Standard	Content Standards	Performance Expectations	*Physical Science: Exploring Matter and Energy* Student Edition, Annotated Teacher Edition
			Student CD: SE in PDF format with audio files, Spanish activities, Interactive Laboratory activities, Presentation Builder, Graphic Organizer Software Teacher CD: ATE in PDF format, Instructional Interactivities, Presentation Builder, Science notebook and graphics organizer software, Spanish activities
EALR 1: Systems (SYS) - Predictability & Feedback			
9-12 SYSA	*Feedback* is a process in which the *output* of a *system* provides information used to regulate the operation of the *system*. *Positive feedback* increases the disturbance to a *system*. *Negative feedback* reduces the disturbance to a *system*.	Give examples of a positive *feedback system* and *explain* its regulatory mechanism (e.g., global warming causes Earth's ice caps to melt, reflecting less energy to space, increasing temperatures).*a Give examples of a negative *feedback system* and *explain* its regulatory mechanism (e.g., when a human body overheats, it produces sweat that cools the body by evaporation).*a	Ch 11, Pg 184-185 Ch 15, Pg 244-247, 250-251 *Figure It Out,* pg 246 Transparencies: 26- Laundry/Force, 27- Effect of machines
9-12 SYSB	Systems thinking can be especially useful in analyzing complex situations. To be useful, a *system* needs to be specified as clearly as possible.	Determine if a *systems* approach will be helpful in answering a *question* or solving a problem.*b Represent the *system* with a diagram specifying components, boundaries, flows, and *feedbacks*.*a *Describe* relevant *subsystems* and the larger *system* that contains the *system* being analyzed.*a Determine how the *system functions* with respect to other *systems*.	Ch 6, Pg 93-105 *Figure It Out,* pg 96, 101 Laboratory Manual, 6a, 6c Student Workbook, 33-35 Transparency: 9-Periodic table
9-12 SYSC	In complex *systems*, entirely new and unpredictable *properties* may emerge. Consequently, modeling a complex *system* in sufficient detail to make *reliable* predictions may not be possible.	Create a simplified *model* of a complex *system*. Trace the possible consequences of a change in one part of the *system* and *explain how* the simplified *model* may not be adequate to reliably *predict* consequences.	Ch 5, Pg 76-83 *Figure It Out,* pg 79, 81 Laboratory Manual, 5b, 5c Transparencies: 7-Ruther's experiment, 8-Spectrum/ energy levels Student CD: Interactive Lab 5b, 5c; Graphic Organizer
9-12 SYSD	Systems can be changing or in equilibrium.	Analyze whether or not a *system* (e.g., population) is changing or in *equilibrium*. *c Determine whether a *state* of equilibrium is *static* or *dynamic* (e.g., inflows equal outflows).	Ch 11, Pg 178, 184-185 Ch 13, Pg 207-208 *Figure It Out,* pg 178, 208 Transparencies: 20- Stable ratio, 24- Net force
EALR 2: Inquiry (INQ) - Conducting Analyses & Thinking Logically			
9-12 INQA Question	Scientists *generate* and *evaluate* *questions* to *investigate* the *natural* *world*	*Generate* and *evaluate* a *question* that can be answered through a scientific investigation. Critique *questions generated* by others and *explain* whether or not the *questions* are scientific.*a	Ch 1, pg 7-8 *Explore It,* e.g. pg 9, 23 *After You Read,* e.g. pg 29 Laboratory Manual, e.g. 3b Student Workbook, e.g. 5-6

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9-12 INQB Investigate	Scientific progress requires the use of various methods appropriate for answering different kinds of research *questions*, a thoughtful plan for gathering data needed to answer the *question*, and care in collecting, analyzing, and displaying the data.	Plan and conduct a scientific investigation, choosing a method appropriate to the *question* being asked. Collect, analyze, and display data using calculators, computers, or other technical devices when available.*b	Ch 1, pg 8-12 *Explore It,* e.g. pg 9, 23, 32, 183 *Research the Big Picture,* (ATE) e.g. pg 70-71 Appendix D, pg 465 Laboratory Manual e.g. 3b Student Workbook, e.g. 6 Student CD: Graphics Organizer, Presentation Builder
