DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

_____Honors Biology_____

Grade Level: 9, 10

Date of Board Approval: _____2019_____

DELAWARE VALLEY SCHOOL DISTRICT

Planned Instruction

Title of Planned Instruction: Honors Biology

Subject Area: Biology **Grade(s): 9, 10**

Course Description: This course is designed for the advanced level college bound ninth grade student. It focuses on continuity and change, unifying themes of life, the methodology of studying life and the mechanism of evolution. Students have the opportunity to utilize the scientific method in order to investigate mechanisms utilized by living things to maintain homeostasis. Students will also investigate the effect that humans have on the ecosystems and other living and nonliving things. This course is part of the planned science curriculum at Delaware Valley High School.

Time/Credit for the Course: 46 minutes daily/1.0 credit

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DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Map

1. **Marking Period One:**
   - **Overview based on 45 days:**

   UNIT 1: Themes of Biology/ Nature of Science, Behavior and Ecology
   UNIT 2: Biochemistry
   - **Understanding of:**

     Scientific Method and Experimentation as a means for scientific progress and discovery
     Themes of biology and the characteristics of all living things
     Ecology Levels of ecological study and the interactions of organisms and their environment
     The basics of subatomic particles and inorganic chemistry
     The structure of water and its emergent properties
     The fundamentals of chemical underpinning of biological molecules

2. **Marking Period Two:**
   - **Overview based on 45 days:**

   UNIT 3: Cell Structure and Function, Transport
   UNIT 4: Enzyme Dynamics and Cellular Energetics
   - **Understanding of:**

     The studies that led to the discovery of structure and function of the cell
     Comparison of Structure and Function of Prokaryotic and Eukaryotic Cells
     Dynamics and examples of Cell Transport – Active and Passive Transport
     Enzymatic activity and factors that affect it
     Chemical Reactions and Energy Transformation involved in Photosynthesis and Cell
     Respiration

3. **Marking Period Three:**
   - **Overview based on 45 days:**

   UNIT 5: DNA Structure, Replication, Transcription and Translation
   UNIT 6: Cell Division and Reproduction (Mitosis and Meiosis)
   UNIT 7: Mendelian Genetics, Epigenetics and Biotechnology
   - **Goals:**

     The discovery of the structure and function of DNA
     The process of DNA Replication
     Protein synthesis, which consists of DNA Transcription and Translation
     A comparison of Sexual and Asexual Reproduction
     The stages of the Cell Cycle and Mitosis
     The process of Cell cycle regulation and cancer
     The process of Meiosis to Produce Sex Cells
     Genetics Terminology Basics

Mendelian and Non-Mendelian Inheritance Patterns and Probability
Pedigree Analysis
Genetic Engineering and biotechnology including: Gel Electrophoresis, Stem cells, Cloning and Bioethical concerns

4. **Marking Period Four:**
   - **Overview based on 45 days:**

   UNIT 8: Evolution
   UNIT 9: Origin of the Life, Classification and Diversity
   UNIT 10: Animal Kingdom Anatomy and Physiology
   - **Goals:**

     Evolution's Significance in Biology
     Evidences of Evolution
     Charles Darwin and Natural Selection
     The use of Hardy Weinberg Equilibrium to determine evolutionary change
     The barriers of Speciation
     Taxonomy and Binomial Nomenclature
     A survey of the Bacteria, Protist, Fungi and Plant Kingdoms
     Major characteristics of the Animal Kingdom
     Animal Body systems (digestive, nervous, immune, muscle)

(Goals above are to describe the intended general/global outcome of each marking period.)

DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Plan

Unit: Themes of Biology/Nature of Science and Ecology **Marking Period: 1**

Standard(s): PA Academic Standards, PACS Reading and Writing for Science and Technology http://www.corestandards.org/ELA-Literacy/RST/11-12/#CCSS.ELA-Literacy.RST.11-12.1, https://www.pdesas.org/Standard/View#, https://www.pdesas.org/Page/Viewer/ViewPage/13

Anchor(s): CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.2, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.4, CCSS.ELA-LITERACY.RST.11-12.5, CCSS.ELA-LITERACY.RST.11-12.6, CCSS.ELA-LITERACY.RST.11-12.7, CCSS.ELA-LITERACY.RST.11-12.8, CCSS.ELA-LITERACY.RST.11-12.9, CCSS.ELA-LITERACY.RST.11-12.10, **3.1.B.A2, 3.1.B.A4, 3.1.B.A5, 3.1.B.A7, 3.1.B.A8, 3.2.B.B.6, 3.2.C.A1, 4.1.5.C, 4.1.10.1, 4.1.10.B, 4.1.10.C, 4.1.10 E, 4.1.12.A, 4.1.12.C, 4.2.10.A, 4.2.10.B, 4.2.10.C,4.1.12.A, 4.2.12.B, 4.3.10B, 4.3.12.A, 4.5.10B, 4.5.12.B**

Anchor(s): Biology Keystone Anchors
BIO.B. 4.1.1, BIO.B.4.1.2, BIO.4.2.1, BIO.4.2.2, BIO 4.2.3, BIO.4.2.4, BIO.4.2.5

Big Idea(s):
Big Idea # 1: Organisms grow and reproduce and perpetuate their species by obtaining necessary resources through interdependent relationships with other organism and the physical environment.

Essential Questions:

-How and why do organisms interact with their environment and what are the effects of the interactions?

Concepts:

-Ecosystems have carrying capacities, which are limits to the number of organism and populations they can support.

Competencies:

-TSWBAT evaluate data to explain resource availability and other environmental factors that affect carrying capacity.

-TSWBAT plan and carry out investigations to make mathematical comparisons of the populations and biodiversity of two similar ecosystems at different scales.

Big Idea # 2: Organisms grow and reproduce and perpetuate their species by obtaining necessary resources through interdependent relationships with other organism and the physical environment.

Essential Questions:

-How and why do organisms interact with their environment and what are the effects of the interactions?

Concepts:

-Matter is transferred through organisms in an ecosystem, some is stored, but most is lost.

Competencies:

-TSWBAT use data to develop mathematical models to describe the flow of matter and energy between organisms and the ecosystem.

-TSWBAT provide evidence to support explanations of how elements and energy are conserved as they cycle though ecosystems and how organisms compete for matter and energy.

Big Idea #3: Organisms grow and reproduce and perpetuate their species by obtaining necessary resources through interdependent relationships with other organism and the physical environment.

Essential Questions:

-How and why do organisms interact with their environment and what are the effects of the interactions?

Concepts:

-Photosynthetic and/or chemosynthetic organism from the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher lever.

Competencies:

-TSWBAT use data to develop mathematical models to describe the flow of matter and energy between organisms and the ecosystem.

Big Idea #4: Organisms grow and reproduce and perpetuate their species by obtaining necessary resources through interdependent relationships with other organism and the physical environment.

Essential Questions:

-How and why do organisms interact with their environment and what are the effects of the interactions?

Concepts:

-Matter found in organisms is cycled through food webs, as well as the atmosphere and geosphere through biogeochemical cycles.

Competencies:

-TSWBAT provide evidence to support explanations of how elements and energy are conserved as they cycle though ecosystems and how organisms compete for matter and energy.

Big Idea #5: Organisms grow and reproduce and perpetuate their species by obtaining necessary resources through interdependent relationships with other organism and the physical environment.

Essential Questions:

-How and why do organisms interact with their environment and what are the effects of the interactions?

Concepts:

-Competition among species is ultimately competition for the matter and energy needed for life.

Competencies:

-TSWBAT investigate and explain the evidence of competition on individual and species' chances to survive and reproduce.

Big Idea #6: Organisms grow and reproduce and perpetuate their species by obtaining necessary resources through interdependent relationships with other organism and the physical environment.

Essential Questions:

-How and why do organisms interact with their environment and what are the effects of the interactions?

Concepts:

-Significant changes in the conditions or population sizes may affect the functioning of ecosystem's resources and habitat availability. Population size and biodiversity remain relatively constant over time due to complex interactions within ecosystems.

Competencies:

-TSWBAT construct and use a model to communication how complex sets of interactions in ecosystems maintain relatively consistent numbers and types of organisms for long periods of time when conditions are stable.

Big Idea #7: Organisms grow and reproduce and perpetuate their species by obtaining necessary resources through interdependent relationships with other organism and the physical environment.

Essential Questions:

-How and why do organisms interact with their environment and what are the effects of the interactions?

Concepts:

-Ecosystems are resilient, in that they can withstand moderate biological or physical disturbances and return to their original state.

Competencies:

-TSWBAT construct arguments from evidence about the effects of natural and human disturbances and biological or physical disturbances in terms of the time needed to reestablish a stable ecosystem and how the new system differs from the original system.

Big Idea #8: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Organisms maintain homeostasis in response to changing environments via positive and negative feedback mechanisms.

Competencies:

-TSWBAT Plan and conduct an investigation to provide evidence and explain the function of positive and negative feedback mechanisms in maintaining homeostasis that is essential for organisms.

Big Idea #9: Behaviors are the result of Evolutionary Selection

Essential Questions:

-What are proximate and ultimate causes for behavior?
-How do innate and learned behaviors compare and contrast?
-What are examples of learned and innate behaviors?

Concepts:

-Behaviors have proximate and ultimate causes.
-Innate behaviors are those organisms are born with.
-Learned behaviors are those organisms gain through experience.

Competencies:

-TSWBAT evaluate the cost and benefits of behaviors of different organisms.
-TSWBAT describe specific innate and learned behaviors.
-TSWBAT use data to evaluate the adaptive significance of behaviors.
-TSWBAT predict the likelihood of a species having more innate or learned behaviors based on offspring-rearing methods.

Big Idea #10: Ecology is the study of organismal interactions at different levels

Essential Questions:

-What are the levels of ecological study?
-What factors affect population growth?
-What factors affect interactions between species?
-What factors affect trophic structure?
-What factors affect the cycling of nutrients between biotic and abiotic components?
-What are the characteristics of different aquatic and terrestrial biomes?
-How do humans affect the biosphere?

Concepts:

-Ecology can be studied at the population, community, ecosystem, biome and biosphere levels.
-Population growth can be exponential, logistic or dynamic.

-Population growth is determined by density-dependent and density-independent limiting factors.
-All trophic interactions begin at a producer level, and approximately 10% of energy is passed on to each consecutive consumer level.
-The water cycle, carbon cycle, nitrogen cycle, and phosphorus cycle depict the movement of crucial nutrients between biotic and abiotic reservoirs.
-Biomes are large aquatic or terrestrial areas characterized by specific climate ranges and species of plants and animals.
-Humans have affected the biosphere in a multitude of ways, many of them being negative. These include habitat degradation, pollution, global warming,

Competencies:

-TSWBAT define each level of ecological study.
-TSWBAT evaluate factors that can affect population growth and predict how those factors would cause population to change.
-TSWBAT define the relationships demonstrated between species.
-TSWBAT explain the tropic structure of biomes and how changes could have community-wide implications.
-TSWBAT explain the mechanisms involved in the water, carbon, nitrogen and phosphorus cycles.
-TSWBAT characterize aquatic and terrestrial biomes.
-TSWBAT evaluate the effects of human population growth has had on the biosphere.

Overview: Students will identify major themes in scientific research and essential ideas in biology; specifically, characteristics of living things (made of a genetic code, grow and develop, respond and adapt, reproduce, maintain homeostasis, obtain and use energy for life processes, are made of cells, evolve), and the organization of living things. Specifically, this unit will focus on the interactions of organisms and their environment at an ecological level. Students will investigate the interactions of individuals within a population and variables that affect population growth, mechanisms of symbioses and flow of energy within communities, the way abiotic and biotic factors inter-relate at the ecosystem level and finally how major areas of the earth have associated climate and ecosystem characteristics that organize them into specific biomes. Finally, students will investigate the effect that humans have on the biosphere and mechanisms to mitigate these effects.

Goals: For students to better understand how scientific research and investigation applies to real-world situations and to identify patterns in nature by identifying the many factors that help to define ecology and the ways in which living things interact with each other and their environment.

