newton's three laws.

Duration: 1 hr Scoring: 25 points

LESSON 2: KINETIC ENERGY AND WORK

Study: Kinetic Energy, Work, and Force

Learn about these three concepts and how they're related. Use an interactive simulation to see how force relates to work and do some example problems.

Duration: 1 hr 30 min

Practice: Force and Work

Practice using what you've learned about force and work.

Duration: 1 hr

Study: Work Energy Theorem, Total Mechanical Energy, and Efficiency

Explore the work energy theorem, total mechanical energy, efficiency, and nonconservative forces.

Duration: 1 hr

Practice: Work Energy Theorem, Total Mechanical Energy, and Efficiency

Practice using what you've learned to solve problems related to work and energy.

Duration: 0 hr 50 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Use what you've learned by answering computer-scored true-false questions.

Duration: 0 hr 30 min

Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions on kinetic energy and work.

Duration: 1 hr Scoring: 24 points

LESSON 3: MOMENTUM AND COLLISIONS

Discuss: Collisions and Momentum

Discuss the physics behind why automobiles can be dangerous and how the most common safety features work.

Duration: 0 hr 30 min Scoring: 10 points

Study: Momentum

Explore momentum and conservation of momentum.

Duration: 0 hr 40 min

Study: Impulse and Collisions

Explore changes to momentum brought about by collisions and impulses.

Duration: 1 hr

Practice: Momentum, Impulse, and Elastic Collisions

Practice using what you know about momentum, impulse, and elastic collisions.

Duration: 0 hr 50 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Use what you've learned by answering computer-scored true-false questions.

Duration: 0 hr 30 min

Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions on what this lesson covered.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Collisions

Practice what you've learned about momentum and collisions, and send your work to your online instructor.

Duration: 1 hr Scoring: 25 points

LESSON 4: WRAP-UP**Discuss: What is Interesting? What is Confusing?**

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Dynamics, Kinetic Energy, and Work

Prepare for the test by reviewing what you've covered.

Duration: 3 hr 30 min

Test (CS): Dynamics, Kinetic Energy, and Work

Take a computer-scored test to check what you have learned in this unit.

Duration: 0 hr 15 min Scoring: 40 points

Test (TS): Dynamics, Kinetic Energy, and Work

Take a teacher-scored test to check what you have learned in this unit.

Duration: 0 hr 35 min Scoring: 60 points

LESSON 5: DIAGNOSTIC

Diagnostic: Dynamics, Kinetic Energy, and Work

Test your understanding of the key concepts covered.

Duration: 0 hr

45 min Scoring: 31 points

UNIT 4: CIRCULAR MOTION, GRAVITATION, AND ROTATION

LESSON 1: CIRCULAR MOTION

Study: Circular Motion

Explore basics of circular motion, such as angular velocity and centripetal acceleration.

Duration:

1 hr 30 min

Discuss: Centripetal or Centrifugal?

Help your fellow students remember the difference between *centripetal* and *centrifugal* by posting examples of each, and posting tips on how to keep the two words straight.

Duration: 0 hr 30 min

Scoring: 10 points

Practice: Circular Motion

Practice using what you've learned about circular motion and angular acceleration.

Duration: 0

hr 50 min

Quiz: True-False

Answer true-false questions about circular motion.

Duration: 0 hr 30 min Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions about circular motion.

Duration: 1 hr Scoring: 24 points

LESSON 2: GRAVITATION AND PLANETARY ORBITS

Study: Gravitation and Planetary Orbits

Explore how Newton's law of gravitation changed our view of the universe.

Duration: 1 hr

Practice: Gravitation and Orbits

Practice working problems dealing with gravitation and orbits.

Duration: 0 hr 50 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Use what you've learned by answering computer-scored true-false questions.

Duration: 0 hr 30 min

Scoring: 4 points

Quiz: Check-Up

Answer computer-scored questions on circular motion and gravitation.

Duration: 1 hr 30 min Scoring: 18 points

LESSON 3: ROTATIONAL STATICS

Study: Rotational Statics

Explore the basic concepts of rotational statics, such as torque and rotational equilibrium.

