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’ll 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 and engineering.

This course requires students to complete hands-on lab activities that do not depend on access to a supervised laboratory facility. It is appropriate both 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.

*AP is a registered trademark of the College Board.

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
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: DESCRIPTING 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

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**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*

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**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*

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**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.
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
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 the 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
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

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 points*
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**
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.
*Duration: 0 hr 35 min Scoring: 60 points*

**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!).

**Review: Physical Optics: Interference and Diffraction**
Prepare for the test by reviewing what you've covered.

**Test (CS): Physical Optics: Interference and Diffraction**
Take a computer-scored test to check what you have learned in this unit.

**Test (TS): Physical Optics: Interference and Diffraction**
Take a teacher-scored test to check what you have learned in this unit.

**LESSON 4: DIAGNOSTIC**
Test your understanding of the key concepts covered.

**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.

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

**Study: Origins of Quantum Theory**
Study the basics of the theory that uses packets (quanta) of energy as demonstrated by the photoelectric effect.

**Practice: Fundamentals**
Get tips and advice on important concepts and skills.

**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?

**Quiz: True-False**
Put yourself in Einstein's shoes and answer true-false questions about Quantum Theory and Relativity.

**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.
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*

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.
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
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*