



Kutztown Area School District Curriculum (Unit Map)

High School Biology
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Course Description: The purpose of this course is to provide the students with the understanding of scientific inquiry, ecology/environmental science, biochemistry/macromolecules, cells and their organelles, active/passive transport, cellular respiration, the cell cycle, meiosis and genetics, taxonomy/classification of organisms, plant characteristics, microorganisms, and the diversity of animals. There is a lab component, where experiments will be conducted, data will be analyzed, conclusions will be made, and formal lab reports will be written.

Table of Contents

Unit #	Title
<u>1</u>	<i>Basic Biological Principles</i>
<u>2</u>	<i>Evolution</i>
<u>3</u>	<i>Ecology</i>
<u>4</u>	<i>Biochemistry</i>
<u>5</u>	<i>Structure & Function of Cells</i>
<u>6</u>	<i>Cell Transport</i>
<u>7</u>	<i>Bioenergetics</i>
<u>8</u>	<i>Cell Growth & Reproduction</i>
<u>9</u>	<i>Molecular Biology</i>
<u>10</u>	<i>Genetics</i>
<u>11</u>	<i>Environmental Biology</i>

Unit #/Title	1/Basic Biological Principles	Time Frame	4 Weeks
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Standards

3.1.10.A1 Explain the characteristics of life common to all organisms
3.1.B.A1 Describe the common characteristics of life
3.1.12.A1 Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms
3.1.10.A8. Investigate the spatial relationships of organisms' anatomical features using specimens, models, or computer programs.
3.1.B.A8 Recognize that systems within cells and multicellular organisms interact to maintain homeostasis
3.1.10.A9/B6/C4 Compare and contrast scientific theories
3.1.10.A9/B6/C4 Know that both direct and indirect observations are used by scientists to study the natural world and universe
3.1.10.A9/B6/C4/4.5.7.F. Identify questions and concepts that guide scientific investigations

BIO.A.1.1 Explain the characteristics common to all organisms.
BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e. organelles, cells, tissues, organs, organ systems, multicellular organisms).
BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.
BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g. thermoregulation, water regulation, oxygen regulation).
BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.

CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
CC.3.5.9-10.C. 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.
CC.3.5.9-10.D. 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.
CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Big Ideas	Essential Questions
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| <ul style="list-style-type: none"> All living things share a common genetic code and possess the ability to reproduce. The evolution of homeostasis in multicellular organisms is dependent on form and function. Biology is understood through discovery science and scientific inquiry. | <ul style="list-style-type: none"> What is life? How does form and function apply to homeostasis? Why is hypothesis-based science as important as observational science? |
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Content	Skills
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| <ul style="list-style-type: none"> The difference between organelles, cells, tissues, organs, and organisms Thermoregulation, water regulation and oxygen regulation | <ul style="list-style-type: none"> Diagram the hierarchy of structural levels in biological organization Explain the importance of regulatory mechanisms in living things Explain why hypotheses must be testable and falsifiable but are not provable Describe what is meant by a controlled experiment Select and use the appropriate scientific method to investigate biological questions |
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Unit #/Title	2/Evolution	Time Frame	4 Weeks
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Standards

