Centerville Abington Senior High School Curriculum Mapping
Biology
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Biology Overview

The Indiana Academic Standards specify the core, fundamental skills students should learn, master, and apply at grade level beginning in kindergarten and continuing through grade twelve. These academic standards serve as the basis to our curriculum in Centerville-Abington Community Schools but do not serve as curriculum alone. The Indiana Academic Standards are supported through grade-level, content-specific curriculum maps and resources. These curriculum maps and resources are aligned to the Indiana Academic Standards and provide the tools which are necessary to meet the needs of all learners. As a result, the Centerville-Abington Community Schools' curriculum maps are examined regularly and undergo periodic revisions.

This course provides, through regular laboratory and field investigations, a study of the structures and functions of living organisms and their interactions with their environment. At a minimum, this study explores the functions and processes of cells, tissues, organs, and systems within various species of living organisms and the roles and interdependencies of organisms within populations, communities, ecosystems, and the biosphere. Students have opportunities to: gain an understanding of the history of the development of biological knowledge, explore the uses of biology in various careers, and cope with biological questions and problems related to personal needs and social issues.

Textbook: McGraw-Hill. (2017). *Biology*.

<table>
<tr><td colspan="2"><u>Duration of Unit 1</u>
5 weeks</td></tr>
<tr><td><u>Unit 1 Theme</u>
Cell Biology begins with an explanation of cell theory, which explains life on earth as being cellular in structure, and cellular in function. This unit covers the basic anatomy common to all cells, and then looks at the differences between eukaryotes and prokaryotes, and then the differences between plant and animal cells. Finally, the cell unit concludes with the topic of cell specialization and levels of organization in multicellular organisms (plants, animals, and fungi).</td><td><u>Essential Question(s)</u>
What are the basic characteristics of cells?
What are the basic types of cells that make up life on earth?
Why are cells fundamental to life on earth?</td></tr>
<tr><td colspan="2"><u>End of Unit 1 Authentic Learning Task</u>
Pizzas As Cells Students will participate in an end-of-unit project in which they create an edible model of a eukaryotic cell in the form of a pizza. Students will design, create, and make a pizza with toppings arranged like the working parts of a cell (organelles). Students present their projects</td></tr>
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in class, and then participate in a pizza buffet. After evaluation, the projects are eaten.
A rubric will be used to assess students' mastery.

- I can make a 3-D model of a eukaryotic cell using pizza ingredients and toppings.
- I can arrange pizza toppings to simulate the organelles of a eukaryotic cell.
- I can identify and label cellular components represented by toppings on a pizza.
- I can apply my knowledge of cell biology in a creative way by making a pizza look like a eukaryotic cell.

Academic Standards: HS-LS1-1, HS-LS1-2, HS-LS1-3, HSLS1-4, 9-10LST2-3, 9-10LST3-1, 9-10LST3-2, 9-10.LST4-1, 9-10LST7-2

Pacing: Unit 1, Chapter 1 and 7, 5 weeks

Indiana Academic Standards

HS-LS1-1, HS-LS1-2, HS-LS1-3, HS-LS1-3, HS-LS1-4, HS-LS1-6, HS-LS-4-1, HS-LS-4-4,
9-10.LST.2.1, 9-10.LST.2.2, 9-10.LST.3.1, 9-10.LST.3.2, 9-10.LST.4.1, 9-10.LST.5.2, 9-10.LST.6.2, 9-10.LST.7.1

Academic Vocabulary

cell, prokaryote, eukaryote, plant cell, animal cell, organelle, mitochondria, chloroplast, endoplasmic reticulum, plasma membrane, lipids, carbohydrates, proteins, DNA, RNA, protein synthesis, nucleus, nucleolus, lipid bilayer, channel protein, marker protein, receptor protein, golgi bodies, vesicles, endosymbiosis, vacuole, endocytosis, exocytosis, passive transport, active transport, cytoskeleton, microtubules, centrioles, lysosomes, peroxisomes, ribosomes, cell wall, cellulose, homeostasis, metabolism, biological reproduction, evolution, adaptation, cell theory, unicellular, multicellular, microbe, stem cells

