

## Science 7

State Standard Number	State Standard Area/Description	Unit Name	Course Topic Description
1	Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.		
1.M1	Abstraction and symbolic representation are used to communicate mathematically.		
1.M1.1	Extend mathematical notation and symbolism to include variables and algebraic expressions in order to describe and compare quantities and express mathematical relationships.		
1.M1.1a	identify independent and dependent variables	Lesson 2: Variables in Scientific Investigations	"Independent and Dependent variables" p.8
1.M1.1b	identify relationships among variables including: direct, indirect, cyclic, constant; identify non-related material		
1.M1.1c	apply mathematical equations to describe relationships among variables in the natural world		
1.M2	Deductive and inductive reasoning are used to reach mathematical conclusions.		
1.M2.1	Use inductive reasoning to construct, evaluate, and validate conjectures and arguments, recognizing that patterns and relationships can assist in explaining and extending mathematical phenomena.		

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1.M2.1a	interpolate and extrapolate from data	Lesson 3: Organizing Data in Tables and Graphs	"Interpolation and Extrapolation Assignment"
1.M2.1b	quantify patterns and trends		
1.M3	Critical thinking skills are used in the solution of mathematical problems.		
1.M3.1	Apply mathematical knowledge to solve real-world problems and problems that arise from the investigation of mathematical ideas, using representations such as pictures, charts, and tables.		
1.M3.1a	use appropriate scientific tools to solve problems about the natural world	Lesson 1: Tools of science	This entire lesson encompasses this standard.

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1.S1	The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.		
1.S1.1	Formulate questions independently with the aid of references appropriate for guiding the search for explanations of everyday observations.		
1.S1.1a	formulate questions about natural phenomena		
1.S1.1b	identify appropriate references to investigate a question		

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1.S1.1c	refine and clarify questions so that they are subject to scientific investigation		
1.S1.2	Construct explanations independently for natural phenomena, especially by proposing preliminary visual models of phenomena.		
1.S1.2a	independently formulate a hypothesis		
1.S1.2b	propose a model of a natural phenomenon		
1.S1.2c	differentiate among observations, inferences, predictions, and explanations		

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1.S1.3	Represent, present, and defend their proposed explanations of everyday observations so that they can be understood and assessed by others.	Lesson 3: Organizing Data in Tables and Graphs	"Constructing Graphs Lab Assignment"
1.S1.4	Seek to clarify, to assess critically, and to reconcile with their own thinking the ideas presented by others, including peers, teachers, authors, and scientists.	Lesson 4: Science and Society	"Thinking Critically About Scientific Claims" p.9
1.S2	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.		
1.S2.1	Use conventional techniques and those of their own design to make further observations and refine their explanations, guided by a need for more information.		
1.S2.1a	demonstrate appropriate safety techniques		

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		Lesson 11: Chemistry and the Periodic Table	"Solubility Lab"
1.S2.1b	conduct an experiment designed by others		
1.S2.1c	design and conduct an experiment to test a hypothesis		
1.S2.1d	use appropriate tools and conventional techniques to solve problems about the natural world, including:		
1.S2.1d.1	measuring		
1.S2.1d.2	observing		
1.S2.1d.3	describing		
1.S2.1d.4	classifying		
1.S2.1d.5	sequencing		
1.S2.2	Develop, present, and defend formal research proposals for testing their own explanations of common phenomena, including ways of obtaining needed observations and ways of conducting simple controlled experiments.	Lesson 6: Technological Design	"Proposing and Speaking About Solutions to a Problem" Assignment
1.S2.2a	include appropriate safety procedures		
1.S2.2b	design scientific investigations (e.g., observing, describing, and comparing; collecting samples; seeking more information, conducting a controlled experiment; discovering new objects or phenomena; making models)		
1.S2.2c	design a simple controlled experiment		
1.S2.2d	identify independent variables (manipulated), dependent variables (responding), and constants in a simple controlled experiment	Lesson 2: Variables in Scientific Investigations	"Independent and Dependent Variables" p.8
1.S2.2e	choose appropriate sample size and number of trials	Lesson 2: Variables in Scientific Investigations	"Repeated Trials Assignment"
1.S2.3	Carry out their research proposals,		

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	recording observations and measurements (e.g., lab notes, audiotape, computer disk, videotape) to help assess the explanation.		
1.S2.3a	use appropriate safety procedures		
1.S2.3b	conduct a scientific investigation		
1.S2.3c	collect quantitative and qualitative data		
1.S3	The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into phenomena.		
1.S3.1	Design charts, tables, graphs, and other representations of observations in conventional and creative ways to help them address their research question or hypothesis.	Lesson 3: Organizing Data in Tables and Graphs	“Constructing Graphs Lab Assignment”
1.S3.1a	organize results, using appropriate graphs, diagrams, data tables, and other models to show relationships	Lesson 3: Organizing Data in Tables and Graphs	“Constructing Graphs Lab Assignment”
1.S3.1b	generate and use scales, create legends, and appropriately label axes	Lesson 3: Organizing Data in Tables and Graphs	“Constructing Graphs Lab Assignment”
1.S3.2	Interpret the organized data to answer the research question or hypothesis and to gain insight into the problem.		
1.S3.2a	accurately describe the procedures used and the data gathered		
1.S3.2b	identify sources of error and the limitations of data collected		
1.S3.2c	evaluate the original hypothesis in light of the data		
1.S3.2d	formulate and defend explanations and conclusions as they relate to scientific phenomena		
1.S3.2e	form and defend a logical argument about cause-and-effect relationships in an investigation		
1.S3.2f	make predictions based on experimental data		
1.S3.2g	suggest improvements and recommendations for further studying		

