REGION ONE LEARNING SUPPORT CENTER
Irma Zardoya, Regional Superintendent

Imagination is more important than knowledge.
Knowledge is limited. Imagination encircles the world."
Albert Einstein

SCIENCE SYLLABUS
GRADE 6
LIFE SCIENCE

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Introduction

How was the Syllabus Developed?

Alignment with NYS/NYC Standards: Our goal was to develop a document that would help teachers to know "what" to teach and "how" to teach it. The "what" was determined by the New York State Intermediate Level Science Core Curriculum (Core Curriculum). This Core Curriculum provides the major conceptual understandings and science process skills that students should attain as they address the Mathematics, Science, and Technology Learning Standards (Standards 1, 2, 4, 6, and 7). The "how" evolved from the belief that students learn science best when they have opportunities to construct scientific knowledge for themselves and develop their inquiry skills. In addition, the NYC Performance Standards provide a framework for assessing student performance in science. As a result a performance-based, or hands-on, minds-on, inquiry-based, approach was developed.

How Is the Document is Organized?

- **Curriculum Map:** The curriculum map provides an overview of the units and concepts to be explored at each grade level as well as suggested times for each unit. The suggested times help to provide a sense for how much a given unit should be emphasized within the syllabus. The curriculum map may be used by teachers and administrators for school-based curriculum mapping, alignment with thematic units, as well as and long-term unit planning.

- **Units:** On each grade, the syllabus is organized into units spanning anywhere from 1 to 8 weeks. Next to each unit heading (in bold type), the suggested time for the unit is provided.

- **Key Ideas:** Within each unit, several key ideas are addressed. The key ideas are italicized, with key words in bold. Each key idea is referenced to the Performance Indicator it addresses in the NYS Intermediate Level Science Core Curriculum. Most of the key ideas are taken directly from the Major Understandings found in the Core Curriculum. Other key ideas provide background or help to specify additional content knowledge that students will require in order to fully meet the NYS content standards.

- **Performance Tasks:** Suggested performance tasks address each key idea, which allow students to develop an understanding of the key idea and demonstrate important science process and inquiry skills. In addition to content, the Core Curriculum incorporates process skills based on Standard 4, the Science content standard (See pages 10 to 11, Core Curriculum.). For example, students are expected to be competent in the use of a metric ruler, triple beam balance, stop watch, graduated cylinder, thermometer, spring scale, and voltmeter, as well as a compound microscope. These and other process skills have been embedded into the performance tasks throughout the curriculum. By incorporating assessment strategies, such as checklists, observations, student self-reflections, written work, and student/teacher-designed rubrics, the performance tasks may also be used as performance assessments.

  The performance tasks are *suggested* activities. Students are not expected to accomplish all the tasks that are provided. Nor are teachers expected to adhere to the sequence as given. Instead the performance tasks show how students can develop an

understanding of each key idea by engaging in hands-on, minds-on, inquiry-based activities. Teachers may substitute other suitable activities that accomplish similar objectives.

- **NYS MST Standards and NYC Performance Standards in Science:** By completing the performance tasks, including analysis and explanation of their observations and results, student work will always address a variety of standards. References to these standards are provided. Nevertheless, these references are highly dependent on how teachers approach instruction and the types of outcomes or student products that are expected. As a result, the references are not all inclusive. In addition, some of the performance tasks for a given key idea may address all the standards cited, while others may not. However, the references help to illustrate how students can address a variety of standards numerous times and in multiple ways on their journey towards meeting and even exceeding them.

  The NYC Performance standards also address the question of, "How good is good enough?" In order to determine whether student work, that might contain all the elements required by the standards, does in fact meet the standards, teachers must also evaluate the quality of the student's work. The NYC edition of the Performance Standards in Science provides work samples with commentaries that help to illustrate ""How good is good enough?"

- **Resources:** The resources section contains references to curriculum guides, such as AIMS or GEMS, and textbooks, where the actual or similar activities to the performance tasks may be found. In addition, this section may also contain suggested classroom library titles. Technology resources are listed in the Technology Connections, including sciLINKS, and other multimedia resources, such as laser discs, videos or CD-ROMS. SciLINKS are Internet resources for teachers, students, and parents, maintained by the National Science Teachers Association. They contain links to Web sites that include additional information about each topic, classroom/home activities, lesson plans, interactive programs, etc. Teachers should preview all Web sites before students explore them on their own.

- **Mathematics, Technology, and Literacy Connections**: The Mathematics, Technology, and Literacy connections help to illustrate the ways in which these skill areas are embedded in the Science curriculum. Typically these connections allow students to engage in analysis, explanation, evaluation, and presentation of their observations and the data they gather. In addition, many of the Technology connections allow students to build or extend their knowledge of Science and to observe scientific processes that would otherwise be difficult to see. It is understood that these connections are more than add-ons to the Science curriculum. Instead, they are an integral part of scientific study, incorporating what scientists do all the time in the conduct of their research.

- **Inquiry Activities:** Inquiry activities provide teachers with ideas about how to integrate the inquiry process and in-depth investigations into virtually every unit in the science curriculum. In addition, these inquiry units lend themselves to Science Exposition or Eighth Grade Exit Projects. Both the NYS Standards and the NYC Performance Standards in Science require students to complete scientific inquiry projects, including controlled experiments, field studies, designs, and secondary research. The NYC Performance Standards in Science indicate that on an annual basis, students will complete a project that integrates several aspects of Science

Standards 1 to 7. In addition, it is expected that over the course of their middle school years, students will have the opportunity to engage in each of the four kinds of in-depth investigations.

Role of Textbooks in Science Instruction: Textbooks are an important resource for students and teachers. The background information, diagrams, illustrations, and practice problems provide a foundation for student learning. Support materials that accompany textbooks typically provide laboratory activities, assessment strategies, etc. that allow teachers to focus more on tailoring the activities and assessments to their students rather than starting from ground zero. However, exclusive use of textbooks without opportunities for hands-on activities is extremely undesirable, as it will not allow students to achieve the standards or become proficient in science process skills.

Anticipated Changes: Science is not a static subject. Rather, science is constantly changing as scientific laws, models, and theories are periodically redefined and our ways of thinking about the world shift. This syllabus will reflect such changes. The Science department will continue to refine and enhance the performance tasks and resource sections and the Technology department will continue to provide updated and enhanced technology connections, such as software titles and student project ideas. More importantly, as teachers begin to actively use the syllabus for lesson planning and other instructional purposes, their suggestions for improvement will guide the revision process.

Sixth Grade Life Science
Curriculum Map
Key Ideas

Scientific Inquiry
(Integrated Science Exposition Projects)

- The central purpose of scientific inquiry is to develop explanations of scientific phenomena.
- Scientific inquiry involves testing proposed explanations using conventional techniques and procedures.
- When observations are analyzed using conventional and invented methods, they provide new insights into phenomena.

Cells and Cell Division
(4 weeks)

- All living things are composed of cells.
- Plant and animal cells have cell membranes, genetic material, a nucleus, and cytoplasm. Plant cells also have cell walls and chloroplasts.
- All organisms require energy to survive.
- Photosynthesis is a process in which plants and some other organisms use energy from the sun to convert carbon dioxide and water into oxygen and sugars.
- The major source of atmospheric oxygen is photosynthesis.
- The way in which cells function is similar in all living things.
- Nutrients provide energy for the work cells do and to make materials a cell or organism needs.
- Some cells use oxygen to release energy stored in food in a process called respiration.
- Cell division is responsible for growth, maintenance and repair in multicellular organisms.
- During cell division, the duplicated chromosomes are usually separated into two identical sets with a complete set of chromosomes passed to each daughter cell.
- The cell cycle consists of growth, DNA replication, and cell division.
- In some one-celled organisms, cell division is a means of asexual reproduction.
- Cancers are the result of abnormal cell division.

Classification of Living Things
(1 week)

- Living things are classified by shared characteristics.
- Scientists classify living things into several major kingdoms.

Sixth Grade Life Science
Curriculum Map
Key Ideas

Bacteria, Protists, Fungi, and Viruses
(4 weeks)

- Bacterial cells have cell membranes, genetic material, cytoplasm and a cell wall.
- Most bacteria reproduce asexually by cell division.
- Fungi are unicellular or multicellular organisms, which cannot make their own food.
- Decomposers (bacteria and fungi) obtain energy by consuming wastes and/or dead organisms.
- Protists are unicellular organisms that inhabit moist environments.
- Animal-like protists move to obtain food.
- Plant-like protists produce their own food.
- Viruses lack cellular organization.
- Viruses take over the machinery of living cells to reproduce.

Plants
(4 weeks)

- Plants have similar organs (roots stems, leaves, and reproductive structures) and systems specialized for carrying out major life activities.
- The different organs and tissues in plants are made up of different kinds of cells
- Plant adaptations for life on land include ways to get water and other materials from the environment.
- Nonvascular plants (mosses) lack vascular tissue.
- Vascular plants include spore-bearing (ferns) and seed-bearing plants.
- Patterns of development vary among plants.
- Various body structures and functions change as plants age.
- Plants may reproduce asexually via root or stem cuttings.
- Sexual reproduction in plants involves the merging of sex cells (fertilization). Fertilization may be internal (seed-bearing plants) or external (mosses and ferns).

Sixth Grade Life Science
Curriculum Map
Key Ideas

Interactions Among Living Things II
(4 weeks)

- Green plants are the producers of food, which is used directly or indirectly by consumers.
- In ecosystems, balance is the result of interactions between community members and the environment.
- Relationships among organisms may be competitive, harmful, or beneficial.
- Some microorganisms are essential to the survival of other living things.
- The number of organisms an ecosystem can support depends on resources and physical factors.
- The environment may be altered through the activities of organisms.
- The cycling of nutrients and gases are essential to ecosystem function and maintenance.
- Overpopulation by any species impacts the environment.

The Human Organism
(1 week)

- Cells are organized for more effective functioning in multicellular organisms. Levels of organization for multicellular organisms include cells, tissues, organs, and organ systems.
- The human body contains four basic tissue types: muscle, nerve, connective, and epithelial.
- Regulation of an organism's internal environment keeps conditions within the range required for survival.
- Multicellular organisms often have similar organs and specialized systems for carrying out major life activities.

Skin and Skeletal and Muscular Systems
(2 weeks)

- The skin is the largest organ in the body and it performs a variety of functions.
- Locomotion is accomplished by the interaction of skeletal muscles, bones, and the nervous system.
- The skeletal system provides shape, support, enables movement, protects internal organs, produces blood cells and stores materials.
- The muscular system consists of voluntary and involuntary muscles.

Sixth Grade Life Science
Curriculum Map
Key Ideas

Nutrition and Digestion
(2 weeks)

- Metabolism is the sum of all chemical reactions in the body.
- Food contains a variety of substances vital to the survival of the organism.
- To maintain a balanced state all organisms have a minimum daily intake of each type of nutrient.
- All living things must release energy from their food. Energy in food is measured in calories.
- The digestive system and its organs are responsible for the mechanical and chemical breakdown of food.

Circulation, Respiration, Excretion
(2 weeks)

- The circulatory system transports substances to and from cells via heart, blood vessels, and lymph.
- During respiration, cells used oxygen to release energy stored in food.
- The respiratory system and its organs – nose, pharynx, trachea, and lungs - supply oxygen to the body and remove carbon dioxide waste.
- The excretory system functions in the disposal of dissolved waste molecules the elimination of liquid and gaseous wastes and the removal of excess heat and energy.
- The kidneys, large intestines, lungs, and skin are organs of excretion.

Disease and the Immune System
(2 weeks)

- Disease breaks down the structures or function of an organism.
- Contraction of infectious disease, and personal behaviors may interfere with one's dynamic equilibrium.
- The immune system incorporates three lines of defense – barriers and inflammation and immune responses.
- Specialized cells protect the body from infectious diseases.

Sixth Grade Life Science
Curriculum Map
Key Ideas

The Nervous and Endocrine Systems
(2 weeks)

- The nervous and endocrine systems interact to control and coordinate body functions.
- The central and peripheral nervous systems are composed of neurons.
- Each of the senses gathers specific types of information about the environment.
- Hormones are produced in glands and perform specific functions in the body.

Reproduction and Development
(2 weeks)

- Male and female reproductive systems are responsible for producing female and male sex cells (egg and sperm).
- Methods of sexual reproduction depend on the species, but all involve merging of sex cells.
- Fertilization and development in humans is internal.
- Multicellular organisms exhibit complex changes in development following fertilization.
- In humans the fertilized egg grows into tissue, which develops into organs and systems. The fertilized egg contains genetic information from each parent.
- Various body structures and functions change as an organism goes through its life cycle.
- Living things go through a life cycle involving both reproductive and developmental stages.

Sixth Grade Life Science
Curriculum Map
Key Ideas

Heredity
(5 weeks)

- Every organism requires a set of instructions, passed form one generation to the next, for specifying its traits.
- Hereditary information is contained of genes, which are composed of molecules of DNA.
- Each gene carries a single unit of information.
- An inherited trait may be determined by one pair or by many pairs of genes.
- Each human cell contains many thousands of different genes.
- In all organisms, genetic traits are passed from generation to generation.
- Some genes are dominant; some are recessive.
- The probability of traits being expressed can be determined using models of genetic inheritance.
- In sexual reproduction, typically half of the genes come from each parent and offspring are not genetically identical to either parent.
- A special type of cell division accounts for the production of sex cells,
- Sex cells contain half the genetic information of the parent.

Evolution and Extinction
(3 weeks)

- Evolution is the change in species over time.
- Millions of species are alive today, which developed through gradual processes of change over many generations.
- The process of sexual reproduction and mutation give rise to a variety of traits within a species.
- Species acquire many unique characteristics through biological adaptation.
- The survival of a species depends on the ability of individuals to produce offspring.
- Changes in environmental conditions can affect the survival of individual organisms.
- Human activities, such as selective breeding, may affect variation in species.
- In all environments, organisms with similar needs compete for resources.
- Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient.
- Although time needed for change in a species is usually great, some species undergo significant change in a few years.

Science Syllabus: Grade 6: Life Science

Scientific Inquiry	**Integrated Inquiry Projects**
Key Idea	· *The central purpose of **scientific inquiry** is to develop **explanations** of natural **phenomena** in a continuing, creative process.*
NYS MST Standards	· Standard 1: Analysis, Inquiry, and Design: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.
Performance Tasks	· Students develop explanations and hypotheses about scientific phenome
NYS MST Standards	Standard 1: Analysis Inquiry, and Design: Scientific Inquiry: · Key Idea 1: S1.1 - S1.4 Process Skills Based on Standard 4 · General Skills: 4, 5, 8
NYC Performance Standards	Scientific Connections and Applications · S4a, S4e Scientific Thinking · S5a-c, S5d Scientific Communication · S7a-e
Key Idea	· *Scientific inquiry involves the **testing** of proposed explanations of scientific phenomena (hypotheses) using conventional techniques and procedures and usually requiring considerable ingenuity.* · ***Observations** made while testing hypotheses, when analyzed using conventional and invented methods, provide new insights into phenomena.*
NYS MST Standards	· Standard 1: Analysis, Inquiry, and Design: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.
Performance Tasks	· Students develop and execute a research plan to test their hypotheses about particular phenomena.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 2: S2.1-2.2 · Key Idea 3: S3.1- S3.3 Standard 2: Information Systems · Key Idea: 1.3 Process Skills Based on Standard 4 · General Skills: 1-4, 5, 8
NYC Performance Standards	Scientific Connections and Applications · S4a, S4e Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e Scientific Investigation · S8a-d
Resources	· Cothron, J. H, Giese, R, N., and Rezba, R. J. Students and Research: Practical Strategies for Science Classrooms and Competitions. Kendall/Hunt Publishing Company

Mathematics Connections	· Explore methods of collecting and organizing data.
Technology Connections	· National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Scientific Method* (sciLINKS NUMBER: HSTL004)
Literacy Connections	·
Cells and Cell Division	**Suggested Time: 4 weeks**
Key Idea	· *All **living things** are composed of **cells**. Cells are the basic units of structure and function in living things. All cells are produced from other cells. (**Cell Theory**) Cells are usually **microscopic** in size. For all living things, life activities are accomplished at the cellular level.* · *Plant and animal cells have **cell membranes**, **genetic material**, a **nucleus**, and **cytoplasm**. Plant cells have cell walls made of **cellulose** and **chloroplasts**.*
NYS MST Standards	· Performance Indicator 1.1: Compare and contrast the parts of plants, animals, and one-celled organisms.
Performance Tasks	· Students use simple and compound microscopes to observe plant and animal cells. Students prepare wet mount slides and use appropriate staining techniques to observe plant and animals cells and identify their cellular structures. Students use small clear plastic rulers or millimeter grid slides to measure the field of view under low, medium, and high power and use their measurements to estimate the size of the plant and animal cells. Students compare and contrast the parts and functions of plant and animal cells. · Students construct models or drawings of plant and animal cells. As part of their displays, students describe the structures and functions of each cell part.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understandings: 1.1a, 1.1b, 1.1 c, 1.1e Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models Process Skills Based on Standard 4 · Living Environment Skills: 1-4
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5b-c Scientific Tools and Technologies · S6a-b

Resources	· Abramson, D. D. Mastering Basic Skills in Science: *Unit 7: The Microscope: Introduction; Viewing Specimens; Making Measurements* · AIMS: Budding Botanist: *Focus on Cells* · AIMS: Magnificent Microworld Adventures: *The Green Machine (Elodea cells)* · Lab-Aids: Plant Cell Study: Kit No. 61 · Prentice Hall: Science Explorer: Cells and Heredity*: A Magnified View of Life* · Prentice Hall: Science Explorer: Integrated Science Laboratory Manual: *How to Use a Microscope* · Roca, N. and Serrano, M. Cells, Genes and Chromosomes. Chelsea House Publishers · Julivert, M. A. The Life of Plants. Chelsea House Publishers · Lindsay, M. The Visual Dictionary of Plants. Dorling Kindersley · Time Life. Understanding Science and Nature: Plant Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: Plantas. · Stwertka, E. and Stwertka, A. Microscope: How to Use It and Enjoy It.
Mathematics Connections	· Identify equivalent units of measure. · Estimate measurements.
Technology Connections	· Draw and label diagrams using a computer graphics program such as Dabbler or Microsoft Word draw tools. · Use a digital camera to take photos of the cells. · Use Powerpoint to create a slideshow of plant and animal cells. · Cyber ED Inc. Inside the Cell: A Multimedia CD-ROM · National Geographic Society: NGS PictureShow: The Cell: *Structures of Life* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Tools of Life Science* (sciLINKS NUMBER: HSTL015) · SciencePlus: Interactive Explorations Level Red: CD-ROM*: Exploration 1: What's Bugging You* · Windows on Science: Life Science: Volume 1: Microworld: *The Compound Microscope; Looking Through the Microscope; Focusing an Image; Preparing a Slide; Staining an Object; Parts of Cells*
Literacy Connections	· Describe and compare structures and functions of plant and animal cells based upon direct observation and informational texts.
Key Idea	· *All organisms require **energy** to survive. The amount of energy needed and methods for obtaining energy varies among cells* · ***Photosynthesis** is a process in which plants and some other organisms containing chlorophyll use energy from the Sun to convert **carbon dioxide** and **water** into **oxygen** and **sugar** molecules, such as **glucose**. In green plants, photosynthesis occurs in **chloroplasts** and the quantity of sugar molecules in plant cells increases during photosynthesis.* · *The major source of atmospheric oxygen is photosynthesis. Carbon dioxide is removed from the atmosphere and oxygen is released during photosynthesis.*
NYS MST Standards	· Performance Indicator 6.2: Provide evidence that green plants make food and explain the significance of this process to other organisms.

