# Princeton Charter School

## 7 Science Curriculum

### 7.1 Science Program Overview

Numerous studies and reports decry the inadequacy of science education in the United States. For example, in 1991 the Carnegie Commission on Science, Technology, and Government described the current scientific illiteracy as "a chronic and serious threat to our nation's future." Science education at the primary and secondary levels in most schools today is chaotic and ineffective. It ranges from rote memorization of isolated facts and vocabulary, to vague, "hands-on" explorations that do not lead anywhere.

Princeton Charter School adopts a "minds-on, hands-on" approach to science education; it stresses quantitative reasoning as well as experimentation and observation. Students are encouraged to be curious about the natural world surrounding them and come to understand the importance of science in many different careers. The PCS experience will be for some students a good first step towards a career in science, but every student will learn through practice the "scientific method" – which is really a disciplined approach to discovery that applies to almost all walks of life.

Our approach uses three essential components of science education, identified in the *Iowa Guide to Curriculum Development in Science*: "knowledge, skills, and application of scientific information in resolving problems. Knowledge refers to the facts, theories, and principles of science. The skills or processes of science include activities embodied in the scientific method, which encompasses the ability to formulate and state hypotheses and to evaluate them by experimentation or observation. Application is the use of science content and processes not only in work but also in personal, social, and political decision making." The PCS science curriculum complies with the New Jersey Core Curriculum Content Standards for Science as described in the Charter.

In science as in any other subject, children learn in an incremental manner. In early grades (K-3), science should be fun and stimulating, designed to make children explore and wonder about the world; to learn to ask questions, and seek answers. Backyard birds, magnets, the solar system, simple machines, and dinosaurs are topics which have intrigued children for years. In grades 4-8 the approach becomes more rigorous. Students start to ask quantitative questions and develop the ability to determine if they have enough information to answer them. As student's mathematical skills increase, they are applied more extensively in the science program.

Four major areas are covered: physical sciences, life sciences, earth sciences, and astronomy. Some topics from each area are included each year. Emphasis is placed on understanding how facts are interrelated through natural laws and

mathematical relationships. For example, the concept of energy is first used to discuss the conservation law in physical and chemical transformations, and then in the metabolism of living organisms, and finally in the food web. Other examples include the use of probability in genetic studies, or the application of conservation of momentum to understand rocket propulsion. The process skills emphasized are: observing, measuring, classifying, recording, predicting, hypothesizing, inferring, and experimenting. Knowledge and skills mastered are used to discuss issues of social concern, such as burning of fossil fuels.

During selected science periods, students are introduced to computers and their underlying software and hardware concepts. More science period class time is devoted to computer study in the early years, since it is "hands-on," and because students are capable of mastering many computer-usage concepts and skills. In K-1, students are familiarized with the operation of a computer, exposed to basic related vocabulary, and become comfortable with a small number of application programs including a drawing package. In grades 2-3, additional skills and vocabulary are taught, and students begin to use word processing software to prepare reports. During third grade, keyboard skills are emphasized. By the end of fourth grade, all students are proficient at word processing, capable of creating and manipulating a database and spreadsheet, and use its graphing component. Current strategies for navigation and search on the Web are presented to students beginning in third grade. However, the speed of change in this area requires a dynamic approach to establishing curriculum content.

## 7.2 New Jersey Core Curriculum Content Standards in Science

The Princeton Charter School Science curriculum complies with the New Jersey Core Curriculum Content Standards in Science. These standards are listed below, together with some examples of activities associated with each standard.