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1.S3.2h	use and interpret graphs and data tables	Lesson 3: Organizing Data in Tables and Graphs	“Constructing Graphs Lab Assignment”
1.S3.3	Modify their personal understanding of phenomena based on evaluation of their hypothesis.		
1.T1	Engineering design is an iterative process involving modeling and optimization (finding the best solution within given constraints); this process is used to develop technological solutions to problems within given constraints.		
1.T1.1	Identify needs and opportunities for technical solutions from an investigation of situations of general or social interest.	Lesson 6: Technological Design	“Proposing and Speaking About Solutions to a Problem” Assignment
1.T1.1a	identify a scientific or human need that is subject to a technological solution which applies scientific principles	Lesson 6: Technological Design	“Proposing and Speaking About Solutions to a Problem” Assignment
1.T1.2	Locate and utilize a range of printed, electronic, and human information resources to obtain ideas.		
1.T1.2a	use all available information systems for a preliminary search that addresses the need		
1.T1.3	Consider constraints and generate several ideas for alternative solutions, using group and individual ideation techniques (group discussion, brainstorming, forced connections, role play); defer judgment until a number of ideas have been generated; evaluate (critique) ideas; and explain why the chosen solution is optimal.		
1.T1.3a	generate ideas for alternative solutions		
1.T1.3b	evaluate alternatives based on the constraints of design		
1.T1.4	Develop plans, including drawings with measurements and details of construction, and construct a model of the solution, exhibiting a degree		

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	of craftsmanship.		
1.T1.4a	design and construct a model of the product or process		
1.T1.4b	construct a model of the product or process		
1.T1.5	In a group setting, test their solution against design specifications, present and evaluate results, describe how the solution might have been modified for different or better results, and discuss trade-offs that might have to be made.		
1.T1.5a	test a design		
1.T1.5b	evaluate a design		
2	Students will access, generate, process, and transfer information, using appropriate technologies.		
2.1	Information technology is used to retrieve, process, and communicate information as a tool to enhance learning.		
2.1.1	Use a range of equipment and software to integrate several forms of information in order to create good-quality audio, video, graphic, and text-based presentations.		
2.1.2	Use spreadsheets and database software to collect, process, display, and analyze information. Students access needed information from electronic databases and on-line telecommunication services.		
2.1.3	Systematically obtain accurate and relevant information pertaining to a particular topic from a range of sources, including local and national media, libraries, museums, governmental agencies, industries, and individuals.		
2.1.4	Collect data from probes to measure events and phenomena.		
2.1.4a	collect the data, using the appropriate, available tool		
2.1.4b	organize the data		
2.1.4c	use the collected data to		

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	communicate a scientific concept		
2.1.5	Use simple modeling programs to make predictions.		
2.2	Knowledge of the impacts and limitations of information systems is essential to its effectiveness and ethical use		
2.2.1	Understand the need to question the accuracy of information displayed on a computer because the results produced by a computer may be affected by incorrect data entry.		
2.2.1a	critically analyze data to exclude erroneous information		
2.2.1b	identify and explain sources of error in a data collection		
2.2.2	Identify advantages and limitations of data-handling programs and graphics programs.		
2.2.3	Understand why electronically stored personal information has greater potential for misuse than records kept in conventional form.		
2.3	Information technology can have positive and negative impacts on society, depending upon how it is used.		
2.3.1	Use graphical, statistical, and presentation software to present projects to fellow classmates.		
2.3.2	Describe applications of information technology in mathematics, science, and other technologies that address needs and solve problems in the community.	Lesson 6: Technological Design	“Proposing and Speaking About Solutions to a Problem” Assignment
2.3.3	Explain the impact of the use and abuse of electronically generated information on individuals and families.		
6	Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.		
6.1	Through systems thinking, people		

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	can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.		
6.1.1	Describe the differences between dynamic systems and organizational systems.		
6.1.2	Describe the differences and similarities among engineering systems, natural systems, and social systems.		
6.1.3	Describe the differences between open-and closed-loop systems.		
6.1.4	Describe how the output from one part of a system (which can include material, energy, or information) can become the input to other parts.		
6.2	Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.		
6.2.1	Select an appropriate model to begin the search for answers or solutions to a question or problem.		
6.2.2	Use models to study processes that cannot be studied directly (e.g., when the real process is too slow, too fast, or too dangerous for direct observation).		
6.2.3	Demonstrate the effectiveness of different models to represent the same thing and the same model to represent different things.		
6.3	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.		
6.3.1	Cite examples of how different aspects of natural and designed systems change at different rates		

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	with changes in scale.		
6.3.2	Use powers of ten notation to represent very small and very large numbers.		
6.4	Equilibrium is a state of stability due either to a lack of change (static equilibrium) or a balance between opposing forces (dynamic equilibrium).		
6.4.1	Describe how feedback mechanisms are used in both designed and natural systems to keep changes within desired limits.		
6.4.2	Describe changes within equilibrium cycles in terms of frequency or cycle length and determine the highest and lowest values and when they occur.		
6.5	Identifying patterns of change is necessary for making predictions about future behavior and conditions.		
6.5.1	Use simple linear equations to represent how a parameter changes with time.		
6.5.2	Observe patterns of change in trends or cycles and make predictions on what might happen in the future.		
6.6	In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.		
6.6.1	Determine the criteria and constraints and make trade-offs to determine the best decision.		
6.6.2	Use graphs of information for a decision-making problem to determine the optimum solution.		
7	Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.		
7.1	The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve		

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	problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena.		
7.1.1	Analyze science/technology/society problems and issues at the local level and plan and carry out a remedial course of action.	Lesson 36: Environmental Laws and Course Project	The entire lesson is a project that encompasses this standard
7.1.2	Make informed consumer decisions by seeking answers to appropriate questions about products, services, and systems; determining the cost/benefit and risk/benefit tradeoffs; and applying this knowledge to a potential purchase.		
7.1.3	Design solutions to real-world problems of general social interest related to home, school, or community using scientific experimentation to inform the solution and applying mathematical concepts and reasoning to assist in developing a solution.	Lesson 36: Environmental Laws and Course Project	The entire lesson is a project that encompasses this standard
7.1.4	Describe and explain phenomena by designing and conducting investigations involving systematic observations, accurate measurements, and the identification and control of variables; by inquiring into relevant mathematical ideas; and by using mathematical and technological tools and procedures to assist in the investigation.		
7.2	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.		
7.2.1	Students participate in an extended, culminating mathematics, science, and		

