

TITLE	PA STANDARDS ADDRESSED	GR LEVEL	LEXILE LEVEL	BOOK SUMMARY	VOCABULARY
<b>Air Pollution</b> ISBN 0022847170 6 PK ISBN 0022865039	3.5.7.C.e., 3.6.7.A.a., 3.6.7.C.g., 3.8.7.C.a.	V	800	Causes of air pollution and the impact of air pollution on the atmosphere are described in <i>Air Pollution</i> . Also covered are the ozone layer, global warming, and strategies to prevent air pollution.	acid rain atmosphere chlorofluorocarbon fossil fuel greenhouse effect
<b>Alloys: Metals in the Mix *</b> ISBN 002284726X 6 PK ISBN 0022865128	3.2.7.A.d., 3.4.7.A.c., 3.6.7.C.a., 3.7.7.A.a., 3.8.7.C.a.	U	840	<b>Alloys: Metals In the Mix</b> introduces the definition of the term <i>alloy</i> and provides an in-depth look at the history of alloys. Technological applications of alloys and possible future uses of alloys are also described.	alloy cermet converter cupronickel ore
<b>Amusement Park Rides</b> ISBN 0022859152 6 PK ISBN 0022866361	3.4.7.C.a. 3.6.7.C.h. 3.6.7.C.j.	W	680	<b>Amusement Park Rides</b> uses descriptions of rides to clarify the relationship between forces (gravity, friction, etc.) and motion (Newton's Laws). Careers that use science and technological design are addressed in Chapter 8, Meet a Roller Coaster Designer.	force friction g-force gravity motion
<b>Animal Adaptations</b> ISBN 0022847111 6 PK ISBN 0022864962	3.2.7.A.b., 3.3.7.A.a. 3.3.7.A.c., 3.3.7.D.a. 3.3.7.D.b., 3.3.7.D.c. 3.3.7.D.f.	V	820	<b>Animal Adaptations</b> describes adaptations that help animals find food, find mates, move, and stay safe. The relationship between adaptations and specific environments is also described.	adaptation camouflage habitat mimicry niche
<b>Can Cells Grow Too Much?</b> ISBN 0022847049 6 PK ISBN 002286489X	3.3.7.B.b., 3.3.7.B.d., 3.3.7.B.e., 3.6.7.A.b., 3.8.7.A.c.	V	770	<b>Can Cells Grow Too Much?</b> Gives a brief description of cell structure, chromosomes, and DNA. Normal mitosis and its function in the body is contrasted with uncontrolled cell division. Cancer, metastasis, causes of cancer, cancer prevention, and medical technologies used to treat cancer are also discussed.	cancer cell chemotherapy mitosis tumor
<b>Carbon All Around *</b> ISBN 0022847235 6 PK ISBN 002286508X	3.2.7.A.b., 3.3.7.D.e. 3.4.7.A.a., 3.4.7.A.c. 3.4.7.D.h., 3.6.7.A.a. 3.8.7.A.b., 3.8.7.A.c.	U	870	<b>Carbon All Around</b> begins with definitions of the terms element and matter and introduces carbon as one of the most plentiful elements on Earth. Uses of carbon, the carbon cycle, carbon dating, fossil fuels, and other technologies utilizing carbon are also discussed.	carbon carbon cycle carbon dioxide graphite greenhouse effect