**Standard 5.1 Scientific Processes:** *All students will develop problem-solving, decision-making, and inquiry skills, reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.*

By the end of grade 4, PCS students have been presented with simple systems – such as a simple pulley system – for which they are asked to formulate a hypothesis or prediction concerning its physical behavior (e.g., predicted mechanical advantage of a pulley system). The students plan and carry out experimental measurements to test their hypothesis, record the results, and prepare reports describing their observations and presenting their conclusions. By the end of grade 8, students have designed and carried out experimental or observational studies on a variety of systems, including mechanical, electrical, chemical, biological, and astronomical examples. Experimental findings are communicated using words, charts, graphs, pictures, and diagrams. Student reports demonstrate understanding of the role of experimental error, statistical uncertainty, and the role of control experiments.

**Standard 5.2 Science and Society:** *All students will develop an understanding of how people of various cultures have contributed to the advancement of science and technology, and how major discoveries and events have advanced science and technology.*

Curiosity is a central human trait; all historical cultures have formulated explanations for the natural phenomena surrounding us. What we refer to as science is an approach to understanding nature that relies on careful, systematic observation and measurement, the formulation of hypotheses (usually mathematical) to make quantitative predictions concerning natural phenomena, and – most importantly – the testing of these hypotheses by further experiment. By the end of grade 4, PCS students have read about several different scientists and inventors, in historical context. By the end of grade 8, students have learned about major events and people in the history of science.

**Standard 5.3 Mathematical Applications:** *All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories.*

A quantitative approach to science is stressed at PCS, with mathematics integrated naturally into the science curriculum. The level of mathematical sophistication progresses as the requisite mathematical tools and skills are acquired. By the end of grade 4, students use measuring instruments such as thermometers, rulers, graduated cylinders, and scales, and recognize the importance of the units of measurement; tables and graphs are used to represent data. By the end of grade 8, students are able to compute the mean and median for a set of experimental data, and have developed an informal understanding of how the precision of an experimental result can be improved by averaging repeated measurements.

**Standard 5.4 Nature and Process of Technology:** *All students will understand the interrelationships between science and technology and develop a conceptual understanding of the nature and process of technology.*

By the end of grade 4, PCS students have experimented with, thought about, and discussed simple systems such as pulleys and simple electrical circuits, and understand the roles of individual components, and the manner in which these components combine to form a working system. By the end of grade 8, students are able to analyze the properties of such systems using physical laws; students can calculate, for example, the mechanical advantage of a pulley system, or the current flowing in an electrical circuit. This understanding is tested and reinforced by hands-on experiments involving quantitative measurements.

Students appreciate that modern technology has been made possible by the development of scientific understanding of natural phenomena, and how technology in turn supports further scientific progress.

**Standard 5.5 Characteristics of Life:** *All students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate*

*the diversity of life.*

PCS students study the diversity, complexity, and interdependence of life on earth. By the end of grade 4, students have studied several examples of living things, with attention to their basic needs, different levels of organization, and roles in a food web. By the end of grade 4, students are able to describe a simple classification system for grouping organisms. They recognize that individuals vary within every species, and can describe examples of external features of plants and animals that help them survive in varied habitats. By the end of grade 8, students are able to describe the major categories of living organisms, identify different levels of organization of multicellular organisms, and explain the life cycles of organisms. Students are able to classify organisms by internal and external characteristics, illustrate how genetic variation results in the potential for variation among offspring explain how genetic mutation can result in inherited changes among offspring, recognize that individual organisms with certain traits are more likely to survive and have offspring, and recognize how changing environmental conditions can result in evolution of a species.

**Standard 5.6 Chemistry:** *All students will gain an understanding of the structure and behavior of matter.*

PCS students study the states and properties of matter, how these can be understood in terms of matter being composed of atoms and molecules, and understand how this atomic model relates to the principles of chemistry. By the end of grade 4, students recognize that matter can exist as a solid, liquid, or gas, and can be transformed from one state to another by heating or cooling. By the end of grade 8, students are able to explain how substances can react with each other to form new substances with characteristic properties different from those of the original substances; know that commonly-encountered matter is made up of atoms that may join together to form molecules, and that the state of matter is determined by the arrangement and motion of the atoms or molecules; can explain how atoms are rearranged when substances react chemically, but that the total number of atoms and total mass of the substances remains unchanged in the reaction; and know that over 100 different atoms, corresponding to the same number of different elements, have been identified and can be grouped according to their similar properties.