9-12 INQC Explain	Conclusions must be logical, based on *evidence*, and consistent with prior *established* knowledge.	Draw conclusions supported by *evidence* from the investigation and consistent with established scientific knowledge.*c Analyze alternative explanations and decide which best fits the data.*d	Ch 1, pg 11-12 *As You Read,* pg 50 *People In Science*, pg 25, 56 *Explore It,* e.g. pg 9, 23 *Research and Report,* pg 70 *Research the Big Picture,* (ATE) e.g. pg 70-71 Laboratory Manual, e.g. 1a, 1b Student Workbook, e.g. 3, 6
9-12 INQD Communicate Clearly	The methods and procedures that scientists use to obtain *evidence* must be clearly reported to enhance opportunities for further investigation.	Write a detailed laboratory report that includes: the *question* that motivated the study, a justification for the kind of investigation chosen, *hypotheses* (if any), a description of what was done, a summary of data in tables and graphs, and a conclusion, based on the *evidence*, that responds to the *question*.	Ch 1, pg 10-12 *Explore It,* e.g. pg 9, 183 *Explain It,* e.g. pg 25 *Extend It*, e.g. pg 14 Unit Project, (ATE) pg 72 Laboratory Manual, e.g. 1a, 1b Student Workbook, e.g. 3, 6 Student CD: Graphics Organizer, Presentation Builder
9-12 INQE Model	The essence of scientific investigation involves the development of a *theory* or conceptual *model* that can *generate* testable predictions.	Formulate one or more *hypotheses* based on a *model* or *theory* of a causal *relationship*. Demonstrate creativity and critical thinking to formulate and *evaluate* the *hypotheses*.	Ch 1, pg 7-8 Ch 5, pg 78-79 *Explore It,* e.g. pg 9, 23, 32 *After You Read,* e.g. pg 12 *People In Science*, pg 56 *Science Journal,* pg 70 Laboratory Manual, e.g. 3b, 4c Student Workbook, e.g. 6, 24
9-12 INQF Communicate	*Science* is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new *evidence* comes to light.	*Evaluate* an investigation to determine if it was a *valid* means of answering the *question*, and whether or not the results were *reliable*. *e *Describe* the development of a scientific *theory* that illustrates logical reasoning, creativity, testing, revision, and replacement of prior *ideas* in light of new *evidence*.	Ch 5, pg 80-81 Ch 6, pg 91-92 *Before You Read,* e.g. pg 91 *As You Read,* e.g. pg 81, 93 Transparencies: 7- Ruther's Experiment, 8- Emission line
9-12 INQG Intellectual Honesty	Public *communication* among scientists is an essential aspect of research. Scientists *evaluate* the *validity* of one another's investigations, check the *reliability* of results, and *explain* inconsistencies in findings.	Participate in a scientific discussion about their own investigations and those performed by others. Respond to *questions* and criticisms, and if appropriate, revise explanations based on these discussions.	Ch 1, pg 5-6, 12 Ch 5, pg 78-79 *Extend It,* e.g.. pg 14 *Science Journal,* pg 70-71 *People In Science*, pg 25, 56 *Research and Report,* pg 70, 108, 181, 258 Laboratory Manual, e.g. 1a Student Workbook, e.g. 6 Transparency: 7- Ruther's Experiment

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9-12 INQH Intellectual Honesty	Scientists carefully *evaluate* sources of information for *reliability* before using that information. When referring to the *ideas* or findings of others, they cite their sources of information.	Provide appropriate citations for all *ideas*, findings, and information used in any and all written reports. *Explain* the consequences for failure to provide appropriate citations.	*Research and Report, e.g.* pg 70, 108 *Science Links,* e.g. pg 73 Unit Project, (ATE) e.g. pg 72
