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Physics

Standard 1: Key Idea 1: Performance Indicator M1.1: Use algebraic and geometric representations to describe and compare data.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
MATHEMATICAL ANALYSIS M1.1a Use scaled diagrams to represent and manipulate vector quantities. M1.1b Represent physical quantities in graphical form M1.1c Construct graphs of real-world data (scatter plots, line or curve of best fit) M1.1d Manipulate equations to solve for unknowns M1.1e Use dimensional analysis to confirm algebraic solutions	E	▪ How do we view real things using math?	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Mini-lab ▪ Formal lab ▪ Investigation ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 1: Key Idea 2: Performance Indicator M2.1: Use deductive reasoning to construct and evaluate conjectures and arguments, recognizing that patterns and relationships in mathematics assist them in arriving at these conjectures and arguments.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
MATHEMATICAL ANALYSIS M2.1a Interpret graphs to determine the mathematical relationship between the variables	E	▪ How do we interpret graphs to determine the mathematical relationship between the variables	▪ Lecture ▪ Demo ▪ Individual check problem ▪ Wipe board example ▪ Homework explanation ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Check problem ▪ Lab report ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 1: Key Idea 3: Performance Indicator M3.11: Apply algebraic and geometric concepts and skills to the solution of problems.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
MATHEMATICAL ANALYSIS M3.1a Explain the physical relevance of properties of a graphical representation of real-world data, e.g., slope, intercepts, area under the curve	E		• Lecture • Demo • Newsprint summary • Wipe board example • Draw a picture • Individual check problem • Homework explanation • Homework pairs/ newsprint • Mini-lab • Formal lab • Investigation • Brainstorm –concept map • Write a problem • Video clip and analysis	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test	

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Standard 1: Key Idea 1: The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
SCIENTIFIC INQUIRY S2.1a Develop extended visual models and mathematical formulations to represent an understanding of natural phenomena S1.1b Evaluate competing explanations and overcome misconceptions	 I I	▪ Where are we in science? ▪ How do current theories compare with older theories?	• Lecture • Newsprint summary • Homework pairs/ newsprint • Brainstorm –concept map • Film • Open discussion with focused questions	▪ Informal	

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Standard 1: Key Idea 2: Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
SCIENTIFIC INQUIRY S2.1 Devise ways of making observations to test proposed explanations S2.2 Refine research ideas through library investigations, including electronic information retrieval and reviews of the literature, and through peer feedback obtained from review and discussion S2.3 Develop and present proposals including formal hypotheses to test explanation; i.e., predict what should be observed under specific conditions if the explanation is true S2.4 Carry out a research plan for testing explanations, including selecting and developing techniques, acquiring and building apparatus, and recording observations as necessary.	E I I E	▪ What are the variables? ▪ Which variables are dependent, independent and controlled? ▪ Can experiments be re-produced? ▪ How can I prove my hypothesis? ▪ How do I design my prodedure?	▪ Lecture ▪ Demo ▪ Mini labs ▪ Formal labs ▪ Investigation ▪ Open discussion with focused questions ▪ Film ▪ Library research ▪ Internet research	▪ Homework checks ▪ Lab report ▪ Lab report/ rubric scoring	

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Standard 1: Key Idea 3: The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into phenomena.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
SCIENTIFIC INQUIRY S3.1 Use various means of representing and organizing observations (e.g., diagrams, tables, charts, graphs, equations, and matrices) and insightfully interpret the organized data S3.2 Apply statistical analysis techniques when appropriate to test if chance alone explains the result S3.3 Assess correspondence between the predicted result contained in the hypothesis and the actual result, and reach a conclusion as to whether or not the explanation on which the prediction was based is supported S3.4 Based on results of the test and through public discussion, they revise the explanation and contemplate additional research.	E E E E	▪ How can we best display our data? ▪ How did error (uncertainty) affect data? ▪ How do we estimate uncertainty? ▪ How do we report accuracy? (percent error) ▪ How do significant digits report precision? ▪ How do you assess your results in terms of your hypothesis? ▪ Did your hypothesis change? How so?	▪ Lecture ▪ Demo ▪ Mini labs ▪ Formal labs ▪ Investigation ▪ Open discussion with focused questions ▪ Film ▪ Library research ▪ Internet research	▪ Mini labs ▪ Lab report ▪ Lab report/ rubric scoring ▪ Quick quiz ▪ Start question ▪ Mini-test ▪ Chapter test	

