

BERKELEY HEIGHTS PUBLIC SCHOOLS  
BERKELEY HEIGHTS, NEW JERSEY

**COLUMBIA MIDDLE SCHOOL  
SCIENCE DEPARTMENT**

**LIFE SCIENCE**

**Curriculum Guide**

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This curriculum may be modified through varying techniques,  
strategies, and materials, as per an individual student's  
Individualized Educational Plan (IEP).

Approved by the Berkeley Heights Board of Education  
at the regular meeting held on 9/11/08.

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## **VISION STATEMENT**

Life Science is intended for students in grade seven. The course is designed to prepare students to think in a logical, analytical, and creative way when approaching biological issues. The Laboratory experience provides opportunities for students to develop their process and inquiry skills, as well as meeting individual needs, learning styles, ability levels, and interests. The primary objective of the program is to help students develop an open mind, a questioning attitude, and appropriate personal values regarding scientific ideas with related laboratory experiences to reinforce science concepts and processes. A secondary objective is to improve their critical-thinking skills in order for them to better understand the complexities of the changing world around them. Students will expand their understanding of scientific principles and major concepts of life science, the impact of humans on the biosphere, the processes of scientific inquiry, and the historical development of biological concepts in preparation for high school biology.

## **MISSION STATEMENT**

The seventh grade science program allows the students to experience self-discovery and exploration. Students become active participants in the learning process through a series of science investigations. Curriculum topics include:

- Proper laboratory techniques including safety
- Living matter (characteristics that distinguish organisms from non-living matter)
- Concept of the cell
- Natural selection and heredity
- Classification and kingdoms
- Ecology and biodiversity

Students enrolled in the Life Science course will be expected to complete lab exercises that emphasize critical-thinking and group interaction. These exercises include:

- Using the microscope
- Working with live and preserved specimens
- Reading instruments
- Using the International System of Measurement
- Interpretation of data
- Making inferences
- Forming conclusions
- Researching on the World Wide Web

Students will be able to communicate knowledge through note taking, class participation, homework, lab reports, library research, and oral presentations. Further, to ensure application and transfer of learning, science is intertwined with other disciplines whenever possible. National and state standards have been integrated throughout the curriculum.

## **COURSE PROFICIENCIES**

### **COURSE OBJECTIVES**

1. To encourage students to think critically using the scientific method of problem-solving. (5.1/B1-4)
2. To instill in students flexibility in thinking that allows them to have an open mind and the ability to transfer the processes of science to other areas of study.
3. To provide opportunities for students to work independently, in small groups, through cooperative learning strategies, or as part of the whole class. (5.1/A3)
4. To encourage students to explore and evaluate routes to their individual learning styles. (5.1/B1)
5. To give students ample opportunity to identify and correctly use scientific instruments, apparatus, and technologies in life science (such as the microscope) and demonstrate the procedures of biology (preparation of wet mount slides, use of laboratory materials, and protective equipment) in a safe, prescribed manner. (5.1/C1; 5.4/B1)
6. To help students recognize the balance that exists in nature between living and non-living things.
7. To guide students in developing an appreciation for science and the future of science in our society. (5.2/A1)
8. To provide opportunities for students to use their imaginations to expand their learning and stimulate their curiosity about the world around them. (5.2/A2,3)
9. To encourage students to understand and use the metric system when taking measurements. (5.3/B1)
10. To strengthen study skills in science and then apply them to other areas.
11. To understand the structure and function of living things from the evolution of the cell to the complex hierarchy of the organization in multi-cellular organisms. (5.5/A2, B1-3)
12. To challenge students to grow intellectually by performing laboratory experiments that lead to a better understanding of life around them. (5.3/D1-4)
13. To develop an appreciation for the complexity of living systems. (5/5B2.3)
14. To advocate the development of organizational skills through practice with laboratory experiments and independent research. (5.4/C1)

## **STUDENT PROFICIENCIES**

The Life Science student will be able to:

1. Demonstrate knowledge of major biological concepts and processes. (5.1/A1-4)
2. Utilize appropriate skills for scientific inquiry and problem solving. (5.1/B1-4)
3. Identify systems of interacting components and understand that the output of one component can become the input of other components in the system. (5.1/A2-4; 5.5/A1-2)
4. Evaluate the strengths and weaknesses of arguments, claims, and pertinent data (e.g., recognize the differences between opinion and fact.) (5.1/A1)
5. Compare the advantages and disadvantages of alternative solutions to practical problems. (5.4/B1)
6. Recognize that scientific theories emerge over time, depend on the contributions of many people from many different cultures, and reflect the social and political climate of their time. (5.2/B1-2)
7. Describe how technology provides for the expansion of scientific data and the ability of scientists to make accurate measurements and observations. (5.4/A1, C1)
8. Integrate mathematics as a tool for problem-solving by depicting mathematical relationships among variables using graphs, tables, and charts. (5.3/D1-4)
9. Identify the structure and describe the function of cells. (5.5/A1,2)
10. Demonstrate an understanding of how organisms are interacting systems of cells, tissues, and organs. (5.1/B1-3)
11. List the characteristics shared by members of a kingdom of organisms and categorize living organisms based on these characteristics. (5.5/B1-3, C1)
12. Evaluate the interrelationships among organisms in an ecosystem. (5.10/A1, B1)
13. Recognize how the recombination of genetic material provides diversity in the inherited characteristics of offspring. (5.5/C1)
14. Describe the relationship between environmental conditions and their effect on the evolution of a species. (5.5/B2)
15. Summarize the Theory of Natural Selection as it relates to the survival of individuals with beneficial traits. (5.5/B3)

**STUDENT PROFICIENCIES** (continued)

16. Predict how natural systems could be affected by human activities. (5.10/A1)
17. Evaluate the possible long-term effects of human actions on the ecosystems. (5.10/B1)

## **METHODS OF EVALUATION**

Students will demonstrate skills and understanding through:

1. Homework.
2. Oral presentations/reports.
3. Tests.
4. Quizzes.
5. Demonstrations/activities.
6. Lab reports.
7. Final exam.

**SCOPE AND SEQUENCE**  
**COURSE OUTLINE/STUDENT OBJECTIVES**

The student will be able to:

NJ Core Curriculum Standards/ Grade	Strands & Indicators	Course Outline/Student Objectives
5.1/7  5.3/7  5.5/7 5.10/7	A1,2,3,4 B1,2,3,4 C1,2 A1 B1,2,3,4 C1 B1 B1	I. Tools Of Science A. Science Skills 1. Identify the difference between quantitative and qualitative observations 2. Define inferring, predicting, classifying, and making models 3. Define life science 4. Analyze jobs that use these skills B. Safety Rules 1. Recognize the need for and apply general safety procedures in the science laboratory 2. Recognize and properly handle laboratory equipment C. Scientific Measurement 1. Identify the (SI – International System of Measurement) units of distance, volume, mass, and temperature 2. Use the SI system to make measurements of length, mass, volume, and temperature D. Scientific Method 1. List the processes used to solve a problem scientifically 2. Analyze problem-solving through controlled experimentation 3. Compare and contrast a hypothesis and a theory 4. Make predictions based on a hypothesis 5. Design a procedure to test a hypothesis
5.5/7 5.10/7	B1 B1	II. Classification Of Living Things A. Classification Schemes 1. Model the classification hierarchy and explain the basis for classification 2. Explain why scientific names are used for organisms and give an example of “ <i>Genus species</i> ” 3. Use a dichotomous key (classification key) to identify an organism 4. Construct a branching evolutionary diagram for mammals B. Living Things and the Environment 1. Discuss limiting factors and their effect on the environment

		<p>II. Classification Of Living Things (continued)</p> <p>C. Domains and Kingdoms</p> <ol style="list-style-type: none"> <li>1. Define the three domains and the four kingdoms</li> <li>2. Give examples of each</li> </ol>
<p>5.2/7</p> <p>5.4/7</p> <p>5.5/7</p>	<p>A1,2,3</p> <p>B1,2</p> <p>A1</p> <p>B1</p> <p>A1,2</p> <p>B1,2</p>	<p>III. Studying Living Things</p> <p>A. Cells</p> <ol style="list-style-type: none"> <li>1. Explain how Hooke prepared the way for the cell theory</li> <li>2. Identify the contributions of Schleiden, Schwann, and Virchow to the development of the cell theory</li> <li>3. Summarize the three parts of the cell theory</li> <li>4. Compare and contrast prokaryotic and eukaryotic cells</li> <li>5. Evaluate the importance of the cell theory</li> <li>6. Identify the structures within a cell and summarize the function of each organelle</li> <li>7. Compare and contrast plant and animal cells</li> <li>8. Predict what will happen when one organelle is removed or modified</li> <li>9. Construct a hierarchy of life from single cell to ecosystem and give examples at each level</li> <li>10. Describe how the behavior of the whole organism or the whole cell may be different from the behavior of the systems, tissues, or organelles</li> </ol> <p>B. Tools of Life Scientist</p> <ol style="list-style-type: none"> <li>1. Identify the basic parts of a compound microscope and explain their function</li> <li>2. Demonstrate the proper use of a compound microscope</li> <li>3. Recognize the differences between a compound light microscope and the electron microscope</li> <li>4. Identify the different types of microscopes and their characteristics</li> <li>5. Describe and draw the image you see under the light microscope</li> </ol> <p>C. Cell Function</p> <ol style="list-style-type: none"> <li>1. Explain why cells need a membrane</li> <li>2. Describe how materials move in and out of cells</li> <li>3. Compare passive and active transport</li> <li>4. Explain the function of a selectively permeable membrane</li> <li>5. Describe what happens to cells placed in pure water and salt water</li> <li>6. Clarify the relationship between fermentation and cellular respiration</li> <li>7. Describe the process and purpose of photosynthesis</li> <li>8. Compare and contrast photosynthesis and respiration</li> </ol>