Objectives:

1. State the goals of science. (DOK1)
2. Describe the steps used in scientific methodology. (DOK2)
3. List the characteristics of living things. (DOK1)

4. Explain how scientific attitudes generate new ideas. (DOK2)
5. Describe the importance of peer review. (DOK2)
6. Explain what a scientific theory is. (DOK1)
7. Explain the relationship between science and society. (DOK2)
8. Identify the central themes of biology. (DOK1)
9. Explain how life can be studied at different levels. (DOK1)
10. Describe the study of ecology. (DOK2)
11. Explain how biotic and abiotic factors influence an ecosystem. (DOK3)
12. Describe the methods used to study ecology. (DOK2)
13. Define primary producers. (DOK1)
14. Predict how the loss of primary producers will affect the ecosystem. (DOK2)
15. Describe how consumers obtain energy and nutrients. (DOK1)
16. Trace the flow of energy through living systems. (DOK2)
17. Define niche. (DOK1)
18. Describe the role competition plays in shaping communities. (DOK2)
19. Describe the role predation and herbivory play in shaping communities. (DOK2)
20. Identify the three types of symbiotic relationships in nature. (DOK1)
21. Describe how ecosystems recover from a disturbance. (DOK2)
22. Compare succession after a natural disturbance with succession after a human caused disturbance. (DOK3)
23. Describe and compare the characteristics of the major land biomes. (DOK3)
24. Discuss the factors that affect aquatic ecosystems. (DOK3)
25. Identify the major categories of freshwater ecosystems. (DOK1)
26. List the characteristics used to describe a population. (DOK1)
27. Identify factors that affect population growth. (DOK2)
28. Describe exponential growth. (DOK1)
29. Describe logistic growth. (DOK1)
30. Analyze data to determine the type of population growth. (DOK4)
31. Identify factors that determine carrying capacity. (DOK1)
32. Identify the limiting factors that depend on population density. (DOK1)
33. Identify the limiting factors that do not depend on population density. (DOK1)
34. Discuss the trend of human population growth. (DOK2)
35. Describe human activities that can affect the biosphere. (DOK2)
36. Describe the relationship between resource use and sustainable development. (DOK2)
37. Define biodiversity and explain its value and factors affecting it. (DOK2)
38. Explain the concept of ecological footprint. (DOK1)

Core Activities and Corresponding Instructional Methods (teacher is recommended to do the following in addition to their own activities and labs):

1. Students will conduct a controlled experiment focused on the effect of caffeine on human physiology. Also, students will practice identifying the controlled, independent and dependent variables of example experiments. Students will practice writing aspects of a scientific paper based on their investigation. Students will apply appropriate graphing skills to their data collection.

2. Students will use math skills to calculate exponential growth and draw graphs of both exponential and logistic population growth curves. Students will discuss limiting factors that would cause population to level at carrying capacity and hypothesize scenarios that could allow exponential growth.
3. Students will investigate dynamic population relationships, for example, between predator and prey population growth curves ("Boom and Bust activity")
4. Students will investigate the human population growth curve and identify problems with current ecological footprint of countries such as the United States. Teacher will lead a discussion of human population growth, the factors that are affecting changes in human populations, and the ways that the U.S. population compares to the population of other countries.
5. Students will read about symbiotic relationships, and use specific examples to describe the contribution of each species.
6. Students will learn about trophic structure and complete the "Owl Pellet lab" in order to investigate owl preferences and energy gain.
7. Students will utilize the iNaturalist website to identify examples and interactions at each level of ecological study in a particular biome.

Assessments:

- **Diagnostic:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Pre-assessment Resources "Carousel Brainstorm"
  Open response questions ("What are your thoughts on…?")
  Vocabulary Assessment(s) of prior knowledge
  Word Sorts
- **Formative:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Chapters 1, 29, 4-6 in Miller and Levine
  Biology worksheets
  Teacher-generated assignments
  Laboratory Exercises
  Graphic Organizers
  Paper Models Activities
  Review Games Common Assessment
- **Summative:**
  Chapter Quizzes
  Unit I Test

Extensions:

Case Studies - current events and scientific journal articles that pertain this unit
Guided Reading of Supplemental Resources

Interactive Activities on Websites
Video Resources

Correctives:

Biology Re-read Chapters 1, 29, 4-6 in Miller and Levine Biology
Give students supplemental vocabulary review materials
Give students web-based resources that reinforce the material presented in class
Give students extra practice identifying variables in an experiment
Give students extra practice identifying examples of relationships in nature
Reteach and retest important concepts including mandatory vocabulary

DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Plan

Unit: Biochemistry **Marking Period: 1**

Standard(s): PA Academic Standards, PACS Reading and Writing for Science and Technology http://www.corestandards.org/ELA-Literacy/RST/11-12/#CCSS.ELA-Literacy.RST.11-12.1, https://www.pdesas.org/Standard/View#, https://www.pdesas.org/Page/Viewer/ViewPage/13

Anchor(s): CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.2, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.4, CCSS.ELA-LITERACY.RST.11-12.5, CCSS.ELA-LITERACY.RST.11-12.6, CCSS.ELA-LITERACY.RST.11-12.7, CCSS.ELA-LITERACY.RST.11-12.8, CCSS.ELA-LITERACY.RST.11-12.9, CCSS.ELA-LITERACY.RST.11-12.10, 3.1.B.A2, 3.1.B.A5, 3.1.B.A7, 3.1.B.A8, 3.1.C.A1, 3.1.C.A2, 3.1.C.A7, 4.1.10.C

Anchor(s): Biology Keystone Anchors
BIO.A.3.1.1, BIO.A.3.2.1, BIO.A.3.2.2, BIO.A.2.1.1, BIO.A.2.2.1, BIO.A.2.2.2, BIO.A2.2.3, BIO.A.2.3.1, BIO.A.2.3.2

Big Idea(s):

Big Idea # 1: All organisms are made of cells and can be characterized by common aspects of structure and function. Organic molecules include Carbohydrates, Lipids, Proteins and Nucleic Acids

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?
-What makes carbon the element suited to life?
-How do functional groups affect the properties of a hydrocarbon?
-What are defining characteristics of structure and function of carbohydrates, lipids, proteins and nucleic acids?
-How are monomers joined to make polymers?

Concepts:

-Sugar molecules are carbohydrates with hydrocarbon backbones. These serve as the basis for amino acids and other larger organic molecules needed by the cell.
-Carbon can bond four times; making highly diverse structures.
-Functional groups, including hydroxyl, carbonyl, carboxyl, amine, phosphate, sulfhydryl, and methyl, can influence structure and function of hydrocarbons.
-Carbohydrates provide energy and structure, lipids provide energy storage and make up the cell membrane, proteins have a great variety of functions, and nucleic acids hold the genetic code.
-Monomers are joined by a process called dehydration synthesis. Polymers are broken down into monomers by the process of hydrolysis.

Competencies:

-TSWBAT construct a model that illustrates the biosynthesis of certain amino acids from metabolic products produced during aerobic respiration.

-TSWBAT identify functional groups and predict molecule features based on functional groups it has.

-TSWBAT describe the structure and function of all macromolecules

-TSWBAT model dehydration synthesis and hydrolysis.

Big Idea # 2: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Chemical reactions are driven by matter and energy flowing through different organizational levels of biological systems which form different products.

Competencies:

-TSWBAT use a model to illustrate how cells use carbon, hydrogen, oxygen, nitrogen and sulfur to synthesize biological models.

Big Idea #3: The subatomic particles of atoms affect element behavior and bonding

Essential Questions:

-What are protons, neutrons and electrons?

-How do you determine proton, neutron and electron numbers from atomic mass and atomic number?

-What are the characteristics of covalent, ionic and hydrogen bonds?

-How can you determine a polar or a non-polar covalent bond?

Concepts:

-Protons, neutrons and electrons make up an atom, each having mass and a designation of charge.

-Atomic mass indicates number of protons and neutrons, atomic number indicates number of protons.

-Covalent bonds are due to sharing of electrons, ionic bonds are due to donation of electrons, hydrogen bonds

-Non polar covalent bonds exist between atoms of similar electronegative charges, polar bonds result from an unequal sharing of electrons

Competencies:

-TSWBAT draw an atom with electron orbitals when given atomic number and atomic mass

-TSWBAT describe differences and similarities between types of bonds

-TSWBAT predict the type of bond demonstrated between CHON molecules

Big Idea #4: Water is a polar molecule

Essential Questions:

-What bonds are found within one water molecule and what bonds are shown between water molecules?
-How do hydrogen bonds contribute to the emergent properties of water?
-What are the emergent properties of water?
-How do these properties contribute to life functions?
-What types of molecules interact with water and why?

Concepts:

-In a water molecule, one oxygen shares polar covalent bonds with two hydrogen.
-Hydrogen bonds allow for water to demonstrate cohesion, adhesion, high surface tension, high specific heat, evaporative cooling, providing an environment conducive to chemical reactions and capillary action.
-Hydrophilic molecules have charge and hydrophobic molecules are uncharged.

Competencies:

-TSWBAT draw and label a water molecule.
-TSWBAT describe all emergent properties of life and draw connections to specific life functions.
- TSWBAT predict how a molecule will interact with water based on its structure alone.

Overview: Students will identify the chemical basis of living things including the major molecules and elements that are present in living cells and tissues; distinguish between types of bonds that form molecules and compounds; describe properties of water and the significance of the molecule in living systems; distinguish between acids and basis and identify ways that pH affects the functioning of living systems; and identify and describe the structure and function of organic macromolecules, including carbohydrates, lipids, proteins, and nucleic acids.

Goals: For students to better understand the chemical basis of life by identifying major elements and molecules that are found in all living things and the factors that can affect the structure and functioning of such molecules.

Objectives:

1. Identify and distinguish between the three subatomic particles found in atoms (DOK 1, 2)
2. Describe the properties or nonpolar and polar covalent bonds and ionic bonds (DOK 2)
3. Predict if a covalent bond is polar or nonpolar. (DOK3)
4. Evaluate why different bonds affect the properties of a molecule. (DOK3)
5. Identify patterns about the unique properties of water and explain the molecular basis behind the properties (DOK 2)
6. Describe how the emergent properties of water directly affect living things (DOK3)
7. Compare acidic solutions and basic solutions, evaluate the importance of buffers in biological systems (DOK 3)

8. Relate the properties of carbon to its significance in many different structural and functional characteristics of living things (DOK 2)
9. Identify the properties of functional groups (DOK1)
10. Explain the processes of dehydration synthesis and hydrolysis to join and separate monomers (DOK 2)
11. Compare, contrast and make predictions about the structures and functions of each of the four groups of macromolecules (DOK 4)
12. Identify macromolecules based on structure or function (DOK4)
13. Identify the factors that can cause denaturing of enzymes. (DOK1)
14. Create connections to the ecological cycling of nutrients and chemicals to the characteristics of the four macromolecules (DOK 3)

Core Activities and Corresponding Instructional Methods (teacher is recommended to do the following in addition to their own activities and labs):
1. Readings in Miller and Levine Biology, Chapter 2
2. Direct instruction and discussion on biochemistry
3. Perform a lab that investigates the effect of saliva, namely the enzyme amylase on the digestion of starch, using iodine as an indicator. This can be performed as a lab or as a demonstration. Another applicable demonstration could be used to show enzyme dynamics. ("Amylase "Super Spit" activity")
4. Use tubers or other manipulatives to demonstrate the four levels of protein folding.
5. Demonstrate dehydration synthesis and hydrolysis between monomers
6. Create graphic organizer to compare and contrast the macromolecules
7. Perform an unknown identification lab for macromolecules using Iodine, Benedicts and Biuret solutions.
8. Demonstrate the effect of heat and temperature on proteins (Protein Denaturing "Milk" Lab)

Assessments:

- **Diagnostic:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Pre-assessment Resources "Carousel Brainstorm"
  Open response questions ("What are your thoughts on…?")
  Vocabulary Assessment(s) of prior knowledge
  Word Sorts
- **Formative:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Chapter 2 in Miller and Levine
  Biology worksheets
  Teacher-generated assignments