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Standard 1: Key Idea 1: Engineering design is an iterative process involving modeling and optimization (finding the best solution within given constraints) which is used to develop technological solutions to problems within given constraints.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
ENGINEERING DESIGN T1.1 Engage in the following steps of a design process: - How can we investigate this? - What information can we use? - Develop a list of ideas - Develop an implementation plan - Develop/ implement test - Evaluate/ adjust	E		▪ Investigation ▪ Internet research ▪ Library research	▪ Lab report ▪ Lab report/ rubric scoring	

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Standard 2: Key Idea 1: Information technology is used to retrieve, process, and communicate information as a tool to enhance learning.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
INFORMATION SYSTEMS 1.3 Access, select, collate, and analyze information obtained from a wide range of sources such as research databases, foundations, organizations, national libraries, and electronic communication networks, including the Internet 1.3a Use knowledge of physics to evaluate articles in the popular press on contemporary scientific topics. 1.4 Utilize electronic networks to share information 1.5 Model solutions to a range of problems in mathematics, science, and technology, using computer simulation software	E E I I	▪ What is happening now in science? ▪ How can we get clarification and share data using www and e-mail? ▪ How can we understand physics using a modeling program?	▪ Lecture ▪ Library research ▪ Internet research ▪ Open discussion with focused questions	▪ Lab report ▪ Lab reports/ rubric scoring ▪ Check problem ▪ Mini- test ▪ Chapter test	

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Standard 4: Key Idea 4: Performance Indicator 4.1: Students can observe and describe transmission of various forms of energy.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
THE PHYSICAL SETTING 4.1a All energy transfers are governed by the law of conservation of energy. 4.1b Energy may be converted among mechanical, electromagnetic, nuclear, and thermal forms. 4.1c Potential energy is the energy an object possesses by virtue of its position or condition. Types of potential energy include gravitational and elastic. 4.1d Kinetic energy is the energy an object possesses by virtue of its motion. 4.1e In an ideal mechanical system, the sum of the macroscopic kinetic and potential energies (mechanical energy) is constant. 4.1f In a non-ideal mechanical system, as mechanical energy decreases there is a corresponding increase in other energies such as internal energy. 4.1g When work is done on or by a system, there is a change in the total energy of the system.	E E E E E E E E	▪ How can we track the total energy of a system? ▪ How is work related to transfer of energy? ▪ How can we define potential energy in terms of work? ▪ How can we define kinetic energy in terms of work done against inertia? ▪ How is friction involved in energy?	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Draw a picture ▪ Individual check problem ▪ Homework explanation ▪ Homework pairs/ newsprint ▪ Mini lab ▪ Formal lab ▪ Investigation ▪ Brainstorm- concept map ▪ Build a model ▪ Film ▪ Write a problem ▪ Video clip and analysis	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 4: Key Idea 4: Performance Indicator 4.1: Students can observe and describe transmission of various forms of energy.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
4.1h Work done against friction results in an increase in the internal energy of the system. 4.1i Power is the time-rate at which work is done or energy is expended. 4.1j Energy may be stored in electric or magnetic fields. This energy may be transferred through conductors or space and may be converted to other forms of energy. 4.1k moving electric charges produce magnetic fields. The relative motion between a conductor and a magnetic field may produce a potential difference in the conductor. 4.1l All materials display a range of conductivity. At constant temperature, common metallic conductors obey Ohm's Law. 4.1m The factors affecting resistance in a conductor are length, cross-sectional area, temperature, and resistivity. 4.1n A circuit is a closed path in which a current can exist. 4.1o Circuit components may be connected in series or in parallel. Schematic diagrams are used to represent circuit and circuit elements. 4.1p Electrical power and energy can be determined for electric circuits	E E E E E E E E E	▪ How can power be differentiated from work? ▪ What is light? ▪ How can electrical energy be stored and used? ▪ How is electric current generated? ▪ How do we define resistance in terms of current and voltage? ▪ What affects the resistance of a conductor? ▪ Define and describe a circuit in terms of energy ▪ Contrast series and Parallel circuits ▪ How many ways can energy and power be determined in a circuit? Describe them all.	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Draw a picture ▪ Individual check problem ▪ Homework explanation ▪ Homework pairs/ newsprint ▪ Mini lab ▪ Formal lab ▪ Investigation ▪ Brainstorm- concept map ▪ Build a model ▪ Film ▪ Write a problem ▪ Video clip and analysis	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 4: Key Idea 4: Performance Indicator 4.3: Students can explain variations in wavelength and frequency in terms of the source of the vibrations that produce them, e.g., molecules, electrons, and nuclear particles.

