

The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

## Life Science

- The learner will be able to identify those items that can be recycled and those that can not.  
Source: PA Standards, 2002, Grade 4, 4.2.4.D
- The learner will be able to identify use of reusable products.  
Source: PA Standards, 2002, Grade 4, 4.2.4.D
- The learner will be able to identify the use of compost, landfills and incinerators.  
Source: PA Standards, 2002(a), Grade 4, 4.2.4.D
- The learner will be able to identify actions that can prevent or reduce waste pollution.  
Source: PA Standards, 2002(a), Grade 4, 4.3.4.A
- The learner will be able to identify how human actions affect environmental health.  
Source: PA Standards, 2002(a), Grade 4, 4.3.4.B
- The learner will be able to identify and categorize living and nonliving things.  
Source: PA Standards, 2002, Grade 4, 4.6.4.A
- The learner will be able to identify differences in living things.  
Source: PA Standards, 2002, Grade 4, 4.7.4.A
- The learner will be able to explain what happens to a living thing when its food, water, shelter or space is changed.  
Source: PA Standards, 2002(a), Grade 4, 4.7.4.B
- The learner will be able to explain how the recycling law impacts the school and home.  
Source: PA Standards, 2002, Grade 4, 4.9.4.A

## Earth and Space Science

- The learner will be able to explain how human activities may change the environment.  
Source: PA Standards, 2002, Grade 4, 4.8.4.C
- The learner will be able to identify everyday human activities and how they affect the environment.  
Source: PA Standards, 2002, Grade 4, 4.8.4.C
- The learner will be able to identify examples of how human activities within a community affect the natural environment.  
Source: PA Standards, 2002(a), Grade 4, 4.8.4.C
- The learner will be able to explain the influence of climate on how and where people live.  
Source: PA Standards, 2002(a), Grade 4, 4.8.4.B

## Unifying Themes

- The learner will be able to recognize change in natural and physical systems.  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.E
- The learner will be able to examine and explain change by using time and measurement.  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.E

## Inquiry and Design

- The learner will be able to describe objects in the world using the five senses.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.B
- The learner will be able to recognize observational descriptors from each of the five senses (e.g., see-blue, feel-rough).  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.B
- The learner will be able to use observations to develop a descriptive vocabulary.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.B
- The learner will be able to conduct an experiment.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.C
- The learner will be able to state a conclusion that is consistent with the information.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.C

- The learner will be able to identify possible solutions and their course of action.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.D

## Biological Sciences

- The learner will be able to know the similarities and differences of living things.  
Source: PA Standards, 2002(a), Grade 4, 3.3.4.A
- The learner will be able to identify life processes of living things (e.g., growth, digestion, react to environment).  
Source: PA Standards, 2002(a), Grade 4, 3.3.4.A

## Earth Sciences

- The learner will be able to explain how the different seasons effect plants, animals, food availability and daily human life.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.C

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## Life Science

- The learner will be able to identify needs of people.  
Source: PA Standards, 2002, Grade 4, 4.2.4.A
- The learner will be able to know that plants, animals and humans are dependent on air and water.  
Source: PA Standards, 2002(a), Grade 4, 4.3.4.A
- The learner will be able to know that all living things need air and water to survive.  
Source: PA Standards, 2002(a), Grade 4, 4.3.4.A
- The learner will be able to identify things that cause sickness when put into the air, water or soil.  
Source: PA Standards, 2002(a), Grade 4, 4.3.4.A
- The learner will be able to identify different areas where health can be affected by air, water or land pollution.  
Source: PA Standards, 2002(a), Grade 4, 4.3.4.A
- The learner will be able to describe how people can reduce pollution.  
Source: PA Standards, 2002, Grade 4, 4.3.4.B
- The learner will be able to identify people's basic needs.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.A
- The learner will be able to identify what plants and animals need to grow.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.C
- The learner will be able to describe the basic needs of an organism.  
Source: PA Standards, 2002, Grade 4, 4.6.4.A

- The learner will be able to identify basic needs of a plant and an animal and explain how their needs are met.  
Source: PA Standards, 2002, Grade 4, 4.6.4.A
- The learner will be able to identify how the environment provides for the needs of people.  
Source: PA Standards, 2002(a), Grade 4, 4.2.4.A

## Earth and Space Science

- The learner will be able to identify plants, animals, water, air, minerals and fossil fuels as natural resources.  
Source: PA Standards, 2002, Grade 4, 4.2.4.A
- The learner will be able to identify products derived from natural resources.  
Source: PA Standards, 2002, Grade 4, 4.2.4.B
- The learner will be able to identify products made from trees.  
Source: PA Standards, 2002(a)Grade 4, 4.2.4.B
- The learner will be able to know that some natural resources have limited life spans.  
Source: PA Standards, 2002, Grade 4, 4.2.4.C
- The learner will be able to identify various means of conserving natural resources.  
Source: PA Standards, 2002, Grade 4, 4.2.4.C
- The learner will be able to identify several ways that people use natural resources.  
Source: PA Standards, 2002(a), Grade 4, 4.8.4.A
- The learner will be able to explain how human activities may change the environment.  
Source: PA Standards, 2002, Grade 4, 4.8.4.C
- The learner will be able to identify examples of how human activities within a community affect the natural environment.  
Source: PA Standards, 2002(a), Grade 4, 4.8.4.C
- The learner will be able to know the importance of natural resources in daily life.  
Source: PA Standards, 2002, Grade 4, 4.8.4.D
- The learner will be able to identify items used in daily life that come from natural resources.  
Source: PA Standards, 2002(a), Grade 4, 4.8.4.D

- The learner will be able to identify ways to conserve our natural resources.  
Source: PA Standards, 2002, Grade 4, 4.8.4.D
- The learner will be able to identify by-products of plants and animals.  
Source: PA Standards, 2002(a), Grade 4, 4.2.4.B
- The learner will be able to identify how regional natural resources influence what people use.  
Source: PA Standards, 2002(a), Grade 4, 4.8.4.B

## Inquiry and Design

- The learner will be able to provide clear explanations that account for observations and results.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.A
- The learner will be able to conduct an experiment.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.C
- The learner will be able to state a conclusion that is consistent with the information.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.C
- The learner will be able to identify possible solutions and their course of action.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.D

## Biological Sciences

- The learner will be able to know the similarities and differences of living things.  
Source: PA Standards, 2002(a), Grade 4, 3.3.4.A
- The learner will be able to describe basic needs of plants and animals.  
Source: PA Standards, 2002(a), Grade 4, 3.3.4.A
- The learner will be able to identify characteristics for animal and plant survival in different climates.  
Source: PA Standards, 2002(a), Grade 4, 3.3.4.C

## Physical Science, Chemistry and Physics

- The learner will be able to recognize basic concepts about the structure and properties of matter.  
Source: PA Standards, 2002(a), Grade 4, 3.4.4.A

- The learner will be able to describe properties of matter (e.g., hardness, reactions to simple chemical tests).  
Source: PA Standards, 2002(a), Grade 4, 3.4.4.A
- The learner will be able to know that combining two or more substances can make new materials with different properties.  
Source: PA Standards, 2002(a), Grade 4, 3.4.4.A
- The learner will be able to know different material characteristics (e.g., texture, state of matter, solubility).  
Source: PA Standards, 2002(a), Grade 4, 3.4.4.A

## Earth Sciences

- The learner will be able to identify the composition of soil as weathered rock and decomposed organic remains.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.A
- The learner will be able to describe fossils and the type of environment they lived in (e.g., tropical, aquatic, desert).  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.A
- The learner will be able to know types and uses of earth materials.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.B
- The learner will be able to identify uses of various earth materials (e.g., buildings, highways, fuels, growing plants).  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.B
- The learner will be able to identify and sort earth materials according to a classification key.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.B
- The learner will be able to recognize the earth's different water resources.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.D
- The learner will be able to know that approximately three-fourths of the earth is covered by water.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.D
- The learner will be able to identify examples of water in the form of solid, liquid and gas on or near the surface of the earth.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.D

## Technology Education

- The learner will be able to identify waste management treatment processes.  
Source: PA Standards, 2002(a), Grade 4, 3.6.4.A
- The learner will be able to identify waste and pollution resulting from a manufacturing enterprise.  
Source: PA Standards, 2002(a), Grade 4, 3.6.4.C

## Science, Technology, and Human Endeavors

- The learner will be able to know that people select, create and use science and technology and that they are limited by social and physical restraints.  
Source: PA Standards, 2002(a), Grade 4, 3.8.4.A
- The learner will be able to identify how physical technology (e.g., construction, manufacturing, transportation), informational technology and biotechnology are used to meet human needs.  
Source: PA Standards, 2002(a), Grade 4, 3.8.4.A
- The learner will be able to describe how scientific discoveries and technological advancements are related.  
Source: PA Standards, 2002(a), Grade 4, 3.8.4.A
- The learner will be able to identify interrelationships among technology, people and their world.  
Source: PA Standards, 2002(a), Grade 4, 3.8.4.A
- The learner will be able to know how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.  
Source: PA Standards, 2002(a), Grade 4, 3.8.4.B
- The learner will be able to identify and distinguish between human needs and improving the quality of life.  
Source: PA Standards, 2002(a), Grade 4, 3.8.4.B
- The learner will be able to identify and distinguish between natural and human-made resources.  
Source: PA Standards, 2002(a), Grade 4, 3.8.4.B
- The learner will be able to identify and discuss examples of technological change in the community that have both positive and negative impacts.  
Source: PA Standards, 2002(a), Grade 4, 3.8.4.C

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## Life Science

- The learner will be able to identify common animals found on Pennsylvania farms.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.B
- The learner will be able to identify common plants found on Pennsylvania farms.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.B
- The learner will be able to identify a fiber product from Pennsylvania farms.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.B
- The learner will be able to know that food and fiber originate from plants and animals.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.C
- The learner will be able to describe the journey of a local agricultural product from production to the consumer.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.C
- The learner will be able to identify animals that live underground.  
Source: PA Standards, 2002(a), Grade 4, 4.6.4.A
- The learner will be able to understand the concept of cycles.  
Source: PA Standards, 2002(a), Grade 4, 4.6.4.B
- The learner will be able to identify local plants or animals and describe their habitat.  
Source: PA Standards, 2002, Grade 4, 4.7.4.A
- The learner will be able to define and understand extinction.  
Source: PA Standards, 2002, Grade 4, 4.7.4.C
- The learner will be able to identify plants and animals that are extinct.  
Source: PA Standards, 2002(a), Grade 4, 4.7.4.C
- The learner will be able to explain why some plants and animals are extinct.  
Source: PA Standards, 2002, Grade 4, 4.7.4.C
- The learner will be able to know that there are local and state laws regarding plants and animals.  
Source: PA Standards, 2002(a), Grade 4, 4.7.4.C
- The learner will be able to identify local and state laws and regulations regarding the environment.  
Source: PA Standards, 2002(a), Grade 4, 4.9.4.A
- The learner will be able to identify and describe the role of a local or state agency that deals with environmental laws and regulations.  
Source: PA Standards, 2002, Grade 4, 4.9.4.A
- The learner will be able to know the importance of agriculture to humans.  
Source: PA Standards, 2002, Grade 4, 4.4.4.A
- The learner will be able to know how people depend on agriculture.  
Source: PA Standards, 2002, Grade 4, 4.4.4.A
- The learner will be able to know that there are laws and regulations for the environment.  
Source: PA Standards, 2002, Grade 4, 4.9.4.A
- The learner will be able to explain the influence of agriculture on food, clothing, shelter and culture from one area to another.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.A
- The learner will be able to identify the role of the sciences in Pennsylvania agriculture.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.B
- The learner will be able to identify the parts of important agricultural related plants (i.e., corn, soybeans, barley).  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.B
- The learner will be able to identify agricultural products that are local and regional.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.C

- The learner will be able to identify an agricultural product based on its origin.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.C
- The learner will be able to describe several products and tell their origins.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.C
- The learner will be able to identify technology and energy use associated with agriculture.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.D
- The learner will be able to identify the various tools and machinery necessary for farming.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.D
- The learner will be able to identify the types of energy used in producing food and fiber.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.D
- The learner will be able to identify tools and machinery used in the production of agricultural products.  
Source: PA Standards, 2002(a), Grade 4, 4.4.4.D
- The learner will be able to identify environmental variables that affect plant growth.  
Source: PA Standards, 2002, Grade 4, 4.6.4.A
- The learner will be able to know that natural and human-made objects are made up of parts.  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.A
- The learner will be able to identify and describe what parts make up a system.  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.A
- The learner will be able to identify system parts that are natural and human-made (e.g., ball point pen, simple electrical circuits, plant anatomy).  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.A
- The learner will be able to identify and apply models as tools for prediction and insight.  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.B
- The learner will be able to apply appropriate simple modeling tools and techniques.  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.B
- The learner will be able to illustrate patterns that regularly occur and reoccur in nature.  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.C
- The learner will be able to identify observable patterns (e.g., growth patterns in plants, crystal shapes in minerals, climate, structural patterns in bird feathers).  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.C
- The learner will be able to use knowledge of natural patterns to predict next occurrences (e.g., seasons, leaf patterns, lunar phases).  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.C
- The learner will be able to describe relative motion.  
Source: PA Standards, 2002(a), Grade 4, 3.1.4.E

## Earth and Space Science

- The learner will be able to identify types of precipitation.  
Source: PA Standards, 2002, Grade 4, 4.1.4.B
- The learner will be able to explain air, water and nutrient cycles.  
Source: PA Standards, 2002(a), Grade 4, 4.2.4.A
- The learner will be able to identify renewable and nonrenewable resources used in the local community.  
Source: PA Standards, 2002(a), Grade 4, 4.2.4.C
- The learner will be able to explain the water cycle.  
Source: PA Standards, 2002, Grade 4, 4.6.4.B
- The learner will be able to identify major land uses in the community.  
Source: PA Standards, 2002(a), Grade 4, 4.8.4.D

## Unifying Themes

## Inquiry and Design

- The learner will be able to provide clear explanations that account for observations and results.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.A
- The learner will be able to relate how new information can change existing perceptions.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.A
- The learner will be able to recognize and use the elements of scientific inquiry to solve problems.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.C

- The learner will be able to conduct an experiment.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.C
- The learner will be able to state a conclusion that is consistent with the information.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.C
- The learner will be able to identify possible solutions and their course of action.  
Source: PA Standards, 2002(a), Grade 4, 3.2.4.D

### Physical Science, Chemistry and Physics

- The learner will be able to observe and describe different types of force and motion.  
Source: PA Standards, 2002(a), Grade 4, 3.4.4.C
- The learner will be able to describe various types of motions.  
Source: PA Standards, 2002(a), Grade 4, 3.4.4.C
- The learner will be able to compare the relative movement of objects and describe types of motion that are evident.  
Source: PA Standards, 2002(a), Grade 4, 3.4.4.C

### Earth Sciences

- The learner will be able to know basic weather elements.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.C
- The learner will be able to identify cloud types.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.C
- The learner will be able to identify weather patterns from data charts (including temperature, wind direction and speed, precipitation) and graphs of the data.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.C
- The learner will be able to know that approximately three-fourths of the earth is covered by water.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.D
- The learner will be able to explain and illustrate evaporation and condensation.  
Source: PA Standards, 2002(a), Grade 4, 3.5.4.D

### Technology Education

- The learner will be able to identify agricultural and industrial production processes that involve plants and animals.  
Source: PA Standards, 2002(a), Grade 4, 3.6.4.A
- The learner will be able to describe how biotechnology has impacted various aspects of daily life (e.g., health care, agriculture, waste treatment).  
Source: PA Standards, 2002(a), Grade 4, 3.6.4.A
- The learner will be able to demonstrate the ability to communicate an idea by applying basic sketching and drawing techniques.  
Source: PA Standards, 2002(a), Grade 4, 3.6.4.B
- The learner will be able to identify examples of manufactured goods present in the home and school.  
Source: PA Standards, 2002(a), Grade 4, 3.6.4.C
- The learner will be able to identify basic resources needed to produce a manufactured item.  
Source: PA Standards, 2002(a), Grade 4, 3.6.4.C
- The learner will be able to identify basic component operations in a specific manufacturing enterprise (e.g., cutting, shaping, attaching).  
Source: PA Standards, 2002(a), Grade 4, 3.6.4.C
- The learner will be able to explain and demonstrate the concept of manufacturing (e.g., assemble a set of papers or ball point pens sequentially, mass produce an object).  
Source: PA Standards, 2002(a), Grade 4, 3.6.4.C

### Technological Devices

- The learner will be able to select appropriate instruments to study materials.  
Source: PA Standards, 2002(a), Grade 4, 3.7.4.B
- The learner will be able to explain appropriate instrument selection for specific tasks.  
Source: PA Standards, 2002(a), Grade 4, 3.7.4.B
- The learner will be able to use on-line searches to answer age appropriate questions.  
Source: PA Standards, 2002(a), Grade 4, 3.7.4.E

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## Earth and Space Science

- The learner will be able to identify the earth's composition: solid rocks, soil, water, and atmospheric gases.  
Source: National Science Education Standards, 1996, Grades K-4, p. 134
- The learner will be able to recognize the composition of soil as being decomposed organic remains and weathered rock.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.5.4.A
- The learner will be able to recognize the uses of Earth materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.5.4.B
- The learner will be able to comprehend the types of earth materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.5.4.B
- The learner will be able to comprehend the uses of earth materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.5.4.B
- The learner will be able to understand that the Earth's surface changes slowly (e.g., weathering) and quickly (e.g., earthquakes).  
Source: National Science Education Standards, 1996, Grades K-4, p. 134

- The learner will be able to explain the differences between moving and still water.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.B
- The learner will be able to explain why water moves or does not move.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.B

## Life Science

- The learner will be able to recognize the life processes of living things.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.A
- The learner will be able to comprehend the similarities and differences of living things.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.A
- The learner will be able to recognize alterations in organisms over time.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.D
- The learner will be able to understand that living things have different structures that serve different functions.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.B
- The learner will be able to understand that living things may have similar external characteristics.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.A
- The learner will be able to understand that similarities and differences in an organisms external features is associated with its' environmental habitat.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.A
- The learner will be able to determine how different structures of a living thing work together to make the organism function.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.B
- The learner will be able to comprehend that traits are inherited and therefore offspring resemble their parents.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.C

- The learner will be able to describe potentially dangerous pest controls used in the home.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.A
- The learner will be able to know types of pests.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.A
- The learner will be able to identify classifications of pests.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.A
- The learner will be able to identify and categorize pests.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.A
- The learner will be able to know how pests fit into a food chain.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.A
- The learner will be able to explain pest control.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.B
- The learner will be able to know reasons why people control pests.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.B
- The learner will be able to identify different methods for controlling specific pests in the home, school and community.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.B
- The learner will be able to identify chemical labels (e.g., caution, poison, warning).  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.B
- The learner will be able to understand society's need for integrated pest management.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.C
- The learner will be able to identify integrated pest management practices in the home.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.C
- The learner will be able to identify integrated pest management practices outside the home.  
Source: PA Standards, 2002(a), Grade 4, 4.5.4.C
- The learner will be able to describe how certain insects interact with soil for their needs.  
Source: PA Standards, 2002(a), Grade 4, 4.6.4.A
- The learner will be able to understand the concept of cycles.  
Source: PA Standards, 2002(a), Grade 4, 4.6.4.B

- The learner will be able to identify characteristics that living things inherit from their parents.  
Source: PA Standards, 2002, Grade 4, 4.7.4.A

### Physical Science

- The learner will be able to identify the properties of sound.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.C
- The learner will be able to comprehend sources of energy.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.B

### Research and Inquiry

- The learner will be able to explain the solution to a problem, recognize its effects, and make modifications if necessary.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to comprehend that people choose, create, and apply science and technology, which is limited by social and physical constraints.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.8.4.A
- The learner will be able to provide explanations that account for results.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.A
- The learner will be able to form plausible explanations from data based on observations.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.A
- The learner will be able to identify observational descriptors from each of the five senses.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.B
- The learner will be able to utilize observations to develop a descriptive vocabulary.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.B

