

Course Description:

Physics B continues the student’s exploration of mechanics while also guiding them through some other important topics of physics. Students begin by exploring simple harmonic motion, wave properties, and optics. Students then learn the basics of thermodynamics and fluids. Afterwards, the students explore the principles of electricity and magnetism. Finally, students explore the area of physics known as Modern Physics, which includes topics such as the photoelectric effect, nuclear science, and relativity. This is a trig-based course. It is assumed you know and can use trigonometry.

Module	Lesson Title	Objectives
Module 7	Simple Harmonic Motion	<ul style="list-style-type: none"> Describe simple harmonic motion. Define and use Hooke's Law to find the spring constant of a spring. Describe the motion of a mass-spring system in terms of force, max displacement (amplitude), and equilibrium. Determine the variables that effect the period of a pendulum.
	Measuring Simple Harmonic Motion	<ul style="list-style-type: none"> Calculate the period and frequency of an object in simple harmonic motion. Use the relationship between the period and length of a pendulum in problem solving. Use the relationship between the period, mass, and spring constant of a spring in problem solving.
	Wave Properties	<ul style="list-style-type: none"> Define the properties of mechanical waves. Distinguish between longitudinal and transverse waves. Use the properties of waves and wave motion in problem solving.
	Interactions of Waves	<ul style="list-style-type: none"> Define the types of interference when two waves meet. Distinguish between constructive and destructive interference. Describe what happens to a wave when it encounters a boundary. Identify the characteristics of a standing wave.
	Sound Waves	<ul style="list-style-type: none"> Describe sound waves and how they move. Use the wave equation to solve problems involving sound. Explain the Doppler Effect. Define and calculate the intensity of sound.
	Fundamental Frequencies and Harmonics	<ul style="list-style-type: none"> Explain why resonance occurs. Calculate the frequencies and wavelengths of harmonics on a string or in tubes. Understand what affects sound quality (timbre).

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Module 8	Light and Color	<ul style="list-style-type: none"> Define the characteristics of light. Explain the characteristics of the different colors of light. Explain the electromagnetic spectrum and its applications. Describe what determines the color of a pigment. Evaluate claims about the effect of different frequencies of electromagnetic radiation on the human body.
	Reflection & Mirrors	<ul style="list-style-type: none"> Describe the characteristics of the types of mirrors and the images that they form. Draw ray diagrams for mirror problems to determine the image characteristics. Calculate the image distance and magnification given the mirror focus and object distance for spherical mirrors.
	Refraction & Lenses	<ul style="list-style-type: none"> Describe the characteristics of the types of lenses and the images that they form. Draw ray diagrams for lens problems to determine the image characteristics. Define Snell's Law and use it to solve problems dealing with refraction. Calculate the image distance and magnification given the lens focus and object distance for spherical lenses.
	Temperature	<ul style="list-style-type: none"> Define the relationship between temperature and kinetic energy. Define the relationship between the temperature scales. Convert between Celsius, Fahrenheit, and Kelvin temperature scales.
	Thermal Equilibrium and Thermal Expansion	<ul style="list-style-type: none"> Explain thermal equilibrium and thermal expansion. Explain the unique thermal properties of water.
	Heat	<ul style="list-style-type: none"> Define heat and the ways that heat is transferred from one object to another. Apply the conservation of energy to heat. Describe the thermal properties of conductors and insulators.
Module 9	Calorimetry & Specific Heat	<ul style="list-style-type: none"> Define and use specific heat capacity in thermal energy problems Define calorimetry and explain what happens when you mix two substances in terms of heat. Use calorimetry concepts in problem solving.
	Latent Heat & Phase Changes	<ul style="list-style-type: none"> Explain the concepts of latent heat and phase change. Interpret and use phase change diagrams in problem solving.