Essential Knowledge/Skills (Major Understandings)	*Priority Code*	*Essential Question*	*Classroom Ideas*	*Assessment Ideas*	*Time/Notes*
4.3a An oscillating system produces waves. The nature of the system determines the type of wave produced. 4.3b Waves carry energy and information without transferring mass. This energy may be carried by pulses or periodic waves. 4.3c The model of a wave incorporates the characteristics of amplitude, wavelength, frequency, period, wave speed, and phase. 4.3d Mechanical waves require a material medium through which to travel. 4.3e Waves are categorized by the direction in which particles in a medium vibrate about an equilibrium position relative to the direction of propagation of the wave, such as transverse and longitudinal waves. 4.3f Resonance occurs when energy is transferred to a system at its natural frequency. 4.3g Electromagnetic radiation exhibits wave characteristics. Electromagnetic waves can propagate through a vacuum. 4.3h when a wave strikes a boundary between two media, reflection, transmission, and absorption occur. A transmitted wave may be refracted.	E E E E E E E E	▪ List all the kinds of waves you can think of, then explain how wavelength and frequency are related to each wave type ▪ Describe all sources of wavs mentioned in 4.3. ▪ How can you tell waves don't transfer matter? ▪ Define and describe waves in terms of wave speed, phase, period, frequency and amplitude. ▪ Contrast light waves and mechanical waves. ▪ Describe all waves in terms of equilibrium, crests, and troughs. ▪ Describe and provide a variety of examples of resonance in the real world. ▪ Describe em radiation as a vibrating field. ▪ Classify all general behaviors of waves.	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Draw a picture ▪ Individual check problem ▪ Homework explanation ▪ Homework pairs/ newsprint ▪ Mini lab ▪ Formal lab ▪ Investigation ▪ Brainstorm- concept map ▪ Build a model ▪ Film ▪ Write a problem ▪ Video clip and analysis	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 4: Key Idea 4: Performance Indicator 4.3: Students can explain variations in wavelength and frequency in terms of the source of the vibrations that produce them, e.g., molecules, electrons, and nuclear particles.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
4.3i When a wave moves from one medium into another, the wave may refract due to a change in speed. The angle of refraction (measured with respect to the normal) depends on the angle of incidence and the properties of the media (indices of refraction) 4.3j The absolute index of refraction is inversely proportional to the speed of a wave. 4.3k All frequencies of electromagnetic radiation travel at the same speed in a vacuum. 4.3l Diffraction occurs when waves pass by obstacles or through openings. The wavelength of the incident wave and the size of the obstacle or opening affect how the wave spreads out. 4.3m When waves of a similar nature meet, the resulting interference may be explained using the principle of superposition. Standing waves are a special case of interference. 4.3n when a wave source and an observer are in relative motion, the observed frequency of the waves traveling between them is shifted (Doppler effect)	E E E E E	▪ Develop and describe a practical model that shows wave refraction. ▪ How is the index of refraction related to wave speed? ▪ Why does light's speed not depend on frequency? ▪ Develop a way of explaining why different reaction of waves occur. ▪ Why can two waves be at the same place at the same time, when two objects cannot? ▪ Explain how observed frequency can shift due to motion between observer and source.	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Draw a picture ▪ Individual check problem ▪ Homework explanation ▪ Homework pairs/ newsprint ▪ Mini lab ▪ Formal lab ▪ Investigation ▪ Brainstorm- concept map ▪ Build a model ▪ Film ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 4: Key Idea 5: Performance Indicator 5.1: Students can explain and predict different patterns of motion of objects (e.g., linear and uniform circular motion, velocity and acceleration, momentum and inertia)

