The Living Environment

Revised July 2006 By Nicole Lener

Topic: Importance of observation in science.

Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

Key Idea 1 - The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing and creative process.

Performance Indicators	Essential Questions	ERM	Essential Knowledge & Skills	Classroom Ideas	Assessment Ideas
Performance Indicator 1.1 Elaborate on basic scientific and personal explanations of natural phenomena, and develop extended visual models and mathematical formulation to represent one's thinking. Performance Indicator 1.2 Hone ideas through reasoning, library research, and discussion with others, including experts.	What is science? Who are scientists? How are questions answered using science? What does observation mean? In what ways can something be observed? What does observation have to do with science?		Scientific explanations are built by combining evidence that can be observed with what people already know about the world. Inquiry involves asking questions and locating, interpreting, and processing information form a variety of sources. Follows safety rules in the laboratory. Uses metric ruler to measure length. Makes observations of biological processes.	- Bell ringer: Write a list of important things that you need to know in order to protect yourself and people you care about. - Teacher led discussion about how things on the list have been impacted by science. - Notes- Handwritten- What is science? Who are scientists? Answering questions using science - Block Activity pg 2 from textbook. Followed by teacher led class discussion on the importance of being specific in directions and what that has to do with science.	* Successful completion of pg 7 #1,3-5 * Participation in class discussion/ block activity * Successful completion of the Observing Fungi Lab

	How is metric measurement used in order to determine length? How is a stereoscope used properly?		Uses a compound microscope/stereoscope effectively to see specimens clearly, using different magnifications.	- Assignment in textbook: Read pgs 3-7. Do # 1,3-5 Lab: Observing Fungi Teacher Demo: Spore Drop	
Connections to text: Pages 3-7					
Vocabulary: science, data, inference, hypothesis, fungi, observation, Class, cap, gills, stipe, veil, volva, warts, stereoscope					

The Living Environment

Topic: Ethics, morals, and money in science.

Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

Key Idea 1 - The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing and creative process.

Performance Indicators	Essential Questions	ERM	Essential Knowledge & Skills	Classroom Ideas	Assessment Ideas
Performance Indicator 1.1 Elaborate on basic scientific and personal explanations of natural phenomena, and develop extended visual models and mathematical formulation to represent one's thinking. Performance Indicator 1.2 Hone ideas through reasoning, library research, and discussion with others, including experts. Performance Indicator 1.3 Work toward reconciling competing explanations; clarify points of agreement and disagreement.	What are morals? What is ethics? How do morals, ethics, and money play a role in science? What is the scientific method and how is it used? How are theories established?		Scientific explanations are built by combining evidence that can be observed with what people already know about the world. Learning about the historical development of scientific concepts or about individuals who have contributed to scientific knowledge provides a better understanding of scientific inquiry and the relationship between science and society. Science provides knowledge, but values are also essential to making effective and ethical decisions about the application of scientific knowledge.	- Teacher led class discussion on what are morals and ethics and how they play a role in science using various examples. (ex. cloning, human fertility technology, genetically modified foods, pollution, "What does it mean to be alive?" (legal/biological definitions) - Notes handwritten I. Review: Steps in the scientific method II. A famous experiment using the scientific method (Refer students to page 9 in text and explain)	* Successful completion of pg 15 #1-5 * Successful completion of scientific method quiz * Successful completion of scientific method exam * Successful completion of answering questions about maggots in a jar (next day activity to start class)

			Inquiry involves asking questions and locating, interpreting, and processing information form a variety of sources. Inquiry involves making judgments about the reliability of the sources and relevance of information. Scientific explanations are accepted when they are consistent with experimental and observational evidence and when they lead to accurate predictions. All scientific explanations are tentative and subject to change or improvement. Each new bit of evidence can create more questions than it answers. This leads to increasingly better understanding of how things work in the living world.	- Go over overheads: "Using the scientific method to find a date for Friday night." Redi experiment - Read pgs 8-15 in textbook do #1-5	

Connections to text: Pages 8-15, 23

Vocabulary: ethics, morals, spontaneous generation, controlled experiment, problem statement, trial, bias, research plan, data, refute, dependent variable, independent variable, controls, control group, experimental group, conclusion, peer review, Redi, theory

The Living Environment

Topic: Applying the scientific method and metric measurement.

Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

Performance Indicators	Essential Questions	ERM	Essential Knowledge & Skills	Classroom Ideas	Assessment Ideas
Performance Indicator 1.4 Coordinate explanations at different levels of scale, points of focus, and degrees of complexity and specificity, and recognize the need for such alternative representations of the natural world. Performance Indicator 2.1 Devise ways of making observations to test proposed explanations.	What are the steps in the scientific method? How is metric measurement used? How are mass, length, and volume measured? How are metric units converted?		Well-accepted theories are ones that are supported by different kinds of scientific investigations often involving the contributions of individuals from different disciplines. Hypotheses are predictions based upon both research and observation. Hypotheses are widely used in science for determining what data to collect and as a guide for interpreting the data.	- Bell ringer: Demo: Meat in a jar with maggots - Have two jars that contain meat one is covered with no maggots, the other one is not covered and has maggots on it. When students enter have them make observations about the two jars. Have them work backwards and list the problem, hypothesis, controls, control group, experimental group, independent variable, dependent variable, and state what hypothesis this evidence supports. - Assign "Scientific Method Exercises" worksheet	* Successful completion of bell ringer activity * Successful completion of "Scientific Method Exercises" worksheet * Successful completion of "Using SI Units of Measure" lab * Successful completion of the worksheet "Applying Scientific Method to Everyday Applications of Biology"

Performance indicator 2.3 Develop and present proposals including formal hypotheses to test explanations; i.e., predict what should be observed under specific conditions if the explanation is true. Appendix A Living Environment - Laboratory Checklist - Selects and uses the correct instruments (for measurement purposes)				-Notes (handwritten) I. Intro to metric measurement II. Types of measurements using metric - "Using SI Units of Measure" lab - Worksheet "Applying Scientific Method to Everyday Applications of Biology"	

Connections to text: pages 8-15
Vocabulary: controlled experiment, problem statement, hypothesis, controls, control group, experimental group, independent variable, dependent variable, conclusion, length, meter, mass, gram, volume, liter, temperature, time

The Living Environment

Topic: Introduction to biochemistry

Standard 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.

Key Idea 1 - Living things are both similar and different from each other and from nonliving things.

Key Idea 5 - Organisms maintain a dynamic equilibrium that sustains life.
Key Idea 6 - Plants and animals depend on each other and their physical environment.

Performance Indicators	Essential Questions	ERM	Essential Knowledge & Skills	Classroom Ideas	Assessment Ideas
Performance Indicator 1.1 Describe and explain the structures and functions of the human body at different organizational levels (e.g., systems, tissues, cells, organelles). Performance Indicator 5.1 Explain the basic biochemical processes in living Organisms and their importance in maintaining dynamic equilibrium.	What are the parts of an atom? What is the difference between an atom, a molecule, an element, and a compound? What are the differences between the following organic compounds: proteins, Carbohydrates, lipids, and nucleic acids?		Many organic and inorganic substances dissolved in cells allow necessary chemical reactions to take place in order to maintain life. Large organic food molecules such as proteins and starches must initially be broken down (digested to amino acids and simple sugars respectively), in order to enter cells. Once nutrients enter a cell, the cell will use them as building blocks in the synthesis of compounds necessary for life.	- Notes- handwritten- I. Introduction to chemistry II. Introduction to organics III. Properties of water IV. Chemical bonds V. pH - Demo: Using molecular models to help students visualize concepts - Demo: Floating paper clip	* Successful completion of pg 38 & 48 * Successful (65% or better) completion of Introduction to Biochemistry quiz * Successful completion of “Introduction to Chemistry” worksheet.