Performance Tasks	· Students observe production of oxygen during photosynthesis by placing a piece of water plant (*Elodea*) in a test tube of water. Students invert the test tube in a small container half-filled with water and place the set-up in a well-lit location. Students will observe bubbles of gas escaping from the Elodea and over time a large bubble will collect at the top of the tube. · Students observe the use of carbon dioxide during photosynthesis by a water plant (*Elodea*). Students prepare 4 flasks with 100ml of bromthymol blue solution. Using straws, students blow carbon dioxide into the solution until it turns yellow (Bromthymol blue turns yellow in the presence of carbon dioxide. As the carbon dioxide is used up, the solution turns back to blue.). After placing sprigs of *Elodea* that are about the same size in two of the flasks, students place two flasks in a well-lit location (one with *Elodea* and one without) and the other two flasks in a dark location. After 24 hours, students examine and explain the results, then predict what might happen if the system were left for an additional 24 hours.
Inquiry Activity	· Students explore how variables such as light and temperature affect the rate of photosynthesis.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understandings: 6.2a, 6.2b Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 1, 4, 7, 9 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-d, S5f Scientific Tools and Technologies · S6c Scientific Communication · S7a-b, S7e
Resources	· AIMS: Budding Botanist: *Photosynthesis* · Gardner: Science Projects about Plants: *Plants and Carbon Dioxide* · Prentice Hall: Cells and Heredity: *Gases in Balance* · Julivert, M. A. The Life of Plants. Chelsea House Publishers · Lindsay, M. The Visual Dictionary of Plants. Dorling Kindersley · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Photosynthesis · Time Life. Understanding Science and Nature: Plant Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: Plantas.
Mathematics Connections	· Measure liquid volume and identify equivalent units of measure. · Analyze data organized in a graph format.

Technology Connections	· Use a dissolved oxygen probe and computer interface to measure changes in oxygen levels over time. · National Geographic Society: NGS PictureShow: Plants: What It Means to Be Green: *Roots, Stems, and Leaves* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic*: Cell Energy* (sciLINKS NUMBER: HSTL080); sciLINKS Topic: *Photosynthesis* (sciLINKS NUMBER: HSTL085) · Cyber ED Inc.: Photosynthesis: A Multimedia CD-ROM · Windows on Science: Life Science: Volume 1: Rooting for Plants: *Photosynthesis*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· *The way in which cells **function** is similar in all living things. Cells grow and divide, thereby producing more cells. Cells take in **nutrients**, which are used to provide **energy** for the work cells do and to make the **materials** that a cell or an organism needs.*
NYS MST Standards	· Performance Indicator 1.1: Compare and contrast the parts of plants, animals, and one-celled organisms.
Performance Tasks	· Students prepare wet mounts of Amoeba and observe them engulfing food particles. · Students observe the effects of water moving out of a plant cell by osmosis in *Elodea*. Students prepare a wet mount of the tip of an *Elodea* leaf. Students observe and sketch the cells under low power, then estimate the size of the cells. Students remove the coverslip, blot the slide and leaf tip to remove fresh water, then place two-three drops of salt water on the slide. Students observe and sketch the cells, and explain their observations. Students estimate the size of the cell membrane before and after the addition of salt water.
Inquiry Activity	· Students explore the effects of different concentrations of salt solutions on *Elodea* cells.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understanding: 1.1b Standard 6: Interconnectedness: Common Themes · Key Idea 4: Equilibrium and Stability: 4.1 Process Skills Based on Standard 4 · General Skills: 1, 7 · Living Environment Skills: 1-3, 9
NYC Performance Standards	Life Sciences Concepts · S2a, S2c Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-b Scientific Communication · S7a-b, S7e

Resources	· AIMS: Budding Botanist: *Cell Facts; Model a Cell* · AIMS: Magnificent Microworld Adventures: *The Green Machine II (Osmosis in Elodea)* · Prentice Hall: Science Explorer: Cells and Heredity: *Observing Osmosis in a Plant Cell* · Roca, N. and Serrano, M. Invisible World: Cells, Genes, and Chromosomes. Chelsea House Publishers
Mathematics Connections	· Estimate microscopic measurements.
Technology Connections	· Draw and label diagrams using Dabbler or Microsoft Word draw tools. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Osmosis* (sciLINKS NUMBER: HSTL075) · Windows on Science: Life Science: Volume 1: Microworld: *Parts of Cells*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· *All living things, including plants, must release **energy** from their **food** to carry out their **life processes**. The process of releasing energy from food molecules is accomplished at the cellular level. Some cells (i.e. plant and animal) use **oxygen** to breakdown simple food molecules, such as glucose, and release the energy they contain in a process known as **respiration**. A **waste product** of respiration is **carbon dioxide**.*
NYS MST Standards	· Performance Indicator 5.1: Compare the way a variety of living specimens carry out basic life functions and maintain dynamic equilibrium.
Performance Tasks	· Students demonstrate respiration in plants by placing a sprig of *Elodea* into a flask with 100mL bromthymol blue solution. Another flask should be prepared without the sprig of *Elodea*. Students place both flasks in a dark location overnight, then observe and explain their results (The blue solution turns yellow in the presence of carbon dioxide). · Students use compound microscopes to observe the breakdown of starch molecules in the vacuoles of banana cells. Students prepare thin smears of unripe, ripe, and very ripe banana cells on separate slides, then stain each slide with iodine solution. The unripe cells will have many food vacuoles filled with starch. The very ripe cells will have mostly empty vacuoles. Students sample 10 cells of each type (unripe, ripe, very ripe) to determine the average number of starch-filled vacuoles and use a bar graph to compare their findings for each of the cell types. Students may also taste the bananas to determine that the starch has been converted to sugar in the ripe and very ripe bananas.
Inquiry Activity	· Students explore the effects of variables such as light, temperature, and oxygen levels on respiration rates.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understanding: 5.1c Standard 6: Interconnectedness: Common Themes · Key Idea 4: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 1, 4, 7, 9 · Living Environment Skills: 1-4, 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-d, S5f Scientific Tools and Technologies · S6a-c Scientific Communication · S7a-b, S7e
Resources	· Prentice Hall: Science Explorer: Cells and Heredity: *Demonstrating Respiration in Elodea* · Julivert, M. A. The Life of Plants. Chelsea House Publishers · Lindsay, M. The Visual Dictionary of Plants. Dorling Kindersley · Roca, N. and Serrano, M. Invisible World: Cells, Genes, and Chromosomes. Chelsea House Publishers · Time Life. Understanding Science and Nature: Plant Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: Plantas.
Mathematics Connections	· Measure liquid volume and identify equivalent units. · Collect, organize, and display data using a bar graph.
Technology Connections	· Draw and label diagrams using a graphics program, such as Dabbler or Microsoft Word draw tools. · Construct a bar graph in Microsoft Excel. · Use a dissolved oxygen probe and computer interface to monitor and graph oxygen levels in *Elodea* experiment. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Cell Energy* (sciLINKS NUMBER: HSTL080) · Cyber ED Inc.: Cellular Respiration: A Multimedia CD-ROM
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· *In multicellular organisms, **cell division** is responsible for **growth**, **maintenance**, and **repair**. During cell division, the duplicated **chromosomes** are **separated** into two identical sets in a process known as **mitosis**. A complete set of the chromosomes is passed to each of the two resulting cells. As a result, the **hereditary information** is identical in the new cells.* · *The **cell cycle** consists of **growth**, **DNA replication**, and **cell division**. In some one-celled organisms, cell division is the means of **asexual reproduction**.*

NYS MST Standards	· Performance Indicator 4.4: Observe and describe cell division at the microscopic level and its macroscopic effects.
Performance Tasks	· Students use compound microscopes to observe prepared slides of onion root tip and/or whitefish blastula. Students identify the stages of cell division, then sketch and describe each phase. If both plant and animal cells are observed, students compare similarities and differences in cell division between the plant and animal cells. Students estimate the size of the dividing cells, chromosomes, and daughter cells.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understandings: 4.4a, 4.4b Standard 7: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 1, 4, 7 · Living Environment Skills: 1-2, 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5b-c, S5f Scientific Tools and Technologies · S6a-b Scientific Communication · S7a-b, S7e
Resources	· Prentice Hall: Cells and Heredity: Teacher Resources: *Multiplying by Dividing* · Roca, N. and Serrano, M. Invisible World: Cells, Genes, and Chromosomes. Chelsea House Publishers
Mathematics Connections	· Estimate microscopic measurements.
Technology Connections	· Draw and label diagrams using Dabbler or Microsoft Word draw tools. · Cyber ED Inc: Mitosis: A Multimedia CD-ROM · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Cell Division* (sciLINKS NUMBER: HSTL120) · Windows on Science: Life Science: Volume 1: Microworld: *Cell Division*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.

Inquiry Activity	· Students estimate the length of the stages of the cell cycle in an onion root tip by finding an area of the slide where many cells are undergoing cell division. Under a magnification that allows a view of about 50 cells, students examine the cells row by row and count how many cells are in each phase (interphase, prophase, metaphase, anaphase, and telophase.). Students move to a different area on the slide and repeat this procedure. Students combine the tallies for each of the phases to get a total number of cells in each phase and add up all the totals to obtain the total number of cells counted. Given a cell cycle length of 720 minutes for an onion root tip, students calculate the time for each stage using the formula: (Number of Cells in Stage / Total Cells Counted) x 720 minutes. Students construct a circle graph to illustrate their results.
Key Idea	· ***Cancers*** *are the result of abnormal cell division.*
NYS MST Standards	· Performance Indicator 4.4: Observe and describe cell division at the microscopic level and its macroscopic effects.
Performance Tasks	· Students research factors, such as smoking, diet, and exposure to toxins, known to increase people's risk of abnormal cell division resulting in various types of cancer. Students research and explain statistics regarding cancer rates.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 Standard 2: Information Systems · Key Idea: 1.3 Standard 4: The Living Environment · Major Understanding 4.4d
NYC Performance Standards	Life Sciences Concepts · S2a-b Scientific Connections and Applications · S4c Scientific Thinking · S5b-c, S5f Scientific Tools and Technologies · S6d Scientific Communication · S7b-c, S7e
Resources	· Hyde, M. O. <u>The Disease Book: A Kids' Guide</u> · Roca, N. and Serrano, M. <u>Invisible World: Cells, Genes, and Chromosomes</u>. Chelsea House Publishers
Mathematics Connections	· Interpret statistics such as frequency and mean. · Construct circle graphs to explore the concept of percent.
Technology Connections	· Prepare a report using Microsoft Word. · Construct circle graphs using Microsoft Excel. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Cancer and HIV* (sciLINKS NUMBER: HSTL675)
Literacy Connections	· Use at least three cited sources to prepare a science report incorporating informational writing.

Classification of Living Things	**Suggested Time: 1 week**
Key Idea	· *Living things are **classified** by **shared characteristics** on the cellular and organism level. In classifying organisms biologists consider details of internal and external structures.* · *Scientists classify living things into several major **kingdoms**: bacteria, protists, fungi, plants, and animals. Biological **classification systems** are arranged from **general** (**kingdom** level) to **specific** (**species** level).*
NYS MST Standards	· Performance Indicator 1.1: Compare and contrast the parts of plants, animals, and one-celled organisms.
Performance Tasks	· Students develop a **dichotomous key** classification system for a collection of ordinary objects, such as rocks, hardware, seashells, buttons, leaves, seeds, etc. Students can collect the objects themselves or the objects can be provided. Students observations should include use of hand lenses to explore texture and color, measurements of size (length, mass, etc.), indications of shape and structure, and other properties. · Students use an established dichotomous key classification system to classify trees, or other organisms.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 Standard 4: The Living Environment · Major Understanding: 1.1h Process Skills Based on Standard 4 · General Skills: 5, 6 · Living Environment Skills: 6
NYC Performance Standards	Life Sciences Concepts · S2e Scientific Connections and Applications · S4c Scientific Thinking · S5f Scientific Tools and Technologies · S6d Scientific Communication · S7a-c
Resources	· AIMS: Our Wonderful World: Solutions for Math + Science. *Nature's Food Factories* (leaf classification). · AIMS: Math + Science A Solution: *Sorting All Sorts* · Gardner: Science Projects about Plants: *Collecting Seeds; Leaves and Veins*
Mathematics Connections	· Measure length and mass of objects. · Use percents to describe the distribution of their collections into the categories of their dichotomous keys.
Technology Connections	· Construct a diagram of the dichotomous key using Inspiration. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *The Basis for Classification* (sciLINKS NUMBER: HSTL110); sciLINKS Topic: *Dichotomous Keys* (sciLINKS NUMBER: HSTL215) · Windows on Science: Life Science Volume 1: Sorting It all Out: *Classification; Form and Structure*
Literacy Connections	· Prepare and deliver individual or group presentations.

Bacteria, Protists, Fungi, and Viruses	**Suggested Time: 4 weeks**
Key Idea	· *The cells of **bacteria** have **cell membranes, genetic material, cytoplasm** and a **cell wall**. Bacterial cells do not have nuclei. The genetic material is contained in the cytoplasm of the cell. Most bacteria reproduce **asexually** by **cell division**.*
NYS MST Standards	· Performance Indicator 1.1: Compare and contrast the parts of plants, animals, and one-celled organisms. · Performance Indicator 5.1: Compare the way a variety of living specimens carry out basic life functions and maintain dynamic equilibrium.
Performance Tasks	· Students study prepared slides of different types of bacteria and estimate the size of bacterial cells. Students compare and contrast their observations of bacteria in terms of size, shape, and visible structures with those of plant and animal cells studied previously. · Students prepare a wet mount of yogurt and stain it with methylene blue dye. Students observe the bacterial cells under low and High power and draw a diagram of what they see.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understandings: 4.1a, 4.4b, 5.1b Process Skills Based on Standard 4 · General Skills: 1 · Living Environment Skills: 1-2
NYC Performance Standards	Life Sciences Concepts · S2a, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5b, S5f Scientific Tools and Technologies · S6a, b Scientific Communication · S7a-b, S7e
Resources	· Prentice Hall: Science Explorer: From Bacteria to Plants: *Try This: Bacteria for Breakfast*
Mathematics Connections	· Estimate the size of microscopic objects.
Technology Connections	· Draw and label diagrams. · National Geographic Society: NGS PictureShow: The Cell: *Protists and Bacteria* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Microbes* (sciLINKS NUMBER: HSTL085); sciLINKS Topic: *Bacteria* (sciLINKS NUMBER: HSTL230) · Windows on Science: Life Science Volume 1: Sorting It all Out: *Kingdom Monera*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.

