
Coal City Unit District #1
Biology
Science Curriculum

SC.B:1 Students will be able to apply science and engineering practices to study biology. (NGSS SEPs)

- SC.B:1-1 Ask questions that are able to be investigated to better understand phenomena.
- SC.B:1-2 Define criteria and constraints for a successful solution to a problem.
- SC.B:1-3 Develop models/illustrations to show explanations for non-observable phenomena.
- SC.B:1-4 Evaluate a model to identify limitations, merits, and opportunities for revision.
- SC.B:1-5 Analyze a system using a model to make predictions or improvements.
- SC.B:1-6 Analyze data to identify the significant features and patterns in the data.
- SC.B:1-7 Explain a phenomena using scientific theories and laws, a model, experimental evidence, or real world examples.
- SC.B:1-8 Design solutions to a problem that fits the criteria and constraints for success.
- SC.B:1-9 Defend an explanation of a phenomena using collected data, research, and collaboration.
- SC.B:1-10 Obtain relevant information from credible sources.
- SC.B:1-11 Evaluate the scientific validity and credibility of information obtained.
- SC.B:1-12 Effectively communicate scientific information. (e.g. lab reports, debates, essays, verbal communication)

SC.B:2 Students will be able to develop a model of the interactions between organ systems. (HS-LS1-2)

- SC.B:2-1 Explain the levels of organization that build from a cell to a multicellular organism. (LS1.A)
- SC.B:2-2 Contrast how an organism receives information (externally and internally) and processes/stores information (internally). (LS1.D)
- SC.B:2-3 Describe how a multicellular organism uses its brain to perceive, interpret, and act based on a stimuli. (visual perception, auditory perception, interpretation, movement, decision making, emotions, memories). (LS1.D)
- SC.B:2-4 Recognize the structures and functions of protein, carbohydrates, lipids, and nucleic acids. (LS1.A)
- SC.B:2-5 Explain the purpose and reasoning for specialized cells within multicellular organisms. (LS1.A)
- SC.B:2-6 Describe the effect of gene expression and the environment that lead to differences in specialized cells. (LS1.B)
- SC.B:2-7 Contrast positive and negative feedback mechanisms. (LS1.A)
- SC.B:2-8 Explain how positive and negative feedback mechanisms lead to homeostasis. (LS1.A)
- SC.B:2-9 Analyze data to categorize feedback as either positive or negative feedback mechanisms. (LS1.A)
- SC.B:2-10 Plan and carry out an experiment to study the response of an organism to maintain homeostasis during changing external conditions. (HS-LS1-3)

SC.B:3 Students will be able to explain the structure of DNA. (LS1.A, LS3.A)

- SC.B:3-1 Describe that the genetic material of a living organism is DNA/chromosomes and that those genes hold the information to make proteins. (LS1.A, LS3.A)
- SC.B:3-2 Describe that segments of DNA are genes, with most individuals carrying 2 alleles for each gene. (LS3.A)
- SC.B:3-3 Identify that a chromosome is one long piece of DNA. (LS3.A)
- SC.B:3-4 Predict a complementary strand of DNA using base pairing rules.
- SC.B:3-5 Explain the importance of DNA replication before the cell divides. (LS3.A)

SC.B:4 Students will be able to explain the significance of cell division using a model. (HS-LS1-4)

- SC.B:4-1 Describe that cell division results in two identical daughter cells. (LS1.B)
- SC.B:4-2 Develop a model of cell division. (HS-LS1-4)
- SC.B:4-3 Explain how cell division is necessary for and results in specialized cells. (LS1.B)
- SC.B:4-4 Describe that meiosis results in four gametes/spores with half the DNA. (LS1.B)
- SC.B:4-5 Compare and contrast cell division and meiosis. (LS1.B)
- SC.B:4-6 Explain how crossover occurs during meiosis. (LS3.B)

SC.B:5 Students will be able to develop and use a model of photosynthesis. (HS-LS1-5)

- SC.B:5-1 Explain that plants get energy from the sun. (LS1.C, LS2.B)
- SC.B:5-2 Recall the reaction for photosynthesis. (LS1.C)
- SC.B:5-3 Recall the cellular location for photosynthesis. (LS1.C)

SC.B:6 Students will be able to develop and use a model of cellular respiration. (HS-LS1-7)

- SC.B:6-1 Explain that organisms break down food for growth or storage. (LS1.C)
- SC.B:6-2 Explain that both plants and animals undergo cellular respiration. (LS1.C)
- SC.B:6-3 Recall the reaction for cellular respiration. (LS1.C)
- SC.B:6-4 Recall the cellular location for cellular respiration. (LS1.C)
- SC.B:6-5 Compare and contrast aerobic and anaerobic respiration. (LS1.C)

SC.B:7 Students will be able to construct an explanation of the cycling of matter and energy between organisms. (LS1.C, LS2.B)

- SC.B:7-1 Recognize that matter and energy are conserved. (LS1.C/LS2.B)
- SC.B:7-2 Explain how matter can store and release energy in living organisms. (LS2.B)
- SC.B:7-3 Analyze a biomass graph of matter and energy flow. (HS-LS2-4)
- SC.B:7-4 Construct an explanation of the matter and energy cycling in photosynthesis and cellular respiration. (HS-LS2-3)
- SC.B:7-5 Refine an explanation of the matter and energy cycling in photosynthesis and cellular respiration. (HS-LS2-3)
- SC.B:7-6 Develop a model of the carbon cycle. (HS-LS2-5)