EALR 3: Application (APP) - Combining Science & Technology to Solve Problems			
9-12 APPA	*Science* affects society and cultures by influencing the way many people think about themselves, others, and the *environment*. Society also affects *science* by its prevailing views about what is important to study and by deciding what research will be funded.	*Describe* ways that scientific *ideas* have influenced society or the development of differing cultures. List *questions* that scientists *investigate* that are stimulated by the needs of society (e.g., medical research, *global climate* change).	*Extend It*, e.g. pg 14, 187, 385 *Connection*, e.g. pg 26, 35, 37 50 *Science Journal*, e.g. pg 70-71 *Reading Links,* (ATE) e.g. 19, 39 Laboratory Manual, e.g. 1a Student Workbook, e.g. 6 *SciLinks*, e.g. pg 3, 20, 40 *Unit Project*, (ATE) e.g. pg 2, 72, 110
9-12 APPB	The *technological design process* begins by defining a problem in terms of *criteria* and *constraints*, conducting research, and generating several different solutions.	Work collaboratively with other students to *generate ideas* for solving a problem. Identify *criteria* and *constraints*, research the problem, and *generate* several possible *solutions*.	Ch 1, pg 5-6, 12 *Explore It,* e.g. 218 *Research the Big Picture,* (ATE) e.g. pg 70, 108-109 Laboratory Manual, e.g. 12c
9-12 APPC	Choosing the best *solution* involves comparing alternatives with respect to *criteria* and *constraints*, then building and testing a *mode* or other representation of the final design.	Choose the best *solution* for a problem, create a model or drawing of the final design, and devise a way to test it. Redesign the *solution*, if necessary, then present it to peers.*b	*People in Science,* e.g. pg 25, 56 *Explore It,* e.g. pg 32 *SciLinks*, e.g. pg 3, 20, 40 *Research the Big Picture,* (ATE) e.g. pg 70, 108 Student CD: Presentation Builder, Graphics Organizer
9-12 APPD	The ability to solve problems is greatly enhanced by use of mathematics and information technologies.	Use proportional reasoning, *functions*, graphing, and estimation to solve problems.*a*b*c Use computers, probes, and software when available to collect, display, and analyze data.	Ch 1, pg 8, 10-12 *Explore It, e.g.* pg 9, 23, 183 *Think About It,* e.g. pg 3 *Research and Report*, e.g. pg 70, 108 *SciLinks*, e.g. pg 3, 20, 40 Appendix A pg 462 Appendix D pg 465 Laboratory Manual, e.g.1b, 2a Student CD: Interactive Lab 14c, Graphic Organizer 6tudent Workbook, e.g.. 3, 6
9-12 APPE	Perfect *solutions* do not exist. All technological *solutions* involve *trade-offs* in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended others not.	Analyze a societal issue that may be addressed through *science* and/or *technology*. *Compare* alternative *solutions* by *considering trade-offs* and unintended consequences (e.g., removing dams to increase salmon spawning).	Ch 11, pg 185-186 Ch 16, pg 271-275 *After You Read, pg 274* *Connection*, e.g. pg 185 Transparency: 30- Energy resources
9-12 APPF	It is important for all citizens to *apply science* and *technology* to critical issues that influence society.	Critically analyze scientific information in current events to make personal choices, or to inform public-policy decisions.*d	Ch 16, pg 276-277 *Extend It*, pg 277 *As You Read,* pg 277 *After You Read,* pg 277
EALR 4: Physical Science: Force and Motion (PS1) - *Newton's Laws*			

Standard	Content Standards	Performance Expectations	*Physical Science: Exploring Matter and Energy* Student Edition, Annotated Teacher Edition
9-11 PS1A	*Average velocity* is defined as a change in position with respect to time. Velocity includes both *speed* and direction.	Calculate the *average velocity* of a moving object, given the object's change in position and time. (v = x2-x1/ t2-t1) *a *Explain how* two objects moving at the same *speed* can have different velocities.	Ch 12, pg 194-196, 198