- 3.1.B.A1.** Explain that some structures in eukaryotic cells developed from early prokaryotic cells (e.g., mitochondria, chloroplasts)
- 3.1.B.B3.** Cite evidence to support that the genetic code is universal.
- 3.1.12.B3.** Explain the impact of environmental factors on gene expression.
- 3.1.10.C1.** Explain the mechanisms of biological evolution.
- 3.1.B.C1.** Describe species as reproductively distinct groups of organisms.
- 3.1.B.C1.** Analyze the role that geographic isolation can play in speciation.
- 3.1.B.C1.** Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population.
- 3.1.B.C1.** Describe how the degree of kinship between species can be inferred from the similarity in their DNA sequences.
- 3.1.B.C2.** Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of single-celled organisms evolved.
- 3.1.B.C2.** Describe the relationship between environmental changes and changes in the gene pool of a population.
- 3.1.12.C1.** Analyze how natural selection leads to speciation.
- 3.1.10.C3.** Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution.
- 3.1.B.C3.** Compare and contrast various theories of evolution.
- 3.1.B.C3.** Discuss the implications of a universal genetic code for evolution.
- 3.1.12.C3.** Analyze the evidence to support various theories of evolution (gradualism, punctuated equilibrium).
- 3.1.12.C3.** Evaluate survival of the fittest in terms of species that have remained unchanged over long periods of time.
- 4.1.7.F/4.2.7.D.** Compare and contrast scientific theories.
- BIO.B.3.1** Explain the mechanisms of evolution.
- BIO.B.3.1.1** Explain how natural selection can impact allele frequencies of a population.
- BIO.B.3.1.2** Describe the factors that can contribute to the development of new species (e.g. isolating mechanisms, genetic drift, founder effect, migration).
- BIO.B.3.1.3** Explain how genetic mutations may result in genotypic and phenotypic variations within a population.
- BIO.B.3.2** Analyze the sources of evidence for biological evolution.
- BIO.B.3.2.1** Interpret evidence supporting the theory of evolution (i.e. fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).
- BIO.B.3.3** Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution.
- CC.3.5.9-10.A.** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.H.** Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
- CC.3.5.9-10.I.** 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.
- CC.3.6.9-10.A.** Write arguments focused on *discipline-specific content*.
- CC.3.6.9-10.A.** Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons and evidence.
- CC.3.6.9-10.A.** Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- CC.3.6.9-10.A.** Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- CC.3.6.9-10.A.** Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- CC.3.6.9-10.A.** Provide a concluding statement or section that follows from or supports the argument presented.
- CC.3.6.9-10.C.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

<p>CC.3.6.9-10.D. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</p> <p>CC.3.6.9-10. G. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.</p> <p>CC3.6.9-10.H. Draw evidence from informational texts to support analysis, reflection and research.</p>	
Big Ideas	Essential Questions
<ul style="list-style-type: none"> • The theory of evolution by means of natural selection is dependent on a common genetic code. • Evolution is the result of many random processes selecting for the survival and reproduction of a population. • Evolution is supported by evidence such as fossils, comparative biology and molecular biology. 	<ul style="list-style-type: none"> • What evidence shows that different species are related? • How does genetic variation among organisms affect survival and reproduction? • How does the environment influence populations of organisms over multiple generations? • How do we scientifically explain the evidence and mechanisms for biological evolution?
Content	Skills
<ul style="list-style-type: none"> • Mutations alter a gene’s genetic information, but most are evolutionarily neutral. • Evolution occurs when the gene frequency of alleles in a population shifts to confer survival and reproductive success. • Differential reproductive success of populations of organisms with advantageous traits is known as natural selection. • Speciation occurs when one population is isolated from another population. 	<ul style="list-style-type: none"> • Describe the role of DNA in evolution • Identify and describe various ways models are used to explain, interpret, and predict natural selection • Distinguish between artificial and natural selection • Define sympatric and allopatric speciation • Compose a scientific debate

Unit #/Title	3/Ecology	Time Frame	3 Weeks
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Standards
<p>3.1.12.A2. Evaluate how organisms must derive energy from their environment or their food in order to survive.</p> <p>4.1.10.B. Explain the consequences of interrupting natural cycles.</p> <p>4.1.10.C. Evaluate the efficiency of energy flow within a food web. Describe how energy is converted from one form to another as it moves through a food web. (photosynthetic, geothermal).</p> <p>4.1.10.A. Examine the effects limiting factors have on population dynamics. Analyze possible causes of population fluctuations. Explain the concept of carrying capacity in an ecosystem. Describe how organisms become classified as threatened or endangered. Describe how limiting factors cause organisms to become extinct.</p> <p>4.1.12.A. Analyze the significance of biological diversity in an ecosystem. Explain how species adapt to limiting factors in an ecosystem.</p> <p>4.1.10.E. Analyze how humans influence the pattern of natural changes (e.g. primary/secondary succession and desertification) in ecosystems over time.</p>

BIO.B.4.1 Describe ecological levels of organization in the biosphere.