Key Idea	· ***Fungi*** *are* ***unicellular*** *or* ***multicellular*** *organisms, which cannot make their own food. There are several types of fungi including bread mold (thread-like), yeast (sac fungi), and button mushrooms (club fungi).* ***Decomposers*** *such as bacteria and fungi obtain energy by consuming wastes and/or dead organisms.*
NYS MST Standards	· Performance Indicator 1.1: Compare and contrast the parts of plants, animals, and one-celled organisms. · Performance Indicator 5.1: Compare the way a variety of living specimens carry out basic life functions and maintain dynamic equilibrium.
Performance Tasks	· Students prepare cultures of yeast and observe budding yeast cells under the microscope. · Students culture and observe bread mold using a hand lens or dissecting scope. Students observe bread mold daily for 2 weeks, indicating the rate of growth on centimeter graph paper (surface area). Students can compare growth rates for different types bread molds and different types of bread. · Students use hand lenses to observe a variety of edible mushrooms whole and in cross section (with dissecting scopes if available). Students sketch, label, and describe each type of mushroom. · Students grow mushrooms using a mushroom farm kit. Students can manipulate variables, such as light, moisture, amount of substrate, etc., and record data about the date first mushrooms appear, number of mushrooms, height of mushrooms, and diameter of caps.
Inquiry Activity	· Students explore the effects of variables such as light, temperature, moisture, or use of salt or sugar solutions on bread mold or mushroom growth.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understanding: 5.1b Process Skills Based on Standard 4 · General Skills: 1 · Living Environment Skills: 1-4, 9
NYC Performance Standards	Life Sciences Concepts · S2a, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5b-c, S5f Scientific Tools and Technologies · S6a-b Scientific Communication · S7a-b, S7e
Resources	· AIMS: Fun with Foods: A Recipe for Math + Science: *My Moldy Garden* · AIMS: Magnificent Microworld Adventures: *A Pretty Rotten Time* · Prentice Hall: Science Explorer: From Bacteria to Plants: *A Mushroom Farm!*

Mathematics Connections	· Estimate the size of microscopic objects. · Find the area of circles.
Technology Connections	· Draw and label diagrams using Dabbler or Microsoft Word draw tools. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Fungi* (sciLINKS NUMBER: HSTL265) · Windows on Science: Life Science Volume 1: Sorting It all Out: *Kingdom Fungi*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· ***Protists*** *are unicellular organisms that inhabit moist environments. The cells of protists have nuclei, which contain the genetic information.* ***Animal-like protists*** *are* ***consumers*** *(heterotrophs) and are able to move from place to place to obtain their food. Examples of* ***animal-like*** *protists include the Amoeba, which moves and feeds by forming* ***pseudopods****, and the Paramecium, which uses hair-like projections (cilia) to move, obtain food, and sense the environment.* ***Plant-like protists*** *are* ***producers*** *(autotrophs) and thus are able to make their own food. Plant-like protists include Euglena, green algae, red algae, and brown algae.*
NYS MST Standards	· Performance Indicator 1.1: Compare and contrast the parts of plants, animals, and one-celled organisms. · Performance Indicator 5.1: Compare the way a variety of living specimens carry out basic life functions and maintain dynamic equilibrium.
Performance Tasks	· Students prepare wet mounts of pond or aquarium water, or infusions of hay, soil, or compost to observe a variety of protists. Students sketch each type of protist observed and classify it as animal-like or plant-like. Students estimate the number of each type of protist using sampling techniques and represent the data using a frequency chart and/or bar graph. · Students prepare wet mounts of cultures of representative protists, such as *Amoeba*, *Paramecium*, and *Euglena*. Students sketch each type of protist, indicating structures and functions. · Students collect, press, and mount a variety of red, green and brown seaweeds (algae) showing structures and functions. Students identify the adaptations of algae to aquatic environments. · Students collect scrapings of *Protococcus*, the green algae seen on tree trunks, wooden fences, flowerpots and buildings. Students prepare wet mounts of the scrapings and examine the structures and functions of the visible cell parts.
Inquiry Activity	· Students explore the effects of variables such as light, temperature, salinity, oxygen levels, or source (hay, soil, compost, pond, aquarium) on the diversity and abundance of protists.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understanding: 1.1c, 1.1d, 5.1b Process Skills Based on Standard 4 · General Skills: 1, 5 · Living Environment Skills: 1-4, 9
NYC Performance Standards	Life Sciences Concepts · S2a, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5b, S5f Scientific Tools and Technologies · S6a-b Scientific Communication · S7a-b, S7e
Resources	· AIMS: Magnificent Microworld Adventures: *Making a Hay Infusion, Dropping in on Protozoa, Moving in on Protozoa (Paramecium, Euglena, Amoeba), Algae- The Food Factory.* · Holt, Rinehart and Winston: Holt Science & Technology: Life Science: *Cells Alive*
Mathematics Connections	· Estimate the size of microscopic objects. · Collect, organize and display data using frequency charts and bar graphs.
Technology Connections	· Draw and label diagrams using a graphics program such as Dabbler or Microsoft Word draw tools. · Construct frequency charts and bar graphs in Microsoft Excel. · National Geographic Society: NGS PictureShow: The Cell: *Protists and Bacteria* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Archaebacteria* (sciLINKS NUMBER: HSTL1235); sciLINKS Topic *Algae*: (sciLINKS NUMBER: HSTL1255); sciLINKS Topic: *Protists* (sciLINKS NUMBER: HSTL1260) · Windows on Science: Life Science Volume 1: Sorting It all Out: *Kingdom Fungi*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· ***Viruses*** *lack* ***cellular organization****. They consist of a* ***protein coat*** *and* ***hereditary information****. Viruses take over the machinery of living cells in order to reproduce.*
NYS MST Standards	· Key Idea 1: Living things are both similar to and different from each other and from nonliving things.
Performance Tasks	· Students construct a model of a virus and compare/contrast the model with that of a protist, plant and/or animal cell. · Students prepare a poster display that compares/contrasts a virus with a protist, plant and/or animal cell.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 Standard 4: The Living Environment · Major Understanding: 5.1b Standard 6: Interconnectedness: Common Themes Key Idea 2: Models: 2.1-2.3 Process Skills Based on Standard 4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5c, S5f Scientific Tools and Technologies · S6d Scientific Communication · S7a-b, S7d-e
Resources	· Facklam, H. and Facklam, M. Viruses.
Mathematics Connections	· Make and use measurements of length.
Technology Connections	· Design and construct a model of a virus using Dabbler or Microsoft Word draw tools. · Use PowerPoint to create a slideshow summarizing information about viruses. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Viruses* (sciLINKS NUMBER: HSTL1240)
Literacy Connections	· Present reports five to seven minutes long for teachers and other students. · Organize what to say using notes or other memory aids (poster display). · Begin by stating a main idea or purpose, support it with details, examples, and reasons, and end by summarizing main points. · Keep a design journal.
Plant Adaptations	**Suggested Time: 4 weeks**
Key Idea	· *Specialized cells **perform specialized functions in multicellular organisms. Levels of organization** for structure and function of a multicellular organism include **cells, tissues, organs,** and **organ systems**.* · *Like all multicellular organisms, plants have similar organs and systems specialized for carrying out the plant's major life activities. The different body organs and tissues are made up of different kinds of cells. Many plants have **roots, stems, leaves**, and **reproductive structures.***
NYS MST Standards	· Performance Indicator 1.1: Compare and contrast the parts of plants, animals, and one-celled organisms. · Performance Indicator 5.1: Compare the way a variety of living specimens carry out basic life functions and maintain dynamic equilibrium.

Performance Tasks	· Using compound microscopes, students analyze the cellular structure of plant roots, stems, leaves, and reproductive structures. Students estimate the size of various structures. · Students compare and contrast the roots, stems, leaves, and reproductive structures of a variety of plants by observing live specimens or conducting library or internet research. · Students dissect live plants and use a triple-beam balance to determine the mass of the roots, stems, leaves and reproductive structures. Students use percentages and circle graphs to display their data for each category.
Inquiry Activity	· Students explore and compare the anatomy of a variety of plant types.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 2: Information Systems · Key Idea: 1.3 Standard 4: The Living Environment · Major Understandings: 1.1e, 1.1f Standard 7: Interconnectedness: Common Themes · Key Idea 1: Systems Thinking: 1.4 Process Skills Based on Standard 4 · General Skills: 1-2 · Living Environment Skills: 1-4, 9
NYC Performance Standards	Life Sciences Concepts · S2a, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5b-c, S5f Scientific Tools and Technologies · S6a-b Scientific Communication · S7a-c, S7e
Resources	· AIMS: Budding Botanist: *Leaves; A Twigs Story; Tale of Two Twigs; Herb and Woody; Down Under* · AIMS: Magnificent Microworld Adventures: *A Complete Package* (Cell organization in upper epidermis and lower epidermis of leaf) · Gardner: Science Projects about Plants: *Stomates* · Julivert, M. A. The Life of Plants. Chelsea House Publishers · Lindsay, M. The Visual Dictionary of Plants. Dorling Kindersley · Time Life. Understanding Science and Nature: Plant Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: Plantas.
Mathematics Connections	· Estimate the size of microscopic structures. · Make and compare measurements of length and mass. · Use circle graphs to explore the concept of percent

Technology Connections	· Construct circle graphs in Microsoft Excel. · Cyber ED Inc.: Roots & Stems: A Multimedia CD-ROM · National Geographic Society: NGS PictureShow: Plants: What It Means to Be Green: *Roots, Stems, and Leaves* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Plant Characteristics (*sciLINKS NUMBER: HSTL280) · Windows on Science Laser Disc: Life Science Volume 1: Rooting for Plants: *Roots; Stems; Leaves; Flowers*
Literacy Connections	· Prepare a lab report incorporating informational and narrative procedure writing.
Inquiry Activities	· Design controlled experiments to explore the effects of variables, such as amounts of light, soil, or moisture, on the distribution of plant growth among roots, stems, leaves and reproductive structures.
Key Idea	· ***Plant adaptations*** *for life on land include ways to: obtain water and other materials from their environment, retain moisture, support their bodies, transport materials from one part of the plant to another, and reproduce.*
NYS MST Standards	· Performance Indicator 1.1: Compare and contrast the parts of plants, animals, and one-celled organisms. · Performance Indicator 5.1: Compare the way a variety of living specimens carry out basic life functions and maintain dynamic equilibrium.
Performance Task	· Students examine the similarities and differences in plant adaptations for representative plants from each of the major biomes. · Students examine the internal vascular organization of tree trunks utilizing tree cookies. · Students explore transpiration in plants by placing a pebble in the bottom of a clear plastic bag and placing the bag over a small branch or stem with several leaves (This can be done outdoors or indoors). Students secure the bag with a rubber band, then place additional bags in other locations. Students leave the bags in place for 24 hours, then collect the bags and measure the amount of water in them using a graduated cylinder and represent the data using a bar graph. Students can also track weather data for several days and correlate daily transpiration rates with weather conditions.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understandings: 5.1b Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 1-4 · Living Environment Skills: 9

NYC Performance Standards	Life Sciences Concepts · S2a, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· AIMS: Budding Botanist: *Cones and Needles, History of a Tree & How Old Was The Tree;* · AIMS: Our Wonderful World: Solutions for Math + Science: *Tree Cookies; Thirsty Greens* · Gardner: Science Projects about Plants: *Transpiration: A More Quantitative Look* · Julivert, M. A. The Life of Plants. Chelsea House Publishers · Lindsay, M. The Visual Dictionary of Plants. Dorling Kindersley · Time Life. Understanding Science and Nature: Plant Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: Plantas.
Mathematics Connections	· Measure liquid volume. · Construct bar graphs. · Find area of circles and rings.
Technology Connections	· Construct bar graphs using Microsoft Excel. · Investigate the adaptations of five rainforest plants using Sunburst: A Field Trip to the Rainforest Deluxe: *Adaptations.* · National Geographic Society: NGS PictureShow: Plants: What It Means To Be Green: *X-Treme Survival* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Plant Characteristics* (sciLINKS NUMBER: HSTL280) · Windows on Science Laser Disc: Life Science Volume 1: Sorting It All Out: *Plants: Simple or Complex?; Gymnosperms and Angiosperms;* Rooting for Plants: *Seed Dispersal*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Inquiry Activities	· Students design controlled experiments to explore some of the variables that affect transpiration rates (such as number of leaves in the bag, type of plant, amount of light, temperature, wind speed, and amount of time bags are left) using the above activity as a model. · Students explore some of the variables that affect transpiration rates in plants utilizing a water-filled flask, 2-hole rubber stopper, glass and rubber tubing, pipette, ring stand and clamp apparatus (See AIMS: Our Wonderful World: Solutions for Math + Science. *Transpiration: Why are Plants so Thirsty?*). After collecting baseline data, students explore the effect of fanning and covering the leaves with a plastic bag (high humidity) on transpiration rates, then graph and analyze their results.

Key Idea	· ***Nonvascular plants*** *are low-growing plants that lack vascular tissue for transport of materials. Nonvascular plants include mosses, liverworts, and hornworts.* · ***Vascular plants*** *include ferns, which reproduce via* ***spores****, and the* ***seed-bearing*** *plants (gymnosperms and angiosperms).*
NYS MST Standards	· Performance Indicator 1.1: Compare and contrast the parts of plants, animals, and one-celled organisms. · Performance Indicator 5.1: Compare the way a variety of living specimens carry out basic life functions and maintain dynamic equilibrium.
Performance Tasks	· Students observe moss plants, identifying their structures and functions. · Students collect fern spores from a fern plant and place them in agar-filled petri dishes. The dishes should be placed upside down in a well-lit location. Students observe and sketch the developmental stages that lead to the growth of the fern plant. Students estimate the size of various structures. · Students collect, soak, and dissect a variety of seeds representing both gymnosperms (cone-bearing plants) and angiosperms (flowering plants) such as lima or kidney beans and corn kernels. · Students compare and contrast the characteristics of nonvascular and vascular plants via a poster presentation.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understandings: 5.1b Process Skills Based on Standard 4 · General Skills: 1-3 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a, S2e Scientific Thinking · S5b-c, S5f Scientific Tools and Technologies · S6a-b Scientific Communication · S7a-e
Resources	· AIMS: Budding Botanist: *Seed Facts; Seed Search; Dissect a Seed; Seeds from Fruits; Cones and Needles* · Gardner: Science Projects about Plants: *A Look at Seeds* · Julivert, M. A. The Life of Plants. Chelsea House Publishers · Lindsay, M. The Visual Dictionary of Plants. Dorling Kindersley · Time Life. Understanding Science and Nature: Plant Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: Plantas.
Mathematics Connections	· Make and use metric measurements of length. · Estimate microscopic measurements.

Technology Connections	· Draw and label diagrams using Dabbler or Microsoft Word draw tools. · Use Inspiration to construct a chart that compares and contrasts types and/or parts of plants. · National Geographic Society: NGS PictureShow: Classifying Plants and Animals: *Classifying Plants* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Plant Characteristics* (sciLINKS NUMBER: HSTL280); *How are Plants Classified (*sciLINKS NUMBER: HSTL285); *Seedless Plants:* sciLINKS NUMBER: HSTL290; *Plants with Seeds* (sciLINKS NUMBER: HSTL295); *The Structure of Seed Plants* (sciLINKS NUMBER: HSTL300) · Windows on Science Laser Disc: Life Science Volume 1: Rooting for Plants: *Fast Plants*
Literacy Connections	· Present reports five to seven minutes long for teachers and other students. · Organize what to say using notes or other memory aids (poster display). · Begin by stating a main idea or purpose, support it with details, examples, and reasons, and end by summarizing main points.
Key Idea	· *Patterns of **development** vary among plants. In **seed-bearing** plants, **seeds** contain stored food for early development. All plants have complex **life cycles**. Various body structures and functions change as plants age.*
NYS MST Standards	· Performance Indicator 4.3: Observe and describe developmental patterns in selected plants and animals.
Performance Tasks	· Students compare growth of corn (monocot) and peas (dicot) from seed, identifying roots, stems, leaves, and reproductive structures. Students compare and contrast these observations with those made of the fern's life cycle. Students record measurements of plant height and number of leaves over time using a timeline or bar graph to organize and present their data. · Students explore the effects of gravity on seed growth by arranging bean and/or corn seeds in a variety of positions with respect to the earth in clear plastic cups lined with moistened paper towel. As the seeds germinate, students record the height/depth and direction of shoot and root growth. · Students set up terrariums and plant a variety of monocot and dicot seeds (barley, clover, corn, peas, and radish). Students draw a map to show where each type of seed is planted. Students observe the terrariums every 2-3 days for 2 weeks and record observations about the soil, moisture levels, first and last seeds to sprout, seeds that grow best, height of plants, etc. · Students conduct experiments with four kinds of plants to discover their range of tolerance for water (or range of tolerance for salt) and describe the optimum water (or salinity) conditions for early growth of seeds. Students plant four types of seeds--barley, corn, pea, and radish--in five water conditions--absolutely dry soil, moist soil, wet soil, very wet soil, and soaked soil (or use the same amount water but vary salinity by adding one to four spoons of salt to water used to irrigate plants). Students observe the plants every 2-3 days for 2 weeks, and record observations about number of seeds to sprout, height of plants, # of leaves on plants, condition of plants, etc.

Inquiry Activity	· Students explore the effects of variables such as light, temperature, or soil type, moisture, salinity and seed treatments (heating, freezing, soaking, etc.) on the growth of monocot and/or dicot seeds.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understandings: 4.3e, 4.3f Process Skills Based on Standard 4 · General Skills: 1-2, 4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a, S2c Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· AIMS: Budding Botanist: *Seed Facts; Seed Search; Dissect a Seed; Seeds from Fruits; Cones and Needles* · FOSS: Environments *Terrestrial Environments, Water Tolerance, Salt of the Earth* · Gardner: Science Projects about Plants: *Watching Seeds Germinate; Germinating Seeds; Air and Germination; More on Air and Germination; Germinating Seeds and Freezing Temperatures; Light and Germination; Bean Seeds without Cotyledons: Can They Grow?; Seedlings and Their Cotyledons; Soil, Germination, and Growth; Depth of Planting and Seeds; Growing Grass on a Turntable; Sand and Seashore Sand* · Prentice Hall: Science Explorer: From Bacteria to Plants: *Which Way is Up?* · Julivert, M. A. The Life of Plants. Chelsea House Publishers · Lindsay, M. The Visual Dictionary of Plants. Dorling Kindersley · Time Life. Understanding Science and Nature: Plant Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: Plantas.
Mathematics Connections	· Make and use metric measurements of length. · Construct a bar graph or time line to scale.

