KENOSHA UNIFIED SCHOOL DISTRICT NO. 1
CURRICULUM AND INSTRUCTIONAL SERVICES

STANDARDS AND BENCHMARKS
SCIENCE

	GRADE 8	GRADES 9 BIOLOGY	GRADE 10 CHEMISTRY	ELECTIVES
STANDARD A: SCIENCE CONNECTIONS—STUDENTS WILL UNDERSTAND AND DESCRIBE THE UNIFYING CONCEPTS AND PROCESSES AMONG SCIENCE TOPICS WHICH LEAD TO CONNECTIONS BETWEEN PHYSICAL SCIENCE, EARTH/SPACE SCIENCE, AND LIFE SCIENCE.				
A-1: Systems	***A system can include processes as well as things.*** ***Any system is usually connected to other systems, both internally and externally.*** A-1.8	A system has properties that are different from those of its parts. The successful operation of a system involves feedback. It may not be possible to predict accurately the result of changing some part of a system. A-1.9	A system has properties that are different from those of its parts. The successful operation of a system involves feedback. It may not be possible to predict accurately the result of changing some part of a system. A-1.10	A system has properties that are different from those of its parts. The successful operation of a system involves feedback. It may not be possible to predict accurately the result of changing some part of a system. A-1.11
A-2: Models	***Models are often used to think about processes that are not easily observed.*** ***Different models can be used to represent the same thing.*** ***A-2.8***	***Models are often used to think about processes that are not easily observed.*** ***The usefulness of a model can be tested by comparing its predictions to actual observations in the real world.*** ***A-2.9***	***The basic idea of mathematical modeling is to find a mathematical relationship that behaves in the same ways as the objects or processes under investigation.*** ***The usefulness of a model can be tested by comparing its predictions to actual observations in the real world.*** ***A-2.10***	***The basic idea of mathematical modeling is to find a mathematical relationship that behaves in the same ways as the objects or processes under investigation.*** ***The usefulness of a model can be tested by comparing its predictions to actual observations in the real world.*** ***A-2.11***

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A-3: Change and Constancy	***Physical and biological systems tend to change until they become stable and then remain that way unless their surroundings change.*** ***Many systems contain feedback mechanisms that serve to keep changes within specified limits.*** ***Equations can be used to summarize how the quantity of some-thing changes over time or in response to other changes.*** ***A-3.8***	A system in equilibrium may return to the same state of equilibrium if the disturbances it experiences are small. Large disturbances may cause it to escape that equilibrium and eventually settle into some other state of equilibrium. The concept of the conservation of matter and energy is involved in all fields of science. Graphs and equations are useful ways for depicting and analyzing patterns of change. In evolutionary change, the present arises gradually from the materials and forms of the past. The precise behavior of most systems is unpredictable. A-3.9	A system in equilibrium may return to the same state of equilibrium if the disturbances it experiences are small. Large disturbances may cause it to escape that equilibrium and eventually settle into some other state of equilibrium. The concept of the conservation of matter and energy is involved in all fields of science. Graphs and equations are useful ways for depicting and analyzing patterns of change. In evolutionary change, the present arises gradually from the materials and forms of the past. The precise behavior of most systems is unpredictable. A-3.10	A system in equilibrium may return to the same state of equilibrium if the disturbances it experiences are small. Large disturbances may cause it to escape that equilibrium and eventually settle into some other state of equilibrium. The concept of the conservation of matter and energy is involved in all fields of science. Graphs and equations are useful ways for depicting and analyzing patterns of change. In evolutionary change, the present arises gradually from the materials and forms of the past. The precise behavior of most systems is unpredictable. A-3.11
A-4: Scale	***As the complexity of any system increases, gaining an understanding of it depends increasingly on summaries, such as averages and ranges, and on descriptions of typical examples of that system.***	Representing large numbers in terms of powers of ten makes it easier to think about them and to compare things that are greatly different. Large changes in scale typically change the way that things work in physical or biological systems.	***Representing large numbers in terms of powers of ten makes it easier to think about them and to compare things that are greatly different.*** Large changes in scale typically change the way that things work in physical or	***Representing large numbers in terms of powers of ten makes it easier to think about them and to compare things that are greatly different.*** Large changes in scale typically change the way that things work in physical or