Duration: 1 hr

Practice: Rotational Statics

Practice using what you've learned by solving rotational statics problems.

Duration: 0 hr 40 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Lab: Statics-Beam

Use an interactive simulation to see how rotational forces act on a beam.

Duration: 1 hr 30 min Scoring: 25 points

Quiz: True-False

Use what you've learned by answering computer-scored true-false questions.

Duration: 0 hr 30 min

Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions on rotational statics.

Duration: 1 hr Scoring: 24 points

Practice: Circular Motion and Rotational Statics

Practice using what you've learned by solving rotational statics and circular motion problems.

Duration: 1 hr Scoring: 25 points

LESSON 4: FLUIDS**Study: Fluids at Rest**

Explore the basic concepts of fluids at rest, including hydrostatic pressure and buoyancy.

Duration: 1 hr

Practice: Fluids at Rest

Practice using what you've learned by solving problems involving fluids at rest.

Duration: 1 hr

Lab: Archimedes, Water Pressure, and the Bernoulli Effect

Find the density of materials based on their buoyancy.

Duration: 2 hr Scoring: 25 points

Study: Fluids in Motion

Explore the basic concepts of fluids in motion, including fluid flow continuity and Bernoulli's equation.

Duration: 1 hr

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Use what you've learned by answering computer-scored true-false questions.

Duration: 0 hr 30 min

Scoring: 8 points

Practice: Fluids in Motion

Practice using what you've learned by solving problems involving fluids in motion.

Duration: 1

hr

Practice: Fluids

Practice using what you've learned by solving problems involving all aspects of fluids.

Duration: 1 hr

Scoring: 25 points

LESSON 5: WRAP-UP

Discuss: What is Interesting? What is Confusing?

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Circular Motion, Gravitation, and Rotation

Prepare for the test by reviewing what you've covered.

Duration: 3

hr 30 min

Test (CS): Circular Motion, Gravitation, and Rotation

Take a computer-scored test to check what you have learned in this unit.

Duration: 0 hr 15 min Scoring: 40 points

Test (TS): Circular Motion, Gravitation, and Rotation

Take a teacher-scored test to check what you have learned in this unit.

Duration: 0 hr 35 min Scoring: 60 points

LESSON 6: DIAGNOSTIC

Diagnostic: Circular Motion, Gravitation, and Rotation

Test your understanding of the key concepts covered.

Duration: 0 hr 45 min Scoring: 27 points

UNIT 5: VIBRATION, WAVES, AND SOUND

LESSON 1: OSCILLATION (VIBRATION) AND SIMPLE HARMONIC MOTION

Study: Simple Harmonic Motion

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Explore the basics of simple back-and-forth motion.

Duration: 1 hr

Lab: Simple Harmonic Motion

Explore simple harmonic motion with a pendulum or simulations of a mass on a spring.

Duration: 1 hr 30 min Scoring: 25 points

Study: Pendulums Kinematics and Coupled Oscillator

Explore the theory behind a simple pendulum and a more complicated situation: two oscillating masses coupled together.

Duration: 1 hr

Practice: Oscillation

Practice doing calculations with what you've learned.

Duration: 1 hr

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer computer-scored true-false questions on SHM.

Duration: 0 hr 30 min Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions on oscillation.

Duration: 1 hr 30 min Scoring: 24 points

LESSON 2: WAVES

Discuss: What Is a Wave?

What **is** a wave, really, and why do waves appear in so many different contexts?

Duration: 0

hr 30 min Scoring: 10 points

Study: Properties of Waves

Learn about principles of wave motion that apply to nearly any medium, from water to guitar strings. Use an interactive simulation to explore interference patterns.

Duration: 1 hr 30 min

Practice: Waves

Practice applying what you've learned by solving problems related to waves.

Duration: 0 hr 40 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Use what you've learned by answering computer-scored true-false questions.

Duration: 0 hr 30 min

Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions on waves.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Waves

Practice applying what you've learned.

Duration: 0 hr 45 min Scoring: 20 points

LESSON 3: SOUND

Study: What Is Sound?

