



## Course 3– Grade 8 Science Unit # 2 Life Science

**Grade 8**

**Unit # 2 Life Science**

**Topic 4 (15 days) – Genes and Heredity**

**Topic 5 (18 days) – Natural Selection and Change Over Time**

**Unit Overview:** Students will explore patterns of reproduction and inheritance through investigation of advances in the fields of genetics and inheritance. Students will discover how inherited alleles are related to an organism's traits and how probability is related to inheritance. Students will then explore the relationship between genes, chromosomes, and inheritance. Models such as a pedigree chart will be used to track inheritance. DNA replication, protein synthesis, trait variations due to changes in DNA and RNA will be introduced. Artificial selection, mutations, and the engineering of new traits will be investigated. Students will then use this information to explore the process that explains how organisms change over time. Students will investigate factors that drive natural selection and learn about evidence that supports the scientific theory of evolution. This will lead into the investigation of how genetics and trait variations influence a population as well as how species interactions affect evolution. Studying of fossil evidence and modern technologies and DNA will provide new evidence about the theory of evolution.

### **Unit 2 NYSSLS Performance Expectations (PE)**

**MS-LS3-1. Develop and use a model to explain why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. [Clarification Statement: Mutations in body cells are not inherited. Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]**

**MS-LS3-2. Develop and use a model to describe how asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as diagrams and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring.]**

**MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, selective breeding, gene therapy); and, on the impacts these technologies have on society.]**

**MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]**

**MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]**

**MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.**

**[Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures as evidence of common ancestry.]**

**MS-LS4-3. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.**

**[Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]**

**MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]**

**MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**

## **Unit 2 NYSSLS Science and Engineering Practices (SEP)**

- Obtaining, Evaluating, and Communicating Information
- Developing and Using Models
- Analyzing and Interpreting Data
- Engaging in Argument from Evidence
- Constructing Explanations and Designing Solutions
- Using Mathematics and Computational Thinking
- Planning and Carrying Out Investigations

## **Unit 2` NYSSLS Disciplinary Core Ideas (DCI)**

### **LS3.A: Inheritance of Traits**

- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1)
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

### **LS1.B: Growth and Development of Organisms**

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2)
- Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)
- Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)

### **LS3.B: Variation of Traits**

- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Some changes are beneficial, others are harmful, and some neutral to the organism. (MS-LS3-1)
- (NYSED) Mutations may result in changes to the structure and function of proteins. (MS-LS3-1)

### **LS4.B: Natural Selection**

- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring. (MS-LS4-5)
- (NYSED) Natural selection can lead to an increase in the frequency of some traits and the decrease in the frequency of other traits. (MS-LS4-4)

### **LS4.C: Adaptation**

- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)

### **LS4.A: Evidence of Common Ancestry and Diversity**

- The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)
- Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)
- Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)

## **Unit 2 NYSSLS Cross Cutting Concepts (CCC)**

- **Cause and Effect**
- **Structure and Function**
- **Patterns**

## **Resources**

- **Pearson Elevate Science Book Chapters Topics 4-5**
- **PearsonRealize.com**
- **Pearson Lab materials**
- <http://ngss.nsta.org/Classroom-Resources.aspx>
- <http://newyorkscienceteacher.com/sc>
- **Z-Space**

## **Measurement of Student Learning**

- Topic Readiness Test
- Lesson Checks
- Lesson Quiz
- Topic Review and Assessment
- Quest Rubrics
- Exam view Assessments

## **Step Up to Writing**

### **SUTW Strategy**

#### **Connect, Case Studies**

Easy 2-Column Notes

SUTW 4<sup>th</sup> Edition p. 31

SUTW Tools S1-17a-c

#### **Content Vocabulary**

Breaking Down Definitions

SUTW 4<sup>th</sup> Edition p. 212

SUTW Tools S3-2a-b, S3-1a

#### **Investigate/Synthesize/Quest**

IVF Summary Sentences

SUTW 4<sup>th</sup> Edition p. 43

SUTW Tools S1-23b

#### **Investigate/Synthesize/Quest**

Four Step Summary Paragraph

SUTW 4<sup>th</sup> Edition p. 44

SUTW Tools S1-24a-b

#### **Investigate/Synthesize/Quest**

Color-Coding the Elements of Informative

SUTW 4<sup>th</sup> Edition p. 2688

SUTW Tools S4-1a-b

#### **Investigate/Synthesize/Quest**

Explanatory Writing Informal Outlines

SUTW 4<sup>th</sup> Edition p. 272

SUTW Tools S4-3a-b, S4-4a,b

<b>ELL Enhancements</b>				
<p><b>Pearson Elevate Science Supports</b>                      Topic Differentiated Instruction in TE                      Topic Remediation Summary in TE                      ELL Support in TE                      ELL Vocabulary Support in TE</p>				
<p><b>Listening</b>                      Build Background Knowledge                      Audio</p>	<p><b>Speaking</b>                      Sentence Frames                      Academic conversation Starters</p>	<p><b>Reading</b>                      Supplementary Texts                      Visual Aids                      Video                      Standards-based questions</p>	<p><b>Writing</b>                      Sentence Frames                      Graphic Organizers                      Standards-based sentence stems</p>	<p><b>Accommodations</b>                      Extended time                      Directions read 3x                      Oral interpretation                      Translated version of test (may have both English and other)                      Responses in home language</p>
<b>Special Education Modifications</b>				
<p><b>Pearson Elevate Science Supports</b>                      Topic Differentiated Instruction in TE                      Topic Remediation Summary in TE</p>				
<p><b>Instructional</b>                      Pre-teach vocabulary                      Use picture vocabulary                      Picture examples of safety measures posted                      Pictures for each category of science                      Scaffold Depth of Knowledge questions                      Provide copy of notes/notes in "cloze" form                      Peer partner                      Extended time for written tasks/verbal response                      Break long tasks over multiple days                      Allow for multiple ways to respond (verbal, written, response board, scribe)                      Provide mock/model of performance task                      Model use of graphic organizers (fade until mastery)                      Modify informational text to shorter passages                      Provide model of exemplar lab write-up                      Provide interactive notebook                      Present complex tasks in multiple ways</p>	<p><b>Assistive technology</b>                      Computer for lengthy writing tasks                      Audio textbook                      Videos to clarify concepts                      Recording device to record class lecture/discussions</p> <p><b>Other</b>                      Arrange seating for maximum engagement and minimum distraction                      Accessible lab space (counter level)</p>	<p><b>Assessment:</b>                      Scaffold written assignments                      Individual criteria for success                      Provide with review packet                      Modify the number of questions                      Provide model of the task                      Provide multiple options for project                      Practice calculating density with sample problem before assessing student.</p>		

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Model steps to read, interpret, and construct graphs Multiple opportunities to perform to repeat labs Provide advance organizer of class tasks			
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**Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom**

**Pearson Elevate Science Supports**

[Pearson Elevate Science Resources](#)

- Materials, resources, and/or discussions address diverse cultural backgrounds and real world applications
- Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population
- All students are given an opportunity to engage in science discourse
- Teacher demonstrates high expectations for all students