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TITLE	PA STANDARDS ADDRESSED	GR LEVEL	LEXILE LEVEL	BOOK SUMMARY	VOCABULARY
<b>Cells</b> ISBN 0022847022 6 PK ISBN 0022864873	3.2.7.A.d., 3.2.7.C.a. 3.2.7.C.f., 3.3.7.B.b. 3.3.7.B.c., 3.3.7.B.d. 3.3.7.C.g., 3.6.7.A.b. 3.6.7.A.f., 3.8.7.C.a.	S	820	<b>Cells</b> discusses the structure and function of cells and organelles and describes levels of organization in organisms. Chapter 4 gives an in-depth look at the history of cell research, and Chapter 5 describes applications of cell research.	<b>cell</b> <b>cell membrane</b> <b>cytoplasm</b> <b>mitochondria</b> <b>nucleus</b>
<b>Costa Rican Rain Forests</b> ISBN 0022847081 6 PK ISBN 0022864946	3.3.7.A.a., 3.3.7.A.c., 3.3.7.B.d., 3.3.7.D.a., 3.3.7.D.b.	S	800	<b>Costa Rican Rain Forests</b> explores relationships between living things in the Costa Rican rain forest. Adaptations of plants and animals are discussed. Costa Rica's commitment to conservation is highlighted in Chapter 1.	<b>adaptation</b> <b>life cycle</b> <b>metamorphosis</b> <b>predator</b> <b>vertebrate</b>
<b>Discovering the Elements</b> ISBN 0022847227 6 PK ISBN 0022865071	3.1.7.C.a., 3.1.7.C.c. 3.2.7.A.d., 3.4.7.A.a. 3.4.7.A.c., 3.6.7.C.c.	T	730	<b>Discovering the Elements</b> describes the discovery and uses of some common elements. It also explains the organization of the periodic table, and the contributions of scientists who discovered and studied elements.	<b>atom</b> <b>atomic weight</b> <b>element</b> <b>periodic table</b> <b>property</b>
<b>Earth's Heat</b> ISBN 0022861750 6 PK ISBN 0022866310	3.2.7.A.a., 3.2.7.A.c. 3.2.7.A.d., 3.5.7.A.a. 3.5.7.A.b., 3.5.7.A.e.	W	800	In <b>Earth's Heat</b> , the structure of Earth is described and the relationship of Earth's internal energy to plate tectonics is identified. This book also explains how earthquakes and volcanoes are related to plate motion.	<b>Lava</b> <b>lithosphere</b> <b>magma</b> <b>mantle</b> <b>tectonic plates</b>
<b>Earth's Oceans</b> ISBN 0022861742 6 PK ISBN 0022866272	3.5.7.D.c., 3.5.7.D.d., 3.5.7.D.e., 3.8.7.C.b.	W	820	<b>Earth's Oceans</b> provides a description of the physical and ecological features of oceans. The distinguishing characteristics of the Pacific, Atlantic, Indian, and Arctic Oceans are identified. The book also includes an in-depth description of coral reef ecosystems.	<b>abyssal plain</b> <b>continental shelf</b> <b>current</b> <b>plankton</b> <b>vent</b>
<b>Earth's Water</b> ISBN 0022861769 6 PK ISBN 0022864997	3.1.7.A.a., 3.1.7.A.c. 3.5.7.D.a., 3.5.7.D.b. 3.5.7.D.d., 3.6.7.A.a.	S	860	<b>Earth's Water</b> describes ways that water is used on Earth, as well as water pollution and water treatment. The water cycle is diagramed, and the processes of evaporation, condensation, and precipitation are described.	<b>condensation</b> <b>precipitation</b> <b>reservoir</b> <b>water cycle</b> <b>water treatment</b>

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TITLE	PA STANDARDS ADDRESSED	GR LEVEL	LEXILE LEVEL	BOOK SUMMARY	VOCABULARY
<b>Genetics</b> ISBN 0022859136 6 PK ISBN 0022866256	3.2.7.A.d., 3.3.7.C.g. 3.6.7.A.b., 3.8.7.A.c. 3.8.7.C.a. 3.8.7.C.b.	W	780	<b>Genetics</b> includes a description of Mendel's work and the history of genetics. It also covers cells and DNA, as well as applications of DNA technology.	<b>chromosome</b> <b>DNA</b> <b>gene genetics</b> <b>heredity</b>
<b>Global Weather</b> ISBN 0022859144 6 PK ISBN 0022866337	3.4.7.B.b., 3.5.7.C.b., 3.5.7.C.e., 3.5.7.C.f., 3.6.7.A.a.	W	670	<b>Global Weather</b> identifies the factors that make up weather, the role of the water cycle in weather, forms of severe weather, and human impact on weather. It also includes information about careers in meteorology.	<b>air pressure</b> <b>drought</b> <b>global wind patterns</b> <b>meteorologist</b> <b>troposphere</b>
<b>Hurricanes and Tornadoes</b> ISBN 0022847154 6 PK ISBN 0022865012	3.2.7.A.b. 3.5.7.C.b. 3.5.7.C.c. 3.5.7.C.f. 3.8.7.C.b.	T	830	<b>Hurricanes and Tornadoes</b> explains how hurricanes and tornadoes form, locations where they commonly occur, and types of damage they cause.	<b>air pressure</b> <b>cyclone</b> <b>hurricane</b> <b>thunderstorm</b> <b>typhoon</b>
<b>Life Goes On *</b> ISBN 0022847219 6 PK ISBN 0022865063	3.3.7.A.a. 3.3.7.C.e. 3.3.7.D.a. 3.3.7.D.b. 3.3.7.D.c.	U	690	Sexual and asexual reproduction are compared and contrasted in <b>Life Goes On</b> . This book also discusses diversity among individuals, and adaptations that help young organisms survive in different environments.	<b>asexual reproduction</b> <b>fertilization</b> <b>pollination</b> <b>sexual reproduction</b> <b>species</b>
<b>Life on a Space Station</b> ISBN 6 PK ISB	3.4.7.D.f., 3.4.7.D.g., 3.4.7.D.h., 3.8.7.C.b.	V	900	Students explore everyday life on a space station, the history of the space station, and careers in space exploration in <b>Life On a Space Station</b> .	<b>atmosphere</b> <b>microgravity</b> <b>mission</b> <b>orbit</b> <b>radiation</b>
<b>Looking to the Sky</b> ISBN 0022847189 6 PK ISBN 0022865047	3.2.7.A.a., 3.2.7.A.c. 3.2.7.A.d., 3.4.7.D.f. 3.4.7.D.g., 3.4.7.D.h. 3.8.7.C.b.	T	820	<b>Looking to the Sky</b> highlights the cumulative nature of scientific knowledge, discusses the development of the sciences of astronomy and rocketry, and describes the future of space exploration.	<b>astronomy</b> <b>comet galaxy</b> <b>rocketry</b> <b>telescope</b>

