HAZLETON AREA SCHOOL DISTRICT
SCIENCE CURRICULUM

BIOLOGY IA

APRIL 2014

Biology IA

Unit 1: Basics of Biology
(1st half of semester)

Big Idea: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

Anchor Descriptor	Eligible Content	Essential Questions	Objectives	ELL/IEP Modified Objectives	PA Core*	Vocabulary
BIO.B.3.3 Apply scientific thinking processes, tools, and technologies in the study of the theory of evolution.	BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.	How are experiments designed and evaluated?	All students will formulate a hypothesis using the if/then format. All students will distinguish between personal belief and scientific evidence. All students will critique the validity of resources and assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions. All students will use results of an experiment to develop a conclusion to an investigation that addresses the initial questions and supports or refutes the stated hypothesis. All students will read, interpret and examine the validity of scientific articles, advertisements, or media stories. All students will recognize the steps in the scientific method.	All students will formulate a hypothesis using the if/then format. All students will distinguish between fact and opinion. All students will critique the relevance of resources for a given experiments. All students will use results of an experiment to support or refute the hypothesis. All students will recognize the steps in the scientific method.	CC.3.6.9-10.B CC.3.6.9-10.E CC.3.5.9-10.C. Develop a lab report based on a classroom activity using technology CC.3.5.9-10.D Vocabulary activities CC.3.5.9-10.G Interpreting data from experiments	• Scientific method • Observation • Research • Hypothesis • Experiment • Results • Conclusion • Inference • Fact • Theory • Law • Principle

Anchor Descriptor	Eligible Content	Essential Questions	Objectives	ELL/IEP Modified Objectives	PA Core*	Vocabulary
BIO.A.1.1 Explain the characteristics common to all organisms.	BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.	Why is an organism considered alive?	All students will evaluate living and nonliving specimens and determine what is necessary for life to exist. All students will recognize and interpret connections between life processes in prokaryotes and eukaryotes. All students will identify and describe the characteristics of life shared by all living things.	All students will analyze the hierarchy of organization of living organisms. All students will recognize connections between life processes in prokaryotes and eukaryotes in a visual. All students will identify and describe the characteristics of life shared by all living things.	CC.3.5.9-10.E Activity identifying characteristics of life.	• Prokaryote • Eukaryote • Unicellular • Multicellular • Organelle • Homeostasis • Stimulus • Metabolism • Asexual reproduction • Sexual reproduction • DNA • Evolution
BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.	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, and multicellular organisms).	How do organisms vary in their organization?	All students will analyze the hierarchy of organization of living organisms. All students will make predictions based on relationships between structure and function at various levels of biological organization. All students will evaluate relationships between structures and functions at various levels of biological organization. All students will develop and use models to explain the organization of interacting systems working together to provide specific functions within organisms.	All students will list the hierarchy of organization of living organisms (graphically). All students will identify relationships between structure and function at various levels of biological organization. All students will explain the organization of interacting systems working together to provide specific functions within organisms.	CC.3.5.9-10.B Students evaluate issues and/or decision making articles.	• Cells • Tissues • Organs • Organ systems • Organism

Unit 2: Ecology
(1st half of semester)

Big Idea: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Anchor Descriptor	**Eligible Content**	**Essential Questions**	**Objectives**	**ELL/IEP Modified Objectives**	**PA Core***	**Vocabulary**
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 the characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.	How is the biosphere organized?	All students will distinguish between biotic and abiotic factors when given a list of environmental factors. All students will construct a pyramid detailing the levels of organization in the biosphere. All students will compare and contrast the components of various types of ecosystems.	All students will distinguish between biotic and abiotic factors when given a list of environmental factors. All students will construct a pyramid detailing the levels of organization in the biosphere. All students will compare and contrast the components of two types of ecosystems.	CC.3.5.9-10.D Vocabulary activities CC.3.5.9-10.E Create a graphic that represents levels of organization in the biosphere	• Abiotic • Aquatic • Biotic • Ecology • Terrestrial • Organism • Population • Community • Ecosystem • Biome • Biosphere