		<p>III. Studying Living Things (continued)</p> <ol style="list-style-type: none"> <li>9. Evaluate the importance of photosynthesis in energy transfer</li> <li>10. Identify the contribution of plants to the health of our planet</li> </ol> <p>D. The Cell Cycle</p> <ol style="list-style-type: none"> <li>1. Explain the term “cell cycle”</li> <li>2. Diagram a eukaryotic chromosome that has duplicated and identify the parts</li> <li>3. Define the term mitosis and describe the process of cell division</li> <li>4. Recognize the phases of mitosis and identify important structures visible during each phase</li> <li>5. Relate mitosis and asexual reproduction</li> <li>6. Compare cytokinesis in animal and plant cells</li> <li>7. Predict what would happen if cytokinesis occurred without mitosis or if mitosis occurred without cytokinesis</li> </ol>
<p>5.2/7 5.3/7 5.4/7 5.5/7</p>	<p>B2 A1 D1 A1 B1 C1 A2 B1,2,3 C1</p>	<p>IV. Change: Natural Selection And Heredity</p> <p>A. Genetics</p> <ol style="list-style-type: none"> <li>1. Describe the work of Gregor Mendel</li> <li>2. Outline the physical process of fertilization in flowers and explain how Mendel controlled their reproduction</li> <li>3. Define phenotype and genotype</li> <li>4. Explain how genes and alleles are related to genotypes and phenotypes</li> <li>5. Predict the outcome of certain genetic combinations using a diagram (Punnett square)</li> <li>6. Explain how probability is related to heredity</li> <li>7. Compare complete and incomplete dominance</li> <li>8. Cite evidence that one gene can influence more than one trait</li> <li>9. Explain how eye color inheritance is different from simple (Mendelian) inheritance in pea plants</li> <li>10. Summarize the chromosome theory of inheritance</li> </ol> <p>B. Meiosis</p> <ol style="list-style-type: none"> <li>1. Compare and contrast mitosis and meiosis</li> <li>2. Show how meiosis relates to sexual reproduction</li> <li>3. Model the process of meiosis and summarize the results</li> <li>4. Using a Punnett Square, illustrate how males and females are produced</li> </ol> <p>C. Genes and Gene Technology</p> <ol style="list-style-type: none"> <li>1. Describe the basic structure of a DNA molecule</li> <li>2. Explain base pairing</li> </ol>

		<p>IV. Change: Natural Selection And Heredity (continued)</p> <ol style="list-style-type: none"> <li>3. Given one side of a DNA molecule, complete the other side</li> <li>4. Summarize the process of DNA replication</li> <li>5. Define mutation and list several mutagens</li> <li>6. Model three different DNA mutations</li> <li>7. Given a pedigree chart, determine the genetic characteristics of the individuals</li> <li>8. Clarify the concept of selective breeding and give examples</li> </ol> <p>D. Human Inheritance</p> <ol style="list-style-type: none"> <li>1. Identify some patterns of inheritance in humans</li> <li>2. Describe the functions of the sex chromosome</li> <li>3. Explain the relationship between genes and environment</li> <li>4. Identify two major causes of genetic disorders in humans</li> <li>5. Explain how geneticists trace the inheritance of traits</li> <li>6. Describe how genetic disorders are diagnosed and treated</li> <li>7. Describe three ways of producing organisms with desired traits</li> <li>8. State the goal of the Human Genome Project</li> </ol> <p>E. Natural Selection</p> <ol style="list-style-type: none"> <li>1. Explain how fossils provide evidence that organisms have evolved over time</li> <li>2. Discuss how similarities in the fore-limb bones of humans, cats, dolphins, and bats support the theory of evolution</li> <li>3. Cite other kinds of evidence to support the theory of evolution</li> <li>4. Explain the importance of Darwin's finches</li> <li>5. Summarize Darwin's inferences about why organisms change and relate these inferences to his observations</li> <li>6. Outline Darwin's theory of evolution by natural selection</li> <li>7. Describe what is meant by "survival of the fittest"</li> <li>8. Explain how mutations are important to evolution</li> <li>9. Demonstrate how the environment can influence species change and explain how this is an example of natural selection.</li> <li>10. List some factors that promote evolution to a new species</li> </ol>
5.5/7	B1	<p>V. Simple Living Things</p> <p>A. Viruses</p>