9-11 PS1B	*Average acceleration* is defined as a change in velocity with respect to time. *Acceleration* indicates a change in *speed* and/or a change in direction.	Calculate the *average acceleration* of an object, given the object's change in velocity with respect to time. (a = v2-v1/ t2-t1) *a *Explain how* an object moving at constant *speed* can be accelerating.*b	Ch 12, pg 199-201 Appendix C, pg 464 Student Workbook, 75-76 Laboratory Manual, 12c
9-11 PS1C	An object at rest will remain at rest unless acted on by an unbalanced *force*. An object in *motion* at constant velocity will continue at the same velocity unless acted on by an unbalanced *force*. (Newton's 1st *Law* of *Motion*, the =*Law* of Inertia)	Given specific scenarios, *compare* the *motion* of an object acted on by balanced *forces* with the *motion* of an object acted on by unbalanced *forces*.	Ch 13, pg 208, 217 *After You Read,* pg 218 *Figure It Out,* pg 208 Student Workbook, 81, 83, 85 Transparency: 24- Net force
9-11 PS1D	A net *force* will cause an object to accelerate or change direction. A less massive object will *speed* up more quickly than a more massive object subjected to the same *force*. (Newton's 2nd *Law* of *Motion*, F=ma)	*Predict* how objects of different *masses* will accelerate when subject to the same *force*. Calculate the *acceleration* of an object, given the object's *mass* and the net *force* on the object, using Newton's 2nd *law* of *Motion* (F=ma).*c	Ch 12, pg 202-203 Ch 13, pg 218 Student Workbook, 83-85
9-11 PS1E	Whenever one object exerts a *force* on another object, a *force* of equal magnitude is exerted on the first object in the opposite direction. (Newton's 3rd *Law* of *Motion*)	Illustrate with everyday examples that for every action there is an equal and opposite reaction (e.g., a person exerts the same *force* on the Earth as the Earth exerts on the person).	Ch 12, pg 203 Ch 13, pg 218-219 Student Workbook, 82-83, 85
9-11 PS1F	*Gravitation* is a universal attractive *force* by which objects with *mass* attract one another. The gravitational *force* between two objects is proportional to their *masses* and inversely proportional to the square of the distance between the objects. (Newton's *Law* of Universal Gravitation)	*Predict* how the gravitational *force* between two bodies would differ for bodies of different *masses* or different distances apart.*d *Explain how* the *weight* of an object can change while its *mass* remains constant.	Ch 13, pg 212-215 *After You Read,* pg 216 *Connection,* pg 214 Laboratory Manual, 13a
9-11 PS1G	Electrical *force* is a *force* of nature, independent of *gravity* that exists between charged objects. Opposite charges attract while like charges repel.	*Predict* whether two charged objects will attract or repel each other, and *explain* why.	Ch 23, pg 392-394 *After You Read,* pg 394 *Figure It Out,* pg 394 Student Workbook, 144

Standard	Content Standards	Performance Expectations	*Physical Science: Exploring Matter and Energy* Student Edition, Annotated Teacher Edition
9-11 PS1H	Electricity and magnetism are two aspects of a single *electromagnetic force*. Moving electric charges produce magnetic *forces*, and moving magnets produce electric *forces*.	Demonstrate and *explain that* an electric current flowing in a wire will create a magnetic field around the wire (e.g., *electromagnetic effect*). Demonstrate and *explain that* moving a magnet near a wire will cause an electric current to flow in the wire (e.g., the generator *effect*).	Ch 24, pg 413-414 Ch 25, pg 427-429, 431-435 Student Workbook, 157, 159-160 Laboratory Manual, 25a Transparencies: 45- Magnetic fields, 46- Electric motor