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	A-4.8	As the number of parts of a system grows in size, the number of possible internal interactions increases much more rapidly. A-4.9	biological systems. As the number of parts of a system grows in size, the number of possible internal interactions increases much more rapidly. A-4.10	biological systems. As the number of parts of a system grows in size, the number of possible internal interactions increases much more rapidly. A-4.11
A-5: Connections	The study of earth and space science, life and environmental science, and physical science are interconnected by unifying themes. A-5.8	Any event, issue, or problem in the natural or de-signed world can be associated with the general domains of science and the unifying themes of science. Many scientific investigations require the contributions of individuals from different disciplines, including engineering. A-5.9	Any event, issue, or problem in the natural or de-signed world can be associated with the general domains of science and the unifying themes of science. Many scientific investigations require the contributions of individuals from different disciplines, including engineering. A-5.10	Any event, issue, or problem in the natural or de-signed world can be associated with the general domains of science and the unifying themes of science. Many scientific investigations require the contributions of individuals from different disciplines, including engineering. A-5.11
STANDARD B: NATURE OF SCIENCE—STUDENTS WILL UNDERSTAND THAT THE STUDY OF SCIENCE IS ONGOING, AND THEORIES AND CONCEPTS IN SCIENCE CHANGE OVER TIME AS NEW EVIDENCE IS FOUND. SCIENTIFIC EXPLANATIONS MUST ADHERE TO CRITERIA SUCH AS: A PROPOSED EXPLANATION MUST BE LOGICALLY CONSISTENT, IT MUST ABIDE BY THE RULES OF EVIDENCE, IT MUST BE OPEN TO QUESTIONS AND POSSIBLE MODIFICATION, AND IT MUST BE BASED ON HISTORICAL AND CURRENT SCIENTIFIC KNOWLEDGE.				
B-1: Science is a Human Endeavor, and There are Many Commonly Known Careers in Science.	***Women and men of various social and ethnic back-grounds engage in the activities of science, engineering, and related fields.*** ***Many people choose science as a career and de-vote their lives to studying it.***	Scientists in different disciplines ask different questions, use different methods of investigation, and accept different types of evidence to support their explanations. ***Many people choose science as a career and devote their***	Scientists in different disciplines ask different questions, use different methods of investigation, and accept different types of evidence to support their explanations. ***Many people choose science as a career and devote their***	Scientists in different disciplines ask different questions, use different methods of investigation, and accept different types of evidence to support their explanations. ***Many people choose science as a career and devote their***

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	Some scientists work alone and some in teams, but all communicate extensively with others. B-1.8	***lives to studying it.*** Scientists value peer review, truthful reporting about the methods and outcomes of investigations, and making public the results of work. B-1.9	***lives to studying it.*** Scientists value peer review, truthful reporting about the methods and outcomes of investigations, and making public the results of work. B-1.10	***lives to studying it.*** Scientists value peer review, truthful reporting about the methods and outcomes of investigations, and making public the results of work. B-1.11
B-2: Nature of Scientific Process and Knowledge	***Scientists formulate and test their explanations of nature using observations, experiments, and theoretical and mathematical models.*** ***It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists.*** It is common for scientists to differ with one another about the interpretation of the evidence or theory being considered. B-2.8	***Scientists strive for the best possible explanations about the natural world.*** ***Scientific explanations must be consistent with experimental and observational evidence.*** ***Scientific knowledge is subject to change as new evidence becomes available.*** Mathematical tools and models guide and improve the posing of questions, gathering data, constructing explanations, and communicating results. B-2.9	Scientists strive for the best possible explanations about the natural world. Scientific explanations must be consistent with experimental and observational evidence. Scientific knowledge is subject to change as new evidence becomes available. Mathematical tools and models guide and improve the posing of questions, gathering data, constructing explanations, and communicating results. B-2.10	Scientists strive for the best possible explanations about the natural world. Scientific explanations must be consistent with experimental and observational evidence. Scientific knowledge is subject to change as new evidence becomes available. Mathematical tools and models guide and improve the posing of questions, gathering data, constructing explanations, and communicating results. B-2.11
B-3: History of Science	***Many individuals have contributed to the traditions of science. Studying some of these individuals provides further understanding of scientific inquiry, science as a human endeavor, the***	***In history, diverse cultures have contributed scientific knowledge and technologic inventions.*** Changes in science occur as modifications in existing	***In history, diverse cultures have contributed scientific knowledge and technologic inventions.*** Changes in science occur as modifications in existing	***In history, diverse cultures have contributed scientific knowledge and technologic inventions.*** Changes in science occur as modifications in existing