Essential Knowledge/Skills (Major Understandings)	*Priority Code*	*Essential Question*	*Classroom Ideas*	*Assessment Ideas*	*Time/Notes*
5.1a Measured quantities can be classified as either vector or scalar. 5.1b A vector may be resolved into perpendicular components. 5.1c The resultant of two or more vectors, acting at any angle, is determined by vector addition. 5.1d An object in linear motion may travel with a constant velocity or with acceleration. 5.1e An object in free fall accelerates due to the force of gravity. Friction and other forces cause the actual motion of a falling object to deviate from its theoretical motion. 5.1f The path of a projectile is the result of the simultaneous effect of the horizontal and vertical components of its motion; these components act independently. 5.1g A projectile's time of flight is dependent upon the vertical component of its motion.	E E E E E E E	▪ What does a vector have that a scalar doesn't? ▪ How do components add up to original vector? ▪ What ways can vectors be added graphically? ▪ How is motion described in terms of velocity and acceleration? ▪ What is free fall? ▪ How can components of velocity be used to understand complex motion? ▪ Why doesn't horizontal velocity affect projectile's flight time?	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Draw a picture ▪ Individual check problem ▪ Homework explanation ▪ Homework pairs/ newsprint ▪ Mini lab ▪ Formal lab ▪ Investigation ▪ Brainstorm- concept map ▪ Build a model ▪ Film ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 4: Key Idea 5: Performance Indicator 5.1: Students can explain and predict different patterns of motion of objects (e.g., linear and uniform circular motion, velocity and acceleration, momentum and inertia)

Essential Knowledge/Skills (Major Understandings)	*Priority Code*	*Essential Question*	*Classroom Ideas*	*Assessment Ideas*	*Time/Notes*
5.1h The horizontal displacement of a projectile is dependent upon the horizontal component of its motion and its time of flight. 5.1i According to Newton's First Law, the inertia of an objet is directly proportional to its mass. An object remains at rest or moves with constant velocity, unless acted upon by an unbalanced force. 5.1j When the net force on a system is zero, the system is in equilibrium. 5.1k According to Newton's Second Law, an unbalanced force causes a mass to accelerate. 5.1l Weight is the gravitational force with which a planet attracts a mass. The mass of an object is independent of the gravitational field in which it is located. 5.1m The elongation or compression of a spring depends upon the nature of the spring (its spring constant) and the magnitude of the applied force. 5.1n Centripetal force is the net force which produces centripetal acceleration. In uniform circular motion, the centripetal force is perpendicular to the tangential velocity.	E E E E E E	▪ Why does horizontal velocity affect range? ▪ Define inertia. ▪ Why doesn't velocity change without a force? ▪ What does it mean to be in equilibrium? Can it be moving? ▪ How does Newton's 2nd law quantify inertia? ▪ Connect Newton's 2nd law to weight. ▪ Describe Hooke's Law. ▪ Why is a force needed to move in a circle?	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Draw a picture ▪ Individual check problem ▪ Homework explanation ▪ Homework pairs/ newsprint ▪ Mini lab ▪ Formal lab ▪ Investigation ▪ Brainstorm- concept map ▪ Build a model ▪ Film ▪ Write a problem ▪ Video clip/ analysis	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 4: Key Idea 5: Performance Indicator 5.1: Students can explain and predict different patterns of motion of objects (e.g., linear and uniform circular motion, velocity and acceleration, momentum and inertia)

