New Paltz Central School District
Physics

	ESSENTIAL QUESTIONS/CONTENT	SKILLS	ASSESSMENTS
September	**UNIT 1: MATHEMATICAL SKILLS AND MEASUREMENT CONCEPTS** • How are precision and accuracy different? • What is the proper use of measuring tools? • What are the benefits of the metric system? • How are scalar and vector quantities represented and mathematically manipulated?	• Compare English and metric units of measure. • Learn to use measuring devices with precision. • Properly use significant figures mathematically. • Use vectors to represent addition of perpendicular displacement, force, and velocity.	• Quizzes • Tests • Labs
October	**UNIT 2: MECHANICS – KINEMATICS (LINEAR)** • How is motion represented graphically? • How are velocity, acceleration, and distance calculated? • How are horizontal and vertical motions different?	• Draw graphs of motion. • Interpret graphs of motion using concepts of scope and area. • Use significant figures, units, and precise measurements to analyze motion. • Calculate velocity, acceleration, and distance in linear motion vertically and horizontally.	• Quizzes • Tests • Labs
November	**UNIT 3: MECHANICS: KINEMATICS (TWO-DIMENSIONAL)** • What factors affect variables of projectiles? • How are height and range of projectiles calculated? • How are horizontal and vertical components analyzed?	• Calculate time of flight for projectiles. • Use time of flight to determine range and height of projectiles. • Observe and demonstrate independency of horizontal and vertical components of projectiles. • Diagram vectors representing projectile motion.	• Quizzes • Tests • Research Lab

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November - December	**UNIT 4: MECHANICS – DYNAMICS** • What are Newton's Laws of Motion? • What are forces? • What is inertia? • What types of friction exist? • How are various forces calculated?	• Define and exemplify forces acting on an object. • State Newton's Three Laws of Motion. • Identify and calculate static and kinetic friction. • Resolve forces into various components. • Calculate the spring constant of a spring.	• 3-5 page paper • Presentation of findings • Quizzes • Tests • Labs
December - January	**UNIT 5: ENERGY** • How are potential and kinetic energy related? • How is energy calculated and measured? • How are energy and momentum related and conserved? • How is energy transformed? • How is power related to energy?	• Calculate potential and kinetic energy and power. • Observe and explain energy transformations. • Prove the laws of energy and momentum conservation.	• Quizzes • Tests • Research Lab • Midterm Examination
January - February	**UNIT 6: ELECTROSTATICS** • How is static electricity different and the same as standard electricity? • How is static electricity created? • How is static electricity measured?	• Draw electric fields for point charges. • Use Coulomb's Law to calculate forces between charges. • Create and observe static charges.	• Quizzes • Tests • Labs

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February – March	**UNIT 7: ELECTRICITY** • What are electrical fields and what are their uses? • How was the elementary unit of charge determined? • How are electricity and magnetism related? • What is the difference between a series and parallel circuit? • What is current and how is it defined? • What is voltage? • What is resistance and how is it related to current and voltage? • How does a magnetic field affect a current carrying wire or a moving charged particle?	• Draw electric fields for point charges and parallel plates. • Simulate Milikan's oil drop experiment to calculate the charge on one electron. • Draw magnetic field lines for a bar magnet. • Construct and analyze electrical circuits. • Calculate the current in a circuit. • Use Ohm's law to calculate resistance.	• Quizzes • Tests • Research Lab
April - May	**UNIT 8: MODERN PHYSICS** • What is the particle theory of light? • How is light created? • What is a photon? • How do solar panels operate and produce electricity? • Why do elements have individual atomic spectra? • What do energy level diagrams tell you about elements? • What is the standard model of particles?	• Compare wave theory with particle theory. • Describe light as photons. • Read energy level diagrams. • Use the photoelectric effect to calculate energy and wavelength of photons. • Diagram and describe solar cells. • Determine the energies of the spectral lines of various elements. • Calculate the energy of a photon absorbed or released by an atom. • Discover the building blocks of matter (quarks).	• Quizzes • Tests • Research Lab

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10 Week Mini-Course	**<u>WAVE THEORY</u>** • How are waves created? • How do waves travel? • What different types of waves exist? • What are the parts of a wave? • How are wave parts related? • How do waves interact with other waves and different media? --- • Hooke's law • Periodic motion	• Classify waves as transverse or longitudinal. • Diagram and label wave parts. • Calculate wave period, frequency, and length. • Use the law of reflection and Snell's Law to find wave direction after interaction with media. • Observe and draw examples of reflection, refraction, dispersion, and diffraction. • Calculate wavelength of laser light using Young's experiment.	• Quizzes • Tests • Labs