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	nature of science, and the relationships between science and society. B-3.8	knowledge. The historical perspective of scientific explanations demonstrates how scientific knowledge changes by evolving over time. B-3.9	knowledge. The historical perspective of scientific explanations demonstrates how scientific knowledge changes by evolving over time. B-3.10	knowledge. The historical perspective of scientific explanations demonstrates how scientific knowledge changes by evolving over time. B-3.11
STANDARD C: SCIENCE INQUIRY—STUDENTS WILL INVESTIGATE QUESTIONS USING SCIENTIFIC METHODS AND TOOLS, REVISE THEIR PERSONAL UNDERSTANDING TO ACCOMMODATE KNOWLEDGE, AND COMMUNICATE THOSE UNDERSTANDINGS TO OTHERS.				
C-1: Ask Questions about Objects, Organ-isms, and Events in the Everyday World.	***Formulate a testable hypothesis suggested by current social issues, scientific literature, or observations of phenomena and demonstrate its connections to scientific concepts.*** ***C-1.8***	***Formulate a testable hypothesis suggested by current social issues, scientific literature, or observations of phenomena and demonstrate its connections to scientific concepts.*** ***C-1.9***	***Formulate a testable hypothesis suggested by current social issues, scientific literature, or observations of phenomena and demonstrate its connections to scientific concepts.*** ***C-1.10***	***Formulate a testable hypothesis suggested by current social issues, scientific literature, or observations of phenomena and demonstrate its connections to scientific concepts.*** ***C-1.11***
C-2: Make Connections to Prior Knowledge.	***Use prior knowledge of scientific facts, concepts, and investigations to make predictions and help answer the question being investigated.*** ***C-2.8***	***Use prior knowledge of scientific facts, concepts, and investigations to make predictions and guide the design of an experiment.*** ***C-2.9***	***Use prior knowledge of scientific facts, concepts, and investigations to make predictions and guide the design of an experiment.*** ***C-2.10***	***Use prior knowledge of scientific facts, concepts, and investigations to make predictions and guide the design of an experiment.*** ***C-2.11***
C-3: Gather Background Knowledge Related to the Questions Being Investigated.	***Locate and access data and scientific knowledge in age-appropriate information sources and reference materials. (See English/ Language Arts and Information and Technology Literacy***	***Locate and access data and scientific knowledge in age-appropriate information sources and reference materials. (See English/ Language Arts and Information and Technology Literacy***	***Locate and access data and scientific knowledge in age-appropriate information sources and reference materials. (See English/ Language Arts and Information and Technology Literacy***	***Locate and access data and scientific knowledge in age-appropriate information sources and reference materials. (See English/ Language Arts and Information and Technology Literacy***

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	Standards.) ***C-3.8***	***Standards.)*** ***C-3.9***	***Standards.)*** ***C-3.10***	***Standards.)*** ***C-3.11***
C-4: Design and Conduct Responsible and Safe Investigations to Help Answer Questions.	***Demonstrate knowledge of age-appropriate safe laboratory procedures.*** ***Design, plan, and conduct investigations that involve the identification of independent (manipulated) and dependent (responding) and controlled variables and determining which is the most logical data to collect.*** ***C-4.8***	***Demonstrate knowledge of age-appropriate safe laboratory procedures.*** ***Design an appropriate scientific investigation based on current issues, scientific concepts, or student observations.*** ***C-4.9***	***Demonstrate knowledge of age-appropriate safe laboratory procedures.*** ***Design an appropriate scientific investigation based on current issues, scientific concepts, or student observations.*** ***C-4.10***	***Demonstrate knowledge of age-appropriate safe laboratory procedures.*** ***Design an appropriate scientific investigation based on current issues, scientific concepts, or student observations.*** ***C-4.11***
C-5: Safely Use Appropriate Senses, Equip-ment and Tools to Make Observations and Gather Data.	***Select and use appropriate tools and equipment to make accurate observations and SI measurements for the purpose of scientific investigation.*** ***C-5.8***	***Select and use appropriate tools and equipment to make accurate observations and SI measurements for the purpose of scientific investigation.*** ***C-5.9***	***Select and use appropriate tools and equipment to make accurate observations and SI measurements for the purpose of scientific investigation.*** ***C-5.10***	***Select and use appropriate tools and equipment to make accurate observations and SI measurements for the purpose of scientific investigation.*** ***C-5.11***
C-6: Collecting and Representing Qualitative and Quantitative Data **(See Math Standard E.)**	***Collect and organize qualitative and quantitative data in a journal, lab report, record sheet, or by using media and technology appropriate to purpose and content.*** ***Create and interpret appro-priate types of graphs (bar graphs, line graphs, pie graphs).***	***Collect and organize qualitative and quantitative data in a, lab notebook or report, or by using media and technology appropriate to purpose and content.*** ***Create and interpret appro-priate types of graphs.***	***Collect and organize qualitative and quantitative data in a, lab notebook or report, or by using media and technology appropriate to purpose and content.*** ***Create and interpret appro-priate types of graphs.***	***Collect and organize qualitative and quantitative data in a, lab notebook or report, or by using media and technology appropriate to purpose and content.*** ***Create and interpret appro-priate types of graphs.***