Laboratory Exercises
Graphic Organizers
Paper Models Activities
Review Games Common Assessment

- **Summative:**
  Chapter Quizzes
  Unit II Test

Extensions:
Case Studies - current events and scientific journal articles that pertain this unit
Guided Reading of Supplemental Resources
Interactive Activities on Websites
Video Resources

Correctives:
Biology Re-read Chapter 2 in Miller and Levine Biology
Give students supplemental vocabulary review materials
Give students web-based resources that reinforce the material presented in class
Give students extra practice identifying variables in an experiment
Give students extra practice identifying examples of relationships in nature
Reteach and retest important concepts including mandatory vocabulary

DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Plan

Unit: Cell Structure and Function
Marking Period: 2

Standard(s): PA Academic Standards, PACS Reading and Writing for Science and Technology http://www.corestandards.org/ELA-Literacy/RST/11-12/#CCSS.ELA-Literacy.RST.11-12.1, https://www.pdesas.org/Standard/View#, https://www.pdesas.org/Page/Viewer/ViewPage/13

Anchor(s): CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.2, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.4, CCSS.ELA-LITERACY.RST.11-12.5, CCSS.ELA-LITERACY.RST.11-12.6, CCSS.ELA-LITERACY.RST.11-12.7, CCSS.ELA-LITERACY.RST.11-12.8, CCSS.ELA-LITERACY.RST.11-12.9, CCSS.ELA-LITERACY.RST.11-12.10, 3.3.4.B, 3.3.7.B, 3.3.10B, 3.1.B.A1, 3.1.B.A2, 3.1.B.A4, 3.1.A.B.A5, 3.1.B.A6, 3.1.B.A7, 3.1.C.A1, 3.1.B.C2, 4.1.3.A, 4.1.4.A

Anchor(s): Biology Keystone Anchors
BIO.A.1.1.1, BIO1.A.A, BIO.A.2.1.1, BIO.A.4.1.1, BIO.A.4.1.2, BIO.A.4.1.3

Big Idea(s):
Big Idea # 1: All organisms are made of cells and can be characterized by common aspects of structure and function. Prokaryotes are bacterial cells and lack a nucleus. Eukaryotes are non-bacterial cells and contain a nucleus

Essential Questions:
-How do organisms live, grow, respond to their environment and reproduce?
-What are the major differences between prokaryotic and eukaryotic cells?
-What are major similarities between prokaryotic and eukaryotic cells?

Concepts:
-Compare cellular structure and their functions in prokaryotic and eukaryotic cells.
-Prokaryotic cells are bacterial, lack a nucleus and membrane-bound organelles.
-Eukaryotic cells are either animal, plant, fungi or protest. They enclose the DNA in a nucleus, contain membrane-bound organelles to increase efficiency and are much larger than prokaryotic cells.
-All cells contain DNA, ribosomes, a cell membrane and cytoplasm

Competencies:
-TSWBAT create a model to explain, compare and contrast the structure and function of prokaryotic and eukaryotic cells.
-TSWBAT identify cell type based on their structures and characteristics.

Big Idea # 2: All organisms are made of cells and can be characterized by common aspects of structure and function. Eukaryotic cells separate functions using different organelles

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?
-Why is it advantageous to compartmentalize functions in an eukaryotic cell?
- What are the functions of eukaryotic organelles?
-How does the endomembrane system work together?
-What is the endosymbiotic theory?

Concepts:

-Within cells special structures are responsible for particular functions.
-Compartmentalization is useful as it allows larger eukaryotic cells to maintain efficiency.
-Each organelle has a particular function in the eukaryotic cell.
-The endomembrane system is a series of membrane bound organelles that can transport materials, specifically secretory proteins, via vesicles.
-Mitochondria and chloroplasts were prokaryotic cells, engulfed into eukaryotic cells to develop a symbiotic relationship.

Competencies:

-TSWBAT construct a model to illustrate the similarities and differences between passive and active transport.
-TSWBAT state the function of each organelle in an eukaryotic cell.
-TSWBAT compare a plant and animal cell.
-TSWBAT follow a protein's path through the endomembrane system.
-TSWBAT predict the outcome of a protein based on the location of the ribosome.
-TWSBAT explain supporting evidences of the Endosymbiotic Theory.

Big Idea # 3: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Multicellular organisms have a hierarchical structural organization, in which any one system is made of numerous parts and is itself a component of the next level.

Competencies:

-TSWBAT Formulate scientific explanations through models to explain the hierarchical organization of interacting systems working together to provide specific functions within multicellular organisms.

Big Idea #4: The Cell membrane is a selectively permeable membrane through which passive and active transport can occur

Essential Questions:

-What components make up the cell membrane?
-Why are phospholipids selectively permeable?
-What are the functions of proteins in the cell membrane?

-What are the differences and similarities between passive and active transport?

Concepts:

-The cell membrane is composed of phospholipids, proteins, and cholesterol (in animal cells).

-Phospholipids are amphipathic; their hydrophobic fatty acid tail core blocks the movement of large, or charged molecules.

-Proteins can serve as channels, pumps, receptors, enzymes, antigens in the cell membrane.

-Passive transport requires no energy, going with the concentration gradient. Types include diffusion, osmosis, and facilitated diffusion. Active transport requires energy, going against the concentration gradient. Types include protein pumps, endocytosis and exocytosis.

Competencies:

-TSWBAT draw and label a cell membrane.

-TSWBAT explain why the phospholipids are selectively permeable.

-TSWBAT identify the different functions of proteins in the cell membrane.

-TSWBAT describe the mechanisms of transport by cell membrane proteins.

-TWSBAT compare and contrast passive and active transport, and determine the type of transport depicted in different situations.

Big Idea #5: Cell communication includes the steps of reception, transduction and response, and allows cells to work together

Essential Questions:

-What are the stages of cell communication?

-Why do cells communicate?

-What are examples of cell membrane receptors?

-What are transduction pathways and how to the help a cell?

-What could a cell response be and why can the same signaling molecule elicit different responses from different cells?

-How is reception of a protein and lipid hormone different?

Concepts:

-Cell communication includes reception, transduction and response.

-Cell membrane receptors include G-Protein Coupled Receptors, Tyrosine Kinase receptors and Ligand-Gates Ion Channel receptors.

-Transduction pathways often include secondary messengers to fine-tune and amplify responses.

-Different cells have different receptors where they will cause different responses even to the same signaling molecules.

-Lipids reception is intracellular and protein reception is on the cell membrane.

Competencies:

-TSWBAT identify and describe the three stages of cell communication.

-TSWBAT compare between the different protein receptors.

-TSWBAT explain how the used of multi-step pathways and secondary messengers amplify and fine tune responses.

-TSWBAT predict where reception occurs based on the type of signaling molecule.

Overview: Students will identify the three main components of the cell theory; compare and contrast prokaryotic and eukaryotic cells and provide examples of each type; identify examples of cell specialization and the formation of tissues; explain the significance of cell parts and how their structure relates to their function; and describe the mechanisms and the energy requirements that allow materials to move into and out of a cell.

Goals: For students to identify and master the understanding of prokaryotic and eukaryotic cell structure and function in addition to cell processes such as cell transport.

Objectives:
1. State the three parts of the cell theory (All living things are made of cells; cells are the basic structure and function of living things; all cells come from preexisting cells) and be able to apply each part to an example in nature (DOK 1, 4)
2. List and arrange the cellular organization of living things (cells->tissues->organs->organ systems->organism) (DOK 1)
3. Relate an example to the cellular organization of living things (DOK 2)
4. Make connections of diversity and specialization of cells to real-life examples (DOK 4)
5. Compare and contrast prokaryotic and eukaryotic cells (DOK 2)
6. List organelles found in eukaryotic cells (DOK 1)
7. Classify structural features of eukaryotic cell organelle and relate the structural features with the organelle's function (DOK 2)
8. Describe the pathway, including relationship and functions of each portion of the endomembrane system, used to generate, modify and distribute proteins in and out of the cell (DOK3)
9. Compare and contrast animal and plant cells (DOK 2)
10. Identify components of the cell membrane (DOK 1)
11. Discuss the chemical basis for the semi-permeable nature of the phospholipid bilayer (DOK3)
12. Predict the ability of a molecule to diffuse through the cell membrane based on its polarity (DOK4)
13. Apply knowledge of concentration gradients in order to explain the mechanisms by which materials move across the cell membrane (DOK 4)
14. Compare and contrast active and passive cell membrane transport and identify different examples of each (DOK 3)
15. Recall the energy requirements that apply to different types of cell transport (DOK 1)

Core Activities and Corresponding Instructional Methods (teacher is recommended to do the following in addition to their own activities and labs):
1. Use compound light microscopes to observe cells and identify organelles that may be visible.
2. Set up a lab or demonstration to explain size limitations on cells (surface to volume ratio).
3. Use a graphic organizer to compare and contrast prokaryotic and eukaryotic cells.

4. Apply an analogy of cell structure and function being compared to a city or other applicable model. Describe the pathway that is used by the endomembrane system and that the similarity in cell membrane allows materials to pass from one part to the next.
5. Draw a model of each component of the endomembrane system and how proteins are modified and moved through the cell.
6. Utilize a lab that demonstrates passive transport, such as the "Egg Lab"
7. Utilize a lab using dialysis tubing to observe the effect of molarity on osmosis.

Assessments:

- **Diagnostic:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Pre-assessment Resources "Carousel Brainstorm"
  Open response questions ("What are your thoughts on…?")
  Vocabulary Assessment(s) of prior knowledge
  Word Sorts
- **Formative:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Chapter 7 in Miller and Levine
  Biology worksheets
  Teacher-generated assignments
  Laboratory Exercises
  Graphic Organizers
  Paper Models Activities
  Review Games Common Assessment
- **Summative:**
  Chapter Quizzes
  Unit III Test

Extensions:

Case Studies - current events and scientific journal articles that pertain this unit
Guided Reading of Supplemental Resources
Interactive Activities on Websites
Video Resources

Correctives:

Biology Re-read Chapter 7 in Miller and Levine Biology
Give students supplemental vocabulary review materials
Give students web-based resources that reinforce the material presented in class
Give students extra practice identifying variables in an experiment
Give students extra practice identifying examples of relationships in nature
Reteach and retest important concepts including mandatory vocabulary

Curriculum Plan

Unit: Enzymes and Cellular Energetics
Marking Period: 2

Standard(s): PA Academic Standards, PACS Reading and Writing for Science and Technology http://www.corestandards.org/ELA-Literacy/RST/11-12/#CCSS.ELA-Literacy.RST.11-12.1, https://www.pdesas.org/Standard/View#, https://www.pdesas.org/Page/Viewer/ViewPage/13

Anchor(s): CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.2, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.4, CCSS.ELA-LITERACY.RST.11-12.5, CCSS.ELA-LITERACY.RST.11-12.6, CCSS.ELA-LITERACY.RST.11-12.7, CCSS.ELA-LITERACY.RST.11-12.8, CCSS.ELA-LITERACY.RST.11-12.9, CCSS.ELA-LITERACY.RST.11-12.10, 3.1.B.A.7, 3.1.C.A2, 3.1.C.A2, 3.3.10A, 3.1.C.A1, 3.3.10B, 3.4.10A, 3.1.B.A2, 3.1.B.A2, 3.1.B.A5, 3.1.B.A7, 4.1.10.C

Anchor(s): Biology Keystone Anchors
BIO.A.2.2.2, BIO. A. 2.3.1, BIO.A.2.3.2, **BIO.A.3.1.1, BIO.A.3.2.1, BIO.A.3.2.2.**

Big Idea(s):

Big Idea # 1: Reactions can be energy-requiring or energy-releasing

Essential Questions:

-What are the differences between endergonic and exergonic reactions?
-What are the First and Second Laws of Thermodynamics?
-Why are some reactions spontaneous and others non-spontaneous?

Concepts:

-Endergonic reactions are energy-absorbing, non-spontaneous, anabolic and have a positive delta G. Exergonic reactions are energy releasing, spontaneous, catabolic and have a negative delta G.
-The First Law of Thermodynamics states that energy is neither created or destroyed, only transferred or transformed.
-The Second Law of Thermodynamics states that all reactions will increase the entropy of the universe.