Technology Connections	· Write and edit a lab report. Teacher creates a template for the lab report in Microsoft Word. · Construct bar graphs in Microsoft Excel. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Plants with Seeds* (sciLINKS NUMBER: HSTL295); *The Structure of Seed Plants* (sciLINKS NUMBER: HSTL300); *Plant Tropisms* (sciLINKS NUMBER: HSTL315) · SciencePlus: Interactive Explorations Level Red: CD-ROM*: Exploration 8: How's It Growing* · Windows on Science Laser Disc: Life Science Volume 1: Rooting for Plants: *Vegetative Reproduction and Tropisms*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Inquiry Activities	· Design and conduct controlled experiments to explore variables that affect seed germination such as light, temperature, moisture, air, soil type, soil depth, and seed viability.
Key Idea	· *There are a number of methods of **asexual reproduction** in plants, including when part of the plant is separated from the parent and becomes another individual.*
NYS MST Standards	· Performance Indicator 4.1: Observe and describe the variations in reproductive patterns of organisms, including asexual and sexual reproduction.
Performance Tasks	· Students use root cuttings to reproduce plants, such as carrots or potatoes, and/or stem cuttings to reproduce houseplants. Students monitor plant growth by counting the number of shoots that develop and by recording height measurements.
Inquiry Activity	· Students explore the effects of variables such as size of cutting, rooting medium, light, or temperature on cloning success.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understandings: 4.1b Process Skills Based on Standard 4 · General Skills: 1 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Thinking · S5b, S5f Scientific Tools and Technologies · S6a-b
Resources	· Gardner: Science Projects about Plants: *Cloning Plants* (house plants) · Julivert, M. A. The Life of Plants. Chelsea House Publishers · Lindsay, M. The Visual Dictionary of Plants. Dorling Kindersley · Time Life. Understanding Science and Nature: Plant Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: Plantas.
Mathematics Connections	· Measurement of metric length.

Technology Connections	· Use a digital camera to document growth of clones. · Create a multimedia presentation using PowerPoint to explain asexual reproduction in plants. · Windows on Science Laser Disc: Life Science Volume 1: Rooting for Plants: *Vegetative Reproduction and Tropisms*
Literacy Connections	· Record daily quantitative and qualitative observations in a science journal or lab notebook.
Inquiry Activities	· Students explore the variables that affect success rates of cloning, such as size of cuttings, treatment of cuttings, growing medium, light, and temperature.
Key Idea	· *While methods of **sexual reproduction** in plant species vary, all involve the merging of **sex cells** to begin the development of a new individual. In many species of plants, **eggs** and **sperm** are produced. **Fertilization** may be **internal** (conifers and flowering plants) or **external** (ferns and mosses).*
NYS MST Standards	· Performance Indicator 4.1: Observe and describe the variations in reproductive patterns of organisms, including asexual and sexual reproduction.
Performance Tasks	· Students study the structure and function of flowers by observing a fresh flower, such as a lily. Students distinguish between the sepals and petals and count the number of sepals. Using scissors, students remove the sepals then observe and count the petals. After removing the petals the male and female parts of the flower are identified. Students use a compound microscope to view a wet mount of the pollen grains from one of the anthers. Students make a cross section of the ovary and count the number of ovules. · Students research the relationship between flowers and their pollinators.
Inquiry Activity	· Students explore the comparative anatomy of different types of flowers.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 2: Information Systems · Key Idea: 1.3 Standard 4: The Living Environment · Major Understandings: 4.1c Process Skills Based on Standard 4 · General Skills: 1 · Living Environment Skills: 1-4, 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5b, S5f Scientific Tools and Technologies · S6a-b

Resources	· AIMS: Budding Botanist: *Seeds Travel; A Flower Study* · Prentice Hall: Science Explorer: From Bacteria to Plants: *A Close Look at Flowers* · Julivert, M. A. The Life of Plants. Chelsea House Publishers · Lindsay, M. The Visual Dictionary of Plants. Dorling Kindersley · Time Life. Understanding Science and Nature: Plant Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: Plantas.
Mathematics Connections	· Explore concepts of symmetry in floral structures.
Technology Connections	· National Geographic Society: NGS PictureShow: Plants: What It Means To Be Green: *X-Treme Survival* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *How are Plants Classified* (sciLINKS NUMBER: HSTL285); *Seedless Plants* (sciLINKS NUMBER: HSTL290); *Plants with Seeds* (sciLINKS NUMBER: HSTL295); *Reproduction of Plants* (sciLINKS NUMBER: HSTL305) · Windows on Science Laser Disc: Life Science Volume 1: Rooting for Plants: *Flowers*
Literacy Connections	· Conduct library research. · Write a lab report incorporating informational and narrative procedure writing.
Interactions Among Living Things II	**Suggested Time: 4 weeks**
Key Idea	· ***Green plants** are the **producers** of food, which is used directly or indirectly by consumers.*
NYS MST Standards	· Performance Indicator 6.2: Provide evidence that green plants make food and explain the significance of this process to other organisms.
Performance Tasks	· Students analyze energy pyramids for particular ecosystems, identify the particular organisms that occupy each level of the pyramid (producers, first-, second-, and third-level consumers) and calculate how much energy is used or lost as heat (about 90%) and how much is available for the next level of the pyramid (10%). Students prepare poster presentations incorporating energy pyramid diagrams, descriptions of the organisms at each level on the pyramid and circle graphs for each pyramid's energy budget.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 Standard 4: The Living Environment · Major Understandings: 6.2c Standard 6: Interconnectedness: Common Themes · Key Idea 1: Systems Thinking: 1.4 Process Skills Based on Standard 4 · General Skills: 1, 4, 7 · Living Environment Skills: 7

NYC Performance Standards	Life Sciences Concepts · S2d Scientific Connections and Applications · S4a Scientific Thinking · S5b, S5f Scientific Tools and Technologies · S6c Scientific Communication · S7a, S7d
Resources	· Hunken, J. Ecology for all Ages: Discovering Nature through Activities for Children and Adults · Julivert, M. A. The Life of Plants. Chelsea House Publishers · Lindsay, M. The Visual Dictionary of Plants. Dorling Kindersley · Rees, R., ed. The Way Nature Works · Scott, M. The Young Oxford Book of Ecology · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Food Chains · Time Life. Understanding Science and Nature: Plant Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: Plantas; Understanding Science and Nature: Ecology; Enciclopedia Ilustrada de Sciencia y Naturaleza Ecología
Mathematics Connections	· Find the percent of a number. · Use circle graphs to represents percents.
Technology Connections	· Construct circle graphs illustrating the energy available at each level of the pyramid using Microsoft Excel. · Create a diagram of the pyramid using Inspiration. · Cyber ED Inc.: Food Chains & Webs: A Multimedia CD-ROM · Windows on Science Laser Disc: Life Science Volume 1: Know Your Niche: *Producers and Consumers*
Literacy Connections	· Write descriptions incorporating informational writing.
Key Idea	· *In **ecosystems**, balance is the result of **interactions** between **community** members and their **environment**. The number of organisms an ecosystem can support (carrying capacity) depends on the available **resources** and **physical factors**: quantity of light, air, and water; range of temperatures; and soil composition.*
NYS MST Standards	· Performance Indicator 7.2: Describe the effects of environmental changes on humans and other populations.
Performance Tasks	· Students explore the concept of carrying capacity and discover some of the limiting factors involved, through simulation games, such as *How Many Bears Can Live in this Forest?* After a number of colored slips of paper are placed around the room representing habitat necessities for bears, the "bears" collect as many slips as they can find (This can be done as a whole class, small groups, or individually, as well as indoors or outdoors). Students tally up the Calories represented by each food item, as well as the amount of water and other requirements that they collect. Based upon recommended minimum amounts for a bear's survival, students determine whether their bear would survive or not. Students compare and contrast the simulation game to real conditions a bear would experience.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 Standard 4: The Living Environment · Major Understandings: 7.2a Standard 7: Interconnectedness: Common Themes · Key Idea 1: Systems Thinking: 1.4 Process Skills Based on Standard 4 · Living Environment Skills: 7
NYC Performance Standards	Life Sciences Concepts · S2d, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5b-c, S5f Scientific Tools and Technologies · S6d-e Scientific Communication · S7a-b
Resources	· Project WILD: *How Many Bears Can Live in this Forest; Classroom Carrying Capacity; Carrying Capacity* · Hunken, J. Ecology for all Ages: Discovering Nature through Activities for Children and Adults · Rees, R., ed. The Way Nature Works · Scott, M. The Young Oxford Book of Ecology · Time Life: Understanding Science and Nature: Ecology; Enciclopedia Ilustrada de Sciencia y Naturaleza: Ecología
Mathematics Connections	· Use addition, subtraction, multiplication, and division facts.
Technology Connections	· Use calculators to perform calculations. · National Geographic Society: NGS PictureShow: Looking at Ecosystems: *Depending on Each Other* · Windows on Science Laser Disc: Life Science Volume 1: Know Your Niche: *Interdependence and Energy Flow*
Literacy Connections	· Write a response to the activity in a science journal.
Key Idea	· *Within an ecosystem all living things occupy a unique role, or **niche**, which includes their **habitat**, food, food gathering activities, relationships with other organisms, and methods of reproduction.*
NYS MST Standards	· Performance Indicator 7.1: Describe how living things including humans, depend upon the living and nonliving environment for their survival.
Performance Tasks	· Students study grasses and weeds from different microhabitats such as a lawn, along a fence, in shaded areas, in a vacant lot, near shrubs, or in a wooded area, using eyes, hand lenses, and/or microscopes. Students sketch, photograph, or make rubbings of each plant then identify each plant using field guides. Students also describe the plant's microhabitat (niche) in terms of sunlight, moisture, types of vegetation, depth to soil, etc. Students determine whether any plants were found in all locations, and which plants were found only in certain locations.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 Standard 4: The Living Environment · Major Understanding: 7.2a Process Skills Based on Standard 4 · General Skills: 4, 7 · Living Environment Skills: 7, 9
NYC Performance Standards	Scientific Connections and Applications · S4a, S4e Scientific Thinking · S5a-c, S5d Scientific Communication · S7a-e
Resources	· AIMS: The Budding Botanist: *Enviroscape*, *Observe a Tree* · Gardner, R. Science Projects about the Environment and Ecology: *Grasses and Weeds in Different Places*
Mathematics Connections	· Explore methods of collecting and organizing data.
Technology Connections	· Use digital camera to record pictures of individual weed species. · Create a PowerPoint slideshow about the weeds and their microhabitats. · National Geographic Society: NGS PictureShow: Looking at Ecosystems: *What Is a Food Chain?* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Habitats and Niches:* sciLINKS Number: HSTL450
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· *In all environments organisms **interact** with one another in many ways. Relationships among organisms may be **competitive**, harmful (i.e parasitism) or **beneficial** (i.e commensalism, mutualism). Some **species** have adapted to be dependent upon each other with the result that neither could survive without the other (symbiosis, i.e., lichens) Some **microorganisms** are essential to the survival of other living things.*
NYS MST Standards	· Performance Indicator 7.1: Describe how living things, including humans, depend upon the living and nonliving environment for their survival.
Performance Tasks	· Students investigate competitive, harmful, beneficial, and predator/prey relationships in ecosystems by researching the relationships between particular organisms, such as owls and the rodents they consume (predator prey), humans and *E, coli* (beneficial), oxpeckers and hippopotamus (beneficial), fleas and dogs (harmful), humans and pathogens (harmful), remora fish and sharks (beneficial). Students prepare poster presentations including pictures of the organisms, descriptions of how the organisms interact (quantitatively and qualitatively), and an explanation of the type of relationship (competitive, harmful, beneficial, predator/prey) the organisms share.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 Standard 2: Information Systems · Key Idea: 1.3 Standard 4: The Living Environment · Major Understandings: 7.1c, 7.1d Standard 7: Interconnectedness: Common Themes · Key Idea 1: Systems Thinking: 1.4 Process Skills Based on Standard 4 · Living Environment Skills: 7
NYC Performance Standards	Life Sciences Concepts · S2d, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5b-c, S5f Scientific Tools and Technologies · S6d Scientific Communication · S7b-e
Resources	· Project WILD: *Good Buddies; Quick Frozen Critters; Birds of Prey* · Hunken, J. Ecology for all Ages: Discovering Nature through Activities for Children and Adults · Rees, R., ed. The Way Nature Works · Scott, M. The Young Oxford Book of Ecology · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Food Chains · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Symbiosis · Time Life: Understanding Science and Nature: Ecology · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: Ecología
Mathematics Connections	· Use line graphs to depict predator/prey relationships.
Technology Connections	· Construct line graphs in Microsoft Excel. · Investigate symbiotic relationships between plants and/or animals in tropical rainforest ecosystems using Sunburst: A Field Trip to the Rainforest Deluxe: *Partners* · SciencePlus: Interactive Explorations Level Red: CD-ROM*: Exploration 1: What's Bugging You* · Windows on Science Laser Disc: Life Science Volume 1: Know Your Niche: *Symbiotic Relationships*
Literacy Connections	· Present reports five to seven minutes long for teachers and other students. · Organize what to say using notes or other memory aids (poster display). · Begin by stating a main idea or purpose, support it with details, examples, and reasons, and end by summarizing main points.
Key Idea	· *The environment may be altered through the activities of organisms. **Alterations** are sometimes abrupt as through **natural disasters** like floods, volcanoes etc. Some species may replace others over time, resulting in long-term gradual changes (ecological succession).*
NYS MST Standards	· Performance Indicator 7.2: Describe the effects of environmental changes on humans and other populations.

Performance Tasks	· Students explore how a model pond community changes over time by filling a baby food jar 3/4 full with a hay solution and then pond water until the jar is nearly full. Students place the jar in a safe location out of direct sunlight (If lids are used, holes should be punched in them so that air exchange is possible.). After two days students use a dropper to collect a few drops of water from the surface. Students prepare a wet mount and draw each type of organism they see, estimating the number of each type of organism in the sample. Students repeat this procedure drawing a few drops of water from the side and then from the bottom of the jar. Students sample their jar again on days 5 and 8 in the same manner. Students compare and contrast their results and describe how the pond community changed over time.
Inquiry Activity	· Students explore the effects of variables such as light and temperature on the abundance and diversity of organisms in their model pond communities.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1- S3.3 Standard 4: The Living Environment · Major Understanding: 7.2b Process Skills Based on Standard 4 · General Skills: 1, 5 · Living Environment Skills: 1-3
NYC Performance Standards	Life Sciences Concepts · S2d, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-b
Resources	· Project WILD: *Oh Deer!; Pond Succession* · Prentice Hall: Science Explorer: Environmental Science: *Change in a Tiny Community* · Hunken, J. Ecology for all Ages: Discovering Nature through Activities for Children and Adults · Rees, R., ed. The Way Nature Works · Scott, M. The Young Oxford Book of Ecology · Time Life: Understanding Science and Nature: Ecology · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: Ecología
Mathematics Connections	· Use frequency charts and bar graphs to illustrate relative amounts of each type of organism observed.
Technology Connections	· Construct data tables, frequency charts, and bar graphs in Microsoft Excel. · Write a lab report using Microsoft Word. · Windows on Science Laser Disc: Life Science Volume 1: Know Your Niche*: The Biosphere, Ecosystems, and Succession*

Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing. · Write a response to the activity in a science journal.
Key Idea	· ***Energy*** *and* ***matter*** *flow from one organism to another. 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. The* ***cycling*** *of nutrients and gases is essential to functioning and maintenance in ecosystems.*
NYS MST Standards	· Performance Indicator 6.1: Describe the flow of energy and matter through food chains and food webs.
Performance Tasks	· Students research how water, nitrogen, oxygen and carbon dioxide cycle in a particular ecosystem (forest, tundra, desert, grassland, ocean, lake, polar, rainforest). Students prepare a poster presentation incorporating a diagram of the cycle, and a description of the specific living and nonliving components that interact during the cycling of these materials.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design · Key Idea 1: S1.1- S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 6.1c Standard 6: Interconnectedness: Common Themes · Key Idea 1: Systems Thinking: 1.4 Process Skills Based on Standard 4 · General Skills: 1, 4
NYC Performance Standards	Life Sciences Concepts · S2d, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-b
Resources	· Hunken, J. Ecology for all Ages: Discovering Nature through Activities for Children and Adults · Rees, R., ed. The Way Nature Works · Scott, M. The Young Oxford Book of Ecology · Time Life: Understanding Science and Nature: Ecology · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: Ecología
Mathematics Connections	· Use percents to indicate the relative amounts of oxygen, water, carbon dioxide, and nitrogen in each phase of their cycle.
Technology Connections	· Draw and label cycle diagrams using Dabbler or Microsoft Word draw tools. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic*: The Water Cycle* (sciLINKS NUMBER: HSTL455); *The Carbon Cycle* (sciLINKS NUMBER: HSTL460); *The Nitrogen Cycle* (sciLINKS NUMBER: HSTL465)

Literacy Connections	· Present reports five to seven minutes long for teachers and other students. · Organize what to say using notes or other memory aids (poster display). · Begin by stating a main idea or purpose, support it with details, examples, and reasons, and end by summarizing main points.
Key Idea	· ***Overpopulation*** *by any species impacts the environment due to the increased use of resources. To insure the survival of life on our planet, people have a responsibility to consider the impact of their actions on the environment.*
NYS MST Standards	· Performance Indicator 7.2: Describe the effects of environmental changes on humans and other populations.
Performance Tasks	· Students obtain and analyze actual human or wildlife (deer, rodents) population data to investigate the nature of overpopulation it impacts on local and/or global ecosystems. · Students define and explain extinction listing wildlife that are extinct or on the verge of extinction. · Students research case studies of endangered or threatened species, such as the Bald eagle, Grey wolf and Florida panther.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 7.2c Standard 6: Interconnectedness: Common Themes · Key Idea 1: Systems Thinking: 1.4 Process Skills Based on Standard 4 · General Skills: 8
NYC Performance Standards	Life Sciences Concepts · S2d, S2e Scientific Connections and Applications · S4a Scientific Thinking · S5f Scientific Tools and Technologies · S6d Scientific Communication · S7b-e
Resources	· Project WILD: *Shrinking Habitat* · Hunken, J. Ecology for all Ages: Discovering Nature through Activities for Children and Adults · Rees, R., ed. The Way Nature Works · Scott, M. The Young Oxford Book of Ecology · Time Life: Understanding Science and Nature: Ecology · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: Ecología
Mathematics Connections	· Construct a bar graph of population data.

