Unit	Lesson	Lesson Objectives
Motion		
	Speed and Velocity	
		Describe the motion of an object using different reference frames.
		Differentiate between speed and velocity.
		Interpret motion maps to describe linear motion.
		Use graphs and equations to solve speed and velocity problems.
	Acceleration	
		Distinguish between constant velocity and constant acceleration.
		Interpret motion maps to describe linear motion.
		Solve problems involving distance, time, velocity, and acceleration.
		Use graphs to analyze motion with constant acceleration.
	Lab: Motion with Constant Acceleration	
		Calculate the average velocity of a moving object.
		Recognize the relationships between position, time, velocity, and acceleration.
		Use graphs to determine acceleration.
	Vectors	
		Resolve a vector into horizontal and vertical components.
		Use vector diagrams to determine the resultant vector.
	Projectile Motion	
		Identify examples of projectile motion.
		Recognize that the horizontal and vertical motions of a projectile are independent.
		Solve problems involving projectile motion.
Forces		
	Introduction to Forces	
		Analyze free-body diagrams.
		Determine how net force affects the motion of an object.
		Identify and describe various forces.
	Newton's First and Third Laws	
		Describe Newton's first law of motion and how it relates to inertia.
		Explain Newton's third law of motion and how it relates to action and reaction forces.
		Use vectors to calculate the effect of forces on objects.
	Newton's Second Law	
		Calculate force, mass, or acceleration given the other two quantities.
		Describe Newton's second law of motion.
		Interpret free-body diagrams for accelerating objects.
	Lab: Newton's Second Law	
		Calculate the acceleration of a moving object.
		Determine how force and mass affect acceleration.

Unit	Lesson	Lesson Objectives
	Impulse and Momentum	
		Analyze and compare the momentum and impulse of different objects.
		Calculate mass, velocity, or momentum given the other two quantities.
		Describe impulse and how it relates to momentum.
		Solve problems involving impulse.
	Conservation of Momentum	
		Apply the law of conservation of momentum to analyze collisions between objects.
		Describe the law of conservation of momentum.
		Solve problems involving the conservation of momentum.
	Lab: Conservation of Linear Momentum	
		Calculate the momentum of a moving object before and after a collision.
		Demonstrate that momentum is conserved during a collision.
Gravity		
	Universal Law of Gravitation	
		Describe the effect of gravity on an object.
		Explain the relationships among gravitational force, mass, and distance.
		Solve problems that involve the universal law of gravitation.
	Centripetal Acceleration	
		Define and identify examples of centripetal acceleration.
		Describe and calculate tangential speed.
		Solve problems involving centripetal acceleration.
	Circular Motion	
		Describe how circular motion is caused by centripetal force.
		Explain the relationship between centripetal force and inertia.
		Interpret motion maps to describe circular motion.
		Use centripetal force concepts to solve problems.
	Orbital Motion	
		Explain how Newton's universal law of gravitation affects orbital motion.
		Identify the forces acting on an object in orbit.
		Solve problems involving the orbital speed and period of an object in orbit.
	Earth-Moon-Sun System	
		Describe Kepler's three laws of planetary motion.
		Explain the effects of Earth, the moon, and the Sun on each other.
		Solve problems using Kepler's laws.
	Simple Harmonic Motion	
		Describe simple harmonic motion.
		Explain how position, velocity, and acceleration change during simple harmonic motion.
		Solve problems using Hooke's law.