Anchor Descriptor	Eligible Content	Essential Questions	Objectives	ELL/IEP Modified Objectives	PA Core*	Vocabulary
BIO.B.4.2 Describe interactions and relationships in an ecosystem.	BIO.B.4.2.1 Describe how energy flows through an ecosystem (i.e. food chains, food webs, energy pyramids)	How does the flow of energy differ than the flow of matter through the biosphere?	All students will construct a food chain, food web, and energy pyramid for a given ecosystem. All students will use an energy pyramid to illustrate how and why energy flows in an ecosystem. All students will use data to develop mathematical models to describe the flow of matter and energy between organisms and the ecosystem. All students will critique a given energy pyramid for possible errors or flaws, providing an improved version of the pyramid if applicable.	All students will construct a food chain, food web, and energy pyramid for a given ecosystem. All students will critique a given energy pyramid for possible errors.	CC.3.5.9-10.D Vocabulary activities CC.3.5.9-10.E Food web activity	• Bioenergetics • Ecosystem • Energy pyramid • Food chain • Food web • Trophic level • Biomass • Autotrophs (producers) • Photosynthesis • Chemosynthesis • Heterotrophs (consumers) • Herbivore • Carnivore • Decomposer
	BIO.B.4.2.2 Describe biotic interactions in an ecosystem (i.e. competition, predation, symbiosis)	How do organisms vary with their interactions with each other?	All students will analyze the different causes of competition within an ecosystem. All students will apply concepts about predator/prey relationship for a given ecosystem. All students will list examples of symbioses in a given environment and hypothesize how these relationships evolved.	All students will analyze the different causes of competition within an ecosystem. All students will apply concepts about predator/prey relationship for a given ecosystem. All students will list examples of symbioses in a given environment.	CC.3.5.9-10.A Interpreting data supporting the predator/prey relationship	• Competition • Resource • Niche • Competitive Exclusion Principle • Predation • Predator • Prey • Symbiosis • Commensalism • Mutualism • Parasitism • Parasite • Host

Anchor Descriptor	Eligible Content	Essential Questions	Objectives	ELL/IEP Modified Objectives	PA Core*	Vocabulary
	BIO.B.4.2.3 Describe how matter recycles through an ecosystem (i.e. water cycle, carbon cycle, oxygen cycle, and nitrogen cycle)	How do organisms rely on each other to recycle matter? How does transforming matter ensure the renewal of resources?	All students will construct a diagram detailing the components of the ecosystem involved in the water cycle, carbon cycle, oxygen cycle and nitrogen cycle. All students will list the changes that occur within each cycle. All students will provide evidence to support explanations. All students will predict the consequences of changes to these cycles when given a scenario.	All students will complete a diagram detailing the components of the ecosystem involved in the water cycle, carbon cycle, oxygen cycle and nitrogen cycle. All students will list the changes that occur within each cycle. All students will provide evidence to support explanations.	CC.3.5.9-10.D Vocabulary activities CC.3.5.9-10.E Activities analyzing the biogeochemical cycles	• Water cycle • Evaporation • Transpiration • Condensation • Precipitation • Carbon cycle • Biogeochemical cycles • Nitrogen fixation • Denitrification • Decomposition • Phosphorus cycle

Unit 3: Humans and the Environment
(1st half of semester)

Big Idea: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Anchor Descriptor	Eligible Content	Essential Questions	Objectives	ELL/IEP Modified Objectives	PA Core*	Vocabulary
BIO.B.4.2 Describe interactions and relationships in an ecosystem.	BIO.B.4.2.5 Describe the effects of limiting factors on population dynamics and potential species extinction.	Why do population sizes vary over time?	All students will interpret population growth charts and project future growth trends. All students will identify limiting factors in specific environments and classify them as being density dependent or density independent. All students will calculate population density in a given area. All students will evaluate data to explain resource availability and other environmental factors that affect carrying capacity of ecosystems. All students will plan and carry out investigations to make mathematical comparisons of the populations and biodiversity of two similar ecosystems at different scales.	All students will interpret population growth charts and project future growth trends in bar and line graphs. All students will identify limiting factors in specific environments. All students will calculate population density in a given area. All students will evaluate data to explain resource availability and other environmental factors that affect carrying capacity of ecosystems. All students will compare populations and biodiversity of two similar ecosystems.	CC.3.5.9-10.D Vocabulary activities CC.3.5.9-10.E Analyzing the effect that limiting factors have on populations	• Population • Exponential growth • Logistic growth • Carrying capacity • Limiting factor • Population density • Geographic distribution • Age structure • Growth rate • Death rate • Density-dependent limiting factor • Density-independent limiting factor • Demographic transition • Extinction