Competencies:

-TSWBAT identify major differences between endergonic and exergonic reactions.
-TSWBAT predict if a reaction is endergonic or exergonic based on its characteristics.
-TSWBAT state the Laws of Thermodynamics and apply them to biological systems.

-TSWBAT explain why some reactions occur spontaneously.

Big Idea #2: Enzymes are biological catalysts that lower activation energy for reactions to begin.

Essential Questions:

-How do enzymes aid in catalyzing chemical reactions?
-Why are enzymes specific to their substrates?
-What environmental conditions can affect enzyme functionality?

Concepts:

-The activation energy of a reaction is the amount of energy needed to begin a reaction.
-Enzymes are usually proteins that utilize different mechanisms to lower activation energy for reactions.
-Enzymes are specific to their substrates, similar to a lock and key specificity, and are not used up in reactions.
-Enzymes can denature or change shape and lose functionality when exposed to changes in pH and increases in temperature.
-All enzymes have a temperature and pH at which they work best, known as optimal temperature and pH.

Competencies:

-TSWBAT describe how enzymes work, and elaborate on their specificity.
-TSWBAT predict how enzyme functionality will change when environmental conditions are altered.

Big Idea # 3: All organisms are made of cells and can be characterized by common aspects of structure and function. Photosynthesis utilizes light to synthesize organic molecules. Photosynthesis occurs in the chloroplasts.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?
-What is the equation of photosynthesis?
-Why is photosynthesis an example of a redox reaction?
-What reactions transform into which products in photosynthesis?
-What is the role of the chloroplast in photosynthesis?
-What adaptations do plants have to reduce transpiration when performing photosynthesis?

Concepts:

-Photosynthesis is the process in which light energy is transformed into chemical energy; carbon dioxide and water react to form sugar and oxygen.

-In photosynthesis organic molecules are broken down into carbon dioxide, oxygen is transformed into water and ATP energy is released. Organic molecules are oxidized and oxygen is reduced.
-Glycolysis occurs in the cytoplasm, while the Krebs Cycle and Oxidative Phosphorylation occur in the mitochondria.
-Electron carriers carry energized elections, which help produce a proton gradient utilized by ATP synthase in ATP production.
-Lactic acid and ethanol fermentation can occur in anaerobic situations and in obligate anaerobes.

Competencies:

-TSWBAT construct a model to support explanations of the process of photosynthesis by which light energy is converted to stored energy.
-TSWBAT state the reactants and products of cellular respiration, and identify where in the steps of cellular respiration each conversion occurs.
-TSWBAT utilize images to describe the stages of cellular respiration.
-TSWBAT describe the types of transport used to generate ATP in oxidative phosphorylation.
-TSWBAT depict fermentation and the advantage of ATP generation in an oxygen deprived environment.

Big Idea #4: All organisms are made of cells and can be characterized by common aspects of structure and function. Cellular Respiration is a process of releasing ATP energy from the bonds in organic molecules. Some steps of Cellular Respiration occur in the Mitochondria.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?
-What is the equation of cellular respiration?
-Why is cellular respiration an example of a redox reaction?
-What reactions transform into which products in cellular respiration?
-What is the role of the mitochondria in cellular respiration?
-How do electron carriers and proton gradients contribute to ATP production?
-What process occurs in the absence of oxygen gas?

Concepts:

-Energy flow through systems by means of chemical reactions. Aerobic cellular respiration involved a series of chemical reactions in which energy in food molecules can be converted into a form that the cell can readily use for life functions.
-In cellular respiration, organic molecules are broken down into carbon dioxide, oxygen is transformed into water and ATP energy is released. Organic molecules are oxidized and oxygen is reduced.

-Glycolysis occurs in the cytoplasm, while the Krebs Cycle and Oxidative Phosphorylation occur in the mitochondria.
-Electron carriers carry energized elections, which help produce a proton gradient utilized by ATP synthase in ATP production.
-Lactic acid and ethanol fermentation can occur in anaerobic situations and in obligate anaerobes.

Competencies:

-TSWBAT use a model to explain cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and bond in new compounds are formed that result in a net energy transfer.
-TSWBAT state the reactants and products of cellular respiration, and identify where in the steps of cellular respiration each conversion occurs.
-TSWBAT utilize images to describe the stages of cellular respiration.
-TSWBAT describe the types of transport used to generate ATP in oxidative phosphorylation.
-TSWBAT depict fermentation and the advantage of ATP generation in an oxygen deprived environment.

Big Idea #5: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Anaerobic cellular respiration follows a different and less efficient chemical pathway to provide energy in cells. Matter and energy are conserved in each change.

Competencies:

-TSWBAT evaluate data to compare the energy efficiency of aerobic and anaerobic respiration within organisms.

Big Idea #6: Organisms grow and reproduce and perpetuate their species by obtaining necessary resources through interdependent relationships with other organism and the physical environment.

Essential Questions:

-How and why do organisms interact with their environment and what are the effects of the interactions?

Concepts:

-Photosynthesis and cellular respiration provide most of the energy for life processes.

Competencies:

-TSWBAT use data to develop mathematical models to describe the flow of matter and energy between organisms and the ecosystem.

Big Idea #7: Organisms grow and reproduce and perpetuate their species by obtaining necessary resources through interdependent relationships with other organism and the physical environment.

Essential Questions:

-How and why do organisms interact with their environment and what are the effects of the interactions?

Concepts:

-Photosynthesis and cellular respiration are important components of the carbon cycle.

Competencies:

-TSWBAT use models to explain the role of photosynthesis and cellular respiration in the carbon cycle specific to the carbon cycle exchanges among the biosphere, atmosphere, oceans and geosphere, though chemical, physical and biological processes.

Overview: Students will investigate the need for activation energy in reactions. Students will compare between endergonic and endergonic reactions. Students will gain the understanding that photosynthesis and cell respiration are examples of cell processes that transfer energy through an ecosystem. Students will distinguish between the reactants and products of each process and be able to identify the cell structures and specific steps that are responsible for carrying out the processes. Finally, students will describe the relationship that exists between photosynthesis and cell respiration for the overall success of an ecosystem.

Goals: For students to evaluate the First law of thermodynamics in the scope of endergonic and exergonic reactions, in context of energy coupling. For students to be able to recognize photosynthesis and cell respiration as patterns in nature that influence the success of an ecosystem. Students will be able to describe the steps of cellular respiration and photosynthesis, focusing on reactants and products of each part. Students will cite evidence for the energy transformation that occurs during each process, as well as understand the relationship that occurs between the processes.

Objectives:

1. State and apply the effects of the first and second law of thermodynamics (DOK1, 4)

2. State the properties of endergonic and exergonic reactions. (DOK1)
3. Predict if a reaction is exergonic or endergonic and connect the ideas of spontaneous. Nonspontaneous, anabolic and catabolic to this concept(DOK4)
4. Identify the structure of ATP and explain its role in cellular work. (DOK2)
5. Explain the effect of enzymes in lowering activation energy to catalyze reactions. (DOK2)
6. Predict the effect of environmental factors on enzyme dynamics (DOK 4)
7. Recognize that light and pigments are necessary components of photosynthesis (DOK1)
8. Identify and explain the role of electron carrier molecules in photosynthesis (DOK 1, 3)
9. Write the chemical equation for photosynthesis, including both reactants and products (DOK 1)
10. Distinguish between the light-dependent reactions and the light-independent reactions in photosynthesis (DOK 2)
11. Identify and be able to draw the general structure of a chloroplast (DOK 1)
12. Compare the different factors that affect the rate at which photosynthesis (DOK 3)
13. Label a cross-section of a leaf and be able to distinguish which tissues are involved in photosynthesis (DOK 1, 2)
14. Identify that evolutionary adaptations (such as CAM, C4, thicker cuticle) exist for reduction of transpiration. (DOK1)
15. Explain the general purpose of cell respiration (DOK 1)
16. Write the chemical equation for cellular respiration, including reactants and products (DOK 1)
17. Identify and be able to draw the general structure of a mitochondrion (DOK 1)
18. State what happens during glycolysis and identify the location of this process (DOK 2)
19. Summarize what happens during the Krebs cycle and identify the location of this process (DOK 2)
20. Recognize how high-energy electrons are used by the electron transport chain. Describe what happens during oxidative phosphorylation and identify the location of this process (DOK 2)
21. Compare and contrast aerobic and anaerobic respiration (DOK 2)
22. Describe different types of anaerobic respiration (alcohol fermentation and lactic acid fermentation) (DOK 1)
23. Analyze the net production of ATP that is generated by both anaerobic and aerobic respiration (DOK 4)
24. Assess the relationship that exists in ecosystems between the processes of photosynthesis and cellular respiration (DOK 3)
25. Identify which types of cells undergo photosynthesis and cell respiration (DOK 1)
26. Apply prior understanding of autotrophs and heterotrophs to the processes of photosynthesis and cell respiration (DOK 4)

Core Activities and Corresponding Instructional Methods (teacher is recommended to do the following in addition to their own activities and labs):

1. Demonstrate or perform a lab that demonstrates enzyme activity. This lab may be the effect of catalase on hydrogen peroxide or the effect of amylase on starch digestion

2. Investigate the effect of variables on enzymatic activity – "Toothpickase lab"
3. Perform a lab that allows students to visualize the different pigments used in photosynthesis (paper chromatography)
4. Show videos that demonstrate the steps of photosynthesis and cellular respiration
5. Perform a lab that investigate the effect of activity of cellular respiration (BTB straw lab)
6. Perform a lab that investigates the effect of energy availability on yeast fermentation as measured by gas release

Assessments:

- **Diagnostic:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Pre-assessment Resources "Carousel Brainstorm"
  Open response questions ("What are your thoughts on…?")
  Vocabulary Assessment(s) of prior knowledge
  Word Sorts

- **Formative:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Chapters 8, 9 in Miller and Levine
  Biology worksheets
  Teacher-generated assignments
  Laboratory Exercises
  Graphic Organizers
  Paper Models Activities
  Review Games Common Assessment

- **Summative:**
  Chapter Quizzes
  Unit IV Test

Extensions:
Case Studies - current events and scientific journal articles that pertain this unit
Guided Reading of Supplemental Resources
Interactive Activities on Websites
Video Resources

Correctives:
Biology Re-read Chapter 8, 9 in Miller and Levine Biology
Give students supplemental vocabulary review materials
Give students web-based resources that reinforce the material presented in class

Give students extra practice identifying variables in an experiment
Give students extra practice identifying examples of relationships in nature
Reteach and retest important concepts including mandatory vocabulary

DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Plan

Unit: DNA Structure and Function, Protein Synthesis
Marking Period: 3

Standard(s): PA Academic Standards, PACS Reading and Writing for Science and Technology http://www.corestandards.org/ELA-Literacy/RST/11-12/#CCSS.ELA-Literacy.RST.11-12.1, https://www.pdesas.org/Standard/View#, https://www.pdesas.org/Page/Viewer/ViewPage/13

Anchor(s): CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.2, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.4, CCSS.ELA-LITERACY.RST.11-12.5, CCSS.ELA-LITERACY.RST.11-12.6, CCSS.ELA-LITERACY.RST.11-12.7, CCSS.ELA-LITERACY.RST.11-12.8, CCSS.ELA-LITERACY.RST.11-12.9, CCSS.ELA-LITERACY.RST.11-12.10, 3.1.B.A1, 3.1.B.A5,3.1.B.A6, 3.1.B.B1, 3.1.B.B2, 3.1.3B.B3, 3.1.B.B5,3.1.B.C2, 3.1.C.B3, 3.1.C.C2

Anchor(s): Biology Keystone Anchors
BIO.A.1.2.2, BIO.B.1.2.1, BIO.B.1.2.2, BIO.B.2.2.1, BIO.B.2.2.2, BIO.A.4.1.3

Big Idea(s):

Big Idea #1: 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. DNA is the genetic material, has a specific double helix structure and replicates in a semi-conservative manner

Essential Questions:

-How are the characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics.
-What is the structure and function of DNA?
-How does DNA replicate?

