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# Physics, Part 2

**ATTENTION**

Grading at the end of the semester can take 7 school days!
Submit your **last assignment two weeks** before your school's semester ends.

The prerequisites for this course are: Algebra 1, Geometry, and Algebra 2 (co-requisite)
OR
Integrated Math 1, Integrated Math 2, and Integrated Math 3 (co-requisite)

## How to Take This Course

Complete all the quizzes and the assignment in each unit. Once the quizzes for a unit are complete, you will have access to the unit test. We recommend you complete the unit assignment before you attempt the unit test; the assignment will help you prepare. You will have access to the final after you have been enrolled in the course for at least 30 days, all unit tests are completed, and your assignments are graded.

Allow 3-4 school days for an assignment to be graded. To understand the course grading, read the full course instructions.

Course Instructions

How This Course Works & Suggested Timeline

Submitting Your Assignments

List of Lab Supplies and Equipment

This is a laboratory science course; all assignments are mandatory. Each unit will have a lab investigation. You need to complete each lab as directed and submit your lab write-up.

You do NOT have to purchase a lab kit. Here is a **list of supplies and equipment** that you will need for the course.

Ask The Teacher

Meet your teacher for this course and ask a question.

**Need help with the course?** We offer online tutoring; find more details about it here.

MANDATORY QUIZ — Completion

You are required to take this quiz before you start the course. To prepare, read the course instructions and the "submitting your assignments" document, watch the video on the how this course works page and review the suggested timeline.

Learning Objectives & Standards Met By This Course

## Unit 1: Waves and Sound

In this unit, you will discover how vibrations give rise to waves, forming the foundation for much of the physical world around us. You will be introduced to the basic types of waves—mechanical and electromagnetic—and learn how to describe them in terms of their key properties: frequency, wavelength, amplitude, and speed. These concepts will help you visualize how waves transfer energy without transporting matter. You will then investigate how waves behave when they interact with different materials and obstacles. For example, you will see how waves can reflect (bounce back), refract (bend when entering a new medium), diffract (spread out around corners), and interfere with each other (overlap to produce patterns of reinforcement or cancellation). You will also explore how standing waves form when waves reflect and overlap in just the right way, creating stable patterns of vibration.

A special focus will be placed on sound waves, one of the most familiar forms of mechanical waves. You will study how sound travels through solids, liquids, and gases, and how the speed of sound depends on the medium. You will learn how frequency relates to pitch, why amplitude determines loudness, and how resonance can amplify sound in real-world situations, from musical instruments to architectural acoustics. By the end of the unit, you will understand not only the scientific principles of wave behavior but also how these principles explain everyday phenomena—from echoes in a canyon to the way noise-canceling headphones work. This knowledge will prepare you to apply wave concepts to fields ranging from music and engineering to communication technology and medicine.

Unit 1 Study Guide

This study guide will help you preview the concepts and guide your learning as each new skill or concept is introduced. Use this study guide as the foundation of your notes. You may use it on the unit quizzes, unit tests, and course final.

Click on the link above, and make a copy of the file. If you don't have access to Google Docs, preview the worksheet and download an editable version or PDF.

1.1 Vibrations and Waves

Quiz 1.1 — Completion

1.2 Nature of Waves

Quiz 1.2 — Completion

1.3 Properties of Waves

Quiz 1.3 — Completion

1.4 Behavior of Waves

Quiz 1.4 — Completion

1.5 Standing Waves

Quiz 1.5 — Completion

1.6 Sound Waves and Their Properties

Quiz 1.6 — Completion

1.7 Behavior of Sounds Waves

Quiz 1.7 — Completion

1.8 Resonance

Quiz 1.8 — Completion

Unit 1 Assignment: Creating a Wave — Completion

Unit 1 Test

Not available unless: The activity **Quiz 1.1** is marked complete ... Show more

## Unit 2: Light

In this unit, you will be able to explain and apply the principles of reflection and refraction in mirrors and lenses. You will analyze how plane, concave, and convex mirrors form images, and how convex and concave lenses bend light to produce real or virtual images. You will also use ray diagrams and mathematical relationships to predict image size, orientation, and location.