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	technology project. The project would require students to:		
7.2.1a	Working Effectively: Contributing to the work of a brainstorming group, laboratory partnership, cooperative learning group, or project team; planning procedures; identify and managing responsibilities of team members; and staying on task, whether working alone or as part of a group.		
7.2.1b	Gathering and Processing Information: Accessing information from printed media, electronic data bases, and community resources and using the information to develop a definition of the problem and to research possible solutions.	Lesson 36: Environmental Laws and Course Project	The entire lesson is a project that encompasses this standard
7.2.1c	Generating and Analyzing Ideas: Developing ideas for proposed solutions, investigating ideas, collecting data, and showing relationships and patterns in the data.		
7.2.1d	Common Themes: Observing examples of common unifying themes, applying them to the problem, and using them to better understand the dimensions of the problem.		
7.2.1e	Realizing Ideas: Constructing components or models, arriving at a solution, and evaluating the result.		
7.2.1.f	Presenting Results: Using a variety of media to present the solution and to communicate the results.		
4	Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.		
4.L1	Living things are both similar to and different from each other and from nonliving things.	Lesson 17: Species and the Physical Environment	"Organisms and Species" p.6
4.L1.1	Compare and contrast the parts of plants, animals, and one-celled		

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	organisms.		
4.L1.1a	Living things are composed of cells. Cells provide structure and carry on major functions to sustain life. Cells are usually microscopic in size.		
4.L1.1b	The way in which cells function is similar in all living things. Cells grow and divide, producing more cells. Cells take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.		
4.L1.1c	Most cells have cell membranes, genetic material, and cytoplasm. Some cells have a cell wall and/or chloroplasts. Many cells have a nucleus.		
4.L1.1d	Some organisms are single cells; others, including humans, are multicellular.		
4.L1.1e	Cells are organized for more effective functioning in multicellular organisms. Levels of organization for structure and function of a multicellular organism include cells, tissues, organs, and organ systems.		
4.L1.1f	Many plants have roots, stems, leaves, and reproductive structures. These organized groups of tissues are responsible for a plant's life activities.		
4.L1.1g	Multicellular animals often have similar organs and specialized systems for carrying out major life activities.		
4.L1.1h	Living things are classified by shared characteristics on the cellular and organism level. In classifying organisms, biologists consider details of internal and external structures. Biological classification systems are arranged from general (kingdom) to specific (species).		
4.L1.2	Explain the functioning of the major	Lesson 12:	The combination of all

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	human organ systems and their interactions.	Respiratory/Circulatory Systems, Lesson 13: Nervous/Endocrine systems, Lesson 14: Digestive/Excretory systems, Lesson 15: Skeletal/Muscular systems, Lesson 16: Reproductive system	these lessons meet this standard.
4.L1.2a	Each system is composed of organs and tissues which perform specific functions and interact with each other, e.g., digestion, gas exchange, excretion, circulation, locomotion, control, coordination, reproduction, and protection from disease.	Lesson 12: Respiratory/Circulatory Systems, Lesson 13: Nervous/Endocrine systems, Lesson 14: Digestive/Excretory systems, Lesson 15: Skeletal/Muscular systems, Lesson 16: Reproductive system	The combination of all these lessons meet this standard.
4.L1.2b	Tissues, organs, and organ systems help to provide all cells with nutrients, oxygen, and waste removal.		
4.L1.2c	The digestive system consists of organs that are responsible for the mechanical and chemical breakdown of food. The breakdown process results in molecules that can be absorbed and transported to cells.	Lesson 14: Digestive/Excretory systems	This entire lesson encompasses this standard
4.L1.2d	During respiration, cells use oxygen to release the energy stored in food. The respiratory system supplies oxygen and removes carbon dioxide (gas exchange).	Lesson 12: Respiratory/Circulatory Systems,	This entire lesson encompasses this standard
4.L1.2e	The excretory system functions in the disposal of dissolved waste molecules, the elimination of liquid and gaseous wastes, and the	Lesson 14: Digestive/Excretory systems	This entire lesson encompasses this standard

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	removal of excess heat energy.		
4.L1.2f	The circulatory system moves substances to and from cells, where they are needed or produced, responding to changing demands.	Lesson 12: Respiratory/Circulatory Systems,	This entire lesson encompasses this standard
4.L1.2g	Locomotion, necessary to escape danger, obtain food and shelter, and reproduce, is accomplished by the interaction of the skeletal and muscular systems, and coordinated by the nervous system.	Lesson 15: Skeletal/Muscular systems,	This entire lesson encompasses this standard.
4.L1.2h	The nervous and endocrine systems interact to control and coordinate the body's responses to changes in the environment, and to regulate growth, development, and reproduction. Hormones are chemicals produced by the endocrine system; hormones regulate many body functions.	Lesson 13: Nervous/Endocrine systems,	This entire lesson encompasses this standard.
4.L1.2i	The male and female reproductive systems are responsible for producing sex cells necessary for the production of offspring.	Lesson 16: Reproductive system	This entire lesson encompasses this standard.
4.L1.2j	Disease breaks down the structures or functions of an organism. Some diseases are the result of failures of the system. Other diseases are the result of damage by infection from other organisms (germ theory). Specialized cells protect the body from infectious disease. The chemicals they produce identify and destroy microbes that enter the body.		
4.L2	Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.		
4.L2.1	Describe sexual and asexual mechanisms for passing genetic materials from generation to generation.	Lesson 16: Reproductive system	"Reproduction" interactive p.6
4.L2.1a	Hereditary information is contained in genes. Genes are composed of		