Anchor Descriptor	Eligible Content	Essential Questions	Objectives	ELL/IEP Modified Objectives	PA Core*	Vocabulary
	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)	How are humans impacting the biosphere?	All students will list both the immediate and long term effects of human disturbances in specific environments. All students will differentiate between primary and secondary succession. All students will identify contributing factors to climate change and how human activity attributes to the accumulation of greenhouse gases. All students will design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. All students will design solutions for creating or maintaining the sustainability of local ecosystems.	All students will list both the immediate and long term effects of human disturbances in specific environments. All students will differentiate between primary and secondary succession. All students will identify contributing factors to climate change and how human activity attributes to the accumulation of greenhouse gases. All students will generate possible solutions for reducing the impacts of human activities on the environment and biodiversity.	CC.3.5.9-10.D Vocabulary activities CC.3.6.9-10.A CC.3.6.9-10.H CC.3.6.9.-10.F Use data from texts to create an argument on an environmental issue CC.3.6.9-10.F CC.3.5.9 10I CC.3.6-10.G. Environmental research project on chosen topic	• Greenhouse effect • Global warming • Deforestation • Desertification • Acid rain • Soil erosion • Habitat fragmentation • Invasive species • Biological magnification • Endangered species • Endemic species • Pollution • Succession • Ozone depletion

Unit 4: Genetics & Inheritance
(2nd half of semester)

Big Idea: Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.

Anchor Descriptor	Eligible Content	Essential Questions	Objectives	ELL/IEP Modified Objectives	PA Core*	Vocabulary
BIO.B.1.2 Explain how genetic information is inherited.	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.	How are traits inherited?	All students will summarize the role that DNA, genes, alleles, and chromosomes play in inheritance.	All students will summarize that role the DNA, genes, alleles, and chromosomes play in inheritance.	CC.3.6.9-10.I PDN, tickets out the door, etc. CC.3.5.9-10.D. Vocabulary Activities	• DNA • Genes • Alleles • Chromosomes • 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, co-dominance, incomplete dominance, sex-linked, polygenic, and multiple alleles).	How is Mendelian inheritance different from other methods of inheritance?	All students will investigate and analyze the various patterns of inheritance using Mendelian and non-Mendelian genetics. All students will construct and analyze a Punnett square to predict genetic probability. All students will formulate genotypes and interpret the phenotype they represent. All students will construct and analyze karyotypes and pedigrees.	All students will investigate the various patterns of inheritance using Mendelian and non-Mendelian genetics. All students will construct and analyze a Punnett square to predict genetic probability. All students will formulate genotypes and interpret the phenotype they represent. All students will construct and analyze karyotypes and pedigrees	CC.3.6.9-10.A CC.3.5.9-10.G CC.3.5.9-10.I Complete a project using Punnett squares and draw conclusions about inheritance.	• Dominant • Recessive • Co-dominant • Incomplete Dominance • Sex-linked • Polygenic/Multiple Alleles • Homozygous • Heterozygous • Genotype • Phenotype • Karyotype • Pedigree • Punnett square • Probability

Anchor Descriptor	Eligible Content	Essential Questions	Objectives	ELL/IEP Modified Objectives	PA Core*	Vocabulary
	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).		All students will compare and contrast various chromosomal mutations (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion).	All students will compare and contrast various chromosomal mutations (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion) in visual form.		• Crossing-over • Nondisjunction • Translocation • Deletion • Insertion • Inversion
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).	How are the concepts and methods of modern genetic technologies utilized?	All students will assess and critique the impact of genetic engineering on science and society. All students will describe the processes involved in genetic engineering (gene splicing, gel electrophoresis, transformation, etc.).	All students will assess the impact of genetic engineering on science and society. All students will describe the processes involved in genetic engineering (gene splicing, gel electrophoresis, transformation, etc.).	CC.3.6.9-10.D Stem-cell research project CC.3.5.9-10.B CC.3.5.9-10.F CC.3.5.9-10.H CC.3.6.9-10.G Debate on ethics of genetic engineering	• Gene splicing • Selective breeding • Genetic engineering • Cloning • Gene therapy • Genetic Modifications • Transformation • DNA fingerprinting • Gel electrophoresis

Unit 5: Evidence of Evolution
(2nd half of semester)

Big Idea: Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.