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TITLE	PA STANDARDS ADDRESSED	GR LEVEL	LEXILE LEVEL	BOOK SUMMARY	VOCABULARY
<b>Magnetism</b> ISBN 0022859071 6 PK ISBN 0022866388	3.1.7.A.a., 3.1.7.A.c. 3.1.7.A.g., 3.1.7.B.c. 3.1.7.E.a., 3.2.7.A.d. 3.4.7.B.d., 3.6.7.B.c. 3.6.7.C.i., 3.8.7.A.b. 3.8.7.A.c., 3.8.7.C.a.	P	620	The force of magnetism and Earth's magnetic field are described in <i>Magnetism</i> . This book also explains the relationship between magnetism and electricity and applications of electromagnets and motors.	compass electromagnet magnet magnetic field pole
<b>Mission: Green Earth *</b> ISBN 0022859101 6 PK ISBN 0022866329	3.1.7.E.a., 3.2.7.D.a. 3.2.7.D.b., 3.2.7.D.c. 3.2.7.D.d., 3.2.7.D.e. 3.2.7.D.f. 3.4.7.B.b. 3.5.7.B.c. 3.6.7.A.a. 3.6.7.A.d. 3.6.7.A.e.	U	650	The term natural resources is defined in <i>Mission: Green Earth</i> . This book also describes how Earth's resources can be used in sustainable ways and describes the negative impact of fossil fuel use and clear cutting.	environment global warming natural resource nonrenewable renewable
<b>Mixtures and Solutions</b> ISBN 0022859373 6 PK ISBN 0022866345	3.1.7.A.c., 3.4.7.A.b., 3.4.7.A.d.	Q	590	In <i>Mixtures and Solutions</i> students are introduced to the differences between mixtures and solutions and methods that can be used to separate mixtures and solutions. This book also describes the difference between chemical change and physical change.	chemical change mixture physical change solution suspension
<b>Motion and Energy at Play *</b> ISBN 002285911X 6 PK ISBN 002286637X	3.1.7.E.a., 3.4.7.C.a., 3.6.7.C.h., 3.6.7.C.j.	T	800	<i>Motion and Energy at Play</i> explains how the science of physics is applied in bicycling, skateboarding, and inline skating. Simple machines are discussed, and the force of friction is defined and discussed.	accelerate friction gravity inertia physics
<b>Nature's Partners</b> ISBN 0022859047 6 PK ISBN 0022866264	3.3.7.A.a., 3.3.7.A.c., 3.3.7.D.a.	P	530	<i>Nature's Partners</i> describes and gives examples of symbiosis, mutualism, and commensalism. Examples of each type of relationship are pictured and described. For example, the relationship between sea anemone and clownfish is used to illustrate mutualism.	commensalism mutualism organism parasitism symbiosis
<b>One-Celled Organisms *</b> ISBN 0022847030 6 PK ISBN 0022864881	3.2.7.A.d., 3.3.7.B.a. 3.3.7.B.b., 3.3.7.B.c. 3.3.7.D.a., 3.8.7.C.b.	U	730	<i>One-Celled Organisms</i> discusses cells and microscopes. It also explores classification and gives a description of various types of one-celled organisms, including Monera, Protists, and Fungi.	bacteria cell fungi/fungus microbe protist

