Curriculum	
Grade:	12 IP
Subject:	Physics

Topic	Description	Lesson	Lesson Code	Objectives
Momentum and Collisions	Analysis of momentum and collisions between two or more objects. The student will consider the mass and velocity of one or more objects and the conservation of momentum and energy.	Momentum and Impulse	C1.1	→Compare the momentum of different moving objects. →Compare the momentum of the same object moving with different velocities. →Identify examples of change in the momentum of an object. →Describe changes in momentum in terms of force and time.
		Conservation of Momentum	C1.2	→Describe the interaction between two objects in terms of the change in momentum of each object. →Compare the total momentum of two objects before and after they interact. →State the law of conservation of momentum. →Predict the final velocities of objects after collisions, given the initial velocities.
		Elastic and Inelastic Collisions	C1.3	→Identify different types of collisions. →Determine the changes in kinetic energy during perfectly inelastic collisions. →Compare conservation of momentum and conservation of kinetic energy in perfectly inelastic and elastic collisions. →Find the final velocity of an object in perfectly inelastic and elastic collisions.

Circular Motion and Gravitation	The student will learn how to describe circular motion and the forces associated with it, including the force due to gravity.	Circular Motion	C2.1	→Solve problems involving centripetal acceleration. →Solve problems involving centripetal force. →Explain how the apparent existence of an outward force in circular motion can be explained as inertia resisting the centripetal force.
		Newton's Law of Universal Gravitation	C2.2	→Explain how Newton's law of universal gravitation accounts for various phenomena, including satellite and planetary orbits, falling objects, and the tides. →Apply Newton's law of universal gravitation to solve problems.
		Motion in Space	C2.3	→Describe Kepler's laws of planetary motion. →Relate Newton's mathematical analysis of gravitational force to the elliptical planetary orbits proposed by Kepler. →Solve problems involving orbital speed and period.
		Torque and Simple Machines	C2.4	→Distinguish between torque and force. →Calculate the magnitude of a torque on an object. →Identify the six types of simple machines. →Calculate the mechanical advantage of a simple machine.
Vibrations and Waves	The student will study a kind of periodic motion called simple harmonic motion and will learn about the relationship between simple harmonic vibrations and waves.	Simple Harmonic Motion	C3.1	→Identify the conditions of simple harmonic motion. →Explain how force, velocity, and acceleration change as an object vibrates with simple harmonic motion. →Calculate the spring force using Hooke's law.

		Measuring Simple Harmonic Motion	C3.2	→Identify the amplitude of vibration. →Recognize the relationship between period and frequency. →Calculate the period and frequency of an object vibrating with simple harmonic motion.
		Properties of Waves	C3.3	→Distinguish local particle vibrations from overall wave motion. →Differentiate between pulse waves and periodic waves. →Interpret waveforms of transverse and longitudinal waves. →Apply the relationship among wave speed, frequency, and wavelength to solve problems. →Relate energy and amplitude.
		Wave Interactions	C3.4	→Apply the superposition principle. →Differentiate between constructive and destructive interference. →Predict when a reflected wave will be inverted. →Predict whether specific traveling waves will produce a standing wave. →Identify nodes and antinodes of a standing wave.
Interference and Diffraction	The student will learn about interference of light. In interference, light waves combine to produce resultant waves that are either brighter or less bright than the component waves.	Interference	C4.1	→Describe how light waves interfere with each other to produce bright and dark fringes. →Identify the conditions required for interference to occur. →Predict the location of interference fringes using the equation for double-slit interference.
		Diffraction	C4.2	→Describe how light waves bend around obstacles and produce bright and dark fringes. →Calculate the positions of fringes for a diffraction grating.

				→Describe how diffraction determines an optical instrument's ability to resolve images.
		Lasers	C4.3	→Describe the properties of laser light. →Explain how laser light has particular advantages in certain applications.
Atomic Physics	The student will learn about the development of the field known as quantum mechanics, which is more successful than classical physics in describing phenomena at the atomic level.	Quantization of Energy	C5.1	→Explain how Planck resolved the ultraviolet catastrophe in blackbody radiation. →Calculate energy of quanta using Planck's equation. →Solve problems involving maximum kinetic energy, work function, and threshold frequency in the photoelectric effect.
		Models of the Atom	C5.2	→Explain the strengths and weaknesses of Rutherford's model of the atom. →Recognize that each element has a unique emission and absorption spectrum. →Explain atomic spectra using Bohr's model of the atom. →Interpret energy-level diagrams.
		Quantum Mechanics	C5.3	→Recognize the dual nature of light and matter. →Calculate the de Broglie wavelength of matter waves. →Distinguish between classical ideas of measurement and Heisenberg's uncertainty principle. →Describe the quantum-mechanical picture of the atom, including the electron cloud and probability waves.

Subatomic Physics	The student will study the atomic nucleus, radioactive decay, and the processes of fission and fusion. The student will also learn about the standard model of the universe.	The Nucleus	C6.1	→Identify the properties of the nucleus of an atom. →Explain why some nuclei are unstable. →Calculate the binding energy of various nuclei.
		Nuclear Decay	C6.2	→Describe the three modes of nuclear decay. →Predict the products of nuclear decay. →Calculate the decay constant and the half-life of a radioactive substance.
		Nuclear Reactions	C6.3	→Distinguish between nuclear fission and nuclear fusion. →Explain how a chain reaction is utilized by nuclear reactors. →Compare fission and fusion reactors.
		Particle Physics	C6.4	→Define the four fundamental interactions of nature. →Identify the elementary particles that make up matter. →Describe the standard model of the universe.
SAT2 Subject Test	Preparation for the SAT standardized test that is widely used for college admissions.	SAT2 Practice	SAT2	Learning different strategies and tactics to solve various SAT2 questions.