- The learner will be able to plan a scientific investigation.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.C
- The learner will be able to formulate questions about objects, organisms, and/or events that can be answered through scientific exploration.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.C
- The learner will be able to recognize positive and negative impacts that result from or are influenced by new tools or techniques.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.8.4.A
- The learner will be able to explain positive and negative impacts that result from or are influenced by new tools or techniques.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.8.4.A
- The learner will be able to describe appropriate instrument choices for specific tasks.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.7.4.B
- The learner will be able to choose suitable instruments to study materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.7.4.B
- The learner will be able to identify a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to recognize possible solutions to problems and their course of action.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to describe a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to implement a solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to demonstrate the steps taken and results of finding the solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to recognize models as tools for insight and prediction.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B
- The learner will be able to recognize theories that serve as models.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B
- The learner will be able to recognize various types of models.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B
- The learner will be able to comprehend that models are simplifications of objects or processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B
- The learner will be able to utilize basic modeling tools and techniques.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B
- The learner will be able to utilize models as tools for insight and prediction.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B
- The learner will be able to differentiate between a scientific fact and a belief.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.A
- The learner will be able to state a conclusion that is consistent with the data.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.C
- The learner will be able to develop fundamental skills to measure, cut, fasten, and record.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.7.4.B

- The learner will be able to recognize the use of scale as it relates to the measurement of volume, mass, and distance.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.D
- The learner will be able to identify parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.C
- The learner will be able to utilize parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.C
- The learner will be able to perform a scientific investigation.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.C
- The learner will be able to recognize the nature of scientific and technological knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.A
- The learner will be able to utilize the nature of scientific and technological knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.A
- The learner will be able to associate how new information can alter existing perceptions.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.A
- The learner will be able to recognize observable patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.C
- The learner will be able to utilize knowledge of natural patterns to predict future occurrences.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.C
- The learner will be able to illustrate patterns that occur and reoccur on a regular basis in nature.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.C
- The learner will be able to describe change using time and measurement.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.E
- The learner will be able to analyze change using time and measurement.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.E
- The learner will be able to describe the importance of scale in creating models.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.D
- The learner will be able to utilize scale to produce models.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.D

The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

## Earth and Space Science

- The learner will be able to understand that 75% of the Earth's surface is water.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.5.4.D
- The learner will be able to identify earth's place in the solar system.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.D
- The learner will be able to explain earth's place in the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.D
- The learner will be able to explain the structure of the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.D
- The learner will be able to explain the movement of objects in the solar system with respect to day, year, seasons, eclipses and phases of the moon.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.D
- The learner will be able to recognize the planets in our solar system.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.D
- The learner will be able to recognize the general characteristics of planets in our solar system.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.D

- The learner will be able to understand the earth's history (Solar System).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 4, 3.5.4.A
- The learner will be able to identify fish, insects, and amphibians that are found in fresh water.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.C
- The learner will be able to identify plants found in fresh water.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.C
- The learner will be able to recognize the impact of watersheds and wetlands on animals and plants.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.E
- The learner will be able to explain the role of watersheds in everyday life.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.E
- The learner will be able to identify the role of watersheds and wetlands for plants and animals.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.E
- The learner will be able to identify plants, animals, water, air, minerals and fossil fuels as natural resources.  
Source: PA Standards, 2002, Grade 4, 4.2.4.A
- The learner will be able to identify ways to conserve our natural resources.  
Source: PA Standards, 2002, Grade 4, 4.8.4.D

## Life Science

- The learner will be able to recognize human needs.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.8.4.B
- The learner will be able to recognize the life processes of living things (Animal adaptations and habitats).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.A
- The learner will be able to comprehend the similarities and differences of living things.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.A

- The learner will be able to recognize characteristics that allow for plant and animal survival in various climates (Animal adaptations and Habitats).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.C
- The learner will be able to explain the fundamental needs of plants and animals (Animal adaptations and habitats).
  - Source: Supporting PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.A
  - The learner will be able to understand that similarities and differences in an organisms external features is associated with its' environmental habitat ( animal adaptations).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 4, 3.3.4.A
  - The learner will be able to identify various types of water environments.  
Source: PA Standards, 2002, Grade 4, 4.1.4.A
  - The learner will be able to identify the lotic system (e.g., creeks, rivers, streams).  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.A
  - The learner will be able to identify the lentic system (e.g., ponds, lakes, swamps).  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.A
  - The learner will be able to identify living things found in water environments.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.C
  - The learner will be able to identify a wetland and the plants and animals found there.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.D
  - The learner will be able to identify different kinds of wetlands.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.D
  - The learner will be able to identify plants and animals found in wetlands.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.D
  - The learner will be able to explain wetlands as habitats for plants and animals.  
Source: PA Standards, 2002(a), Grade 4, 4.1.4.D
  - The learner will be able to identify pollutants.  
Source: PA Standards, 2002(a), Grade 4, 4.3.4.B
  - The learner will be able to identify sources of pollution.  
Source: PA Standards, 2002, Grade 4, 4.3.4.B
  - The learner will be able to identify litter and its effect on the environment.  
Source: PA Standards, 2002(a), Grade 4, 4.3.4.B
  - The learner will be able to understand that living things are dependent on non-living things in the environment for survival.  
Source: PA Standards, 2002, Grade 4, 4.6.4.A
  - The learner will be able to identify plants and animals with their habitat and food sources.  
Source: PA Standards, 2002, Grade 4, 4.6.4.A
  - The learner will be able to describe how animals interact with plants to meet their needs for shelter.  
Source: PA Standards, 2002, Grade 4, 4.6.4.A
  - The learner will be able to understand the components of a food chain.  
Source: PA Standards, 2002, Grade 4, 4.6.4.A
  - The learner will be able to identify a local ecosystem and its living and nonliving components.  
Source: PA Standards, 2002, Grade 4, 4.6.4.A
  - The learner will be able to identify a simple ecosystem and its living and nonliving components.  
Source: PA Standards, 2002(a), Grade 4, 4.6.4.A
  - The learner will be able to identify how ecosystems change over time.  
Source: PA Standards, 2002, Grade 4, 4.6.4.C
  - The learner will be able to explain why plants and animals are different colors, shapes and sizes and how these differences relate to their survival.  
Source: PA Standards, 2002, Grade 4, 4.7.4.A
  - The learner will be able to explain why each of the four elements in a habitat is essential for survival.  
Source: PA Standards, 2002(a), Grade 4, 4.7.4.A
  - The learner will be able to identify local plants or animals and describe their habitat.  
Source: PA Standards, 2002, Grade 4, 4.7.4.A

- The learner will be able to know that adaptations are important for survival.  
Source: PA Standards, 2002, Grade 4, 4.7.4.B
- The learner will be able to explain how specific adaptations can help a living organism to survive.  
Source: PA Standards, 2002, Grade 4, 4.7.4.B
- The learner will be able to explain what happens to a living thing when its food, water, shelter or space is changed.  
Source: PA Standards, 2002(a), Grade 4, 4.7.4.B
- The learner will be able to define and understand extinction.  
Source: PA Standards, 2002, Grade 4, 4.7.4.C

## Physical Science

- The learner will be able to utilize knowledge of basic electrical circuitry to design and build simple direct current circuits.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.B
- The learner will be able to categorize materials as conductors and nonconductors.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.B
- The learner will be able to recognize forces that attract or repel other objects.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.C
- The learner will be able to demonstrate forces that attract or repel other objects.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.C
- The learner will be able to explain static electricity with regard to attraction, repulsion, and sparks.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.4.4.B
- The learner will be able to show the relationship between electricity and magnetism.  
Source: GA: Quality Core Curriculum, January 2000, Grade Four, #6

## Research and Inquiry

- The learner will be able to explain the solution to a problem, recognize its effects, and make modifications if necessary.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to comprehend that people choose, create, and apply science and technology, which is limited by social and physical constraints.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.8.4.A
- The learner will be able to utilize observations to develop a descriptive vocabulary.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.B
- The learner will be able to choose suitable instruments to study materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.7.4.B
- The learner will be able to identify a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to recognize possible solutions to problems and their course of action.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to describe a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to implement a solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to demonstrate the steps taken and results of finding the solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.D
- The learner will be able to recognize models as tools for insight and prediction.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B

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- The learner will be able to recognize various types of models.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B
  - The learner will be able to comprehend that models are simplifications of objects or processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B
  - The learner will be able to utilize basic modeling tools and techniques.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B
  - The learner will be able to utilize models as tools for insight and prediction.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.B
  - The learner will be able to differentiate between a scientific fact and a belief.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.A
  - The learner will be able to recognize agricultural and industrial production processes where plants and animal are involved.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.6.4.A
  - The learner will be able to identify parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.C
  - The learner will be able to utilize parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.C
  - The learner will be able to choose suitable tools and materials to find solutions to simple problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.7.4.A
  - The learner will be able to perform a scientific investigation.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.2.4.C
  - The learner will be able to describe the importance of scale in creating models.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.D
  - The learner will be able to utilize scale to produce models.  
Source: PA: Academic Standards, July 12, 2001, Grade 4, 3.1.4.D

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## Earth and Space Science

- The learner will be able to describe how the development of civilization relates to the environment.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.A
- The learner will be able to explain earth's features (land only).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to explain earth processes (water cycle).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to describe the behavior of earth's water systems (watershed).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to describe the impact of earth's water systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to describe the water cycle using the processes of condensation and evaporation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to identify earth resources and the way in which they influence everyday life (land, plants).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.B
- The learner will be able to describe the value and uses of earth's resources.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.B
- The learner will be able to compare the locations of human settlements associated with available resources.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.B
- The learner will be able to know that raw materials come from natural resources.  
Source: PA Standards, 2002, Grade 7, 4.2.7.A
- The learner will be able to identify resources used to provide humans with energy, food, housing and water.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.A
- The learner will be able to explain how plants and animals may be classified as natural resources.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.A
- The learner will be able to examine the renewability of resources.  
Source: PA Standards, 2002, Grade 7, 4.2.7.B
- The learner will be able to determine how consumption may impact the availability of resources.  
Source: PA Standards, 2002, Grade 7, 4.2.7.B
- The learner will be able to explain natural resource distribution.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.C
- The learner will be able to distinguish between readily available and less accessible resources.  
Source: PA Standards, 2002, Grade 7, 4.2.7.C
- The learner will be able to identify the locations of different concentrations of fossil fuels and mineral resources.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.C
- The learner will be able to explain how people use natural resources in their environment.  
Source: PA Standards, 2002, Grade 7, 4.8.7.A
- The learner will be able to locate and identify natural resources in different parts of the world.  
Source: PA Standards, 2002, Grade 7, 4.8.7.A

- The learner will be able to compare and contrast how people use natural resources in different parts of the world.  
Source: PA Standards, 2002, Grade 7, 4.8.7.A
- The learner will be able to explain how people use natural resources.  
Source: PA Standards, 2002, Grade 7, 4.8.7.B
- The learner will be able to define the roles of Pennsylvania agencies that deal with natural resources.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.D
- The learner will be able to identify types of minerals and fossil fuels used by humans.  
Source: PA Standards, 2002, Grade 7, 4.2.7.A
- The learner will be able to identify fiber and other raw materials used in clothing and shelter production.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.A
- The learner will be able to identify renewable resources and describe their uses.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.B
- The learner will be able to identify nonrenewable resources and describe their uses.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.B
- The learner will be able to recognize interrelationships between resources and systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to compare finished products to their original raw material.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.B
- The learner will be able to compare the time spans of renewability for fossil fuels and alternative fuels.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.B
- The learner will be able to comprehend the sun as a major source of energy that produces wavelengths of visible, infrared, and ultraviolet radiation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.B
- The learner will be able to explain the major layers of the atmosphere of earth.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C
- The learner will be able to illustrate the major layers of the atmosphere of earth.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C
- The learner will be able to explain factors that influence condensation and evaporation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to describe the earth's layers: a metal core, a mantle, and a thin outer crust.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to differentiate between examples of surface changes that occur rapidly and those that occur slowly.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to explain the processes that formed the geological structures and resources in his/her state including mountains, glacial formations, ridges, and water gaps.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to explain the processes used in the creation of geologic features and that these processes that occur today are similar to those processes that occurred in the past.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to describe how the rock cycle has affected the rock formations in his/her state.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to compare the properties of the planets.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to understand the role of the watershed.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.B

- The learner will be able to identify and explain what determines the boundaries of a watershed.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.B
- The learner will be able to explain how water enters a watershed.  
Source: PA Standards, 2002, Grade 7, 4.1.7.B
- The learner will be able to describe the impact of watersheds and wetlands on people.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.E
- The learner will be able to explain factors that affect water quality and flow through a watershed.  
Source: PA Standards, 2002, Grade 7, 4.1.7.B
- The learner will be able to explain how water is necessary for all life.  
Source: PA Standards, 2002, Grade 7, 4.1.7.C

## Life Science

- The learner will be able to explain that the cell is the fundamental structural and functional unit of all living things (plants).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to explain reproductive cycles (plants).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to describe the life cycle of living things (plants).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to explain the ways in which alterations in the environment may impact the survival of a species (plants).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to understand that members of the same species can possess variations which can be an advantage to survival (plants).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D

- The learner will be able to explain the similarities and differences that characterize diverse living things.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
- The learner will be able to explain how the structures of organisms help them to function in unique ways (plants).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
- The learner will be able to describe that organisms have specific structures each with a specific function (plants).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to describe how changes in the environment influence the survival of organisms.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to account for the adaptations among living things that live in a specific environment.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
- The learner will be able to identify that populations of organisms can increase rapidly.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to describe the processes involved in the formation of coal and oil in his/her state.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.B
- The learner will be able to define how energy and fuels can be produced through the process of biomass conversion.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.6.7.A
- The learner will be able to recognize the environmental, societal, and economic impacts that waste has on the environment.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.6.7.A

- The learner will be able to explain how energy and fuels can be produced through the process of biomass conversion.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.6.7.A
- The learner will be able to describe that cells have specific structures each with a specific function (plants).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to describe the role of recycling and waste management.  
Source: PA Standards, 2002, Grade 7, 4.2.7.D
- The learner will be able to identify materials that can be recycled in the community.  
Source: PA Standards, 2002, Grade 7, 4.2.7.D
- The learner will be able to explain the process of closing the loop in recycling.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.D
- The learner will be able to describe different types of pest controls and their effects on the environment.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.A
- The learner will be able to identify alternative products that can be used in life to reduce pollution.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.A
- The learner will be able to describe how human actions affect the health of the environment.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.B
- The learner will be able to identify land use practices and their relation to environmental health.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.B
- The learner will be able to explain how acid deposition can affect water, soil and air quality.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.B
- The learner will be able to explain the relationship between resource use, reuse, recycling and environmental health.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.B
- The learner will be able to identify residential and industrial sources of pollution and their effects on environmental health.  
Source: PA Standards, 2002, Grade 7, 4.3.7.B
- The learner will be able to explain society's standard of living in relation to agriculture.  
Source: PA Standards, 2002(a), Grade 7, 4.4.7.A
- The learner will be able to compare and contrast agricultural changes that have been made to meet society's needs.  
Source: PA Standards, 2002, Grade 7, 4.4.7.A
- The learner will be able to compare and contrast how animals and plants affect agricultural systems.  
Source: PA Standards, 2002(a), Grade 7, 4.4.7.A
- The learner will be able to compare several technological advancements and their effect(s) on the historical growth of agriculture.  
Source: PA Standards, 2002(a), Grade 7, 4.4.7.A
- The learner will be able to compare different environmental conditions related to agricultural production, cost and quality of the product.  
Source: PA Standards, 2002(a), Grade 7, 4.4.7.A
- The learner will be able to investigate how agricultural science has recognized the various soil types found in Pennsylvania.  
Source: PA Standards, 2002(a), Grade 7, 4.4.7.B
- The learner will be able to explain the importance of particle sizes in different soil types.  
Source: PA Standards, 2002(a), Grade 7, 4.4.7.B
- The learner will be able to determine how water has influenced the development of Pennsylvania soil types.  
Source: PA Standards, 2002(a), Grade 7, 4.4.7.B
- The learner will be able to investigate how soil types have influenced the plant types used on Pennsylvania farms.  
Source: PA Standards, 2002(a), Grade 7, 4.4.7.B
- The learner will be able to analyze how soil types and geographic regions have impacted the profitability of Pennsylvania farms.  
Source: PA Standards, 2002(a), Grade 7, 4.4.7.B
- The learner will be able to analyze the needs of plants and animals as they relate to climate and soil conditions.  
Source: PA Standards, 2002, Grade 7, 4.4.7.C

- The learner will be able to explain how different soil types determine the characteristics of ecosystems.  
Source: PA Standards, 2002, Grade 7, 4.6.7.A
- The learner will be able to describe diversity of plants and animals in ecosystems.  
Source: PA Standards, 2002, Grade 7, 4.7.7.A
- The learner will be able to identify Pennsylvania plants and animals that are on the threatened or endangered list.  
Source: PA Standards, 2002(a), Grade 7, 4.7.7.C
- The learner will be able to describe state laws passed regarding threatened and endangered species in Pennsylvania.  
Source: PA Standards, 2002(a), Grade 7, 4.7.7.C
- The learner will be able to explain the role of environmental laws and regulations.  
Source: PA Standards, 2002(a), Grade 7, 4.9.7.A
- The learner will be able to identify and explain environmental laws and regulations (e.g., Clean Air Act, Clean Water Act, Recycling and Waste Reduction Act, Act 26 on Agricultural Education).  
Source: PA Standards, 2002, Grade 7, 4.9.7.A
- The learner will be able to explain the role of local and state agencies in enforcing environmental laws and regulations (e.g., Department of Environmental Protection, Department of Agriculture, Game Commission).  
Source: PA Standards, 2002, Grade 7, 4.9.7.A
- The learner will be able to explain and describe characteristics of a wetland.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.D
- The learner will be able to evaluate materials for the appropriateness of their application.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to describe the factors that were considered in the design of a specific object.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.6.7.A
- The learner will be able to recognize alterations in sound of moving objects.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.B
- The learner will be able to explain alterations in sound of moving objects.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.B
- The learner will be able to describe how light and sound travel in waves of varying speed, size, and frequency.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.C
- The learner will be able to associate energy sources and transfers to temperature and heat.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.B
- The learner will be able to describe the conversion of one form of energy to another using knowledge of each of the forms of energy.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.B
- The learner will be able to describe how convex and concave lenses alter light images.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.C
- The learner will be able to describe the components of a basic system and their relationship to each other.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
- The learner will be able to explain a system as a group of related components that function together to produce a desired result.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A

## Physical Science

- The learner will be able to describe systems by outlining a system's relevant components and its purpose and/or designing a model that depicts its function.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B

- The learner will be able to recognize change as a variable that describes natural and physical systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.E
- The learner will be able to describe the significance of order in a system.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
- The learner will be able to explain the impact that altering one part of a system has on the entire system.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.E
- The learner will be able to utilize system analysis to solve problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
- The learner will be able to differentiate between system inputs, outputs, and processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
- The learner will be able to categorize fluid power systems based on the fluid used or the mode of transmission.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.C
- The learner will be able to interpret data, formulate models, design models, and generate solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to utilize knowledge of various measurement systems to measure and record the properties of objects.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.B
- The learner will be able to design an exploration with limited variables to investigate a question.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to answer "what if" questions based on inference, observation, experience, or prior knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to formulate questions about objects, organisms, and/or events that can be answered through scientific exploration.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to assess the importance of experimental data in answering the question.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C

## Research and Inquiry

- The learner will be able to design controlled experiments, identify variables, and manipulate variables.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to describe the results, present improvements, recognize and infer the effects of solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to communicate, utilize space/time relationships, operationally define, raise questions, make hypotheses, experiment, and test.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to assess the suitability of questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to utilize suitable instruments and apparatus to study materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.B
- The learner will be able to define various problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to define all aspects of a problem, including necessary data, and questions that must be answered.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D