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TITLE	PA STANDARDS ADDRESSED	GR LEVEL	LEXILE LEVEL	BOOK SUMMARY	VOCABULARY
<b>Periodic Table Families</b> ISBN 0022847243 6 PK ISBN 0022865098	3.1.7.C.a., 3.1.7.C.c. 3.2.7.A.c., 3.2.7.A.d. 3.4.7.A.a., 3.4.7.A.c.	V	840	<b>Periodic Table Families</b> defines the term matter and describes the structure of the atom. It also explains how the periodic table was developed, describes states of matter, and discusses the properties of metals, nonmetals, and gases.	atom element matter metal metalloid
<b>Plastics</b> ISBN 0022847278 6 PK ISBN 0022865136	3.2.7.A.b., 3.4.7.A.c. 3.6.7.A.a., 3.6.7.C.c. 3.7.7.A.a.	W	890	<b>Plastics</b> explains how various plastics are made, describes uses and properties of different types of plastics, and emphasizes the importance of recycling plastics.	compound molecule plastic polymer synthetic
<b>Seeds and Spores</b> ISBN 0022861734 6 PK ISBN 0022864938	3.3.7.A.a., 3.3.7.A.c., 3.3.7.C.e., 3.3.7.D.a.	O	770	<b>Seeds and Spores</b> explains how plants are classified based on their method of reproduction, describes the life cycle of plants, and identifies the roles played by animals in the fertilization of plants.	fertilization pollination reproduce seed spores
<b>Shake, Rattle, and Explode *</b> ISBN 0022859098 6 PK ISBN 0022866299	3.5.7.A.b., 3.8.7.A.c., 3.8.7.C.b.	U	660	Volcanoes are the focus of <b>Shake, Rattle, and Explode!</b> Earthquakes, tsunamis, and plate tectonics are also discussed. Significant historical eruptions, such as Krakatau, are described and the December 24, 2004 tsunami is discussed.	erupt lava magma seismograph tsunami
<b>Sir Isaac Newton</b> ISBN 0022859063 6 PK ISBN 0022866353	3.2.7.A.c., 3.2.7.A.d. 3.4.7.C.a., 3.4.7.D.d., 3.7.7.E.e., 3.8.7.C.b.	P	510	<b>Sir Isaac Newton</b> describes Newton's life, his major discoveries, and Newton's three laws of motion. Newton's work on the topic of gravity is also discussed. Each of the three laws of motion is clarified with photos, and experiments to demonstrate the laws of motion are included.	experiment force gravity mass motion
<b>Sonar, Radar, and Lasers</b> ISBN 0022859160 6 PK ISBN 0022863418	3.4.7.C.e., 3.8.7.A.b., 3.8.7.A.c., 3.8.7.C.b.	W	830	<b>Sonar, Radar, and Lasers</b> gives an overview of how these three technologies work and their current and possible future applications.	laser optic fiber radar sonar transmitter
<b>The Sun and Other Stars *</b> ISBN 0022847197 6 PK ISBN 0022865055	3.4.7.B.b., 3.4.7.D.b. 3.4.7.D.g., 3.4.7.D.e., 3.7.7.E.e. 3.8.7.C.b.	U	770	<b>The Sun and Other Stars</b> compares the Sun to other stars, describes eclipses, the life cycle of stars, constellations, galaxies, and the history of astronomy.	astronomer galaxy light year solar system supernova

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TITLE	PA STANDARDS ADDRESSED	GR LEVEL	LEXILE LEVEL	BOOK SUMMARY	VOCABULARY
<b>The Water Cycle *</b> ISBN 0022847138 6 PK ISBN 0022864989	3.5.7.D.a., 3.5.7.D.b., 3.5.7.D.d.	U	900	The importance of water on Earth, the water cycle, aquifers, glaciers, wetlands, and water use management are discussed in <i><b>The Water Cycle</b></i> .	<b>aquifer</b> <b>condense</b> <b>evaporate</b> <b>groundwater</b> <b>precipitation</b>
<b>The Weather Detectives *</b> ISBN 0022847162 6 PK ISBN 0022865020	3.2.7.A.d., 3.5.7.C.a. 3.5.7.C.c., 3.5.7.C.d. 3.5.7.C.e., 3.5.7.C.f. 3.8.7.C.b.	U	840	<i><b>The Weather Detectives</b></i> describes historic and current methods and tools used for weather forecasting. Clouds, air pressure, and humidity are characteristics of weather that are defined and discussed in this book.	<b>air pressure</b> <b>barometer</b> <b>front</b> <b>humidity</b> <b>meteorology</b>
<b>Weird and Wonderful Plants *</b> ISBN 0022847065 6 PK ISBN 002286492X	3.3.7.A.a., 3.3.7.A.c., 3.3.7.D.a.	U	830	<i><b>Weird and Wonderful Plants</b></i> explains the process of photosynthesis. It also describes parasitic plants, semi-parasitic plants, epiphytes, and insect-eating plants.	<b>chlorophyll</b> <b>epiphyte</b> <b>nitrogen</b> <b>parasite</b> <b>photosynthesis</b>
<b>What is GPS?</b> ISBN 0022859055 6 PK ISBN 0022866280	3.8.7.A.a., 3.8.7.A.b., 3.8.7.A.c., 3.8.7.C.a., 3.8.7.C.b.	Q	610	<i><b>What is GPS?</b></i> describes historic methods of navigation and explains how Global Position Systems work and are used. The role of satellites in the function of Global Position Systems is described, and causes of errors in GPS readings are discussed.	<b>GPS (Global</b> <b>Positioning System)</b> <b>latitude</b> <b>longitude</b> <b>orbit</b> <b>satellite</b>
<b>When Energy Changes *</b> ISBN 0022859128 6 PK ISBN 0022866396	3.2.7.A.d., 3.4.7.B.c. 3.4.7.B.d., 3.4.7.C.e. 3.8.7.A.b., 3.8.7.A.c.	T	660	Forms of energy and changes in energy are described in <i><b>When Energy Changes</b></i> . This book also describes uses of solar energy, the history of electricity, how an electric circuit works, and how sound is heard.	<b>circuit</b> <b>electric current</b> <b>energy</b> <b>force</b> <b>solar energy</b>