Performance Indicator 6.1 Explain factors that limit growth of individuals and populations.	What is the structure and function of the four different types of organic molecules found in living things? How is water important to all living things? What is pH and what does it have to do with living things? What is a chemical indicator? How can a food be tested for the presence of proteins, starch, simple sugars, and fats? What is the purpose of a control in an experiment?		In all organisms, organic compounds can be used to assemble other molecules such as proteins, DNA, starch, and fats. The chemical energy stored in bonds can be used as a source of energy for life processes. In any particular environment, the growth and survival of organisms depend on the physical conditions including light intensity, temperature range, mineral availability, soil/rock type, and relative acidity (pH). Follows safety rules in the laboratory States an appropriate hypothesis Follows directions to correctly use and interpret chemical indicators Identifies the control group and / or controlled variables	-Demo: Sugar & water solution (conserving mass) - Demo: pH neutralization of vinegar -Demo: Chemical indicator for pH using phenothalein -Do “Introduction to Chemistry” worksheet -Do “Testing for Nutrients” lab -Do “pH Lab” - Notes (handwritten) I. Energy in chemical reactions II. What is an enzyme? III. Interpreting enzyme graphs - Demo: Set Kleenex on fire within a beaker to show importance of a catalyst, what energy is, and to show a chemical reaction. - Demo: Add lemon juice to a beaker of milk in order to show the denaturing of proteins specific to pH.	* Successful completion of “Testing for Nutrients” lab report. * Successful completion of pH lab report. * Successful completion of pg 51 and 53 in textbook. * Successful completion of “Catalase Lab.” * Successful completion of Biochemistry Exam. * Successful completion of “Biochemistry Worksheet.”

	What is the difference between an acid, base, and neutral substance? How is pH measured? What types of substances are acids, bases, or neutral? How are conclusions drawn from conflicting data? What is an enzyme? How do enzymes work? In what ways are enzymes specific? Why are enzymes necessary within living things?		Collects, organizes, and analyses data, using a computer and/ or other laboratory equipment. Analyzes results from observations/ expressed data Formulates an appropriate conclusion or generalization from the results of an experiment Recognizes assumptions and limitations of the experiment Biochemical processes, both breakdown and synthesis, are made possible by a large set of biological catalysts called enzymes. Enzymes can affect the rates of chemical change. The rate at which enzymes work can be influenced by internal environmental factors such as pH and temperature.	- Virtual demo: Mr. Wannamaker's biology web site showing enzyme action. - Complete "Biochemistry Worksheet" -Do "Catalase Lab"	

	How does temperature effect the reaction rate of an enzyme? How is time converted into reaction rate? In what ways are enzymes specific? How could temperature negatively effect the action of enzymes within a living thing? How are conclusions drawn from data?		Enzymes and other molecules, such as hormones, receptor molecules, and antibodies, have specific shapes that influence both how they function and how they interact with other molecules.		

Connections to text: Read pgs 34-38 skip Van der Waals forces do #1-4 Read pgs 40-43 do #2-5 Read pgs. 44-48 do #1,2,4 Read pgs. 49-53 do # 1-5 on pg 51 do#1-5 on pg 53
Vocabulary: protons, electrons, neutrons, atom, chemical symbol, element, compound, molecule, polymer, monomer, organic, inorganic, fat (lipid), fatty acid, glycerol, carbohydrate, complex carbohydrate, simple sugar, glucose, starch, protein, amino acid, nucleic acids, nucleotides, DNA, RNA, mixture, solution, solute, solvent, suspension, chemical bonds, ionic bond, ion, covalent bond, hydrogen bond, pH scale, acid, base, neutral, enzyme, activation energy, catalyst, reaction rate, products, reactants

The Living Environment

Topic: *Cells*

Standard 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.