Technology Connections	· Construct a bar graph in Microsoft Excel. · Use PowerPoint to create a slideshow about factors that impact the environment.
Literacy Connections	· Write a report incorporating informational writing.
The Human Organism	**Suggested Time: 1 week**
Key Idea	· *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**. Tissues, organs, and organ systems help to provide all cells with basic needs such as nutrients, oxygen, and waste removal.* · *The human body contains four basic **tissue types**: **muscle, nerve, connective** and **epithelial**.*
NYS MST Standards	· Performance Indicator 1.1: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Students describe the four types of tissues in the body indicating their functions, where they are found in the body, and the types of cells that make up each tissue type. Students then research a particular organ, such as the stomach or the heart and describe how the different types of tissues work together and allow the organ to function.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea: 1.3 Standard 4: The Living Environment · Major Understandings: 1.1e, 1.2b
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5b-c, S5f Scientific Tools and Technologies · S6a-b Scientific Communication · S7a-b, S7e

Resources	· Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body. · Parker, S. Readers Digest: How the Body Works · Roca, N. and Serrano, M. Invisible World: Cells, Genes, and Chromosomes. Chelsea House Publishers · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Compare and contrast the size and shape of different cell types in the body.
Technology Connections	· Construct graphic organizers to summarize key information using Inspiration. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Tissues and Organs* (sciLINKS NUMBER: HSTL530) · Windows on Science Laser Disc: Life Science Volume 2: Introducing the Human Body*: Tissues and Organs*
Literacy Connections	· Write a brief report to accompany the graphic organizer incorporating informational writing.
Key Idea	· ***Regulation** of an organism's internal environment (**homeostasis**) involves sensing the **internal environment** and changing **physiological activities** to keep conditions within the range required for survival. This includes a variety of nervous and hormonal feedback systems.*
NYS MST Standards	· Performance Indicator 1.1: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Students monitor heart rate before and after exercise as an example of homeostasis.
Inquiry Activity	· Students conduct controlled experiments to explore the effects of type and duration of exercise on heart rates before and after exercise.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 5.1f Standard 6: Interconnectedness: Common Themes · Key Idea 1: Systems Thinking: 1.4 Process Skills Based on Standard 4 · General Skills: 1, 4, 8 · Living Environment Skills: 8

NYC Performance Standards	Life Sciences Concepts · S2a, S2c Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· AIMS: From Head to Toe: *How Does Your Heart Rate?; Step In Time* · Gardner, R. Science Projects about the Human Body: *Take Your Pulse* · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Stein, S. The Body Book. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body. · Parker, S. Readers Digest: How the Body Works · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Collect, organize, and display data using appropriate tables and graphs.
Technology Connections	· Construct graphs in Microsoft Excel. · Windows on Science Laser Disc: Life Science Volume 2: Introducing the Human Body*: Maintaining Homeostasis*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· ***Multicellular*** *organisms often have similar* ***organs*** *and specialized* ***systems*** *for carrying out major life activities. Humans have systems for* ***digestion, gas exchange, reproduction, circulation, excretion, control, coordination, movement*** *and* ***protection from disease****. Each system is composed of organs and* ***tissues****, which perform specific functions and interact with each other.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Given a poster-size outline of the human body and a sheet with illustrations of human organs, students cut out the organs, determine where in the body outline they should go, then tape the organ to the poster. Students draw a line to the outside of the body from each organ, then label the organ. (Note: This activity is designed to elicit students' current knowledge of the human body. Students should not refer to texts or classroom libraries until after they complete the activity).

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 Standard 4: The Living Environment · Major Understandings: 1.1g, 1.2a Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models: 2.1-2.3 Process Skills Based on Standard 4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5d, S5f Scientific Communication · S7a-b
Resources	· Smithsonian/The National Academies National Science Resources Center: Science & Technology Concepts for Middle Schools: Human Body Systems: *Human Body Mapping*
Mathematics Connections	· Measure metric length.
Technology Connections	· Create a PowerPoint slideshow illustrating the structures of one of the organ systems and their functions. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Body Systems* (sciLINKS NUMBER: HSTL535) · Sunburst: Multimedia: The Human Body: *Amazing Voyage* · Windows on Science Laser Disc: Life Science Volume 2: Introducing the Human Body*: Systems*
Literacy Connections	· Present reports five to seven minutes long for teachers and other students. · Organize what to say using notes or other memory aids (poster display). · Begin by stating a main idea or purpose, support it with details, examples, and reasons, and end by summarizing main points.
Skin and the Skeletal and Muscular Systems	**Suggested Time: 2 weeks**
Key Idea	· *The **skin** is the largest organ in the body. Skin covers the body, prevents water loss, protects the body from injury and infection, helps regulate body temperature, eliminates waste, gathers information about the environment, and produces vitamin D.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.

Performance Tasks	· Students explore the role of skin as a barrier to disease using apples. Students wash and dry four apples and place one apple (the control) into a plastic bag. Students insert a toothpick into a rotten apple then trace a vertical line without breaking the skin on a second apple. Students make three more lines on the apple skin in the same manner and place this apple in a second bag. Students then insert a toothpick into a rotten apple then scratch a vertical line through the skin of a third apple. Students make three more scratches in the same manner and place this apple in a third bag. Finally, students make four scratches on the last apple as above but before placing the apple in the bag, students swab each of the scratches with rubbing alcohol. Students place the bags in a warm, dark location and observe them every day for a week. Students summarize and explain their results. · Students explore the role of skin in maintaining body temperature by comparing the temperature of wet and dry bulb thermometers. Students record the starting temperature of two thermometers, then wrap a wet cotton ball around one of the thermometers. After two minutes student record the temperatures on both thermometers. Students then fan the thermometers for several minutes then record the temperatures again. Students graph and analyze their results and compare their observations to skin function.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1- S1.4 · Key Idea 2: S2.1a-b, d · Key Idea 3: S3.1- S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2a Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models: 2.1- 2.3 Process Skills Based on Standard 4 · General Skills: 1, 4, 8
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e

Resources	· Prentice Hall: Science Explorer: Human Biology and Health: *The Skin as a Barrier; Try This: Sweaty Skin* · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body. · Parker, S. Readers Digest: How the Body Works · Silverstein, A. Silverstein, V., and Silverstein, R. The Skeletal System · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Construct tables and graphs to organize quantitative data.
Technology Connections	· Construct tables and graphs in Microsoft Excel. · A.D.A.M. The Inside Story: *Integumentary System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *The Integumentary System* (sciLINKS NUMBER: HSTL545) · Windows on Science Laser Disc: Life Science Volume 2: The Body Outside In*: Skin*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· ***Locomotion**, necessary to escape danger, obtain food and shelter, and reproduce, is accomplished by the interaction of **skeletal muscles** and **bones**, and coordinated by the **nervous system**.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Students observe a chicken wing, identifying the upper arm, elbow, lower arm, and wing tip. Using scissors, students cut open the inside of the chicken wing, identifying skin and muscle tissue. Holding the wing steady at the shoulder, students pull on each of the muscle groups in the upper arm and observe movement of the wing. Holding the wing at the elbow, students pull on each of the muscle groups in the lower arm and again observe the movement. Students compare and contrast the movement of the wing to the movement of their arms. Students further dissect the wing to identify tendons, ligaments, points of origin and insertion of muscles, joints, cartilage, blood vessels, nerve tissue, and bone. Students measure the length in cm or mm of various structures. · Students investigate the specialized adaptations for locomotion of a particular animal and compare/contrast the animal's locomotion with that of a human.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2g Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models: 2.1- 2.3 Process Skills Based on Standard 4 · General Skills: 1, 8 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Arnau, E. Invisible World: The Skeletal System. · Biblioteca Visual Altea: Esqueletos. · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body; The Visual Dictionary of the Skeleton. · Llamas, A. Muscles and Bones · Parker, S. Readers Digest: How the Body Works · Silverstein, A. Silverstein, V., and Silverstein, R. The Skeletal System · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body · Smithsonian/The National Academies National Science Resources Center: Science & Technology Concepts for Middle Schools: Human Body Systems: *Winging It*
Mathematics Connections	· Measure metric length.
Technology Connections	· Record digital images of dissection. · Construct a digital portfolio using PowerPoint. · A.D.A.M. The Inside Story: *Skeletal System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Skeletal System* (sciLINKS NUMBER: HSTL537) · Sunburst: Multimedia: The Human Body: *The Athlete*

Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· *The **skeletal system** provides shape and support, enables movement, protects internal organs, produces blood cells, and stores materials such as calcium and fat. **Bones** are joined together by **joints**, which may be immovable (skull) or movable (elbow, knee) to provide a wide range of motion.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Students examine skeletal models to identify the bones of the body and observe the movement of bones with respect to their joints. · Students construct a model of a joint, such as the hinge joint in the arm, and explore how it works. Students describe the structures represented by each part of the model, indicate the types of movement allowed by the joint, and how opposing muscle groups produce the movement of the joint. · Students compare the density of a chicken leg bone to that of a rock. Students examine the leg bone and rock with a hand lens, then gently tap the bone and the rock on a hard surface. After recording their observations, students measure the mass of each object using a triple-beam balance and obtain their volumes by displacement using overflow cans or graduated cylinders. Students calculate the densities of the bone and rock then compare and contrast their results and observations.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2g Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models: 2.1- 2.3 Process Skills Based on Standard 4 · General Skills: 1, 8 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a, S4e Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7d-e

Resources	· AIMS: From Head To Toe: *Golden Proportion; Dem Bones* · Arnau, E. Invisible World: The Skeletal System. · Biblioteca Visual Altea: Esqueletos. · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body; The Visual Dictionary of the Skeleton. · Llamas, A. Muscles and Bones · Parker, S. Readers Digest: How the Body Works · Silverstein, A. Silverstein, V., and Silverstein, R. The Skeletal System · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body Smithsonian/The National Academies National Science Resources Center: Science & Technology Concepts for Middle Schools: Human Body Systems: *Exploring Joints with Models*
Mathematics Connections	· Measure angles to indicate the range of motion in joints.
Technology Connections	· Create a PowerPoint slideshow on the skeletal system and its functions using pictures obtained from Internet and CD-ROM research. Animate slides with sound explanations. · A.D.A.M. The Inside Story: *Skeletal System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Skeletal System* (sciLINKS NUMBER: HSTL537) · Sunburst: Multimedia: The Human Body: *The Athlete* · Windows on Science Laser Disc: Life Science Volume 2: The Body Outside In*: Bones; Torso and Limb Bones; Joints; Ligaments and Cartilage*
Literacy Connections	· Write a design journal incorporating informational and narrative procedure writing.
Key Idea	· *The **muscular system** consists of two types of muscles: those that are **involuntary**, or not consciously controlled, such as those for breathing and circulation, and those that are **voluntary**, such as those used for locomotion.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Working in pairs, students explore muscle fatigue by squeezing a test tube holder or a spring-type clothespin as many times as they can in 150 seconds. The persons squeezing counts out loud while their partners time and record the number of squeezes at the end of each 30-second interval. When both partners have completed their trials, the students graph and analyze their results using a double bar or line graph. · Students investigate as many body responses as possible and classify responses as voluntary and/or involuntary.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2g Process Skills Based on Standard 4 · General Skills: 1-4, 8 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Llamas, A. Muscles and Bones · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Parker, S. Readers Digest: How the Body Works · Silverstein, A. Silverstein, V., and Silverstein, R. The Muscular System · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body · Prentice Hall: Science Explorer: Human Biology and Health: *A Look Beneath the Skin* · Smithsonian/The National Academies National Science Resources Center: Science & Technology Concepts for Middle Schools: Human Body Systems: *Working Against Fatigue*
Mathematics Connections	· Construct graphs of quantitative data.
Technology Connections	· Construct graphs and prepare a multimedia lab report using Microsoft Excel and PowerPoint. · A.D.A.M. The Inside Story: *Muscular System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *The Muscular System* (sciLINKS NUMBER: HSTL540) · Sunburst: Multimedia: The Human Body: *The Athlete* · Windows on Science Laser Disc: Life Science Volume 2: The Body Outside In*: Bones; Torso and Limb Bones; Joints; Ligaments and Cartilage*

Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Nutrition and Digestion	**Suggested Time: 2 weeks**
Key Idea	· ***Metabolism*** *is the sum of all* ***chemical reactions*** *in the body. Hormones, exercise, and diet influence metabolism.*
NYS MST Standards	· Performance Indicator 5.2: Describe the importance of major nutrients, vitamins, and minerals in maintaining health and promoting growth, and explain the need for constant input of energy for living organisms.
Performance Tasks	· Using measurements of their height in centimeters, their mass in kilograms (weight in pounds x 0.454kg/lb), and their age in years, students calculate their basal metabolic rate (BMR) or estimate of the number of Calories their bodies need each day to survive. Females: BMR = 65 + (10 x mass) + (1.8 x height) – (4.7 x age); Males: BMR = 66 + (13.5 x mass) + (5 x height) – (6.8 x age). To calculate the number of Calories needed to stay healthy, students should multiply their BMR by an activity factor (moderately inactive = 1.3; moderately active = 1.4; very active = 1.6; extremely active = 1.8).
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 5.2c Process Skills Based on Standard 4 · General Skills: 1-4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a, S2c Scientific Connections and Applications · S4a Scientific Thinking · S5b, f Scientific Tools and Technologies · S6c Scientific Communication · S7a

Resources	· Holt, Rinehart and Winston: Holt Science & Technology: Life Science: *Stayin' Alive* · Avraham, R. The Encyclopedia of Health: The Digestive System · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Parker, S. Readers Digest: How the Body Works · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body · Paramon, E. Invisible World: The Digestive System. Chelsea House Publishers
Mathematics Connections	· Find solutions for unknown quantities using in linear equations.
Technology Connections	· Construct graphs of class data in Microsoft Excel. · Windows on Science Laser Disc: Life Science Volume 2: You Are What You Eat*: Nutrients and Calories*
Literacy Connections	· Students write a lab report incorporating narrative procedure and informational writing.
Key Idea	· ***Food*** *provides molecules that serve as* ***fuel*** *and* ***building material*** *for all organisms. Foods contain a variety of substances, which include* ***carbohydrates, fats, proteins, vitamins, minerals,*** *and* ***water****. Each substance is vital to the survival of organisms.*
NYS MST Standards	· Performance Indicator 5.2: Describe the importance of major nutrients, vitamins, and minerals in maintaining health and promoting growth, and explain the need for constant input of energy for living organisms.
Performance Tasks	· Students use "Clinitest tablets, benedict solution, or yeast to test various foods for simple sugars. A dilute iodine solution or Lugol's solution can be used to test for the presence of starch, and brown paper can be used to test for the presence of fats. Students test various fruit juices for their vitamin C content using an indophenol solution and their acidity using baking soda. · Students determine whether extra iron has been added to cereals by measuring out 50g of cereal, placing it in a plastic bag and crushing it to a fine powder. Students pour the cereal into a plastic jar, add warm water to cover the cereal, secure the lid on the jar, and shake vigorously for 15 minutes. Students then run a bar magnet along the outside of the jar and observe what happens. Students can test several types of cereals and compare their results.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 5.2a, 5.2b Process Skills Based on Standard 4 · General Skills: 1-4, 9 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e

Resources	· AIMS: Fun with Foods: *How Sweet it Is…* · Gardner, R. Science Projects About Kitchen Chemistry: *Fatty Food, Testing for Starch* · GEMS: Vitamin C Testing: *Conducting the Tests, Analyzing the Results, Testing More Beverages, Experimenting with Vitamin C Content.* · FOSS: Food and Nutrition *The Sugar Test, The Fat Test, The Acid Test (vitamin C and acidity),* · Lab-Aids: Food Analysis: Kit No. 6 · Prentice Hall: Science Explorer: Cells and Heredity: *What's in Your Lunch?* · Prentice Hall: Science Explorer: Human Biology and Health: *Iron for Breakfast.* · Smithsonian/The National Academies National Science Resources Center: Science & Technology Concepts for Middle Schools: Human Body Systems*: Testing Foods for Sugar and Starch* · Avraham, R. The Encyclopedia of Health: The Digestive System · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Paramon, E. Invisible World: The Digestive System. Chelsea House Publishers · Parker, S. Readers Digest: How the Body Works · Silverstein, A., Silverstein, V., and Silverstein, R. Proteins · Stein, S. The Body Book. · Woodward, J. Our Food: Under the Microscope · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body · VanCleave, J. Food and Nutrition for Every Kid
Mathematics Connections	· Construct graphs of quantitative data.
Technology Connections	· Construct graphs in Microsoft Excel. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: Nutrition (sciLINKS NUMBER: HSTL680); *Vitamins* (sciLINKS NUMBER: HSTL685); Food Pyramids (sciLINKS NUMBER: HSTL690) · Sunburst: Multimedia: The Human Body: *The Athlete* · Windows on Science Laser Disc: Life Science Volume 2: You Are What You Eat*: Carbohydrates; Fats, Proteins, and Water; Vitamins and Minerals*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Inquiry Activity	· Students explore the effects of different treatments of foods, such as freezing, heating (cooking), drying, or leaving them out over night, on their acidity, or vitamin C, sugar, and fat contents.