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# Pennsylvania Academic Standards for Science and Technology

## 3.1.7 Unifying Themes

*Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:*

- 3.1.7.A. Explain the parts of a simple system and their relationship to each other.
- 3.1.7.A.a. • Describe a system as a group of related parts that work together to achieve a desired result (e.g., digestive system).
- 3.1.7.A.b. • Explain the importance of order in a system.
- 3.1.7.A.c. • Distinguish between system inputs, system processes and system outputs.
- 3.1.7.A.d. • Distinguish between open loop and closed loop systems.
- 3.1.7.A.e. • Apply systems analysis to solve problems.
- 3.1.7.A.f. • Identify and apply models as tools for prediction and insight.
- 3.1.7.A.g. • Apply appropriate simple modeling tools and techniques.
- 3.1.7.A.h. • Identify theories that serve as models (e.g., molecules).
- 3.1.7.B. Describe the use of models as an application of scientific or technological concepts.
- 3.1.7.B.a. • Identify and describe different types of models and their functions.
- 3.1.7.B.b. • Apply models to predict specific results and observations (e.g., population growth, effects of infectious organisms).
- 3.1.7.B.c. • Explain systems by outlining a system's relevant parts and its purpose and/or designing a model that illustrates its function.
- 3.1.7.C. Identify patterns as repeated processes or recurring elements in science and technology.
- 3.1.7.C.a. • Identify different forms of patterns and use them to group and classify specific objects.
- 3.1.7.C.b. • Identify repeating structure patterns.
- 3.1.7.C.c. • Identify and describe patterns that occur in physical systems (e.g., construction, manufacturing, transportation), informational systems and biochemical-related systems.
- 3.1.7.D. Explain scale as a way of relating concepts and ideas to one another by some measure.
- 3.1.7.D.a. • Apply various applications of size and dimensions of scale to scientific, mathematical, and technological applications.
- 3.1.7.D.b. • Describe scale as a form of ratio and apply to a life situation.
- 3.1.7.E. Identify change as a variable in describing natural and physical systems.
- 3.1.7.E.a. • Describe fundamental science and technology concepts that could solve practical problems.
- 3.1.7.E.b. • Explain how ratio is used to describe change.
- 3.1.7.E.c. • Describe the effect of making a change in one part of a system on the system as a whole.

### 3.2.7 Inquiry and Design

*Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:*

- 3.2.7.A. Explain and apply scientific and technological knowledge.
  - 3.2.7.A.a. • Distinguish between a scientific theory and a belief.
  - 3.2.7.A.b. • Answer “What if” questions based on observation, inference or prior knowledge or experience.
  - 3.2.7.A.c. • Explain how skepticism about an accepted scientific explanation led to a new understanding.
  - 3.2.7.A.d. • Explain how new information may change existing theories and practice.
- 3.2.7.B. Apply process knowledge to make and interpret observations.
  - 3.2.7.B.a. • Measure materials using a variety of scales.
  - 3.2.7.B.b. • Describe relationships by making inferences and predictions.
  - 3.2.7.B.c. • Communicate, use space / time relationships, define operationally, raise questions, formulate hypotheses, test and experiment,
  - 3.2.7.B.d. • Design controlled experiments, recognize variables, and manipulate variables.
  - 3.2.7.B.e. • Interpret data, formulate models, design models, and produce solutions.
- 3.2.7.C. Identify and use the elements of scientific inquiry to solve problems.
  - 3.2.7.C.a. • Generate questions about objects, organisms and/or events that can be answered through scientific investigations.
  - 3.2.7.C.b. • Evaluate the appropriateness of questions.
  - 3.2.7.C.c. • Design an investigation with limited variables to investigate a question.
  - 3.2.7.C.d. • Conduct a two-part experiment.
  - 3.2.7.C.e. • Judge the significance of experimental information in answering the question.
  - 3.2.7.C.f. • Communicate appropriate conclusions from the experiment.
- 3.2.7.D. Know and use the technological design process to solve problems.
  - 3.2.7.D.a. • Define different types of problems.
  - 3.2.7.D.b. • Define all aspects of the problem, necessary information and questions that must be answered.
  - 3.2.7.D.c. • Propose the best solution.
  - 3.2.7.D.d. • Design and propose alternative methods to achieve solutions.
  - 3.2.7.D.e. • Apply a solution.
  - 3.2.7.D.f. • Explain the results, present improvements, identify and infer the impacts of the solution.

