High School

Prentice Hall

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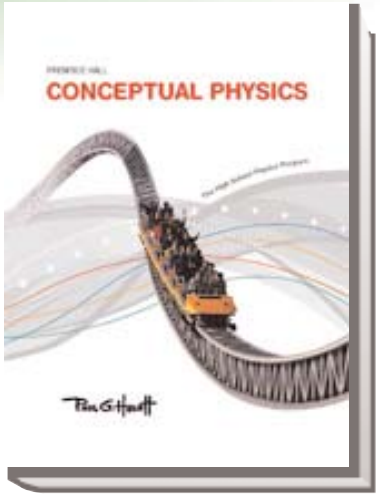

CORRELATED TO

Indiana's Revised Academic Standards for Physics I / 3084
(High School)

PEARSON

TEACH & LEARN • ASSESS & INFORM • DEVELOP & LEAD

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INDIANA ACADEMIC STANDARDS	SE Lessons (chapter & lesson numbers)	SE, TE, TR, TECH (page numbers)
Physics I		
Students should understand that scientific knowledge is gained from observation of natural phenomena and experimentation, by designing and conducting investigations guided by theory, and by evaluating and communicating the results of those investigations according to accepted procedures. Thus, scientific knowledge is scientists' best explanations for the data from many investigations. Further, ideas about objects in the microscopic world that we cannot directly sense are often understood in terms of concepts developed to understand objects in the macroscopic world that we can see and touch. In the science classroom student work should align with this process of science and should be guided by the following principles. These should be woven throughout the daily work that students are doing when learning the content presented in the standard indicators.		
* Develop explanations based on reproducible data and observations gathered during laboratory investigations.	**SE:** Ch 2, 6.7, 9.3, Ch 10, 22.3, Ch 25, 27.5, Ch 30, 32.6, Ch 37	**SE:** Representative Pages: 12, 97, 147, 170, 436, 490, 539, 602, 655, 740 **TR:** Laboratory Manual: Representative Pages: 17, 43, 51, 75 87, 225, 293, 117, 325, 365
* Recognize that their explanations must be based both on their data and other known information from investigations of others.		**TR:** Laboratory Manual: Representative Pages: 54, 115-116, 117-120, 127-129, 141-144, 158, 165-169, 181-186, 289-292, 295-296
* Clearly communicate their ideas and results of investigations verbally and in written form using tables, graphs, diagrams, and photographs.		**TR:** Laboratory Manual: Representative Pages: 141-144, 163-164, 167-169, 171-172, 178-179, 185, 224, 260, 294, 336 **TECH:** All Probeware labs
* Regularly evaluate the work of their peers and in turn have their work evaluated by their peers.	**SE:** All Chapters	**SE:** Can Be Developed From: All "discover!" and "Do the Math" Activities **TR:** Laboratory Manual: 54, 158, 320, 320
* Apply standard techniques in laboratory investigations to measure physical quantities in appropriate units and convert known quantities to other units as necessary.		**TR:** All labs and probeware labs

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INDIANA ACADEMIC STANDARDS	SE Lessons (chapter & lesson numbers)	SE, TE, TR, TECH (page numbers)
* Use analogies and models (mathematical and physical) to simplify and represent systems that are difficult to understand or directly experience due to their size, time scale, or complexity, and recognize the limitations of analogies and models.	**SE:** 5.6, 6.3, 8.5, 11.2, 13.4, 15.4, 18.2, 21.5, 21.6, 21.8, 25.4, 27.2, 32.3	**SE:** Representative Pages: 76, 89, 135, 191, 289, 302, 412, 536, 650, 782 **TR:** Laboratory Manual: 22-23, 38-41, 47-49, 57, 73, 132-133, 143, 292, 293-294, 329-332 **TECH:** All probeware labs
* Focus on the development of explanatory models based on their observations during laboratory investigations.		**TR:** Laboratory Manual: 288, 329-332 **TECH:** All probeware labs
* Explain that the body of scientific knowledge is organized into major theories, which are derived from and supported by the results of many experiments, and allow us to make testable predictions.	**SE:** 1.4	**SE:** 3
* Recognize that new scientific discoveries often lead to a re-evaluation of previously accepted scientific knowledge and of commonly held ideas.	**SE:** 1.4	**SE:** 3
* Describe how scientific discoveries lead to the development of new technologies, and conversely how technological advances can lead to scientific discoveries through new experimental methods and equipment.	**SE:** 1.6	**SE:** 5
* Explain how scientific knowledge can be used to guide decisions on environmental and social issues.	**SE:** 1.6, 9.11, 13.9, 14.6, 22.7	**SE:** Can Be Developed From: 5, 163, 248, 275, 441