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	DNA that makes up the chromosomes of cells.		
4.L2.1b	Each gene carries a single unit of information. A single inherited trait of an individual can be determined by one pair or by many pairs of genes. A human cell contains thousands of different genes.		
4.L2.1c	Each human cell contains a copy of all the genes needed to produce a human being.		
4.L2.1d	In asexual reproduction, all the genes come from a single parent. Asexually produced offspring are genetically identical to the parent.		
4.L2.1e	In sexual reproduction typically half of the genes come from each parent. Sexually produced offspring are not identical to either parent.		
4.L2.2	Describe simple mechanisms related to the inheritance of some physical traits in offspring.		
4.L2.2a	In all organisms, genetic traits are passed on from generation to generation.		
4.L2.2b	Some genes are dominant and some are recessive. Some traits are inherited by mechanisms other than dominance and recessiveness.		
4.L2.2c	The probability of traits being expressed can be determined using models of genetic inheritance. Some models of prediction are pedigree charts and Punnett squares.		
4.L3	Individual organisms and species change over time.	Lesson 18: History of Life on Earth	“Natural Selection” assignment
4.L3.1	Describe sources of variation in organisms and their structures and relate the variations to survival.	Lesson 18: History of Life on Earth	“Variation among organisms” p.6
4.L3.1a	The processes of sexual reproduction and mutation have given rise to a variety of traits within a species.	Lesson 18: History of Life on Earth	“Mutations” p.7
4.L3.1b	Changes in environmental conditions can affect the survival of individual organisms with a	Lesson 18: History of Life on Earth	“Natural Selection” assignment

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	particular trait. Small differences between parents and offspring can accumulate in successive generations so that descendants are very different from their ancestors. Individual organisms with certain traits are more likely to survive and have offspring than individuals without those traits.		
4.L3.1c	Human activities such as selective breeding and advances in genetic engineering may affect the variations of species.		
4.L3.2	Describe factors responsible for competition within species and the significance of that competition.		
4.L3.2a	In all environments, organisms with similar needs may compete with one another for resources.		
4.L3.2b	Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to permit its survival. Extinction of species is common. Fossils are evidence that a great variety of species existed in the past.		
4.L3.2c	Many thousands of layers of sedimentary rock provide evidence for the long history of Earth and for the long history of changing lifeforms whose remains are found in the rocks. Recently deposited rock layers are more likely to contain fossils resembling existing species.	Lesson 18: History of Life on Earth	"Fossil Record" p.12
4.L3.2d	Although the time needed for change in a species is usually great, some species of insects and bacteria have undergone significant change in just a few years.		
4.L4	The continuity of life is sustained through reproduction and development.		
4.L4.1	Observe and describe the variations in reproductive patterns of organisms, including asexual and sexual reproduction.		

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4.L4.1a	Some organisms reproduce asexually. Other organisms reproduce sexually. Some organisms can reproduce both sexually and asexually.	Lesson 16: Reproductive system	"Reproduction" interactive p.6
4.L4.1b	There are many methods of asexual reproduction, including division of a cell into two cells, or separation of part of an animal or plant from the parent, resulting in the growth of another individual.		
4.L4.1c	Methods of sexual reproduction depend upon the species. All methods involve the merging of sex cells to begin the development of a new individual. In many species, including plants and humans, eggs and sperm are produced.	Lesson 16: Reproductive System	"Fertilization" p.12
4.L4.1d	Fertilization and/or development in organisms may be internal or external.	Lesson 16: Reproductive System	"Fertilization" p.12
4.L4.2	Explain the role of sperm and egg cells in sexual reproduction.	Lesson 16: Reproductive System	"Fertilization" p.12
4.L4.2a	The male sex cell is the sperm. The female sex cell is the egg. The fertilization of an egg by a sperm results in a fertilized egg.	Lesson 16: Reproductive System	"Fertilization" p.12
4.L4.2b	In sexual reproduction, sperm and egg each carry one-half of the genetic information for the new individual. Therefore, the fertilized egg contains genetic information from each parent.	Lesson 16: Reproductive System	"Fertilization" p.12
4.L4.3	Observe and describe developmental patterns in selected plants and animals (e.g., insects, frogs, humans, seed-bearing plants).		
4.L4.3a	Multicellular organisms exhibit complex changes in development, which begin after fertilization. The fertilized egg undergoes numerous cellular divisions that will result in a multicellular organism, with each cell having identical genetic information.		
4.L4.3b	In humans, the fertilized egg grows into tissue which develops into		

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	organs and organ systems before birth.		
4.L4.3c	Various body structures and functions change as an organism goes through its life cycle.		
4.L4.3d	Patterns of development vary among animals. In some species the young resemble the adult, while in others they do not. Some insects and amphibians undergo metamorphosis as they mature.		
4.L4.3e	Patterns of development vary among plants. In seed-bearing plants, seeds contain stored food for early development. Their later development into adulthood is characterized by varying patterns of growth from species to species.		
4.L4.3f	As an individual organism ages, various body structures and functions change.		
4.L4.4	Observe and describe cell division at the microscopic level and its macroscopic effects.		
4.L4.4a	In multicellular organisms, cell division is responsible for growth, maintenance, and repair. In some one-celled organisms, cell division is a method of asexual reproduction.		
4.L4.4b	In one type of cell division, chromosomes are duplicated and then separated into two identical and complete sets to be passed to each of the two resulting cells. In this type of cell division, the hereditary information is identical in all the cells that result.		
4.L4.4c	Another type of cell division accounts for the production of egg and sperm cells in sexually reproducing organisms. The eggs and sperm resulting from this type of cell division contain one-half of the hereditary information.		
4.L4.4d	Cancers are a result of abnormal cell division.		
4.L5	Organisms maintain a dynamic		