### 3.3.7 Biological Sciences

*Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:*

- 3.3.7.A. Describe the similarities and differences that characterize diverse living things.
  - 3.3.7.A.a. • Describe how the structures of living things help them function in unique ways.

- 3.3.7.A.b. • Explain how to use a dichotomous key to identify plants and animals.
  - 3.3.7.A.c. • Account for adaptations among organisms that live in a particular environment.
  - 3.3.7.B. Describe the cell as the basic structural and functional unit of living things.
  - 3.3.7.B.a. • Identify the levels of organization from cell to organism.
  - 3.3.7.B.b. • Compare life processes at the organism level with life processes at the cell level.
  - 3.3.7.B.c. • Explain that cells and organisms have particular structures that underlie their functions.
  - 3.3.7.B.d. • Describe and distinguish among cell cycles, reproductive cycles and life cycles.
  - 3.3.7.B.e. • Explain disease effects on structures or functions of an organism.
  - 3.3.7.C. Know that every organism has a set of genetic instructions that determines its inherited traits.
  - 3.3.7.C.a. • Identify and explain inheritable characteristics.
  - 3.3.7.C.b. • Identify that the gene is the basic unit of inheritance.
  - 3.3.7.C.c. • Identify basic patterns of inheritance (e.g., dominance, recessive, co-dominance).
  - 3.3.7.C.d. • Describe how traits are inherited.
  - 3.3.7.C.e. • Distinguish how different living things reproduce (e.g., vegetative budding, sexual).
  - 3.3.7.C.f. • recognize that mutations can alter a gene.
  - 3.3.7.C.g. • Describe how selective breeding, natural selection and genetic technologies can change genetic makeup of organisms.
  - 3.3.7.D. Explain basic concepts of natural selection.
  - 3.3.7.D.a. • Identify adaptations that allow organisms to survive in their environment.
  - 3.3.7.D.b. • Describe how an environmental change can affect the survival of organisms and entire species.
  - 3.3.7.D.c. • know that differences in individuals of the same species may give some advantage in surviving and reproducing.
  - 3.3.7.D.d. • recognize that populations of organisms can increase rapidly.
  - 3.3.7.D.e. • Describe the role that fossils play in studying the past.
  - 3.3.7.D.f. • Explain how biologic extinction is a natural process.
- Ecosystem Standards are in the Environment and Ecology Standard Category (4.6).

### **3.4.7 Physical Science, Chemistry and Physics**

*Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:*

- 3.4.7.A. Describe concepts about the structure and properties of matter.
- 3.4.7.A.a. • Identify elements as basic building blocks of matter that cannot be broken down chemically.
- 3.4.7.A.b. • Distinguish compounds from mixtures.
- 3.4.7.A.c. • Describe and conduct experiments that identify chemical and physical properties.
- 3.4.7.A.d. • Describe reactants and products of simple chemical reactions.
- 3.4.7.B. Relate energy sources and transfers to heat and temperature.

- 3.4.7.B.a. • Identify and describe sound changes in moving objects.
  - 3.4.7.B.b. • Know that the sun is a major source of energy that emits wavelengths of visible light, infrared and ultraviolet radiation.
  - 3.4.7.B.c. • Explain the conversion of one form of energy to another by applying knowledge of each form of energy.
  - 3.4.7.B.d. • Explain the parts and functions in an electrical circuit.
  - 3.4.7.C. Identify and explain the principles of force and motion.
    - 3.4.7.C.a. • Describe the motion of an object based on its position, direction and speed.
    - 3.4.7.C.b. • Classify fluid power systems according to fluid used or mode of power transmission (e.g., air, oil).
    - 3.4.7.C.c. • Explain various motions using models.
    - 3.4.7.C.d. • Explain how convex and concave mirrors and lens change light images.
    - 3.4.7.C.e. • Explain how sound and light travel in waves of differing speeds, sizes and frequencies.
  - 3.4.7.D. Describe essential ideas about the composition and structure of the universe and the earth's place in it.
    - 3.4.7.D.a. • Compare various planets' characteristics.
    - 3.4.7.D.b. • Describe basic star types and identify the sun as a star type.
    - 3.4.7.D.c. • Describe and differentiate comets, asteroids and meteors.
    - 3.4.7.D.d. • Identify gravity as the force that keeps planets in orbit around the sun and governs the rest of the movement of the solar system and the universe.
    - 3.4.7.D.e. • Illustrate how the positions of stars and constellations change in relation to the Earth during an evening and from month to month.
    - 3.4.7.D.f. • Identify equipment and instruments that explore the universe.
    - 3.4.7.D.g. • Identify the accomplishments and contributions provided by selected past and present scientists in the field of astronomy.
    - 3.4.7.D.h. • Identify and articulate space program efforts to investigate possibilities of living in space and on other planets.
- Refer to Technology Standard Category 3.6 for applied uses of these concepts and principles.