Unit 2 Study Guide

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2.1 Light as a Wave, Light as a Particle, Color and Vision

Quiz 2.1 — Completion

2.2 Reflection and Its Importance

Quiz 2.2 — Completion

2.3 Image Formation in Plane Mirrors

Quiz 2.3 — Completion

2.4 Concave Mirrors

Quiz 2.4 — Completion

2.5 Convex Mirrors

Quiz 2.5 — Completion

2.6 Refraction and Light Rays

Quiz 2.6 — Completion

2.7 Mathematics of Refraction

Quiz 2.7 — Completion

2.8 Internal Reflection

Quiz 2.8 — Completion

2.9 Convergent Lenses

Quiz 2.9 — Completion

2.10 Diverging Lenses

Quiz 2.10 — Completion

Unit 2 Assignment: Reflection and Refraction — Completion

Unit 2 Test

Not available unless: The activity **Quiz 2.1** is marked complete ... Show more

## Unit 3: Electricity

In this unit, you will explore the fundamental principles of electrostatics by examining how electric charges interact and influence one another through forces and fields. You will learn how conductors and insulators differ in their ability to allow charge movement, and how polarization occurs when charges within a material shift in response to an electric field. You will investigate the relationship between electric force, electric field strength, and electric potential, building a conceptual and mathematical understanding of how charged objects create and respond to electric environments.

By the end of the unit, you will apply these concepts to analyze and model systems that store and transfer electrical energy, such as capacitors and dielectrics. Through guided inquiry and problem-solving, you will connect microscopic charge behavior to macroscopic electrical phenomena, explaining how energy can be stored, transferred, and controlled using electric fields and materials with different conductive and insulating properties.

Unit 3 Study Guide

This study guide will help you preview the concepts and guide your learning as each new skill or concept is introduced. Use this study guide as the foundation of your notes. You may use it on the unit quizzes, unit tests, and course final.

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3.1 Neutral vs Charged Objects, Charge Interactions, Conductors, Insulators, and Polarization

Quiz 3.1 — Completion

3.2 Electrical Force

Quiz 3.2 — Completion

3.3 Electrical Fields

Quiz 3.3 — Completion

3.4 Electric Potential

Quiz 3.4 — Completion

3.5 Capacitors and Dielectrics

Quiz 3.5 — Completion

Unit 3 Assignment: Charges and Electrical Fields — Completion

Unit 3 Test

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## Unit 4: Circuits

In this unit on current, resistance, and circuits, you will learn the fundamental principles of how electric charge moves through a conductor and what factors affect that movement. You will explore electric current as the flow of electrons, measured in amperes (A), and resistance as the opposition to that flow, measured in ohms (Ω). Through Ohm's Law (V = IR), you will understand how voltage, current, and resistance are mathematically related. You will also examine how materials, length, and temperature affect resistance and use circuit diagrams to represent simple paths where current can flow continuously through wires, resistors, and power sources.

When studying series, parallel, and complex circuits, you will learn how components can be arranged to control current flow in different ways. In series circuits, current travels through a single path, so the same current passes through each resistor, but the total resistance adds up. In parallel circuits, current splits among multiple branches, keeping the same voltage across each branch while the total resistance decreases. You will also explore complex circuits that combine series and parallel elements, applying circuit rules to calculate the total current, voltage, and resistance. These lessons explore the role of batteries as energy sources that maintain potential difference, illustrating how electrical systems power devices safely and efficiently.

In this unit's lab, you will need several small light bulbs to complete the experiment. It is advisable to plan to purchase them as you begin the unit, so you can have them when you need them. They are readily available from places like Walmart, Amazon, or even your local hardware store, which may have what you need.

Unit 4 Study Guide

This study guide will help you preview the concepts and guide your learning as each new skill or concept is introduced. Use this study guide as the foundation of your notes. You may use it on the unit quizzes, unit tests, and course final.

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4.1 Current

Quiz 4.1 — Completion

4.2 Resistance

Quiz 4.2 — Completion

4.3 Series Circuits

Quiz 4.3 — Completion

4.4 Parallel Circuits

Quiz 4.4 — Completion

4.5 Batteries, Lights and Complex Circuits

Quiz 4.5 — Completion

Unit 4 Assignment: Circuits — Completion

Unit 4 Test

Not available unless: The activity **Quiz 4.1** is marked complete ... Show more

## Unit 5: Magnetism

In this unit, you will explore the fundamental principles of magnetism and magnetic fields, learning how magnets interact and how magnetic forces arise from the motion of electric charges. You will investigate how magnetic fields are represented, measured, and visualized, as well as how they affect materials and charges within their influence. You will connect magnetism to electricity, recognizing that electric currents produce magnetic fields and that these fields, in turn, can exert forces on moving charges.