Concepts:

-Each chromosome consists of a single very long DNA molecule and each gene n the chromosome is a particular segment of the DNA. The instructions for forming species' characteristic are on the DNA.
-Studies have demonstrated DNA to be the genetic material, and has a double helix shape
-DNA uses a concert of enzymes to separate the parental strands of the double helix, and use each original side to serve as a template to add on a new daughter strand in a complementary manner

Competencies:

-TSWBAT ask questions and obtain information about the role of patterns of gene sequences in DNA molecules and subsequent inheritance of traits.

Big Idea #2: 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.

Essential Questions:

-How are the characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics.

Concepts:

-All cells in an organism have the same genetic content, but the genes used by the cell may be regulated in different ways.

Competencies:

-TSWBAT construct an explanation for how cell differentiation is the result of activation or inactivation of specific genes as well as small differences in the immediate environment of the cells.
-TSWBAT describe the studies performed to determine DNA is the genetic material
-TSWBAT describe the students performed to determine the method of DNA replication
-TSWBAT identify the enzymes that help perform DNA replication
-TSWBAT explain how complementary base pairing helps maintain the sequence of nucleotides

Big Idea # 3: All organisms are made of cells and can be characterized by common aspects of structure and function. DNA is used as code for protein synthesis

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?
-What are the steps of protein synthesis and what molecules and organelles are involved in the process?
-How does protein synthesis in prokaryotes and eukaryotes compare?
-Mutations can change DNA and amino acid sequence.
-What mechanisms are used to control protein synthesis?

Concepts:

-DNA molecules contain genetic information that is found in all cells. Genes are sections of DNA that code for proteins, which are important for cell functioning.
-Transcription is the production of mRNA from DNA in a complementary fashion.
-Translation is the production of amino acid sequence of a polypeptide from mRNA code, using tRNA to bring amino acids to the ribosome.
-At each level of protein synthesis, there are regulatory controls to increase or decrease protein production.

-Mutations are changes in nucleotide sequence.
-Prokaryotes and eukaryotes perform protein synthesis in similar ways, although there are differences in location and regulation.

Competencies:

-TSWBAT use models to demonstrate how DNA sequences determine the structure and function of proteins.
-TSWBAT produce amino acids structure from a DNA sequence.
-TSWBAT explain the functions of each molecule and enzyme in protein synthesis.
-TSWBAT identify the contribution of regulatory controls, including epigenetics, transcription factors, repressors, activators and operons in prokaryotes.
-TSWBAT describe and predict the effect of different types of mutations on DNA and protein.

Big Idea # 4: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Tissues and organs are produced by cellular division and differentiation and they work together to meet a multicellular organism's needs.

Competencies:

-TSWBAT use a model to describe the role of cellular division and differentiation to produce and maintain complex organisms composed of organ systems and tissue subsystems that work together to meet the needs of the entire organism.

Overview: Students will be exposed to a greater analysis of nucleic acids by studying the structural and functional characteristics of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). Students will learn about the mechanisms of DNA replication; DNA transcription and the formation of RNA; and the role of DNA and RNA in protein synthesis (translation). Students will also relate this new understanding of the molecular structure of DNA to their most recent topic of study—meiosis and the vital role of DNA in heredity.

Goals: For students to understand how the structure of DNA codes for the synthesis of proteins. For students to recognize the role of RNAs in the synthesis of proteins and the mechanisms of control of protein synthesis.

Objectives:

1. Identify the role of DNA in heredity (DOK 1)

2. Recall that nucleotides are the molecular subunits of DNA discussed in unit 2 (DOK 1)
3. Label a subunit in DNA, including labeling the numbered carbons in the sugar subunit (DOK 1)
4. Illustrate the double helix structure of DNA elaborating on the antiparallel nature of the molecule (DOK 1)
5. Explain the experiments done by Griffith, Avery, Hershey and Chase, and Chargoff to demonstrate DNA's role in heredity. (DOK3)
6. Summarize the events in DNA replication (DOK 2)
7. Identify and evaluate the function of the enzymes utilized in DNA replication (DOK3)
8. Look at a molecule of DNA and predict the leading and lagging strand sides (DOK4)
9. Identify DNA replication as a repeating pattern that occurs in an organism's lifetime (DOK 2)
10. Recognize that mutations may occur during DNA replication and may or may not have observable effects (DOK 2)
11. Compare DNA in prokaryotes with that of eukaryotes (DOK 2)
12. Compare the occurrence of mutations between prokaryotes and eukaryotes and elaborate on the effects of these differences (DOK4)
13. Compare and contrast the structure of DNA to that of RNA (DOK 2)
14. List the 3 major types of RNA used in protein synthesis (DOK 1)
15. Explain why DNA must make mRNA in order to successfully produce proteins (DOK 1)
16. Summarize the process and location of transcription (DOK 2)
17. Recall that amino acids are the subunits of proteins (DOK 1)
18. Make connections to show how mRNA codons, that were transcribed from a DNA blueprint, are then translated into a code of amino acids (DOK 4)
19. Summarize the process of translation, including the role of DNA, mRNA, tRNA, and rRNA (DOK 2)
20. Describe different types of point mutations, as seen in both DNA code (Insertion deletion, substitution, frameshift) and amino acid sequence (silent, missense, nonsense) (DOK 1)
21. Create an analogy for the process of protein synthesis (DOK 4)

Core Activities and Corresponding Instructional Methods (teacher is recommended to do the following in addition to their own activities and labs):

1. Have the students recall prior information about DNA using a graphic organizer or some type of review activity.
2. Have the students create, draw, or color a model of the DNA double helix.
3. Have students perform a DNA extraction from their own cheek cells or a fruit sample
4. Create an analogy for the students about the roles of DNA, mRNA, rRNA, tRNA and the production of proteins (DNA = Captain of ship; mRNA = first mate; rRNA = the ship deck; tRNA = the crew members doing the heavy lifting).
5. Have the students create their own analogy for protein synthesis.
6. Perform an activity that allows students to practice transcription and translation (Ice Cream activity, CHNOPS activity, Learn.genetics activity)

Assessments:

- **Diagnostic:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Pre-assessment Resources "Carousel Brainstorm"
  Open response questions ("What are your thoughts on…?")
  Vocabulary Assessment(s) of prior knowledge
  Word Sorts

- **Formative:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Chapters 12, 13 in Miller and Levine
  Biology worksheets
  Teacher-generated assignments
  Laboratory Exercises
  Graphic Organizers
  Paper Models Activities
  Review Games Common Assessment

- **Summative:**
  Chapter Quizzes
  Unit V Test

Extensions:
Case Studies - current events and scientific journal articles that pertain this unit
Guided Reading of Supplemental Resources
Interactive Activities on Websites
Video Resources

Correctives:
Biology Re-read Chapters 12, 13 in Miller and Levine Biology
Give students supplemental vocabulary review materials
Give students web-based resources that reinforce the material presented in class
Give students extra practice identifying variables in an experiment
Give students extra practice identifying examples of relationships in nature
Reteach and retest important concepts including mandatory vocabulary

DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Plan

Unit: Cell Division
Marking Period: 3

Standard(s): PA Academic Standards, PACS Reading and Writing for Science and Technology http://www.corestandards.org/ELA-Literacy/RST/11-12/#CCSS.ELA-Literacy.RST.11-12.1, https://www.pdesas.org/Standard/View#, https://www.pdesas.org/Page/Viewer/ViewPage/13

Anchor(s): CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.2, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.4, CCSS.ELA-LITERACY.RST.11-12.5, CCSS.ELA-LITERACY.RST.11-12.6, CCSS.ELA-LITERACY.RST.11-12.7, CCSS.ELA-LITERACY.RST.11-12.8, CCSS.ELA-LITERACY.RST.11-12.9, CCSS.ELA-LITERACY.RST.11-12.10, 3.1.B.A1, 3.1.B.B1, 3.1.B.B3, 3.1.B.A4, 3.1.B.A5, 3.1.B.B1, 3.1.B.B2, 3.1.B.B4, 3.1.B.B5, 3.1.B.C2, 3.1.C.C2, 4.4.10.A, 4.4.12, A, 4.4.10.B, 4.4.12.B

Anchor(s): Biology Keystone Anchors
BIO.B.1.1.1, BIO.B.1.1.2, BIO.B.1.2.1, BIO.B.2.1.2, BIO.B.2.3.1, BIO.B.2.4.1

Big Idea(s):

Big Idea # 1: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Mitosis is the process in which individual cells multiply, which allows multicellular organisms to grow. Both daughter cells receive identical genetic information from the parent cell.

Competencies:

-TSWBAT use a model to explain how mitotic cell division results in identical daughter cells with identical patterns of genetic materials essential for growth and repair of multicellular organisms.

Big Idea # 2: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-In sexual reproduction, specialized cell division, meiosis occurs, resulting in the production of sex cells.

Competencies:

-TSWBAT use a model to explain the role of cellular division and the mechanisms for transmitting genetic information from parents to offspring.

Big Idea #3: 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.

Essential Questions:

-How are the characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics.

Concepts:

-In sexual reproduction, chromosomes can create new genetic combinations through the process of meiosis, which creates new genetic combinations and more genetic variation.

Competencies:

-TSWBAT using a model, explain he information that inheritable genetics may result from genetic combinations in haploid sex cells, errors occurring during replication, crossover between homologous chromosomes during meiosis and environmental factors

Overview: Students will discuss the differing types of cell reproduction and division in order to gain an understanding of how organisms develop, grow, repair tissues, and reproduce. Students will learn vocabulary essential for the understanding of both mitosis and meiosis and why each process is so important for the survival of an organism and also an entire species. Students will differentiate the processes of meiosis and mitosis and discern how and why the final products are different. Students will investigate the regulatory controls for cell division and the effects of loss of regulation.

Goals: For students to be able to describe the processes of mitosis and meiosis. Students will be able to state how mitosis produces identical cells and when this process is necessary. Students will be able to explain that from a zygote, differentiation will occur within a multicellular organism, allowing for specialization of cells and cell processes. Students will be able to identify the purpose of meiosis and three specific ways that it increases variation. Students will explain why variation is necessary within a genome and within a population. Students will identify cell cycle controls and explain the results when control mechanisms are lost or damaged.

Objectives:

1. Recognize that cell size is limited because of growth (DOK 1)
2. Compare asexual and sexual reproduction (DOK 2)

3. Summarize the stages of the cell cycle (DOK 2)
4. Identify different forms of DNA and how it should appear at different stages of the cell cycle (molecular, chromatin, chromosome) (DOK 1)
5. Explain the role of DNA and chromosomes in cell division (DOK 1)
6. Differentiate between diploid (2n) and haploid (n) cells (DOK 3)
7. Recall what happens during the four phases of mitosis (DOK 1)
8. Describe the process of cytokinesis (DOK 1)
9. Explain how cytokinesis is different between plant and animal cells (DOK3)
10. State different mechanisms for how the cell cycle is regulated (DOK 1)
11. Distinguish between cancer cells and healthy cells (DOK3)
12. Relate the onset of cancer to the control of the cell cycle (DOK 2)
13. Compare and contrast a somatic cell and a gamete (DOK 2)
14. Summarize the events of meiosis (DOK 2)
15. Compare and contrast meiosis and mitosis (DOK 2)
16. Identify three specific events in meiosis and fertilization that lead to new genetic variation (DOK2)
17. Evaluate the benefit of genetic diversity within a population (DOK4)
18. Explain what a karyotype is and why it is used (DOK 1)
19. Create and analyze a karyotype (DOK 4)
20. Recognize chromosomal defects that may occur during meiosis (DOK 1)
21. Apply an understanding of cells to the processes of mitosis and meiosis (DOK 4)

Core Activities and Corresponding Instructional Methods (teacher is recommended to do the following in addition to their own activities and labs):

1. Have the students brainstorm reasons for cell division.
2. Use a graphic organizer or other image-based product to allow students to understand the process of mitosis— have the students draw out the phases in order to fully understand what happens to the nucleus and DNA during cell division.
2. Use a graphic organizer or comparison chart to allow students to understand the process of meiosis and how it is similar and different from mitosis—have the students draw out the phases in order to recognize that meiosis occurs in two phases and produces four cells, or gametes, that are all genetically different.
3. Use the “Chromosomes of Frimpanzee” activity to show stages of mitosis and meiosis and compare between them.
4. Utilize an appropriate (such as University of Arizona) website to create and analyze a karyotype.
5. Have the students research a genetic disorder and present it to the class in a specific way.