Using what you know about waves, explore the basics of the nature of sound.

Duration: 0 hr 50

min

Discuss: Sounds and Components

Recall an interesting sound you've heard, and discuss the components that might make the wave form.

Duration: 0 hr 30 min Scoring: 10 points

Practice: Basics of Sound

Apply what you've learned and solve some practice problems.

Duration: 0 hr 50 min

Study: Interference

Learn how different sounds interact.

Duration: 0 hr 30 min

Practice: Interference

Practice using what you've learned about interference.

Duration: 0 hr 40 min

Study: Doppler Effect

Learn the details of why a train's horn drops in pitch as it goes past.

Duration: 0 hr 50 min

Study: Tones and Pipes

Explore the physics of musical notes.

Duration: 0 hr 50 min

Practice: Doppler Effect and Tones

Practice what you've learned about the Doppler effect and tones by applying your skills to solve problems.

Duration: 0 hr 50 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Practice: Doppler Effect and Pipes

Practice applying what you've learned.

Duration: 0 hr 45 min Scoring: 20 points

Lab: Sound Waves and Resonance

Explore the relationship between wavelength and resonant frequencies using a "closed pipe" and several tuning forks.

Duration: 1 hr 30 min Scoring: 25 points

Quiz: True-False

Use what you've learned by answering computer-scored true-false questions.

Duration: 0 hr 30 min

Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions on sound.

Duration: 1 hr 30 min Scoring: 24 points

LESSON 4: WRAP-UP**Discuss: What is Interesting? What is Confusing?**

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Vibration, Waves, and Sound

Prepare for the test by reviewing what you've covered.

Duration: 3 hr 30 min

Test (CS): Vibration, Waves, and Sound

Take a computer-scored test to check what you have learned in this unit.

Duration: 0 hr 15 min Scoring: 40 points

Test (TS): Vibration, Waves, and Sound

Take a teacher-scored test to check what you have learned in this unit.

Duration: 0 hr 35 min Scoring: 60 points

LESSON 5: DIAGNOSTIC

Diagnostic: Vibration, Waves, and Sound

Test your understanding of the key concepts covered.

Duration: 0 hr 45 min

Scoring: 31 points

UNIT 6: TEMPERATURE, HEAT, AND THERMODYNAMICS

LESSON 1: TEMPERATURE, THE IDEAL GAS LAW, AND KINETIC THEORY

Study: Temperature

Review the basic concepts of temperature: what it is and how it's measured.

Duration: 0 hr 50 min

Study: Kelvin Scale and the Ideal Gas Law

Learn about how changes in temperature, pressure, and volume are related in an ideal gas. Learn how these factors are related to kinetic energy.

Duration: 1 hr 30 min

Practice: Temperature, Kinetic Theory, and the Ideal Gas Law

Practice doing calculations with temperature, kinetic theory, and the ideal gas law.

Duration: 1 hr

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Use what you've learned by answering computer-scored true-false questions.

Duration: 0 hr 30 min

Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions on temperature and the ideal gas law.

Duration: 1 hr 30 min

Scoring: 24 points

Practice: Temperature, Kinetic Theory, and the Ideal Gas Law

Do calculations using what you've learned about temperature, kinetic theory, and the ideal gas law.

Duration: 1 hr Scoring: 25 points

LESSON 2: HEAT AND PHASES OF MATTER

Study: Heat Basics

Explore the basics of heat. Concepts include units for measuring heat, mechanical equivalent of heat, calorimetry, heat of combustion, and specific heat.

Duration: 1 hr 30 min

Discuss: Temperature and Heat

Discuss the difference between temperature and heat.

Duration: 0 hr 30 min Scoring:

10 points

Practice: Heat Basics

Practice what you've learned about heat.

Duration: 0 hr 50 min

Study: Phases of Matter

Explore how heat is transferred as matter changes from liquid to a solid to a gas.

Duration: 0 hr

50 min

Practice: Phases of Matter

Practice using what you've learned about phases of matter.

Duration: 0 hr 50 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Lab: Phases of Matter

Using a simulated burner and container, chart the temperature of a sample as it melts and then boils.