**Standard 5.7 Physics:** *All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.*

The basic principles of mechanical physics are studied at PCS, leading ultimately to the concept of energy. By the end of grade 4, students can understand that the motion of an object is described by both speed and direction; demonstrate that the state of motion of an object can be changed by pushing or pulling, and that the amount of change is related to the strength of the push or pull; recognize that some forces are invisible and can act at a distance; understand that sound can be produced by vibrating objects, and that the pitch of the sound depends on the rate of vibration; investigate sources of heat and show how heat can be transferred from

one place to another; investigate sources of light and show how light behaves when it strikes different objects; demonstrate how electricity can be used to produce heat, light, motion, and sound. By the end of grade 8, students can explain that the state of motion of an object which is subject to zero net force will remain unchanged; can show that when more than one force acts on an object at the same time, the forces can reinforce or cancel each other, resulting in a net force; investigate how the force of friction acts to retard motion; know that there are various forms of energy, including heat, light, sound, chemical, mechanical, electrical, and nuclear, and that energy can be transferred from one form to another; can explain how heat flows through materials or space from warmer objects to cooler ones; know that the sun is a major source of the earth's energy, and that the emission from the sun includes visible, infrared, and ultraviolet light; can explain how light is reflected, refracted, or absorbed when it interacts with matter, and how materials may appear colored as a result of this interaction; and can show how vibrations in materials can generate waves which can transfer energy from one place to another.

**Standard 5.8 Earth Science:** *All students will gain an understanding of the structure, dynamics, and geophysical systems of the earth.*

By the end of grade 4, students, recognize and demonstrate the use of different kinds of maps; are aware of the different materials that make up the earth, including rocks, soils, liquids, and gases; understand the ways in which water moves from one place to another on the earth; collect and record weather data to characterize existing weather conditions, and recognize how those conditions affect our daily lives. By the end of grade 8, students can compare different map projections, and explain how physical features are represented on each; identify the major features of the earth's crust, the processes and events that change them, and the impact of those changes upon the biosphere, including people; identify the age of fossils, and explain how they provide evidence that life has changed through time; describe and explain the causes of the natural processes and events that have shaped the earth's surface and interior; monitor local weather conditions and changes in the atmosphere that lead to weather systems; discuss the composition, cycling, and distribution of the earth's oceans and other naturally occurring bodies of water.

**Standard 5.9 Astronomy and Space Science:** *All students will gain an understanding of the origin, evolution, and structure of the universe.*

Students should learn about the place of the earth in the universe, the size of the universe, and the history of the earth and the universe. By the end of grade 4, students observe and identify celestial objects and their apparent motion in the day and night sky; relate the motions of the earth-sun-moon system to units of time (days, months, years); depict a model of the solar system; compare the different length scales in the solar system, including the diameters of the earth, moon, planets, and sun, and the diameters of the planets' orbits. By the end of grade 8, students are able to describe the physical characteristics of the components of the solar system, and compare the earth to other planets; explain how naturally

occurring events on earth (days, tides, seasons) are related to the positions of the sun, earth, and moon; describe some of the technologies used to explore the universe; discuss the distance to the nearest star, the size of our galaxy, the number of stars in our galaxy, and the distances to nearby galaxies.

**Standard 5.10 Environmental Studies:** *All students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena.*

Students learn about the finiteness of natural resources, and about the ways in which both natural phenomena and human activity can affect the atmosphere, surface, and oceans of the earth. By the end of grade 4, students are able to discuss the interdependence of living things and their environment, explain how human activity affects the environment, and recognize the distinction between renewable and nonrenewable natural resources. By the end of grade 8, students evaluate the impact of personal and societal activities on the local and global environment, and compare and contrast policies that affect the use and management of natural resources.