Essential Knowledge/Skills (Major Understandings)	*Priority Code*	*Essential Question*	*Classroom Ideas*	*Assessment Ideas*	*Time/Notes*
5.1o Kinetic friction is a force that opposes motion. 5.1p The impulse imparted to an object causes a change in its momentum. 5.1q According to Newton's 3rd Law, forces occur in action/ reaction pairs. When one object exerts a force on a second, the second exerts a force on the first that is equal in magnitude and opposite in direction. 5.1rMomentum is conserved in a closed system. 5.1s field strength and direction are determined using a suitable test particle. 5.1t Gravitational forces are only attractive, whereas electrical and magnetic forces can be attractive or repulsive. 5.1u The inverse square law applies to electrical and gravitational fields produced by point sources.	E E E E E E E	▪ Why is a force needed to move in a circle? ▪ What causes kinetic friction and why is it different from static friction? ▪ Describe how impulse and momentum are related. ▪ Can an object exert a force without itself experiencing a force? ▪ What is momentum? How does it change in a closed and isolated system? ▪ What are fields used for? ▪ How is a force field defined? ▪ How do forces fundamentally differ? ▪ Explain why forces that are conveyed in 3 dimensions obey inverse square relationship?	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Draw a picture ▪ Individual check problem ▪ Homework explanation ▪ Homework pairs/ newsprint ▪ Mini lab ▪ Formal lab ▪ Investigation ▪ Brainstorm- concept map ▪ Build a model ▪ Video clip/ analysis ▪ Library research ▪ Internet research ▪ Open discussion with focused questions	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 4: Key Idea 5: Performance Indicator 5.3: Students can compare energy relationships within an atom's nucleus to those outside the nucleus.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
5.3a States of matter and energy are restricted to discrete values (quantized). 5.3b Charge is quantized on two levels. On the atomic level, charge is restricted to multiples of the elementary charge (charge on the electron or proton). On the subnuclear level, charge appears as fractional values of the elementary charge (quarks). 5.3c On the atomic level, energy is emitted or absorbed in discrete packets called photons. 5.3d The energy of a photon is proportional to its frequency. 5.3e On the atomic level, energy and matter exhibit the characteristics of both waves and particles. 5.3f Among other things, mass-energy and charge are conserved at all levels (from sub-nuclear to cosmic). 5.3g The Standard Model of Particle Physics has evolved from previous attempts to explain the nature of the atom and states that: - atomic particles are composed of sub-nuclear particles - the nucleus is a conglomeration of quarks which manifest themselves as protons and neutrons - each elementary particle has a corresponding antiparticle	E E E E E E E	▪ Describe energy quantization at an atomic level. ▪ Describe ways charge is quantified. ▪ How do you find the energy amount of a single photon at a particular frequency? ▪ What are the differences and similarities between atomic particles and photons? ▪ Discuss conservation on the atomic level and the universal level. Mention nuclear reactions on an atomic scale (decay) and on a galactic scale (supernova or stars). ▪ Using the information on the reference table, describe the attributes of the basic elementary particles and how they form nucleon.	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Draw a picture ▪ Individual check problem ▪ Homework explanation ▪ Homework pairs/ newsprint ▪ Mini lab ▪ Formal lab ▪ Investigation ▪ Brainstorm- concept map ▪ Build a model ▪ Video clip/ analysis ▪ Library research ▪ Internet research ▪ Open discussion with focused questions	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 4: Key Idea 5: Performance Indicator 5.3: Students can compare energy relationships within an atom's nucleus to those outside the nucleus.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
5.3h Behaviors and characteristics of matter, from the microscopic to the cosmic levels, are manifestations of its atomic structure. The macroscopic characteristics of matter, such as electrical and optical properties, are the result of microscopic interactions. 5.3i The total of the fundamental interactions is responsible for the appearance and behavior of the objects in the universe. 5.3j The fundamental source of all energy in the universe is the conversion of mass into energy.	E E E	▪ Explain several physical properties (conductivity, optical, etc.) in terms of the atomic /molecular structure. ▪ List the three main types of forces and describe their context. ▪ Trace the energy it takes to do work back to our Sun.	▪ Lecture ▪ Demo ▪ Homework explanation ▪ Build a model ▪ Video clip/ analysis ▪ Open discussion with focused questions	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 6: Key Idea 1: Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
SYSTEMS THINKING 1.1 Define boundary conditions when doing systems analysis to determine what influences a system and how it behaves.	I	▪ Give examples of closed and isolated mechanical systems. ▪ Discuss boundaries in terms of what can/ cannot influence a system.	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Mini-lab ▪ Formal lab ▪ Investigation ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 6: Key Idea 2: Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
MODELS 2.1 Revise a model to create a more complete or improved representation of the system. 2.2 Collect information about the behavior of a system and use modeling tools to represent the operation of the system. 2.3 Find and use mathematical models that behave in the same manner as the processes under investigation.	E E E	▪ Identify a system that is not closed and isolated and revise it. ▪ How do you choose the appropriate equation and display method to demonstrate a physical phenomenon?	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Mini-lab ▪ Formal lab ▪ Investigation ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 6: Key Idea 3: The grouping of magnitudes of size, time, frequency, and pressures or other units of measurement into a series of relative order provides a useful way to deal with the immense range and the changes in scale that affect the behavior and design of systems.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
EQUILIBRIUM AND SCALE 3.1 Describe the effects of changes in scale on the functioning of physical, biological, or designed systems. 3.2 a Extend their use of powers of ten notation to understanding the exponential function and performing operations with exponential factors. 3.2b Orders of magnitude are used to estimate quantitative results. 3.2c. Scientific notation is used to simplify calculations.	E E E E	▪ How are orders of magnitude helpful? ▪ Demonstrate the need for scientific notation and metric pre-fixes.	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Mini-lab ▪ Formal lab ▪ Investigation ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 6: Key Idea 4: Equilibrium is a state of stability due either to a lack of changes (static equilibrium) or a balance between opposing forces (dynamic equilibrium)					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
EQUILIBRIUM AND STABILITY 4.1 Describe specific instances of how disturbances might affect a system's equilibrium, from small disturbances that do not upset the equilibrium to larger disturbances (threshold level) that cause the system to become unstable 4.2 Cite specific examples of how dynamic equilibrium is achieved by equality of change in opposing directions.	E E	▪ Describe the circumstances that can lead to a shift from static equilibrium to acceleration. ▪ How can an object be moving without a net force?	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Mini-lab ▪ Formal lab ▪ Investigation ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 6: Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Question***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
PATTERNS OF CHANGE 5.1 Use sophisticated mathematical models, such as graphs and equations of various algebraic or trigonometric functions. 5.2 Search for multiple trends when analyzing data for patterns, and identify data that do not fit the trends.	E E	▪ Describe all the ways we can use graphs to display and summarize and interpret data. ▪ Is all data correct? Since it isn't, develop and use techniques to identify and discount data that is irrelevant.	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Mini-lab ▪ Formal lab ▪ Investigation ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 7: Key Idea 1: The knowledge and skill of mathematics, science, and technology are use together to make informed decisions and solve problems, especially those relating to issues of science/ technology/ society, consumer decision making, design, and inquiry into phenomena.