Duration: 1 hr 30 min Scoring: 25 points

Quiz: True-False

Use what you've learned by answering computer-scored true-false questions.

Duration: 0 hr 30 min

Scoring: 8 points

Quiz: Check-Up

Answer computer-scored questions about heat.

Duration: 1 hr 30 min Scoring: 24 points

LESSON 3: THERMODYNAMICS

Discuss: Whipped Cream

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Using what you know about the ideal gas law, discuss what would happen to a can of whipped cream under different circumstances.

Duration: 0 hr 30 min Scoring: 10 points

Study: The First Law of Thermodynamics

Learn about the first law of thermodynamics and four types of thermodynamic processes.

Duration: 1 hr 30 min

Practice: The First Law of Thermodynamics

Practice problems on one of the fundamental laws of nature - the first law of thermodynamics.

Duration: 0 hr 50 min

Study: Entropy and the Second Law of Thermodynamics

Learn about entropy and the second law of thermodynamics.

Duration: 1 hr 30 min

Discuss: Thermodynamics in Life

Help your classmates remember the laws of thermodynamics by coming up with examples of how the laws apply to common situations.

Duration: 0 hr 30 min Scoring: 10 points

Practice: Entropy and the Second Law

Practice problems on the direction the universe is headed - the direction of increased entropy.

Duration: 0 hr 50 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer true-false questions to check your understanding of basic thermodynamics.

Duration: 0 hr 30 min Scoring: 8 points

Quiz: Check-Up

Practice doing calculations using what you know about thermodynamics.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Thermodynamics

Practice doing calculations using what you know about thermodynamics.

Duration: 1 hr Scoring: 25 points

LESSON 4: WRAP-UP

Discuss: What is Interesting? What is Confusing?

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Temperature, Heat, and Thermodynamics

Review your studies of basic physics in preparation for the test.

Duration: 3 hr 30 min

LESSON 5: DIAGNOSTIC

Diagnostic: Temperature, Heat, and Thermodynamics

Test your understanding of the key concepts covered.

Duration:

0 hr 45 min Scoring: 28 points

UNIT 7: REVIEW AND EXAM

LESSON 1: AP PHYSICS B

Review: AP Physics B

Do a structured review of everything you learned in this semester.

Duration: 5 hr

Exam: AP Physics B

Take a 50-minute Semester Final, modeled after the AP Exam.

Duration: 0 hr 50 min Scoring: 90

points

Final Exam: AP Physics B

Take a 60-minute Semester Final, modeled after the AP Exam.

Duration: 1 hr Scoring: 110

points

UNIT 8: ELECTROSTATICS

LESSON 1: COULOMB: LAW OF ELECTROSTATIC FORCES

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Discuss: Best of the Past and Hope for the Future

What was the most interesting/useful topic you studied last semester? What are you really looking forward to in second semester and why?

Duration: 0 hr 30 min Scoring: 10 points

Study: Coulomb: Law of Electrostatic Forces

Begin your study of electricity with the fundamentals of electric charge and Coulomb's law.

Duration: 1 hr 30 min

Practice: Coulomb: Using the Electrostatics Law

Practice using Coulomb's law with problems from Schaum's Outlines.

Duration: 1 hr

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer true-false questions about electrostatics.

Duration: 0 hr 30 min Scoring: 8 points

Quiz: Check-Up

Apply what you've learned about electrostatics and Coulomb's law when you answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Coulomb: Using the Electrostatics Law

Practice answering questions on electrostatics and Coulomb's law, and send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 2: ELECTRIC FIELDS AND POTENTIAL**Study: Electric Fields**

Study Gauss's law and the effects of electric fields on charges.

Duration: 1 hr 30 min

Practice: Electric Fields

Practice what you've learned about electric fields with problems from *Schaum's Outlines*.

Duration: 1 hr

Study: Potential

Explore the concept of electric potential, including the origin of the Volt.

Duration: 1 hr 30 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer true-false questions about your potential with potential.

