Essentials Biology Alignment Document

Michigan Academic Standards: Science

Science

MI.SC.15. Earth's Systems

HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Biology CR (1 correlated item)
06.01 Plants

MI.SC.4. Energy

HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

Biology CR (1 correlated item)
01.04 Properties of Water

MI.SC.18. Engineering Design

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Biology CR (2 correlated items)
04.04 Impacts on our Ecosystem
04.05 Recycling

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Biology CR (1 correlated item)
04.05 Recycling

MI.SC.14. History of Earth

HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

Biology CR (1 correlated item)
01.05 Earth's Early Atmosphere

MI.SC.17. Human Sustainability

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Biology CR (2 correlated items)
04.04 Impacts on our Ecosystem
04.05 Recycling

HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

Biology CR (2 correlated items)
04.04 Impacts on our Ecosystem
04.05 Recycling

HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

Biology CR (2 correlated items)
04.04 Impacts on our Ecosystem
04.05 Recycling

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Biology CR (1 correlated item)
04.05 Recycling

HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Biology CR (2 correlated items)
04.04 Impacts on our Ecosystem
04.05 Recycling

MI.SC.10. Inheritance and Variation of Traits

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Biology CR (3 correlated items)
03.01 The Cell Cycle and Mitosis
03.06 Mutations
06.02 Plant Cells and Tissues

HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Biology CR (7 correlated items)
02.01 Chemistry of Life
02.03 Cell Structure and Function
03.01 The Cell Cycle and Mitosis
03.02 Meiosis
03.04 Heredity Patterns
03.05 DNA Replication
03.06 Mutations

HS-LS3-2. Make and defend a claim based on evidence that inheritable 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.

Biology CR (4 correlated items)
03.02 Meiosis
03.06 Mutations
03.08 Health and Genetics
05.02 Evolutionary Relationships

MI.SC.11. Inheritance and Variation of Traits (continued)

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

Biology CR (2 correlated items)
03.03 Mendel
03.04 Heredity Patterns

MI.SC.9. Interdependent Relationships in Ecosystems

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

Biology CR (1 correlated item)
04.03 Ecosystems

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

Biology CR (4 correlated items)
04.02 The Biosphere
04.03 Ecosystems
04.04 Impacts on our Ecosystem
04.05 Recycling

HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

Biology CR (2 correlated items)
04.01 Ecology
04.03 Ecosystems

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Biology CR (2 correlated items)
04.04 Impacts on our Ecosystem
04.05 Recycling

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Biology CR (2 correlated items)
04.04 Impacts on our Ecosystem
04.05 Recycling

MI.SC.7. Matter and Energy in Organisms and Ecosystems

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

Biology CR (3 correlated items)
02.03 Cell Structure and Function
02.06 Introduction to Photosynthesis
06.02 Plant Cells and Tissues

HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

Biology CR (8 correlated items)
02.01 Chemistry of Life
02.04 Cellular Energy
02.05 Cellular Respiration
02.06 Introduction to Photosynthesis
03.01 The Cell Cycle and Mitosis
03.05 DNA Replication
03.06 Mutations
04.05 Recycling

HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Biology CR (3 correlated items)
02.04 Cellular Energy
02.05 Cellular Respiration
02.06 Introduction to Photosynthesis

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

Biology CR (6 correlated items)
02.04 Cellular Energy
02.05 Cellular Respiration
02.06 Introduction to Photosynthesis
04.01 Ecology
04.05 Recycling
05.05 Bacteria, Protists, and Fungus

HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

Biology CR (4 correlated items)
02.06 Introduction to Photosynthesis
04.01 Ecology
04.05 Recycling
05.05 Bacteria, Protists, and Fungus

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

Biology CR (3 correlated items)
02.04 Cellular Energy
02.05 Cellular Respiration
02.06 Introduction to Photosynthesis

MI.SC.12. Natural Selection and Evolution

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

Biology CR (4 correlated items)
05.01 Evolution
05.02 Evolutionary Relationships
05.03 Primate Evolution
05.04 Classification of Living Organisms

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

Biology CR (7 correlated items)
01.05 Earth's Early Atmosphere
02.02 Early Cells
05.01 Evolution
05.02 Evolutionary Relationships
05.03 Primate Evolution
05.04 Classification of Living Organisms
06.01 Plants

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

Biology CR (2 correlated items)
05.02 Evolutionary Relationships
05.03 Primate Evolution

HS-LS4-5. 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.