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INDIANA ACADEMIC STANDARDS	SE Lessons (chapter & lesson numbers)	SE, TE, TR, TECH (page numbers)
Standard I: Motion and Forces		
Core Standard - Collaboratively describe, test through experiments, explain and defend mathematical models of the motion of macroscopic objects in terms of Newton's Laws: 1) The motion of an object is constant unless a net force acts on the object; 2) The magnitude of the acceleration of an object varies directly with the magnitude of the net force acting on the object and inversely with the mass of the object, and the direction of the acceleration is in the direction of the net force acting on the object; and 3) Forces are interactions between objects. Whenever an object exerts a force on another object, the second object exerts and equal and opposite force on the first.		
P.1.1 Describe, measure, and analyze using motion maps, graphs, and algebraic equations, constant acceleration motion in terms of time and the vector quantities of displacement, velocity and acceleration.	**SE:** 4.3, 4.4, 4.5, 4.7, 5.3, 5.4, 5.5, 5.6, 6.6, 6.7	**SE:** 50-52, 53-55, 57-58, 68, 73-79, 93-97 **TR:** Laboratory Manual: 11-14, 19-20, 37-42, 43-45 **TECH:** Probeware Lab Manual: 2-5, 6-9, 10-14, 15-18, 19-23
P.1.2 Describe, measure, and analyze, using motion, maps, graphs, and algebraic equations, constant acceleration motion in one dimension in terms of time and the vector quantities of displacement, velocity, and acceleration.	**SE:** 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 6.6	**SE:** 46, 47-59, 50-52, 53-54, 93-97 **TR:** Laboratory Manual: 19-20 **TECH:** Probeware Lab Manual: 2-5, 6-9
P.1.3 Describe, measure, and analyze, using motion, maps, graphs, and algebraic equations, constant acceleration motion in two dimensions in terms of time and the vector quantities of displacement, velocity, and acceleration. Consider specifically projectile motion and uniform circular motion.	**SE:** 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 6.6, 10.1, 10.2, 10.3, 10.4, 10.5	**SE:** 53-55, 68-72, 73-79, 93-97, 170-180 **TR:** Laboratory Manual: 11-14, 37-424, 43-45, 55-58, 59-65 **TECH:** Probeware Lab Manual: 10-14, 15-18, 19-23, 29-35
P.1.4 Describe the magnitude and direction of kinds of forces, including both contact forces and non-contact forces, those that act at a distance. Find the net force acting on an object using free-body diagrams and the addition of forces. Use Newton's three laws to deductively analyze static and dynamic systems.	**SE:** 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.4, 5.1, 6.3	**SE:** 13-19, 69, 88-89 **TECH:** Probeware Lab Manual: 15-18