EALR 4: Physical Science - Properties and Change (PS2) - *Chemical Reactions*			
9-11 PS2A	*Atoms* are composed of *protons*, *neutrons*, and *electrons*. The *nucleus* of an *atom* takes up very little of the *atom*'s volume but makes up almost all of the *mass*. The *nucleus* contains *protons* and *neutrons*, which are much more massive than the *electrons* surrounding the *nucleus*. *Protons* have a positive charge, *electrons* are negative in charge, and *neutrons* have no net charge.	*Describe* the relative charges, *masses*, and locations of the *protons*, *neutrons*, and *electrons* in an *atom* of an element.	Ch 2, pg 26 Ch 5, pg 77-80, 82, 84-86 Ch 7, pg 113-114 Ch 11, pg 177, 179 Ch 23, pg 392 Student Workbook, 25, 30-31 Laboratory Manual, 5a-5c Transparencies: 4- He & C atoms, 7- Ruther's experiment, 10- Energy levels, 20- Stable ratio Student CD: Interactive Lab 5c
9-11 PS2B	*Atoms* of the same element have the same number of *protons*. The number and arrangement of *electrons* determines how the *atom* interacts with other *atoms* to form molecules and ionic *compounds*.	Given the number and arrangement of *electrons* in the outermost shell of an *atom*, *predict* the *chemical properties* of the element.	Ch 2, pg 26 Ch 3, pg 47-48 Ch 6, pg 85, 99-105 Ch 7, pg 114-115, 118-119 *Figure It Out,* pg 101 Student Workbook, 32-35, 42 Laboratory Manual, 6c Transparencies: 4- He & C atoms, 10- Chl ions
9-11 PS2C	When *elements* are listed in order according to the number of *protons*, repeating *patterns* of physical and *chemical properties* identify families of *elements* with similar *properties*. This Periodic Table is a consequence of the repeating *pattern* of outermost *electrons*.	Given the number of *protons*, identify the *element* using a Periodic Table. *Explain* the arrangement of the *elements* on the Periodic Table, including the significant *relationships* among *elements* in a given column or row.	Ch 6, pg 91-105 *Figure It Out,* pg 96, 98, 101 Student Workbook, 32-38 Laboratory Manual, 6a, 6c Transparency: Periodic table
9-11 PS2D	*Ions* are produced when *atoms* or molecules lose or gain *electrons*, thereby gaining a positive or negative electrical charge. *Ions* of opposite charge are attracted to each other, forming *ionic bonds*. Chemical formulas for *ionic compounds* represent the proportion of *ion* of each *element* in the *ionic array*.	*Explain how ions* and *ionic bonds* are formed (e.g., sodium *atoms* lose an *electron* and chlorine *atoms* gain an *electron*, then the charged *ions* are attracted to each other and form bonds). *Explain* the meaning of a chemical formula for an *ionic array* (e.g., NaCl).	Ch 7, pg 115-119, 122-124 Student Workbook, 39, 41 Laboratory Manual, 7b, 7c Transparencies: 10- Chl ions, 1- Ionic bonds

Standard	Content Standards	Performance Expectations	*Physical Science: Exploring Matter and Energy* Student Edition, Annotated Teacher Edition
9-11 PS2E	*Compounds* are composed of two or more *elements* bonded together in a fixed proportion by sharing *electrons* between *atoms*, forming *covalent bond*s. Such *compound*s consist of well-defined *molecules*. Formulas of *covalent compound*s represent the types and number of *atoms* of each *element* in each molecule.	Give examples to illustrate that molecules are groups of two or more *atoms* bonded together (e.g., a molecule of water is formed when one oxygen *atom* shares *electrons* with two hydrogen *atoms*). *Explain* the meaning of a chemical formula for a molecule (e.g., CH4 or H2O).*a	Ch 2, pg 22, 28 Ch 7, pg 112, 117-118, 120-122, 124-125 Ch 10, pg 164 *Extend It,* pg 125 Student Workbook, 39, 41 Laboratory Manual, 7a, 7c Transparencies: 11- Na & Chl ions, 12- Covalent bonds