Assessments:

- **Diagnostic:**
  Informal Questioning
  Teacher Observation
  Class Discussion

At-the-Bell Questions
Pre-assessment Resources "Carousel Brainstorm"
Open response questions ("What are your thoughts on…?")
Vocabulary Assessment(s) of prior knowledge
Word Sorts

- **Formative:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Chapters 10, 11.4 in Miller and Levine
  Biology worksheets
  Teacher-generated assignments
  Laboratory Exercises
  Graphic Organizers
  Paper Models Activities
  Review Games Common Assessment

- **Summative:**
  Chapter Quizzes
  Unit VI Test

Extensions:
Case Studies - current events and scientific journal articles that pertain this unit
Guided Reading of Supplemental Resources
Interactive Activities on Websites
Video Resources

Correctives:
Biology Re-read Chapters 10, 11.4 in Miller and Levine Biology
Give students supplemental vocabulary review materials
Give students web-based resources that reinforce the material presented in class
Give students extra practice identifying variables in an experiment
Give students extra practice identifying examples of relationships in nature
Reteach and retest important concepts including mandatory vocabulary

Curriculum Plan

Unit: Genetics, Inheritance Patterns and Biotechnology
Marking Period: 3

Standard(s): PA Academic Standards, PACS Reading and Writing for Science and Technology http://www.corestandards.org/ELA-Literacy/RST/11-12/#CCSS.ELA-Literacy.RST.11-12.1, https://www.pdesas.org/Standard/View#, https://www.pdesas.org/Page/Viewer/ViewPage/13

Anchor(s): CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.2, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.4, CCSS.ELA-LITERACY.RST.11-12.5, CCSS.ELA-LITERACY.RST.11-12.6, CCSS.ELA-LITERACY.RST.11-12.7, CCSS.ELA-LITERACY.RST.11-12.8, CCSS.ELA-LITERACY.RST.11-12.9, CCSS.ELA-LITERACY.RST.11-12.10, 3.1.B.B1, 3.1.B.B2, 3.1.B.B3, 3.1.B.B5, 3.1.C.B3, 3.1.C.C2

Anchor(s): Biology Keystone Anchors
BIO.B.1.2, BIO.B.2.1, BIO.B.2.2.1, BIO.B.1.2.2, BIO.B.2.4

Big Idea(s):
Big Idea # 1: Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to another via genes, and explains why offspring resemble, but are not identical to, their parents.

Essential Questions:

-How are the characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?

Concepts:

-Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation.

Competencies:

-TSWBAT Using a model, explain information that heritable genetic variations may result from 1. Genetic combinations in haploid sex cells, 2. Errors occurring in replication 3. Crossover between homologous chromosomes during meiosis 4. Environmental factors.

Big Idea #2: Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to another via genes, and explains why offspring resemble, but are not identical to, their parents.

Essential Questions:

-How are the characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?

Concepts:

-Environmental factors can also cause mutations in genes, and viable mutations are inherited.

Competencies:

-TSWBAT Communicate information that heritable genetic variations may result from 1. Genetic combinations in haploid sex cells, 2. Errors occurring in replication 3. Crossover between homologous chromosomes during meiosis 4. Environmental factors.

Big Idea # 3: Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to another via genes, and explains why offspring resemble, but are not identical to, their parents.

Essential Questions:

-How are the characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?
-What are the Mendelian patterns of inheritance?
-How does a Punnet Square predict outcomes between a mating of two individuals?

Concepts:

-Environmental factors can also affect expression of traits, and hence affect the probability of occurrences of traits in a population.
-Alleles of genes can be dominant, recessive, incompletely dominant and co-dominant.
-Based on the pattern of inheritance, one can utilize a Punett Square to predict the genotypes and phenotypes of possible offspring. Pedigrees follow inherited traits throughout generations.

Competencies:

-TSWBAT Use probability to explain the variation and distribution of expressed traits in a population.
-TSWBAT describe different modes of inheritance and use Punnett Squares to predict offspring outcomes based on parent genotypes and phenotypes.
-TSWBAT predict the pattern of inheritance using a pedigree.

Big Idea #4: 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.

Essential Questions:

-How are the characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics.

Concepts:

-The information passed from parents to offspring is coded in the DNA molecules that form the chromosomes.

Competencies:

-TSWBAT using a model, explain the information that inheritable genetics may result from genetic combinations in haploid sex cells, errors occurring during replication, crossover between homologous chromosomes during meiosis and environmental factors

Big Idea #5: Non-Mendelian inheritance patterns can also demonstrate patterns of inheritance

Essential Questions:

-How do sex linked traits differ in inheritance from Mendelian inheritance?
-How do linked genes affect the inheritance of two different traits at the same time?

Concepts:

-A sex linked trait is carried on the X chromosome and is often recessive; females can be carriers, while males demonstrate the trait if they have the trait on their X chromosome. This will cause for males to have a higher frequency of the trait than females.
-When genes are linked, they will be inherited more frequently together than what independent assortment would predict. Data analysis can allow for a determination of recombination frequency and relative distance between genes on the chromosome.

Competencies:

-TSWBAT identify sex-linked inheritance patterns and predict offspring using Punnett squares.
-TSWBAT analyze data to determine if traits are linked, and if so, calculate recombination frequency and relative distance in map units.

Big Idea # 6: Multiple technologies can be applied to analyze, alter and enhance biological systems. New biotechnologies must be evaluated in an ethical sense to determine the implications of their application.

Essential Questions:

- What tools allow forensic scientists to analyze DNA?
-What processes can be used to alter genetic structure of organisms?
-What are the ethical considerations that must be accounted for as biotechnologies advance?

Concepts:

-Tools including PCR, gel electrophoresis, and genetic fingerprinting of STRs allow forensic scientists to analyze DNA.
-DNA can be altered using plasmid technology, gene vectoring, CRISPR.
-Cloning produces genetic identical often using somatic cell nuclear transfer.
-Stem Cells are cell that have not yet differentiated, and can be derived from multiple sources.

Competencies:

-TSWBAT explain how DNA analysis procedures are used and their practical applications.
TSWBAT experience labs where they will produce gel electrophoresis and bacterial transformation.
-TSWBAT explain the processes for cloning and stem cells.
-TSWBAT evaluate the ethical considerations that must be made for each biotechnology.

Overview: Students will analyze Mendelian patterns of inheritance and become acclimated with predicting genetic crosses through the use of tools such as Punnett Squares and Pedigree Charts. Students will learn about the differences between complete, incomplete, co-dominance. Students will investigate how to determine blood types and how to administer appropriate blood transfusions. Students will learn about linked genes and why genes can be inherited together. Students will learn about how genes can be turned "on" and "off" by various levels of epigenetic control. Students will learn about types of biotechnologies currently available, including gel electrophoresis, cloning, stem cells and gene therapy, and how they affect organisms.

Goals: For students to gain a clear understanding of how genes are inherited and how to predict the offspring of two individuals based on genetic traits. Students will be able to understand how to use tools like Punnett Squares and Pedigrees to visualize inheritance. Students will explore the new genetic biotechnologies and evaluate their impact on society.

Objectives:

1. Describe Gregor Mendel's studies and conclusions about inheritance (DOK 1)
2. Recall what happens during segregation in meiosis (DOK 1)
3. Recognize patterns of inheritance of human traits (DOK 1)
4. Display how geneticists use the principles of probability to predict genetic crosses by setting up and analyzing Punnett Squares (DOK 2, 4)
5. Recall the principle of independent assortment as it applies to meiosis (DOK 1)
6. Explain how Mendel's principles apply to all organisms (DOK 1)

7. Explain the differences between Mendelian (complete dominance) and non-Mendelian (co-dominance, incomplete dominance, sex-linked traits) and predict offspring genotypes and phenotypes based on parent genotype (DOK 4)
8. Define codominance and apply the ABO blood typing system as a model of codominance (DOK 1, 4)
9. Predict the multiplicative effects of inheritance of multiple different traits at the same time (dihybrid inheritance patterns.) (DOK 3)
10. Show the cause and effect relationship between gene expression and the environment (DOK 2)
11. Analyze a pedigree chart to better understand how geneticists can study inheritance patterns (DOK 4)
12. Cite evidence for the causes of genetic disorders—distinguish between small changes in DNA; errors occurring in meiosis; and chromosomal abnormalities (DOK 2, 3)
13. Explain epigenetics and how it affects gene expression (DOK2)
14. Determine if genes are linked (On the same chromosome) (DOK3)
15. Identify examples of biotechnology and genetic engineering (DOK 1)
16. Evaluate the effect of new biotechnologies in society (DOK4)
17. Apply ethical reasoning to new biotechnologies for appropriate uses (DOK4)

Core Activities and Corresponding Instructional Methods (teacher is recommended to do the following in addition to their own activities and labs):

1. Have students learn about the patterns of inheritance and understand how to generate allele symbols and create Punnet Squares for different crosses.
2. Have students connect the model of a Punnet Square to predict probabilities of offspring phenotypic ratios.
3. Perform a blood simulation lab to demonstrate the ABO blood typing system and the inability to mix different types of blood together.
4. Have the students analyze Pedigree Charts to learn how geneticists can predict inheritance patterns in families
5. Provide current events examples for the students to read about genetic technology and how it has impacted the fields of medicine, forensics, and agriculture.

Assessments:

- **Diagnostic:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Pre-assessment Resources “Carousel Brainstorm”
  Open response questions (“What are your thoughts on…?”)
  Vocabulary Assessment(s) of prior knowledge
  Word Sorts

- **Formative:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Chapters 11, 14, 15 in Miller and Levine
  Biology worksheets
  Teacher-generated assignments
  Laboratory Exercises
  Graphic Organizers
  Paper Models Activities
  Review Games Common Assessment

- **Summative:**
  Chapter Quizzes
  Unit VII Test

Extensions:
Case Studies - current events and scientific journal articles that pertain this unit
Guided Reading of Supplemental Resources
Interactive Activities on Websites
Video Resources

Correctives:
Biology Re-read Chapters 11, 14, 15 in Miller and Levine Biology
Give students supplemental vocabulary review materials
Give students web-based resources that reinforce the material presented in class
Give students extra practice identifying variables in an experiment
Give students extra practice identifying examples of relationships in nature
Reteach and retest important concepts including mandatory vocabulary

DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Plan

Unit: Evolution
Marking Period: 4

Standard(s): PA Academic Standards, PACS Reading and Writing for Science and Technology http://www.corestandards.org/ELA-Literacy/RST/11-12/#CCSS.ELA-Literacy.RST.11-12.1, https://www.pdesas.org/Standard/View#, https://www.pdesas.org/Page/Viewer/ViewPage/13

Anchor(s): CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.2, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.4, CCSS.ELA-LITERACY.RST.11-12.5, CCSS.ELA-LITERACY.RST.11-12.6, CCSS.ELA-LITERACY.RST.11-12.7, CCSS.ELA-LITERACY.RST.11-12.8, CCSS.ELA-LITERACY.RST.11-12.9, CCSS.ELA-LITERACY.RST.11-12.10, 3.1.B.A9, 3.1.B.B3, 3.1.B.C1, 3.1.B.C3, 3.3.10.C, 3.3.10.D, 4.7.10.C, 4.8.10.A, 4.8.10.C, 4.8.10.D

Anchor(s): Biology Keystone Anchors
BIO.B.3.1.1, BIO.B.3.1.2, BIO.B.3.1.3, BIO.B.3.2.1, BIO.B.3.3.1

Big Idea(s):
Big Idea #1: Biological evolution explains both the unity and diversity of specie and provides a unifying principle for the history and diversity of life on Earth.