Duration: 0 hr 30 min Scoring: 8 points

Practice: Electric Fields and Potential

Practice answering questions on electric fields and potential, and send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 3: CAPACITANCE**Practice: Potential and Capacitance**

Practice working with capacitors by solving problems from *Schaum's Outlines*.

Duration: 1 hr

Study: Capacitance

Study the ability of a conductor to hold electric charge.

Duration: 1 hr 30 min

Quiz: True-False

Answer true-false questions that test your capacitance capacity.

Duration: 0 hr 30 min Scoring: 8 points

Quiz: Check-Up

Apply what you've learned about capacitance when you answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

LESSON 4: WRAP-UP**Discuss: What Is Interesting? What Is Confusing?**

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Electrostatics

Prepare for the test by reviewing what you've covered.

Duration: 3 hr

Test (CS): Electrostatics

Take a computer-scored test to check what you have learned in this unit.

Duration: 0 hr 15 min

Scoring: 40 points

Test (TS): Electrostatics

Take a teacher-scored test to check what you have learned in this unit.

Duration: 0 hr 35 min

Scoring: 60 points

LESSON 5: DIAGNOSTIC

Diagnostic: Electrostatics

Test your understanding of the key concepts covered.

Duration: 0 hr 45 min Scoring: 27

points

UNIT 9: ELECTRIC CURRENT

LESSON 1: OHM: LAW OF ELECTRIC CURRENT AND RESISTANCE

Study: Ohm: Law of Electric Current and Resistance

Explore the flow of electrical charges (current) and a law that lets you analyze resistance to flow (Ohm's law).

Duration: 1 hr 30 min

Practice: Ohm: Applying the Law

Practice using Ohm's law with problems from *Schaum's Outlines*.

Duration: 1 hr

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer "current" true-false questions about Ohm's law.

Duration: 0 hr 30 min Scoring: 8 points

Quiz: Check-Up

Apply what you've learned about current and Ohm's law when you answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

LESSON 2: INTRODUCTION TO CIRCUITS AND CIRCUITS WITH RESISTORS

Discuss: No Resistance to Resistance

Where is resistance useful? Where would it be great if there were no resistance?

Duration: 0 hr 30 min Scoring: 10 points

Practice: Equivalent Resistance and Simple Circuits

Practice analyzing resistor circuits with problems from *Schaum's Outlines*.

Duration: 1 hr

Study: Introduction to Circuits and Circuits With Resistors

Study the basic elements and structure of electric circuits.

Duration: 1 hr 30 min

Quiz: True-False

Answer true-false questions to test your resistance to circuits.

Duration: 0 hr 30 min Scoring: 8 points

Practice: Circuits With Resistors

Practice analyzing circuits with resistors, and send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 3: CIRCUITS WITH CAPACITORS

Study: Circuits With Capacitors

Explore the use of capacitors in basic circuits.

Duration: 1 hr 30 min

Practice: Capacitors in Parallel and Series and RC Circuits

Practice analyzing capacitance and RC circuits with problems from *Schaum's Outlines*.

Duration: 1 hr

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: Check-Up

Apply what you've learned about circuits with capacitors when you answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Capacitance Circuits and RC Circuits

Practice analyzing circuits with capacitors, and send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 4: KIRCHHOFF: CIRCUIT RULES

Study: Kirchoff: Circuit Rules

Study the rules that let you quickly analyze circuits: Kirchhoff's Rules.

Duration: 1 hr 30

min

Quiz: True-False

Answer true-false questions about Kirchhoff's Rules.

Duration: 0 hr 30 min Scoring: 8 points

Practice: Applying Circuit Rules

Practice applying Kirchhoff's Rules with problems from *Schaum's Outlines*.

Duration: 1

hr

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Discuss: Circuit Design Analogies

If you were to explain circuit elements to a fifth grade class or to someone with little science background, what good analogy can you come up with for how current flows through resistors, capacitors, and so on?

Duration: 0 hr 30 min Scoring: 10 points

Lab: Circuit Design, Electric Current, and Resistors in Circuits

Use resistors and capacitors to create and analyze electric circuits.

Duration: 2 hr Scoring: 25 points

LESSON 5: WRAP-UP

Discuss: What Is Interesting? What Is Confusing?