### 7.3 Science: Kindergarten

In kindergarten, the science program centers on activities through which students:

- engage their curiosity about the world around them;
- communicate observations and comparisons;
- begin to develop a scientific vocabulary;
- observe living organisms over time;
- ask questions and make and record observations.

**Topics:**

**Trees** - their characteristics, structures, and life cycles.

**Animals** - their life cycles, habitats, environments, and care.

**Magnetism** - experiments with this natural force.

**Sunshine & Shadows** - relationship between the sun's position and shadows it casts.

**Five Senses** - how we perceive the world around us.

**Instructional Materials:**

*Full Option Science System: Trees; Animals Two by Two*, Lawrence Hall of Science, University of California, Berkeley.

*Sunshine and Shadows* K, Delta Science Modules II.

*Smell, Taste, Touch Discovery Kit*, Delta Education.

## 7.4 Science: Grade One

In first grade, the science program centers on activities through which students:

- conduct experiments;
- make simple measurements in the course of experiments;
- record and graph data;
- make predictions based on data and analysis; and
- ask questions and make and record observations.

Students investigate **Balance and Motion** through the following activities:

In **Balance,** students explore balance, counterbalance, and stability through experiments with shapes, pencils, and mobiles. They discover ways to balance two-dimensional tagboard shapes, find balance points, and use counterweights to balance shapes.

In **Spinners,** students discover different ways to produce rotational motion using tops and other spinning toys they construct. Students explore variables that influence the spinning of zoomers (disks on a string), and twirlers (flying spinners).

In **Rollers,** students roll objects down slopes to observe and compare rolling systems with different-sized wheels. They roll paper cups, add weights, and predict the curved rolling paths, and they experiment with marbles to observe spheres as rollers.

Students investigate **New Plants** and observe life cycle through the following activities:

In **Brassica Seeds,** students plant rapid-growing seeds and observe the sequence of changes over time. They record observations by drawing, labeling, and captioning.

In **Grass and Grain Seeds,** students find out what happens when they grow rye grass and alfalfa plants, mow them close to the surface, and allow them to grow again. They plant wheat seed in soda straws, monitor the plant's growth, and record observations with labeled drawings.

In **Stems,** students cut plant stems, place them in water or soil, and observe changes over time. Students select the stems that show promise for developing into new plants and plant them in soil. They also plant potato pieces and observe and record the results.

In **Bulbs and Roots,** students initiate the growth of a new plant from a bulb, and from a carrot or radish root or part of the root. They observe changes

and record their observations in labeled drawings. They make conclusions about the likelihood of producing new plants from parts that are normally underground.

Students study **Dinosaurs** to learn about their structure, how they interacted with their environment, and how scientists have discovered what they know about dinoaurs

Students study **Nutrition and Germs** to discover how to keep their bodies healthy.

**Instructional Materials:**

*Full Option Science System,* Lawrence Hall of Science, University of California, Berkeley.

## 7.5 Science: Grade Two

In second grade, the science program centers on activities through which students are expected to learn how to:

- conduct experiments;
- use measurements in the course of experiments;
- record and graph data;
- use data and analysis to make predictions; and
- write questions and observations.

Students investigate **Air and Weather** through the following activities:

Students are actively involved in monitoring the weather. They explore properties of air using plastic syringes and tubes to find that air takes up space and builds up pressure when compressed. Students construct devices that use air to function including parachutes, propellers, balloon rockets, gliders, pinwheels, streamers, wind socks, kites, and whirligigs.

Students investigate **Solids and Liquids** through the following activities:

Students are introduced to characteristics of two states of matter: solid and liquid. After describing properties of solid objects, students use them in construction projects. They investigate the properties of particulate solids (cornmeal, beans, rice) and liquids (water, corn syrup, oil) and compare their behaviors. After observing solid/liquid and liquid/liquid interactions, students investigate toothpaste to determine if it is solid or liquid.