Key Concepts/Learning Targets	**Question Stems**
I can describe the scope of inquiry common to the science of biology. I can list the major characteristics common to living things. I can list the three tenets that comprise the cell theory of life. I can describe four anatomical features that all cells have in common. I can distinguish between unicellular and multicellular life. I can identify the major differences between prokaryotic and eukaryotic cells. I can explain the functionality of a plasma, or cell, membrane. I can explain how diffusion, passive, and active transport move materials into and out of the cell. I can describe the architecture of the plasma membrane, including the molecular components of lipids, proteins, and carbohydrates.	What is biology? What are the characteristics common to all living things? What are the principles of cell theory? What features are common to all cells? What is the difference between unicellular and multicellular life? What are the differences between a prokaryotic and eukaryotic cell? How does a plasma membrane function? In what way do diffusion, active transport, and passive transport move materials across the plasma membrane? What are the main features of a plasma membrane? What are the structures of a typical eukaryotic cell? What is the role of a mitochondrion?

I can list the major organelles common to eukaryotic cells. I can explain the role of a mitochondrion. I can explain the role of a nucleus. I can explain the role of the endoplasmic reticulum. I can explain the role of a golgi body. I can explain the role of a vacuole. I can explain the role of a centriole. I can explain the role of the cytoskeleton. I can explain the role of a cell wall. I can explain the role of a chloroplast. I can compare and contrast plant and animal cells, highlighting the ways they are alike and the ways they are different. I can discuss the process of cell specialization in eukaryotic cells. I can sequence the levels of organization in multicellular plants and animals, beginning at the cellular level and concluding with the organism. I can summarize the theory of endosymbiosis as it relates to the evolution of eukaryotic cells. I can determine the central ideas of a text. I can determine the conclusions of a text. I can follow a multistep procedure for experiments. I can take measurements and perform technical tasks. I can identify what tools or instruments I need for a procedure. I can analyze results of an experiment, including evidence and data to support my conclusion. I can use the context to determine the meaning of words. I can use the context to determine the meaning of symbols. I can analyze the relationship among concepts in a text. I can analyze the structure of a text. I can analyze how specific sections contribute to my understanding of the topic. I can convey the purpose of a section of the text. I can determine why an author provided an explanation. I can determine why an author described a procedure, or discussed an experiment. I can determine what question an author is addressing in a text. I can translate quantitative or technical information from words into a visual like a table or chart.	What is the role of the nucleus? What is the role of endoplasmic reticulum? What is the role of a golgi body? What is the role of a vacuole? What is the role of a centriole? What is the role of the cytoskeleton? What is the role of a cell wall? What is the role of a chloroplast? How are plant and animal cells alike? How are plant and animal cells different? What is cell specialization? What are the levels of organization seen in multicellular plants and animals? How does the theory of endosymbiosis explain the evolution of cells over time? What is the central idea of this text? What is the purpose of this experiment? What comes first? What are the steps? What is the best unit of measurement to use? What instruments or tools are used? Based on the context, what does the key terms or domain-specific mean? Based on the context, what does this symbol mean? How did the author structure the text? What is the relationship between the concept of _____ and _____ in the text? What question(s) is the author answering in the text? Why did the author explain _____ in the text? Why did the author describe the procedure? What was the author demonstrating with the description of this procedure? How can you summarize the information? How can you summarize the table or chart? How can you express this information mathematically? How can you express this information in a table or chart?