BIO.B.4.1.1 Describe the levels of ecological organization (i.e. organism, population, community, ecosystem, biome, and biosphere).

BIO.B.4.1.2 Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.

BIO.B.4.2 Describe interactions and relationships in an ecosystem.

BIO.B.4.2.1 Describe how energy flows through an ecosystem (e.g. food chains, food webs, energy pyramids).

BIO.B.4.2.2 Describe biotic interactions in an ecosystem (e.g. competition, predation, symbiosis).

BIO.B.4.2.3 Describe how matter recycles through an ecosystem (water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).

BIO.B.4.2.4 Describe how ecosystems change in response to natural and human disturbances (e.g. climate changes, introduction of nonnative species, pollution, fires)

BIO.B.4.2.5 Describe the effects of limiting factors on population dynamics and potential species extinction.

CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.C. 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.

CC.3.5.9-10.D. 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.

CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Big Ideas	Essential Questions
<ul style="list-style-type: none"> ● Changes in abiotic factors influence species composition and distribution within aquatic and terrestrial ecosystems and communities. ● Carrying capacity determines the difference between exponential and logistic growth. ● Nutrient cycles determine how and why organisms interact with environment and the effect this has on the interactions with other species. 	<ul style="list-style-type: none"> ● How and why do organisms interact with the living and nonliving environments to obtain matter and energy? ● What are the differences between exponential and logistic growth? ● How do matter and energy move through an ecosystem?
Content	Skills
<ul style="list-style-type: none"> ● Importance of abiotic factors and how they influence all biotic factors ● Limiting factors help to maintain balance in an ecosystem ● Essential nutrient cycle disruptions have far reaching effects on all living and nonliving things on our biosphere 	<ul style="list-style-type: none"> ● Construct food webs and trophic structures in an ecosystem ● Graph population dynamics ● Citing specific textual evidence to support analysis of science texts

Unit #/Title	4/Biochemistry	Time Frame	3 Weeks
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Standards

- 3.1.B.A5.** Explain the role of water in cell metabolism.
- 3.1.12.B5.** Relate the monomer structure of biology macromolecules to their functional roles.
- 3.1.10.A7.** Describe the relationship between the structure of organic molecules and the function they serve in living organisms.
- 3.1.B.A7.** Analyze the importance of carbon to the structure of biological macromolecules. Compare and contrast the functions and structures of proteins, lipids, carbohydrates, and nucleic acids. Explain the consequences of extreme changes in pH and temperature on cell proteins.
- 3.1.C.A7.** Illustrate the formation of carbohydrates, lipids, proteins, and nucleic acids.
- 3.1.B.A8.** Demonstrate the repeating patterns that occur in biological polymers. Describe how the unique properties of water support life.
- 3.1.10.B5/3.1.C.B5.** Use models to demonstrate patterns in bio macromolecules.
- BIO.A.2.1** Describe how the unique properties of water support life on earth.
- BIO.A.2.1.1** Describe the unique properties of water and how these properties support life on earth (e.g. freezing point, high specific heat, cohesion).
- BIO.A.2.2** Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e. atoms, molecules, and macromolecules).
- BIO.A.2.2.1** Explain how carbon is uniquely suited to form biological macromolecules.
- BIO.A.2.2.2** Describe how biological macromolecules form from monomers.
- BIO.A.2.2.3** Compare the structure and function of carbohydrates, lipids, proteins, nucleic acids in organisms.
- CC.3.5.9-10.A.** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.C.** 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.
- CC.3.5.9-10.D.** 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.
- CC.3.5.9-10.E.** Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Big Ideas	Essential Questions
<ul style="list-style-type: none"> The specific structure and chemistry of water makes it essential to all living things. The structure and function of carbohydrates, lipids, proteins and nucleic acids are essential to all living things. 	<ul style="list-style-type: none"> Why does the structure of water lead to its unique characteristics? How do the characteristics of carbohydrates, lipids, proteins and nucleic acids lead to their specific function? How does chemistry impact biological processes?
Content	Skills
<ul style="list-style-type: none"> Water's role in living organisms Carbohydrate, nucleic acid, protein and lipid significance for life 	<ul style="list-style-type: none"> Construct atoms and molecules Differentiate between carbohydrates, lipids, proteins and nucleic acids Cite specific textual evidence to support analysis of science texts

