

Virginia Science

# Grades 7, 8

Adopted 2018

## Life Science

### 1. The student will demonstrate an understanding of scientific and engineering practices by **LS.1**

- a. asking questions and defining problems **LS.1.A**
  - i. ask questions and develop hypotheses to determine relationships between independent and dependent variables **LS.1.A.I**
  - ii. offer simple solutions to design problems **LS.1.A.II**
- b. planning and carrying out investigations **LS.1.B**
  - i. independently and collaboratively plan and conduct observational and experimental investigations; identify variables, constants, and controls where appropriate and include the safe use of chemicals and equipment **LS.1.B.I**
  - ii. evaluate the accuracy of various methods for collecting data **LS.1.B.II**
  - iii. take metric measurements using appropriate tools and technologies including the use of microscopes **LS.1.B.III**
- c. interpreting, analyzing, and evaluating data **LS.1.C**
  - i. identify, interpret, and evaluate patterns in data **LS.1.C.I**
  - ii. construct, analyze, and interpret graphical displays of data **LS.1.C.II**
  - iii. compare and contrast data collected by different groups and discuss similarities and differences in their findings **LS.1.C.III**
  - iv. consider limitations of data analysis and/or seek to improve precision and accuracy of data **LS.1.C.IV**
  - v. use data to evaluate and refine design solutions **LS.1.C.V**
- d. constructing and critiquing conclusions and explanations **LS.1.D**
  - i. construct explanations that include qualitative or quantitative relationships between variables **LS.1.D.I**
  - ii. construct scientific explanations based on valid and reliable evidence obtained from sources (including the students' own investigations) **LS.1.D.II**
  - iii. differentiate between a scientific hypothesis and theory **LS.1.D.III**
- e. developing and using models **LS.1.E**
  - i. construct and use models and simulations to illustrate, predict, and/or explain observable and unobservable phenomena, life processes, or mechanisms **LS.1.E.I**
  - ii. evaluate limitations of models **LS.1.E.II**
- f. obtaining, evaluating, and communicating information **LS.1.F**
  - i. read scientific texts, including those adapted for classroom use, to obtain scientific and/or technical information **LS.1.F.I**
  - ii. gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication **LS.1.F.II**

- iii. construct, use, and/or present an argument supported by empirical evidence and scientific reasoning [LS.1.F.III](#)
- 

**2. The student will investigate and understand that all living things are composed of one or more cells that support life processes, as described by the cell theory. Key ideas include** [LS.2](#)

- a. the development of the cell theory demonstrates the nature of science; [LS.2.A](#)
  - b. cell structure and organelles support life processes; [LS.2.B](#)
  - c. similarities and differences between plant and animal cells determine how they support life processes; [LS.2.C](#)
  - d. cell division is the mechanism for growth and reproduction; and [LS.2.D](#)
  - e. cellular transport (osmosis and diffusion) is important for life processes. [LS.2.E](#)
- 

**3. The student will investigate and understand that there are levels of structural organization in living things. Key ideas include** [LS.3](#)

- a. patterns of cellular organization support life processes; [LS.3.A](#)
  - b. unicellular and multicellular organisms have comparative structures; and [LS.3.B](#)
  - c. similar characteristics determine the classification of organisms. [LS.3.C](#)
- 

**4. The student will investigate and understand that there are chemical processes of energy transfer which are important for life. Key ideas include** [LS.4](#)

- a. photosynthesis is the foundation of virtually all food webs; and [LS.4.A](#)
  - b. photosynthesis and cellular respiration support life processes. [LS.4.B](#)
- 

**5. The student will investigate and understand that biotic and abiotic factors affect an ecosystem. Key ideas include** [LS.5](#)

- a. matter moves through ecosystems via the carbon, water, and nitrogen cycles; [LS.5.A](#)
  - b. energy flow is represented by food webs and energy pyramids; and [LS.5.B](#)
  - c. relationships exist among producers, consumers, and decomposers. [LS.5.C](#)
- 

**6. The student will investigate and understand that populations in a biological community interact and are interdependent. Key ideas include** [LS.6](#)

- a. relationships exist between predators and prey and these relationships are modeled in food webs; [LS.6.A](#)
- b. the availability and use of resources may lead to competition and cooperation; [LS.6.B](#)
- c. symbiotic relationships support the survival of different species; and [LS.6.C](#)
- d. the niche of each organism supports survival. [LS.6.D](#)

---

**7. The student will investigate and understand that adaptations support an organism's survival in an ecosystem. Key ideas include** LS.7

- a. biotic and abiotic factors define land, marine, and freshwater ecosystems; and LS.7.A
- b. physical and behavioral characteristics enable organisms to survive within a specific ecosystem. LS.7.B

---

**8. The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic and change over time. Key ideas include** LS.8

- a. organisms respond to daily, seasonal, and long-term changes; LS.8.A
- b. changes in the environment may increase or decrease population size; and LS.8.B
- c. large-scale changes such as eutrophication, climate changes, and catastrophic disturbances affect ecosystems. LS.8.C

---

**9. The student will investigate and understand that relationships exist between ecosystem dynamics and human activity. Key ideas include** LS.9

- a. changes in habitat can disturb populations; LS.9.A
- b. disruptions in ecosystems can change species competition; and LS.9.B
- c. variations in biotic and abiotic factors can change ecosystems. LS.9.C

---

**10. The student will investigate and understand that organisms reproduce and transmit genetic information to new generations. Key ideas include** LS.10

- a. DNA has a role in making proteins that determine organism traits; LS.10.A
- b. the role of meiosis is to transfer traits to the next generation; and LS.10.B
- c. Punnett squares are mathematical models used to predict the probability of traits in offspring. LS.10.C