Essential Questions:

-How can there be so many similarities among organisms yet so many different kinds of plants, animals and microorganisms?
-What evidences support that species change over time?
-How does a phylogenic tree demonstrates common ancestry?

Concepts:

-Evidence of evolution is found in anatomy, heredity, embryology and the fossil record.
-Evidences that support and reinforce evolution include biogeography, fossil record, direct observation, homologous structures, vestigial structures, molecular biology, embryology.
-DNA analysis is the strongest support of evolution.
-Additional evidences include the Endosymbiotic theory, common metabolic processes and protein synthesis.
-Phylogenic trees can depict common ancestry using different evidences of evolution.

Competencies:

-TSWBAT Use evidence obtained from technologies to compare similarity in DNA sequences, anatomical structures, and embryological appearance as evidence to support multiple lines of descent in evolution.

-TSWBAT analyze evidences of evolution to suggest recent common ancestry and evolutionary paths.
-TSWBAT use evidences to create and analyze phylogenic trees.
-TSWBAT connect information from previous units that support evolution.

Big Idea #2: Biological evolution explains both the unity and diversity of specie and provides a unifying principle for the history and diversity of life on Earth.

Essential Questions:

-How can there be so many similarities among organisms yet so many different kinds of plants, animals and microorganisms?

Concepts:

-Natural selection occurs only of there is both a variation in the genetic information between organisms in a population and variation in the expression of that genetic information trait variation) that leads to differences in performance among individuals.

Competencies:

-TSWBAT Plan out and carry out investigations to gather evidence of patterns in the relationship between natural selection and changes in the environment.

Big Idea #3: Biological evolution explains both the unity and diversity of specie and provides a unifying principle for the history and diversity of life on Earth.

Essential Questions:

-How can there be so many similarities among organisms yet so many different kinds of plants, animals and microorganisms?

Concepts:

-The traits that positively affect survival are more likely to be reproduced and thus are more common in the population.

Competencies:

-Apply statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

Big Idea #4: Biological evolution explains both the unity and diversity of specie and provides a unifying principle for the history and diversity of life on Earth.

Essential Questions:

-How can there be so many similarities among organisms yet so many different kinds of plants, animals and microorganisms?

Concepts:

Natural selection is the result of four factors: 1. The potential for a species to increase in number 2. The genetic variation of individuals in a species due to mutation and sexual reproduction 3. Competition for an environment's limited supply of resources 4. The increase in number of those organisms that are better able to survive and reproduce in the environment.

Competencies:

-Use models to explain how the process of natural selection is the result of four factors.

Big Idea #5: Biological evolution explains both the unity and diversity of specie and provides a unifying principle for the history and diversity of life on Earth.

Essential Questions:

-How can there be so many similarities among organisms yet so many different kinds of plants, animals and microorganisms?

Concepts:

-Natural selection leads to adaptations.

Competencies:

-TSWBAT Use evidence to explain the process by which adaptation drives natural selection that result in populations dominated by organisms that are anatomically, behaviorally, and physiologically able to survive and or reproduce in a specific environment.

-TSWBAT Develop an argument to support the convergent or divergent changes among life on earth in response to earth's dynamic changes.

Big Idea #6: Biological evolution explains both the unity and diversity of specie and provides a unifying principle for the history and diversity of life on Earth.

Essential Questions:

-How can there be so many similarities among organisms yet so many different kinds of plants, animals and microorganisms?

Concepts:

-Differential survival and reproduction of organisms in a population that have advantageous heritable traits leads to an increase in future generations having that desired trait.

Competencies:

-TSWBAT Investigate and communicate data describing how changes in environmental conditions can affect the distribution of traits in a population and cayuse increase in numbers of some species, the emergence of new species and the extinction of other species.

Big Idea #7: Biological evolution explains both the unity and diversity of specie and provides a unifying principle for the history and diversity of life on Earth.

Essential Questions:

-How can there be so many similarities among organisms yet so many different kinds of plants, animals and microorganisms?

Concepts:

-Changes to the physical world from both natural occurring and human generated events can cause adverse effects of biodiversity.

Competencies:

-TSWBAT Utilize a variety of fata to provide evidence and construct explanations and design solutions for the impact of human activities on the environment including ways to sustain biodiversity and maintain the flow of the planet's future natural resources.

Big Idea #8: Biological evolution explains both the unity and diversity of specie and provides a unifying principle for the history and diversity of life on Earth.

Essential Questions:

-How can there be so many similarities among organisms yet so many different kinds of plants, animals and microorganisms?

Concepts:

-Biodiversity is increased by the formation of new species and decreased by the loss of species. Biological extinction is a critical factor in reducing natural resources for future generations.

Competencies:

-TSWBAT Design solutions for creating or maintain the sustainability of local ecosystems.

Big Idea # 9: Evolution is a scientific theory and a scientific law.

Essential Questions:

-What are the differences between a scientific theory and a scientific law?

-How is evolution considered both a theory and a law?
-Darwin's Theory of Natural Selection provided a mechanism for population to change over time.

Concepts:

-A scientific theory is an explanation of a law supported with diverse evidences. A scientific law is a statement of a phenomenon.
-Evolution is a theory, as it explains how species change. Species do change over time, which makes Evolution a law as well.
-The Theory of Natural Selection demonstrates how selective pressures act upon natural variations in a population to produce changes over time.

Competencies:

-TSWBAT explain the difference between a theory and law and how evolution is both.

Big Idea #10: The Hardy Weinberg Theorem provides mathematical analysis to demonstrate evolution of a population

Essential Questions:

-What is the Hardy Weinberg theorem and how can it demonstrate evolution is occurring?
-What are the sources for evolution in a population?

Concepts:

-Evidences that support and reinforce evolution include biogeography, fossil record, direct observation, homologous structures, vestigial structures, molecular biology, embryology.
-DNA analysis is the strongest support of evolution.
-Additional evidences include the Endosymbiotic theory, common metabolic processes and protein synthesis.
-Phylogenic trees can depict common ancestry using different evidences of evolution.

Competencies:

-TSWBAT analyze evidences of evolution to suggest recent common ancestry and evolutionary paths.
-TSWBAT use evidences to create and analyze phylogenic trees.
-TSWBAT connect information from previous units that support evolution.

Overview: In this unit, students will learn that evolution is one of the foundations of biology and is a scientific explanation for the diversity of life on Earth. Students will read about and discuss historical events that have occurred to shape the current scientific principles of evolution and how it applies to species diversity, population changes, advancements in

medicine, extinction of organisms, selective breeding, and more. Three main ideas will be addressed: 1. Evolution is the process by which the diversity of life on earth developed over time from common ancestors 2. Over time, the genetic makeup of a population changes, resulting in changes in the distribution of characteristics in that population 3. These changes result in differences within species (microevolution) as well as the emergence of new species (macroevolution).

Goals: For students to define evolution as a central theme in biology that focuses on evidence of change in a population over time. Students will distinguish between large changes in a population that may give rise to a new species versus small changes in a population that will alter the appearance or adaptations of individuals in the population, without forming a new species. Furthermore, students will focus on highlighting the figureheads in biological history who contributed to the present day thoughts on evolutionary theories.

Objectives:
1. Define evolution (DOK 1)
2. Summarize Charles Darwin's journey on the HMS Beagle (DOK 2)
3. Explain Darwin's theory of natural selection and how it has affected changes in populations over time, or how it may affect future changes in populations (DOK 3)
4. Identify the patterns of biodiversity that were observed by Darwin (DOK 2)
5. Distinguish between the conclusions drawn by James Hutton and Charles Lyell about the Earth's history (DOK 2)
6. Compare Jean-Baptiste Lamarck's hypothesis of evolution with that of Darwin's (DOK 2)
7. Report on Thomas Malthus' view of human population growth (DOK 1)
8. Explain how the research of Hutton, Lyell, Lamarck, Malthus, and Wallace influenced Darwin's research (DOK 1)
9. Explain the role of inherited variation in artificial selection (DOK 1)
10. Identify the conditions under which natural selection occur (DOK 1)
11. Cite evidence of adaptions in nature (DOK 3)
12. Describe how an organism's fitness can affect its ability to survive (DOK 2)
13. Explain the principle of common descent (DOK 1)
14. Compare how geologic distribution of species relates to their evolutionary history (DOK 2)
15. Explain how fossils and the fossil record provide evidence of the descent of modern species from ancient ancestors (DOK 1)
16. Describe what homologous structures, analogous structures, vestigial structures, and embryology suggest about the process of evolutionary change (DOK 1)
17. Apply the idea that DNA is molecular evidence that can be used to trace the process of evolution (DOK 4)
18. Describe how genetics plays a role in evolutionary change (DOK 1)
19. Make connections about mutations and genetic variation in a population (DOK 4)
20. Identify ways in which genetic recombination in sexual reproduction plays a role in evolution (DOK 1)
21. Describe genetic drift (DOK 1)

22. Describe genetic equilibrium as determined by the Hardy Weinberg Equilibrium and state what types of factors may affect it (DOK 3)
23. Identify the types of isolation that can lead to the formation of new species (DOK 1)
24. Explain how a species is defined using Ernst Mayr's Biological Species Concept and what the barriers are to inter-species reproduction. (DOK2)
25. Summarize the processes that influence survival or extinction of a species (DOK 2)
26. Create and read cladograms/phylogenic trees based on shared derived characteristics (DOK4)

Core Activities and Corresponding Instructional Methods (teacher is recommended to do the following in addition to their own activities and labs):

1. Ask the students to brainstorm what they already know about evolution and Charles Darwin.
2. Use an activity that challenges students to accomplish a task using various adaptations (Battle of the Beaks).
3. Use different video clips to display examples of adaptations in organisms.
4. Use an appropriate example (dogs, pigeons) to display how artificial selection has influenced a species.
5. Use of HHMI Biointeractive Click and Learns to understand mechanisms of evolution.
6. Use of PTC tasting strips to calculate class dominant and recessive alleles and genotype frequencies. Connect examples of genetic change to how frequencies may change as well.
7. Use NOVA Evolution Lab to practice the creation of phylogenic trees.

Assessments:

- **Diagnostic:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Pre-assessment Resources "Carousel Brainstorm"
  Open response questions ("What are your thoughts on…?")
  Vocabulary Assessment(s) of prior knowledge
  Word Sorts

- **Formative:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Chapters 16, 17 in Miller and Levine
  Biology worksheets
  Teacher-generated assignments
  Laboratory Exercises
  Graphic Organizers
  Paper Models Activities

Review Games Common Assessment

- **Summative:**
  Chapter Quizzes
  Unit VIII Test

Extensions:
Case Studies - current events and scientific journal articles that pertain this unit
Guided Reading of Supplemental Resources
Interactive Activities on Websites
Video Resources

Correctives:
Biology Re-read Chapters 16, 17 in Miller and Levine Biology
Give students supplemental vocabulary review materials
Give students web-based resources that reinforce the material presented in class
Give students extra practice identifying variables in an experiment
Give students extra practice identifying examples of relationships in nature
Reteach and retest important concepts including mandatory vocabulary

DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Plan

Unit: Origin of Life, Classification and Diversity
Marking Period: 4

Standard(s): PA Academic Standards, PACS Reading and Writing for Science and Technology http://www.corestandards.org/ELA-Literacy/RST/11-12/#CCSS.ELA-Literacy.RST.11-12.1, https://www.pdesas.org/Standard/View#, https://www.pdesas.org/Page/Viewer/ViewPage/13

Anchor(s): CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.2, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.4, CCSS.ELA-LITERACY.RST.11-12.5, CCSS.ELA-LITERACY.RST.11-12.6, CCSS.ELA-LITERACY.RST.11-12.7, CCSS.ELA-LITERACY.RST.11-12.8, CCSS.ELA-LITERACY.RST.11-12.9, CCSS.ELA-LITERACY.RST.11-12.10, 4.7.10.C, 3.3.10.D

Anchor(s): Biology Keystone Anchors
BIO.B.3.1.1, BIO.B.3.2.1, BIO.B.3.3.1

Big Idea(s):
Big Idea # 1: Different theories exist to propose how life began on Earth

Essential Questions:
-What are the theories of life's origin on earth?
-What evidences support these theories?