Unit #/Title	5/Structure & Function of Cells	Time Frame	2 Weeks
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Standards

3.1.B.A1. Compare and contrast the cellular structures and degrees of complexity of prokaryotic and eukaryotic organisms.

3.1.10.A5. Relate life processes to subcellular and cellular structures to their functions.

3.1.B.A5. Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc.).

3.1.12.A5. Analyze how structure is related to function at all levels of biological organization from molecules to organisms.

BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.

BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.

BIO.A.1.2.1 Compare cellular structures and their functions in prokaryotic and eukaryotic cells.

BIO.A.4.1.3 Describe how membrane-bound cellular organelles (e.g. endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.

CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.C. 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.

CC.3.5.9-10.D. 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.

CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Big Ideas	Essential Questions
<ul style="list-style-type: none"> Prokaryotic and eukaryotic cells are distinct. There are similarities and differences between plant and animal cells. Structure and function of organelles play an important role in cells. 	<ul style="list-style-type: none"> How have prokaryotic cells evolved into eukaryotic cells? How do the structures of organelles enable life's functions?
Content	Skills
<ul style="list-style-type: none"> Bacteria are unique from all other life forms Plant and animal cells have evolved where specific structure leads to specific function 	<ul style="list-style-type: none"> Demonstrate Gram staining technique Perform Cheek cell extractions Differentiate between plant and animal cells Cite specific textual evidence to support analysis of science texts

Unit #/Title	6/Cell Transport	Time Frame	4 Weeks
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Standards

3.1.10.A2. Explain cell processes in terms of chemical reactions and energy changes.

3.1.B.A2. Explain the importance of enzymes as catalysts in cell reactions.

3.1.B.A2. Identify how factors such as pH and temperature may affect enzyme function.

3.1.B.A5. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane.

3.1.12.A7. Evaluate metabolic activities using experimental knowledge of enzymes.

BIO.A.2.3 Explain how enzymes regulate biochemical reactions within a cell.

BIO.A.2.3.1 Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.

BIO.A.2.3.2 Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.

BIO.A.3.2.2 Describe the role of ATP in biochemical reactions.

BIO.A.4.1 Identify and describe the cell structures involved in transport of material into, out of, and throughout a cell.

BIO.A.4.1.1 Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for the cell.

BIO.A.4.1.2 Compare the mechanisms that transport materials across the plasma membrane (i.e. passive transport-diffusion, osmosis, facilitated diffusion; and active transport-pumps, endocytosis, exocytosis).

CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.C. 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.

CC.3.5.9-10.D. 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.

CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Big Ideas	Essential Questions
<ul style="list-style-type: none"> • There is a cooperative dependency between active and passive transport in living organisms. • Enzymes play a critical role in the transport of nutrients and wastes in cells. • Enzymes require specificity for their structure and function. 	<ul style="list-style-type: none"> • Why have organisms evolved to couple active and passive transport in cells? • How essential are enzymes to life? • What is the significance of inactivating enzymes?
Content	Skills
<ul style="list-style-type: none"> • Similarities and differences between osmosis, diffusion and facilitated diffusion • Similarities and differences between pumps, endocytosis and exocytosis • Role of ATP in active transport • Required specificity of enzymes 	<ul style="list-style-type: none"> • Construct tables and graphs in APA format • Cite specific textual evidence to support analysis of science texts • Reason for energy coupling in chemical reactions