Essential Knowledge/Skills (Major Understandings)	*Priority Code*	*Essential Question*	*Classroom Ideas*	*Assessment Ideas*	*Time/Notes*
CONNECTIONS 7.1a Physics can be used in solving problems on many scales, e.g., local, national, and global. 7.1b Scientific methodology is used to solve real-world problems.	E E	▪ How can physics be used to improve the world? ▪ How is analysis helpful in everyday life?	▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Mini-lab ▪ Formal lab ▪ Investigation ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	

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Standard 7: Key Idea 2: Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.

Essential Knowledge/Skills (Major Understandings)	*Priority Code*	*Essential Question*	*Classroom Ideas*	*Assessment Ideas*	*Time/Notes*
STRATEGIES 7.2a Collect, analyze, interpret, and present data, using appropriate tools. 7.2b if students participate in an extended, culminating mathematics, science, and technology project, then the students should: - work effectively - gather and process information - generate and analyze ideas - observe common themes - realize ideas - present results	E N		▪ Lecture ▪ Demo ▪ Newsprint summary ▪ Wipe board example ▪ Mini-lab ▪ Formal lab ▪ Investigation ▪ Write a problem	▪ Quick quiz ▪ Start question ▪ Homework checks ▪ Wipe board work ▪ Check problem ▪ Homework pairs ▪ Mini-lab ▪ Lab report ▪ Problem writing ▪ Unit check ▪ Mini-test ▪ Test revisions ▪ Chapter test ▪ Lab report/ rubric scoring	