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	C-6.8	*C-6.9*	*C-6.10*	*C-6.11*
C-7: Summarizing, Synthesizing, Inferring, and Building Explanations	***Analyze and interpret qualitative and quantitative data for experimental errors; and use them to build explanations, develop models, and raise further questions.*** ***Use the explanations and models found in science to develop likely explanations for the results of the investigation.*** *C-7.8*	***Use experimental results, mathematical formulas, models, and current scientific knowledge to develop and defend likely explanations of investigation results and refine work.*** ***Relate mathematical functions to data.*** *C-7.9*	***Use experimental results, mathematical formulas, models, and current scientific knowledge to develop and defend likely explanations of investigation results and refine work.*** ***Relate mathematical functions to data.*** *C-7.10*	***Use experimental results, mathematical formulas, models, and current scientific knowledge to develop and defend likely explanations of investigation results and refine work.*** ***Relate mathematical functions to data.*** *C-7.11*
C-8: Communicating Results	***Complete a lab report or journal.*** ***Share, defend, and revise results, explanations, and procedures using media and technology appropriate to purpose and content.*** *C-8.8*	***Complete an appropriate lab report.*** ***Share, defend, and revise results, explanations, and procedures using media and technology appropriate to purpose and content.*** ***Evaluate physical and conceptual models for accuracy and completeness.*** *C-8.9*	***Complete appropriate lab report.*** ***Share, defend, and revise results, explanations, and procedures using media and technology appropriate to purpose and content.*** ***Evaluate physical and conceptual models for accuracy and completeness.*** *C-8.10*	***Complete appropriate lab report.*** ***Share, defend, and revise results, explanations, and procedures using media and technology appropriate to purpose and content.*** ***Evaluate physical and conceptual models for accuracy and completeness.*** *C-8.11*
STANDARD D: PHYSICAL SCIENCE —STUDENTS WILL DEMONSTRATE AN UNDERSTANDING OF THE PHYSICAL AND CHEMICAL PROPERTIES OF MATTER, THE FORMS AND PROPERTIES OF ENERGY, AND THE WAYS IN WHICH MATTER AND ENERGY INTERACT.				
D-1: Properties of Matter		***In living organisms, atoms are arranged n special molecules that function in the processes necessary to support life.***	***The components that make up atoms have measurable properties.*** ***Chemical and physical***	

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		D-1.9	***properties of a substance can be measured: density, melting point, boiling point, pH, conductivity, magnetic attraction, and solubility.*** ***The physical properties of compounds reflect the nature of the interactions among its molecules. These interactions are determined by the structures of the molecule, including the constituent atoms and the distances and angles between them.*** ***Solids, liquids, and gases differ in the distances and angles between molecules or atoms and therefore the energy that binds them together.*** ***Carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures including synthetic polymers, oils, and the large molecules essential to life.*** ***D-1.10***	
D-2: Structure of Matter	***Different arrangements of atoms compose all substance and atoms may be bonded together.***		***The numbers of protons in the nucleus of an atom determines the atom's electron configuration,***	

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	A compound is formed when two or more kinds of atoms bind together chemically. ***Atoms may stick together in well-defined molecules or may be packed together n large arrays. Different arrangements of atoms compose all substances.*** ***Atoms and molecules are in constant motion.***		***which determines how the atom interacts with other atoms.*** ***Atoms form bonds which other atoms by transferring or sharing outer electrons.*** ***The configuration of atoms in a molecule determines the molecule's properties.*** ***Neutrons have a mass that is nearly identical to that of protons, but neutrons have no electric charge.*** ***Neutrons have little effect on how an atom interacts with others, but they do affect the mass and stability of the nucleus.*** ***Isotopes of the same element have the same number of protons, but different numbers of neutrons.*** ***Scientists continue to investigate atoms and have discovered even smaller constituents of which protons and neutrons are made.*** ***At the atomic level, electric forces between oppositely charged electrons and***	

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	D-2.8		***protons hold atoms and molecules together and they are involved in all chemical reactions.*** ***The states of matter can be identified and described based on motion and distance between the particles that make them up.*** ***D-2.10***	
D-3: Physical, Chemical and Nuclear Changes in Matter	***Elements combine in a multitude of ways to produce compounds, which account for the living and nonliving sub-stances that we encounter. The properties of the new substances may be very different from those of the old.*** ***When substances interact chemically to form new substances, the elements composing them combine in new ways.*** ***Regardless of how substances within a closed system interact, the total mass of the system remains the same.*** ***Atoms do not break down during normal laboratory***	A wide variety of biological, chemical, and physical phe-nomena can be explained by changes in the arrangement and motion of atoms and molecules.	***A wide variety of biological, chemical, and physical phe-nomena can be explained by changes in the arrangement and motion of atoms and molecules.*** ***Chemical reactions form products that are different from the reactants and these chemical reactions can be represented by chemical equations.*** ***Different energy levels are associated with different con-figurations of atoms in molecules. Some changes of configuration require a net input of energy, whereas others cause a net release.*** ***During chemical reactions, energy is absorbed or release and the energy can***	