Biology CR (3 correlated items)
04.03 Ecosystems
05.02 Evolutionary Relationships
05.03 Primate Evolution

MI.RST.9-10. Reading Standards for Literacy in Science and Technical Subjects

Key Ideas and Details

RST.9-10.2. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Biology CR (30 correlated items)
01.02 Exploring Life
01.03 New Technology
01.04 Properties of Water
01.05 Earth's Early Atmosphere
02.01 Chemistry of Life
02.02 Early Cells
02.03 Cell Structure and Function
02.04 Cellular Energy
02.05 Cellular Respiration
02.06 Introduction to Photosynthesis
03.01 The Cell Cycle and Mitosis
03.02 Meiosis
03.03 Mendel
03.04 Heredity Patterns
03.05 DNA Replication
03.06 Mutations
03.08 Health and Genetics
04.01 Ecology
04.02 The Biosphere
04.03 Ecosystems
04.04 Impacts on our Ecosystem
04.05 Recycling
05.01 Evolution
05.02 Evolutionary Relationships
05.03 Primate Evolution
05.04 Classification of Living Organisms
05.05 Bacteria, Protists, and Fungus
06.01 Plants
06.02 Plant Cells and Tissues

06.03 Plant Reproduction and Development

RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

Biology CR (9 correlated items)
01.03 New Technology
02.02 Early Cells
03.01 The Cell Cycle and Mitosis
03.03 Mendel
04.02 The Biosphere
04.03 Ecosystems
05.02 Evolutionary Relationships
05.03 Primate Evolution
06.02 Plant Cells and Tissues

Craft and Structure

RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

Biology CR (30 correlated items)
01.02 Exploring Life
01.03 New Technology
01.04 Properties of Water
01.05 Earth's Early Atmosphere
02.01 Chemistry of Life
02.02 Early Cells
02.03 Cell Structure and Function
02.04 Cellular Energy
02.05 Cellular Respiration
02.06 Introduction to Photosynthesis
03.01 The Cell Cycle and Mitosis
03.02 Meiosis
03.03 Mendel
03.04 Heredity Patterns
03.05 DNA Replication
03.06 Mutations
03.08 Health and Genetics
04.01 Ecology
04.02 The Biosphere
04.03 Ecosystems
04.04 Impacts on our Ecosystem

04.05 Recycling
05.01 Evolution
05.02 Evolutionary Relationships
05.03 Primate Evolution
05.04 Classification of Living Organisms
05.05 Bacteria, Protists, and Fungus
06.01 Plants
06.02 Plant Cells and Tissues
06.03 Plant Reproduction and Development

RST.9-10.5. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Biology CR (30 correlated items)
01.02 Exploring Life
01.03 New Technology
01.04 Properties of Water
01.05 Earth's Early Atmosphere
02.01 Chemistry of Life
02.02 Early Cells
02.03 Cell Structure and Function
02.04 Cellular Energy
02.05 Cellular Respiration
02.06 Introduction to Photosynthesis
03.01 The Cell Cycle and Mitosis
03.02 Meiosis
03.03 Mendel
03.04 Heredity Patterns
03.05 DNA Replication
03.06 Mutations
03.08 Health and Genetics
04.01 Ecology
04.02 The Biosphere
04.03 Ecosystems
04.04 Impacts on our Ecosystem
04.05 Recycling
05.01 Evolution
05.02 Evolutionary Relationships
05.03 Primate Evolution
05.04 Classification of Living Organisms
05.05 Bacteria, Protists, and Fungus
06.01 Plants
06.02 Plant Cells and Tissues

06.03 Plant Reproduction and Development

Integration of Knowledge and Ideas

RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Biology CR (6 correlated items)
03.01 The Cell Cycle and Mitosis
03.02 Meiosis
03.03 Mendel
03.04 Heredity Patterns
04.03 Ecosystems
05.04 Classification of Living Organisms

RST.9-10.9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Biology CR (30 correlated items)
01.02 Exploring Life
01.03 New Technology
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02.01 Chemistry of Life
02.02 Early Cells
02.03 Cell Structure and Function
02.04 Cellular Energy
02.05 Cellular Respiration
02.06 Introduction to Photosynthesis
03.01 The Cell Cycle and Mitosis
03.02 Meiosis
03.03 Mendel
03.04 Heredity Patterns
03.05 DNA Replication
03.06 Mutations
03.08 Health and Genetics
04.01 Ecology
04.02 The Biosphere
04.03 Ecosystems
04.04 Impacts on our Ecosystem
04.05 Recycling
05.01 Evolution
05.02 Evolutionary Relationships
05.03 Primate Evolution

05.04 Classification of Living Organisms
05.05 Bacteria, Protists, and Fungus
06.01 Plants
06.02 Plant Cells and Tissues
06.03 Plant Reproduction and Development

Range of Reading and Level of Text Complexity

RST.9-10.10. By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

Biology CR (30 correlated items)
01.02 Exploring Life
01.03 New Technology
01.04 Properties of Water
01.05 Earth's Early Atmosphere
02.01 Chemistry of Life
02.02 Early Cells
02.03 Cell Structure and Function
02.04 Cellular Energy
02.05 Cellular Respiration
02.06 Introduction to Photosynthesis
03.01 The Cell Cycle and Mitosis
03.02 Meiosis
03.03 Mendel
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03.05 DNA Replication
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04.01 Ecology
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04.04 Impacts on our Ecosystem
04.05 Recycling
05.01 Evolution
05.02 Evolutionary Relationships
05.03 Primate Evolution
05.04 Classification of Living Organisms
05.05 Bacteria, Protists, and Fungus
06.01 Plants
06.02 Plant Cells and Tissues
06.03 Plant Reproduction and Development