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Electric Current

Prepare for the test by reviewing what you've covered.

Duration: 3 hr

Test (CS): Electric Current

Take a computer-scored test to check what you have learned in this unit.

Duration: 0 hr 15

min Scoring: 40 points

Test (TS): Electric Current

Take a teacher-scored test to check what you have learned in this unit.

Duration: 0 hr 35 min

Scoring: 60 points

LESSON 6: DIAGNOSTIC

Diagnostic: Electric Current

Test your understanding of the key concepts covered.

Duration: 0 hr 45 min Scoring: 22

points

UNIT 10: MAGNETOSTATICS

LESSON 1: INTRODUCTION TO MAGNETIC FIELDS

Practice: Forces in Magnetic Fields

Practice finding the forces due to magnetic fields with problems from *Schaum's Outlines*.

Duration: 1 hr

Study: Introduction to Magnetic Fields

Study the basics of magnetic fields.

Duration: 1 hr 30 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer true-false questions about the basics of magnetic fields.

Duration: 0 hr 30 min Scoring: 8 points

Quiz: Check-Up

Apply what you've learned about magnetic fields when you answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Lorentz Force in Magnetic Fields

Practice answering questions about magnetic fields, and send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 2: APPLIED MAGNETIC FIELDS

Discuss: The Symmetry of Nature

Think of a common device that uses the relationship between electricity and magnetism to help mankind, and explain how it works.

Duration: 0 hr 30 min Scoring: 10 points

Study: Applied Magnetic Fields

Explore the forces and torques caused by magnetic fields.

Duration: 1 hr 30 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Practice: Magnetic Fields

Practice answering questions on magnetic fields, and send your work to your instructor.

Duration: 1 hr Scoring: 25 points

Lab: Electric and Magnetic Fields

Analyze the connection between electric and magnetic fields.

*Duration: 2 hr Scoring:
25 points*

LESSON 3: ELECTROMAGNETIC INDUCTION

Study: Electromagnetic Induction

Study magnetic flux and how magnetic fields can induce electric current.

*Duration: 1
hr 30 min*

Quiz: True-False

Induce some answers to true-false questions about magnetic induction.

*Duration: 0 hr 30 min Scoring:
8 points*

Practice: Induced emf

Solve problems from *Schaum's Outlines* about induced electromotive force (emf).

Duration: 1 hr

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: Check-Up

Apply what you've learned about induction when you deductively answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Electromagnetic Induction and Magnetic Flux

Practice answering questions on induction and flux, and send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 4: WRAP-UP**Discuss: What Is Interesting? What Is Confusing?**

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Magnetostatics

Prepare for the test by reviewing what you've covered.

Duration: 3 hr

Test (CS): Magnetostatics

Take a computer-scored test to check what you have learned in this unit.

Duration: 0 hr 15

min Scoring: 40 points

Test (TS): Magnetostatics

Take a teacher-scored test to check what you have learned in this unit.

Duration: 0 hr 35 min

Scoring: 60 points

LESSON 5: DIAGNOSTIC**Diagnostic: Magnetostatics**

Test your understanding of the key concepts covered.

Duration: 0 hr 45 min Scoring: 26

UNIT 11: ELECTROMAGNETIC WAVES AND LIGHT

LESSON 1: INTRODUCTION TO EM WAVES AND LIGHT

Study: Introduction to EM Waves and Light

Study the fundamental properties of electromagnetic waves.

Duration: 1 hr

30 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer these true-false questions and you may see the light (the electromagnetic version).

Duration: 0

hr 30 min Scoring: 8 points

Quiz: Check-Up

Apply what you've learned about electromagnetic waves when you answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

Discuss: A New Theory of Light

If you were alive in 1700, what would be your theory of light?

Duration: 0 hr 30 min

Scoring: 10 points

Lab: Polarization

Study the electromagnetic nature of light through the phenomenon of polarization.

Duration: 2 hr

Scoring: 25 points

LESSON 2: MIRRORS

Practice: Reflection of Light

Solve problems from *Schaum's Outlines* about reflection and mirrors.