Unit #/Title	7/Bioenergetics	Time Frame	3 Weeks
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Standards	
<p>3.1.C.A1. Explain the chemistry of metabolism.</p> <p>3.1.B.A2. Identify the initial reactants, final products, and general purposes of photosynthesis and cellular respiration.</p> <p>3.1.B.A2. Explain the important role of ATP in cell metabolism. Describe the relationship between photosynthesis and cellular respiration in photosynthetic organisms. Explain why many biological macromolecules such as ATP and lipids contain high-energy bonds.</p> <p>BIO.A.3.1. Identify and describe the cell structures involved in processing energy.</p> <p>BIO.A.3.1.1 Describe the fundamental rules of plastids (e.g. chloroplasts) and mitochondria in energy transformations.</p> <p>BIO.A.3.2 Identify and describe how organisms obtain and transform energy for their life processes.</p> <p>BIO.A.3.2.1 Compare the basic transformation of energy during photosynthesis and cellular respiration.</p> <p>CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p> <p>CC.3.5.9-10.C. 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.</p> <p>CC.3.5.9-10.D. 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.</p> <p>CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</p>	
Big Ideas	Essential Questions
<ul style="list-style-type: none"> Structure and function of organelles allow for chemical reactions like photosynthesis and cellular respiration to occur. Photosynthesis and cellular respiration are dependent on each other. Energy is transferred and conserved in living organisms. 	<ul style="list-style-type: none"> How are structure and function related in living things? How are matter and energy transferred and transformed in living things? How are the processes of photosynthesis and cellular respiration interrelated?
Content	Skills
<ul style="list-style-type: none"> Photosynthesis, including reactants and products, light reaction and Calvin cycle Cellular respiration, including reactants and products, glycolysis, Krebs cycle and oxidative phosphorylation Cellular energy, ATP, and its role in cellular metabolism 	<ul style="list-style-type: none"> Construct tables and graphs in APA format Cite specific textual evidence to support analysis of science texts Justify from where cellular energy is derived in living organisms

Unit #/Title	8/Cell Growth & Reproduction	Time Frame	3 Weeks
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Standards

3.1.10.A3. Compare and contrast the life cycles of different organisms.

3.1.B.A3. Explain how all organisms begin their life cycles as a single cell and that in multicellular organisms, successive generations of embryonic cells form by cell division.

3.1.10.A4. Describe the cell cycle and the process and significance of mitosis.

3.1.B.A4. Summarize the stages of the cell cycle. Examine how interactions among the different molecules in the cell cause the distinct stages of the cell cycle, which can also be influenced by other signaling molecules. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.

3.1.B.A4. Compare and contrast a virus and a cell. Relate the stages of viral cycles to the cell cycle.

3.1.C.A4. Relate mitosis and meiosis at the molecular level.

3.1.12.A4. Explain how the cell cycle is regulated.

3.1.10.A6. Identify the advantages of multicellularity in organisms.

3.1.B.A6. Explain how cells differentiate in multicellular organisms.

3.1.12.A6. Analyze how cells in different tissues/organs are specialized to perform specific functions.

3.1.12.A7. Describe the potential impact of stem cell research on the biochemistry and physiology of life.

3.1.10.B2. Explain the process of meiosis resulting in the formation of gametes. Compare and contrast the function of mitosis and meiosis.

3.1.B.B2. Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance of meiosis in sexual reproduction. Compare and contrast the function of mitosis and meiosis. Illustrate that the sorting and recombining of genes in sexual reproduction results in a great variety of possible gene combinations in offspring.

BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, and cytokinesis.

BIO.B1.1.1 Describe the events that occur during the cell cycle: interphase, nuclear division (i.e. mitosis or meiosis), and cytokinesis.

BIO.B.1.1.2 Compare the processes and outcomes of mitotic and meiotic nuclear divisions.