Students investigate **Insects** and observe their life cycle through the following activities:

Darkling beetles, wax moths, silk moths, painted lady butterflies, crickets, and ants are a few of the organisms observed over time. Students observe and compare insect structures and behaviors in different stages of the life cycle, discuss and record findings, and pose questions to be resolved. Students observe complete insect metamorphosis and are introduced to a sampling of the diversity in the animal kingdom.

Students investigate the **Physics of Sound** through the following activities:

Students experiment with sound sources and receivers, amplification, pitch, and directionality. They develop the central idea of vibration as the source of all sounds. Students work at learning centers, investigating various concepts associated with the physics of sound.

Students study **Nutrition and Germs** to discover how to keep their bodies healthy.

**Instructional Materials:**

*Full Option Science System,* Lawrence Hall of Science, University of California, Berkeley.

## 7.6 Science: Grade Three

In third grade, the science program centers on activities through which students are expected to learn how to:

- design and conduct experiments;
- use measurements and the metric system in the course of experiments;
- record and graph data;
- use data and analysis to make predictions; and
- write organized lab reports.

Students investigate **Structures of Life** through the following activities:

In **Origin of Seeds** students examine and sort a selection of seeds and look for seeds in fresh fruit. They describe and compare seed properties.

By **Sprouting Seeds** students investigate the effect water has on the seeds by observing and recording changes over time. They examine germinated seeds to study growth and set up a hydroponic garden to study plant life cycles.

Students **Meet a Crawfish,** observe its structure and behavior, establish a feeding and maintenance schedule, and map its track in the habitat.

Students investigate **Magnetism and Electricity** through the following activities:

The **Force** deals with permanent magnetism. Students study magnetic interactions and investigate variables that influence the force of attraction.

**Making Connections** investigates the flow of electricity through circuits. Students test materials to see if they are conductors or insulators.

In **Current Attractions** students discover that electric currents create magnetic fields and moving magnets make electric currents.

In **Click It** students build telegraphs, create a code, and wire up a two-way communications channel.

Students investigate **Earth, Moon, and Stars** through the following activities:

In **Earth's Shape and Gravity,** students use balls to study why the Earth's globe appears flat to a person on the surface, and learn that gravity attracts objects toward the center of the earth.

In **Moon,** students observe, record, and discuss the phases of the moon. They model eclipses using balls for the Earth and moon, and a light source for the sun.

With **Stars,** students learn that the rotation of the Earth on its axis causes the stars to appear to spin around the North Star at night, and that the revolution of the Earth around the sun causes different constellations to appear in the night sky. They make a star clock and learn to use a star map.

Students investigate **Earth Materials** to discover properties and identifying characteristics of rocks and minerals, and to learn about how rocks are formed.

In **Mock Rocks,** students use geologist's tools and techniques to separate mock rocks into ingredients to discover their composition.

In **Scratch Test,** students observe, describe, and record properties of four minerals, and use the scratch test to determine relative hardness.

In **Calcite Quest,** students observe that a characteristic property of calcite is that it bubbles in vinegar. Using this test, students go on a quest to find calcite in common rocks.

In **Take it for Granite,** Students use the properties of five minerals to find out which of the minerals compose granite.

Students study the **Human Digestive and Skeletal Systems** to learn about how their bodies work.

**Instructional Materials:**

*Full Option Science System,* Lawrence Hall of Science, University of California, Berkeley.

*Great Explorations in Math and Science,* Lawrence Hall of Science, University of California, Berkeley.

## 7.7 Science: Grade Four

In fourth grade, the science program centers on activities through which students are expected to learn how to:

- design and conduct experiments;
- use measurements and the metric system in the course of experiments;
- record and graph data;
- work with independent and dependent variables;
- apply mathematics to analyze the experiments;
- use data and analysis to make predictions; and
- write lab reports following the scientific method.