### **3.5.7 Earth Sciences**

*Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:*

- 3.5.7.A. Describe earth features and processes.
  - 3.5.7.A.a. • Describe major layers of the earth.
  - 3.5.7.A.b. • Describe the processes involved in the creation of geologic features (e.g., folding, faulting, volcanism, sedimentation) and that these processes seen today (e.g., erosion, weathering crustal plate movement) are similar to those in the past.
  - 3.5.7.A.c. • Describe the processes that formed Pennsylvania geologic structures and resources including mountains, glacial formations water gaps and ridges.
  - 3.5.7.A.d. • Explain how the rock cycle affected rock formations in the state of Pennsylvania.
  - 3.5.7.A.e. • Distinguish between examples of rapid surface changes (e.g., landslides, earthquakes) and slow surface changes (e.g., weathering).
- 3.5.7.B. Recognize earth resources and how they affect everyday life.
  - 3.5.7.B.a. • Identify and locate significant earth resources (e.g., rock types, oil, gas, coal deposits) in Pennsylvania.
  - 3.5.7.B.b. • Explain the processes involved in the formation of oil and coal in Pennsylvania.

- 3.5.7.B.c. • Explain the value and uses of different earth resources (e.g., selected minerals, ores, fuel sources, agricultural uses).
  - 3.5.7.B.d. • Compare the locations of human settlements as related to available resources.
  - 3.5.7.C. Describe basic elements of meteorology.
  - 3.5.7.C.a. • Explain weather forecasts by interpreting weather data and symbols.
  - 3.5.7.C.b. • Explain the oceans' impact on local weather and the climate of a region.
  - 3.5.7.C.c. • Identify how cloud types, wind directions and barometric pressure changes are associated with weather patterns in different regions of the country.
  - 3.5.7.C.d. • Explain and illustrate the processes of cloud formation and precipitation.
  - 3.5.7.C.e. • Describe and illustrate the major layers of the earth's atmosphere.
  - 3.5.7.C.f. • Identify different air masses and global wind patterns and how they relate to the weather patterns in different regions of the U.S.
  - 3.5.7.D. Explain the behavior and impact of the earth's water systems.
  - 3.5.7.D.a. • Explain the water cycle using the processes of evaporation and condensation.
  - 3.5.7.D.b. • Describe factors that affect evaporation and condensation.
  - 3.5.7.D.c. • Distinguish salt from fresh water (e.g., density, electrical conduction).
  - 3.5.7.D.d. • Compare the effect of water type (e.g., polluted, fresh, salt water) and the life contained in them.
  - 3.5.7.D.e. • Identify ocean and shoreline features, (e.g., bays, inlets, spit, tidal marshes).
- Refer to Environment and Ecology Standards Categories 4.1, 4.3, 4.8 for standards that deal with environmental impact of Earth structures and forces.

### **3.6.7 Technology Education**

*Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:*

- 3.6.7.A. Explain biotechnologies that relate to related technologies of propagating, growing, maintaining, adapting, treating and converting.
- 3.6.7.A.a. • Identify the environmental, societal and economic impacts that waste has in the environment.
- 3.6.7.A.b. • Identify and explain the impact that a specific medical advancement has had on society.
- 3.6.7.A.c. • Explain the factors that were taken into consideration when a specific object was designed.
- 3.6.7.A.d. • Define and describe how fuels and energy can be generated through the process of biomass conversion.
- 3.6.7.A.e. • Identify and group basic plant and animal production processes.
- 3.6.7.A.f. • explain the impact that agricultural science has had on biotechnology.
- 3.6.7.B. Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.
- 3.6.7.B.a. • Demonstrate the effectiveness of image generating technique to communicate a story (e.g., photography, video).
- 3.6.7.B.b. • Analyze and evaluate the effectiveness of a graphic object designed and produced to communicate a thought or concept.
- 3.6.7.B.c. • Apply basic technical drawing techniques to communicate an idea or solution to a problem.
- 3.6.7.B.d. • Apply the appropriate method of communications technology to communicate a thought.