MI.SC.13. Space Systems

HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

Biology CR (2 correlated items)
04.02 The Biosphere
04.04 Impacts on our Ecosystem

MI.SC.6. Structure and Function

HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Biology CR (4 correlated items)
02.01 Chemistry of Life
03.01 The Cell Cycle and Mitosis
03.05 DNA Replication
03.06 Mutations

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Biology CR (3 correlated items)
04.02 The Biosphere
06.01 Plants
06.02 Plant Cells and Tissues

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Biology CR (7 correlated items)
02.02 Early Cells
02.03 Cell Structure and Function
02.04 Cellular Energy
02.05 Cellular Respiration
02.06 Introduction to Photosynthesis
03.01 The Cell Cycle and Mitosis
03.02 Meiosis

MI.SC.1. Structure and Properties of Matter

HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

Biology CR (1 correlated item)
01.04 Properties of Water

MI.SC.5. Waves and Electromagnetic Radiation

HS-PS4-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

Biology CR (2 correlated items)
03.06 Mutations
03.08 Health and Genetics

HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Biology CR (1 correlated item)
01.03 New Technology

MI.SC.16. Weather and Climate

HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

Biology CR (2 correlated items)
04.02 The Biosphere
04.04 Impacts on our Ecosystem

MI.WHST.9-10. Writing Standards for Literacy in Science and Technical Subjects

Text Types and Purposes

WHST.9-10.1. Write arguments focused on discipline-specific content.

WHST.9-10.1(a) Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

Biology CR (5 correlated items)
01.02 Exploring Life
02.02 Early Cells
03.01 The Cell Cycle and Mitosis
03.03 Mendel

05.02 Evolutionary Relationships

WHST.9-10.1(e) Provide a concluding statement or section that follows from or supports the argument presented.

Biology CR (10 correlated items)
01.02 Exploring Life
01.03 New Technology
02.02 Early Cells
03.01 The Cell Cycle and Mitosis
03.03 Mendel
04.02 The Biosphere
04.03 Ecosystems
05.02 Evolutionary Relationships
05.03 Primate Evolution
06.02 Plant Cells and Tissues

WHST.9-10.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.9-10.2(a) Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

Biology CR (10 correlated items)
01.02 Exploring Life
01.03 New Technology
02.02 Early Cells
03.01 The Cell Cycle and Mitosis
03.03 Mendel
04.02 The Biosphere
04.03 Ecosystems
05.02 Evolutionary Relationships
05.03 Primate Evolution
06.02 Plant Cells and Tissues

WHST.9-10.2(b) Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

Biology CR (9 correlated items)
01.03 New Technology
02.02 Early Cells
03.01 The Cell Cycle and Mitosis

03.03 Mendel
04.02 The Biosphere
04.03 Ecosystems
05.02 Evolutionary Relationships
05.03 Primate Evolution
06.02 Plant Cells and Tissues

WHST.9-10.2(c) Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

Biology CR (9 correlated items)
01.03 New Technology
02.02 Early Cells
03.01 The Cell Cycle and Mitosis
03.03 Mendel
04.02 The Biosphere
04.03 Ecosystems
05.02 Evolutionary Relationships
05.03 Primate Evolution
06.02 Plant Cells and Tissues

WHST.9-10.2(d) Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

Biology CR (30 correlated items)
01.02 Exploring Life
01.03 New Technology
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02.04 Cellular Energy
02.05 Cellular Respiration
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03.02 Meiosis
03.03 Mendel
03.04 Heredity Patterns
03.05 DNA Replication
03.06 Mutations
03.08 Health and Genetics

04.01 Ecology
04.02 The Biosphere
04.03 Ecosystems
04.04 Impacts on our Ecosystem
04.05 Recycling
05.01 Evolution
05.02 Evolutionary Relationships
05.03 Primate Evolution
05.04 Classification of Living Organisms
05.05 Bacteria, Protists, and Fungus
06.01 Plants
06.02 Plant Cells and Tissues
06.03 Plant Reproduction and Development

WHST.9-10.2(f) Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Biology CR (10 correlated items)
01.02 Exploring Life
01.03 New Technology
02.02 Early Cells
03.01 The Cell Cycle and Mitosis
03.03 Mendel
04.02 The Biosphere
04.03 Ecosystems
05.02 Evolutionary Relationships
05.03 Primate Evolution
06.02 Plant Cells and Tissues

Production and Distribution of Writing

WHST.9-10.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Biology CR (30 correlated items)
01.02 Exploring Life
01.03 New Technology
01.04 Properties of Water
01.05 Earth's Early Atmosphere
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02.04 Cellular Energy
02.05 Cellular Respiration

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06.02 Plant Cells and Tissues
06.03 Plant Reproduction and Development