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	reactions. ***D-3.8***	D-3.9	***be in the form of light, heat or electrical energy.*** ***Matter and energy are conserved during chemical and physical changes.*** ***The nuclei of radioactive isotopes spontaneously decay emitting particles and/or wave-like radiation.*** ***Nuclear reactions (fission or fusion) convert a fraction of the mass of interacting particles into energy, but the total amount of mass and energy is conserved.*** ***D-3.10***	
D-4: Position and Motion of Objects				Objects change their motion only when a net force is applied. Laws of motion are used to calculate and graph precisely the effects of forces on the motion of objects. D-4.11
D-5: Forces of Nature	***Everything on or anywhere near the earth is pulled toward the earth's center by gravitational force.*** ***Every object exerts gravitational force on every other object. The force depends on how much mass the objects***		***At the atomic level, electric forces between oppositely charged electrons and protons held atoms and molecules together and thus are involved in all chemical reactions. On a larger scale, these forces hold solid and liquid materials together.***	Gravitational force is an attraction between masses. The strength of the force is proportional to the masses and weakens rapidly with increasing distance between them. The electric force is a

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	have and on how far apart they are. ***The electric force is a universal force that exists between any two charged objects. There are two kinds of charges—positive and negative.*** ***Opposite charges attract, while like charges repel. Electric currents and magnets can exert a force on each other.*** ***Moving electric charges produce magnetic forces, and moving magnets produce electric forces.***		***There are two kinds of charges—positive and negative. Like charges repel one another, opposite charges attract. In materials, there are almost exactly equal proportions of positive and negative charges, making the materials as a whole electrically neutral. Negative charges, being associated with electrons, are far more mobile in materials than positive charges are. A very small excess or deficit of negative charges in a material produces noticeable electric forces.***	universal force that exists between any two charged objects. Opposite charges attract, while like charges repel. The strength of the electric force is proportional to the charges and inversely proportional to the square of the distance between them. Negative charges, being associated with electrons, are far more mo-bile in materials than positive charges are. A very small excess or deficit of negative charges in a material produces noticeable electric forces. At the atomic level, electric forces between oppositely charged electrons and protons hold atoms and molecules together and are involved in all chemical reactions. These forces also hold solid and liquid materials together and act between objects when they are in contact. Electricity and magnetism are two aspects of a single electro-magnetic force. Moving electric charges produce magnetic forces, and

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	D-5.8		***D-5.10***	moving magnets produce electric forces. The forces that hold the nucleus of an atom together are much stronger than the electro-magnetic force, so great amounts of energy are released from the nuclear reactions in the sun and other stars. D-5.11
D-6: Interactions of Energy and Matter	***Most of what goes on in the universe involves some form of energy being transformed into another.*** ***Energy in the form of heat is almost always one of the products of an energy transformation.*** ***The sun's energy arrives as light with a range of wavelengths, consisting of visible light infrared, and ultraviolet radiation.*** ***The visible light from the sun is made up of a mixture of many different colors of light, even though to the eye the light looks almost white.*** ***Light interacts with matter by transmission, absorption, or scattering.***	***All living things use energy.*** ***The sun is a major source of energy for changes on the earth's surface.*** ***Plants convert light energy into stored chemical energy through photosynthesis, and animals get energy from cellular respiration (i.e. energy can change from one form to another in living things).***	***Heat consists of random motion and the vibrations of atoms, molecules, and ions. The higher the temperature, the greater the atomic or molecular motion.*** ***Energy is required to change the state of matter.*** ***In most chemical and nuclear re-actions, energy is transferred into or out of a sys-tem. Heat, light, mechanical motion, or elec-tricity might all be involved in such transfers.*** ***Each kind of atom or molecule can gain or lose energy only in particular discrete amounts and thus can absorb and emit light only at wavelengths corresponding to these***	Different kinds of materials respond differently to electric forces. In conducting materials such as metals, electric charges flow easily, whereas in insulating materi-als, such as glass, they can move hardly at all. At very low temperatures, some materials become super-conductors and offer no resistance to the flow of current. Electromagnetic waves result when a charged object is accelerated or decelerated. The energy of electromagnetic waves is carried in packets whose magnitude is inversely proportional to the wavelength.

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	Vibrations in materials set up wavelike disturbances that transfer energy and spread away from the source. ***These and other waves move at different speeds in different materials.*** ***Electrical circuits provide a means of converting electrical energy into other forms of energy.*** D-6.8	***D-6.9***	***amounts. These wavelengths can be used to identify the substance.*** ***D-6.10***	To see an object, light from that object—emitted by or scattered from it—must enter the eye. To hear a sound, waves from an object must enter the ear. D-6.11
D-7: Conservation of Energy	The total energy of the universe is constant. Energy can be transferred in many ways, but it can never be destroyed. D-7.8	The total energy of the universe is constant. Energy can be transferred in many ways, but it can never be destroyed. D-7.9	***The total energy of the universe is constant. Energy can be transferred in many ways, but it can never be destroyed.*** As transfers of energy occur, the matter involved becomes steadily less ordered. ***D-7.10***	***The total energy of the universe is constant. Energy can be transferred in many ways but in can never be destroyed.*** As transfers of energy occur, the matter involved becomes steadily less ordered. ***D-7.11***
STANDARD E: EARTH SCIENCE—STUDENTS WILL DEMONSTRATE AN UNDERSTANDING OF THE STRUCTURE AND SYSTEMS OF EARTH AND THE UNIVERSE AND OF THEIR INTERACTIONS.				
E-1: Properties and Structures of the Earth and its Materials	***Earth is the only body in the solar system that appears able to support life.*** ***Living organisms have played many roles in the earth system, including affecting the composition of***			Earth systems have internal and external sources of energy, both of which create heat. The sun is the major external source of heat. Two primary sources of internal energy are the decay of radioactive isotopes and the