Duration: 1 hr

Study: Mirrors

Explore the different images that are formed from different types of mirrors, and begin to use ray-tracing diagrams.

Duration: 1 hr 30 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: Check-Up

Reflect on what you've learned about electromagnetic waves when you answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Mirrors

Create real (and perhaps virtual) answers to questions, and send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 3: LENSES

Study: Lenses

See how the refraction of light is applied in different types of thin lenses.

Duration: 1 hr 30 min

Lab: Refraction and Optics

Study the effects of refraction on light as it travels through lenses.

Duration: 2 hr Scoring: 25 points

Quiz: True-False

Answer some convex and concave true-false questions about lenses.

Duration: 0 hr 30 min Scoring: 8 points

Practice: Thin Lenses

Practice using the lens equation and ray tracing with problems from *Schaum's Outlines*.

Duration: 1 hr

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: Check-Up

Focus on what you've learned about lenses when you answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Lenses

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Create real (and perhaps virtual) answers to questions, and send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 4: OPTICAL INSTRUMENTS

Study: Optical Instruments

Study common optical instruments, such as the human eye.

Duration: 1 hr 30 min

Practice: Optical Instruments

Practice using the basic principles of lenses on common optical instruments with problems from *Schaum's Outlines*.

Duration: 1 hr

Quiz: Check-Up

Apply what you've learned about optical instruments when you answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

Discuss: Voluntary Refractive Eye Surgery

Voluntary refractive eye surgery: Would you do it?

Duration: 0 hr 30 min

Scoring: 10 points

LESSON 5: WRAP-UP

Discuss: What Is Interesting? What Is Confusing?

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Electromagnetic Waves and Light

Prepare for the test by reviewing what you've covered.

Duration: 3 hr

Test (CS): Electromagnetic Waves and Light

Take a computer-scored test to check what you have learned in this unit.

Duration: 0 hr 15 min Scoring: 40 points

Test (TS): Electromagnetic Waves and Light

Take a teacher-scored test to check what you have learned in this unit.

LESSON 6: DIAGNOSTIC

Diagnostic: Electromagnetic Waves and Light

Test your understanding of the key concepts covered.

Duration: 0 hr 45

min Scoring: 28 points

UNIT 12: PHYSICAL OPTICS: INTERFERENCE AND DIFFRACTION

LESSON 1: INTERFERENCE

Study: Interference

Explore the consequence of light waves interfering, both constructively and destructively.

Duration: 1

hr 30 min

Practice: Interference

Practice analyzing interference of light waves with problems from *Schaum's Outlines*.

Duration: 1

hr

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

LESSON 2: DIFFRACTION

Study: Diffraction

Study the principles of single-slit diffraction and diffraction gratings.

Duration: 1 hr 30 min

Lab: One- and Two-Slit Interference and Diffraction

Analyze the effects of light waves on each other as they pass through single and double slits.

Duration: 2 hr Scoring: 25 points

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer some true-false questions about diffraction.

Duration: 0 hr 30 min Scoring: 8 points

Quiz: Math Exercise

Check your knowledge of diffraction (with a little interference review as well) using what you've been learning in this lesson.

Duration: 1 hr 30 min Scoring: 24 points

Practice: Interference and Diffraction

Make sure you know how light bends by answering questions on interference and diffraction, and then send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 3: WRAP-UP**Discuss: What Is Interesting? What Is Confusing?**

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Physical Optics: Interference and Diffraction

Prepare for the test by reviewing what you've covered.

Duration:

3 hr

Test (CS): Physical Optics: Interference and Diffraction

Take a computer-scored test to check what you have learned in this unit.

Duration: 0 hr 15 min Scoring: 40 points

Test (TS): Physical Optics: Interference and Diffraction

Take a teacher-scored test to check what you have learned in this unit.

Duration: 0 hr 35 min Scoring: 60 points

LESSON 4: DIAGNOSTIC**Diagnostic: Physical Optics: Interference and Diffraction**

Test your understanding of the key concepts covered.