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INDIANA ACADEMIC STANDARDS	SE Lessons (chapter & lesson numbers)	SE, TE, TR, TECH (page numbers)
P.1.5 Use Newton's Law of universal gravitation and the laws of motion to quantitatively analyze the motions of orbiting objects such as the moon, the planets and satellites, e.g. Kepler's third law.	**SE:** 13.2, 13.3, 13.4, 13.5, 13.6, 14.1, 14.2, 14.3, 14.4, 14.5	**SE:** 237-239, 262-272 **TR:** Laboratory Manual: 165-169
P.1.6 Use Newton's law of universal gravitation to quantitatively analyze the motions of orbiting objects such as the moon, the planets and satellites, e.g., Kepler's third law.	**SE:** 13.2, 13.3, 13.4, 13.5, 13.6, 14.1, 14.2, 14.3, 14.4, 14.5	**SE:** 237-239, 262-272
Standard 2: Energy and Momentum		
Core Standard - Collaboratively describe, test, explain and defend mathematical models of the motion of macroscopic objects in terms of energy, momentum and their conservation laws as developed using Newton's three laws of motion.		
P.2.1 Describe qualitatively and quantitatively the concepts of momentum, work, kinetic energy, potential energy, and power.	**SE:** 8.1, 8.2, 8.3, 8.4, 8.6, 9.1, 9.2, 9.4, 9.5	**SE:** 124-131, 135-136, 145-146, 148-149, 150 **TR:** Laboratory Manual: 91-96, 97-99, 103-104, 105-106, 107-109
P.2.2 Quantitatively predict changes in momentum using the impulse- momentum theorem and in kinetic energy using the work-energy theorem, as developed from Newton's laws of motion.	**SE:** 8.2, 9.6	**SE:** 125-129, 151-152
P.2.3 Analyze evidence that illustrates the laws of conservation of energy and conservation of momentum. Apply these laws to analyze elastic and completely inelastic collisions.	**SE:** 8.5, 8.6	**SE:** 132-136 **TR:** Laboratory Manual: 91-96, 97-99
P.2.4 Describe and quantify energy in its different mechanical forms (such as kinetic, gravitational potential, elastic potential) and recognize that these forms of energy can be transformed one into another and into non-mechanical forms of energy (such as thermal, chemical, nuclear, and electromagnetic).	**SE:** 9.4, 9.5, 9.7, 9.10, 9.11	**SE:**148-149, 150, 153-154, 160-162 **TR:** Laboratory Manual: 111-113

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INDIANA ACADEMIC STANDARDS	SE Lessons (chapter & lesson numbers)	SE, TE, TR, TECH (page numbers)
Standard 3: Temperature and Thermal Energy Transfer		
Core Standard - Describe and distinguish the concepts of temperature and thermal energy, and use the kinetic-molecular theory to explain some thermal properties of gases and phase changes of solids, liquids and gases.		
P.3.1 Describe temperature, thermal energy, and thermal energy transfer in terms of the kinetic molecular model. Expand the concept of conservation of mechanical energy to include thermal energy.	**SE:** 9.5, 9.7	**SE:** 150, 153-154
P.3.2 Describe the kinetic molecular model, use it to derive the ideal gas law and show how it explains the relationship between the temperature of an object and the average kinetic energy of its molecules.	**SE:** 21.1	**SE:** 407-408
P.3.3 Use the kinetic theory to explain that the transfer of heat occurs during a change of state.	**SE:** 23.8	**SE:** 460-461
P.3.4 Use examples from everyday life to describe the transfer of thermal energy by conduction, convection and radiation.	**SE:** 22.1, 22.2, 22.3	**SE:** 431-432, 433-435, 436
Standard 4: Electricity and Magnetism		
Core Standard - Understand the interplay of electricity and magnetism. Apply this understanding to electrostatic problems and basic electrical circuits.		
P.4.1 Describe and determine the force on a stationary charge due to other stationary charges using Coulomb's Law. Know that this force is many times greater than the gravitational force.	**SE:**32.3	**SE:** 648-650
P.4.2 Define electric field and describe the motion of a charged particle in a simple electric field.	**SE:** 33.1	**SE:** 665-666
P.4.3 Describe electric potential energy and electric potential (voltage), and use voltage to explain the motion of electrical charges and the resulting electric currents in conductors.	**SE:** 33.4, 33.5	**SE:** 669-671

