Virginia Science

Life Science

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
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
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
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
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
The student will investigate and understand that populations in a biological community	**a relationships exist between predators and prey and these relationships are modeled in food webs;** LS.6.A

interact and are interdependent. Key ideas include LS.6	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
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
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
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
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
The student will investigate and understand that populations of organisms can change	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

over time. Key ideas include LS.11

- **c** **environmental factors and genetic variation, influence survivability and diversity of organisms.** LS.11.C