



Physics 5-6 Syllabus

Course Goals

1 An Introduction to Physics

Students receive an introduction to a variety of concepts in physics, including kinematics, optics, and electromagnetism.

2 Implementation of Physics Concepts

Students partake in the scientific method and create tools using their physics knowledge.

Course Topics

1 What is Physics?

Students learn what the study of physics entails, its applications, the basics of the scientific method, and the difference between a hypothesis and a theory.

2 Measurement

Students learn about the SI measurement system, unit conversions, and numerical prefixes.

3 One-Dimensional Kinematics

Students learn about the difference between distance and displacement, position, velocity, and acceleration. Using the basic kinematic equations students solve word problems and other real world applications.

4 Newton's Laws

Students learn about Newton's 3 Laws: 1) The law of inertia 2) $\text{force} = \text{mass} \times \text{acceleration}$ 3) For every action there is an equal and opposite reaction. They focus on the application of these laws in solving problems that continue to build on their kinematics knowledge.

5 Applications of Forces

Students see how Newton's laws are applied to problems relating to weight, friction, and the normal force.

6 Work and Springs

Students learn about the concept of work and how to quantify it using the equation $\text{Work} = \text{Force} \times \text{distance}$. Students also learn about forces and work associated with springs via Hooke's Law.

7 Optics

Students learn about the science optics and observe properties of light.

8 Energy

Students learn about the different types of energy.

9 Electronic Components

Students construct different electronic components, including a battery, motor, and steam engine.

10 Magnetism

Students observe the property of magnetism.

11 Waves

Students make observations about the properties of waves.

Course Schedule

Day 1

Course Introduction

Students are introduced to the instructor(s), classmates, and class expectations.

Introduction to Physics

Students are introduced to the study of physics, its applications, the difference between a hypothesis and a theory, and receive their course notebooks.

Physics Measurements

Students learn about the different systems of measurement, such as SI and Imperial. Students learn common conversion factors and numerical prefixes.

Measurement and Error Lab

Students learn hands-on about the importance of precise measurement in science and the inherent uncertainty that comes with it.

Day 2

What is the study of kinematics?

Students learn about the study of kinematics and what it entails.

General Problem Solving Strategies

Students learn about the best ways to approach problems in physics.

Distance, Displacement, and Position

Students learn the difference between distance, displacement, and position.

Velocity and Speed

Students learn the definitions and differences between velocity and speed.

Acceleration

Students learn the basics of acceleration.

Free Falling Lab

Students use kinematics to predict the speed of falling objects at various time intervals and distances.

Day 3

Newton's First 2 Laws Discussion

Students are introduced to Newton's first two laws of motion.

Newton's 3rd Law Discussion

Students are introduced to Newton's 3rd law of motion.

Newton's Second Law Lab

Students observe Newton's Second Law, the relationship between force, mass, and acceleration.

Day 4

Applications of Newton's Laws

Students learn about the applications of Newton's Laws, including weight, the normal force, and friction.

Simple Machine Demonstration

Students are introduced to the usefulness and functionality of pulley systems and inclined planes.

Friction Observation Lab

Students observe friction for different materials.

Day 5

Work Discussion

Students learn about the concept of work and how it relates to forces.

Spring Constant Lab

Students calculate the spring constant for 5 different springs.

100 Greatest Discoveries in Physics

Students watch a documentary video on the 100 Greatest Discoveries in Physics, reflect on what they found most interesting in the video, and reflect on what they have learned during the week.

Day 6

Optics Discussion

Students learn about the basics of optics.

Measuring the Speed of Light

Students calculate an approximation of the speed of light.

Bending Light

Students create a lens and observe the behavior of light.

Light and Water

Students observe the connection between light and water flow.

Day 7

Energy Discussion

Students learn about the different types of energy.

Transfer of Heat Energy

Students observe and analyze the transfer of heat through the processes of conduction, radiation, and convection.

Day 8

Constructing a Battery

Students learn about how batteries work and construct their own battery using coins.

Constructing a Motor

Students are introduced to the concept of a motor and construct their own motor using a pre-made battery.

Day 9

Constructing a Steam Engine

Students learn the mechanism behind steam engines and construct their own steam engine.

Physics Jeopardy

Students review what they have learned over the last 9 classes.

Day 10

Magnetism

Students learn about the property of magnetism, and observe magnetism in different objects.

Waves, Part 1

Students observe behavior of waves through different states of matter.

Waves, Part 2 - Types of Waves

Students learn about different types of waves.

Waves, Part 3 - Sound Waves

Students learn about sound waves and understand how different pitches lead to different sounds.

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