BIO.B.1.2 Explain how genetic information is inherited.

CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.C. 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.

CC.3.5.9-10.D. 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.

CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Big Ideas	Essential Questions
<ul style="list-style-type: none"> The cell cycle is universal to all living things. Viruses are nonliving. Sexual and Asexual reproduction are necessary for the continuation of life. Mitosis is necessary for growth and repair, while meiosis is for sexual reproduction only. 	<ul style="list-style-type: none"> How do organisms live and grow? What are the differences and similarities between sexual and asexual reproduction? How are the characteristics of one generation passed to the next?
Content	Skills
<ul style="list-style-type: none"> Phases of the cell cycle, mitosis, and meiosis Sexual and asexual reproduction 	<ul style="list-style-type: none"> Construct tables in APA format Cite specific textual evidence to support analysis of science texts Identify different phases of the cell cycle

Unit #/Title	9/Molecular Biology	Time Frame	3 Weeks
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Standards	
<p>3.1.10.A7. Explain how cells store and use information to guide their functions.</p> <p>3.1.B.B1. Explain the basic process of DNA replication. Describe the basic processes of transcription and translation.</p> <p>3.1.10.B3. Describe the basic structure of DNA and its function in genetic inheritance. Describe the role of DNA in protein synthesis as it relates to gene expression.</p> <p>3.1.B.B3. Describe the basic structure of DNA, including the role of hydrogen bonding. Explain how the process of DNA replication results in the transmission and conservation of the genetic code. Describe how transcription and translation result in gene expression. Differentiate among the end products of replication, transcription, and translation.</p> <p>3.1.C.B3. Describe the structure of the DNA and RNA molecules.</p> <p>3.1.B.B5. Explain how the processes of replication, transcription, and translation are similar in all organisms.</p> <p>BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.</p> <p>BIO.B.2.2 Explain the process of protein synthesis (i.e. transcription, translation, and protein modification).</p> <p>BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms.</p> <p>BIO.B.2.2.2 Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins.</p> <p>CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p> <p>CC.3.5.9-10.C. 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.</p> <p>CC.3.5.9-10.D. 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.</p> <p>CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</p>	
Big Ideas	Essential Questions
<ul style="list-style-type: none"> DNA & RNA structure and function are directly related to one another. DNA codes for proteins through a process known as protein synthesis. 	<ul style="list-style-type: none"> How are the structures of DNA & RNA related to their functions? What is the significance of copying DNA? How are genes expressed?
Content	Skills
<ul style="list-style-type: none"> DNA replication Role of RNA in protein synthesis Transcription and translation 	<ul style="list-style-type: none"> Extract DNA from fruit Cite specific textual evidence to support analysis of science texts

Unit #/Title	10/Genetics	Time Frame	5 Weeks
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Standards

3.1.B.B1 Explain that the information passed from parents to offspring is transmitted by means of genes, which are coded in DNA molecules. Explain how crossing over, jumping genes, and deletion of genes result in genetic variation. Explain how mutations can alter genetic information and the possible consequences on resultant cells. Explain gene inheritance and expression at the molecular level.

3.1.B.B3 Cite evidence to support that the genetic code is universal.

3.1.12.B3 Explain the impact of environmental factors on gene expression.

3.1.B.B4 Explain how genetics technologies have impacted the fields of medicine, forensics, and agriculture.

3.1.12.B4 Evaluate the societal impact of genetic engineering techniques, and applications.

3.1.10.B5 Compare and contrast Mendelian and non-Mendelian patterns of inheritance.

3.1.B.B5 Describe how Mendel's law of segregation and independent assortment can be observed through patterns of inheritance. Distinguish among observed inheritance patterns caused by several (dominant, recessive, codominant, sex-linked, polygenic, incomplete dominance, multiple alleles).

3.4.10.E1. Assess how medical technologies over time have impacted prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, and genetic engineering.

BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.

BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance.