- The learner will be able to suggest the best solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to implement a solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to implement a plan of action for the best alternative solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to recognize various types of models.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to recognize the functions of various types of models.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to explain the use of models as an application of scientific and technological concepts.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to utilize models to predict specific results and observations.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to recognize the uses of tools, materials, machines, people, information, money, energy, and time to meet the requirements for a specific design.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to explain relationships by forming inferences and making predictions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to explain the appropriate and safe use of tools, materials, and techniques to solve problems and answer questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to communicate suitable conclusions from the investigation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to recognize the resources required to solve a given problem in a community, that will improve the quality of life.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to explain the resources required to solve a given problem in a community, that will improve the quality of life.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to utilize process knowledge to formulate and interpret observations.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to measure materials using different scales.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to explain safe procedures for the use of tools and materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to identify parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to utilize parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to compare and contrast potential solutions to technological, economic, social, and environmental problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to choose suitable instruments to measure the size, weight, temperature, and shape of both living and non-living objects.  
Source: PA: Academic Standards, July 12, 2001, Grade

7, 3.7.7.B

- The learner will be able to describe how new information can alter existing theories and practice.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to differentiate between a scientific theory and a belief.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to conduct a two-part investigation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to describe scientific knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to utilize scientific knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to recognize repeating structural patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to recognize different forms of patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to recognize patterns that occur in physical, informational, and biochemical systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to explain patterns that occur in physical, informational, and biochemical systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to classify specific objects using different forms of patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to describe how ratio is used to explain alterations.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.E
- The learner will be able to recognize important earth resources in his/her state.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.B
- The learner will be able to describe scale as a means of associating concepts and ideas by some measure.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.D
- The learner will be able to explain scale as a form of ratio and apply to a situation in life.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.D
- The learner will be able to utilize various applications of size and dimensions of scale in scientific, technological, and mathematical applications.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.D
- The learner will be able to describe how human ingenuity and technological resources fulfill specific human needs and improve the quality of life.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B

The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

## Earth and Space Science

- The learner will be able to describe the impact of earth's water systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to differentiate fresh water from salt water.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to explain how water is necessary for all life.  
Source: PA Standards, 2002, Grade 7, 4.1.7.C
- The learner will be able to identify earth resources and the way in which they influence everyday life (focus on water).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.B
- The learner will be able to describe the value and uses of earth's resources (focus on water).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.B
- The learner will be able to explain how people use natural resources in their environment.  
Source: PA Standards, 2002, Grade 7, 4.8.7.A
- The learner will be able to explain how conservation practices have influences ecosystems.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.D
- The learner will be able to explain how human activities may affect local, regional and national environments.  
Source: PA Standards, 2002, Grade 7, 4.8.7.C
- The learner will be able to recognize features of the ocean and shoreline.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to explain the major layers of the atmosphere of earth.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C
- The learner will be able to illustrate the major layers of the atmosphere of earth.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C
- The learner will be able to describe the water cycle using the processes of condensation and evaporation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to explain factors that influence condensation and evaporation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to explore and explain how weather changes daily, seasonally, and over long periods of time.  
Source: Avon Grove School District, June 2002: leading to a mastery of PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to explain the fundamental elements of meteorology.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C
- The learner will be able to explain how climate and extreme weather events (e.g., drought, flood) influence people's lives.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.B
- The learner will be able to recognize various air masses and global wind patterns and how they are associated to patterns of weather in different regions of the U.S.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C

- The learner will be able to explain the impact of ocean currents on climate.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C
- The learner will be able to describe weather forecasts by interpreting weather data and symbols.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C
- The learner will be able to describe the impact of the ocean on local weather.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C
- The learner will be able to describe the process of cloud formation and precipitation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C
- The learner will be able to illustrate the process of cloud formation and precipitation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.C
- The learner will be able to recognize and articulate efforts of the space program to explore the possibilities of living in space and on other planets.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to recognize gravity as the force that keeps the planets in orbit around the sun and directs the motions of the solar system and universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to recognize the tools and equipment used to investigate the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to explain earth's place in the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to explain significant concepts with regard to the structure and composition of the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to recognize the contributions and accomplishments in the field of astronomy by a select group of past and present scientists.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to recognize the sun as a particular type of star.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to explain the basic star types.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to compare the properties of the planets.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to explain the characteristics of meteors, comets and asteroids.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to explain the differences between asteroids, comets, and meteorites.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D
- The learner will be able to illustrate the way in which the positions of the stars and constellations alter in relation to the Earth during and evening from month to month.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.D

## Life Science

- The learner will be able to understand that members of the same species can possess variations which can be an advantage to survival (focus on marine life).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to explain the ways in which alterations in the environment may impact the survival of a species (focus on marine environment).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D

- The learner will be able to describe the fundamental concepts of natural selection.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
  - The learner will be able to explain the similarities and differences that characterize diverse living things (marine environment).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
  - The learner will be able to explain how the structures of organisms help them to function in unique ways (whales).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
  - The learner will be able to describe that organisms have specific structures each with a specific function (whales).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
  - The learner will be able to describe how changes in the environment influence the survival of organisms (focus on ocean).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- Earth and Space Science**
- The learner will be able to describe how the development of civilization relates to the environment.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.A
- Life Science**
- The learner will be able to identify that populations of organisms can increase rapidly.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
  - The learner will be able to recognize the environmental, societal, and economic impacts that waste has on the environment (marine environment only).  
Source: Avon Grove School District, June 2002: leading to a mastery of PA: Academic Standards, July 12, 2001, Grade 7, 3.6.7.A
  - The learner will be able to interpret the balance between producers and consumers in ecosystems.  
Source: Avon Grove School District
  - The learner will be able to recognize the primary producer in an ecosystem .  
Source: Avon Grove School District
  - The learner will be able to recognize the roles of living things in the movement of energy in an ecosystem.  
Source: Avon Grove School District
  - The learner will be able to explain biological diversity.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.C
  - The learner will be able to explain the complex, interactive relationships among members of an ecosystem.  
Source: PA Standards, 2002, Grade 7, 4.3.7.C
  - The learner will be able to understand limiting factors and predict their effects on an organism.  
Source: PA Standards, 2002, Grade 7, 4.6.7.A
  - The learner will be able to demonstrate the dependency of living components in the ecosystem on the nonliving components.  
Source: PA Standards, 2002(a), Grade 7, 4.6.7.A
  - The learner will be able to identify niches for producers, consumers and decomposers within an ecosystem.  
Source: PA Standards, 2002, Grade 7, 4.6.7.A
  - The learner will be able to identify the relationship of abiotic and biotic components and explain their interaction in an ecosystem.  
Source: PA Standards, 2002, Grade 7, 4.6.7.A
  - The learner will be able to explain how ecosystems change over time.  
Source: PA Standards, 2002, Grade 7, 4.6.7.C
  - The learner will be able to explain how habitat loss can affect the interaction among species and the population of a species.  
Source: PA Standards, 2002, Grade 7, 4.7.7.C
  - The learner will be able to compare and contrast the major ecosystems of Pennsylvania.  
Source: PA Standards, 2002(a), Grade 7, 4.6.7.A

- The learner will be able to select an ecosystem and describe different plants and animals that live there.  
Source: PA Standards, 2002(a), Grade 7, 4.7.7.A
- The learner will be able to understand levels of ecosystem organization (e.g., individuals, populations, species).  
Source: PA Standards, 2002(a), Grade 7, 4.7.7.A
- The learner will be able to explain the importance of the predator/prey relationship and how it maintains the balances within ecosystems.  
Source: PA Standards, 2002, Grade 7, 4.6.7.A
- The learner will be able to identify the major characteristics of a biome.  
Source: PA Standards, 2002, Grade 7, 4.6.7.A
- The learner will be able to compare and contrast different biomes and their characteristics.  
Source: PA Standards, 2002, Grade 7, 4.6.7.A
- The learner will be able to explain how animals behave in their environment.  
Source: Avon Grove School District, June 2002: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
- The learner will be able to discover animal behaviors that have specific functions in the growth and survival of an animal in a particular habitat.  
Source: Avon Grove School District
- The learner will be able to explain the behaviors of various water animals.  
Source: Avon Grove School District
- The learner will be able to describe diversity of plants and animals in ecosystems.  
Source: PA Standards, 2002, Grade 7, 4.7.7.A
- The learner will be able to describe and explain the adaptations of plants and animals to their environment.  
Source: PA Standards, 2002, Grade 7, 4.6.7.A
- The learner will be able to explain the role of individual variations in natural selection.  
Source: PA Standards, 2002, Grade 7, 4.7.7.B
- The learner will be able to identify natural or human impacts that cause habitat loss.  
Source: PA Standards, 2002, Grade 7, 4.7.7.C
- The learner will be able to recognize that adaptations are developed over long periods of time and are passed on from one generation to the next.  
Source: PA Standards, 2002, Grade 7, 4.7.7.A
- The learner will be able to describe how a particular trait may be selected over time and account for a species' adaptation.  
Source: PA Standards, 2002, Grade 7, 4.7.7.B
- The learner will be able to find similarities and differences among the adaptations of different marine organisms to the environment.  
Source: Avon Grove School District, June 2002: leading to a mastery of PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
- The learner will be able to interpret the ways in which organisms relate in aquatic food chains.  
Source: Avon Grove School District
- The learner will be able to understand that the food chain is a succession of organisms in an ecosystem, each of which feeds on a lower member and is in turn eaten by a high member.  
Source: Avon Grove School District
- The learner will be able to illustrate a series of food chains for particular habitats using drawings or models.  
Source: Avon Grove School District
- The learner will be able to track the path of energy through food chains and food webs utilizing a minimum of two local ecosystems as examples.  
Source: Avon Grove School District
- The learner will be able to explain the range of physical conditions of saltwater habitats.  
Source: Avon Grove School District, June 2002: leading to a mastery of PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to investigate the interactions among the biotic and abiotic factors in a marine environment (wetlands & oceans).  
Source: Avon Grove School District, June 2002: leading to a mastery of PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D

- The learner will be able to explain how the physical components of aquatic systems influence the organisms that live there in terms of size, shape and physical adaptations.  
Source: PA Standards, 2002, Grade 7, 4.1.7.C
- The learner will be able to describe the life cycle of organisms that depend on water.  
Source: PA Standards, 2002, Grade 7, 4.1.7.C

## Earth and Space Science

- The learner will be able to describe the impact of watersheds and wetlands on people.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.E
- The learner will be able to explain the impact of watersheds and wetlands in flood control, wildlife habitats and pollution abatement.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.E

## Life Science

- The learner will be able to explain and describe characteristics of a wetland.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.D
- The learner will be able to identify specific characteristics of wetland plants and soils.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.D
- The learner will be able to recognize the common types of plants and animals.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.D
- The learner will be able to describe different types of wetlands.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.D
- The learner will be able to describe the different functions of a wetland.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.D
- The learner will be able to explain the influence of flooding on wetlands.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.E

## Earth and Space Science

- The learner will be able to define the roles of Pennsylvania agencies that deal with natural resources.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.D

## Life Science

- The learner will be able to describe the role of recycling and waste management.  
Source: PA Standards, 2002, Grade 7, 4.2.7.D
- The learner will be able to identify materials that can be recycled in the community.  
Source: PA Standards, 2002, Grade 7, 4.2.7.D
- The learner will be able to explain the process of closing the loop in recycling.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.D
- The learner will be able to describe methods that could be used to reuse materials for new products.  
Source: PA Standards, 2002, Grade 7, 4.2.7.D
- The learner will be able to evaluate the costs and benefits of disposable products.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.D
- The learner will be able to identify alternative products that can be used in life to reduce pollution.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.A
- The learner will be able to describe how human actions affect the health of the environment.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.B
- The learner will be able to explain how natural disasters affect environmental health.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.B
- The learner will be able to explain the relationship between resource use, reuse, recycling and environmental health.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.B
- The learner will be able to explain how nonpoint source pollution can affect the water supply and air quality.  
Source: PA Standards, 2002, Grade 7, 4.3.7.B

## Earth and Space Science

- The learner will be able to describe the behavior of earth's water systems (oceans & wetlands).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to recognize interrelationships between resources and systems (ecology - food webs).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B

## Life Science

- The learner will be able to analyze and explain the changes in an animal population over time.  
Source: PA Standards, 2002, Grade 7, 4.7.7.C
- The learner will be able to explain how a habitat management practice affects a population.  
Source: PA Standards, 2002(a), Grade 7, 4.7.7.C

## Physical Science

- The learner will be able to recognize elements as the basic building blocks of matter that cannot be chemically broken down.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.A
- The learner will be able to explain the concepts regarding the structure of matter.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.A
- The learner will be able to explain the reactants and products of basic chemical reactions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.A
- The learner will be able to describe a variety of motions using models (pendulum, sledding, etc.).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.C
- The learner will be able to describe the factors that were considered in the design of a specific object.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.6.7.A

- The learner will be able to explain experiments that identify chemical and physical properties.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.A
- The learner will be able to perform experiments that identify chemical and physical properties.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.A
- The learner will be able to recognize the principles of force and motion.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.C
- The learner will be able to describe the principles of force and motion.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.C
- The learner will be able to associate energy sources and transfers to temperature and heat.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.B
- The learner will be able to describe the conversion of one form of energy to another using knowledge of each of the forms of energy (focus on formulas).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.B
- The learner will be able to explain the concepts regarding the properties of matter.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.A
- The learner will be able to differentiate compounds and mixtures.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.A
- The learner will be able to explain the motion of an object in terms of speed, direction, and position.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.C
- The learner will be able to describe the components of a basic system and their relationship to each other.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A

- The learner will be able to recognize change as a variable that describes natural and physical systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.E
- The learner will be able to describe the significance of order in a system.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
- The learner will be able to utilize system analysis to solve problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A

## Research and Inquiry

- The learner will be able to design controlled experiments, identify variables, and manipulate variables.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to describe the results, present improvements, recognize and infer the effects of solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to communicate, utilize space/time relationships, operationally define, raise questions, make hypotheses, experiment, and test.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to interpret data, formulate models, design models, and generate solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to utilize knowledge of various measurement systems to measure and record the properties of objects.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.B
- The learner will be able to describe how skepticism about an accepted scientific explanation led to a new comprehension (evolution of whales).  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A

- The learner will be able to design an exploration with limited variables to investigate a question.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to answer "what if" questions based on inference, observation, experience, or prior knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to formulate questions about objects, organisms, and/or events that can be answered through scientific exploration.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to assess the importance of experimental data in answering the question.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to assess the suitability of questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to utilize suitable instruments and apparatus to study materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.B
- The learner will be able to define various problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to define all aspects of a problem, including necessary data, and questions that must be answered.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to suggest the best solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to implement a solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D

- The learner will be able to implement a plan of action for the best alternative solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to recognize various types of models.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to explain the use of models as an application of scientific and technological concepts.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to utilize models to predict specific results and observations.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to recognize the uses of tools, materials, machines, people, information, money, energy, and time to meet the requirements for a specific design.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to explain relationships by forming inferences and making predictions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to explain the appropriate and safe use of tools, materials, and techniques to solve problems and answer questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to communicate suitable conclusions from the investigation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to recognize the resources required to solve a given problem in a community, that will improve the quality of life.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to explain the resources required to solve a given problem in a community, that will improve the quality of life.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to utilize process knowledge to formulate and interpret observations.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to measure materials using different scales.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to explain safe procedures for the use of tools and materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to identify parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to utilize parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to explain basic science and technology concepts that might solve practical problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.E
- The learner will be able to compare and contrast potential solutions to technological, economic, social, and environmental problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to choose suitable instruments to measure the size, weight, temperature, and shape of both living and non-living objects.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.B

- The learner will be able to describe how new information can alter existing theories and practice.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to differentiate between a scientific theory and a belief.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to describe scientific knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to utilize scientific knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to classify specific objects using different forms of patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to describe scale as a means of associating concepts and ideas by some measure.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.D

The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

## Earth and Space Science

- The learner will be able to compare the impact of water type and the living things contained within them (other than the ocean).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.D
- The learner will be able to talk about geological evidence that connects to the earth's past.  
Source: Avongrove School District., June 2002:  
Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to understand the earth's history.  
Source: Avongrove School District., June 2002:  
Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to explain the role of the water cycle within a watershed.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.A
- The learner will be able to explain the water cycle.  
Source: PA Standards, 2002, Grade 7, 4.1.7.A
- The learner will be able to explain the water cycle as it relates to a watershed.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.A
- The learner will be able to explain the effects of water on the life of organisms in a watershed.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.C

- The learner will be able to explain how water is necessary for all life.  
Source: PA Standards, 2002, Grade 7, 4.1.7.C
- The learner will be able to explain the impact of watersheds and wetlands in flood control, wildlife habitats and pollution abatement.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.E
- The learner will be able to explain how plants and animals may be classified as natural resources.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.A
- The learner will be able to explain how people use natural resources in their environment.  
Source: PA Standards, 2002, Grade 7, 4.8.7.A
- The learner will be able to describe how natural resources are used for survival.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.B
- The learner will be able to describe what effect consumption and related generation of wastes have on the environment.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.C
- The learner will be able to explain the importance of maintaining the natural resources at the local, state and national levels.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.D
- The learner will be able to explain how human activities and natural events have affected ecosystems.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.D
- The learner will be able to explain how conservation practices have influences ecosystems.  
Source: PA Standards, 2002(a), Grade 7, 4.8.7.D

## Life Science

- The learner will be able to explain that the cell is the fundamental structural and functional unit of all living things.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to explain cell cycles.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B

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- The learner will be able to differentiate among life cycles, reproductive cycles, and cell cycles.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to recognize adaptations that allow the survival of organisms in their environment.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to explain reproductive cycles.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to differentiate how various organisms reproduce.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.C
- The learner will be able to recognize living plants and animals that resemble fossil forms.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.5.7.A
- The learner will be able to explain the role that fossils play in researching the past.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to recognize basic patterns of inheritance.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.C
- The learner will be able to describe the life cycle of living things (animals).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to recognize levels of organization including cells, tissues, organs, organ systems, and organisms.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to explain the ways in which alterations in the environment may impact the survival of a species.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to understand that members of the same species can possess variations which can be an advantage to survival.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to describe the fundamental concepts of natural selection.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to describe that extinction is a natural process.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to describe that cells have specific structures each with a specific function (animal cells).  
Source: Supporting PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to explain the similarities and differences that characterize diverse living things.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
- The learner will be able to explain how the structures of organisms help them to function in unique ways.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
- The learner will be able to explain the way the structure and/or function of a living thing is impacted by disease.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to describe that organisms have specific structures each with a specific function.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.B
- The learner will be able to describe how changes in the environment influence the survival of organisms.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to understand that genetic instructions are included in cells that specify traits of an organism.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.C

- The learner will be able to explain how selective breeding, natural selection, and genetic technologies can alter the genetic makeup of living things.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.C
- The learner will be able to account for the adaptations among living things that live in a specific environment.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
- The learner will be able to identify that populations of organisms can increase rapidly.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.D
- The learner will be able to describe how to use a dichotomous key to recognize plants and animals.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.A
- The learner will be able to identify that mutations can alter a gene.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.C
- The learner will be able to identify inherited traits of organisms.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.C
- The learner will be able to describe inheritable traits.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.C
- The learner will be able to explain how traits are inherited.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.C
- The learner will be able to recognize the gene as the basic unit of inheritance.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.3.7.C
- The learner will be able to categorize basic plant and animal production processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.6.7.A
- The learner will be able to describe the function and structure of cell parts (animal cells).  
Source: Avon Grove School District, June 2002
- The learner will be able to explain the process of meiosis.  
Source: Avon Grove School District, June 2002
- The learner will be able to explain the process of mitosis.  
Source: Avon Grove School District, June 2002
- The learner will be able to outline what occurs in each phase in the processes of mitosis and meiosis.  
Source: Avon Grove School District, June 2002
- The learner will be able to explain how cells are organized into tissues, organs and systems.  
Source: Avon Grove School District, June 2002
- The learner will be able to sort cell groups into tissues, organs, or systems on the basis of observation and/or explanation.  
Source: Avon Grove School District, June 2002
- The learner will be able to classify members of the Chordata phylum by observing properties.  
Source: Avon Grove School District, June 2002
- The learner will be able to explain how genes work together to create the traits of a living thing.  
Source: Avon Grove School District, June 2002
- The learner will be able to explain the structure of chromosomes.  
Source: Avon Grove School District, June 2002
- The learner will be able to explain how genetic disorders are able to be inherited.  
Source: Avon Grove School District, June 2002
- The learner will be able to identify the life processes that occur within cells.  
Source: Avon Grove School District
- The learner will be able to explain how the physical components of aquatic systems influence the organisms that live there in terms of size, shape and physical adaptations.  
Source: PA Standards, 2002, Grade 7, 4.1.7.C

