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