BIO.B.2.1.1 Describe and/or predict observed patterns of inheritance (i.e. dominant, recessive, codominance, incomplete dominance, sex-linked, polygenic, and multiple alleles).

BIO.B.2.1.2 Describe processes that can alter composition or number of chromosomes (i.e. crossing over, nondisjunction, duplication, translocation, deletion, insertion, and inversion).

BIO.B.2.3 Explain how genetic information is expressed.

BIO.B.2.3.1 Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g. silent, nonsense, frameshift).

BIO.B.2.4 Apply scientific thinking, processes, tools, and technologies, in the study of genetics.

BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g. selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).

CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.C. 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.

CC.3.5.9-10.D. 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.

CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

CC.3.6-9.10.B. 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.

Big Ideas	Essential Questions
<ul style="list-style-type: none"> Genes are inherited in either Mendelian or Non-Mendelian patterns. Mendel's Laws of Inheritance determine how monohybrid and dihybrid crosses are set up. 	<ul style="list-style-type: none"> How is genetic information passed through generations? What is the significance of a Punnett Square?

Content	Skills
<ul style="list-style-type: none"> • Mendelian inheritance • Dominant and recessive alleles • Homozygous, heterozygous, genotype and phenotype • Multiple alleles, codominance and incomplete dominance 	<ul style="list-style-type: none"> • Diagram and predict the results of monohybrid & dihybrid crosses • Cite specific textual evidence to support analysis of science texts

Unit #/Title	11/Environmental Biology	Time Frame	3 Weeks
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Standards
<p>3.1.12.A8. Describe and interpret dynamic changes in stable systems.</p> <p>3.1.10.A9/4.1.7.F/4.3.7.C/4.4.7.E/4.5.7.F. Recognize and analyze alternative explanations and models.</p> <p>3.1.10.B6/C4. Formulate and revise explanations and models using logic and evidence.</p> <p>3.1.10.B6/C4/4.2.7.D. Recognize and analyze alternative explanations and models.</p> <p>4.1.12.B. Research solutions to problems caused by interrupting natural cycles.</p> <p>4.1.12.C. Research how humans affect energy flow. Describe the impact of industrial, agricultural, and commercial enterprises on an ecosystem.</p> <p>4.1.12.A. Analyze the differences between natural causes and human causes extinction. Research wildlife management laws and their effects on biodiversity.</p> <p>4.1.12.E. Research solutions addressing human impacts on ecosystems over time.</p> <p>4.4.12.D. Describe how policies, regulations and laws affect the technologies adopted in agriculture.</p> <p>3.1.10.B6/4.4.7.E/4.1.7.F/4.2.7.D/4.3.7.C/4.5.7.F. Know that scientists study the natural world and universe using both direct and indirect observations.</p> <p>3.4.10.E2. Compare and contrast how the engineering design and management of agricultural systems require knowledge of artificial ecosystems and the effects of technological development on flora and fauna.</p> <p>CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p> <p>CC.3.5.9-10.C. 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.</p> <p>CC.3.5.9-10.D. 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.</p> <p>CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</p> <p>CC.3.5.9-10.H. Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.</p> <p>CC.3.6-9.10.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.</p>

CC.3.6-9.10.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. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. 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 to the expertise of likely readers. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. 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).

Big Ideas	Essential Questions
<ul style="list-style-type: none"> ● Solving environmental problems are multifaceted and complex. ● The water, carbon, nitrogen and phosphorous cycles are essential to the biosphere. 	<ul style="list-style-type: none"> ● How does biodiversity affect humans? ● How do engineers solve biodiversity problems associated with human origins? ● How does matter and energy flow through an ecosystem?
Content	Skills
<ul style="list-style-type: none"> ● Water, carbon, nitrogen and phosphorous cycles ● Organisms interact with their environment and how this affects the ecosystem 	<ul style="list-style-type: none"> ● Model biogeochemical cycles ● Research environmental topics ● Write a full APA Research Paper