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- The learner will be able to describe the life cycle of organisms that depend on water.  
Source: PA Standards, 2002, Grade 7, 4.1.7.C
- The learner will be able to identify organisms that have aquatic stages of life and describe those stages.  
Source: PA Standards, 2002(a), Grade 7, 4.1.7.C
- The learner will be able to compare the decomposition rates of different organic materials.  
Source: PA Standards, 2002(a), Grade 7, 4.2.7.D
- The learner will be able to identify environmental health issues.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.A
- The learner will be able to identify various examples of long term pollution and explain their effects on environmental health.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.A
- The learner will be able to identify diseases that have been associated with poor environmental quality.  
Source: PA Standards, 2002(a), Grade 7, 4.3.7.A
- The learner will be able to explain the concept of cycles.  
Source: PA Standards, 2002(a), Grade 7, 4.6.7.B
- The learner will be able to identify and explain cycles within an ecosystem.  
Source: PA Standards, 2002, Grade 7, 4.6.7.B
- The learner will be able to analyze the role of different cycles within an ecosystem.  
Source: PA Standards, 2002(a), Grade 7, 4.6.7.B
- The learner will be able to identify the succession stages of a given ecosystem.  
Source: PA Standards, 2002, Grade 7, 4.6.7.C
- The learner will be able to explain how specific organisms may change an ecosystem.  
Source: PA Standards, 2002, Grade 7, 4.6.7.C
- The learner will be able to explain a change in an ecosystem that relates to humans.  
Source: PA Standards, 2002, Grade 7, 4.6.7.C
- The learner will be able to describe diversity of plants and animals in ecosystems.  
Source: PA Standards, 2002, Grade 7, 4.7.7.A
- The learner will be able to recognize that adaptations are developed over long periods of time and are passed on from one generation to the next.  
Source: PA Standards, 2002, Grade 7, 4.7.7.A
- The learner will be able to explain how species of living organisms adapt to their environment.  
Source: PA Standards, 2002, Grade 7, 4.7.7.B
- The learner will be able to explain the role of individual variations in natural selection.  
Source: PA Standards, 2002, Grade 7, 4.7.7.B
- The learner will be able to explain how an adaptation is an inherited structure or behavior that helps an organism survive and reproduce.  
Source: PA Standards, 2002, Grade 7, 4.7.7.B
- The learner will be able to describe how a particular trait may be selected over time and account for a species' adaptation.  
Source: PA Standards, 2002, Grade 7, 4.7.7.B
- The learner will be able to compare and contrast animals and plants that have very specific survival requirements with those that have more general requirements for survival.  
Source: PA Standards, 2002(a), Grade 7, 4.7.7.B
- The learner will be able to explain how living things respond to changes in their environment.  
Source: PA Standards, 2002, Grade 7, 4.7.7.B
- The learner will be able to explain how one species may survive an environmental change while another may not.  
Source: PA Standards, 2002, Grade 7, 4.7.7.B
- The learner will be able to explain natural or human actions in relation to the loss of species.  
Source: PA Standards, 2002, Grade 7, 4.7.7.C
- The learner will be able to explain why one species may be more susceptible to becoming endangered than another species.  
Source: PA Standards, 2002(a), Grade 7, 4.7.7.C

**Physical Science**

- The learner will be able to describe systems by outlining a system's relevant components and its purpose and/or designing a model that depicts its function.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
  - The learner will be able to describe the conversion of one form of energy to another using knowledge of each of the forms of energy.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.4.7.B
  - The learner will be able to describe the components of a basic system and their relationship to each other.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
  - The learner will be able to explain a system as a group of related components that function together to produce a desired result.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
  - The learner will be able to describe systems by outlining a system's relevant components and its purpose and/or designing a model that depicts its function.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
  - The learner will be able to evaluate materials for the appropriateness of their application.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
  - The learner will be able to describe the factors that were considered in the design of a specific object.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.6.7.A
  - The learner will be able to describe the components of a basic system and their relationship to each other.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
  - The learner will be able to recognize change as a variable that describes natural and physical systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.E
  - The learner will be able to describe the significance of order in a system.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
  - The learner will be able to explain the impact that altering one part of a system has on the entire system.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.E
  - The learner will be able to utilize system analysis to solve problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
  - The learner will be able to differentiate between system inputs, outputs, and processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
  - The learner will be able to differentiate between open and closed loop systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.A
- ### Research and Inquiry
- The learner will be able to design controlled experiments, identify variables, and manipulate variables.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
  - The learner will be able to describe the results, present improvements, recognize and infer the effects of solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
  - The learner will be able to communicate, utilize space/time relationships, operationally define, raise questions, make hypotheses, experiment, and test.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
  - The learner will be able to interpret data, formulate models, design models, and generate solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B

- The learner will be able to describe how skepticism about an accepted scientific explanation led to a new comprehension.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to design an exploration with limited variables to investigate a question.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to answer "what if" questions based on inference, observation, experience, or prior knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to formulate questions about objects, organisms, and/or events that can be answered through scientific exploration.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to assess the importance of experimental data in answering the question.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to assess the suitability of questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to utilize suitable instruments and apparatus to study materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.B
- The learner will be able to define various problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to define all aspects of a problem, including necessary data, and questions that must be answered.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to suggest the best solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to implement a solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to implement a plan of action for the best alternative solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to recognize various types of models.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to recognize the functions of various types of models.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to explain various types of models and their functions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to explain the use of models as an application of scientific and technological concepts.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to utilize models to predict specific results and observations.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to recognize the uses of tools, materials, machines, people, information, money, energy, and time to meet the requirements for a specific design.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to explain relationships by forming inferences and making predictions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to explain the appropriate and safe use of tools, materials, and techniques to solve problems and answer questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A

- The learner will be able to communicate suitable conclusions from the investigation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to recognize the resources required to solve a given problem in a community, that will improve the quality of life.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to explain the resources required to solve a given problem in a community, that will improve the quality of life.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to utilize process knowledge to formulate and interpret observations.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to measure materials using different scales.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to explain safe procedures for the use of tools and materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to identify parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to utilize parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to recognize the impact that a particular advancement in medicine has had on society.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.6.7.A
- The learner will be able to recognize alterations in society as a result of technological development.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.A
- The learner will be able to explain the positive and negative impacts of the expected and unexpected technological developments.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.C
- The learner will be able to describe the impact that a particular advancement in medicine has had on society.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.6.7.A
- The learner will be able to explain basic science and technology concepts that might solve practical problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.E
- The learner will be able to compare and contrast potential solutions to technological, economic, social, and environmental problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to choose suitable instruments to measure the size, weight, temperature, and shape of both living and non-living objects.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.B
- The learner will be able to describe how new information can alter existing theories and practice.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to differentiate between a scientific theory and a belief.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to conduct a two-part investigation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to describe scientific knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A

- The learner will be able to utilize scientific knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to recognize repeating structural patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to recognize different forms of patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to recognize patterns that occur in physical, informational, and biochemical systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to explain patterns that occur in physical, informational, and biochemical systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to classify specific objects using different forms of patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to describe how human ingenuity and technological resources fulfill specific human needs and improve the quality of life.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to design controlled experiments, identify variables, and manipulate variables.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to describe the results, present improvements, recognize and infer the effects of solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to communicate, utilize space/time relationships, operationally define, raise questions, make hypotheses, experiment, and test.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to interpret data, formulate models, design models, and generate solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to describe how skepticism about an accepted scientific explanation led to a new comprehension.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to design an exploration with limited variables to investigate a question.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to answer "what if" questions based on inference, observation, experience, or prior knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to formulate questions about objects, organisms, and/or events that can be answered through scientific exploration.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to assess the importance of experimental data in answering the question.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to assess the suitability of questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to utilize suitable instruments and apparatus to study materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.B
- The learner will be able to define various problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to define all aspects of a problem, including necessary data, and questions that must be answered.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D

# Science

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# \*Grade 7 Life Science

Final, 2004

- The learner will be able to suggest the best solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to implement a solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to implement a plan of action for the best alternative solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.D
- The learner will be able to recognize various types of models.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to recognize the functions of various types of models.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to explain various types of models and their functions.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to explain the use of models as an application of scientific and technological concepts.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to utilize models to predict specific results and observations.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.B
- The learner will be able to recognize the uses of tools, materials, machines, people, information, money, energy, and time to meet the requirements for a specific design.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to communicate suitable conclusions from the investigation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to explain the resources required to solve a given problem in a community, that will improve the quality of life.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to utilize process knowledge to formulate and interpret observations.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.B
- The learner will be able to explain safe procedures for the use of tools and materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.A
- The learner will be able to identify parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to utilize parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to explain basic science and technology concepts that might solve practical problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.E
- The learner will be able to compare and contrast potential solutions to technological, economic, social, and environmental problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.8.7.B
- The learner will be able to choose suitable instruments to measure the size, weight, temperature, and shape of both living and non-living objects.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.7.7.B
- The learner will be able to describe how new information can alter existing theories and practice.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A

- The learner will be able to differentiate between a scientific theory and a belief.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to conduct a two-part investigation.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.C
- The learner will be able to describe scientific knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to utilize scientific knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.2.7.A
- The learner will be able to recognize repeating structural patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to recognize different forms of patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to recognize patterns that occur in physical, informational, and biochemical systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C
- The learner will be able to classify specific objects using different forms of patterns.  
Source: PA: Academic Standards, July 12, 2001, Grade 7, 3.1.7.C

The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

## Earth and Space Science

- The learner will be able to describe the origin of meteorites, comets and asteroids.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to find the similarities and differences between comets, meteorites and asteroids.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to talk about geocentric and heliocentric models of the solar system.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to understand the components of the solar system: the sun, nine planets and their moons, asteroids, and comets.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to understand that most objects in the solar system, such as planets, are in regular and predictable motion.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, grade 10, 3.4.10.D

- The learner will be able to understand that the motions in the solar system explain certain phenomena, such as eclipses or phases of the moon.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to explain how the revolution of the earth creates the seasons.  
Source: Avon Grove school District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to explain the motion of planets.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to explain the properties of planets.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to explain the features of planets.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to recognize the use of probes, satellites, light and radio telescopes, and spectroscopes to obtain information on space.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to recognize the findings of many space instruments with regard to the composition and extent of the solar system and universe.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to examine the findings of many space instruments with regard to the composition and extent of the solar system and universe.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D

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- The learner will be able to explain the process by which information is gathered about space.  
Source: Avon Grove school District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to explain the history of the space program.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to analyze the impact of the space program on our lives.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to find the similarities and differences between solar and lunar eclipses.  
Source: Avon Grove school District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to talk about the impact of the sun and moon on tides.  
Source: Avon Grove school District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to explain how the motion of the earth, moon, and sun relate.  
Source: Avon Grove school District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to define lunar phases.  
Source: Avon Grove school District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to understand that gravity is the force that maintains the orbit of planets around the sun.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to understand that gravity is a force that pulls objects toward the center of the Earth.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to understand that gravity explains the tides phenomena.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to explain significant concepts with regard to the structure and composition of the universe.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to compare the fundamental structures of the universe.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to recognize stars and/or star systems.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to explain stars and/or star systems.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to describe the nuclear processes that produce energy in stars.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to explain the life cycle of a star based on its position in the Hertzsprung-Russel diagram.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to explain the structure of a star using the Hertzsprung-Russell diagram.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
  - The learner will be able to describe the red-shift and how the Hubble used it to find stellar distance and movement.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D

- The learner will be able to compare apparent versus absolute star magnitude and how they are related to stellar distance.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to explain galaxy types.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to explain the makeup of the earth's atmosphere.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to understand that a mixture of nitrogen, oxygen, and trace gases that include water vapor makes up the atmosphere.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to catalog the most common gases in the atmosphere.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to explain the structure of the Earth's atmosphere.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to recognize the layers of the atmosphere.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to explain why each layer of the atmosphere is important.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to understand that the water cycle moves water from the earth's surface, to the atmosphere, and back to the earth's surface.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to understand that as water flows through the water cycle, it dissolves minerals and gases and carries them to the oceans.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to describe how topography influences streams.  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.B
- The learner will be able to explain the influence of mountains on precipitation.  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.B
- The learner will be able to evaluate the value of water as a resource.  
Source: Avon Grove School District June 2002-PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to explain conditions in the atmosphere that cause weather.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to understand that clouds affect weather and climate.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to recognize the common cloud types and their formation.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to understand that clouds are formed by condensation of water vapor.  
Source: Avon Grove School District 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C

# Science

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# \*Grade 8 Earth Science

Final, 2004

- The learner will be able to identify weather phenomena.  
Source: Avon Grove School District 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to explore weather phenomena.  
Source: Avon Grove School District 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to analyze the impact of city pollution on weather.  
Source: Avon Grove School District 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to explore the impact of weather phenomena on the surface of the earth.  
Source: Avon Grove School District June 2002- Meeting  
PA: Academic Standards, Grade 10, 3.5.10.C
- The learner will be able to comprehend how air masses impact weather patterns.  
Source: Avon Grove School District June 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to explain weather and climate patterns on global levels.  
Source: Avon Grove School District June 2002- PA:  
Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to compare the basic types of air masses.  
Source: Avon Grove School District 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to interpret meteorological information.  
Source: Avon Grove School District June 2002- PA:  
Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to predict weather patterns through the analysis of data gathered from meteorological instruments and on-line sources.  
Source: Avon Grove School District June 2002- PA:  
Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to analyze the impact of burning fuels on the atmosphere, polar ice caps, and earthquake estimation.  
Source: Avon Grove School District June 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to interpret a weather map to predict the weather for an extended forecast.  
Source: Avon Grove School District June 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to associate earth's features and processes that alter the earth.  
Source: Avon Grove School District June 2002-PA:  
Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to describe the composition of the earth.  
Source: Avon Grove School District June, 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to understand the layers of the Earth: lithosphere, mantle, and core.  
Source: Avon Grove School District June 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to show the composition of the Earth.  
Source: Avon Grove School District June, 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to interpret geologic history using geologic maps.  
Source: Avon Grove School District June 2002- PA:  
Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to interpret earth's geology based on the principles of superposition and uniformitarianism.  
Source: Avon Grove School District June 2002- Meeting  
PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A

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- The learner will be able to assess geologic history using geologic maps.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to assess the impacts of geologic events.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to understand that convection currents in the mantle cause the plates of the earth to move.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to describe plate tectonics as the mechanism of continental movement and alterations in the sea floor.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to depict plate tectonics as the mechanism of continental movement and alterations in the sea floor.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to compare examples of alterations to the surface of the earth over time with regard to continental movement and the formation of the ocean basin.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to identify constructive forces, such as crustal deformation, volcanic eruption, or deposition of sediments.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to understand that constructive and destructive forces create landforms.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to describe several methods of dating earth structures and materials.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to explain how radio carbon dating is done.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to explain alterations that depict major events in the development of the earth based on a time line.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to correlate geologic time periods in earth's history with rock units.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to explain the history of the earth.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to understand how Earth's history has been influenced by catastrophes, such as the impact of a comet.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to recognize types of minerals.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to test minerals by standard means to recognize properties of minerals from unknown samples.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to test minerals by standard means to recognize minerals from unknown samples.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A

- The learner will be able to explain types of minerals.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to recognize minerals by physical characteristics.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to explain the components of the rock cycle: erosion, transportation, deposition.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to explain the fundamental types of rocks.  
Source: Avon Grove School District June 2002-PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to recognize rock types.  
Source: Avon Grove School District June 2002-PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to distinguish between various rock types on the basis of origin and mineral content.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to understand that some natural phenomena, including earthquakes, landslides, fires, volcanic eruptions, and floods, may be a hazard to humans.  
Source: Avon Grove school District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to understand that human activities, such as urban growth or waste disposal, can accelerate natural phenomena.  
Source: Avon Grove School District June, 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to understand that natural phenomena present societal challenges to humans.  
Source: Avon Grove School District June, 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to understand that risk analysis contemplates the type of natural phenomena (e.g., earthquake) and estimates the number of people that may be affected. The results of such an analysis are used to determine options for reducing risks.  
Source: Avon Grove School District June, 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to describe natural occurrences that may affect the natural resources.  
Source: PA Standards, 2002(a), Grade 10, 4.2.10.B
- The learner will be able to explain the complete cycle of a natural resource, from extraction to disposal, detailing its uses and effects on the environment.  
Source: PA Standards, 2002(a), Grade 10, 4.2.10.C
- The learner will be able to compare and contrast the environmental effects of different industrial strategies (e.g., energy generation, transportation, logging, mining, agriculture).  
Source: PA Standards, 2002, Grade 10, 4.8.10.C
- The learner will be able to identify natural occurrences that have international impact (e.g., El Nino, volcano eruptions, earthquakes).  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.D
- The learner will be able to analyze technologies that affect the use of our natural resources.  
Source: PA Standards, 2002, Grade 10, 4.2.10.B
- The learner will be able to identify the basic symbols, series, scales, and colors that are utilized to stand for features on topographic maps and Earth models.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A

## Physical Science

- The learner will be able to examine the transfer of heat.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.B
- The learner will be able to understand that heat moves in a predictable pattern, from warmer objects to cooler objects until one common temperature is reached.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade

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- The learner will be able to understand the transfer of energy.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.B
- The learner will be able to identify crystalline systems of minerals.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to understand that the sun's energy arrives at earth in the form of light.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.B
- The learner will be able to understand that the sun is a major source of energy.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.B
- The learner will be able to understand that the parts of an atom have measurable characteristics.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to comprehend that atoms are composed of smaller subatomic structure.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to explain the concepts regarding the properties of matter.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to explain the concepts regarding the structure of matter.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to explain changes to matter caused by heat, cold, light, or chemicals using a rate function.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.E

- The learner will be able to explain the motion of sound, light, and other objects.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.C
- The learner will be able to comprehend Newton's laws of motion and gravity.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.C
- The learner will be able to predict the behavior of gases by applying Boyle's law, Charles' law, or the ideal gas law to everyday situations.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to explain a gas, liquid or solid in terms of the kinetic molecular theory.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to recognize the function of subsystems within a larger system.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.A
- The learner will be able to identify that stable systems often involve underlying dynamic changes.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.E
- The learner will be able to explain the organization of the periodic table.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to understand that chemical elements do not break down during exposure to normal laboratory reactions involving heat, electrical current, or acids.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to understand that there are over one hundred known elements.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A

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- The learner will be able to understand that combining elements produces compounds.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to identify chemical symbols.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to describe the repeating patterns among chemical properties using the repeating patterns of atomic structure within the periodic table.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A

## Research and Inquiry

- The learner will be able to communicate the process and assess and present the effects of a solution.  
Source: Avon Grove School District June 2002-PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.D
- The learner will be able to analyze the problem, sequence all necessary information and all questions that must be answered.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.D
- The learner will be able to assess the solution, test, redesign, and make improvements if necessary.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.D
- The learner will be able to differentiate among various models and modeling techniques and apply their use appropriately in particular applications.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.B
- The learner will be able to utilize process knowledge and organize scientific and technological events in a variety of ways.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.B
- The learner will be able to utilize process skills to make predictions and inferences using gathered data, and to communicate using space/time relationships, and operational definitions.

- Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.B
- The learner will be able to utilize knowledge of oceanography, geology, meteorology, and human anatomy to describe significant considerations needed for the construction of homes, businesses, and buildings in the United States.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
  - The learner will be able to recognize, explain, and complete advanced on-line research.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.E
  - The learner will be able to develop suitable scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, identifying and manipulating variables, interpreting data, and generating solutions.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.B
  - The learner will be able to suggest further steps that may be done experimentally.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
  - The learner will be able to conduct a multi-step investigation.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
  - The learner will be able to design an exploration with limited variables to investigate a question.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
  - The learner will be able to perform a scientific investigation.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
  - The learner will be able to design an exploration with adequate control to investigate a question.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C

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- The learner will be able to plan a scientific investigation.  
Source: AvonGrove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
- The learner will be able to identify questions that may be answered through scientific investigations.  
Source: AvonGrove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
- The learner will be able to formulate questions about objects, organisms, and/or events that can be answered through scientific exploration.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
- The learner will be able to assess the importance of experimental data in answering the question.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
- The learner will be able to assess the suitability of questions.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
- The learner will be able to explain the operation and use of advanced instrumentation in assessing material and chemical properties.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to show the operation and use of advanced instrumentation in assessing material and chemical properties.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to utilize suitable instruments and apparatus to examine various objects and processes.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to explain suitable instruments to collect and analyze data.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to utilize suitable instruments to collect and analyze data.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to utilize the proper kind of tool for measuring objects in a given problem or situation.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.B
- The learner will be able to analyze the advantages of using models to show processes and outcomes.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.B
- The learner will be able to utilize parts of scientific inquiry to find solutions to problems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
- The learner will be able to examine the impacts that transportation systems have on a community.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.6.10.C
- The learner will be able to examine the impacts that accepting or rejecting scientific and technological advances have on society.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.C
- The learner will be able to explain basic science and technology concepts that might solve practical problems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.E
- The learner will be able to choose the appropriate tools, materials, and processes required to solve complex problems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.A
- The learner will be able to implement a solution to a problem.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.D

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- The learner will be able to safely utilize the appropriate tools, materials, and processes required to solve complex problems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.A
- The learner will be able to utilize advanced tool and equipment manipulation methods to solve problems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.A
- The learner will be able to compare and contrast potential solutions to technological, economic, social, and environmental problems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.C
- The learner will be able to integrate new data into existing theories and describe implied results.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.A
- The learner will be able to compare scientific theories and beliefs.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.A
- The learner will be able to explain stationary physical patterns.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.C
- The learner will be able to explain recurring patterns that form the basis of biological classification, chemical periodicity, astronomical order, and geological order.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.C
- The learner will be able to analyze stationary physical patterns.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.C
- The learner will be able to analyze physical patterns in motion.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.C
- The learner will be able to analyze recurring patterns that form the basis of biological classification, chemical periodicity, astronomical order, and geological order.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.C
- The learner will be able to utilize dimensional analysis and scale as a ratio.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.D
- The learner will be able to utilize scale as a means of associating concepts and ideas to each other by some measure.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.D
- The learner will be able to utilize mathematical models in science and technology.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.B
- The learner will be able to examine how human ingenuity and technological resources fulfill specific human needs and improve the quality of life.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
- The learner will be able to recognize various on-line services.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.E
- The learner will be able to organize investigational data using a variety of analytical methods.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
- The learner will be able to employ critical thinking skills to determine the relationship between evidence and explanations.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
- The learner will be able to explain the proper use of electronic and graphic communication systems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.6.10.B
- The learner will be able to utilize advanced techniques in communication to generate an image that effectively conveys a message.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.6.10.B

- The learner will be able to utilize various advanced methods of mechanical and electronic drafting techniques to communicate a solution to a specific problem.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.6.10.B
- The learner will be able to examine advanced techniques in communication to generate an image that effectively conveys a message.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.6.10.B
- The learner will be able to describe the concept of system redesign.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.A
- The learner will be able to explain the effectiveness of systems to solve specific problems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.A
- The learner will be able to utilize the concept of system redesign to improve technological systems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.A
- The learner will be able to utilize the universal systems model to illustrate and troubleshoot specific problems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.A
- The learner will be able to examine the effectiveness of systems to solve specific problems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.A
- The learner will be able to understand that both men and woman have contributed to science and technology.  
Source: AvonGrove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
- The learner will be able to understand that science and technology cannot solve all human problems nor meet all human needs.  
Source: AvonGrove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
- The learner will be able to recognize past and current tradeoffs between production increases, social values, and harm to the environment.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.A
- The learner will be able to understand that scientists are of different backgrounds, interests, races, and genders.  
Source: AvonGrove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
- The learner will be able to understand the qualities necessary for scientists: insight, reasoning, energy, skill, and creativity. In addition, scientists must be open minded, honest, and have a tolerance for ambiguity and skepticism.  
Source: AvonGrove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
- The learner will be able to describe how man's view of the universe was impacted by Copernican and Newtonian thinking.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to understand that scientists often disagree on the explanations of natural phenomena, interpretations of data, and theories; know that scientists do agree that questioning, responding to criticism, and communication are vital to the scientific process.  
Source: AvonGrove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
- The learner will be able to study individual scientists to learn more about inquiry, the nature of science, and the relationship between science and society.  
Source: AvonGrove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
- The learner will be able to view science as a human endeavor.  
Source: Avon Grove School District June 2002- Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B

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- The learner will be able to begin to develop an understanding of the history of science.  
Source: AvonGrove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
- The learner will be able to comprehend that science uses both direct and indirect means of observation to study the world and the universe.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.A
- The learner will be able to recognize various tools, basic machines, materials, and techniques to solve problems and answer questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.A
- The learner will be able to review the history of science to see how difficult it was for scientific innovators to change the accepted ideas of their time to reach the conclusions we now applaud.  
Source: AvonGrove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
- The learner will be able to understand that science has both beneficial and detrimental effects on society.  
Source: AvonGrove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.8.10.B
- The learner will be able to communicate scientific procedures.  
Source: AvonGrove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
- The learner will be able to understand and apply proper safety procedures within a laboratory.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, Grade 10, 3.7.10.A
- The learner will be able to recognize standard measurement.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to define standard measurement.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to state the prefixes utilized in the SI system.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to recognize SI units and symbols for various measurements.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to do unit conversions in metric measurement.  
Source: Avon Grove School District June 2002-Meeting PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to describe the necessity to estimate measurements within error of various instruments.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to explain the impacts of error in measurement.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.E
- The learner will be able to choose the best system of scientific measurement for a particular situation.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to utilize accurate measurement knowledge to find solutions to everyday problems.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to compare various systems of scientific measurement.  
Source: Avon Grove School District June 2002- PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B

<b>Life Science</b>
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- The learner will be able to identify the effects on human health of air, water and soil pollution and the possible economic costs to society.  
Source: PA Standards, 2002(a), Grade 10, 4.3.10.A
- The learner will be able to describe how indoor pollution may affect human health (e.g., dust mites, fumes, cat dandruff).  
Source: PA Standards, 2002(a), Grade 10, 4.3.10.A
- The learner will be able to identify evidence of natural events around the world and their effects on environmental health (e.g., Yellowstone National Park fires).  
Source: PA Standards, 2002(a), Grade 10, 4.3.10.B
- The learner will be able to identify local and state environmental regulations and their impact on environmental health.  
Source: PA Standards, 2002(a), Grade 10, 4.3.10.B

The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

## 311 TOPEC

Year 1.0 credit 9

This course (Themes of Oceanography, Physics, Environment and Chemistry) is a fast paced science course designed for college bound students planning on majoring in a science or related field. It has an environmental science theme integrating life science, earth science, chemistry, physical science and physics. Topics will provide a global view relating science to the world we live in; including population growth, the environment, food production, resources and economics.

## 312 TOPEC

Year 1.0 credit 9

This course (Themes of Oceanography, Physics, Environment and Chemistry) is designed for college bound students. The environmental science theme integrates life science, earth science, chemistry, physical science and physics. Topics will provide a global view relating science to the world we live in; including population growth, the environment, food production, resources and economics.

## 313 TOPEC

Year 1.0 credit 9

This course (Themes of Oceanography, Physics, Environment and Chemistry) is an entry-level science course. It will approach science through an environmental theme, which integrates life science, earth science, chemistry, physical science and physics. Topics will provide a global view relating science to the world we live in; including population growth, the environment, food production, resources and economics.

## Earth and Space Science

- The learner will be able to explain land-based, industrial, and commercial agents of ocean water pollution.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.5.10.D
- The learner will be able to find similarities and differences in the parts of marine water stratification and the parts of inland bodies of water.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.5.10.B
- The learner will be able to explain the composition of soil.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to suggest techniques to conserve soil.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.5.10.B
- The learner will be able to explain the nature, causes, and agents of soil erosion.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.5.10.B
- The learner will be able to recognize a variety of processes and activities that promote soil formation.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to connect particle size to soil texture.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to recognize properties of soil.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to recognize soil as a significant resource.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001,

Grade 10, 3.5.10.B

- The learner will be able to distinguish between soil texture and structure.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to explain the water cycle.  
Source: Avon Grove School District, June 2002, supporting PA Standard 3.5.10.D
- The learner will be able to explain the process by which water accumulates as underground water.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.5.10.D
- The learner will be able to identify water sources that provide drinking water.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to explain the properties of water.  
Source: Avon Grove School District, June 2002, supporting PA Standard 3.5.10.D
- The learner will be able to explain eutrophication of water by means of industrial effluents and agricultural runoffs.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.5.10.D
- The learner will be able to explain the procedure for treating wastewater.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to perform lab or field tests on samples of water from point sources.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.5.10.D
- The learner will be able to recognize water pollution sources from agriculture.  
Source: Avon Grove School District, June 2002 PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to recognize water pollution sources from domestic contributors.  
Source: Avon Grove School District, June 2002 PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to recognize water pollution sources from industrial contributors.  
Source: Avon Grove School District, June 2002 PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to recognize water pollution sources from natural contributors.  
Source: Avon Grove School District, June 2002 PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to categorize the effects on aquatic life of domestic, industrial, and agricultural water use.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to identify the different geographic properties of the ocean floor.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.5.10.A
- The learner will be able to describe changes that occur from a stream's origin to its final outflow.  
Source: PA Standards, 2002, Grade 10, 4.1.10.A
- The learner will be able to identify Pennsylvania's major watersheds and their related river systems.  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.A
- The learner will be able to describe changes by tracing a specific river's origin back to its headwaters including its major tributaries.  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.A
- The learner will be able to explain the relationship among landforms, vegetation and the amount and speed of water.  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.B
- The learner will be able to analyze a stream's physical characteristics.  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.B

- The learner will be able to explain how vegetation affects storm water runoff.  
Source: PA Standards, 2002, Grade 10, 4.1.10.B
- The learner will be able to delineate the boundaries of a watershed.  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.B
- The learner will be able to describe factors that affect the quality of groundwater.  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.B
- The learner will be able to explain how the speed of water and vegetation cover relates to erosion.  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.B
- The learner will be able to describe the physical characteristics of a stream and determine the types of organisms found in aquatic environments.  
Source: PA Standards, 2002, Grade 10, 4.1.10.C
- The learner will be able to describe and explain the physical factors that affect a stream and the organisms living there.  
Source: PA Standards, 2002, Grade 10, 4.1.10.C
- The learner will be able to describe how natural events affect a watershed (e.g., drought, floods).  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.D
- The learner will be able to identify and compare fuels used in industrial and agricultural societies.  
Source: PA Standards, 2002(a), Grade 10, 4.2.10.A
- The learner will be able to compare and contrast the cycles of various natural resources.  
Source: PA Standards, 2002(a), Grade 10, 4.2.10.A
- The learner will be able to evaluate factors affecting availability of natural resources.  
Source: PA Standards, 2002, Grade 10, 4.2.10.B
- The learner will be able to analyze how society's needs relate to the sustainability of natural resources.  
Source: PA Standards, 2002(a), Grade 10, 4.8.10.A
- The learner will be able to analyze how human activities may cause changes in an ecosystem.  
Source: PA Standards, 2002(a), Grade 10, 4.8.10.C

- The learner will be able to describe the relationship between population density and resource use and management.  
Source: PA Standards, 2002(a), Grade 10, 4.8.10.D

## Life Science

- The learner will be able to recognize and describe various kinds of wastes, their sources, and their effect on health.  
Source: Avon Grove School District, June 2002 supporting PA Academic Standard 4.3.10.D
- The learner will be able to find similarities and differences among the plants and animals in biomes.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.6.10.A
- The learner will be able to describe the function of limiting factors in an ecosystem.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.6.10.A
- The learner will be able to explore the interactions in an ecosystem.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.6.10.A
- The learner will be able to recognize the chemical equations related to the combustion of fossil fuels and their byproducts.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.4.10.A
- The learner will be able to explain the creation of fossil fuels.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.2.10.A
- The learner will be able to recognize fossil fuels as a source of energy.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.2.10.A
- The learner will be able to identify a variety of diseases and disorders associated with water pollution.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.3.10.A

- The learner will be able to recognize environmental pollutants' impact on human health.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.3.10.A
- The learner will be able to sort chemical pollutants as hazardous, mutagenic, biodegradable and nonbiodegradable.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.3.10.A
- The learner will be able to recognize the role of recycling centers in reducing wastes.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.3.10.D
- The learner will be able to comprehend the function of the EPA and other agencies in reaching the national goals of waste management including composting, recycling, reusing, and reclaiming.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.3.10.D
- The learner will be able to distinguish between biodegradable and nonbiodegradable wastes.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.3.10.D
- The learner will be able to explain how to manage industrial wastes that are not radioactive.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.3.10.D
- The learner will be able to explain how to manage organic wastes.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.3.10.D
- The learner will be able to explain how to manage industrial wastes that are radioactive.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.3.10.D
- The learner will be able to demonstrate the relationships, from broad to specific, among the following terms related to the environment: ecospheres, ecosystems, populations, communities, organisms, tissues, cells, molecules, and atoms.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.6.10.A
- The learner will be able to explain that the sun is the initial source of energy for all activity in ecosystems.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.6.10.A
- The learner will be able to explain the habitat needs of specific aquatic organisms.  
Source: PA Standards, 2002, Grade 10, 4.1.10.C
- The learner will be able to describe wetlands in terms of their effects (e.g., habitat, flood, buffer zones, prevention areas, nurseries, food production areas).  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.D
- The learner will be able to explain how a wetland influences water quality, wildlife and water retention.  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.D
- The learner will be able to analyze wetlands through their indicators (e.g., soils, plants, hydrology).  
Source: PA Standards, 2002(a), Grade 10, 4.1.10.D
- The learner will be able to explain different management alternatives involved in recycling and solid waste management.  
Source: PA Standards, 2002(a), Grade 10, 4.2.10.D
- The learner will be able to analyze the manufacturing process (before, during, and after) with consideration for resource recovery.  
Source: PA Standards, 2002(a), Grade 10, 4.2.10.D
- The learner will be able to compare various methods dealing with solid waste (e.g., incineration, compost, land application).  
Source: PA Standards, 2002, Grade 10, 4.2.10.D
- The learner will be able to differentiate between pre/post-consumer and raw materials.  
Source: PA Standards, 2002(a), Grade 10, 4.2.10.D
- The learner will be able to illustrate how one natural resource can be managed through reduction, recycling, reuse or use.  
Source: PA Standards, 2002, Grade 10, 4.2.10.D
- The learner will be able to describe environmental health issues.  
Source: PA Standards, 2002(a), Grade 10, 4.3.10.A

- The learner will be able to explain the costs and benefits of cleaning up contaminants.  
Source: PA Standards, 2002(a), Grade 10, 4.3.10.A
- The learner will be able to explain how common household cleaning products are manufactured and how to dispose of their by-products after use.  
Source: PA Standards, 2002(a), Grade 10, 4.3.10.A
- The learner will be able to identify evidence of natural events around the world and their effects on environmental health (e.g., Yellowstone National Park fires).  
Source: PA Standards, 2002(a), Grade 10, 4.3.10.B
- The learner will be able to analyze data and explain how point source pollution can be detected and eliminated.  
Source: PA Standards, 2002(a), Grade 10, 4.3.10.B
- The learner will be able to explain biological diversity as an indicator of a healthy environment.  
Source: PA Standards, 2002(a), Grade 10, 4.3.10.C
- The learner will be able to analyze the effects of species extinction on the health of an ecosystem.  
Source: PA Standards, 2002, Grade 10, 4.3.10.C
- The learner will be able to describe the importance of agriculture to society.  
Source: PA Standards, 2002, Grade 10, 4.4.10.A
- The learner will be able to identify the major cash crops of Pennsylvania.  
Source: PA Standards, 2002(a), Grade 10, 4.4.10.A
- The learner will be able to identify what percentage of the United States' population is involved in the food and fiber industry.  
Source: PA Standards, 2002(a), Grade 10, 4.4.10.A
- The learner will be able to compare the practices of no-till farming to traditional soil preparation (e.g., plow, disc).  
Source: PA Standards, 2002, Grade 10, 4.4.10.B
- The learner will be able to identify and describe how food safety issues have impacted production in agriculture.  
Source: PA Standards, 2002(a), Grade 10, 4.4.10.C
- The learner will be able to explain the biotic and abiotic components of an ecosystem and their interaction.  
Source: PA Standards, 2002, Grade 10, 4.6.10.A
- The learner will be able to identify the major biomes and explain their similarities and differences.  
Source: PA Standards, 2002, Grade 10, 4.6.10.A
- The learner will be able to explain energy flow in a food chain through an energy pyramid.  
Source: PA Standards, 2002, Grade 10, 4.6.10.A
- The learner will be able to evaluate the efficiency of energy flow in a food chain.  
Source: PA Standards, 2002, Grade 10, 4.6.10.A
- The learner will be able to explain the concept of carrying capacity in an ecosystem.  
Source: PA Standards, 2002, Grade 10, 4.6.10.A
- The learner will be able to explain trophic levels.  
Source: PA Standards, 2002(a), Grade 10, 4.6.10.A
- The learner will be able to examine and explain how organisms modify their environments to sustain their needs.  
Source: PA Standards, 2002, Grade 10, 4.6.10.A
- The learner will be able to assess the effects of latitude and altitude on biomes.  
Source: PA Standards, 2002(a), Grade 10, 4.6.10.A
- The learner will be able to interpret possible causes of population fluctuations.  
Source: PA Standards, 2002, Grade 10, 4.6.10.A
- The learner will be able to analyze how ecosystems change over time.  
Source: PA Standards, 2002, Grade 10, 4.6.10.C
- The learner will be able to identify and explain the succession stages in an ecosystem.  
Source: PA Standards, 2002, Grade 10, 4.6.10.C
- The learner will be able to identify causes of succession.  
Source: PA Standards, 2002, Grade 10, 4.6.10.C
- The learner will be able to analyze consequences of interrupting natural cycles.  
Source: PA Standards, 2002(a), Grade 10, 4.6.10.C

- The learner will be able to explain the role that specific organisms have in their ecosystem.  
Source: PA Standards, 2002, Grade 10, 4.7.10.A
- The learner will be able to identify a species and explain what effects its increase or decline might have on the ecosystem.  
Source: PA Standards, 2002(a), Grade 10, 4.7.10.A
- The learner will be able to identify a species and explain how its adaptations are related to its niche in the environment.  
Source: PA Standards, 2002, Grade 10, 4.7.10.A
- The learner will be able to explain how structure, function, and behavior of plants and animals affect their ability to survive.  
Source: PA Standards, 2002, Grade 10, 4.7.10.B
- The learner will be able to describe an organism's adaptations for survival in its habitat.  
Source: PA Standards, 2002, Grade 10, 4.7.10.B
- The learner will be able to compare adaptations among species.  
Source: PA Standards, 2002, Grade 10, 4.7.10.B
- The learner will be able to identify and explain why adaptations can lead to specialization.  
Source: PA Standards, 2002(a), Grade 10, 4.7.10.C
- The learner will be able to explain factors that could lead to a species' increase or decrease.  
Source: PA Standards, 2002, Grade 10, 4.7.10.C
- The learner will be able to explain how management practices may influence the success of specific species.  
Source: PA Standards, 2002, Grade 10, 4.7.10.C
- The learner will be able to identify and explain criteria used by scientists for categorizing organisms as threatened, endangered or extinct.  
Source: PA Standards, 2002(a), Grade 10, 4.7.10.C
- The learner will be able to explain the positive and negative impacts of the Endangered Species Act.  
Source: PA Standards, 2002(a), Grade 10, 4.9.10.A
- The learner will be able to plan and perform explorations where inferences and conclusions are made.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standards, 3.2.10.C
- The learner will be able to plan and perform an investigation that gathers, interprets and communicates data.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.2.10.C
- The learner will be able to plan and perform an investigation that differentiates between manipulated, responding and controlled variables.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.2.10.C
- The learner will be able to utilize the following science process skills in lab or field explorations: observation, classification, communication, metric measurement, prediction, inference, and gathering and interpreting information.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.2.10.C
- The learner will be able to investigate the background and historical information about a scientific concept utilizing traditional reference materials.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.2.10.C
- The learner will be able to follow standard safety procedures for explorations in the lab or the field.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.2.10.C

## Physical Science

- The learner will be able to use the principle of energy conservation when dealing with fuel consumption.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.B
- The learner will be able to recognize global alternative sources of energy.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.2.10.A

## Research and Inquiry

- The learner will be able to recognize local alternative sources of energy.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.2.10.A
- The learner will be able to identify the need for tapping energy from local resources as alternatives.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.2.10.A
- The learner will be able to distinguish between renewable and nonrenewable sources of energy.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 4.2.10.A
- The learner will be able to explain the law of conservation of energy.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.B
- The learner will be able to recognize the relative size of subatomic particles.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to recognize the relative location of subatomic particles.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to recognize the relative charge of subatomic particles.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to explain the structure of the atom as a specific arrangement of protons, neutrons and electrons.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to define radioactivity.  
Source: Avon Grove School District, June 2002, supporting PA Academic Standard 3.4.10.A

# Science

AGSD K-12 Science Curriculum  
Avon Grove School District

# \*Biology

Final, 2004

The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

A comprehensive, Introductory Biology course designed to meet PA State Standards and Avon Grove School District Standards.

