Physics Curriculum Bundle #4

Title	Suggested Dates
Gravitation and Energy	10/25-11/12 (15 Days)

Big Idea/Enduring Understanding	Guiding Questions
The motion of all masses in the presence of gravity is predictable. Energy is associated with an object's motion and position.	What affects the force of gravity between two objects?

The resources included here provide teaching examples and/or meaningful learning experiences to address the District Curriculum. In order to address the TEKS to the proper depth and complexity, teachers are encouraged to use resources to the degree that they are congruent with the TEKS and research-based best practices. Teaching using only the suggested resources does not guarantee student mastery of all standards. Teachers must use professional judgment to select among these and/or other resources to teach the district curriculum.

Knowledge & Skills with Student Expectations	Specificity & Examples	Suggested Resources (Read the note above)
Phy.5 Science concepts. The student knows the nature of forces in the physical world. The student is expected to: 5A research and describe the historical development of the concepts of gravitational, electromagnetic, weak nuclear, and strong nuclear forces;	Including • Gravitation (Kepler and Newton)	History of Physics Website – http://web.mit.edu/redingtn/www/netadv/hist.html
Phy.5 Science concepts. The student knows the nature of forces in the physical world. The student is expected to: 5B describe and calculate how the magnitude of the gravitational force between two objects depends on their masses and the distance between their centers;	Including • Describe the law of universal gravitation. • Calculate the amount of gravitational force between two objects. • Determine the strength of a gravitational field • Differentiate between mass and weight	
Phy.6 Science concepts. The student knows that changes occur within a physical system and applies the laws of conservation of energy and momentum. The student is expected to:	Including • Describe conversion of forms of mechanical energy in different systems • Such as	

6B investigate examples of kinetic and potential energy and their transformations;	• Falling bodies • Roller coasters • Pendulums	
Phy.6 Science concepts. The student knows that changes occur within a physical system and applies the laws of conservation of energy and momentum. The student is expected to: 6C calculate the mechanical energy of, power generated within, impulse applied to, and momentum of a physical system;	Including • Solve problems involving calculation of mechanical energy. • Such as • Billiards • Cars • Trains	Roller coaster lab – determine how well energy is conserved for marble roller coaster. (Phys_4_rollercoasterlab) Mechanical energy website – http://www.glenbrook.k12.il.us/gbssci/phys/Class/energy/u5l1d.html Honda Rube Goldberg Machine Video – http://autorepair.about.com/library/multimedia/hhonda-ad-300k.swf
1 The student conducts investigations, for at least 40% of instructional time, using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. **1A** demonstrate safe practices during laboratory and field investigations		
1 The student conducts investigations, for at least 40% of instructional time, using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom.		

1B demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions. **2A** know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions. **2B** know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories;		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions. **2C** know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but may be subject to change as new areas of science and new technologies are developed;		
2 The student uses a systematic approach to answer scientific laboratory and field investigative		

questions. **2D** distinguish between scientific hypotheses and scientific theories		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions. **2E** design and implement investigative procedures, including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions. 2F demonstrate the use of course apparatus, equipment, techniques, and procedures, including, triple beam balances, clamps, dynamics demonstration equipment, slotted and hooked lab masses, power supply, stopwatches, trajectory apparatus, carbon paper, graph paper, protractors, metric rulers, meter sticks, scientific calculators, graphing technology, computers, ballistic carts or equivalent, spools of nylon thread or string.2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.		

2G use a wide variety of additional course apparatus, equipment, techniques, materials, and procedures as appropriate such as ripple tank with wave generator, wave motion rope, micrometer, caliper, radiation monitor, computer, ballistic pendulum, electroscope, inclined plane, optics bench, optics kit, pulley with table clamp, resonance tube, ring stand screen, four inch ring, stroboscope, graduated cylinders, and ticker timer;		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions. **2H** make measurements with accuracy and precision and record data using scientific notation and International System (SI) units;		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions. **2I** identify and quantify causes and effects of uncertainties in measured data;		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions. **2J** organize and evaluate data and make inferences from data, including the use of tables, charts, and graphs;		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions. **2K** communicate valid conclusions supported by the		

data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;		
2 The student uses a systematic approach to answer scientific laboratory and field investigative questions. **2L** express and manipulate relationships among physical variables quantitatively, including the use of graphs, charts, and equations.		
3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. **3A** in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student		
3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. **3B** communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials		
3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. **3C** draw inferences based on data related to promotional materials for products and services		

3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. **3D** explain the impacts of the scientific contributions of a variety of historical and contemporary scientists on scientific thought and society		
3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. **3E** research and describe the connections between physics and future careers		
3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. **3F** express and interpret relationships symbolically in accordance with accepted theories to make predictions and solve problems mathematically, including problems requiring proportional reasoning and graphical vector addition		