- 3.6.7.C. Explain physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design.
- 3.6.7.C.a. • Use knowledge of material effectiveness to solve specific construction problems (e.g., steel vs. wood bridges).
  - 3.6.7.C.b. • Differentiate among the different types of construction applications (e.g., microwave tower, power plants, aircrafts).
  - 3.6.7.C.c. • Explain basic material processes that manufactured objects undergo during production. (e.g., separating, forming, combining).
  - 3.6.7.C.d. • Evaluate a construction activity by specifying task analyses and necessary resources.
  - 3.6.7.C.e. • Explain the relationships among the basic resources needed in the production process for a specific manufactured object.
  - 3.6.7.C.f. • Explain the difference between design engineering and production engineering processes.
  - 3.6.7.C.g. • Analyze manufacturing steps that affect waste and pollutants.
  - 3.6.7.C.h. • Explain transportation technologies of propelling, structuring, suspending, guiding, controlling and supporting.
  - 3.6.7.C.i. • Identify and explain the workings of several mechanical power systems.
  - 3.6.7.C.j. • Model and explain examples of vehicular propulsion, control, guidance, structure and suspension systems.
  - 3.6.7.C.k. • Explain the limitations of land, marine, air and space transportation systems.

### 3.7.7 Technological Devices

*Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:*

- 3.7.7.A. Describe the safe and appropriate use of tools, materials and techniques to answer questions and solve problems.
- 3.7.7.A.a. • Identify uses of tools, machines, materials, information, people, money, energy and time that meet specific design criteria.
  - 3.7.7.A.b. • Describe safe procedures for using tools and materials.
  - 3.7.7.A.c. • Assess materials for appropriateness of use.
- 3.7.7.B. Use appropriate instruments and apparatus to study materials.
- 3.7.7.B.a. • Select appropriate instruments to measure the size, weight, shape and temperature of living and non-living objects.
  - 3.7.7.B.b. • Apply knowledge of different measurement systems to measure and record objects' properties.
- Computer literacy, including the use of hardware and software in standard statements C, D, and E, should be integrated across all content areas.
- 3.7.7.C. Apply basic computer operations and concepts.
- 3.7.7.C.a. • Identify solutions to basic hardware and software problems.
  - 3.7.7.C.b. • Apply knowledge of advanced input devices.
  - 3.7.7.C.c. • Apply knowledge of hardware setup.
  - 3.7.7.C.d. • Describe the process for basic software installation and demonstrate it.
  - 3.7.7.C.e. • Analyze and solve basic operating systems problems.
  - 3.7.7.C.f. • Apply touch keyboarding skills and techniques at expectable speed and accuracy.
  - 3.7.7.C.g. • Demonstrate the ability to perform basic software installation.
- 3.7.7.D. Utilize computer software to solve specific problems.
- 3.7.7.D.a. • Identify legal restrictions in the use of software and the output of data.

- 3.7.7.D.b. • Apply advanced graphic manipulation and desktop publishing techniques.
- 3.7.7.D.c. • Apply basic multimedia applications.
- 3.7.7.D.d. • Apply advanced word processing, database and spreadsheet skills.
- 3.7.7.D.e. • Describe and demonstrate how two or more software applications can be used to produce an output.
- 3.7.7.D.f. • Select and apply software designed to meet specific needs.
- 3.7.7.E. Apply basic computer communications systems.
- 3.7.7.E.a. • Identify and explain various types of on-line services.
- 3.7.7.E.b. • Identify and explain the function of the parts of a basic network.
- 3.7.7.E.c. • Describe and apply the components of a web page and their function.
- 3.7.7.E.d. • Explain and demonstrate file transfer within and out side of a computer network.
- 3.7.7.E.e. • Identify, describe and complete advanced on-line research.

### **3.8.7 Science, Technology and Human Endeavors**

*Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:*

- 3.8.7.A. Explain how sciences and technologies are limited in their effects and influences on society.
- 3.8.7.A.a. • Identify and describe the unavoidable constraints of technological design.
- 3.8.7.A.b. • Identify changes in society as a result of a technological development.
- 3.8.7.A.c. • Identify and explain improvements in transportation, health, sanitation and communications as a result of advancements in science and technology and how they effect our lives.
- 3.8.7.B. Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.
- 3.8.7.B.a. • Identify interrelationships between systems and resources.
- 3.8.7.B.c. • Identify and explain specific examples of how agricultural science has met human needs and has improved the quality of life.
- 3.8.7.C. Identify the pros and cons of applying technological and scientific solutions to address problems and the effect upon society.
- 3.8.7.C.a. • Describe the positive and negative expected and unexpected effects of specific technological developments.
- 3.8.7.C.b. • Describe ways technology extends and enhances human abilities.