Key Idea 1 - Living things are both similar and different from each other and from non-living things.

Performance Indicators	Essential Questions	ERM	Essential Knowledge & Skills	Classroom Ideas	Assessment Ideas
Performance Indicator 1.2 Describe and explain the structures and functions of the human body at different organizational levels (e.g. systems, tissues, cells, organelles). Performance Indicator 1.3 Explain how a one-celled organism is able to function despite lacking the levels of organization present in more complex organisms.	What contributions did Robert Hooke make to science? What are the three parts to the Cell Theory? What are the different parts of a cell? What do cells look like and what is their function? How are animal and plant cells different from each other?		Cells have particular structures that perform specific jobs. These structures perform the actual work of the cell. Just as systems are coordinated and work together, cell parts must also be coordinated and work together.	- Notes(handwritten)- I. Who was Robert Hooke? II. The Cell Theory III. Basic cell structure - Activity- On a blank piece of computer paper draw an animal cell on one side with labeled parts of a plant cell on the other side with labeled parts as we cover them in the notes. - Guided web tour: "The Virtual Cell Worksheet" - Demo: Using TV scope look at prepared slides of paramecium, blood, smooth muscle, red onion w/ & w/o salt added.	* Successful completion of pgs. 172 & 183 in textbook * Successful completion of cell quiz I * Successful completion of "The Virtual Cell Worksheet" * Successful completion of "Cell Worksheet #1" * Successful completion of "How Plant and Animal Cells Differ" lab

	What do the different cell parts look like and what is their function? What do different types of cells look like? How big are different cells compared to one another? What is the purpose of a stain in creating slides? How is a wet mount made? What are the differences between animal and plant cells? What do the different cell parts look like?		Each cell is covered by a membrane that performs a number of important functions for the cell. These include: separation from its outside environment, controlling which molecules enter and leave the cell, and recognition of chemical signals. The processes of diffusion and active transport are important in the movement if materials in and out of the cell. Inside the cell a variety of specialized structures, formed from many different molecules, carry out the transport of materials (cytoplasm), extraction of energy from nutrients (mitochondria), protein building (ribosomes), waste disposal (cell membr5an), storage (vacuole), and information storage (nucleus). Compares relative sizes of cells and organelles. Identifies and compares parts of a variety of cells.	- Web demo: "Cells Alive!" Go over the relative size animation. - Complete "Cell Worksheet #1" - Lab: "How Plant and Animal Cells Differ" - Completion of "Cell Worksheet #2" -Notes(handwritten)- I. Two main categories of cells II. Receptor molecules III. Unicellular vs. multi-cellular - Go over overheads (depression medicine cartoon (receptors), examples of prokaryotic vs. eukaryotic cells) - Go over diagrams of receptor molecules on back of "Cell Worksheet #3" - Complete reading passage on receptor molecules on the back of "Cell Worksheet #3" and complete the front of the worksheet. - Complete "Word Wise" cell worksheet	* Successful completion of "Cell Worksheet #2" * Successful completion of "Cell Worksheet #3" * Successful completion of Cell Exam * Successful completion of "Living Things in Pond Water" * Successful completion of pg 188 & 189 and diffusion worksheet * Successful completion of "Diffusion, Osmosis, Receptor Quiz"