9-11 PS2F	All forms of life are composed of large molecules that contain carbon. Carbon *atoms* bond to one another and other *elements* by sharing, forming *covalent bond*s. Stable molecules of carbon have four *covalent bond*s per carbon *atom*.	Demonstrate how carbon *atoms* form four *covalent bond*s to make large molecules. Identify the *functions* of these molecules (e.g., plant and animal tissue, polymers, sources of food and nutrition, *fossil fuels*).	Ch 10, pg 162-173 *Explain It,* pg 170 *Explore It,* pg 172 *Figure It Out,* pg 165, 169, 173 Student Workbook, 59-65 Laboratory Manual, 10a-10c Transparencies: 17- Hydrocarbons, 18- Polymers, 19- Protein synthesis
9-11 PS2G	*Chemical reactions* change the arrangement of *atoms* in the molecules of substances. *Chemical reactions* release or acquire energy from their surroundings and result in the formation of new substances.	*Describe* at least three *chemical reactions* of particular importance to humans (e.g., burning of *fossil fuels*, *photosynthesis*, rusting of metals). Use a chemical equation to illustrate how the *atoms* in molecules are arranged before and after a reaction. Give examples of *chemical reactions* that either release or acquire energy and result in the formation of new substances (e.g., burning of fossil fuels releases large amounts of energy in the form of heat).	Ch 3, pg 50-51 Ch 8, pg 129-140 Ch 17, pg 289 *Explain It,* pg 133 *After You Read,* pg 138 *Connection,* pg 50 Student Workbook 46-52, 117, Laboratory Manual, 8a, 8b Transparencies: 13- Chemical reactions, 31- Calorimeter
9-11 PS2H	*Solutions* are *mixtures* in which particles of one substance are evenly distributed through another substance. *Liquids* are limited in the amount of dissolved *solid* or *gas* that they can contain. *Aqueous solutions* can be described by relative quantities of the dissolved substances and acidity or alkalinity (pH).	Give examples of *common solutions*. *Explain* the differences among the processes of dissolving, melting, and reacting. *Predict* the result of adding increased amounts of a substance to an *aqueous solution*, in concentration and pH.*b	Ch 2, pg 33-35 Ch 9, pg 145-148, 150, 152, 155-158 *Figure It Out,* pg 37, 148, 151, 156 Student Workbook, 53-58 Laboratory Manual, 3b, 9b, 9c Transparencies: 14- Molecule of H2O/Salt, 16- ph scale
9-11 PS2I	The rate of a physical or *chemical change* may be affected by *factors* such as temperature, surface area, and pressure.	*Predict* the *effect* of a change in temperature, surface area, pressure, on the rate of a given physical or *chemical change*.*b	Ch 3, pg 42, 44-46, 49-51 Ch 4, pg 61-67 Ch 9, pg 149, 151, 153 Ch 14, pg 224-225 Ch 17, pg 290-295 *Explore It,* pg 149, 153 *Figure It Out,* pg 46, 151 Student Workbook, 13, 15, 16, 56, 108 Laboratory Manual, 3c, 9a Transparencies: 5- Boyle's law, 6- State of changes of water, 15- Solubility, 25- Hydraulic device

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9-11 PS2J	The number of *neutrons* in the *nucleus* of an *atom* determines the *isotope* of the *element*. Radioactive isotopes are unstable and emit particles and /or *radiation*. Though the timing of a single nuclear decay is unpredictable, a large group of nuclei decay at a predictable rate, making it possible to estimate the age of materials that contain radioactive isotopes.	Given the *atomic number* and *atomic mass number* of an isotope, students draw and label a *model* of the *isotope's* atomic structure (number of *protons*, *neutrons* and *electrons*). Given data from a sample, use a decay curve for a radioactive isotope to find the age of the sample. *Explain how* the decay curve is derived. *c	Ch 5, pg 84-87 Ch 6, pg 96 Ch 11, pg 179-183 *Figure It Out,* pg 85, 182 Laboratory Manual, 5c, 11b Transparency: 21- Alpha/ beta decay Student CD: Interactive Labs 5c, 11b