## 320 HONORS BIOLOGY

Year 1.0 credit 6 periods 9, 10

Prerequisite: B minimum in Algebra I (from Middle School), A minimum in 311 Integrated Science (from the high school), or permission of the instructor.

This course is an advanced high school biology course with a laboratory-oriented approach structured around inquiry. It is designed for the science/math college-bound student. High-level reading and writing skills, and in-depth analysis of experimental data are essential. The students will be expected to do independent work both on an individual and group level. \$5 lab fee/year.

## 321 BIOLOGY

Year 1.0 credit 6 periods 10

Prerequisite: B- minimum in 311 Integrated Science, permission of the instructor. This course is a laboratory-oriented approach structured around inquiry. It is designed for the college-bound student, with emphasis on reading and writing skills, and in-depth analysis of experimental data. It is considered a laboratory science course for college admission. \$5 lab fee/year.

## 322 BIOLOGY

Year 1.0 credit 10

Prerequisite: C minimum in current math course. The student will be learning the basic content for units in cellular biology, animal structure and function, genetics, evolution and taxonomy. Laboratory exercises emphasizing reading, writing and following directions will be provided for each unit. This course is designed for the college-bound student. \$5 lab fee/year.

## 323 BIOLOGY

Year 1.0 credit 10

Students will engage in the study of living organisms from a comparative viewpoint. Units of scientific inquiry, mammals, birds, worms, amphibians, reptiles, human biology, fish, insects, cell biology, plant classification, ecology, and others will be taught. \$5 lab fee/year.

## 350 \*AP BIOLOGY

Year 1.0 credit 6x/week 11, 12

Prerequisite: B minimum in Chemistry 330 or 331 and Algebra II or permission of the instructor. This course exposes students to advanced study in the areas of bacteriology, biochemistry, physiology, microbiology, genetics, anatomy, ecology, laboratory techniques and others. Reading and writing skills commensurate with advanced level work are needed for this demanding course. Formal laboratory reports and projects will be required. College bound students interested in majoring in the sciences will benefit from this course. \$5 lab fee/year.

### Physical Science

- The learner will be able to comprehend that atoms are composed of smaller subatomic structure.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to comprehend that carbon can form many types of compounds.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to describe the formation of compounds and their properties using bonding theories.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A

### Research and Inquiry

- The learner will be able to utilize specific language for the communication of procedures, data tables, graphs, analytical methods, results, and error analyses.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B

- The learner will be able to show proficiency in the application of science process skills in laboratory and/or field activities involving observation, communication, classification, metric measurement, inference, prediction, variable identification and control, hypotheses formulation, operationally defining, planning and conducting investigations, gathering qualitative and quantitative data, constructing tables for and interpreting data, graphing, analyzing and drawing conclusions.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B
- The learner will be able to show the applicable use of reference sources to find, interpret, judge, and present information connected to research problems.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B
- The learner will be able to classify various organisms in the laboratory by utilizing a dichotomous key.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 A
- The learner will be able to discern relationships while utilizing a classification scheme to sort organisms.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 A
- The learner will be able to compose a written report in the accepted journal format.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B
- The learner will be able to utilize laboratory equipment to perform safe and precise laboratory work.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B
- The learner will be able to design an exploration with adequate control to investigate a question.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B
- The learner will be able to safely utilize various tools, basic machines, materials, and techniques to solve problems and answer questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.A

- The learner will be able to utilize suitable instruments to collect and analyze data.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B

## Life Science

- The learner will be able to explain the function of organic compounds in the cell.  
Source: Avon Grove School District, June 2002 supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to explain the four general forms of organic compounds.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to cite the importance of mitosis to single and multicellular organisms.  
Source: Avon Grove School District, June 2002 supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.C
- The learner will be able to distinguish between prokaryotes and eukaryotes.  
Source: Avon Grove School District, June 2002 supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.A
- The learner will be able to cite the cell theory.  
Source: Avon Grove School District, June 2002 supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to explain the transportation of matter through cell membranes.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 B
- The learner will be able to gauge the effect of human activities on the environment.  
Source: PA Standards, 2002(a), Grade 10, 4.8.10.C
- The learner will be able to explain how homeostasis helps maintain life.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B

# Science

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# \*Biology

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- The learner will be able to show the correct care and use of the microscope.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to identify that life has a chemical basis.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to explain what role water plays in living systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to distinguish between living and non-living things.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to describe natural selection.  
Source: Avon Grove School District, June 2002, supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to explain how natural selection is impacted by alterations in the environment.  
Source: Avon Grove School District, June 2002, supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to explain the process of photosynthesis.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to explain the role of DNA in protein synthesis.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to explain the role of RNA in protein synthesis.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to explain the process of transcription.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to explain the process of translation.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to describe cellular functions and processes in terms of energy changes and chemical reactions.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to describe how cells store and utilize information to control their functions.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to differentiate various reproductive patterns in organisms.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.C
- The learner will be able to describe various types of inheritance.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to describe why natural selection can act only on inherited traits.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to describe the mechanisms in the theory of evolution.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to explain the roles of natural selection and genetic drift.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to describe the structure of DNA and the relationship between DNA, genes, and chromosomes.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to recognize the specialized structures and areas of the cell and the function of each.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B

- The learner will be able to explain the chemical and structural basis of organisms.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to compare and contrast the function of mitosis and meiosis.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to describe the role of mutations and gene recombination in altering a population of organisms.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to explain how genetic information is inherited and expressed.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to characterize major life forms according to their placement in existing classification categories.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.A
- The learner will be able to compare selective and random breeding practices and their results.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to describe how a mutation may impact traits that are inherited.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to compare adaptations among species.  
Source: PA Standards, 2002, Grade 10, 4.7.10.B
- The learner will be able to identify and describe how food safety issues have impacted production in agriculture.  
Source: PA Standards, 2002(a), Grade 10, 4.4.10.C
- The learner will be able to identify introduced species that are classified as pests in their new environments.  
Source: PA Standards, 2002(a), Grade 10, 4.5.10.A

- The learner will be able to explain the significance of diversity in ecosystems.  
Source: PA Standards, 2002, Grade 10, 4.7.10.A
- The learner will be able to identify a species and explain how its adaptations are related to its niche in the environment.  
Source: PA Standards, 2002, Grade 10, 4.7.10.A
- The learner will be able to describe an organism's adaptations for survival in its habitat.  
Source: PA Standards, 2002, Grade 10, 4.7.10.B

### Research and Inquiry

- The learner will be able to utilize specific language for the communication of procedures, data tables, graphs, analytical methods, results, and error analyses.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B
- The learner will be able to show proficiency in the application of science process skills in laboratory and/or field activities involving observation, communication, classification, metric measurement, inference, prediction, variable identification and control, hypotheses formulation, operationally defining, planning and conducting investigations, gathering qualitative and quantitative data, constructing tables for and interpreting data, graphing, analyzing and drawing conclusions.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B
- The learner will be able to show the applicable use of reference sources to find, interpret, judge, and present information connected to research problems.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B
- The learner will be able to compose a written report in the accepted journal format.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B
- The learner will be able to utilize laboratory equipment to perform safe and precise laboratory work.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B

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- The learner will be able to design an exploration with adequate control to investigate a question.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B
- The learner will be able to safely utilize various tools, basic machines, materials, and techniques to solve problems and answer questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.A
- The learner will be able to utilize suitable instruments to collect and analyze data.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.2.10 B

## Life Science

- The learner will be able to distinguish between living and non-living things.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B

## Physical Science

- The learner will be able to comprehend that carbon can form many types of compounds.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to comprehend that atoms are composed of smaller subatomic structure.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to describe the formation of compounds and their properties using bonding theories.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A

## Life Science

- The learner will be able to explain how homeostasis helps maintain life.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B

- The learner will be able to show the correct care and use of the microscope.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to explain the four general forms of organic compounds.  
Source: Avon Grove School District, June 2002 supporting PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to identify that life has a chemical basis.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to explain what role water plays in living systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to explain the function of organic compounds in the cell.  
Source: Avon Grove School District, June 2002 supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to cite the cell theory.  
Source: Avon Grove School District, June 2002 supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to distinguish between prokaryotes and eukaryotes.  
Source: Avon Grove School District, June 2002 supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.A
- The learner will be able to recognize the specialized structures and areas of the cell and the function of each.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to explain the transportation of matter through cell membranes.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 B
- The learner will be able to describe cellular functions and processes in terms of energy changes and chemical reactions.  
Source: PA: Academic Standards, July 12, 2001, Grade

10, 3.3.10.B

- The learner will be able to describe how cells store and utilize information to control their functions.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to explain the chemical and structural basis of organisms.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to cite the importance of mitosis to single and multicellular organisms.  
Source: Avon Grove School District, June 2002 supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.C
- The learner will be able to compare and contrast the function of mitosis and meiosis.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to explain the process of photosynthesis.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.B
- The learner will be able to explain the role of DNA in protein synthesis.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to explain the role of RNA in protein synthesis.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to explain the process of transcription.  
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- The learner will be able to explain the process of translation.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to differentiate various reproductive patterns in organisms.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.C

- The learner will be able to describe the structure of DNA and the relationship between DNA, genes, and chromosomes.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to describe various types of inheritance.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to describe the role of mutations and gene recombination in altering a population of organisms.  
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- The learner will be able to describe how a mutation may impact traits that are inherited.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to explain how genetic information is inherited and expressed.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to compare selective and random breeding practices and their results.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 C
- The learner will be able to characterize major life forms according to their placement in existing classification categories.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.A

### Research and Inquiry

- The learner will be able to discern relationships while utilizing a classification scheme to sort organisms.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 A
- The learner will be able to classify various organisms in the laboratory by utilizing a dichotomous key.  
Source: Avon Grove School District, June 2002 supported by PA Standards 3.3.10 A

## Life Science

- The learner will be able to describe an organism's adaptations for survival in its habitat.  
Source: PA Standards, 2002, Grade 10, 4.7.10.B
- The learner will be able to compare adaptations among species.  
Source: PA Standards, 2002, Grade 10, 4.7.10.B
- The learner will be able to describe the mechanisms in the theory of evolution.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to describe natural selection.  
Source: Avon Grove School District, June 2002, supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to explain how natural selection is impacted by alterations in the environment.  
Source: Avon Grove School District, June 2002, supported by PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to explain the roles of natural selection and genetic drift.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to gauge the effect of human activities on the environment.  
Source: PA Standards, 2002(a), Grade 10, 4.8.10.C
- The learner will be able to describe why natural selection can act only on inherited traits.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to identify and describe how food safety issues have impacted production in agriculture.  
Source: PA Standards, 2002(a), Grade 10, 4.4.10.C
- The learner will be able to identify introduced species that are classified as pests in their new environments.  
Source: PA Standards, 2002(a), Grade 10, 4.5.10.A
- The learner will be able to explain the significance of diversity in ecosystems.  
Source: PA Standards, 2002, Grade 10, 4.7.10.A
- The learner will be able to identify a species and explain how its adaptations are related to its niche in the environment.  
Source: PA Standards, 2002, Grade 10, 4.7.10.A

# Science

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# \*Earth and Space Science

Final, 2004

The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

## 383 EARTH AND SPACE SCIENCE

Year 1.0 credit 11, 12

It is strongly recommended that the student have passed 2 high school science courses before taking this course. This course is an introduction to the various fields of the Earth Sciences. Students will study: Physical Geology (plate tectonics and processes of weathering and erosion); Meteorology (a detailed examination of weather, climate, and severe weather events); Astronomy (a study of the universe, galaxies, solar system, earth moon system, time and navigation, and a short unit on the history of space exploration). This course is for everybody, college-bound or not!

### Physical Science

- The learner will be able to explain the concepts regarding the structure of matter.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to describe common events using knowledge of the conservation of energy.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.B
- The learner will be able to comprehend Newton's laws of motion and gravity.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.C
- The learner will be able to explain the concepts regarding the properties of matter.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.A
- The learner will be able to identify that stable systems often involve underlying dynamic changes.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.E
- The learner will be able to explain patterns of change in natural, physical, and man made systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.E
- The learner will be able to explain the concepts of inertia, motion, equilibrium, and action/reaction through words, models, and mathematical symbols.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to utilize concepts regarding the structure of matter.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to examine translational motion, velocity, and acceleration as associated with free fall and projectile motion.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to use the predictable rate of nuclear decay to approximate the age of materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to describe how the decay of radioactive isotopes can be used to estimate the age of materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to interpret a model that depicts circular motion and acceleration.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to apply the concept of the conservation of energy to diverse fields, including mechanics, studies in the origin of the universe, and nuclear particles.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A

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# \*Earth and Space Science

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- The learner will be able to utilize the principles of force and motion.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to utilize concepts regarding the properties of matter.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to utilize systems analysis to predict outcomes.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.A
- The learner will be able to examine how systems, models, and technologies have altered over time.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.E

## Earth and Space Science

- The learner will be able to compare the locations of strategic earth resources and minerals in the world with their geological history through the use of maps and global systems of information.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to interpret topographic maps to recognize and explain important geologic history/structures in his/her state.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to associate earth's features and processes that alter the earth.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to evaluate the value of water as a resource.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.D
- The learner will be able to recognize the findings of many space instruments with regard to the composition and extent of the solar system and universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D

- The learner will be able to examine the findings of many space instruments with regard to the composition and extent of the solar system and universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to describe how natural resources may be used.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to describe the origin of earth's resources.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to interpret meteorological information.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to explain significant concepts with regard to the structure and composition of the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to compare the fundamental structures of the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to describe the nuclear processes that produce energy in stars.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to explain the life cycle of a star based on its position in the Hertzsprung-Russel diagram.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to explain the structure of a star using the Hertzsprung-Russell diagram.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to describe the red-shift and how the Hubble used it to find stellar distance and movement.  
Source: PA: Academic Standards, July 12, 2001, Grade

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# \*Earth and Space Science

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10, 3.4.10.D

- The learner will be able to compare apparent versus absolute star magnitude and how they are related to stellar distance.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D
- The learner will be able to explain weather and climate patterns on global levels.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to predict weather patterns through the analysis of data gathered from meteorological instruments and on-line sources.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.C
- The learner will be able to interpret geologic history using geologic maps.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to assess geologic history using geologic maps.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to assess the impacts of geologic events.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to describe plate tectonics as the mechanism of continental movement and alterations in the sea floor.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to depict plate tectonics as the mechanism of continental movement and alterations in the sea floor.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to compare examples of alterations to the surface of the earth over time with regard to continental movement and the formation of the ocean basin.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A

- The learner will be able to describe several methods of dating earth structures and materials.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.A
- The learner will be able to explain alterations that depict major events in the development of the earth based on a time line.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.3.10.D
- The learner will be able to show the impacts of sedimentation and erosion prior to, and after, the implementation of a conservation plan.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.5.10.B
- The learner will be able to assess earth processes and features that alter the earth.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.A
- The learner will be able to examine the principles and history of hydrology.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.D
- The learner will be able to compare the utilization of radio, visual, and x-ray telescopes to gather data regarding the structure and evolution of the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.D
- The learner will be able to examine the significant concepts with regard to the structure and composition of the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.D
- The learner will be able to correlate the special theory of relativity with a star's life.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.D
- The learner will be able to examine energy transfers in the atmosphere.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.C

# Science

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# \*Earth and Space Science

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- The learner will be able to examine energy transformations that occur during the greenhouse effect.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.C
- The learner will be able to evaluate the age of various earth features and objects utilizing knowledge of radioactive decay.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.A
- The learner will be able to examine the utilization of gravitational and nuclear reaction in the Big Bang theory to explain a possible origin of the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.D
- The learner will be able to explain how weather and climate involve energy transfer into and out of the atmosphere.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.C
- The learner will be able to utilize knowledge of geophysical processes to describe the formation and degradation of earth structures.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.A
- The learner will be able to comprehend the way that satellites are put into orbit around the earth.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.D
- The learner will be able to examine the mechanisms that drive weather events through the correlation of the three types of heat energy transfers.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.C
- The learner will be able to explain how differential heating of the earth's surface, atmosphere, and oceans, generates ocean and wind currents.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.C

## Life Science

- The learner will be able to interpret geological evidence that supports the theory of evolution.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.A
- The learner will be able to predict the long-term impact of increased pollutants in the atmosphere.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.5.12.C

## Research and Inquiry

- The learner will be able to suggest, develop, and appraise the best solution and develop alternative solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to communicate the process and assess and present the effects of a solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to evaluate the problem, sequence all necessary information and all questions that must be answered.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to comprehend and utilize the ongoing scientific processes to continually improve and further understand how things work.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.A
- The learner will be able to assess and explain the potential impacts of new technologies and the consequences of not keeping up-to-date on technological advances.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.C
- The learner will be able to utilize the knowledge of human abilities, to design or modify technologies that enhance and extend human abilities.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.B

# Science

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# \*Earth and Space Science

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- The learner will be able to organize investigational data using a variety of descriptive methods.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
  - The learner will be able to assess experimental data correctly within experimental limits.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
  - The learner will be able to formulate questions about objects, organisms, and/or events that can be answered through scientific exploration.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
  - The learner will be able to assess the importance of experimental data in answering the question.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
  - The learner will be able to assess the suitability of questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
  - The learner will be able to assess suitable instruments and apparatus to accurately measure materials and processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
  - The learner will be able to utilize appropriate tools, materials, and processes to find the solutions to complex problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.B
  - The learner will be able to utilize advanced tools, materials, and techniques to find answers to complex questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A
  - The learner will be able to evaluate that conclusions are logical and consistent with experimental conditions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
  - The learner will be able to assess experimental data for suitability and adherence to relevant scientific processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
  - The learner will be able to utilize appropriate measurement scales when gathering data.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.D
  - The learner will be able to utilize suitable instruments to accurately measure scientific and technological events within the error limits of the equipment.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
  - The learner will be able to examine appropriate measurement scales when gathering data.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.D
  - The learner will be able to assess the use of suitable instruments to accurately measure scientific and technological events within the error limits of the equipment.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
  - The learner will be able to assess the appropriate use of various measurement scales.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
  - The learner will be able to assess the utility and advantages of a variety of absolute and relative measurement scales for their suitable application.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
  - The learner will be able to evaluate the use of several units of measurement to the same problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.D
  - The learner will be able to utilize parts of scientific inquiry to find solutions to multi-step problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C

# Science

AGSD K-12 Science Curriculum  
Avon Grove School District

# \*Earth and Space Science

Final, 2004

- The learner will be able to utilize concepts of models as a method to predict and comprehend science and technology.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.B
- The learner will be able to assess basic science and technology concepts and their development over time.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.E
- The learner will be able to critically assess the status of existing theories.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.A
- The learner will be able to utilize patterns in science and technology.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.C
- The learner will be able to examine scale as a means of associating concepts and ideas to each other by some measure.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.D
- The learner will be able to differentiate among various models and modeling techniques and apply their use appropriately in particular applications.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.B
- The learner will be able to utilize suitable instruments and apparatus to examine various objects and processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to recognize various tools, basic machines, materials, and techniques to solve problems and answer questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.A
- The learner will be able to comprehend that science uses both direct and indirect means of observation to study the world and the universe.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.A
- The learner will be able to describe the necessity to estimate measurements within error of various instruments.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to explain the impacts of error in measurement.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.E
- The learner will be able to choose the best system of scientific measurement for a particular situation.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to compare various systems of scientific measurement.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to explain suitable instruments to collect and analyze data.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to utilize suitable instruments to collect and analyze data.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.7.10.B
- The learner will be able to utilize parts of scientific inquiry to find solutions to problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.C
- The learner will be able to explain concepts of models as a means to predict and comprehend science and technology.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.B
- The learner will be able to explain basic science and technology concepts that might solve practical problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.E
- The learner will be able to choose the appropriate tools, materials, and processes required to solve complex problems.  
Source: PA: Academic Standards, July 12, 2001, Grade

10, 3.7.10.A

- The learner will be able to compare scientific theories and beliefs.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.2.10.A
- The learner will be able to explain recurring patterns that form the basis of biological classification, chemical periodicity, astronomical order, and geological order.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.1.10.C
- The learner will be able to describe how man's view of the universe was impacted by Copernican and Newtonian thinking.  
Source: PA: Academic Standards, July 12, 2001, Grade 10, 3.4.10.D

The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit.

Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level.

Consequently, previous learning is reinforced but not retaught.

### 330 HONORS CHEMISTRY

Year 1.0 credit 6 periods 10, 11

Prerequisites: 1) B minimum in Honors Algebra I or B+ minimum in Coll. Prep Algebra I and 2) B in Honors Biology or A in Coll. Prep. Biology; or 3) permission of the instructor. This is an advanced, fast paced high school chemistry course requiring the ability to do independent and group work. High-level skills in reading comprehension, mathematics, and scientific reasoning are needed. Weekly laboratory experiments use the basic principles to further topics. Students will complete at least 13 chapters/units including oxidation and reduction. This course is highly recommended for students planning to major in the sciences in college. To be fully prepared to take the AP Chemistry Exam, this course should be followed by AP Chemistry, 360. \$5 lab fee/year.

### 331 CHEMISTRY

Year 1.0 credit 6 periods 10, 11, 12

Prerequisites: B minimum in Algebra I or permission of the instructor. This course is designed for the college bound student interested in a science-related field. Students must be able to apply algebra skills efficiently. Students will complete at least 11 chapters/units. Topics are presented through lecture, demonstrations, weekly laboratory activities, and group discussions, all of which involve problem-solving skills. \$5 lab fee/year.

### 332 CHEMISTRY

Year 1.0 credit 6 periods 10, 11, 12

Prerequisite: C minimum in Algebra I, or C in Basic Algebra. This course is designed for college-bound students. Chemistry topics are presented through lecture, demonstrations, laboratory activities, and group discussions, all of which involve problem-solving skills. \$5 lab fee/year.

### 333 CHEMISTRY

Year 1.0 credit 11, 12

This course provides students with the basic concepts of chemistry through laboratory work. Laboratory experiments are used to introduce theory, and learning is accomplished through these experiences. \$5 lab fee/year.

### 360\*AP CHEMISTRY

Year 1.0 credit 6x/week 11, 12

Prerequisite: B minimum in Chemistry 330 or permission of the instructor. This is a second-year chemistry course of an advanced nature that will stress independent and group learning. It is recommended as preparation for the AP Chemistry exam or SAT 2 subject test. Students majoring in one of the sciences would benefit from this course.

Applications of chemistry as well as organic chemistry topics will be covered. Students will be expected to be able to apply topics from Chemistry 330 to more challenging topics. There will be an emphasis on developing independent work skills. \$5 lab fee/year.

### Research and Inquiry

- The learner will be able to plan and perform explorations where inferences and conclusions are made.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to plan and perform an investigation that gathers, interprets and communicates data.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to plan and perform an investigation that recognizes a problem.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to plan and perform an investigation that differentiates between manipulated, responding and controlled variables.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D

- The learner will be able to utilize the following science process skills in lab or field explorations: observation, classification, communication, metric measurement, prediction, inference, and gathering and interpreting information.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12,3.2.12.B
- The learner will be able to investigate the background and historical information about a scientific concept utilizing traditional reference materials.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
- The learner will be able to follow standard safety procedures for explorations in the lab or the field.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B.
- The learner will be able to learn standard safety procedures for explorations in the lab or the field.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B.
- The learner will be able to utilize current technologies to investigate scientific research that is presently being done.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.6.12.C.
- The learner will be able to judge procedures, data, and conclusions to find out the validity of scientific research.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C and 3.2.12.B.
- The learner will be able to assess experimental data correctly within experimental limits.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
- The learner will be able to utilize the gas laws to calculate and describe the impact of temperature and pressure on the volume of a gas.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.; PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.A, and PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to compare the various explanations regarding acids and bases to include Arrhenius, Bronsted-Lowry and Lewis.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to perform neutralization reactions experimentally by utilizing titration.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A
- The learner will be able to write formulas for various acids, bases, and salts.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards. July 12, 2001, Grade 12.3.4.12.A.
- The learner will be able to name various acids, bases, and salts.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to operationally define acids, bases, and salts in an investigation by utilizing specific indicators.  
Source: Avon Grove School District, June 2002.  
Supporting PA:Academic Stndards, July 12, 2001, Grade 12.3.7.12B.
- The learner will be able to explain the parts of atoms.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade12.4.12.A.
- The learner will be able to explain how ionization energy and electron affinity are related to atomic radius.  
Source: Avon Grove School District, June 2002.  
Supporting PA:Academic Standards, July 12, 2001, Grade 12.3.4.12.A and 12.3.4.12.B.

## Physical Science

- The learner will be able to find the percent weight or volume of a compound by utilizing investigations.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A, and PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to write formulas for various compounds.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to name various compounds.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to find out the polarity of bonds and molecules in order to explain the properties of compounds.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to explain weak bonds.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.3.12.A
- The learner will be able to explain the conditions in which each type of bonding would happen.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.3.12.A
- The learner will be able to explain ionic and covalent bonds.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.3.12.A
- The learner will be able to give evidence that a chemical reaction has happened from an investigation.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standard, July 12, 2001, Grade 12.3.2.12.C
- The learner will be able to utilize the idea of molar volume to calculate the gaseous products of a chemical reaction.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A, and PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to estimate the products of replacement reactions on the basis of the reactants ionization energy, electronegativity, and location in the periodic table.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12.3.4.12.B.
- The learner will be able to sort reaction products into heterogeneous or homogeneous.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12.3.4.12.A.
- The learner will be able to utilize potential energy diagrams to estimate the rate and extent of reactions.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12.3.4.12.B.
- The learner will be able to explain the rate and spontaneity of reactions by using the ideas of free energy, entropy and enthalpy.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.B, and PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.B
- The learner will be able to explain how concentration, temperature, pressure, surface area and catalysts impact the rate of reactions.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12.3.4.12.A.
- The learner will be able to show how products of a reaction are able to be separated.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12.3.4.12.A.

- The learner will be able to group four kinds of chemical reactions.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to use experimental data to find the empirical formula for a compound.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A, and PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to draw electron dot diagrams to illustrate electron configurations of atoms and molecules.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.B
- The learner will be able to explain the orbital configuration for the basic elements.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12B.
- The learner will be able to show the pattern in which the s, p, d, and f orbitals are filled.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12.3.1.12B
- The learner will be able to utilize potential energy diagrams to show activation energy, activated complex, reactant, product, and reaction rates.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001. Grade 12, 3.4.12B.
- The learner will be able to furnish commonly accepted rules for balancing equations.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to furnish commonly accepted rules for writing equations.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to compare solids, liquids, and gases in terms of physical characteristics.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to compare solids, liquids, and gases in terms of collision theory.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to relate the conduct of gases to everyday life.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.3.12.B.
- The learner will be able to differentiate between ideal gases and ones that are not ideal.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001. Grade 12, 3.4.12.A.
- The learner will be able to operationally define temperature and/or calorie.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.B, and PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.B
- The learner will be able to explain liquids in terms of density.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to explain liquids in terms of the interactions between molecules.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.3.12.A and PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to explain liquids by utilizing vapor pressure.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A

- The learner will be able to use the Law of Conservation of Matter.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to find out if a reaction that is caused by mixing two substances is endothermic or exothermic.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12.3.4.12.A.
- The learner will be able to categorize a mixture as: homogenous, heterogeneous, miscible, immiscible, or colloid.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to define mole.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.B.
- The learner will be able to utilize the idea of moles to find out the relative quantity of products and reactants in a reaction.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to utilize the configuration of electrons to estimate the shape and consequently the characteristics of molecules.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.3.12.A
- The learner will be able to explain how organic chemistry can be used in modern industry.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.6.12.A.
- The learner will be able to utilize methane as a model to draw and name various organic compounds.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A, and PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to talk about the solubility characteristics of organic compounds.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12A
- The learner will be able to use the periodic table to find atomic mass.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to use the periodic table to find atomic numbers.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to connect the position of an element in the periodic table with the period and group reactivity.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to explain how valence electrons are related to the trends of reactivity in the periodic table.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to recognize factors that impact solubility.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to make calculations that determine the correct amount of a substance.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A, and PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to explain the characteristics of colloids.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.

- The learner will be able to explain the usage of colloids in the everyday world.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to recognize theories that describe how solutions are formed.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to find the impact of solute on boiling point elevation and freezing point depression.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to make solutions that have varying molarity, molality, and normality.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A
- The learner will be able to utilize data to calculate the molecular weight of a solute.  
Source: Avon Grove School District, June 2002  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A, and PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to explain boiling point by utilizing vapor pressure.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to explain melting points by utilizing crystalline structure.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to explain intermolecular interactions by utilizing vapor pressure.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to find out the variables that impact evaporation, vaporization, condensation, and sublimation in the lab.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to find the amount of heat needed to change a solid to a gas in the lab.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.B and PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to graph the amount of heat needed to change a solid to a gas in the lab.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.B and PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to utilize experimentally obtained pH to find the concentration of hydrogen ions in solutions.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to describe how indicators show the relative pH of a substance.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.
- The learner will be able to understand that atoms can come together to form molecules.  
Source: Avon Grove School District, June 2002.  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A.

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## 381 ADVANCED ENVIRONMENTAL SCIENCE

Year 1.0 credit 11, 12

Advanced Environmental Science is an advanced science class, which is interdisciplinary in nature. It will investigate the inter relatedness of humanity and the living and non-living environments. It is designed for upperclassmen who: 1) have an interest in environmental science, 2) are able to work independently, 3) are able to handle an advanced amount of material, 4) are planning on pursuing a science related major in college, 5) have taken at least biology and chemistry, and 6) have been very successful (grades of A or B) in all previous science classes.

### Earth and Space Science

- The learner will be able to categorize stream order in a watershed.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.A
- The learner will be able to explain the concept of stream order.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.A
- The learner will be able to identify the order of watercourses within a major river's watershed.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.A
- The learner will be able to compare and contrast the physical differences found in the stream continuum from headwater to mouth.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.A
- The learner will be able to explain the relationships that exist within watershed in the United States.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.B
- The learner will be able to understand that various ecosystems may be contained in a watershed.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.B
- The learner will be able to examine and describe the ecosystems contained within a specific watershed.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.B
- The learner will be able to identify and describe the major watersheds in the United States.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.B
- The learner will be able to analyze the parameters of a watershed.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.C
- The learner will be able to interpret physical, chemical and biological data as a means of assessing the environment of a watershed.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.C
- The learner will be able to apply appropriate techniques in the analysis of a watershed (e.g., water quality, biological diversity, erosion, sedimentation).  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.C
- The learner will be able to evaluate the trade-offs, costs, and benefits of conserving watersheds and wetlands.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.E
- The learner will be able to evaluate the effects of natural events on watershed and wetlands.  
Source: PA Standards, 2002, Grade 12, 4.1.12.E
- The learner will be able to evaluate the effects of human activities on watersheds and wetlands.  
Source: PA Standards, 2002, Grade 12, 4.1.12.E
- The learner will be able to analyze the use of renewable and nonrenewable resources.  
Source: PA Standards, 2002(a), Grade 12, 4.2.12.A
- The learner will be able to explain the effects on the environment and sustainability through the use of nonrenewable resources.  
Source: PA Standards, 2002(a), Grade 12, 4.2.12.A
- The learner will be able to evaluate the advantages and disadvantages of reusing our natural resources.  
Source: PA Standards, 2002(a), Grade 12, 4.2.12.A

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- The learner will be able to analyze factors affecting the availability of renewable and nonrenewable resources.  
Source: PA Standards, 2002(a), Grade 12, 4.2.12.B
- The learner will be able to evaluate the use of natural resources and offer approaches for using them while diminishing waste.  
Source: PA Standards, 2002(a), Grade 12, 4.2.12.B
- The learner will be able to compare the economics of different areas based on the availability and accessibility of the natural resources.  
Source: PA Standards, 2002, Grade 12, 4.2.12.B
- The learner will be able to analyze factors that influence availability of natural resources.  
Source: PA Standards, 2002, Grade 12, 4.2.12.C
- The learner will be able to compare the use of natural resources in different countries.  
Source: PA Standards, 2002, Grade 12, 4.2.12.C
- The learner will be able to determine how delivery systems influence the availability of resources at the local, regional and national level.  
Source: PA Standards, 2002(a), Grade 12, 4.2.12.C
- The learner will be able to explain how technology has influenced the sustainability of natural resources over time.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.A
- The learner will be able to describe how technology has changed the use of natural resources by business and industry.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.A
- The learner will be able to analyze the effect of natural resource conservation on a product over time (e.g., automobile manufacturing, aluminum can recycling, paper products).  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.A
- The learner will be able to analyze technology's role on natural resource sustainability.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.B
- The learner will be able to explain how technology has decreased the use of raw natural resources.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.B

- The learner will be able to explain how technology has impacted the efficiency of the use of natural resources.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.B
- The learner will be able to analyze the role of technology in the reduction of pollution.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.B
- The learner will be able to analyze how pollution has changed in quantity, variety and toxicity as the United States developed its industrial base.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.C
- The learner will be able to analyze historical pollution trends and project them for the future.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.C
- The learner will be able to compare and contrast historical and current pollution levels at a given location.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.C
- The learner will be able to analyze the international implications of environmental occurrences.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.D
- The learner will be able to identify natural occurrences that have international impact (e.g., El Nino, volcano eruptions, earthquakes).  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.D
- The learner will be able to analyze environmental issues and their international implications.  
Source: PA Standards, 2002(a), Grade 12, 4.8.12.D

## Life Science

- The learner will be able to analyze the complex and diverse ecosystems of wetlands.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.D
- The learner will be able to explain the functions of habitat, nutrient production, migration, stopover and groundwater recharge as it relates to wetlands.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.D
- The learner will be able to explain the dynamics of a wetland ecosystem.  
Source: PA Standards, 2002(a), Grade 12, 4.1.12.D

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- The learner will be able to describe and analyze different types of wetlands.  
Source: PA Standards, 2002, Grade 12, 4.1.12.D
  - The learner will be able to evaluate solid waste management practices.  
Source: PA Standards, 2002(a), Grade 12, 4.2.12.D
  - The learner will be able to examine and explain the path of a recyclable material from collection to waste, reuse or recycling identifying the market forces.  
Source: PA Standards, 2002(a), Grade 12, 4.2.12.D
  - The learner will be able to understand current regulations concerning recycling and solid waste.  
Source: PA Standards, 2002(a), Grade 12, 4.2.12.D
  - The learner will be able to research new technologies in the use, reuse or recycling of materials.  
Source: PA Standards, 2002(a), Grade 12, 4.2.12.D
  - The learner will be able to analyze the complexity of environmental health issues.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.A
  - The learner will be able to identify environmental health issues and explain how they have been addressed on a worldwide level.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.A
  - The learner will be able to analyze efforts to prevent, control and/or reduce pollution through cooperation and benefit analysis and management.  
Source: PA Standards, 2002, Grade 12, 4.3.12.A
  - The learner will be able to describe the impact of occupational exposures as they relate to environmental health issues.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.A
  - The learner will be able to identify invisible pollutants and explain their effects on human health.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.A
  - The learner will be able to explain the relationship between wind direction and velocity as it relates to dispersal and occurrence of pollutants.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.A
  - The learner will be able to explain the different disposal methods used for toxic and hazardous waste.  
Source: PA Standards, 2002, Grade 12, 4.3.12.A
  - The learner will be able to analyze the local, regional and national impacts of environmental health.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.B
  - The learner will be able to analyze the cost of natural disasters in both dollars and loss of natural habitat.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.B
  - The learner will be able to research and analyze the local, state and national laws that deal with point and nonpoint source pollution and evaluate the costs and benefits of these laws.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.B
  - The learner will be able to explain mitigation and its role in environmental health.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.B
  - The learner will be able to explain industry's initiatives to meet state and federal mandates on clean air and water.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.B
  - The learner will be able to describe the impacts of point and nonpoint source pollution on the Chesapeake Bay.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.B
  - The learner will be able to identify and evaluate the costs and benefits of laws regulating air and water quality and waste disposal.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.B
  - The learner will be able to analyze the need for a healthy environment.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.C
  - The learner will be able to research the relationship of some chronic diseases to an environmental pollutant.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.C
  - The learner will be able to explain how man-made systems may affect the environment.  
Source: PA Standards, 2002(a), Grade 12, 4.3.12.C
  - The learner will be able to analyze the management practices in the agriculture business.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.A
  - The learner will be able to define the components of an agriculture system that would result in a minimal waste of resources.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.A

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- The learner will be able to identify the diversity in crop production and analyze the advantages and disadvantages of such diversity.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.A
- The learner will be able to research and analyze environment practices related to agricultural systems.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.A
- The learner will be able to analyze the effects of agricultural practices on the economy.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.A
- The learner will be able to analyze the impact of nutrient management laws on Pennsylvania agriculture.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.A
- The learner will be able to assess the role of agriculture cooperatives.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.A
- The learner will be able to describe how agricultural science has influenced biotechnology.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.B
- The learner will be able to investigate how bio-engineered crops may influence the food supply.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.B
- The learner will be able to analyze the use of specific bacteria for the control of agricultural pests.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.B
- The learner will be able to evaluate the use of feed additives in shifting metabolism to increase muscle mass and reduce fat in farm animals.  
Source: PA Standards, 2002, Grade 12, 4.4.12.B
- The learner will be able to analyze and research the social, political and economic factors that agricultural systems.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.C
- The learner will be able to analyze the costs and benefits associated with agriculture practice and how they affect economic and human needs.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.C
- The learner will be able to analyze the costs and benefits of agriculture research practices in society.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.C
- The learner will be able to research the use of by-products that are the results of agriculture production (e.g., manure handling, bird feathers).  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.C
- The learner will be able to analyze research and development activities as they relate to agriculture.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.D
- The learner will be able to analyze the role of research development and technology as it related to the food and fiber system.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.D
- The learner will be able to research and analyze energy sources used and/or generated by producing, processing and marketing agricultural products.  
Source: PA Standards, 2002(a), Grade 12, 4.4.12.D
- The learner will be able to research integrated pest management systems.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.A
- The learner will be able to analyze the threshold limits of pests and the need for intervention in a managed environment.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.A
- The learner will be able to research the types of germicides and analyze their effects on homes, industry, hospitals and institutions.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.A
- The learner will be able to design and explain an integrated pest management plan that uses a range of pest controls.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.A
- The learner will be able to research and analyze integrated pest management practices globally.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.B
- The learner will be able to research worldwide integrated pest management systems and evaluate the level of impact.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.B
- The learner will be able to research and analyze the international regulations that exist related to integrated pest management.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.B