	What is the difference between a prokaryotic cell and a eukaryotic cell? What are the differences between unicellular and multicellular organisms? How do receptor molecules play a role in cellular communication? What different types of unicellular organisms are found in pond water? How are unicellular organisms capable of survival?		Uses a compound microscope/ stereoscope effectively to see specimens clearly, using different magnifications. Identifies and compares parts of a variety of cells. Prepares wet-mount slides and uses appropriate staining techniques. Receptor molecules play an important role in the interactions between cells. Two primary agents of cellular communication are hormones and chemicals produced by nerve cells. If nerve or hormone signals are blocked, cellular communication is disrupted and the organism's stability is affected. The structures present in some single-celled organisms act in a manner similar to the tissues and systems found in multi-cellular organisms, thus enabling them to perform all of the life processes needed to maintain homeostasis.	- TV microscope demo: Show some of the various organisms that may be found. - Lab: "Living Things in Pond Water" - Notes(handwritten)- I. Diffusion II. Osmosis III. Facilitated Diffusion IV. Active Transport - Class Discussion- For concentration explain example of a beaker with salt water and the ocean, and explain how the beaker could have a high concentration of salt in it. - Demos: Balloon with a few drops of vanilla in it to show diffusion. Add a few drops of food coloring to a beaker of water to show diffusion. ** Students will write up both demos on a 1/2 sheet of computer paper. - Virtual demo: Using Neo Science Cell Processes CD use animations for diffusion and active transport.	* Successful completion of "Diffusion Through a Membrane" state lab. * Successful completion of "Diffusion Through a Membrane" state quiz. * Successful completion of "Examining Bone, Muscle, and Cartilage" lab. * Successful completion of Cell Exam

	What is concentration? What is the criteria for diffusion to occur? How is facilitated diffusion different from regular diffusion? How is active transport different from diffusion? How are iodine and Benedict's solution used as chemical indicators? What is the criteria for diffusion through a membrane? How can a solution be drawn across a slide?			- Complete "Diffusion Worksheet" - State Lab: "Diffusion Through a Membrane" - Lab: "Examining Bone, Muscle, and Cartilage"	

	How does adding salt to a wet mount of an onion cause for the cell membrane to shrink? How can a shrunken cell membrane be restored to normal size? In what ways can cells appear to be different from each other? In what ways are the functions of different cells different from each other?				

Connections to text: Read pgs. 169-172 do # 1,2,4 Read pgs. 173-183 #1-6 Read pgs. 184-189 do #1-5 on 189 do #1-2 on pg 188
Vocabulary: cell, Robert Hooke, cell theory, cell membrane, cell wall, cellulose, nucleus, cytoplasm, vacuole, ribosome, mitochondria, chloroplast, photosynthesis, chlorophyll, pigment, wet mount, stain, iodine, prokaryote, eukaryote, receptor molecule, unicellular, multi-cellular, diffusion, concentration, solute, solvent, equilibrium, osmosis, facilitated diffusion, active transport

The Living Environment

Topic: Evolution

Standard 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.

Key Idea 3: Individual organisms and species change over time.

Performance Indicators	Essential Questions	ERM	Essential Knowledge & Skills	Classroom Ideas	Assessment Ideas
Performance Indicator 3.1: Explain the mechanisms and patterns of evolution.	What is biological diversity? What does biodiversity have to do with evolution? Who was Charles Darwin? What is the difference between artificial and natural selection? What is the evidence for evolution? How is the evidence for evolution used in order to support the theory of evolution?		The basic theory of biological evolution states that the Earth's present-day species developed from earlier, distinctly different species. Behaviors have evolved through natural selection. The broad patterns of behavior exhibited by organisms are those that have resulted in greater reproductive success. Billions of years ago, life on Earth is thought by many scientists to have begun as simple, single-celled organisms. About a billion years ago, increasingly complex multi-cellular organisms began to evolve.	- Notes (typed fill-in-the-blank) – I. Biological Diversity II. Charles Darwin III. Artificial Variation vrs. Natural Selection - Fill in the blank worksheet with reading assignment from pages 571-583 (from old textbook) - Lab: "Biochemical Evidence for Evolution" - Notes(Fill- in-the-blank) I. Natural Selection II. Driving Forces Behind Evolution - Read Article "Should the Use of Antibiotics Be Restricted?" (text pg 403) Answer questions that follow and end with class discussion.	* Successful completion of pg 372 #1-5 * Successful completion of "Evolution Quiz #1" * Successful completion of "Biochemical Evidence for Evolution" lab * Successful completion of pg 386 #1-5 * Successful completion of worksheet that accompanies the "Evolution: Whale/Tetrapods" movie * Participation in class discussion on resistance within a population