Concepts:
-Theories that suggest how life began include abiotic synthesis, panspermia and deep earth.
-Miller and Urey's experiment demonstrated the possibility of abiotic synthesis of organic monomers.
-RNA is believed to be the first genetic material (RNA world.)

Competencies:
-TSWBAT evaluate the strengths and weaknesses of different biotic origin theories.
-TSWBAT describe the significance of Miller and Urey's experiment.

Big Idea #2: Classification systems allow for an orderly method to compare and contrast organisms.

Essential Questions:
-How are living things classified, what are the levels of classification?
-What information is used to classify new species?

Concepts:

-Levels of classification go as follows from most broad to most specific: Domain, Kingdom, Phylum, Class, Order, Family, Genus, Specific Epithet. Binomial nomenclature of species is the final two levels of classification.
-Anatomy, behavior and DNA analysis are often used to classify new species.

Competencies:

-TSWBAT state the levels of classification.
-TSWBAT compare the characteristics of each domain and kingdom.
-TSWBAT predict where a species would belong based on its characteristics.

Big Idea # 3: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Multicellular organisms have a hierarchical structural organization, in which any one system is made of numerous parts and is itself a component of the next level.

Competencies:

-TSWBAT Formulate scientific explanations through models to explain the hierarchical organization of interacting systems working together to provide specific functions within multicellular organisms.

Big Idea # 4: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Organisms maintain homeostasis in response to changing environments via positive and negative feedback mechanisms.

Competencies:

-TSWBAT Plan and conduct an investigation to provide evidence and explain the function of positive and negative feedback mechanisms in maintaining homeostasis that is essential for organisms.

Big Idea # 5: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Tissues and organs are produced by cellular division and differentiation and they work together to meet a multicellular organism's needs.

Competencies:

-TSWBAT use a model to describe the role of cellular division and differentiation to produce and maintain complex organisms composed of organ systems and tissue subsystems that work together to meet the needs of the entire organism.

Overview: All living things on Earth that have been observed have been classified based on specific set of criteria and evolutionary history. Students will explore traditional classification of organisms, modern evolutionary classification, and the tree of life that highlights common descent. Students will recall information from the evolution unit to make connections that the diversity of life on Earth is the result of ongoing evolutionary change and that species alive today have evolved from ancient common ancestors.

Goals: For students to understand the traditional Linnaean classification system and the modern evolutionary classification of living things. Moreover, students will learn how to interpret a cladogram and use a dichotomous key to identify organisms. Lastly, students will be exposed to a basic overview of the major characteristics of the six kingdoms of life.

Objectives:

1. Identify and evaluate some of the hypotheses about early Earth and the origin of life (DOK 1, 4)
2. Explain the endosymbiotic theory for the evolution of eukaryotes from prokaryotes (DOK 1) .
3. Describe the goals of binomial nomenclature and systematics (DOK 1)
4. Identify the taxa in the classification system devised by Linnaeus (DOK 1)
5. Interpret a cladogram (DOK 2)
6. Analyze the use of DNA sequences in classification (DOK 4)
7. Name the six kingdoms of life as they are currently identified (DOK 1)
8. Explain what the tree of life represents (DOK 1)
9. Summarize some major characteristics of viruses (DOK 2)
10. Explain why viruses are not classified as living organisms (DOK 1)
11. Summarize some major characteristics of eubacteria and archaebacteria (DOK 2)
12. Explain the roles of bacteria in the living world (DOK 1)
13. Identify ways in which bacteria cause disease (DOK 2)
14. Identify ways in which viruses cause disease (DOK 2)
15. Summarize some major characteristics of protists (DOK 2)
16. Summarize some major characteristics of fungi (DOK 2)
17. Summarize some major characteristics of plants (DOK 2)

18. Summarize some major characteristics of animals (DOK 2)
19. Develop a logical argument that all organisms share common characteristics (DOK 3)

Core Activities and Corresponding Instructional Methods (teacher is recommended to do the following in addition to their own activities and labs):

1. Provide the students with an opportunity to interpret cladograms and using dichotomous keys for identifying organisms.
2. Allow students the opportunity to compare and contrast pathogenic organisms (viruses, bacteria, fungi and protist) and effective strategies for prevention and treatment

Assessments:

- **Diagnostic:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Pre-assessment Resources "Carousel Brainstorm"
  Open response questions ("What are your thoughts on…?")
  Vocabulary Assessment(s) of prior knowledge
  Word Sorts

- **Formative:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Chapters 18-24 in Miller and Levine
  Biology worksheets
  Teacher-generated assignments
  Laboratory Exercises
  Graphic Organizers
  Paper Models Activities
  Review Games Common Assessment

- **Summative:**
  Chapter Quizzes
  Unit IX Test

Extensions:
Case Studies - current events and scientific journal articles that pertain this unit
Guided Reading of Supplemental Resources
Interactive Activities on Websites
Video Resources

Correctives:

Biology Re-read Chapters 18-24 in Miller and Levine Biology
Give students supplemental vocabulary review materials
Give students web-based resources that reinforce the material presented in class
Give students extra practice identifying variables in an experiment
Give students extra practice identifying examples of relationships in nature
Reteach and retest important concepts including mandatory vocabulary

DELAWARE VALLEY SCHOOL DISTRICT

Curriculum Plan

Unit: Animal Kingdom Anatomy and Physiology
Marking Period: 4

Standard(s): PA Academic Standards, PACS Reading and Writing for Science and Technology http://www.corestandards.org/ELA-Literacy/RST/11-12/#CCSS.ELA-Literacy.RST.11-12.1, https://www.pdesas.org/Standard/View#, https://www.pdesas.org/Page/Viewer/ViewPage/13

Anchor(s): CCSS.ELA-LITERACY.RST.11-12.1, CCSS.ELA-LITERACY.RST.11-12.2, CCSS.ELA-LITERACY.RST.11-12.3, CCSS.ELA-LITERACY.RST.11-12.4, CCSS.ELA-LITERACY.RST.11-12.5, CCSS.ELA-LITERACY.RST.11-12.6, CCSS.ELA-LITERACY.RST.11-12.7, CCSS.ELA-LITERACY.RST.11-12.8, CCSS.ELA-LITERACY.RST.11-12.9, CCSS.ELA-LITERACY.RST.11-12.10

Big Idea(s):

Big Idea # 1: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Multicellular organisms have a hierarchical structural organization, in which any one system is made of numerous parts and is itself a component of the next level.

Competencies:

-TSWBAT Formulate scientific explanations through models to explain the hierarchical organization of interacting systems working together to provide specific functions within multicellular organisms.

Big Idea # 2: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Organisms maintain homeostasis in response to changing environments via positive and negative feedback mechanisms.

Competencies:

-TSWBAT Plan and conduct an investigation to provide evidence and explain the function of positive and negative feedback mechanisms in maintaining homeostasis that is essential for organisms.

Big Idea # 3: All organisms are made of cells and can be characterized by common aspects of structure and function.

Essential Questions:

-How do organisms live, grow, respond to their environment and reproduce?

Concepts:

-Tissues and organs are produced by cellular division and differentiation and they work together to meet a multicellular organism's needs.

Competencies:

-TSWBAT use a model to describe the role of cellular division and differentiation to produce and maintain complex organisms composed of organ systems and tissue subsystems that work together to meet the needs of the entire organism.

Overview: The organisms within the Animal Kingdom have four major characteristics in common: multicellularity, eukaryotic cells, heterotrophy and a lack of cell walls. The kingdom is further subdivided into specific phyla, each with their own features and model species. Students will have the opportunity to distinguish between the phyla and investigate specific anatomical similarities and differences through the process of dissection. Extensions on physiology and the mechanisms of systems will also be reviewed.

Goals: Students will be able to understand the features of the animal kingdom and shared and unique features of the different phyla within it. Students will have the opportunity to dissect a variety of animals from different phyla to observe the different organ systems and deepen their understanding of how systems integrate.

Objectives:

1. Students will identify the four major characteristics of the Animal Kingdom (DOK1)
2. Students will compare and contrast the animal phyla (DOK 2)
3. Students will learn about the animal organ systems and their major features and structures (DOK 2)
4. Students may choose to dissect an earthworm, grasshopper, crayfish and frog to learn about anatomical features and physiological function (DOK4)

Core Activities and Corresponding Instructional Methods (teacher is recommended to do the following in addition to their own activities and labs):

1. Students will watch Shape of Life videos to learn about different animals
2. Students may choose to dissect model organisms

Assessments:

- **Diagnostic:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Pre-assessment Resources "Carousel Brainstorm"
  Open response questions ("What are your thoughts on…?")
  Vocabulary Assessment(s) of prior knowledge
  Word Sorts

- **Formative:**
  Informal Questioning
  Teacher Observation
  Class Discussion
  At-the-Bell Questions
  Chapters 25-35 in Miller and Levine
  Biology worksheets
  Teacher-generated assignments
  Laboratory Exercises
  Graphic Organizers
  Paper Models Activities
  Review Games Common Assessment

- **Summative:**
  Chapter Quizzes
  Unit X Test

Extensions:

Case Studies - current events and scientific journal articles that pertain this unit
Guided Reading of Supplemental Resources
Interactive Activities on Websites
Video Resources

Correctives:

Biology Re-read Chapters 25-35 in Miller and Levine Biology
Give students supplemental vocabulary review materials
Give students web-based resources that reinforce the material presented in class
Give students extra practice identifying variables in an experiment
Give students extra practice identifying examples of relationships in nature
Reteach and retest important concepts including mandatory vocabulary

Materials and Resources (for full year)

Primary Textbook, Supplemental Notes and Current Events Articles, SAS website, Content-related websites (such as NOVA Evolution lab, Learn.genetics.utah.edu, dnai.org, HHMI Biointeractive), YouTube and Peer-Reviewed Scientific Journal Articles.

DELAWARE VALLEY SCHOOL DISTRICT

Primary Textbook(s) Used for this Course of Instruction

Name of Textbook: Biology

Textbook ISBN #: ISBN-13 #: 978-0-13-366951-0 ISBN-10 #: 0-13-366951-3

Textbook Publisher &Year of Publication: Pearson Education, Inc. 2019

Curriculum Textbook is utilized in (title of course): Honors Biology

DELAWARE VALLEY SCHOOL DISTRICT

Checklist to Complete and Submit:
(Scan and email)

_____ Copy of the curriculum using the template entitled "Planned Instruction," available on the district website.

_____ The primary textbook form(s).

_____ The appropriate payment form, in compliance with the maximum curriculum writing hours noted on the first page of this document.

Each principal and/or department chair has a schedule of First and Second Readers/Reviewers. Each Reader/Reviewer must sign & date below.

First Reader/Reviewer Printed Name_____
First Reader/Reviewer Signature_____ Date_____

Second Reader/Reviewer Printed Name_____
Second Reader/Reviewer Signature _____ Date_____

WRITE IN INK ONLY

CURRICULUM

DELAWARE VALLEY SCHOOL DISTRICT
AUTHORIZATION FOR PAYMENT

Name:	**Building:**
Grade Level (Elementary Only):	**Subject Area (Secondary Only):**
Account Code:	**Date:**

Date	Service Provided (If Sub, Note Who Was Out)	No. of Hours (If Applicable)	Per Diem Hourly Rate	Total

Total Payment _____

I have completed all activities described above and have returned all equipment and materials for which I am responsible.

*This form must be submitted by an employee for payment for the following services:
(1) Substitute teacher, instructional assistant, clerical, etc.
(2) Homebound instruction
(3) Extra Curricular work i.e., coaching, intramural, club or class advisor, director for band, chorus, drama, etc., Approved Activities

This form must be submitted to the Business Office eight days prior to the payroll date.

Signature of Employee	Date
Athletic Director (if applicable)	Date
Principal/Supervisor (if applicable)	Date
Business Administrator	Date
Superintendent or Designee	Date

Revised: August 20, 2001