

2019 Minnesota Academic Standards in Science

9th Grade-12th Grade Biology		
Strand	Code	Benchmark
Exploring Phenomena or Engineering Problems	9L.1.1.1.1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
	9L.1.2.1.1	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
Looking at data and empirical evidence to understand phenomena or solve problems	9L.2.1.1.1	Apply concepts of probability to explain and predict the variation and distribution of expressed traits in a population.
	9L.2.1.1.2	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
	9L.2.2.1.1	Use a computational model to support or revise an evidence-based explanation for factors that have ecological and economic impacts on different sized ecosystems, including factors caused by the practices of various human groups.
	9L.2.2.1.2	Use a computational model to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
Developing possible explanations of phenomena or designing solutions to engineering problems	9L.3.1.1.1	Develop and use a model to illustrate the levels of organization of interacting systems and how that translates into specific functions in multicellular organisms.

	9L.3.1.1.2	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
	9L.3.1.1.3	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
	9L.3.1.1.4	Use a model to illustrate that cellular respiration is a chemical process in which energy from food is used to create new compounds.
	9L.3.2.1.1	Construct an explanation based on evidence for how the structure of DNA determines the structure of the proteins that carry out the essential functions of life.
	9L.3.2.1.2	Construct and revise an explanation based on evidence for how various elements combine with carbon to form molecules that form the basis for life on Earth.
	9L.3.2.1.3	Construct and revise an explanation based on evidence about the role of photosynthesis and cellular respiration (including anaerobic processes) in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
	9L.3.2.1.4	Construct an explanation based on evidence that the process of evolution primarily results from four factors: reproduction within a species, heritable genetic variation of individuals in that species, competition for limited resources, and increased survival and reproduction of the individuals best suited for the environment.
	9L.3.2.1.5	Construct an explanation based on evidence for how natural selection leads to the adaptation of populations.
Communicating reasons, arguments and ideas to others	9L.4.1.1.1	Evaluate evidence for the role of group behavior on an individual's and species' chances to survive and reproduce.
	9L.4.1.1.2	Make and defend a claim based on evidence that heritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

	9L.4.1.1.3	Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species
	9L.4.2.1.1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
	9L.4.2.2.1	Obtain and communicate information about how Minnesota American Indian Tribes and communities and other cultures construct solutions to mitigate threats to biodiversity.