Students investigate **Variables** through the following activities:

**Swingers** introduces variables through experiments with pendulums. Students investigate which variables (weight, length, etc.) affect the period of the pendulum.

**Lifeboats** uses paper cup boats and penny passengers to study buoyancy.

**Plane Sense** has students construct airplanes and determine what variables affect the flying performance.

**Flippers** requires launching objects with a catapult and the investigation of variables that affect the trajectories.

Students investigate **Environments** through the following activities:

Students build a **Terrestrial Environment** to observe interactions and relationships on land.

In **Water Tolerance** students grow four plants and subject them to different amounts of water to discover each plant's tolerance.

Students study **Isopods and Beetles** to determine preferences between moist environments that are dry or dark.

In **Aquatic Environments** students systematically introduce organisms into a freshwater aquarium while monitoring environmental factors including the water's acid content.

Students **Hatch Brine Shrimp** in four controlled salt concentrations to investigate the range of salt tolerance for the eggs.

In **Salt of the Earth**, students grow plants in water with four different salinities to determine salt tolerance and good conditions for growth.

Students investigate **Levers and Pulleys** to learn the fundamental concepts of simple machines.

In **Levers,** students investigate the fulcrum, effort, and load of a lever. They draw and graph results of experiments with a spring scale to illustrate relationships between the parts of the lever.

In **More Levers,** students investigate the mechanical advantage of the three types of levers which differ in the arrangement of the fulcrum, load, and effort.

In **Pulleys,** students set up and diagram single- and multiple-pulley systems. They use a scale to quantify the effort and mechanical advantage.

in **Pulleys at Work,** students record and graph four pulley systems to determine the relationship between the number of ropes pulling on the load and the effort needed to lift it.

Students study the **Human Circulatory and Respiratory Systems** to learn about how their bodies work.

**Instructional Materials:**

*Full Option Science System,* Lawrence Hall of Science, University of California, Berkeley.

## 7.8 Science: Grade Five

The fifth-grade course includes life, physical, and earth sciences. Students are expected to:

- learn scientific concepts and vocabulary in areas covered;
- design and conduct experiments;
- use measurements in the course of experiments;
- record and graph data;
- apply mathematics to analyze experiments;
- use data and analysis to make predictions; and
- write organized laboratory reports.

### Life Sciences – Ecology

Topics: interactions among living things; cycles in nature; biological clocks; biogeography; Earth's biomes; and wildlife conservation.

### Physical Sciences

Topics: chemical reactions, heat, and energy; temperature; phase transitions; thermal expansion;

### Earth Sciences

Topics: structure of the atmosphere; the magnetosphere; structure and motions of the oceans; ocean life zones; fresh water on the surface and below the surface of the Earth; landmasses; and structure of the Earth's interior.

### Health

Topics: human skeletal, muscular and digestive systems; human reproductive system; family life education.

### Instructional Materials:

| | |
|---|---|
| *Ecology: Earth's Living Resources* | Prentice Hall Science, 1997. |
| *Chemical Interactions* | Delta Science Modules II. |
| *Exploring Planet Earth* | Prentice Hall Science, 1997. |
| *Human Biology and Health* | Prentice Hall Science, 1997. |
| *You and Your Body* | Delta Science Modules II. |

## 7.9 Science: Grade Six

The science program includes life, physical, and space sciences. Students are expected to:

- learn scientific concepts and vocabulary in areas covered;
- design and conduct experiments;
- use measurements in the course of experiments;
- record and graph data;
- apply mathematics to analyze the experiments;
- use data and analysis to make predictions; and
- write well organized laboratory reports.

### Life Sciences: Cells

Topics: characteristics of living things; chemistry of living things; cell theory; structure and function of cells; cell growth and division; photosynthesis; respiration.