I can translate information expressed visually or mathematically into words. I can compare ideas in a text to information presented in other formats. I can contrast ideas in a text to information presented in other formats. I can identify similarities in information between multiple sources. I can identify discrepancies in information between multiple sources. I can cite specific textual evidence to support my analysis. I can identify useful specific textual evidence for its use in analysis of science and technical texts. I can cite specific textual evidence for its use in supporting the main idea, supporting details, conclusion, and purpose. I am using precise details or explanations or descriptions in my citation. I can recognize and identify the author's claim. I can evaluate the evidence an author uses to support a claim.	How are the ideas in the text similar to those in the experiment/simulation/video/etc.? How are the ideas in the text different from those in the experiment/simulation/video/etc.? What ideas from the text are supported by previous explanations or the other accounts (experiment/simulation/video/etc.)? What ideas from the text are contradicted by previous explanations or the other accounts (experiment/simulation/video/etc.)? What specific text evidence or data is used to support the main idea? How does the text evidence or data support the supporting details of this text? How does the specific text evidence or data from the text support your conclusion?
Resources/Activities *Biology*, 2017, McGraw Hill (Textbook) ConnectEd, McGraw Hill online (Textbook & Textbook Resources) Smartbook reading assignments, online textbook resource, Chapter 7 Comparing Cells, lab activity (Teacher File) Chapter 7 review worksheet (Textbook Resource & Teacher File) https://www.cellsalive.com/, online resource for cell biology activities and animation https://www.youtube.com/watch?v=URUJD5NEXC8&t=1s, online video, tour of a eukaryotic cell *What Are Cells Like?*, DVD (Classroom Resource) https://www.ibiblio.org/virtualcell/tour/cell/cell.htm, online interactive website, cell organelles and functions Virtual Cell Tour, worksheet for above resource (Teacher File) Cell Biology foldables and cutouts, purchased through https://www.teacherspayteachers.com/ (Teacher File) Microscopes and microbiology supplies, classroom resource, purchased through WARD's Science supply catalog online Pond Water collected from a local source	**Assessment(s)** Cell Biology Unit Quiz, teacher file Cell Biology Unit Test, teacher file Cell Biology Pizza Project, project rubric, teacher file

Duration of Unit 2
4 weeks

Unit 2 Theme	**Essential Question(s)**
Energy and Metabolism This unit looks at a fundamental characteristic of life–metabolism, or how living things get and use energy. The discussion begins at the cellular level with an exploration of how plants trap the energy from the sun through photosynthesis, and next how that trapped energy is made available to cells through photosynthesis. The unit concludes with an ecological discussion that relates photosynthesis and cellular respiration to the global carbon/oxygen cycle.	How do living things get energy? Why is energy essential for life? What role do photosynthesis and cellular respiration play in energy metabolism? What role do photosynthesis and metabolism play in the carbon/oxygen cycle?

End of Unit 2 Authentic Learning Task

Fun With Fermentation. Students complete an investigation into the fermentation pathway that culminates with producing their own fermentation product. Students research the variety of food products produced through fermentation and select one particular product to share with the class. In addition, students use yeast, sugar, water, and flavoring to create their own carbonated drink (soda pop). The fermentation products are enjoyed by all on the last day of the unit. A lab report will be used to assess students' mastery.

- I can research products produced through fermentation.
- I can select a fermentation product and describe how it is produced.
- I can present my research to a classroom of peers.
- I can apply what I know about fermentation to make a carbonated drink.

Academic Standards: HS-LS1-5, HS-LS1-6, HS-LS1-7, HS-LS2-3, 9-10.LST.2-3, 9-10.LST.3-2, 9-10.LST.4-1, 9-10.LST.4-3, 9-10.LST.5-1, 9-10.LST.5-2, 9-10.LST.6-1, 9-10.LST.6-2

Pacing: Unit 2, Chapter 8

Indiana Academic Standards

HS-LS1-5, HS-LS1-6, HS-LS1-7, HS-LS2-3, HS-LS2-4, HS-LS2-5, HS-LS2-6, HS-LS4-6, 9-10.LST.2.3, 9-10.LST.3.2, 9-10.LST.3.3, 9-10.LST.4.2, 9-10.LST.4.3, 9-10.LST.5.1, 9-10.LST.6.1, 9-10.LST.7.2

Academic Vocabulary

thermodynamics, autotroph, heterotroph, consumer, producer, herbivore, carnivore, omnivore, photosynthesis, cellular respiration, aerobic cellular respiration, anaerobic cellular respiration, glucose, ATP (adenosine triphosphate), oxidative respiration, Kreb's cycle, Calvin cycle, light

dependent/independent reactions, alcoholic and lactic acid fermentation, pyruvate, carbon cycle, fossil fuels, combustion, chloroplast, mitochondria