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INDIANA ACADEMIC STANDARDS	SE Lessons (chapter & lesson numbers)	SE, TE, TR, TECH (page numbers)
P.4.4 Explain and analyze simple arrangements of electrical components in series and parallel circuits in terms of current, resistance, voltage, and power and use Ohm's and Kirchhoff's laws to analyze circuits.	**SE:** 34.5, 34.6, 35.3, 35.4, 35.5	**SE:** 685-688, 705-706, 707-708, 709 **TR:** Laboratory Manual: 325-328
P.4.5 Describe the magnetic forces and fields produced by, and acting on, moving charges and magnetic materials.	**SE:** 36.2, 36.3, 36.4, 36.5, 36.6	**SE:** 722-728
Standard 5: Vibrations, Waves		
Core Standard - Apply Newton's laws and the concepts of kinetic and potential energy to describe and explain the motion of vibrating objects.		
P.5.1 Identify properties of objects that vibrate, using Newton's Laws to describe and explain the vibrational motion resulting from restoring forces, such as Hooke's Law in the case of spring, or gravity in the case of a small amplitude pendulum.	**SE:** 18.3, 25.1	**SE:** 348-349, 490-491
P.5.2 Describe how vibrating objects can generate transverse and/or longitudinal waves so that energy is transmitted without the transfer of energy. Distinguish longitudinal waves from transverse waves.	**SE:** 25.5, 25.6	**SE:** 497 **TR:** Laboratory Manual: 261-263, 265-268
P.5.3 Describe and analyze propagating waves in terms of their fundamental characteristics such as wave speed, wavelength, frequency or period, and amplitude.	**SE:** 25.2, 25.4	**SE:** 492, 495-496 **TR:** Laboratory Manual: 261-263, 265-268
P.5.4 Describe and explain the behavior of waves such as transmission, reflection, interference, and polarizations. Qualitatively describe and explain the production and properties of standing waves.	**SE:** 25.7, 25.8, 27.2	**SE:** 498-501, 542-543 **TR:** Laboratory Manual: 263-264

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Standard 6: Light and Optics		
Core Standard - Understand the geometric nature of light propagation and its wave nature as observed in the propagation of light through space, and its interactions with and in matter.		
P.6.1 Understand the geometric nature of light in reflection and refraction, and in image formation by lenses and mirrors. Use that geometric nature to graphically predict the formation of images by lens and mirrors.	**SE:** 29.1, 29.2, 29.3, 29.4, 29.6, 29.8, 30.2, 30.3, 30.4	**SE:** 578-583, 584-585, 587-588, 604-606, 610 **TR:** Laboratory Manual: 295-296, 301-304, 307-308, 309-312
P.6.2 Describe the electromagnetic spectrum (radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, gamma rays) in terms of frequency, wavelength and energy, recognizing that all these waves travel at the same speed in a vacuum.	**SE:** 27.3	**SE:** 536
P.6.3 Understand that electromagnetic waves are produced by the acceleration of charged particles. Describe how electromagnetic waves interact with matter both as packets (photons) and as waves. Show qualitatively how wave theory helps explain polarization and diffraction.	**SE:** 27.1, 27.3, 37.8, 38.2	**SE:** 533, 536, 753-755, 768
Standard 7: Modern Physics		
Core Standard - Understand how our knowledge of physics has changed during the last hundred years, particularly in the areas of atomic and nuclear physics, quantum theory, and relativity. Describe the structure of the atom and the reactions that occur in its nucleus.		
P.7.1 Explain that electrons, protons, and neutrons are parts of the atom, that the nuclei of atoms are composed of protons and neutrons which experience forces of attraction and repulsion consistent with their charges and masses. Distinguish elements from isotopes.	**SE:** 17.7, 39.1, 39.4	**SE:** 331-333, 783, 788 **TR:** Laboratory Manual: 355-358

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P.7.2 Explain that the stability of the nucleus, containing only positive or neutral particles indicates the existence of a new force that is only evident within the nucleus, holding the particles together despite the strong repulsive electrical force.	**SE:** 17.7, 39.1	**SE:** 331-333, 783-784
P.7.3 Distinguish fission from fusion processes. Describe how the binding energies of protons and neutrons determine the stability/instability of nuclei.	**SE:** 40.1, 40.7, 40.8	**SE:** 808, 821-824 **TR:** Laboratory Manual: 365-366
P.7.4 Describe qualitatively how nuclear reactions—fission and fusion—convert very small amounts of matter into large amounts of energy.	**SE:** 40.6, 40.7	**SE:** 809-812, 819-820
P.7.5 Understand that fission results from large, less stable nuclei decomposing to form smaller, more stable nuclei. Understand that fusion results from small nuclei at high temperatures and pressures combining to form larger, more stable nuclei with the release of thermonuclear energy.	**SE:** 40.1, 40.3, 40.6, 40.7	**SE:** 809-812, 817-822