Unit	Lesson	Lesson Objectives
Work and Energy		
	Work and Power	
		Calculate work and power.
		Compare the work done in different situations.
		Define and describe work.
		Explain how work and power are related.
	Kinetic Energy	
		Calculate kinetic energy, mass, or velocity given the other two quantities.
		Define kinetic energy and identify situations in which it's present.
		Describe the work-energy theorem and use it to solve problems.
	Potential Energy	
		Identify and describe different types of potential energy.
		Solve problems involving the potential energy of an object.
	Energy Transformations	
		Analyze and interpret energy transfer diagrams.
		Explain how energy changes form.
		Identify and describe examples of energy transformations.
		Solve problems involving energy transformations.
	Conservation of Energy	
		Apply the law of conservation of energy to solve problems.
		Explain the law of conservation of energy.
		Use energy transfer diagrams to illustrate that energy is conserved.
Thermodynamics		
	Temperature and Heat	
		Describe specific heat and explain why it differs from one substance to another.
		Distinguish between temperature, thermal energy, and heat.
		Explain how temperature relates to kinetic energy.
		Solve problems involving specific heat.
	Heat Transfer	
		Describe how fluid movement transfers thermal energy by convection.
		Explain how electromagnetic waves transfer energy by radiation.
		Explain how molecular movement transfers thermal energy by conduction.
	Lab: Mechanical Equivalent of Heat	
		Calculate gravitational potential energy and heat.
		Describe the conversion of gravitational potential energy to thermal energy in a system.
		Relate the potential energy of an object to the temperature change of water.
	States of Matter	
		Differentiate among the four states of matter.
		Identify the properties of the fourth state of matter: plasma.

Unit	Lesson	Lesson Objectives
	Changes of State	
		Explain and interpret heating curves.
		Identify and describe the six changes of state.
		Solve problems involving latent heat of fusion and latent heat of vaporization.
	First Law of Thermodynamics	
		Apply the first law of thermodynamics to describe how heat engines work.
		Explain the first law of thermodynamics.
		Solve problems using the first law of thermodynamics.
	Second Law of Thermodynamics	
		Apply the second law of thermodynamics to describe how heat engines work.
		Describe how the first and second laws of thermodynamics are related.
		Explain why entropy increases over time.
Waves and Sound		
	Introduction to Waves	
		Compare and contrast transverse waves and longitudinal waves.
		Define waves and explain how they carry energy.
		Differentiate mechanical and electromagnetic waves.
		Identify everyday examples of transverse and longitudinal waves.
	Wave Properties	
		Analyze the relationship between wavelength, frequency, and wave speed.
		Identify and describe the properties of transverse and longitudinal waves.
		Identify factors that affect wave speed.
		Solve problems involving wavelength, frequency, and wave speed.
	Wave Interactions	
		Compare and contrast constructive and destructive interference.
		Distinguish between absorption, transmission, reflection, refraction, and diffraction.
		Identify everyday examples of wave interactions.
	Sound Waves	
		Analyze how sounds are created and propagated.
		Examine how the Doppler effect applies to sound waves.
		Identify and describe properties of sound waves.
	Properties of Sound Waves	
		Analyze the relationship between amplitude, energy, intensity, and loudness.
		Analyze the relationship between pitch and frequency.
		Explain resonance.
		Identify factors that affect intensity of sounds.
Light		
	Electromagnetic Waves	
		Identify and compare the different regions of the electromagnetic spectrum.
		Identify uses and applications of electromagnetic waves.
		Solve problems involving frequency, wavelength, speed, and energy.

Unit	Lesson	Lesson Objectives
	Reflection and Refraction	
		Analyze and interpret ray diagrams.
		Apply Snell's law to solve problems.
		Differentiate between reflection and refraction.
		Use the law of reflection to make predictions.
	Mirrors	
		Distinguish between plane, concave, and convex mirrors.
		Interpret ray diagrams to predict the location, type, orientation, and size of an image formed by a mirror.
		Solve problems involving mirrors.
	Lenses	
		Distinguish between concave and convex lenses.
		Interpret ray diagrams to predict the location, type, orientation, and size of an image formed by a lens.
		Solve problems involving lenses.
	Diffraction	
		Analyze how light waves bend around objects.
		Identify everyday examples of diffraction.
		Solve problems involving diffraction.
	Lab: Waves and Diffraction	
		Demonstrate diffraction and explain why it occurs.
		Describe the relationship between wavelength, gap width, and diffraction.
		Solve problems involving diffraction.
Electricity		
	Electrostatics	
		Analyze the relationship between electric charge and electric force.
		Distinguish between conductors and insulators.
		Examine charging by friction, conduction, and induction.
	Coulomb's Law	
		Compare electric force with gravitational force.
		Examine the factors that affect the electric force between two objects.
		Solve problems using Coulomb's law.
	Electric Fields	
		Analyze and interpret electric field lines.
		Describe the electric field due to a charge.
		Solve problems involving the electric field, charge, and force on an object.
	Electric Potential Difference	
		Differentiate electric potential energy and electric potential difference.
		Solve problems involving electric potential energy and electric potential difference.
	Electric Energy Storage	
		Examine how a capacitor works.
		Solve problems involving capacitors.