Module	Lesson Title	Objectives
	Heat, Work, & Thermodynamic Processes	<ul style="list-style-type: none"> Understand and explain the relationship between work done and heat. Calculate the amount of work done by a gas. Distinguish between the three thermodynamic processes: isovolumetric, isothermal, and adiabatic.
	First Law of Thermodynamics	<ul style="list-style-type: none"> Define The First Law of Thermodynamics and how it translates in each of the ideal thermodynamic processes. Calculate heat, work, and internal energy using the First Law of Thermodynamics. Explain cyclic processes as they relate to the First Law of Thermodynamics. Use a model to describe kinetic and potential energy.
	Second Law of Thermodynamics	<ul style="list-style-type: none"> Define the Second Law of Thermodynamics. Describe the relationship between disorder and the ability to do work or transfer energy. Use the concepts of efficiency of an engine in problem solving.
	Fluids	<ul style="list-style-type: none"> Define density, buoyancy, and liquid pressure. State Archimedes' Principle and use it in problem solving. Determine whether an object will float or sink in a substance. State Pascal's Principle and recognize its application.
Module 10	Electrical Charge	<ul style="list-style-type: none"> Distinguish between protons, electrons, and neutrons in terms of charge and size. Describe static electricity and the ways that charge can be transferred between objects. Distinguish between electric insulators and conductors.
	Coulomb's Law and Electric Fields	<ul style="list-style-type: none"> State Coulomb's Law and use it in problem solving involving charges. Describe electric field lines and find the strength of an electric field. Compare Newton's Law of Gravitation and Coulomb's Law of Electrostatic Force and make predictions about the gravitational and electrostatic forces between objects.
	Electrical Energy	<ul style="list-style-type: none"> Define electric potential energy and its relationship to an electric field. Calculate the electric potential energy of a charge in an electric field and between two charges. Explain the concept of potential difference and calculate the potential difference given different situations. Explain the concept of capacitance and use the concept in problem solving.
	Electric Circuits and Ohm's Law	<ul style="list-style-type: none"> Explain the relationship between resistance, conductivity, length of wire, and area of the wire. Explain the concept of electric power and use these concepts in problem solving. State and use Ohm's Law to calculate the voltage, resistance, and current of a circuit.

Module	Lesson Title	Objectives
	Series Circuits	<ul style="list-style-type: none"> Use the concepts of current, voltage, and resistance through series circuits in problemsolving.
	Parallel Circuits	<ul style="list-style-type: none"> Distinguish between series and parallel circuits. Use the concepts of current, voltage, and resistance through parallel circuits in problemsolving.
Module 11	Introduction to Magnetism	<ul style="list-style-type: none"> Describe magnetism. Explain that magnetic force is due to the motion of charges. Describe the behavior of atoms in magnets. Explain the concepts of magnetic domain, fields, and forces.
	Magnetism From Electricity	<ul style="list-style-type: none"> Understand that a magnetic field is produced by a current-carrying wire and describe what factors affect the strength of the magnetic field. Use the right-hand rule for current-carrying conductor to determine the direction of the magnetic field around a current-carrying wire. Use the relationship between the current and position to determine the magnitude of the magnetic field in a current-carrying wire. Explain the concept of a solenoid and how to create an electromagnet. Explain how an electric motor works and build an electric motor.
	Magnetic Force	<ul style="list-style-type: none"> Explain how a magnetic field creates a force on a charge. Use the concept of magnetic force on a charge in a magnetic field in problem solving. Use the right-hand rule to determine the direction of magnetic field, force on a charge, and the direction of motion of a charge in a magnetic field.
	Electromagnetic Induction	<ul style="list-style-type: none"> Explain how to create a current using a magnetic field. Define Faraday's Law of Electromagnetic Induction. Explain how a generator works and the concept of alternating current. Explain how a transformer changes the voltage of an electrical energy source.
	Quantization of Energy & The Photoelectric Effect	<ul style="list-style-type: none"> Describe the concept of quantization of energy. Use Planck's constant in problem solving involving energy of photons. Explain the photoelectric effect.
	Waves as Particles	<ul style="list-style-type: none"> Explain the dual nature of light. Use the de Broglie properties of light in problem solving.

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		<ul style="list-style-type: none"> • Explain the Heisenberg uncertainty principle.
Module 12	Bohr Model of the Atom	<ul style="list-style-type: none"> • Explain the historical development of the atomic model from Democritus to Bohr.
	Atomic Spectra	<ul style="list-style-type: none"> • Use the concepts of energy levels and the photons moving between levels in problemsolving.
	The Nucleus	<ul style="list-style-type: none"> • Explain the concept of binding energy. • Use the binding energy and mass-energy equivalence in problem solving. • Use a model to illustrate and explain binding energy in atomic interactions.
	Radioactivity	<ul style="list-style-type: none"> • Explain the concept of radioactive decay and distinguish between alpha, beta, positronand gamma decay. • Explain the concept of half-life and use those concepts in problem solving.
	Nuclear Fission and Nuclear Fusion	<ul style="list-style-type: none"> • Explain and distinguish between the processes of nuclear fusion and fission.
	Relativity	<ul style="list-style-type: none"> • Explain Einstein's Theory of Special Relativity. • Distinguish between special relativity and general relativity. • Explain time dilation and length contraction in terms of the Special Theory of Relativity.