Key Concepts/Learning Targets	**Question Stems**
I can describe the laws of thermodynamics. I can draw and label an ATP molecule. I can explain the role of ATP in storing and releasing energy. I can define photosynthesis. I can summarize the two phases of photosynthesis. I can explain the role of chloroplasts in the light reaction of photosynthesis. I can explain the details of the Calvin cycle. I can identify the raw materials, energy source, final product, and waste products of photosynthesis. I can define cellular respiration. I can identify the raw materials, energy source, final product, and waste products of cellular respiration. I can sequence the events of anaerobic and aerobic cellular respiration. I can compare and contrast the anaerobic and aerobic cellular respiration pathways. I can explain the alcoholic pathway of fermentation. I can list foods and beverages produced by alcoholic fermentation. I can explain the lactic acid pathway of fermentation. I can list foods produced by lactic acid fermentation. I can relate photosynthesis and cellular respiration to the global carbon cycle. I can describe how fossil fuel consumption disrupts the carbon cycle. I can identify what tools or instruments I need for a procedure. I can analyze results of an experiment, including evidence and data to support my conclusion. I can analyze the structure of a text. I can analyze how ideas are organized into categories or hierarchies in a text. I can use multiple sources of information presented in a variety of formats to answer a question or solve a problem. I can compare ideas in a text to information presented in other formats. I can contrast ideas in a text to information presented in other formats. I	What are the two laws of thermodynamics? What is ATP? How does ATP work in a cell? What is photosynthesis? What are the two phases of photosynthesis? What is the function of chloroplasts in the light reaction? What happens in the Calvin cycle? What are the raw materials, energy source, final product, and waste product of photosynthesis? What is cellular respiration? What are the raw materials, energy source, final product, and waste product of cellular respiration? What is anaerobic cellular respiration? What is aerobic cellular respiration? What is meant by alcoholic fermentation? How is alcoholic fermentation used to produce foods and beverages? What is meant by lactic acid fermentation? How is lactic acid fermentation used to produce foods? What role do photosynthesis and cellular respiration play in the carbon cycle? How does the combustion of fossil fuels disrupt the carbon cycle? What are the steps of a procedure or experiment? What is the best unit of measurement to use? What instruments or tools are used? Based on the information from the text, what can you conclude from the results? How did the author structure the text? What is the relationship between the concept of _____ and _____ in the text? How are ideas organized within the text? How does this information relate to the question or problem? How are the ideas in the text similar to those in the experiment/simulation/video/etc.? How are the ideas in the text different from those in the

can identify similarities in information between multiple sources. I can write arguments with clear reasons and relevant evidence. I can write an informative text that appropriately applies to my audience. I can clearly and systematically organize my procedure/experiment or process needed. I can use technology to share and update my writing with others. I can evaluate new information and feedback about my writing.	experiment/simulation/video/etc.? What evidence will you use to support your claim? What supporting information will you use to explain your topic? How can you use technology to write collaboratively? Did you effectively incorporate technology into your writing process?
Resources/Activities *Biology*, 2017, McGraw Hill (Textbook) ConnectEd, McGraw Hill online textbook and textbook resources Smartbook reading assignments, online textbook resource, Chapter 8 Photosynthesis Rates and Reaction, lab activity (Teacher File) Chapter 8 review worksheet (Textbook Resource & Teacher File) *Photosynthesis & Cellular Respiration*, DVD, Holt Science Education, (Classroom Resource) https://www.youtube.com/watch?v=CMiPYHNNg28, https://www.youtube.com/watch?v=eJ9Zjc-jdys, https://www.youtube.com/watch?v=YbdkbCU20_M&t=25s online video instruction for photosynthesis, ATP, and cellular respiration *What Are Plants Like?*, DVD, classroom resource Cellular Respiration, online virtual lab, McGraw Hill ConnectEd Cellular Respiration Worksheet (Teacher File) Photosynthesis and Cellular Respiration foldables and cutouts, purchased through https://www.teacherspayteachers.com/ (Teacher File) Anaerobic Cellular Respiration demonstration and observation (Teacher File) Photosynthesis lab materials (*Elodea* aquatic plants and bromothymol blue) purchased through WARD's Science supply catalog online Fermentation lab materials and consumables purchased locally	**Assessment(s)** Photosynthesis quiz, teacher file Cellular Respiration quiz, teacher file Smartbook reading comprehension assessment, McGraw Hill ConnectED Energy and Metabolism Unit Test, teacher file Fun With Fermentation activity and project rubric, teacher file