Key Idea	· *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 can result in weight gain, weight loss, or a diseased state.* · *All living things must **release energy** from their **food**, using it to carry on their life processes. 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 with body weight, age, sex, activity level, and natural body efficiency.*
NYS MST Standards	· Performance Indicator 5.2: Describe the importance of major nutrients, vitamins, and minerals in maintaining health and promoting growth, and explain the need for constant input of energy for living organisms.
Performance Tasks	· Students keep a record of everything they eat for 3 to 7 days, calculate their calorie consumption per day, use graphs to compare their eating patterns with the recommended guidelines in the Food Guide Pyramid, and set goals to improve their eating habits. Students then create a three-day menu following the guidelines in the Food Guide Pyramid. · Students design a "perfect sandwich" that includes all the food groups and satisfies their calorie requirements for lunch as well as their food preferences. · Students conduct a longitudinal study of cafeteria lunches and the food groups they contain. Students use frequency plots and graphs to organize and present the data.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 5.2d-e Process Skills Based on Standard 4 · General Skills: 1-4, 8 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6b-e Scientific Communication · S7a-e

Resources	· AIMS: Fun with Foods: A Recipe for Math + Science. *Daily Food Guide, Cafeteria Critique* · Prentice Hall: Science Explorer: Human Biology and Health: *What's for Lunch?* · Avraham, R. The Encyclopedia of Health: The Digestive System · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Parker, S. Readers Digest: How the Body Works · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body · Paramon, E. Invisible World: The Digestive System. Chelsea House Publishers · VanCleave, J. Food and Nutrition for Every Kid
Mathematics Connections	· Construct graphs of quantitative data.
Technology Connections	· Construct graphs in Microsoft Excel. · Windows on Science Laser Disc: Life Science Volume 2: You Are What You Eat*: Nutrients and Calories*
Literacy Connections	· Write a report or recipe incorporating informational and narrative procedure writing.
Key Idea	· *The **digestive system** consists of organs that are responsible for the **mechanical** and **chemical breakdown** of food. This process results in molecules that can be absorbed and transported to cells.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.

Performance Tasks	· Students trace what happens with food from chewing in the mouth, to mechanical and chemical breakdown in the stomach, to absorption and distribution of nutrients in the intestines, to excretion. Students describe the structure and function of each of the organs that impacts upon digestion. · Students explore chemical digestion in the mouth by preparing four cups with 30 drops of starch solution and two cups with 30 drops of distilled water (control). Two drops of amylase are added to two of the cups with starch solution and the two cups with distilled water. After five minutes, three cups (one from each treatment) are tested for sugar using the Benedicts test and three cups are tested for starch using Lugol solution. Students explain their results. · Students model how intestinal villi increase the surface area for absorption in the small intestine by comparing the amount of string it takes to go around the outline of their hand with their fingers closed and then with them open. Students model the role of bile in the breakdown of fats in the small intestine by filling two small jars halfway with water. Students add few drops of oil to each jar. After adding 1/4 teaspoon of baking soda to one of the jars, students cover both jars and shake. Students compare and contrast the results for both jars.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2c Process Skills Based on Standard 4 · General Skills: 1-4, 8 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e

Resources	· Prentice Hall: Science Explorer: Human Biology and Health: *Food Flight* · Smithsonian/The National Academies National Science Resources Center: Science & Technology Concepts for Middle Schools: Human Body Systems: *Exploring Chemical Digestion in the Mouth* · Avraham, R. The Encyclopedia of Health: The Digestive System · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Llamas, A. Digestion and Reproduction · Parker, S. Readers Digest: How the Body Works · Silverstein, A. Silverstein, V., and Silverstein, R. The Digestive System* · Stein, S. The Body Book. · Paramon, E. Invisible World: The Digestive System. Chelsea House Publishers · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Construct a timeline for the stages of digestion. · Measure liquid volume.
Technology Connections	· Construct graphs in Microsoft Excel. · A.D.A.M. The Inside Story: *Digestive System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *The Digestive System* (sciLINKS NUMBER: HSTL537) · Sunburst: Multimedia: The Human Body: *Digest This* · Windows on Science Laser Disc: Life Science Volume 2: You Are What You Eat*: The Mouth; The Central Digestive System; Digesting Food; Absorption and the Large Intestine*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Circulation, Respiration, and Excretion	**Suggested Time: 2 weeks**
Key Idea	· *The **circulatory system** transports substances to and from cells. The circulatory system responds to a changing internal and external environment. The circulatory system includes the **heart, blood vessels,** and **lymph**.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.

Performance Tasks	· Students design and construct an exhibit that traces the path of a red blood cell through the body's circulatory system. The path should include two loops, one that leaves the heart, goes to the lungs and returns to the heart, and another that leaves the heart, goes to a specific part of the body and then returns to the heart. · Students measure their resting heart rate, then initiate a sustained activity for 2-5 minutes, and measure their heart rate again. Students then measure the time it takes for the heart rate to return to normal. Students calculate their resting and exercising heart rates, then graph and analyze their group results. · Students observe prepared slides of human blood stained with Wright's stain. Students sketch and describe each type blood cell they observe (A magnification of greater than 100X is necessary to observe platelets.). · Students listen to their own heartbeats using stethoscopes and describe what they hear. The stethoscope should be sterilized with rubbing alcohol between student use.
Inquiry Activity	· Students explore how different amounts and/or types of exercise affect the time it takes for the heart rate to return to its resting rate.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2f Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models: 2.1-2.3 Process Skills Based on Standard 4 · General Skills: 1-4, 8 · Living Environment Skills: 1-2, 8-9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e

Resources	· AIMS: From Head to Toe: *Ya Gotta Have Heart; How Does Your Heart Rate* · AIMS: Magnificent Microworld Adventures: *Blood* · Prentice Hall: Science Explorer: Human Biology and Health: *Travels of a Red Blood Cell; Heart Beat, Health Beat; Discover: What Kinds of Cells are in Blood?* · Smithsonian/The National Academies National Science Resources Center: Science & Technology Concepts for Middle Schools: Human Body Systems: *Exploring Factors that Affect Heart Rate* · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Llamas, A. Respiration and Circulation · Paramon, M. Invisible World: How Our Blood Circulates. Chelsea House Publishers · Parker, S. Readers Digest: How the Body Works · Silverstein, A. Silverstein, V., and Silverstein, R. The Circulatory System · Simon, S. The Heart: Our Circulatory System · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Estimate microscopic measurements · Find solutions for unknown quantities in linear equations.
Technology Connections	· Students use heart rate probes and computers to collect, organize, and graph data. · A.D.A.M. The Inside Story: *Cardiovascular System; Lymphatic System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *The Cardiovascular System* (sciLINKS NUMBER: HSTL555) · Windows on Science Laser Disc: Life Science Volume 2: The Heart of the Matter*: The Heart and Circulation; Heart Rates for Different Activities; Heart Structure; Heart Valves; Blood Vessels*
Literacy Connections	· Present reports five to seven minutes long for teachers and other students. · Organize what to say using notes or other memory aids (poster display). · Begin by stating a main idea or purpose, support it with details, examples, and reasons, and end by summarizing main points. · Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· *During **respiration**, cells use **oxygen** to release the **energy** stored in **food**. To do this, the respiratory system supplies **oxygen** and removes **carbon dioxide**; this is called **gas exchange**. Water is also removed.* · *The **respiratory system** includes the **nose, pharynx, trachea,** and **lungs**. Within the lungs, the **bronchi** branch into **bronchioles** until they reach the **alveoli**, the sacs where gas exchange occurs. The **diaphragm** is a muscle that facilitates **breathing**.*

NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Students gather, graph, and analyze information about their pulse rate, breathing rate, and lung capacity. By blowing once into a plastic bag and measuring its volume, students measure their lung capacity. After running in place for 2 minutes, students repeat the exercise, then analyze their results. · Students construct a model of the lungs by removing the bottom of a small plastic soda bottle. Students stretch both a small and large balloon by blowing them up several times. Students place the end of a small balloon through the neck and stretch the neck of the balloon backward over the mouth of the bottle. Students cut off the neck of the large balloon and stretch it over the bottom opening of the bottle. Students push up on the large balloon and observe what happens to the small balloon. Students then release the large balloon and observe what happens. Students compare the model with diaphragm and lung function in the body.
Inquiry Activity	· Students explore how different amounts and/or types of exercise pulse rate, breathing rate, and lung capacity.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 · Key Idea 2: S2.1 · Key Idea 3: S3.1 - S3.3 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2d Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models: 2.1-2.3 Process Skills Based on Standard 4 · General Skills: 1-4, 8 · Living Environment Skills: 1-2, 8-9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e

Resources	· *AIMS: From Head to Toe: Take a Breather; You Take My Breath* Away · Prentice Hall: Science Explorer: Human Biology and Health*: A Breath of Fresh Air* · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Llamas, A. Respiration and Circulation · Parker, S. Readers Digest: How the Body Works · Silverstein, A. Silverstein, V., and Silverstein, R. The Respiratory System · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Find solutions for unknown quantities in linear equations.
Technology Connections	· Construct a multimedia design journal incorporating photos and design information using PowerPoint. · A.D.A.M. The Inside Story: *Respiratory System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *The Respiratory System* (sciLINKS NUMBER: HSTL570) · Windows on Science Laser Disc: Life Science Volume 2: Breathe Easy*: Respiration; Amount of Air; Lungs; Mechanics of Breathing*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· *The **excretory system** functions in the disposal of dissolved **waste molecules**, the elimination of liquid and gaseous **wastes**, and the removal of excess **heat energy**.* · *The **kidneys** are major organs of excretion. Wastes and other materials are filtered from the blood by the kidneys and **urine** is produced. Urine collects in the **urinary bladder** and is excreted. Other organs of excretion are the **lungs**, **skin**, and **liver**.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Students research the structure and function of the kidneys, identifying the substances they remove from the body, as well as the substances they reclaim for use by the body. Students compare and contrast the functions of the kidneys to the functions of the other organs of excretion (lungs, skin, and liver). Students evaluate the role of surface area in the structure and function of the organs of excretion.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2e Process Skills Based on Standard 4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Parker, S. Readers Digest: How the Body Works · Silverstein, A. Silverstein, V., and Silverstein, R. The Excretory System · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Explore concept of surface area.
Technology Connections	· A.D.A.M. The Inside Story: *Urinary System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic*: The Urinary System* (sciLINKS NUMBER: HSTL590) · Windows on Science Laser Disc: Life Science Volume 2: The Heart of the Matter*: Ridding the Body of Waste*
Literacy Connections	· Write a report incorporating informational writing.
Disease and the Immune System	**Suggested Time: 2 weeks**
Key Idea	· ***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*** *with other organisms* ***(noninfectious/infectious diseases).*** · ***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.*

NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions. · Performance Indicator 5.2: Describe the importance of major nutrients, vitamins, and minerals in maintaining health and promoting growth, and explain the need for constant input of energy for living organisms.
Performance Tasks	· Students categorize a list of diseases as those that are infectious and noninfectious. Students discuss how poor diet, unhealthy personal habits and the use of drugs and other toxic substances can weaken the immune system. Students make correlations between good diet, rest, and other healthy personal habits, and the body's ability to resist diseases.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2j, 5.2f Standard 6: Interconnectedness: Common Themes · Key Idea 4: Equilibrium and Stability: 4.1 Process Skills Based on Standard 4 · General Skills: 4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Edelson, E. The Encyclopedia of Health: The Immune System. · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Collect, organize, and display data about disease rates.

Technology Connections	· Conduct Internet research. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *What Causes Disease?* (sciLINKS NUMBER: HSTL655); *Problems in the Digestive System* (sciLINKS NUMBER: HSTL585); *Nutritional Disorders* (sciLINKS NUMBER: HSTL695); *Urinary System Ailments* (sciLINKS NUMBER: HSTL595); *Cardiovascular Problems* (sciLINKS NUMBER: HSTL560); *Respiratory Disorders* (sciLINKS NUMBER: HSTL575); *Allergies* (sciLINKS NUMBER: HSTL670); *Cancer and HIV* (sciLINKS NUMBER: HSTL675) · Windows on Science Laser Disc: Life Science Volume 2: The Heart of the Matter*: Introducing the Immune System; Cardiovascular Disease*
Literacy Connections	· Conduct library research.
Key Idea	· *The **immune system** incorporates three lines of defense: **barriers** to keep pathogens out, the **inflammatory response**, and the **immune response**.* · *During the immune response, the immune system identifies **pathogens** (bacteria, viruses, fungi, protists) that invade the body in a variety of ways (through skin, contaminated food or water, animal bites, or the environment) and reacts to each type of pathogen with a specific **defense**.* · ***Specialized cells** (T-cells, B-cells) protect the body from infectious diseases. The chemicals they produce identify and destroy pathogens that enter and proliferate in the body.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Students research particular a particular infectious or noninfectious disease (i.e., diabetes, cancer, AIDS, lupus, childhood diseases, allergies, etc.) to determine the sequence of events that occur as the disease develops or pathogenic organisms invade or and/or attack the body. Students describe how the body responds and/or defends itself, including which lines of defense are employed and how they are manifested in the body.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2j Standard 6: Interconnectedness: Common Themes · Key Idea 4: Equilibrium and Stability: 4.1 Process Skills Based on Standard 4 · General Skills: 4 · Living Environment Skills: 9

NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Prentice Hall: Science Explorer: Human Biology and Health: *Stop the Invasion!*; Science Explorer: From Bacteria to Plants: *Be a Disease Detective.* · Smithsonian/The National Academies National Science Resources Center: Science & Technology Concepts for Middle Schools: Human Body Systems: *Anchor Activity—Diseases and Health Careers* · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Edelson, E. The Encyclopedia of Health: The Immune System. · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Collect, organize and display data about the incidence of various diseases.
Technology Connections	· Construct tables, charts, and graphs using Microsoft Excel and Inspiration · A.D.A.M. The Inside Story: *Immune System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Body Defenses* (sciLINKS NUMBER: HSTL665); *What Causes Disease?* (sciLINKS NUMBER: HSTL655); *Problems in the Digestive System* (sciLINKS NUMBER: HSTL585); *Nutritional Disorders* (sciLINKS NUMBER: HSTL695); *Urinary System Ailments* (sciLINKS NUMBER: HSTL595); *Cardiovascular Problems* (sciLINKS NUMBER: HSTL560); *Respiratory Disorders* (sciLINKS NUMBER: HSTL575); *Allergies* (sciLINKS NUMBER: HSTL670); *Cancer and HIV* (sciLINKS NUMBER: HSTL675) · Windows on Science Laser Disc: Life Science Volume 2: The Heart of the Matter*: Introducing the Immune System; Cardiovascular Disease*
Literacy Connections	· Present reports five to seven minutes long for teachers and other students. · Organize what to say using notes or other memory aids (poster display). · Begin by stating a main idea or purpose, support it with details, examples, and reasons, and end by summarizing main points. · Write a report incorporating informational writing.

The Nervous and Endocrine Systems	**Suggested Time: 2 weeks**
Key Idea	· *The **nervous** and **endocrine** systems interact to **control** and **coordinate** the **body's responses** to changes in the environment, as well as to regulate growth, development, and reproduction.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Students test their reaction time using a meter stick. While one student holds a meter stick with the zero end about 50 cm above a table, another student gets ready to catch the meter stick by positioning the top of the thumb and forefinger just at the zero position. The first student drops the stick without warning and the second student tries to catch the stick as soon as possible. Students record the distance in centimeters that the meter stick falls. Each student tests their reaction time five times then calculates their average reaction time. · Inquiry:
Inquiry Activity	· Students explore how variables such as exercise or time of day affects their reaction times.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2h Standard 6: Interconnectedness: Common Themes · Key Idea 4: Equilibrium and Stability: 4.1 Process Skills Based on Standard 4 · General Skills: 4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e

Resources	· Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Llamas, A. The Nervous System · Parker, S. Readers Digest: How the Body Works · Stein, S. The Body Book · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body · Prentice Hall: Science Explorer: Human Biology and Health: *Ready or Not* · Roca, N. and Serrano, M. Invisible World: The Nervous System. Chelsea House Publishers · Body
Mathematics Connections	· Measure metric length. · Collect, organize, and display data using appropriate tables and graphs.
Technology Connections	· Construct tables and graphs in Microsoft Excel. · A.D.A.M. The Inside Story: *Nervous System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *The Nervous System* (sciLINKS NUMBER: HSTL605) · Windows on Science Laser Disc: Life Science Volume 2: Don't Get Nervous*: Nervous System and Brain*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Key Idea	· *The **central nervous system** consists of the **brain** and **spinal cord**. The **peripheral nervous system** consists of the network of nerves that branch out from the central nervous system throughout the body. **Neurons** are cells that carry information through the nervous system in the form of nerve impulses.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Students study models or diagrams of the human brain and identify the parts and functions of the brain. · Students create a flow chart that explains how a particular nerve impulse is transmitted in the body from stimulus to response (receptor, sensory neurons, interneurons in spinal cord or brain, motor neuron, muscles).