		<p>V. Simple Living Things (continued)</p> <ol style="list-style-type: none"> <li>1. Explain how viruses are similar and different from living things</li> <li>2. Describe the two kinds of viral reproduction</li> <li>3. Explain the significance of viruses in the world today</li> </ol> <p>B. Bacteria</p> <ol style="list-style-type: none"> <li>1. Compare and contrast eubacteria and archabacteria</li> <li>2. Describe cyanobacteria</li> <li>3. Explain how bacteria reproduce</li> <li>4. Compare helpful and harmful bacteria</li> </ol>
<p>5.5/7</p> <p>5.10/7</p>	<p>A1</p> <p>B2</p> <p>B1</p>	<p>VI. Ecosystem And Biomes</p> <p>A. Interactions of Living Things</p> <ol style="list-style-type: none"> <li>1. Identify the needs that must be met by an organism’s surroundings</li> <li>2. Distinguish between biotic and abiotic parts of a habitat</li> <li>3. Explain how populations, communities, ecosystems, and the biosphere are related</li> <li>4. Describe how the abiotic environment is related to the communities</li> <li>5. Explain how an organism’s adaptations help it survive</li> <li>6. Distinguish between an organism’s habitat and niche</li> <li>7. Describe the major kinds of interactions among organisms in an ecosystem</li> <li>8. Identify the three types of symbiotic relationships</li> <li>9. Describe the differences between primary and secondary succession</li> </ol> <p>B. Energy Transfer</p> <ol style="list-style-type: none"> <li>1. Describe the functions of producers, consumers, and decomposers in an ecosystem</li> <li>2. Distinguish between a food chain and a food web</li> <li>3. Model how energy flows through a food web</li> <li>4. Explain the relationships in the levels of the energy pyramid</li> <li>5. Describe how much energy is available at each level of an energy pyramid</li> <li>6. Trace the cycles of matter: water, carbon, nitrogen</li> <li>7. Distinguish between the major biomes that exist in the world today</li> <li>8. Name and describe two major types of aquatic ecosystems</li> </ol>

Note: The New Jersey Core Curriculum Content Standards can be accessed at [www.state.nj.us](http://www.state.nj.us)

## **RESOURCES/ACTIVITIES GUIDE**

The Prentice Hall Teacher Resource Package includes the following:

1. Student review worksheets.
2. Critical-thinking and problem-solving worksheets.
3. Enrichment worksheets.
4. Test generator – test item listing.
5. Study guide.
6. Text transparencies.
7. Concept map transparencies.
8. Student workbooks
9. Datasheets for labs.
10. Safety poster.
11. CD-ROM planner.
12. Science explorer – exam view.
13. Science explorer – video explorations.
14. Science explorer – presentation express.

## **SUGGESTED AUDIO VISUAL/COMPUTER AIDS**

Union County Film Library video and videodiscs

Web Links: <http://www.scilinks.org> – numbers...see text

<http://www.sciencespot.net>

<http://www.biologycorner.com>

National Science Teachers Association

Links to online chapter activities and resources

<http://www.enchantedlearning.com>

Smithsonian Institution Websites

## **SUGGESTED MATERIALS**

### **Resources for Students**

Prentice Hall Life Science. Prentice Hall, 2007 ed.

### **Resources for Teacher**

Prentice Hall Life Science. Prentice Hall, 2007 ed.

The Prentice Hall Teacher Resource Package

Holt Staff. Holt Life Science. Holt, Rinehart and Winston, 2001 ed.