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	the atmosphere, producing some types of rocks and contributing to the weathering of rocks. E-1.8			gravitational energy from the earth's original formation. The solid crust of the earth consists of separate plates that ride on a denser, hot, gradually deformable layer of the earth. The crust sections move very slowly, pressing against one another in some places, pulling apart in other places. Earthquakes, volcanic activity, mountain building and sea floor formation may occur at these boundaries. E-1.11
E-2: History and Changes of the Earth				The sun, the earth, and the rest of the solar sys-tem formed from a nebular cloud of dust and gas approximately 4.6 billion years ago. The early earth was very different form the planet we live on today. Geologic time can be estimated by observing rock sequences and using fossils to correlate the sequences at various locations. Current methods include using the known decay rates of radio-active isotopes present in rocks to measure the time since the rock was formed.

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				Interactions among the solid earth, the oceans, the atmosphere, and organisms have resulted in ongoing changes of the earth system. Evidence for one-celled forms of life extends back more that 3.5 billion years. The development of life on earth caused dramatic changes in the composition of the atmosphere, which did not originally contain oxygen. E-2.11
E-3: Cycles in the Earth System				Heating of earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents. Weather and climate involve the transfer of energy in and out of the atmosphere. The earth is a system containing essentially a fixed amount of each stable chemical, atom, or element. Each element can exist in several different chemical reservoirs. Movement of matter between reservoirs is driven by the earth's internal and external sources of

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				energy. These movements are often accompanied by a change in the physical and chemical properties of the matter. The formation, weathering, sedimentation, and reformation of rock constitute a continuing "rock cycle" in which the total amount of material stays the same as its forms change. E-3.11
E-4: The Earth, Our Solar System, and Space	***The earth is the third planet from the sun in a sys-tem that includes the moon; the sun; seven other planets and their moons; and smaller objects, such as asteroids and comets.*** ***Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.*** ***The planets, having different sizes, surface features and compositions, move around the Sun in oval (elliptical) orbits, and some planets have a variety of moons and rings of***			The origin of the universe remains one of the greatest questions in science. The "big bang" theory places the origin between 10 and 20 billion years ago, when the universe began in a hot, dense state; according to this theory, the universe has been expanding ever since. Early in the history of the universe, matter—primarily the light atoms, hydrogen and helium—clumped together by gravitational attraction to form countless trillions of stars. Billions of galaxies, each of which is a gravitationally bound cluster of billions of

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	particles orbiting around them. ***There are many different stars, and they have different properties.*** ***The sun is a medium-sized star and is the central and largest body in our solar system.*** ***The sun is the major source of energy for phenomena on the earth's surface, such as weather and ocean currents.*** ***Gravity explains the phenomena of the tides.*** ***The universe contains billions of galaxies, each containing billions of stars.*** ***A light year is a unit of distance.*** ***E-4.8***			stars, now form most of the visible mass in the universe. Stars produce energy from nuclear reactions, primarily the fusion of hydrogen to form helium. These and other processes in stars have led to the formation of al the other elements. E-4.11
STANDARD F: LIFE AND ENVIRONMENTAL SCIENCE —STUDENTS WILL DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND STRUCTURES OF LIVING THINGS, THE PROCESSES OF LIFE, AND HOW LIVING THINGS INTERACT WITH ONE ANOTHER AND THEIR ENVIRONMENT.				
F-1: Characteristics, Structure, and Function in Living Things	***All organisms are composed of cells.*** ***Many organisms are single celled; others are multicellular.***	***Every cell is covered by a membrane that controls what can enter and leave the cell.*** ***A living cell is composed of a small number of chemical***		***Differentiation of cells is regulated through the expression of different genes.***

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	Cells continually divide to make more cells for growth and repair. ***Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems.***	***elements mainly carbon, hydrogen, nitrogen, oxygen, phosphorous, and sulfur.*** ***Different molecules inside the cell form structures that carry out cell functions.*** ***Cell functions include transport of materials, energy capture and release, protein building, waste disposal, information feedback, and movement.*** ***The work of a cell is carried out by the many different proteins it assembles from 20 different amino acids.*** ***The function of each protein molecule depends on its sequence of amino acids.*** ***The genetic information in DNA molecules provides instructions for assembling protein molecules. The code used is virtually the same for all life forms.*** ***Complex interactions among the different kinds of molecules in the cell cause distinct cycles of activities, such as growth and division. Cell behavior can also be affected by molecules from***		