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	equilibrium that sustains life.		
4.L5.1	Compare the way a variety of living specimens carry out basic life functions and maintain dynamic equilibrium.		
4.L5.1a	Animals and plants have a great variety of body plans and internal structures that contribute to their ability to maintain a balanced condition.		
4.L5.1b	An organism's overall body plan and its environment determine the way that the organism carries out the life processes.		
4.L5.1c	All organisms require energy to survive. The amount of energy needed and the method for obtaining this energy vary among cells. Some cells use oxygen to release the energy stored in food.		
4.L5.1d	The methods for obtaining nutrients vary among organisms. Producers, such as green plants, use light energy to make their food. Consumers, such as animals, take in energy-rich foods.		
4.L5.1e	Herbivores obtain energy from plants. Carnivores obtain energy from animals. Omnivores obtain energy from both plants and animals. Decomposers, such as bacteria and fungi, obtain energy by consuming wastes and/or dead organisms.		
4.L5.1f	Regulation of an organism's internal environment involves sensing the internal environment and changing physiological activities to keep conditions within the range required for survival. Regulation includes a variety of nervous and hormonal feedback systems.		
4.L5.1g	The survival of an organism depends on its ability to sense and respond to its external environment.	Lesson 17: Species and the Physical Environment	"Animal Adaptations" research
4.L5.2	Describe the importance of major		

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	nutrients, vitamins, and minerals in maintaining health and promoting growth, and explain the need for a constant input of energy for living organisms.		
4.L5.2a	Food provides molecules that serve as fuel and building material for all organisms. All living things, including plants, must release energy from their food, using it to carry on their life processes.		
4.L5.2b	Foods contain a variety of substances, which include carbohydrates, fats, vitamins, proteins, minerals, and water. Each substance is vital to the survival of the organism.		
4.L5.2c	Metabolism is the sum of all chemical reactions in an organism. Metabolism can be influenced by hormones, exercise, diet, and aging.		
4.L5.2d	Energy in foods is measured in Calories. The total caloric value of each type of food varies. The number of Calories a person requires varies from person to person.		
4.L5.2e	In order to maintain a balanced state, all organisms have a minimum daily intake of each type of nutrient based on species, size, age, sex, activity, etc. An imbalance in any of the nutrients might result in weight gain, weight loss, or a diseased state.		
4.L5.2f	Contraction of infectious disease, and personal behaviors such as use of toxic substances and some dietary habits, may interfere with one's dynamic equilibrium. During pregnancy these conditions may also affect the development of the child. Some effects of these conditions are immediate; others may not appear for many years.		
4.L6	Plants and animals depend on each other and their physical	Lesson 17: Species and the Physical Environment	"Animal Adaptations" research

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	environment.		
4.L6.1	Describe the flow of energy and matter through food chains and food webs.		
4.L6.1a	Energy flows through ecosystems in one direction, usually from the Sun, through producers to consumers and then to decomposers. This process may be visualized with food chains or energy pyramids.		
4.L6.1b	Food webs identify feeding relationships among producers, consumers, and decomposers in an ecosystem.		
4.L6.1c	Matter is transferred from one organism to another and between organisms and their physical environment. Water, nitrogen, carbon dioxide, and oxygen are examples of substances cycled between the living and nonliving environment.		
4.L6.2	Provide evidence that green plants make food and explain the significance of this process to other organisms.		
4.L6.2a	Photosynthesis is carried on by green plants and other organisms containing chlorophyll. In this process, the Sun's energy is converted into and stored as chemical energy in the form of a sugar. The quantity of sugar molecules increases in green plants during photosynthesis in the presence of sunlight.		
4.L6.2b	The major source of atmospheric oxygen is photosynthesis. Carbon dioxide is removed from the atmosphere and oxygen is released during photosynthesis.		
4.L6.2c	Green plants are the producers of food which is used directly or indirectly by consumers.		
4.L7	Human decisions and activities have had a profound impact on the physical and living environment.	Lesson 34: Environmental Health	"Household Hazards Research" assignment

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4.L7.1	Describe how living things, including humans, depend upon the living and nonliving environment for their survival.	Lesson 17: Species and the Physical Environment	"Responding to the Environment" p.7
4.L7.1a	A population consists of all individuals of a species that are found together at a given place and time. Populations living in one place form a community. The community and the physical factors with which it interacts compose an ecosystem.		
4.L7.1b	Given adequate resources and no disease or predators, populations (including humans) increase. Lack of resources, habitat destruction, and other factors such as predation and climate limit the growth of certain populations in the ecosystem.	Lesson 31: Human Population and the Environment	"Human Population Growth" p.6
4.L7.1c	In all environments, organisms interact with one another in many ways. Relationships among organisms may be competitive, harmful, or beneficial. Some species have adapted to be dependent upon each other with the result that neither could survive without the other.		
4.L7.1d	Some microorganisms are essential to the survival of other living things.		
4.L7.1e	The environment may contain dangerous levels of substances (pollutants) that are harmful to organisms. Therefore, the good health of environments and individuals requires the monitoring of soil, air, and water, and taking steps to keep them safe.	Lesson 32: Pollution	"Pollution Matching" Interactive, p.17
4.L7.2	Describe the effects of environmental changes on humans and other populations.	Lesson 34: Environmental Health	"Disease Associated with Environmental Health" assignment
4.L7.2a	In ecosystems, balance is the result of interactions between community members and their environment.	Lesson 17: Species and the Physical Environment	"Research: Animal Adaptations"
4.L7.2b	The environment may be altered	Lesson 27: Ecosystem	"Succession Lab"

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	through the activities of organisms. Alterations are sometimes abrupt. Some species may replace others over time, resulting in long- term gradual changes (ecological succession).	Changes	
4.L7.2c	Overpopulation by any species impacts the environment due to the increased use of resources. Human activities can bring about environmental degradation through resource acquisition, urban growth, land-use decisions, waste disposal, etc.	Lesson 31: Human Population and the Environment	The entire lesson encompasses all points of this standard.
4.L7.2d	Since the Industrial Revolution, human activities have resulted in major pollution of air, water, and soil. Pollution has cumulative ecological effects such as acid rain, global warming, or ozone depletion. The survival of living things on our planet depends on the conservation and protection of Earth's resources.	Lesson 32: Pollution	"Take a stand against pollution" Assignment
4:	Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.	Lesson 4: Science and Society	The entire lesson encompasses this standard.
4.P1	The Earth and celestial phenomena can be described by principles of relative motion and perspective.	Lesson 19: Planet Earth	"Warm Up Activity" p.5
4.P1.1	Explain daily, monthly, and seasonal changes on Earth.	Lesson 19: Planet Earth	"Earth's Motions" p.6
4.P1.1a	Earth's Sun is an average-sized star. The Sun is more than a million times greater in volume than Earth.		
4.P1.1b	Other stars are like the Sun but are so far away that they look like points of light. Distances between stars are vast compared to distances within our solar system.	Lesson 19: Planet Earth	"Observing Stars" p.11
4.P1.1c	The Sun and the planets that revolve around it are the major bodies in the solar system. Other members include comets, moons, and asteroids. Earth' orbit is nearly		