9-11 PS2K	Nuclear reactions convert *matter* into energy, releasing large amounts of energy compared with *chemical reactions*. *Fission* is the splitting of a large *nucleus* into smaller pieces. *Fusion* is the joining of nuclei and is the process that *generates* energy in the Sun and other stars.	Distinguish between nuclear *fusion* and nuclear *fission* by describing how each process transforms *elements* present before the reaction into *elements* present after the reaction.	Ch 11, pg 184-186 Ch 16, pg 273-274 *Connection,* pg 187 Transparency: 30- Energy resources
EALR 4: Physical Science: Energy: Transfer, Transformation, and Conservation (PS3) - *Transformation and Conservation of Energy*			
9-11 PS3A	Although energy can be *transferred* from one object to another and can be *transformed* from one *form* of energy to another form, the total energy in a *closed system* is constant and can neither be created nor destroyed. (*Conservation of Energy*)	*Describe* a situation in which energy is *transferred* from one place to another, and *explain how* energy is conserved.*a *Describe* a situation in which energy is *transformed* from one *form* to another and *explain how* energy is conserved.*a	Ch 15, pg 241, 243 Ch 16, pg 262, 265-266, 268-273 *Connection,* pg 241 *Explore It,* pg 263 Student Workbook, 103 Laboratory Manual, 8c Transparencies: 29- Radiant energy, 30- Energy resources
9-11 PS3B	*Kinetic energy* is the energy of *motion*. The kinetic energy of an object is defined by the equation: Ek = ½ mv2	Calculate the *kinetic energy* of an object, given the object's *mass* and velocity. *b	Ch 16, pg 263 Appendix C, pg 464 Student Workbook, 103
9-11 PS3C	*Gravitational potential energy* is due to the separation of mutually attracting *masses*. *Transformations* can occur between *gravitational potential energy* and *kinetic energy*, but the total amount of energy remains constant.	Give an example in which *gravitational potential energy* and *kinetic energy* are changed from one to the other (e.g., a child on a swing illustrates the alternating *transformation* of *kinetic* and *gravitational potential energy*).	Ch 16, pg 264, 267, 269 *Figure It Out*, pg 267 Appendix C, pg 464 Student Workbook, 103 Transparency: 29- Roller coaster

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9-11 PS3D	*Waves* (including sound, seismic, light, and water *waves*) *transfer* energy when they interact with *matter*. *Waves* can have different *wavelengths, frequencies*, *amplitudes*, and travel at different *speeds*.	Demonstrate how energy can be transmitted by sending *waves* along a spring or rope. Characterize physical *waves* by *frequency, wavelength, amplitude*, and *speed*. *Apply* these *properties* to the pitch and volume of sound *waves*, and to the *wavelength* and magnitude of water *waves*.*b	Ch 19, pg 315-331 Ch 20, pg 335-340 *Figure It Out*, pg 317, 319, 329, 339, 340 *Reading Links* (ATE) pg 333 Appendix C, pg 464 Student Workbook, 119-125, 128 Laboratory Manual, 19a-19c, 20a, 20b Transparencies: 34- Waves in rope, 35- Wave length, 36- Sound waves Student CD: Interactive Labs 19b, 19c
9-11 PS3E	*Electromagnetic waves* differ from physical *waves* because they do not require a medium and they all travel at the same *speed* in a vacuum. This is the maximum *speed* that any object or *wave* can travel. Forms of *electromagnetic waves* include Xrays, ultraviolet, visible light, infrared, and radio.	Illustrate the *electromagnetic spectrum* with a labeled diagram, showing how regions of the spectrum differ regarding *wavelength*, *frequency*, and energy, and how they are used (e.g., infrared in *heat* lamps, microwaves for heating foods, Xrays for medical imaging).	Ch 17, pg 286 Ch 19, pg 318 Ch 21, pg 353-365 Ch 26, pg 448-451 *Figure It Out*, pg 359, 364 Student Workbook, 131-137 Laboratory Manual, 21a-21c Student CD: Interactive Lab 21b Transparency: 38- CFS's destroying ozone