Building on these foundations, you will examine electromagnetism in practical systems such as solenoids, electric motors, and generators. You will study how coiled wires carrying current can create strong, controllable magnetic fields, and how magnetic induction allows changing magnetic fields to produce electric currents. By analyzing the force on a moving charge and the operation of electromagnetic devices, you will understand the key physical principles behind energy conversion between electrical and mechanical forms. This unit ultimately connects theory to real-world applications, emphasizing how electromagnetic principles power much of modern technology.

The final experiment will require Neodymium magnets. Be sure to order some in advance so you have them when you need them.

Unit 5 Study Guide

This study guide will help you preview the concepts and guide your learning as each new skill or concept is introduced. Use this study guide as the foundation of your notes. You may use it on the unit quizzes, unit tests, and course final.

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5.1 Introduction to Magenetism

Quiz 5.1 — Completion

5.2 Magnetic Fields & Electromagnetism

Quiz 5.2 — Completion

5.3 The Solenoid and Electromagnet

Quiz 5.3 — Completion

5.4 Force on a Moving Charge

Quiz 5.4 — Completion

5.5 Magnetic Induction

Quiz 5.5 — Completion

5.6 Electric Motors and Generators

Quiz 5.6 — Completion

Unit 5 Assignment: Magnets and Motors — Completion

Unit 5 Test

Not available unless: The activity **Quiz 5.1** is marked complete ... Show more

## Unit 6: Modern Physics

This unit aims to develop your understanding of the physical laws that govern energy, matter, and motion across scales. You will study topics ranging from thermal energy to the extreme environments described by relativity and nuclear physics. You will explore how heat transfers through conduction, convection, and radiation. You will also examine how specific heat influences temperature change and how the laws of thermodynamics define the limits and behavior of energy in all systems. Through these foundational concepts, you will strengthen your ability to analyze physical processes, solve quantitative problems, and apply energy principles to real-world situations.

Building on this foundation, you will extend your understanding to modern physics. This includes Einstein's theories of special and general relativity, which reveal how time, space, and gravity behave for fast-moving observers and massive objects. You will examine the structure of the nucleus and the processes of alpha, beta, and gamma radioactive decay as an introduction to nuclear physics. Finally, you will explore cutting-edge scientific frontiers, including nanotechnology and the mysteries of dark matter and dark energy. This will help you appreciate how physics continues to evolve and how new discoveries shape our understanding of the universe. You will connect classical physics to the newest questions driving scientific research today.

Unit 6 Study Guide

This study guide will help you preview the concepts and guide your learning as each new skill or concept is introduced. Use this study guide as the foundation of your notes. You may use it on the unit quizzes, unit tests, and course final.

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6.1 Introduction to Thermal Physics

Quiz 6.1 — Completion

6.2 What Is Heat?

Quiz 6.2 — Completion

6.3 The Laws of Thermodynamics

Quiz 6.3 — Completion

6.4 Special & General Relativity

Quiz 6.4 — Completion

6.5 Nuclear Physics

Quiz 6.5 — Completion

6.6 Nanotechnology

Quiz 6.6 — Completion

6.7 Dark Matter and Dark Energy

Quiz 6.7 — Completion

Unit 6 Assignment: Nuclear Physics and Modern Applications — Completion

Unit 6 Test

Not available unless: The activity **Quiz 6.1** is marked complete ... Show more

## Final Exam

You will have access to the final after you have been enrolled in the course for at least 30 days and when all unit tests are completed, and your assignments are graded.

**Warning**: You have only ONE attempt at the final. Are you ready to take the final? We highly recommend you take the practice final first, and if you are weak in any area, review the relevant course material again. You have unlimited attempts at the practice final; it will help you to prepare.

Remember, if you want to improve your grade in this course, you need to do that BEFORE you take the final exam.

Good Luck!!

Not available unless: The activity **MANDATORY QUIZ** is marked complete

## Course Completion & Requesting a Transcript

*Warning* - If you are waiting for a resubmitted assignment to be graded, do NOT generate any course completion record until the teacher has graded it.

**Transcript** - Send a transcript to your school to report the credits you earned. A transcript will list all the courses you have taken with us, including those still in progress.

**Course Certificate** - This link cannot be accessed until you have completed the final. Upon satisfying this requirement, the link will become active.

**Feedback** - Before you go, we would appreciate your opinion on the course; please take 1 minute to complete the feedback form. We hope you enjoyed this course!

Course Feedback

Thank you for taking this course! Let us know what you think about it.

Request a Transcript

Notify your school that you have completed your course. Send them a transcript by email or mail. A transcript will list all the courses you have completed and those in progress.

Certificate of Completion

Not available unless: The activity **Final Exam** is marked complete