- The learner will be able to explain the complexities associated with moving from one level of control to the next with different integrated pest management practices and compare the related costs of each system.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.B
- The learner will be able to analyze the historical significance of integrated pest management on society.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.C
- The learner will be able to explain the dynamics of integrated pest management practices and the relative effects upon society.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.C
- The learner will be able to identify historic events affecting integrated pest management and cite the practices used (e.g., avian flu, bubonic plague, potato blight).  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.C
- The learner will be able to research and analyze the long-term effects of pest management practices on the environment.  
Source: PA Standards, 2002(a), Grade 12, 4.5.12.C
- The learner will be able to analyze the interdependence of an ecosystem.  
Source: PA Standards, 2002, Grade 12, 4.6.12.A
- The learner will be able to analyze the relationships among components of an ecosystem.  
Source: PA Standards, 2002, Grade 12, 4.6.12.A
- The learner will be able to evaluate the efficiency of energy flow within an ecosystem.  
Source: PA Standards, 2002(a), Grade 12, 4.6.12.A
- The learner will be able to explain limiting factors and their impact on carrying capacity.  
Source: PA Standards, 2002, Grade 12, 4.6.12.A
- The learner will be able to understand how biological diversity impacts the stability of an ecosystem.  
Source: PA Standards, 2002, Grade 12, 4.6.12.A
- The learner will be able to analyze the positive or negative impacts of outside influences on an ecosystem.  
Source: PA Standards, 2002, Grade 12, 4.6.12.A
- The learner will be able to analyze how different land use practices can affect the quality of soils.  
Source: PA Standards, 2002(a), Grade 12, 4.6.12.A
- The learner will be able to analyze the impact of cycles on the ecosystem.  
Source: PA Standards, 2002(a), Grade 12, 4.6.12.B
- The learner will be able to evaluate the materials necessary for natural cycles.  
Source: PA Standards, 2002(a), Grade 12, 4.6.12.B
- The learner will be able to explain the processes involved in the natural cycles.  
Source: PA Standards, 2002(a), Grade 12, 4.6.12.B
- The learner will be able to analyze how human action and natural changes affect the balance within an ecosystem.  
Source: PA Standards, 2002, Grade 12, 4.6.12.C
- The learner will be able to analyze the effects of substances that move through natural cycles.  
Source: PA Standards, 2002(a), Grade 12, 4.6.12.C
- The learner will be able to analyze the effects of natural occurrences and their effects on ecosystems.  
Source: PA Standards, 2002, Grade 12, 4.6.12.C
- The learner will be able to analyze effects of human action on an ecosystem.  
Source: PA Standards, 2002, Grade 12, 4.6.12.C
- The learner will be able to compare the stages of succession and how they influence the cycles existing in an ecosystem.  
Source: PA Standards, 2002(a), Grade 12, 4.6.12.C
- The learner will be able to analyze biological diversity as it relates to the stability of an ecosystem.  
Source: PA Standards, 2002, Grade 12, 4.7.12.A
- The learner will be able to examine and explain what happens to an ecosystem as biological diversity changes.  
Source: PA Standards, 2002, Grade 12, 4.7.12.A
- The learner will be able to explain the relationship between species loss and biodiversity.  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.A

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- The learner will be able to examine and explain how a specialized interaction between two species may affect the survival of both species.  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.A
- The learner will be able to examine the effects of extinction, both natural and human caused, on the environment.  
Source: PA Standards, 2002, Grade 12, 4.7.12.B
- The learner will be able to predict how human or natural action can produce change to which organisms cannot adapt.  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.B
- The learner will be able to identify species that became extinct through natural causes and explain how that occurred.  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.B
- The learner will be able to identify a species that became extinct due to human actions and explain what occurred.  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.B
- The learner will be able to analyze the effects of threatened, endangered or extinct species on human and natural systems.  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.C
- The learner will be able to identify and explain how a species increase, decline or elimination affects the ecosystem and/or human, social, cultural and economic structures.  
Source: PA Standards, 2002, Grade 12, 4.7.12.C
- The learner will be able to explain why natural populations do not remain constant.  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.C
- The learner will be able to analyze management strategies regarding threatened or endangered species.  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.C
- The learner will be able to identify laws, agreements or treaties at national or international levels regarding threatened or endangered species.  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.C
- The learner will be able to analyze the role of zoos and wildlife preserves on species that have been identified as threatened or endangered.  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.C
- The learner will be able to examine the influence of wildlife management in preserving different species in Pennsylvania (e.g., bobcat, elk, bald eagle).  
Source: PA Standards, 2002(a), Grade 12, 4.7.12.C
- The learner will be able to analyze environmental laws and regulations as they relate to environmental issues.  
Source: PA Standards, 2002(a), Grade 12, 4.9.12.A
- The learner will be able to analyze and explain how issues lead to environmental law or regulation (e.g., underground storage tanks, regulation of water discharges, hazardous, solid and liquid industrial waste, endangered species).  
Source: PA Standards, 2002(a), Grade 12, 4.9.12.A
- The learner will be able to compare and contrast environmental laws and regulations that may have a positive or negative impact on the environment and the economy.  
Source: PA Standards, 2002, Grade 12, 4.9.12.A
- The learner will be able to research and describe the effects of an environmental law or regulation and how it has impacted the environment.  
Source: PA Standards, 2002(a), Grade 12, 4.9.12.A

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The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

## 382 CURRENT SCIENCE AND TECHNOLOGY

Year 1.0 credit 12

Prerequisite: Seniors who have a successfully completed at least 3 other science courses with C minimum or permission of instructor; algebra skills are required.

This course provides a fourth and/or fifth course of science for those students who will be continuing their education after high school. Current issues and recent scientific developments will be used to illustrate the interdisciplinary nature of science, reinforce the methodology of scientific research, and familiarize the student with electronic publication of scientific data and information. The technology component of the course involves regular access to computers for honing Internet research, graphics, multimedia, and presentation software skills in preparation for college and the workplace. Topics include but are not limited to: Astronomy, Biology, Chemistry, Computer Science & Technology, Environmental Science, Medicine and Physics.

### Research and Inquiry

- The learner will be able to suggest, develop, and appraise the best solution and develop alternative solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to communicate the process and assess and present the effects of a solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D

- The learner will be able to assess the solution, test, redesign, and make improvements if necessary.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to evaluate the problem, sequence all necessary information and all questions that must be answered.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to comprehend and utilize the ongoing scientific processes to continually improve and further understand how things work.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.A
- The learner will be able to assess and explain the potential impacts of new technologies and the consequences of not keeping up-to-date on technological advances.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.C
- The learner will be able to synthesize and assess the interactions and constraints of science and technology on society.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.A
- The learner will be able to suggest solutions to specific scientific and technological applications and include the identification of possible financial considerations.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.C
- The learner will be able to utilize the knowledge of human abilities, to design or modify technologies that enhance and extend human abilities.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.B
- The learner will be able to choose and safely use suitable tools, materials, and processes required to solve complex problems that may result in more than one solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A

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- The learner will be able to utilize appropriate tools, materials, and processes in physical, biotechnological, or informational systems to identify and suggest solutions to international problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.B
- The learner will be able to evaluate and use multiple input and output devices to find solutions to specific problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.C
- The learner will be able to organize investigational data using a variety of descriptive methods.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to assess experimental data correctly within experimental limits.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
- The learner will be able to design an exploration with limited variables to investigate a question.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to design an exploration with adequate control to investigate a question.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to formulate questions about objects, organisms, and/or events that can be answered through scientific exploration.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to assess the importance of experimental data in answering the question.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to assess the suitability of questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to assess suitable instruments and apparatus to accurately measure materials and processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
- The learner will be able to utilize appropriate tools, materials, and processes to find the solutions to complex problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.B
- The learner will be able to implement a solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to utilize advanced tools, materials, and techniques to find answers to complex questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A
- The learner will be able to evaluate that conclusions are logical and consistent with experimental conditions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
- The learner will be able to assess experimental data for suitability and adherence to relevant scientific processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
- The learner will be able to interpret results of investigational research to predict new data or improve a solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
- The learner will be able to formulate additional questions from a research study that could be studied.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to assess the use of suitable instruments to accurately measure scientific and technological events within the error limits of the equipment.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B

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- The learner will be able to assess the appropriate use of various measurement scales.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
- The learner will be able to assess the utility and advantages of a variety of absolute and relative measurement scales for their suitable application.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
- The learner will be able to evaluate the use of several units of measurement to the same problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.D
- The learner will be able to explain the operation of fiber optic, microwave, and satellite informational systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.6.12.B
- The learner will be able to utilize concepts of systems, subsystems, feedback, and control to find solutions to complex technological problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.A
- The learner will be able to utilize a variety of graphic and electronic information techniques to find solutions to real world problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.6.12.B
- The learner will be able to assess patterns of change within a technology.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.E
- The learner will be able to communicate the positive and negative effects on society of a recent technological invention.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.C
- The learner will be able to examine scientific and technological solutions through risk/benefit analysis.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.C
- The learner will be able to examine the positive and negative effects on society of a recent technological invention.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.C
- The learner will be able to utilize parts of scientific inquiry to find solutions to multi-step problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to utilize concepts of models as a method to predict and comprehend science and technology.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.B
- The learner will be able to assess basic science and technology concepts and their development over time.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.E
- The learner will be able to assess the nature of scientific and technological knowledge.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.A
- The learner will be able to assess limitations proposed by society on scientific research and technological applications.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.A
- The learner will be able to assess the benefits, consequences, and impacts of scientific and technological solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.C
- The learner will be able to utilize technological resources to solve complex multistep problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A
- The learner will be able to assess technological resources to solve complex multistep problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A

# Science

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# \*Current Science & Technology

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- The learner will be able to critically assess the status of existing theories.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.A
  - The learner will be able to describe how correlation of variables does not always imply causation.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.E
  - The learner will be able to compare resource choices in finding a solution to a specific manufacturing problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.6.12.C
  - The learner will be able to utilize patterns in science and technology.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.C
  - The learner will be able to utilize recurring patterns in natural and technological systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.C
  - The learner will be able to evaluate patterns in science and technology.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.C
  - The learner will be able to evaluate recurring patterns in natural and technological systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.C
  - The learner will be able to utilize ingenuity and resources to find solutions to the specific needs of society and improving the quality of life.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.B
  - The learner will be able to compare and contrast how technological and scientific knowledge is shared and protected.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.A
  - The learner will be able to assess developments in technology that have altered the way humans do work and discuss their impacts.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.A
  - The learner will be able to utilize advanced multimedia techniques.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.D
  - The learner will be able to examine the legal responsibilities of computer users.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.D
  - The learner will be able to examine the effectiveness of on-line information resources to meet the needs for research, collaboration, and publications.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.E
  - The learner will be able to assess the importance of computer models in interpreting scientific and technological systems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.B
  - The learner will be able to assess the effectiveness of the computer as a presentation tool.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.D
  - The learner will be able to organize investigational data using a variety of analytical methods.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C

The Pennsylvania Academic Standards describe what students should know and be able to do by the end of fourth, seventh, tenth and twelfth grade. In addition, these standards reflect the increasing complexity and sophistication that students are expected to achieve as they progress. This document avoids repetition, making an obvious progression across grade levels less explicit. Teachers shall expect that students know and can apply the concepts and skills expressed at the preceding level. Consequently, previous learning is reinforced but not retaught.

## 340 HONORS PHYSICS

Year 1.0 credit 11

This course is designed for the highly motivated student who is interested in a career in science, engineering, or mathematics. Independent and group learning will be stressed as students apply the basic principles of physics to problem solving and laboratory experiments. This course, when combined with AP Physics, will help students prepare for the AP Physics B exam. A strong math background is required for this course.

## 341 PHYSICS

Year 1.0 credit 11, 12

This course is designed for those students planning to major in a science-related field. It will provide students with a foundation in physics for work at the college level. A strong math background is required for this course.

## 370 \*AP PHYSICS

Year 1.0 credit 12

Prerequisite: C minimum in Honors Physics or permission of the instructor. This course extends the foundation of topics covered in Honors Physics 340. Advanced topics such as electricity, magnetism, electronics, and modern physics are covered. This course is necessary for preparation for the AP Physics exam.

### Physical Science

- The learner will be able to explain the concepts of inertia, motion, equilibrium, and action/reaction through words, models, and mathematical symbols.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C

- The learner will be able to utilize concepts regarding the structure of matter.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to examine translational motion, velocity, and acceleration as associated with free fall and projectile motion.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to interpret a model that depicts circular motion and acceleration.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to examine the principles of rotational motion to find solutions to problems associated with angular momentum and torque.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to apply the concept of the conservation of energy to diverse fields, including mechanics, studies in the origin of the universe, and nuclear particles.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
- The learner will be able to utilize the principles of force and motion.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to assess wave characteristics of frequency, wavelength, and speed when applied to sound and light traveling in different media.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to utilize the appropriate concepts in thermodynamics.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.B
- The learner will be able to explain the function, interaction, and relationship between the subsystems and the system.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.A

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- The learner will be able to examine the function, interaction, and relationship between the subsystems and the system.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.A
  - The learner will be able to utilize concepts regarding the properties of matter.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
  - The learner will be able to understand that significant amounts of energy are released during nuclear changes.  
Source: Avon Grove School District, June 2001;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
  - The learner will be able to explore the laws of conservation relevant to nuclear changes.  
Source: Avon Grove School District, June 2001;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
  - The learner will be able to use the properties of reactants and products to describe nuclear changes.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
  - The learner will be able to understand that a nuclear reaction converts a fraction of the mass of interacting particles into energy.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 3.4.12.A
  - The learner will be able to explain alpha, beta and gamma particles.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
  - The learner will be able to understand nuclear reactions.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.A
  - The learner will be able to identify the characteristics of images formed by different lenses and mirrors.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
  - The learner will be able to recognize a lens as either convex or concave.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
  - The learner will be able to understand the visible spectrum, light waves, reflection, refraction, diffraction, opaque, transparent and/or translucent properties of light.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
  - The learner will be able to associate the properties of light to the characteristics of waves.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
  - The learner will be able to understand wave and/or particle theory.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 21, 2001, Grade 12, 3.4.12.C
  - The learner will be able to comprehend magnetism.  
Source: Avon Grove School District
  - The learner will be able to utilize the left hand rule to explain the magnetic field for straight conductors and solenoids.  
Source: Avon Grove School District
  - The learner will be able to comprehend the nature of magnetism.  
Source: Avon Grove School District
  - The learner will be able to use the idea that like charges repel and opposite charges attract.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.2.C
  - The learner will be able to understand the two aspects of electromagnetic forces: electricity and magnetism.  
Source: Avon Grove School District, June 2002,  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C

- The learner will be able to describe that magnetic forces are related to electric forces and can be viewed as two different components of electromagnetic force.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to explore electromagnetic forces.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to describe the following concepts: magnetic field, electric field, electrical charge, electrical current, and electrical potential, using the definitions of the coulomb, ampere, volt, volt/meter, and tesla.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to assess the parameters of circuits, using Ohm's Law, appropriate data, and computations.  
Source: Avon Grove School District, June, 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to comprehend direct current electrical circuits.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to compare the frequency of sound generated from a stationary source with the frequency of a moving source of sound, the Doppler effect.  
Source: Avon Grove School District; June 2002;  
supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12. C
- The learner will be able to associate the properties of sound to the characteristics of waves.  
Source: Avon Grove School District; June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C

- The learner will be able to investigate sound.  
Source: Avon Grove School District; June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12. C
- The learner will be able to show that s/he knows the basic principles of sound.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to understand how to use the components of a vector to determine its magnitude and direction.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C
- The learner will be able to understand work, power and energy.  
Source: Avon Grove School District, June 2002;  
Supporting PA: Academic Standards, July 12, 2001, Grade 12, 3.4.12.C

## Research and Inquiry

- The learner will be able to suggest, develop, and appraise the best solution and develop alternative solutions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to communicate the process and assess and present the effects of a solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to assess the solution, test, redesign, and make improvements if necessary.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to evaluate the problem, sequence all necessary information and all questions that must be answered.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D

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- The learner will be able to utilize knowledge of complex physical models to interpret data and apply mathematical models.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.B
- The learner will be able to comprehend and utilize the ongoing scientific processes to continually improve and further understand how things work.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.A
- The learner will be able to utilize knowledge of construction technology to design, plan, and apply all resources required to successfully solve a construction problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.6.12.C
- The learner will be able to suggest solutions to specific scientific and technological applications and include the identification of possible financial considerations.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.C
- The learner will be able to choose and safely use suitable tools, materials, and processes required to solve complex problems that may result in more than one solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A
- The learner will be able to organize investigational data using a variety of descriptive methods.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to assess experimental data correctly within experimental limits.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
- The learner will be able to design an exploration with limited variables to investigate a question.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to design an exploration with adequate control to investigate a question.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to formulate questions about objects, organisms, and/or events that can be answered through scientific exploration.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to assess the importance of experimental data in answering the question.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to assess the suitability of questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to assess suitable instruments and apparatus to accurately measure materials and processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
- The learner will be able to utilize appropriate tools, materials, and processes to find the solutions to complex problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.8.12.B
- The learner will be able to implement a solution to a problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to utilize advanced tools, materials, and techniques to find answers to complex questions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A
- The learner will be able to evaluate that conclusions are logical and consistent with experimental conditions.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
- The learner will be able to assess experimental data for suitability and adherence to relevant scientific processes.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B

- The learner will be able to interpret results of investigational research to predict new data or improve a solution.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.B
- The learner will be able to utilize appropriate measurement scales when gathering data.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.D
- The learner will be able to utilize suitable instruments to accurately measure scientific and technological events within the error limits of the equipment.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
- The learner will be able to examine appropriate measurement scales when gathering data.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.D
- The learner will be able to assess the use of suitable instruments to accurately measure scientific and technological events within the error limits of the equipment.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
- The learner will be able to assess the appropriate use of various measurement scales.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
- The learner will be able to assess the utility and advantages of a variety of absolute and relative measurement scales for their suitable application.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.B
- The learner will be able to evaluate the use of several units of measurement to the same problem.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.D
- The learner will be able to show the safe use of instruments and machines within their specifications.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A
- The learner will be able to utilize parts of scientific inquiry to find solutions to multi-step problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to utilize concepts of models as a method to predict and comprehend science and technology.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.B
- The learner will be able to utilize technological design process to solve problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.D
- The learner will be able to utilize technological resources to solve complex multistep problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A
- The learner will be able to assess technological resources to solve complex multistep problems.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.7.12.A
- The learner will be able to critically assess the status of existing theories.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.A
- The learner will be able to examine scale as a means of associating concepts and ideas to each other by some measure.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.D
- The learner will be able to compare and contrast different forms of dimensional analysis.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.1.12.D
- The learner will be able to organize investigational data using a variety of analytical methods.  
Source: PA: Academic Standards, July 12, 2001, Grade 12, 3.2.12.C
- The learner will be able to evaluate the benefits and risks associated with alternative actions.  
Source: Avon Grove School District