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	circular.		
4.P1.1d	Gravity is the force that keeps planets in orbit around the Sun and the Moon in orbit around the Earth.	Lesson 19: Planet Earth	"Phases of the Moon" p.8
4.P1.1e	Most objects in the solar system have a regular and predictable motion. These motions explain such phenomena as a day, a year, phases of the Moon, eclipses, tides, meteor showers, and comets.	Lesson 19: Planet Earth	"Earth's Motions" p.6 "Phases of the Moon" p.8
4.P1.1f	The latitude/longitude coordinate system and our system of time are based on celestial observations.		
4.P1.1g	Moons are seen by reflected light. Our Moon orbits Earth, while Earth orbits the Sun. The Moon's phases as observed from Earth are the result of seeing different portions of the lighted area of the Moon's surface. The phases repeat in a cyclic pattern in about one month.	Lesson 19: Planet Earth	"Phases of the Moon" p.8
4.P1.1h	The apparent motions of the Sun, Moon, planets, and stars across the sky can be explained by Earth's rotation and revolution. Earth's rotation causes the length of one day to be approximately 24 hours. This rotation also causes the Sun and Moon to appear to rise along the eastern horizon and to set along the western horizon. Earth's revolution around the Sun defines the length of the year as 365 1/4 days.	Lesson 19: Planet Earth	"Warm Up Activity" p.5
4.P1.1i	The tilt of Earth's axis of rotation and the revolution of Earth around the Sun cause seasons on Earth. The length of daylight varies depending on latitude and season.		
4.P1.1j	The shape of Earth, the other planets, and stars is nearly spherical.		
4.P2	Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.		
4.P2.1	Explain how the atmosphere (air), hydrosphere (water), and		

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	lithosphere (land) interact, evolve, and change.		
4.P2.1a	Nearly all the atmosphere is confined to a thin shell surrounding Earth. The atmosphere is a mixture of gases, including nitrogen and oxygen with small amounts of water vapor, carbon dioxide, and other trace gases. The atmosphere is stratified into layers, each having distinct properties. Nearly all weather occurs in the lowest layer of the atmosphere.	Lesson 21: Atmosphere and Weather	"Earth's Atmosphere" p.6
4.P2.1b	As altitude increases, air pressure decreases.	Lesson 21: Atmosphere and Weather	"Atmospheric Air Pressure" p.7
4.P2.1c	The rock at Earth's surface forms a nearly continuous shell around Earth called the lithosphere.	Lesson 20: Geologic Processes	"Intro" p.1
4.P2.1d	The majority of the lithosphere is covered by a relatively thin layer of water called the hydrosphere.		
4.P2.1e	Rocks are composed of minerals. Only a few rock-forming minerals make up most of the rocks of Earth. Minerals are identified on the basis of physical properties such as streak, hardness, and reaction to acid.		
4.P2.1f	Fossils are usually found in sedimentary rocks. Fossils can be used to study past climates and environments.		
4.P2.1g	The dynamic processes that wear away Earth's surface include weathering and erosion.	Lesson 20: Geologic Processes	"Erosion Assignment"
4.P2.1h	The process of weathering breaks down rocks to form sediment. Soil consists of sediment, organic material, water, and air.	Lesson 28: Soils	"What is Soil?" p.6
4.P2.1i	Erosion is the transport of sediment. Gravity is the driving force behind erosion. Gravity can act directly or through agents such as moving water, wind, and glaciers.	Lesson 20: Geologic Processes	"Erosion Assignment"
4.P2.1j	Water circulates through the atmosphere, lithosphere, and hydrosphere in what is known as	Lesson 22: Earth's Water	"Water Cycle Lab"

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	the water cycle.		
4.P2.2	Describe volcano and earthquake patterns, the rock cycle, and weather and climate changes.	Lesson 20: Geologic Processes	This entire lesson encompasses this standard.
4.P2.2a	The interior of Earth is hot. Heat flow and movement of material within Earth cause sections of Earth's crust to move. This may result in earthquakes, volcanic eruption, and the creation of mountains and ocean basins.	Lesson 20: Geologic Processes	This entire lesson encompasses this standard.
4.P2.2b	Analysis of earthquake wave data (vibrational disturbances) leads to the conclusion that there are layers within Earth. These layers - the crust, mantle, outer core, and inner core - have distinct properties.		
4.P2.2c	Folded, tilted, faulted, and displaced rock layers suggest past crustal movement.		
4.P2.2d	Continents fitting together like puzzle parts and fossil correlations provided initial evidence that continents were once together.		
4.P2.2e	The Theory of Plate Tectonics explains how the "solid" lithosphere consists of a series of plates that "float" on the partially molten section of the mantle. Convection cells within the mantle may be the driving force for the movement of the plates.		
4.P2.2f	Plates may collide, move apart, or slide past one another. Most volcanic activity and mountain building occur at the boundaries of these plates, often resulting in earthquakes.		
4.P2.2g	Rocks are classified according to their method of formation. The three classes of rocks are sedimentary, metamorphic, and igneous. Most rocks show characteristics that give clues to their formation conditions.		
4.P2.2h	The rock cycle model shows how types of rock or rock material may be transformed from one type of		