Unit	Lesson	Lesson Objectives
	Ohm's Law	
		Examine current, resistance, and voltage.
		Solve problems involving current, charge, and time.
		Use Ohm's law to calculate voltage, current, or resistance.
	Electric Circuits	
		Apply Ohm's law to calculate voltage, current, or resistance in a parallel or series circuit.
		Compare and contrast parallel and series circuits.
		Identify circuits as open, closed, or short.
		Interpret circuit diagrams.
	Lab: Circuit Design	
		Calculate the power used by elements in a circuit.
		Construct series and parallel circuits.
		Use Ohm's law to calculate current, voltage, and resistance.
Magnetism		
	Magnets and Magnetism	
		Analyze the magnetic field around a magnet.
		Determine how magnetic poles interact with each other.
		Distinguish between temporary and permanent magnets.
		Examine how magnetic domains are aligned in a magnet.
	Magnetic Field and Force	
		Analyze the magnetic field produced by a current-carrying wire.
		Apply the right-hand rule to determine the direction of the magnetic force on a charge.
		Solve problems involving magnetic force.
		Use the right-hand rule to determine the direction of the magnetic field in a current-carrying wire.
	Electromagnetic Induction	
		Examine how an electric current is produced by a magnet.
		Identify the characteristics of solenoids and electromagnets.
		Indicate how magnetism is produced by electric currents.
	Applications of Electromagnetic Induction	
		Analyze how a transformer reduces voltage.
		Examine how a generator works.
		Explain how an electric motor uses a magnetic force to cause motion.
	Lab: Electromagnetic Induction	
		Examine how magnetic polarity affects the direction of induced current in a loop of wire.
		Recognize that a moving magnet can induce an electric field, causing current to flow in a loop of wire.
Nuclear Physics		
	Radioactivity	
		Determine possible problems associated with radioactive decay.
		Distinguish between alpha, beta, and gamma decay.
		Identify technological applications of radioactive decay.
		Use the half-life concept to describe the rate of decay of an isotope.

Unit	Lesson	Lesson Objectives
	Lab: Half-Life Model	
		Interpret a graph showing the decay of a radioactive substance.
		Use a model to investigate half-life.
	Fission and Fusion	
		Compare and contrast nuclear fission and nuclear fusion.
		Explain nuclear fission and nuclear fusion in terms of mass-energy equivalence.
		Identify applications of nuclear fission and nuclear fusion.
	The Sun's Energy	
		Examine how energy is transferred from the core to space.
		Identify and describe the steps of hydrogen fusion.
		Recognize the types of energy emitted by the Sun.
	Fundamental Forces	
		Compare the characteristics, strengths, and ranges of the fundamental forces.
		Examine the four fundamental forces.
Modern Physics		
	Atomic Spectra	
		Compare and explain the emission spectra produced by various atoms.
		Define spectroscopy and its applications.
		Outline the historical development of the atomic theory.
		Understand the concepts of emission and absorption spectra.
	Dual Nature of Light	
		Calculate the energy of a photon.
		Describe and give evidence for the dual nature of light.
		Examine the photoelectric effect.
	Special Relativity	
		Analyze the motion of an object using different reference frames.
		Examine how the special theory of relativity leads to time dilation and length contraction.
		Identify Einstein's two postulates of special relativity.
	General Relativity	
		Compare and contrast Newton's universal law of gravitation with Einstein's general theory of relativity.
		Examine Einstein's general theory of relativity.
		Recognize the evidence that supports the general theory of relativity.
	Origin and Evolution of the Universe	
		Analyze how stellar spectra are used to identify the composition and motion of a star.
		Describe the evolution of the universe.
		Distinguish between the different types of stars and their life cycles.
		Examine evidence for the big bang theory.