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2h Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models: 2.1-2.3 Process Skills Based on Standard 4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Llamas, A. The Nervous System · Parker, S. Readers Digest: How the Body Works · Stein, S. The Body Book · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body · Roca, N. and Serrano, M. Invisible World: The Nervous System. Chelsea House Publishers · West, D. and Parker, S. Brain Surgery for Beginners
Mathematics Connections	· Use graphs to compare and contrast the relationship of brain size to body size in a variety of mammals, including humans.
Technology Connections	· Construct a bar graph in Microsoft Excel. · A.D.A.M. The Inside Story: *Nervous System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *The Nervous System* (sciLINKS NUMBER: HSTL605) · Sunburst: Multimedia: The Human Body: *Body Movements and Processes: Cause and Effect; Ouch; Parts of the Brain; Right or Left?* · Windows on Science Laser Disc: Life Science Volume 2: Don't Get Nervous*: Nervous System and Brain; Brain Parts and Functions*
Literacy Connections	· Label diagrams.

Key Idea	· *Each of the **senses – vision, hearing, balance, smell, taste,** and **touch** - gathers specific types of **information** about the environment and converts them to **impulses** to send to the **brain**. The **sensory organs** have specific structures that allow them to carry out their functions. Interactions among the senses, nerves, and brain, make possible the learning that enables humans to cope with changes in their environment.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Working in groups, students research and explain how each sensory organ (one per group) gathers and transmits information about environmental stimuli (such as bright lights, loud noises, heat, cold, strong odors, unusual tastes, etc.) to the brain. This should include experimental investigations of the particular sense, such as testing each group member's vision using vision charts. Students indicate how the brain processes the information and how the body typically responds to the information it receives. Students also describe how the body might or might not be able to compensate for the loss of the sense under investigation. Students prepare poster and oral presentations.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2h Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models: 2.1-2.3 Process Skills Based on Standard 4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e

Resources	· Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Hobart Alexander, S. Do you remember the color blue? And Other Questions Kid ask about Blindness · Llamas, A. The Nervous System · Parker, S. Readers Digest: How the Body Works · Ripoll, J. Invisible World: How Our Senses Work. Chelsea House Publishers National Geographic Society: Mensajeros al cerebro: Nuestros Fantásticos Sentidos · Stein, S. The Body Book · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body · West, D. and Parker, S. Brain Surgery for Beginners
Mathematics Connections	· Collect, organize, and display quantitative data related to sight, sound, smell, taste, and touch.
Technology Connections	· Construct tables and graphs in Microsoft Excel. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *The Senses* (sciLINKS NUMBER: HSTL610) · Sunburst: Multimedia: The Human Body: *Tricking the Eyes* · Windows on Science Laser Disc: Life Science Volume 2: Don't Get Nervous*: Eyes; Color Blindness; Blind Spot; Ears; Tongue and Nose; Touch; Using Your Other senses; Reflexes*
Literacy Connections	· Write a report incorporating informational and narrative procedure writing.
Key Idea	· ***Hormones** are chemicals from **glands** that affect other body parts. Hormones are involved in helping the body respond to danger and in regulating human growth, development, and reproduction.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions.
Performance Tasks	· Students research a particular hormone, describing where in the body the hormone is produced, how it is secreted, on what part(s) of the body it has an effect, and what its effects are. Students also indicate what feedback mechanisms control the production and secretion of the hormone.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2j Standard 6: Interconnectedness: Common Themes · Key Idea 4: Equilibrium and Stability: 4.1 Process Skills Based on Standard 4 · General Skills: 8 · Living Environment Skills: 9

NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Parker, S. Readers Digest: How the Body Works · Stein, S. The Body Book · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Interpret line graphs to illustrate hormonal feedback systems.
Technology Connections	· Conduct Internet research about hormonal feedback systems. · A.D.A.M. The Inside Story: *Endocrine System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Hormones* (sciLINKS NUMBER: HSTL620) · Sunburst: Multimedia: The Human Body: *Temperature and Hunger* · Windows on Science Laser Disc: Life Science Volume 2: Introducing the Human Body*: The Endocrine System*
Literacy Connections	· Write a report incorporating informational writing.
Reproduction and Development	**Suggested Time: 2 weeks**
Key Idea	· *The **male** and **female reproductive systems** are responsible for producing **sex cells** necessary for the production of **offspring**. The male sex cell is the **sperm**. The female sex cell is the **egg**. The 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.* · *Methods of sexual reproduction depend upon the species, but all involve the merging of sex cells (**fertilization**) to begin the development of a new individual. Fertilization and development in humans is **internal**.*
NYS MST Standards	· Performance Indicator 1.2: Explain the functioning of the major human organ systems and their interactions. · Performance Indicator 4.2: Explain the role of sperm and egg cells in sexual reproduction.

Performance Tasks	· Students label diagrams and describe the structures and functions of the human male and female reproductive systems. · Students observe prepared slides of human egg and sperm cells. Students estimate the size of each cell, then sketch and label each drawing and describe the differences between the cells.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 1.2I, 4.2 a, 4.2b Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models: 2.1-2.3 Process Skills Based on Standard 4 · Living Environment Skills: 1-2, 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Llamas, A. Digestion and Reproduction · Paramon, M. Invisible World: The Miracle of Life. Chelsea House Publishers Parker, S. Readers Digest: How the Body Works · Stein, S. The Body Book · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Estimate microscopic measurements.
Technology Connections	· Draw and label diagrams using Dabbler or Microsoft Word draw tools. · A.D.A.M. The Inside Story: *Reproductive System* · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Reproduction* (sciLINKS NUMBER: HSTL630) · Windows on Science Laser Disc: Life Science Volume 2: Life Goes On*: Sexual Reproduction*
Literacy Connections	· Prepare descriptions incorporating informational writing.

Key Idea	· ***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.* · *In humans, the fertilized egg grows into tissue, which develops into organs and organ systems before birth. Each human cell contains a copy of all the genes needed to produce a human being.*
NYS MST Standards	· Performance Indicator 4.3: Observe and describe developmental patterns in selected plants and animals.
Performance Tasks	· Students view the video The Miracle of Life and describe the developmental stages of a human embryo from fertilization to birth. · Students construct a timeline of fetal development indicating the times at which the major organs and systems begin functioning.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 4.3a, 4.3b Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Paramon, M. Invisible World: The Miracle of Life. Chelsea House Publishers · Parker, S. Readers Digest: How the Body Works · Stein, S. The Body Book · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Use scaled measurements to construct a timeline.

Technology Connections	· Prepare timeline labels and/or diagrams using Timeliner and Microsoft Word. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Before Birth* (sciLINKS NUMBER: HSTL635) · NOVA: The Miracle of Life: Video · Windows on Science Laser Disc: Life Science Volume 2: Life Goes On*: Sexual Reproduction*
Literacy Connections	· Develop descriptions incorporating informational writing.
Key Idea	· *Various body structures and functions change as an organism goes through its **life cycle**. Living things go through a life cycle involving both **reproductive** and **developmental** stages. **Development** follows an orderly sequence of events.*
NYS MST Standards	· Performance Indicator 4.3: Observe and describe developmental patterns in selected plants and animals.
Performance Tasks	· Students construct a timeline for human development following birth and describe the changes in human body structures and functions that occur over time, in particular, the changes that occur during infancy as well as during puberty in male and female adolescents. · Students compare and contrast the human life cycle (infancy, childhood, adolescence, and adulthood) with the life cycles of other organisms, such as animals or plants.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 4.3c, 4.3f Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · Living Environment Skills: 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e

Resources	· Prentice Hall: Science Explorer: Human Biologyt and Health: *Growing Up* Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Paramon, M. Invisible World: The Miracle of Life. Chelsea House Publishers · Parker, S. Readers Digest: How the Body Works · Stein, S. The Body Book · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Use scaled measurements to construct a timeline.
Technology Connections	· Prepare timeline labels and/or diagrams using Timeliner and Microsoft Word. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Growth and Development* (sciLINKS NUMBER: HSTL645)
Literacy Connections	· Develop descriptions incorporating informational writing.
Heredity	**Suggested Time: 5 weeks**
Key Idea	· *Every organism requires a set of **instructions** for specifying its traits. As organisms reproduce, these instructions are passed from one generation to the next.* · ***Hereditary information** is contained in **genes**. Genes are composed of a molecule known as **DNA** that makes up the **chromosomes** of **cells**.*
NYS MST Standards	· Performance Indicator 2.1: Describe sexual and asexual mechanisms for passing genetic materials from generation to generation.
Performance Tasks	· Students construct a model of DNA base pairs and use them to show how DNA is replicated.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 2.1a, 2.1b Standard 6: Interconnectedness: Common Themes · Key Idea 2: Models: 2.1-2.3 Process Skills Based on Standard 4 · General Skills: 4

NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Roca, N. and Serrano, M. Invisible World: Cells, Genes, and Chromosomes. Chelsea House Publishers · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Use metric measurements of length in real-world situations.
Technology Connections	· Construct a model using TABS. · Cyber ED Inc.: Exploring Heredity: A Multimedia CD-ROM · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *DNA* (sciLINKS NUMBER: HSTL130); Heredity (sciLINKS NUMBER: HSTL110) · Sunburst: Multimedia: The Human Body: *Cloning* · Windows on Science Laser Disc: Life Science Volume 2: Life Goes On*: Chromosomes and Genes*
Literacy Connections	· Write a summary of the design process incorporating informational and narrative procedure writing.
Key Idea	· *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. Each human cell contains many thousands of different genes. Some genes are **dominant** and some are **recessive**. Some traits are inherited by mechanisms other than dominance and recessiveness, such as **blending**.*
NYS MST Standards	· Performance Indicator 2.2: Describe simple mechanisms related to the inheritance of some physical traits in offspring.

Performance Tasks	· Students survey the class for a variety of traits, such as attached or free earlobes, hair on fingers, widow's peak, curly or straight hair, cleft chin, or ability to taste PTC. Students compile class results and determine how many students have the same combinations of traits. · Students survey the gene pool in their classroom for evidence of whorl, arch, or looped fingerprints. Students calculate the percentage occurrence of each type of fingerprint and establish a dominant and recessive expression for the group. Students can compare their class results with that of other classes to establish whether there were similar patterns.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 2.2a, 2.2b Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 4
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Prentice Hall: Science Explorer: Cells and Heredity: *Take a Class Survey* Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Paramon, M. Invisible World: The Miracle of Life. Chelsea House Publishers · Parker, S. Readers Digest: How the Body Works · Stein, S. The Body Book · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Collect, organize and display statistical data.

Technology Connections	· Use a spreadsheet to record, organize, and display statistical data and to calculate probabilities in Microsoft Excel. · Cyber ED Inc.: Exploring Heredity: Multimedia CD-ROM: · Cyber ED Inc.: Mendel's Principles of Heredity: Multimedia CD-ROM · National Science Teachers Association: sciLINKS Topic: *Heredity* (sciLINKS NUMBER: HSTL110); *Dominant and Recessive Traits* (sciLINKS NUMBER: HSTL11) *Genes and Traits* (sciLINKS NUMBER: HSTL135) · Sunburst: Multimedia: The Human Body: *Genetic Traits Family Tree* · Windows on Science Laser Disc: Life Science Volume 2: Life Goes On*: Chromosomes and Genes; Introducing Genetics; Traits*
Literacy Connections	· Prepare a summary of results incorporating informational and narrative procedural writing.
Key Idea	· *The **probability** of traits being **expressed** can be determined using models of genetic inheritance. Some models of prediction are **pedigree charts** and **Punnett squares**.*
NYS MST Standards	· Performance Indicator 2.2: Describe simple mechanisms related to the inheritance of some physical traits in offspring.
Performance Tasks	· Students select one of the traits surveyed above, such as attached or free earlobes, hair on fingers, etc., and survey their family back to their grandparents for the trait. Students construct a pedigree chart to show the patterns of inheritance in their family. · Students use 2 coins to model Mendel's crosses. Using masking tape and a marker, students label two coins with "T" (for tall) on one side and "t" (for short) on the other. Students toss the coins 20 times and record the letter combinations they obtain from each toss. Students indicate whether the combinations would result in a tall or a short plant. Students pool class data to determine overall ratios and repeat the experiment using different combinations of coins labeled TT, Tt, and tt. Students prepare Punnett squares for each of the crosses and explain their data based upon the predictions of the Punnett squares. · Students use colored tiles or other suitable objects (i.e. two different beans) and two bags to model genetic crosses. Each bag represents a parent; one bag should be designated male and one female. For each cross, each parent contributes one allele. Students model the cross between a homozygous dominant parent and a homozygous recessive parent by placing two blue tiles in one bag to represent the dominant alleles and two green tiles in the other bag for the recessive alleles. Students remove one tile (one allele) from each bag, record the result (genotype), and then return the tiles to their original bags. Students repeat this procedure nine more times for a total of ten trials. Students indicate whether the progeny would be blue or green (phenotype). Students also model the crosses between two heterozygous parents (each bag has one blue and one green tile), as well as between one heterozygous parent and a homozygous dominant (two blue tiles) or a homozygous recessive parent (two green tiles). Students prepare Punnett squares for each of the crosses and explain their data based upon the predictions of the Punnett squares.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 2.2c Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 4 · Living Environment Skills: 5
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Holt, Rinehart and Winston: Holt Science & Technology: Life Science: *Tracing Traits* · Prentice Hall: Science Explorer: Cells and Heredity: *Make the Right Call!; Try This Coin Crosses* · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Collect, organize and display statistical data.
Technology Connections	· Use a spreadsheet to record, organize, and display statistical data and to calculate probabilities in Microsoft Excel. · Construct pedigree chart using Inspiration. · Cyber ED Inc.: Exploring Heredity: Multimedia CD-ROM: · Cyber ED Inc.: Mendel's Principles of Heredity: Multimedia CD-ROM · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Heredity* (sciLINKS NUMBER: HSTL110) · Windows on Science Laser Disc: Life Science Volume 2: Life Goes On*: Introducing Genetics; Punnett Square*
Literacy Connections	· Prepare a summary of results incorporating informational and narrative procedural writing.

Key Idea	· *In **sexual reproduction**, typically half of the genes come from each parent. Sexually produced offspring are not **identical** to either parent.* · *A special type of **cell division** (**meiosis**) 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**.*
NYS MST Standards	· Performance Indicator 4.4: Observe and describe cell division at the microscopic level and its macroscopic effects.
Performance Tasks	· Students observe prepared slides of meiosis, identify each of the stages, then sketch and label their drawings. Students estimate the size of the cells and chromosomes. · Using a variety of materials, such as pasta, yarn, pipe cleaners, beads, etc., students construct a model of meiosis (beginning of meiosis, meiosis I, meiosis II, end of meiosis) that incorporates at least six copied pairs of chromosomes.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 4.4c Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 1, 7 · Living Environment Skills: 1-2, 9
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e

Resources	· Prentice Hall: Science Explorer: Cells and Heredity: *A Model of Meiosis* · Dowling Bruun, R. and Bruun, B. The Human Body: Your Body and How it Works. · Dorling Kindersley: Atlas Visual del Cuerpo Humano. · Dorling Kindersley: Eyewitness Visual Dictionaries: The Visual Dictionary of the Human Body · Paramon, M. Invisible World: The Miracle of Life. Chelsea House Publishers · Roca, N. and Serrano, M. Invisible World: Cells, Genes, and Chromosomes. Chelsea House Publishers · Stein, S. The Body Book. · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Estimate microscopic measurements.
Technology Connections	· Create drawings of the phases of meiosis using Dabbler or Microsoft Word draw tools. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Cell Division* (sciLINKS NUMBER: HSTL120) · Windows on Science Laser Disc: Life Science Volume 2: Life Goes On*: Sexual Reproduction*
Literacy Connections	· Write a lab report incorporating informational and narrative procedure writing.
Evolution and Extinction	**Suggested Time: 3 weeks**
Key Idea	· ***Evolution*** *is the change in a species over time. Millions of diverse species are alive today. Generally this diversity of species developed through gradual processes of change occurring over many* ***generations****.*
NYS MST Standards	· Performance Indicator 3.1: Describe sources of variation in organisms and their structures and relate the variations to survival.
Performance Tasks	· Students trace the evolution of a particular animal alive today, such as the horse or whale. Students construct a timeline of the animal's evolution and describe the major adaptations that occurred.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 4

NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Gamlin, L. Eyewitness Science: Evolution · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Evolution · The Nature Company Discoveries Library: The Human Body · Time Life: Understanding Science & Nature: Human Body · Time Life: Enciclopedia Ilustrada de Sciencia y Naturaleza: El Cuerpo Humano. · Time Life: Student Library: Human Body
Mathematics Connections	· Use scaled measurements to construct a timeline.
Technology Connections	· Prepare timeline using TimeLiner. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *The Fossil Record* (sciLINKS NUMBER: HSTL160; *The Galapagos Islands* (sciLINKS NUMBER: HSTL165; *Human Evolution* (sciLINKS NUMBER: HSTL195)
Literacy Connections	· Write a summary incorporating informational writing.
Key Idea	· *The processes of **sexual reproduction** and **mutation** have given rise to a variety of traits within a species.*
NYS MST Standards	· Performance Indicator 3.1: Describe sources of variation in organisms and their structures and relate the variations to survival.
Performance Tasks	· Students explore variation in organisms by observing a sample of 10 sunflower seeds. Student use metric ruler to measure the size of each seed and a hand lens to observe other traits such as shape, color, or number of stripes. Students explore a variety of ways to group the seeds according to the similarities and differences in their traits.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 3.1a Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 4

NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Prentice Hall: Science Explorer: Cells and Heredity*: Discover: How do Living Things Vary?* · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Evolution
Mathematics Connections	· Make and use metric measurements of length. · Make and use Venn diagrams to illustrate sets and subsets.
Technology Connections	· Construct Venn diagrams or flow charts to show grouping according to traits using Inspiration. · Windows on Science Laser Disc: Life Science Volume 2: Life Goes On*: Mutations*
Literacy Connections	· Prepare descriptions incorporating informational writing.
Key Idea	· ***Species*** *acquire many of their unique characteristics through* ***biological adaptation****, which involves the selection of naturally occurring* ***variations*** *in populations. Biological adaptations are differences in structures, behaviors, or physiology that enhance* ***survival*** *and* ***reproductive success*** *in a particular environment.*
NYS MST Standards	· Performance Indicator 3.1: Describe sources of variation in organisms and their structures and relate the variations to survival.
Performance Tasks	· Students explore adaptations in bird beaks by scattering a small amount of birdseed on a paper plate and 20 raisins to represent insects. Students see how many seeds they can pick up using a variety of different "beaks" (tweezers, hair clips, hairpins). Students repeat the exercise to see how many "insects" they can pick up in 10 seconds with each beak. Students determine which beak worked best for seeds and which worked best for insects.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 3.1a Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 4

NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Prentice Hall: Science Explorer: Cells and Heredity: *Try This: Bird Beak Adaptations; Similarities and Differences: Building Inquiry Skills: Observing* · Gamlin, L. Eyewitness Science: Evolution · Time Life. Understanding Science & Nature: Evolution of Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: La Evolución de la Vida · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Evolution
Mathematics Connections	· Collect, organize, and display data using appropriate tables and graphs.
Technology Connections	· Construct tables and graphs of data in Microsoft Excel. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Species and Adaptation* (sciLINKS NUMBER: HSTL115) ·
Literacy Connections	· Write a lab report incorporating narrative procedure and informational writing. · Construct a graphic organizer summarizing species variation.
Key Idea	· *The **survival** of a **species** depends on the ability of a living organism to produce **offspring.** Changes in environmental conditions can affect the survival of individual organisms with a particular **trai**t. Small differences between parents and offspring can accumulate in successive **generations** so that the **descendants** are very different from their ancestors. Individual organisms born with certain traits are more likely to survive and have offspring than individuals born without those traits.*
NYS MST Standards	· Performance Indicator 3.1: Describe sources of variation in organisms and their structures and relate the variations to survival.
Performance Tasks	· Students explore variation in related species of animals, such as birds, by observing similarities and differences among different species of a particular group (genus or family), such as ducks, warblers, herons, or woodpeckers. Students list all the similarities and differences they observe. Based on the descriptions of habitat and food requirements in the field guide, students infer how each species' characteristics and habitat requirements enable it to survive as well as minimize competition.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 3.1b Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 4
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Bull, J. and Farrand, J. National Audobon Society Field Guide to North American Birds: Eastern Region · Gamlin, L. Eyewitness Science: Evolution · Harrison, C. and Greensmith, A. Eyewitness Handbooks: Birds of the World · Peterson, R. T. Peterson First Guides: Birds · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Evolution · Time Life. Understanding Science & Nature: Evolution of Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: La Evolución de la Vida
Mathematics Connections	· Collect, organize, and display species data using appropriate tables and graphs.
Technology Connections	· Construct tables and graphs of data in Microsoft Excel. · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Species and Adaptation* (sciLINKS NUMBER: HSTL155)
Literacy Connections	· Prepare a report incorporating informational writing.
Key Idea	· *Human activities such as **selective breeding** and advances in **genetic engineering** may affect the variation of a species.*
NYS MST Standards	· Performance Indicator 3.1: Describe sources of variation in organisms and their structures and relate the variations to survival.
Performance Tasks	· Students study breeds of domestic animal, such as dogs, cats, cattle, chickens, etc., and describe the types of variations (color, size, and other physical features) that occur among the breeds. Students describe how breeders develop and maintain new breeds via a poster presentation. · Students study cases of genetic engineering in mammals and/or plants. Students prepare poster presentations summarizing their case.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 3.1c Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 4
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Gamlin, L. Eyewitness Science: Evolution · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Evolution · Time Life. Understanding Science & Nature: Evolution of Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: La Evolución de la Vida
Mathematics Connections	· Construct pedigree charts indicating the relationships among breeds of a particular species.
Technology Connections	· Conduct internet research. · Create pedigree charts using Inspiration · National Science Teachers Association: www.scilinks.org: sciLINKS Topic: *Genetic Engineering* (sciLINKS NUMBER: HSTL140) · Sunburst: Multimedia: The Human Body: *Cloning*
Literacy Connections	· Present reports five to seven minutes long for teachers and other students. · Organize what to say using notes or other memory aids (poster display). · Begin by stating a main idea or purpose, support it with details, examples, and reasons, and end by summarizing main points. · Write a report incorporating informational writing.
Key Idea	· *In all environments, organisms with similar needs may compete with one another for resources. Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to permit survival. Extinction of species is common.*
NYS MST Standards	· Performance Indicator 3.2: Describe factors responsible for competition within species and the significance of that competition.
Performance Tasks	· Students research a species that became extinct within the last 200 years, indicating where it lived, what food it required, how it interacted with other organisms, when it became extinct, and what caused its extinction. Students summarize the information they gather by writing a news report.

NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 3.2a, 3.2b Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 4
NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Gamlin, L. Eyewitness Science: Evolution · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Evolution · Time Life. Understanding Science & Nature: Evolution of Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: La Evolución de la Vida
Mathematics Connections	· Create an extinction timeline for each extinct species indicating when they evolved and when they became extinct.
Technology Connections	· Conduct Internet research. · Create a timeline using Timeliner · Energy & Animals: Laser Disc
Literacy Connections	· Students write a brief news report incorporating informational writing.
Key Idea	· *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.*
NYS MST Standards	· Performance Indicator 3.2: Describe factors responsible for competition within species and the significance of that competition.
Performance Tasks	· Students research how antibiotic resistance has developed in pathogenic bacteria since antibiotics have been introduced.
NYS MST Standards	Standard 1: Analysis, Inquiry, and Design: Scientific Inquiry · Key Idea 1: S1.1 - S1.4 Standard 2: Information Systems · Key Idea 1: 1.3 Standard 4: The Living Environment · Major Understanding: 3.2d Standard 6: Interconnectedness: Common Themes · Key Idea 5: Patterns of Change: 5.2 Process Skills Based on Standard 4 · General Skills: 4

NYC Performance Standards	Life Sciences Concepts · S2a Scientific Connections and Applications · S4a Scientific Thinking · S5a-f Scientific Tools and Technologies · S6a-e Scientific Communication · S7a-e
Resources	· Gamlin, L. Eyewitness Science: Evolution · Silverstein, A., Silverstein, V., Silverstein Nunn, L. Evolution · Time Life. Understanding Science & Nature: Evolution of Life; Enciclopedia Ilustrada de Sciencia y Naturaleza: La Evolución de la Vida
Mathematics Connections	· Use numbers to describe generation rates of bacteria.
Technology Connections	· Conduct Internet research. · Prepare a PowerPoint slideshow to illustrate evolutionary change in a species.
Literacy Connections	· Prepare a summary incorporating informational writing.

Appendix A: Materials List Per Class

Equipment	
Description	**Quantity**
Compound Microscopes	16
Triple-Beam Balances	10
Hot Plates	10
Aquarium Setup (Tank, Pump, Tubing, Gravel)	2
Calculators	10
Goggles	Class Set
Stopwatch	1
Magnifying Glasses, 3x, 6x	16
Meter Sticks	10
Measuring Tapes	16
Lamps with Reflector Shield	10
Alcohol Lamps	16
Thermometers, Metal Back –40°C—110°C	30
Metric Rulers, 30cm	10
Scissors	10
Forceps, Fine Tip, 115 mm	10
Compass with Pencil	10
Protractor, Plastic	10
Nonconsumable Materials	
Beaker, Pyrex, Low form, 250 mL	10
Beaker, Pyrex, Low form, 400 mL	10
Beaker, Pyrex, Low form, 600 mL	10
Measuring Cup, Plastic, 8 ounce	10
Graduated Cylinder, 10 x 0.2 mL	10
Graduated Cylinder, 10 mL	10
Graduated Cylinder, 100 mL	10
Plastic Droppers	100
Magnet, Bar with Marked Poles, 3”	10
Funnel, Plastic, 3.25”	10
Petri Dish, Polystyrene, 100 x 15 mm, Packages of 20	2
Slides, Glass, Box of 72	4
Coverslips, Plastic, Box of 100	2
Stirring Rods, Polypropylene	10
Test Tubes, Pyrex, 13 x 100mm, 9 mL	100
Test Tubes, Pyrex, 18 x 150mm, 27 mL	100
Test Tube Rack, Holds (6) 21 mm Tubes, with (6) Drying Pins	10
Test Tube Holders	20
Kitchen Gloves, Plastic, Washable	Class Set
Tree Cross Sections, 3-1/2—4-1/2” Diameter	10
Slide, mm Grid	16
Slide, Plant Cell, Young Stem	8
Slide, Animal Cell, *Amphiuma* liver	8
Slide, Allium Root Tip Mitosis, all Stages	5 (8)
Slide, Animal Mitosis, Fish Blastodisc	5 (8)

Appendix A: Materials List Per Class

Nonconsumable Materials (continued)	
Description	**Quantity**
Slide, Human Blood Smear	16
Slide, Human Ovary	8
Slide, Human Sperm Smear	8
Slide, Ovary cs., Mammal	8
Slide, Rat Sperm Smear	8
Slide, Typical bacteria, Separate Smears	8
Assorted Objects (Rocks, Buttons, Hardware, or Seashells)	100
Planting Trays	10
Baby Food Jars, with Lids	10
Assorted Seashells	50
Skeletal Models, Complete, Articulated, Tabletop, 46 cm	8
Stethoscope	10
Assorted Colored Tiles or Beans (Two Colors)	20
Sunflower Seeds	100
Consumable Materials	
Description	**Quantity**
Alcohol, isopropyl (rubbing) 500 ml	1
Aluminum Foil, roll 12" x 25 ft	1
Bag, Plastic zip lip, 6" x 8" (1 qt.)	30
Baking Soda, 455 g	1
Balloons, round, 9", pkg. of 35	1
Chlorella, live culture	1
Elodea, live, 12 sprigs	2
Cone, Pine	8
Cup, paper, 200 ml	50
Cup, clear, plastic, 300 ml.	100
Disinfectant, spray, 15 oz.	1
Fern Plant	8
Food coloring, Assorted Colors, 4-pack	8
Glue	8
Leaves, set	8
Lens paper, pkg. of 50, 4" x 6"	1
Marking pencils, black wax	20
Methylene blue chloride biostain, 1% aq. Solution, 100 ml.	8
Moss clump, live	1
Mushrooms, variety	20
Nutrient agar plates, pkg. Of 15	1
Paper clips, box of 100	1
Paper towel, Roll	4
Paper, Construction, pkg/50	4
Paramecium caudatum, live culture	1
Peat moss	1
Phenol red sodium salt, 100 ml. (indicator, pH 6.8 – 8.2)	1
Plant, common house	8
Plates, paper 9", pkg. Of 50	1

Appendix A: Materials List Per Class

Consumable Materials	
Description	**Quantity**
Pond culture, mixed, live	1
Rubber bands, pkg.	3
Salt, non-idonized, 737 g	3
Sand, fine, 1 kg	2
Seeds, (corn, peas, barley, bean, radish, grass) 1 lb each	1
Spoons, plastic, pkg. Of 24	2
Straws, plastic (wrapped) pkg. Of 50	2
String, cotton, 200 ft	2
Sugar, granulated, 454 g	1
Tape, masking, 3/4 x 60 yd	22
Tape, transparent, 3/4 x 27 ft	2
Toothpicks, flat, box of 750	2
Yeast, pkg.	10
Amylase,	1
Biuret Reagent, 500mL.	1
Bromothymol Blue Ind,Stln., 100mL	1
Clay, Modeling (cream) lb. (water resistant)	1
Cotton balls, pkg/300	1
Daphnia (30), live	2
Filter paper, 15 cm Diam,pkg/100	3
Glucose (d-glucose) Anhydrous, 500 g, Science Grade Granular	1
Glucose test strip pkg/40	1
Glue, School White, 4 oz.	8
Hydrochloric Acid, 1 M, 500mL Solution	1
Iodine (starch Test) Reagent Solution, 100 ml	1
Test Paper, Blue Vial/100	1
Oil, Vegetable 16 oz.	3
Petroleum jelly, 4 oz.	1
Rubber bands assorted	3
Stirrer sticks, pkg/50	3
Sugar cubes, 1lb (pkg/96)	2
Swab Applicators, Cotton, pkg/72	1
Vinegar, 500 ml	1
Air Freshener	1
Bird seed	1
Bromothymol Blue Sodium Salt, indicator powder, 1 g	1
Cards, Index, blank, 3” x 5”, pkg/100	1
Chalk, White, pkg/12	1
Cornstarch 500g	1
Filters, Coffee, Box/100	1
Gelatin, Box of 4 packets	2
Iodine (Starch Test) Reagent	1
Pipe Cleaners, Assorted colors, 6” pkg/110	1
Gelatin, Box of 4 packets	2
Iodine (Starch Test) Reagent	1

Appendix A: Materials List Per Class

Consumable Materials	
Description	**Quantity**
Pipe Cleaners, Assorted colors, 6" pkg/110	1
Cactus Potted	8
Charcoal Pieces, 16 oz.	1
Detergent, Household, 14.7 oz.	1
Gravel Aquarium 1 kg	2
Guppies	10
Juice, Lemon, 15 oz.	1
Marker Black, Water soluble	8
Paper, Oaktag, Sheet	15
Perfume, Bottle	1
pH Test Paper, Wide Range 100/vial, 1/4 x 2	10
Plastic Wrap, Roll, 50 sq. ft.	3
Pond Snails	20
Pond Culture Mixed	11
Mushroom Farm Kit	4
Toothpicks, Wooden, Box	1

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Appendix C: Classroom Library Titles

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Appendix D: New York City Performance Standards in Science

Overview of the Middle Level Performance Standards (pp. 66-67)

S1. Physical Sciences Concepts

S1a: Demonstrates understanding of properties and changes of properties in matter

S1b: Demonstrates understanding of position and motion and forces.

S1c: Demonstrates understanding of transfer of energy and the nature of a chemical reaction.

S2. Life Sciences Concepts

S2a: Demonstrates understanding of structure and function in living systems.

S2b: Demonstrates understanding of reproduction and heredity and the role of genes and environment on trait expression.

S2c: Demonstrates understanding of regulation and behavior and response to environmental stimuli.

S2d: Demonstrates understanding of populations and ecosystems and the effects of resources and energy transfer on populations.

S2e: Demonstrates understanding of evolution, diversity, and adaptation of organisms.

S3. Earth and Space Sciences Concepts

S3a: Demonstrates understanding of structure of the Earth System.

S3b: Demonstrates understanding of Earth's history.

S3c: Demonstrates understanding of Earth in the Solar System.

S3d: Demonstrates understanding of natural resource management.

S4. Scientific Connections and Applications

S4a: Demonstrates understanding of big ideas and unifying concepts.

S4b: Demonstrates understanding of the designed world.

S4c: Demonstrates understanding of health.

S4d: Demonstrates understanding of impact of technology.

S4e: Demonstrates understanding of impact of science.

Appendix D: New York City Performance Standards in Science (continued)

Overview of the Middle Level Performance Standards

S5. Scientific Thinking

S5a: Frames questions to distinguish cause and effect; and identifies or controls variables.
S5b: Uses concepts from Science Standards 1 to 4 to explain a variety of observations and phenomena.
S5c: Use evidence from reliable sources to develop descriptions, explanations, and models.
S5d: Proposes, recognizes, analyzes, considers, and critiques alternative explanations; and distinguishes between fact and opinion.
S5e: Identifies problems; proposes and implements solutions; and evaluates the accuracy, design, and outcomes of investigations.
S5f: Works individually and in teams to collect and share information and ideas.

S6. Scientific Tools and Technologies

S6a: Uses technology and tools to observe and measure objects, organisms, and phenomena, directly, indirectly, and remotely.
S6b: Records and stores data using a variety of formats.

S6c: Collects and analyzes data using concepts and techniques in Mathematics Standard 4.
S6d: Acquires information from multiple sources.

S6e: Recognizes sources of bias in data.

S7. Scientific Communication

S7a: Represents data and results in multiple ways.

S7b: Argues from evidence.

S7c: Critiques published materials.

S7d: Explains a scientific concept or procedure to other students.

S7e: Communicates in a form suited to the purpose and the audience.

S8. Scientific Investigation

S8a: Demonstrates scientific competence by completing a controlled experiment.

S8b: Demonstrates scientific competence by completing fieldwork.

S8c: Demonstrates scientific competence by completing a design.

S8d: Demonstrates scientific competence by completing secondary research.

Appendix E
NYS Intermediate Level Science Core Curriculum