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	rock to another.		
4.P2.2i	Weather describes the conditions of the atmosphere at a given location for a short period of time.		
4.P2.2j	Climate is the characteristic weather that prevails from season to season and year to year.		
4.P2.2k	The uneven heating of Earth's surface is the cause of weather.	Lesson 21: Atmosphere and Weather	"Wind" p.8
4.P2.2l	Air masses form when air remains nearly stationary over a large section of Earth's surface and takes on the conditions of temperature and humidity from that location. Weather conditions at a location are determined primarily by temperature, humidity, and pressure of air masses over that location.	Lesson 21: Atmosphere and Weather	"Air Masses" p.13
4.P2.2m	Most local weather condition changes are caused by movement of air masses.	Lesson 21: Atmosphere and Weather	"Air Masses" p.13
4.P2.2n	The movement of air masses is determined by prevailing winds and upper air currents.	Lesson 21: Atmosphere and Weather	"Air Masses" p.13
4.P2.2o	Fronts are boundaries between air masses. Precipitation is likely to occur at these boundaries.	Lesson 21: Atmosphere and Weather	"Weather Fronts" p.14
4.P2.2p	High-pressure systems generally bring fair weather. Low-pressure systems usually bring cloudy, unstable conditions. The general movement of highs and lows is from west to east across the United States.	Lesson 21: Atmosphere and Weather	"Weather Maps" p.16
4.P2.2q	Hazardous weather conditions include thunderstorms, tornadoes, hurricanes, ice storms, and blizzards. Humans can prepare for and respond to these conditions if given sufficient warning.		
4.P2.2r	Substances enter the atmosphere naturally and from human activity. Some of these substances include dust from volcanic eruptions and greenhouse gases such as carbon dioxide, methane, and water vapor. These substances can affect		

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	weather, climate, and living things.		
4.P3	Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.	Lesson 11: Chemistry and the Periodic Table	“Chemistry Review” p.7
4.P3.1	Observe and describe properties of materials, such as density, conductivity, and solubility.	Lesson 11: Chemistry and the Periodic Table	“Chemistry Review” p.9
4.P3.1a	Substances have characteristic properties. Some of these properties include color, odor, phase at room temperature, density, solubility, heat and electrical conductivity, hardness, and boiling and freezing points.	Lesson 11: Chemistry and the Periodic Table	“Chemistry Review” p.9
4.P3.1b	Solubility can be affected by the nature of the solute and solvent, temperature, and pressure. The rate of solution can be affected by the size of the particles, stirring, temperature, and the amount of solute already dissolved.		
4.P3.1c	The motion of particles helps to explain the phases (states) of matter as well as changes from one phase to another. The phase in which matter exists depends on the attractive forces among its particles.		
4.P3.1d	Gases have neither a determined shape nor a definite volume. Gases assume the shape and volume of a closed container.		
4.P3.1e	A liquid has definite volume, but takes the shape of a container.		
4.P3.1f	A solid has definite shape and volume. Particles resist a change in position.		
4.P3.1g	Characteristic properties can be used to identify different materials, and separate a mixture of substances into its components. For example, iron can be removed from a mixture by means of a magnet. An insoluble substance can be separated from a soluble substance by such processes as filtration, settling, and evaporation.		

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4.P3.1h	Density can be described as the amount of matter that is in a given amount of space. If two objects have equal volume, but one has more mass, the one with more mass is denser.		
4.P3.1i	Buoyancy is determined by comparative densities.		
4.P3.2	Distinguish between chemical and physical changes.		
4.P3.2a	During a physical change a substance keeps its chemical composition and properties. Examples of physical changes include freezing, melting, condensation, boiling, evaporation, tearing, and crushing.	Lesson 11: Chemistry and the Periodic Table	“Physical Changes to Matter” p.11
4.P3.2b	Mixtures are physical combinations of materials and can be separated by physical means.	Lesson 11: Chemistry and the Periodic Table	“Physical Changes to Matter” p.11
4.P3.2c	During a chemical change, substances react in characteristic ways to form new substances with different physical and chemical properties. Examples of chemical changes include burning of wood, cooking of an egg, rusting of iron, and souring of milk.	Lesson 11: Chemistry and the Periodic Table	“Chemical Changes to Matter” p.15
4.P3.2d	Substances are often placed in categories if they react in similar ways. Examples include metals, nonmetals, and noble gases.	Lesson 11: Chemistry and the Periodic Table	“Warm Up Activity” p.5
4.P3.2e	The Law of Conservation of Mass states that during an ordinary chemical reaction matter cannot be created or destroyed. In chemical reactions, the total mass of the reactants equals the total mass of the products.		
4.P3.3	Develop mental models to explain common chemical reactions and changes in states of matter.		
4.P3.3a	All matter is made up of atoms. Atoms are far too small to see with a light microscope.	Lesson 11: Chemistry and the Periodic Table	“Chemistry Review” p.7
4.P3.3b	Atoms and molecules are perpetually in motion. The greater the temperature, the greater the		

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	motion.		
4.P3.3c	Atoms may join together in well-defined molecules or may be arranged in regular geometric patterns.	Lesson 11: Chemistry and the Periodic Table	"Chemistry Review" p.7
4.P3.3d	Interactions among atoms and/or molecules result in chemical reactions.	Lesson 11: Chemistry and the Periodic Table	"Chemistry Review" p.7
4.P3.3e	The atoms of any one element are different from the atoms of other elements.	Lesson 11: Chemistry and the Periodic Table	"Trends in the Periodic Table" p.17
4.P3.3f	There are more than 100 elements. Elements combine in a multitude of ways to produce compounds that account for all living and nonliving substances. Few elements are found in their pure form.	Lesson 11: Chemistry and the Periodic Table	"Trends in the Periodic Table" p.17
4.P3.3g	The periodic table is one useful model for classifying elements. The periodic table can be used to predict properties of elements (metals, nonmetals, noble gases).	Lesson 11: Chemistry and the Periodic Table	"Trends in the Periodic Table" p.17
4.P4	Energy exists in many forms, and when these forms change energy is conserved.		
4.P4.1	Describe the sources and identify the transformations of energy observed in everyday life.		
4.P4.1a	The Sun is a major source of energy for Earth. Other sources of energy include nuclear and geothermal energy.		
4.P4.1b	Fossil fuels contain stored solar energy and are considered nonrenewable resources. They are a major source of energy in the United States. Solar energy, wind, moving water, and biomass are some examples of renewable energy resources.		
4.P4.1c	Most activities in everyday life involve one form of energy being transformed into another. For example, the chemical energy in gasoline is transformed into mechanical energy in an automobile engine. Energy, in the form of heat, is almost always one		