Duration: 0 hr 45 min Scoring: 18 points

UNIT 13: QUANTUM THEORY AND NUCLEAR PHYSICS

LESSON 1: RELATIVITY AND THE ORIGINS OF QUANTUM THEORY

Study: Relativity

Explore the concept that was discovered in the early twentieth century, but is still fundamentally important today—Relativity.

Duration: 1 hr 30 min

Practice: Relativity

Practice using the equations associated with special relativity with problems from *Schaum's Outlines*.

Duration: 1 hr

Study: Origins of Quantum Theory

Study the basics of the theory that uses packets (quanta) of energy as demonstrated by the photoelectric effect.

Duration: 1 hr 30 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Discuss: c Is a Variable

If it were found that the speed of light is not a constant, how would that affect (if at all) the state of modern physics?

Duration: 0 hr 30 min Scoring: 10 points

Quiz: True-False

Put yourself in Einstein's shoes and answer true-false questions about Quantum Theory and Relativity.

Duration: 0 hr 30 min Scoring: 8 points

LESSON 2: ATOMIC STRUCTURE: THE BOHR MODEL

Study: Atomic Structure: The Bohr Model

Study Niels Bohr's model of the atom and applications such as the laser.

Duration: 1 hr 30 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Quiz: True-False

Answer true-false questions about a topic that is not Bohr-ing.

Duration: 0 hr 30 min

Quiz: Check-Up

Apply what you've learned about the atom when you answer computer-scored numerical questions.

Duration: 1 hr 30 min Scoring: 24 points

LESSON 3: APPLIED NUCLEAR PHYSICS: FISSION AND FUSION

Practice: Applied Nuclear Physics

Practice calculating the energy and radiation effects of fission and fusion with problems from *Schaum's Outlines*.

Duration: 1 hr

Study: Fission and Fusion

Explore sources of immense power—nuclear fission, and more immense power—nuclear fusion.

Duration: 1 hr 30 min

Practice: Fundamentals

Get tips and advice on important concepts and skills.

Duration: 0 hr 30 min

Discuss: Cold Fusion

A few years ago a miraculous "discovery" offered the possibility of fusion reactions at room temperature. Is that possible?

Duration: 0 hr 30 min Scoring: 10 points

Practice: Applied Nuclear Physics

Analyze fission and fusion by answering questions, and then send your work to your instructor.

Duration: 1 hr Scoring: 25 points

LESSON 4: WRAP-UP

Discuss: What Is Interesting? What Is Confusing?

Discuss what you've learned (or didn't learn!).

Duration: 0 hr 30 min

Scoring: 10 points

Review: Quantum Theory and Nuclear Physics

Prepare for the test by reviewing what you've covered.

Duration: 3 hr

Test (CS): Quantum Theory and Nuclear Physics

Take a computer-scored test to check what you have learned in this

unit.

Duration: 0 hr 15 min Scoring: 40 points

Test (TS): Quantum Theory and Nuclear Physics

Take a teacher-scored test to check what you have learned in this unit.

Duration: 0 hr 35 min Scoring: 60 points

LESSON 5: DIAGNOSTIC

Diagnostic: Quantum Theory and Nuclear Physics

Test your understanding of the key concepts covered.

Duration: 0

hr 45 min Scoring: 31 points

UNIT 14: REVIEW AND EXAM

LESSON 1: AP PHYSICS B

Review: AP Physics B

Do a structured review of everything you learned this semester.

Duration: 3 hr

Discuss: Studying for the AP Exam

Discuss study tips and strategies for taking the Final Exam.

Duration: 0 hr 30 min

Scoring: 10 points

Practice: AP Exam Practice: Multiple Choice

Complete a practice exam of multiple-choice questions.

Duration: 1 hr 30

min

Practice: AP Exam Practice: Free Response

Complete a practice exam of free-response questions.

Duration: 1 hr 30

min

LESSON 2: FINAL COURSE EXAM

Exam: AP Physics B

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Take a 60-minute Semester Final, modeled after the AP Exam.

Duration: 1 hr Scoring: 120 points

Final Exam: AP Physics B

Take a 120-minute Semester Final, modeled after the AP Exam.

Duration: 2 hr Scoring: 180

points