---

**11. The student will investigate and understand that populations of organisms can change over time. Key ideas include** LS.11

- a. mutation, adaptation, natural selection, and extinction change populations; LS.11.A
  - b. the fossil record, genetic information, and anatomical comparisons provide evidence for evolution; and LS.11.B
  - c. environmental factors and genetic variation, influence survivability and diversity of organisms. LS.11.C
-

## Physical Science

### 1. The student will demonstrate an understanding of scientific and engineering practices by **PS.1**

- a. asking questions and defining problems **PS.1.A**
  - i. ask questions that require empirical evidence to answer **PS.1.A.I**
  - ii. develop hypotheses indicating relationships between independent and dependent variables **PS.1.A.II**
  - iii. offer simple solutions to design problems **PS.1.A.III**
- b. planning and carrying out investigations **PS.1.B**
  - i. independently and collaboratively plan and conduct observational and experimental investigations; identify variables, constants, and controls where appropriate and include the safe use of chemicals and equipment **PS.1.B.I**
  - ii. evaluate the accuracy of various methods for collecting data **PS.1.B.II**
  - iii. take metric measurements using appropriate tools and technologies **PS.1.B.III**
  - iv. apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system **PS.1.B.IV**
- c. interpreting, analyzing, and evaluating data **PS.1.C**
  - i. construct and interpret data tables showing independent and dependent variables, repeated trials, and means **PS.1.C.I**
  - ii. construct, analyze, and interpret graphical displays of data and consider limitations of data analysis **PS.1.C.II**
  - iii. apply mathematical concepts and processes to scientific questions **PS.1.C.III**
  - iv. use data to evaluate and refine design solutions to best meet criteria **PS.1.C.IV**
- d. constructing and critiquing conclusions and explanations **PS.1.D**
  - i. construct scientific explanations based on valid and reliable evidence obtained from sources (including the students' own investigations) **PS.1.D.I**
  - ii. construct arguments supported by empirical evidence and scientific reasoning **PS.1.D.II**
  - iii. generate and compare multiple solutions to problems based on how well they meet the criteria and constraints **PS.1.D.III**
  - iv. differentiate between a scientific hypothesis, theory, and law **PS.1.D.IV**
- e. developing and using models **PS.1.E**
  - i. construct, develop, and use models and simulations to illustrate and/or explain observable and unobservable phenomena **PS.1.E.I**
  - ii. evaluate limitations of models **PS.1.E.II**
- f. obtaining, evaluating, and communicating information **PS.1.F**
  - i. read scientific texts, including those adapted for classroom use, to determine the central idea and/or obtain scientific and/or technical information **PS.1.F.I**

- ii. gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication [PS.1.F.II](#)
  - iii. construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning [PS.1.F.III](#)
- 

**2. The student will investigate and understand that matter is composed of atoms. Key ideas include** [PS.2](#)

- a. our understanding of atoms has developed over time; [PS.2.A](#)
  - b. the periodic table can be used to predict the chemical and physical properties of matter; and [PS.2.B](#)
  - c. the kinetic molecular theory is used to predict and explain matter interactions. [PS.2.C](#)
- 

**3. The student will investigate and understand that matter has properties and is conserved in chemical and physical processes. Key ideas include** [PS.3](#)

- a. pure substances can be identified based on their chemical and physical properties; [PS.3.A](#)
  - b. pure substances can undergo physical and chemical changes that may result in a change of properties; [PS.3.B](#)
  - c. compounds form through ionic and covalent bonding; and [PS.3.C](#)
  - d. balanced chemical equations model the conservation of matter. [PS.3.D](#)
- 

**4. The student will investigate and understand that the periodic table is a model used to organize elements based on their atomic structure. Key uses include** [PS.4](#)

- a. symbols, atomic numbers, atomic mass, chemical groups (families), and periods are identified on the periodic table; and [PS.4.A](#)
  - b. elements are classified as metals, metalloids, and nonmetals. [PS.4.B](#)
- 

**5. The student will investigate and understand that energy is conserved. Key ideas include** [PS.5](#)

- a. energy can be stored in different ways; [PS.5.A](#)
  - b. energy is transferred and transformed; and [PS.5.B](#)
  - c. energy can be transformed to meet societal needs. [PS.5.C](#)
- 

**6. The student will investigate and understand that waves are important in the movement of energy. Key ideas include** [PS.6](#)

- a. energy may be transferred in the form of longitudinal and transverse waves; [PS.6.A](#)
- b. mechanical waves need a medium to transfer energy; [PS.6.B](#)
- c. waves can interact; and [PS.6.C](#)
- d. energy associated with waves has many applications. [PS.6.D](#)

---

**7. The student will investigate and understand that electromagnetic radiation has characteristics. Key ideas include** PS.7

- a. electromagnetic radiation, including visible light, has wave characteristics and behavior; and PS.7.A
- b. regions of the electromagnetic spectrum have specific characteristics and uses. PS.7.B

---

**8. The student will investigate and understand that work, force, and motion are related. Key ideas include** PS.8

- a. motion can be described using position and time; and PS.8.A
- b. motion is described by Newton's laws. PS.8.B

---

**9. The student will investigate and understand that there are basic principles of electricity and magnetism. Key ideas include** PS.9

- a. an imbalance of charge generates static electricity; PS.9.A
- b. materials have different conductive properties; PS.9.B
- c. electric circuits transfer energy; PS.9.C
- d. magnetic fields model the magnetic effects of certain materials; PS.9.D
- e. electric current and magnetic fields are related; and PS.9.E
- f. many technologies use electricity and magnetism. PS.9.F