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	of the products of energy transformations.		
4.P4.1d	Different forms of energy include heat, light, electrical, mechanical, sound, nuclear, and chemical. Energy is transformed in many ways.		
4.P4.1e	Energy can be considered to be either kinetic energy, which is the energy of motion, or potential energy, which depends on relative position.		
4.P4.2	Observe and describe heating and cooling events.		
4.P4.2a	Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.		
4.P4.2b	Heat can be transferred through matter by the collisions of atoms and/or molecules (conduction) or through space (radiation). In a liquid or gas, currents will facilitate the transfer of heat (convection).		
4.P4.2c	During a phase change, heat energy is absorbed or released. Energy is absorbed when a solid changes to a liquid and when a liquid changes to a gas. Energy is released when a gas changes to a liquid and when a liquid changes to a solid.		
4.P4.2d	Most substances expand when heated and contract when cooled. Water is an exception, expanding when changing to ice.		
4.P4.2e	Temperature affects the solubility of some substances in water.		
4.P4.3	Observe and describe energy changes as related to chemical reactions.		
4.P4.3a	In chemical reactions, energy is transferred into or out of a system. Light, electricity, or mechanical motion may be involved in such transfers in addition to heat.		
4.P4.4	Observe and describe the properties of sound, light,	Lesson 9: Energy— Sound and Light	These 2 lessons encompass this

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	magnetism, and electricity.	Lesson 10: Energy— Electricity and Magnetism	standard.
4.P4.4a	Different forms of electromagnetic energy have different wavelengths. Some examples of electromagnetic energy are microwaves, infrared light, visible light, ultraviolet light, X-rays, and gamma rays.		
4.P4.4b	Light passes through some materials, sometimes refracting in the process. Materials absorb and reflect light, and may transmit light. To see an object, light from that object, emitted by or reflected from it, must enter the eye.	Lesson 9: Energy— Sound and Light	“Translucent, Transparent, and Opaque” p.17
4.P4.4c	Vibrations in materials set up wave-like disturbances that spread away from the source. Sound waves are an example. Vibrational waves move at different speeds in different materials. Sound cannot travel in a vacuum.	Lesson 9: Energy— Sound and Light	“Speed of sound activity”
4.P4.4d	Electrical energy can be produced from a variety of energy sources and can be transformed into almost any other form of energy.	Lesson 10: Energy— Electricity and Magnetism	The entire lesson encompasses this standard.
4.P4.4e	Electrical circuits provide a means of transferring electrical energy.	Lesson 10: Energy— Electricity and Magnetism	“Current Electricity” p.10
4.P4.4f	Without touching them, material that has been electrically charged attracts uncharged material, and may either attract or repel other charged material.	Lesson 10: Energy— Electricity and Magnetism	“Static Electricity Activity”
4.P4.4g	Without direct contact, a magnet attracts certain materials and either attracts or repels other magnets. The attractive force of a magnet is greatest at its poles.	Lesson 10: Energy— Electricity and Magnetism	“Magnets” p.15
4.P4.5	Describe situations that support the principle of conservation of energy.		
4.P4.5a	Energy cannot be created or destroyed, but only changed from one form into another.		
4.P4.5b	Energy can change from one form to another, although in the process some energy is always converted		

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	to heat. Some systems transform energy with less loss of heat than others.		
4.P5	Energy and matter interact through forces that result in changes in motion.	Lesson 7: Forces and the Force of Gravity	The entire lesson encompasses this standard.
4.P5.1	Describe different patterns of motion of objects.	Lesson 7: Forces and the Force of Gravity	“Resultant Forces” p.7
4.P5.1a	The motion of an object is always judged with respect to some other object or point. The idea of absolute motion or rest is misleading.	Lesson 7: Forces and the Force of Gravity	“Describing Forces Activity”
4.P5.1b	The motion of an object can be described by its position, direction of motion, and speed.		
4.P5.1c	An object's motion is the result of the combined effect of all forces acting on the object. A moving object that is not subjected to a force will continue to move at a constant speed in a straight line. An object at rest will remain at rest.		
4.P5.1d	Force is directly related to an object's mass and acceleration. The greater the force, the greater the change in motion.		
4.P5.1e	For every action there is an equal and opposite reaction.		
4.P5.2	Observe, describe, and compare effects of forces (gravity, electric current, and magnetism) on the motion of objects.		
4.P5.2a	Every object exerts gravitational force on every other object. Gravitational force depends on how much mass the objects have and on how far apart they are. Gravity is one of the forces acting on orbiting objects and projectiles.	Lesson 7: Forces and the Force of Gravity	“Newton’s Law of Gravity” p.11
4.P5.2b	Electric currents and magnets can exert a force on each other.		
4.P5.2c	Machines transfer mechanical energy from one object to another.		
4.P5.2d	Friction is a force that opposes motion.		
4.P5.2e	A machine can be made more efficient by reducing friction. Some		

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	common ways of reducing friction include lubricating or waxing surfaces.		
4.P5.2f	Machines can change the direction or amount of force, or the distance or speed of force required to do work.	Lesson 8: Simple Machines	This entire lesson encompasses this standard.
4.P5.2g	Simple machines include a lever, a pulley, a wheel and axle, and an inclined plane. A complex machine uses a combination of interacting simple machines, e.g., a bicycle.	Lesson 8: Simple Machines	This entire lesson encompasses this standard.