Title ***Exploring Creation With Physics, 2nd Edition***
ISBN 978-1-932012-42-2 (student text) 978-1-932012-43-9 (answer key)

Science Credits	1
Lab Credits[1]	1
Honors Designation[2]	Yes
Science Type	Physical

This college-preparatory, laboratory-based physics course offers the student who has completed algebra 1 and geometry a firm foundation in the basic laws and theories of physics. The geometry course must have a section on the three basic trigonometric functions and how they are defined on a right triangle. This is necessary for the vector analysis used in the course.

The book begins with a review of measurements, units, and significant figures. It then discusses scalar and vector quantities, emphasizing one-dimensional distance, displacement, speed, velocity, and acceleration. The distinctions between instantaneous and average values are discussed, and graphical analysis is used.

The student then learns how to use the five basic equations of motion to analyze one-dimensional situations, with special emphasis on free fall, including the phenomenon of terminal velocity. After one-dimensional situations are discussed, two-dimensional vectors are introduced, covering both the graphical and analytical approaches to adding and subtracting vectors. The student then uses those techniques as well as the motion equations to analyze two-dimensional situations.

Once motion is covered in this manner, the student is ready to learn Newton's three laws of motion. This is also where the concept of friction is introduced, including how to calculate it as well as the distinction between static and kinetic friction. The student then uses those laws to analyze static and dynamic translational equilibrium. The concepts of centripetal force and torque are then introduced so the student can analyze static and dynamic rotational equilibrium as well.

With an introduction to rotational motion, the student can now learn about the gravitational force and the basic structure of the solar system. The student is taught how to equate the centripetal and gravitational forces so as to calculate details regarding how objects orbit other objects. After that, the student learns about work and energy as well as the First Law of Thermodynamics. He or she uses those concepts to analyze situations involving both linear and nonlinear motion.

The concept of momentum is then introduced, as well as situations in which it is conserved. That is used to analyze collisions and recoil. Angular momentum and its conservation is also discussed, and those concepts are used to analyze rotational situations. This naturally leads to a discussion of periodic motion, concentrating on the mass/spring system and the simple pendulum.

Waves are then discussed. First, the general characteristics of waves are covered, including the relationships among speed, wavelength, frequency, and energy. Sound waves are used as a model of longitudinal waves. A detailed mathematical analysis of the Doppler Effect is given, followed by a discussion of how sound travels in media other than air as well as the nature and uses of infrasonic and ultrasonic waves.

Light waves are then discussed as an example of transverse waves, with emphasis on the difference in speed between light and sound, the dual nature of light, the photoelectric effect, and Young's double-slit experiment. A discussion of geometric optics follows, giving the student the skills necessary to analyze situations involving flat mirrors, curved mirrors, and lenses. This include a discussion of reflection, refraction, and Snell's Law.

The text then transitions into concepts related to electricity and magnetism. How objects are charged is discussed, as well as the differences between conductors and insulators. Coulomb's Law is used to analyze the interactions between charges, and electric fields are drawn. The strength of the electric field is also related to the electrostatic force.

Electric potential is then discussed, including how to use it to analyze the motion of charges in an electric field. Capacitors are then covered as well as applications that use them. This leads to a general discussion of electric circuits, including resistance, current, Ohm's Law, and power. The student is then taught how to reduce multiple resistors to a single resistor for the purpose of calculating current and power draw in a circuit. The text ends with a discussion of magnetism, including Oersted's experiment, diamagnetism, paramagnetism, ferromagnetism, Faraday's Law of Electromagnetic Induction, direct current, and alternating current.

There are a total of 34 experiments in the course, comprising 30 hours of laboratory instruction. The experiments use only household items.

[1]To qualify as a lab credit, at least 28 of the experiments must be performed. Those experiments must be fully documented in a laboratory notebook, as discussed in the introduction to the text.

[2]To qualify as an honors credit, all modules must be completed, the tests must be taken closed book, and all experiments must be performed. Those experiments must be fully documented in a laboratory notebook, as discussed in the introduction to the text. In addition, a grade of B or higher must be earned following the pedagogy in the answer key.