SC.B:8 Students will be able to explain the functions of DNA. (LS3.A)

- SC.B:8-1 Ask investigable questions about the relationships between DNA, proteins, and traits. (HS-LS3-1)
- SC.B:8-2 Construct an explanation that all cells have DNA that codes for proteins and leads to specialized cells. (HS-LS1-1)
- SC.B:8-3 Explain the process of transcription. (LS3.A)
- SC.B:8-4 Explain the process of translation. (LS3.A)
- SC.B:8-5 Relate transcription and translation to an individual's traits. (LS3.A)
- SC.B:8-6 Explain the function of proteins (e.g. structures, signaling, regulation, enzymes). (LS1.A)
- SC.B:8-7 Explain that mutations within the structure or code of DNA can cause functional problems in a protein. (LS1.A, LS3.A)
- SC.B:8-8 Explain the value of non-coding DNA. (LS3.A)
- SC.B:8-9 Construct an explanation that food molecules can be rearranged for growth and use within the cell (as amino acids or DNA). (HS-LS1-6)

SC.B:9 Students will be able to construct and defend an explanation of the causes of genetic variation. (HS-LS3-2)

- SC.B:9-1 Explain how crossover in meiosis can lead to genetic variation. (LS3.B)
- SC.B:9-2 Explain how mutations can come from errors in replication or the environment. (LS3.B)
- SC.B:9-3 Explain how sexual reproduction can lead to genetic variation.
- SC.B:9-4 Examine how the environment can change a species' development, appearance, behavior, or reproduction. (LS3.B)
- SC.B:9-5 Analyze data of traits in a population. (HS-LS3-3)
- SC.B:9-6 Predict changes in a population, if the environment changes. (HS-LS3-3)

SC.B:10 Students will be able to communicate information about the evidence for evolution. (HS-LS4-1)

- SC.B:10-1 Describe how common ancestry is shown through species similarity. (DNA comparisons, embryology, fossil records). (LS4.A)
- SC.B:10-2 Describe how common ancestry is shown through species diversity. (LS4.A)
- SC.B:10-3 Explain the effects of species diversity caused by natural selection. (LS4.A)

SC.B:11 Students will be able to construct an explanation of the causes and effects of natural selection. (HS-LS4-4)

- SC.B:11-1 Contrast the selection of expressed and unexpressed traits. (LS4.B)
- SC.B:11-2 Explain the connection between natural selection and reproductive success. (LS4.B)
- SC.B:11-3 Explain the correlations between adaptations, offspring, and fitness levels. (LS4.C)
- SC.B: 11-4 Relate gene frequency to the trait expression within the population. (LS4.B)
- SC.B: 11-5 Construct an explanation that genetic variation and competition result in the driving force for evolution. (HS-LS4-2)
- SC.B: 11-6 Analyze data to explain the differences in success between individuals in a population. (HS-LS4-3)
- SC.B: 11-7 Explain that organisms with shorter life spans result in evolution over a shorter time period. (LS4.C)
- SC.B: 11-8 Explain the process of speciation through adaptation or reproductive isolation. (LS4.C)
- SC.B: 11-9 Correlate species extinction to the decline of adaptive trait frequency in the population. (LS4.C)
- SC.B: 11-10 Explain the significance of biodiversity as it relates to ecosystem resilience. (LS2.C)
- SC.B: 11-11 Identify how species develop behavioral and physiological patterns for survival. (LS2.C)
- SC.B: 11-12 Evaluate how environmental changes can increase or decrease populations. (HS-LS4-5)

SC.B:12 Students will be able to construct an explanation that populations remain relatively constant with stable conditions, but changing conditions can change population sizes. (HS-LS2-6).

- SC.B:12-1 Contrast ecosystem disruptions caused by small events or cataclysmic events. (LS2.C)
- SC.B:12-2 Explain the concept of carrying capacity. (LS2.A)
- SC.B:12-3 Analyze a graph to identify an organism's carrying capacity. (LS2.A)
- SC.B:12-4 Analyze a graph to determine causes of population changes. (HS-LS2-1)
- SC.B:12-5 Evaluate an explanation of population stability or change under stable or changing conditions. (HS-LS2-6)
- SC.B:12-6 Construct an explanation for how living in a group can help an organism to survive. (e.g. flocking, schooling, herding, cooperative hunting, migrating, swarming) (HS-LS2-8)

SC.B:13 Students will be able to explain how human activities are impacting the biosphere. (LS2.C, LS4.D)

- SC.B:13-1 Explain how human activities are adversely impacting the physical environment. (LS4.D)
- SC.B:13-2 Explain how human activities are adversely impacting the living environment. (LS4.D)
- SC.B:13-3 Recognize that there are limits to sustainability (e.g. habitat destruction, air and water pollution, overexploitation, invasive species, climate change). (LS4.D)
- SC.B:13-4 Explain how continued human impacts are damaging our ecosystems and could lead to mass extinction. (LS4.D)
- SC.B:13-5 Design a solution to a human impact on the planet. (HS-LS2-7)
- SC.B:13-6 Create a simulation to test a solution to a human impact on the planet. (HS-LS4-6)
- SC.B:13-7 Evaluate and revise a solution to a human impact on the planet. (HS-LS2-7).