### Space Sciences: Astronomy

Topics: structure of the solar system; seasons and tides; solar and lunar eclipses; space exploration; stars; galaxies; evolution of the Universe. A field trip will be made to Princeton University Observatory (Peyton Hall) to observe the Moon, planets, and other celestial objects.

### Physical Sciences: Electricity and Magnetism

Topics: Electric charges; current flow; series and parallel circuits; magnetic poles; magnetic field lines of force; the Earth as a magnet; charged particles in a magnetic field; electromagnetism; electronic transmission.

### Health

Topics: human nervous and endocrine systems.

### Instructional Materials:

| | |
|---|---|
| *Exploring the Universe* | Prentice Hall Science, 1997. |
| *Cells: Building Blocks of Life* | Prentice Hall Science, 1997. |
| *Electricity and Magnetism* | Prentice Hall Science, 1997. |
| *Human Biology and Health* | Prentice Hall Science, 1997. |
| *You and Your Body* | Delta Science Modules II. |

## 7.10 Science: Grade Seven

The seventh-grade program includes life and physical sciences. Students are expected to:

- learn scientific concepts and vocabulary in areas covered;
- design and conduct experiments;
- use measurements in the course of experiments;
- record and graph data;
- apply mathematics to analyze the experiments;
- use data and analysis to make predictions; and
- write well organized laboratory reports.

### Physical Sciences: Optics and Acoustics

Topics: characteristics of waves; sound waves; the speed of sound; resonance; the wave nature of light; the electromagnetic spectrum; diffraction; rays and shadows; Snell's law; lenses and focal length; refraction of colors;

### Physical Sciences: Motion, Force, and Energy

Topics: velocity and momentum; frames of reference; forces such as gravity and friction; Newton's laws of motion; pressure; motion in fluids; work; power; simple machines; kinetic and potential energy; energy conversions; and conservation of energy.

### Life Sciences: Genetics

Topics: genetics; how chromosomes work; mutations; DNA; human genetics; heredity; sex-linked traits; mapping the human genome.

### Human Biology

Topics: human circulatory, respiratory, and endocrine systems.

### Instructional Materials:

| | |
|---|---|
| *Sound and Light* | Prentice Hall Science, 1997. |
| *Motion, Forces, and Energy* | Prentice Hall Science, 1997. |
| *Heredity: the Code of Life* | Prentice Hall Science, 1997. |
| *Human Biology and Health* | Prentice Hall Science, 1997. |

## 7.11 Science: Grade Eight

The eighth-grade program includes physical and life sciences. Students are expected to:

- learn scientific concepts and vocabulary in areas covered;
- design and conduct experiments;
- use measurements accurately in the course of experiments;
- record and graph data;
- apply mathematics to analyze experiments;
- use data and analysis to make predictions; and
- write thorough, well organized laboratory reports.

### Physical Sciences: Matter: Building Block of the Universe

Topics: general properties of matter: mass, weight, volume, and density; phases of matter; phase changes; mixtures, elements, and compounds; atomic model of matter; structure of atoms; forces within atoms; the periodic table; periodic properties of the elements.

### Physical Sciences: Chemistry of Matter

Topics: atoms and bonding; ionic, covalent, and metallic bonds; chemical reactions; equations for chemical reactions; energy released or absorbed in reactions; reaction rates; acids, bases, and salts; carbon and its compounds; hydrocarbons; petroleum; radioactivity; nuclear reactions.

### Life Sciences: Evolution: Change Over Time

Topics: the rock record; fossil evidence about large-scale changes over time; the concept of evolution; Darwin; Lamarck; human evolution.

### Human Biology

Topics: human body systems.

### Instructional Materials:

| | |
|---|---|
| *Matter: Building Block of the Universe* | Prentice Hall Science, 1997. |
| *Chemistry of Matter* | Prentice Hall Science, 1997. |
| *Evolution: Change Over Time* | Prentice Hall Science, 1997. |
| *Human Biology and Health* | Prentice Hall Science, 1997. |