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	F-1.8	***other parts of the organism.*** ***Most cells function best within a narrow range of temperature and acidity.*** ***Plant cells contain chloro-plasts, the site of photosynthesis.*** ***Plants and many microorganisms use solar energy to combine mole-cules of carbon dioxide and water into complex, energy-rich compounds and release oxygen to the environment.*** ***Complex multicellular organisms are formed as a highly organized arrangement of differentiated cells.*** The complexity and organization of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy used to sustain the organism. *F-1.9*		*F-1.11*
F-2: Life Cycles and Heredity of Living Things	***Every organism requires a set of instructions for specifying its traits. Heredity is the passage of***	***The information passed from parents to offspring is coded in DNA molecules.***		

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	these instructions from one generation to another. ***Hereditary information is contained in genes, located in the chromosomes of each cell. Each gene carries a single unit of information. An inherited trait of an individual can be deter-mined by one or by many genes, and a single gene can influence more than one trait.*** ***Some traits are inherited, and others result from interactions with the environment.*** ***Some organisms reproduce asexually, which means all the genes come from a single parent.*** ***In sexual reproduction, a single specialized cell from a female merges with a specialized cell from a male. As the fertilized egg, carrying genetic information from each parent, multiplies to form the complete organism, the same genetic information is copied in each cell.*** ***F-2.8***	***The chemical and structural properties of DNA explain how the genetic information that underlies heredity is both encoded in genes and replicated.*** ***Genes are segments of DNA molecules.*** ***The sorting and recombination of genes in sexual reproduction results in a great variety of possible gene combinations from the off-spring of any two parents.*** ***Inserting, deleting, or substituting DNA segments can alter genes; and an altered gene may be passed on to every cell that develops from it. This may help, harm, or have little effect on the offspring's success in its environment.*** ***Behavior is one kind of response an organism can make to an internal or environmental stimulus. Behavioral re-sponse is a set of actions deter-mined in part by heredity and in part from experience.*** ***F-2.9***		

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F-3: Organisms, Populations, and Ecosystems	***Biological evolution accounts for the diversity of species developed through gradual processes over many generations.*** ***Species acquire many of their unique characteristics and behaviors through biological adaptations, which involve the selection of naturally occurring variations in populations.*** ***Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival.*** ***Fossils provide evidence that many organisms that lived long ago are extinct.***	***Organisms are classified into a hierarchy of groups and sub-groups based on anatomical similarities and the similarity of their DNA sequences.*** ***Organisms both cooperate and compete in ecosystems. The ecosystems may be stable for hundreds or thousands of years.*** ***Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite.*** ***Genetic variability of organisms due to mutation and recombination of genes makes some organisms better able to survive and leave offspring.*** ***Natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life forms as well as for the striking molecular similarities observed among the diverse species of living organisms.*** ***A great diversity of species increases the chance that at***		

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	F-3.8	***least some living things will survive in the face of large changes in the environment. Human beings are part of the earth's eco-systems. Human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems.*** ***F-3.9***		
F-4: Matter and Energy in Living Systems		***Living systems require a continuous input of energy to maintain their chemical and physical organizations.*** ***The atoms and molecules on the earth cycle among the living and nonliving components of the biosphere.*** ***Energy flows through eco-systems in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers.*** ***Plants capture energy by ab-sorbing light and using it to form strong chemical bonds between the atoms of carbon-containing molecules. The energy stored in bonds between the atoms (chemical energy) can be used as sources of energy***		

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		for life processes. ***At each link in a food web, some energy is stored in newly made structures; but much is dissipated into the environment as heat. Continual input of energy from sunlight keeps the process going.*** ***The amount of life any environment can support is limited by the available energy, water, oxygen, and minerals and by the ability of ecosystems to recycle the residue of dead organic materials. Human activities and technology can change the flow.*** ***F-4.9***		
STANDARD G: SCIENCE APPLICATIONS—STUDENTS WILL DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIP BETWEEN SCIENCE AND TECHNOLOGY AND THE WAYS IN WHICH THAT RELATIONSHIP INFLUENCES HUMAN ACTIVITIES.				
G-1: The Process of Technological Design	***Identify appropriate problems for technological design, design a solution or product, implement a proposed design, evaluate completed technological designs or products, and communicate the process of technological design.***	***Identify a problem or an opportunity to improve a design; propose designs and choose between alternative solutions; implement a proposed solution; evaluate the solution and its consequences; and communicate the problem, process, and solution.*** ***Science and technology are pursued for different***	Identify a problem or an opportunity to improve a design; propose designs and choose between alternative solutions; implement a proposed solution; evaluate the solution and its consequences; and communicate the problem, process, and solution.	Identify a problem or an opportunity to improve a design; propose designs and choose between alternative solutions; implement a proposed solution; evaluate the solution and its consequences; and communicate the problem, process, and solution.