	What does biochemistry have to do with evolution? What does a close biochemical relationship tell you about the ancestry of organism? How do mutations in DNA lead to changes in amino acid sequence? Protein structure? Physical characteristics ? How does natural selection result in evolution? What defines evolution in a population?		Natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life-forms, as well as for the molecular and structural similarities observed among the diverse species of living organisms. Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. Fossils indicate that many organisms that lived long ago are extinct. Extinction of species is common; most of the species that have lived on Earth no longer exist. Mutation and the sorting and recombining of genes during meiosis and fertilization result in a great variety of possible gene combinations.	- Movie : "Evolution: Whales/Tetrapods" Students will complete fill in the blank worksheet that accompanies the movie. Class discussion will ensue during and after the movie led by the teacher. - Peppered Moth Graph worksheet - Notes (Fill-in-the-blank) I. Evidence of Evolution II. Results of Genetic Variation III. Rate of Evolution - Do "Evidence for Evolution" worksheet - Do "Darwin's Theory of Evolution" crossword - Notes (fill-in-the-blank) I. Adaptive Radiation II. Lamarck III. Extinction - Activity – Interpretation of adaptive radiation graphs.	* Successful completion of "Evidence for Evolution" worksheet * Successful completion of "Evidence for Evolution" lab * Successful completion of "Darwin's Theory of Evolution" crossword * Successful completion of "Evolutionary Changes in Primates" lab * Successful completion of pg 377 in text * Successful completion of "Beaks of the Finches" state lab * Successful completion of "Beaks of the Finches" lab quiz * Successful completion of "Evolution Exam"

	What environmental conditions allow for evolution to occur? How does resistance to substances occur over time within a population? What are the driving forces behind evolution? What evolved first land or water organisms? How can structural relationships be used in order to signal relatedness between two organisms? What evidence do scientists have to support the theory of evolution?		Species evolve over time. Evolution is the consequences of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection by the environment of those offspring better able to survive and leave offspring. New inheritable characteristics can result from new combinations of existing genes or from mutations of genes in reproductive cells. Some characteristics give individuals an advantage over others in surviving and reproducing, and the advantaged offspring, in turn, are more likely than others to survive and reproduce. The proportion of individuals that have advantageous characteristics will increase.	- Lab: “Evolutionary Changes in Primates” - State lab “Beaks of The Finches”	

	How do differences in genetics lead to the evolution of a species? What allows for the rate of evolution to differ between different species? What are homologous, analogous, and vestigial structures and how are they used in order to supply evidence for relatedness among species? How is common ancestry determined from evolutionary relationships? How was the theory of selective use/disuse as a part of evolution disproven? How is extinction a part of evolution?		The variation of organisms within a species increases the likelihood that at least some members of the species will survive under changed environmental conditions. Behaviors have evolved through natural selection. The broad patterns of behavior exhibited by organisms are those that have resulted in greater reproductive success. Evolution does not necessitate long-term progress in some set direction. Evolutionary changes appear to be like the growth of a bush: Some branches survive from the beginning with little or no change, many die out altogether, and others branch repeatedly, sometimes giving rise to more complex organisms.		

	How have primates changed over time? How can one characteristic vary within a population? How does adaptive value effect the characteristics of a population?				

Connections to text: Read pages 369-372 do #1-5 Read pages 373-377 and do #1-5 Read pgs. 378-386 do #1-5
Vocabulary: biological diversity, evolution, species, fossil, natural variation, artificial variation, fitness, adaptation, population, alleles, overproduction, carrying capacity, finite, genetic variation, genetic recombination, adaptive value, geographical distribution, homologous structures, analogous structures, vestigial structures,