Anchor Descriptor	Eligible Content	Essential Questions	Objectives	ELL/IEP Modified Objectives	PA Core*	Vocabulary
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).	How does science support the theory of evolution?	All students will define and describe the theory of evolution. All students will analyze the evidence which supports the theory of evolution. All students will investigate examples of evidence which support the theory of evolution and explain how the evidence can be interpreted.	All students will define and describe the theory of evolution. All students will list evidence which supports the theory of evolution.	CC.3.6.9-10.E CC.3.6.9-10.H Evolution webquest CC.3.5.9-10.D CC.3.6.9-10.C CC.3.6.9-10.D Write and adapt an evolution essay as knowledge grows through the unit. CC.3.5.9-10.D Vocabulary activities CC.3.5.9-10.H Evidence of evolution activity	• Fossil • Fossil record • Geological time scale • Universal genetic code • Biochemical • Microfossil • Endosymbiotic theory • Mass extinction • Macroevolution • Adaptive radiation • Coevolution • Convergent evolution • Homologous structures • Anatomical evidence • Physiological evidence • Embryological development • Molecular clocks • Cladogram • Derived characters

Unit 6: Mechanisms of Evolution
(2nd half of semester)

Big Idea: Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.

Anchor Descriptor	**Eligible Content**	**Essential Questions**	**Objectives**	**ELL/IEP Modified Objectives**	**PA Core***	**Vocabulary**
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.3.1.3 Explain how genetic mutations may result in genotypic and phenotypic variations within a population.	How are genetics related to the theory of evolution?	All students will predict how changes in allele frequencies will affect a population. All students will analyze how current environmental factors could affect future allele frequencies. All students will identify mechanisms of Darwin's theory of natural selection. All students will identify a mutation which resulted in an advantageous adaptation. All students will use examples of mutations to predict variations within a population. All students will analyze how genetic mutations can have a positive and/or negative impact within a population.	All students will predict how changes in allele frequencies will affect a population. All students will analyze the effects of current environmental factors on future allele frequencies. All students will define Darwin's theory of natural selection and cite an example. All students will identify an advantageous adaptation from given examples. All students will analyze whether given mutations can have a positive and/or negative impact within a population.	CC.3.5.9-10.D Vocabulary activities CC.3.5.9-10.F Analyzing Darwin's theory of natural selection.	• Adaptation • Genotypic variation • Phenotypic variation • Genetic mutation • Survival of the fittest • Natural selection • Artificial selection • Gene pool • Directional selection • Stabilizing selection • Disruptive selection • Allele frequency

Anchor Descriptor	Eligible Content	Essential Questions	Objectives	ELL/IEP Modified Objectives	PA Core*	Vocabulary
	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).	How do new species evolve?	All students will analyze examples to determine the existence of a temporal, behavioral or geographic isolating mechanism. All students will recognize and identify examples to distinguish between genetic drift, founder effect, and migration. All students will compare and contrast isolating mechanisms (behavioral, geographic, and temporal). All students will evaluate 3 mechanisms of evolution leading to the development of new species.	All students will sort examples to determine the existence of a temporal, behavioral or geographic isolating mechanism. All students will recognize and identify examples to distinguish between genetic drift, founder effect, and migration. All students will cite examples of isolating mechanisms (behavioral, geographic, and temporal).	CC.3.5.9-10.D Vocabulary activities CC .3.6.9-10.I Ongoing essay on population evolution, additional research adjusts essay	• Genetic drift • Founder effect • Migration • Behavioral isolation • Geographic isolation • Temporal isolation • Isolating mechanism • Reproductive isolation

***PA CORE STANDARDS FOR READING IN SCIENCE AND TECHNICAL SUBJECTS:**

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.B
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.

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 in 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.

CC.3.5.9-10.F
Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

CC.3.5.9-10.G
Translate quantitative or technical information expressed in words in a text into visual form and translate information expressed visually or mathematically into words.

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, noting when the findings support or contradict previous explanations or accounts.

CC.3.5.9-10.J
By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

***PA CORE STANDARDS FOR WRITING IN SCIENCE AND TECHNICAL SUBJECTS:**

CC.3.6.9-10.A
Write arguments focused on discipline-specific content.

CC.3.6.9-10.B
Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

CC.3.6.9-19.C
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

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.

CC.3.6.9-10.E
Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

CC.3.6.9-10.F
Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

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.

CC.3.6.9-10.H
Draw evidence from informational texts to support analysis, reflection, and research.

CC.3.6.9-10.I.
Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.