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	G-1.8	***purposes. Scientific inquiry is driven by the desire to understand the natural world, and technology is driven by the need to meet human needs and solve human problems.*** ***G-1.9***	G-1.10	G-1.11
G-2: Abilities to Distinguish Between Natural Objects and Objects Made by Humans	Design, build, evaluate, and revise models and explanations related to the earth and space, life and environ-mental, and physical sciences. G-2.8	Design, build, evaluate, and revise models and explanations related to the earth and space, life and environ-mental, and physical sciences. G-2.9	Design, build, evaluate, and revise models and explanations related to the earth and space, life and environ-mental, and physical sciences. G-2.10	Design, build, evaluate, and revise models and explanations related to the earth and space, life and environ-mental, and physical sciences. Analyze the costs, benefits, or problems resulting from a scientific or technological innovation. G-2.11
G-3: Understanding About Science and Technology	***Technology impacts trends in science and scientific research.*** ***Scientific knowledge can be used to make real-life decisions.*** Scientists rely on technology to enhance the gathering and manipulation of data. G-3.8	***Science often advances with the introduction of new technologies, and solving technological problems often results in new scientific knowledge.*** ***Scientists rely on technology to enhance the gathering and manipulation of data.*** ***The accuracy and precision of data depends on the technology used.*** ***G-3.9***	***Science often advances with the introduction of new technologies, and solving technological problems often results in new scientific knowledge.*** ***Scientists rely on technology to enhance the gathering and manipulation of data.*** ***The accuracy and precision of data depends on the technology used.*** ***G-3.10***	***Science often advances with the introduction of new technologies, and solving technological problems often results in new scientific knowledge.*** ***Scientists rely on technology to enhance the gathering and manipulation of data.*** ***The accuracy and precision of data depends on the technology used.*** ***G-3.11***

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STANDARD H: SCIENCE IN SOCIAL AND PERSONAL PERSPECTIVES—STUDENTS WILL USE SCIENCE INFORMATION AND SKILLS TO MAKE INFORMED DECISIONS ABOUT THEMSELVES, THEIR COMMUNITY, AND THE WORLD IN WHICH THEY LIVE.				
H-1: Personal and Community Health	***Natural environments may contain substances (for example, radon and lead) that are harmful to human beings. Maintaining environmental health involves establishing or monitoring quality standards related to use of soil, water, and air.*** ***H-1.8***	***Scientific knowledge can be used to make real-life decisions.*** ***H-1.9***	***Scientific knowledge can be used to make real-life decisions.*** ***H-1.10***	***Scientific knowledge can be used to make real-life decisions.*** ***H-1.11***
H-2: Human Population Growth	When an area becomes over-populated, the environment will become degraded due to the increased use of resources. H-2.8			Populations grow or decline through the combined effects of births and deaths and through emigration and immigration. Populations can increase through linear or exponential growth, with effects on resource use and environmental pollution. Populations can reach limits to growth. Carrying capacity is the maximum number of individuals that can be supported in a given environment. H-2.11
H-3: Types of Resources	***Humans have used renewable and nonrenewable natural resources through history.***			Human populations use resources in the environment in order to maintain and improve their existence.

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	The global environment is affected by national policies and practices relating to energy use, waste disposal, ecological management, manufacturing, and population. ***H-3.8***			Natural resources have been and will continue to be used to maintain human populations. The earth does not have infinite resources. Increasing human consumption places severe stress on the natural processes that renew some resources, and it depletes those resources that cannot be renewed. H-3.11
H-4: Quality of and Changes in Environments	***Internal and external processes of the earth system cause natural hazards (earthquakes, landslides, wild-fires, volcanic eruptions, floods, storms, asteroid impact) that change or destroy human and wildlife habitats, damage property, and harm or kill living organisms.*** ***Human activities (resource acquisition, urban growth, land-use decisions, and waste disposal) can induce hazards and can accelerate many natural changes.*** ***H-4.8***			Human activities can enhance potential for hazards. Acquisition of resources, urban growth, and waste disposal can accelerate rates of natural change. Some hazards, such as earth-quakes, volcanic eruptions, and severe weather, are rapid and spectacular; but there are slow and progressive changes that also result in problems for individuals and societies. Humans have a major effect on other species. H-4.11

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H-5: Science and Technology in Society	***Societal challenges often inspire questions for scientific research.*** ***Technology influences society through its products and processes.*** ***Social needs, attitudes and values influence the direction of technological development.*** ***H-5.8***			Understanding basic concepts and principles of science and technology should precede active debate about the economics, policies, politics, and ethics of various science and technology-related challenges. Progress in science and technology can be affected by social issues and challenges. H-5.11