Duration of Unit 3 4 weeks

Unit 3 Theme	**Essential Question(s)**
Cell Division is a unifying characteristic of living things. This unit looks at the role of cell division in growth, repair, and maintenance of organisms, and the role of cell division in asexual and sexual reproduction.	Why is cell division a fundamental characteristic of life? Why do cells divide? What role does cell division play in asexual and sexual reproduction?

End of Unit 3 Authentic Learning Task

Mitosis Interactive Project. Students create a simulation of mitosis (body cell division) using a multimedia format of their choosing. The simulation shows the process of mitosis from start to finish, beginning with a diploid body cell and ending with two diploid daughter cells. For example, students can create a hand drawn flip chart of mitosis, cartoon-style, or a stop-motion video that shows the process of mitosis, or a sequenced slide show of cell division . . . students choose a format suited to their own interests and creativity. Projects are presented in class for peer review and critique. A rubric will be used to assess students' mastery.

- I can create a multimedia project that shows mitosis (cell division).
- I can correctly label the phases of mitosis.
- I can show the events that happen in mitosis with a multimedia format that suits my interests and creativity.
- I can present my work for peer review and critique.

Academic Standards: HS-LS3-1, HS-LS3-2, HS-LS4-1, HS-LS4-5, 9-10.LST.2-3, 9-10.LST.3-1, 9-10.LST.3-2, 9-10.LST.4-1, 9-10.LST.4-2, 9-10.LST.4-3, 9-10.LST.5-1, 9-10.LST.5-2, 9-10.LST.6-1, 9-10.LST.6-2, 9-10.LST.7-1, 9-10.LST.7-2

Pacing: Unit 3, 4 weeks, Chapters 9 & 10

Indiana Academic Standards

HS-LS1-4, HS-LS3-1, HS-LS3-2, HS-LS4-1, HS-LS4-5, HS-LS4-6, 9-10.LST.2.1, 9-10.LST.3.1, 9-10.LST.3.3, 9-10.LST.4.1, 9-10.LST.4.3, 9-10.LST.5.1, 9-10.LST.6.1, 9-10.LST.7.1

Academic Vocabulary

mitosis, surface area to volume ratio, diffusion, cell cycle, G1 phase, G2 phase, S phase, M phase, interphase, diploid, haploid, zygote, fertilization, gamete, sperm, oocyte (egg), somatic (body) cell, prophase, metaphase, anaphase, telophase, cytokinesis, check point, chromosome, centromere, centriole, spindle apparatus, cell plate, meiosis I, meiosis II, homologous chromosomes, crossing over, synapsis, cancer, carcinogen, biopsy, metastasis, malignant, benign, chemotherapy, radiation therapy, fraternal and identical twins, ovulation, gestation, menstruation, implantation, cell specialization, stem cell, blastocyst, mother cell, daughter cell

Key Concepts/Learning Targets	**Question Stems**
I can name and sequence the phases of the cell cycle. I can identify several reasons why cell division is critical to life.	What are the phases of the cell cycle? Why do cells divide?

I can explain the relationship between cell size and relate to surface area to volume ratio. I can explain why rates of cell division vary in different cell types of the human body. I can name and sequence the stages of mitosis. I can describe the events that happen in each stage of mitosis. I can describe the process of cytokinesis. I can explain what chromosomes are. I can explain how the chromosome number is a critical species characteristic. I can discuss how the chromosome number compares between mother and daughter cells before and after cell division. I can summarize why cell division is essential for living things. I can describe how cancer is a disease that happens when the cell cycle becomes unregulated. I can explain why cancer rates increase with advancing age. I can summarize the traditional treatments for cancer. I can explain the general outcome of the cell division called meiosis. I can identify and describe the phases of meiosis. I can summarize what happens in meiosis I and meiosis II. I can explain why meiosis is essential for sexual reproduction. I can explain how the chromosome number compares between mother and daughter cells before and after meiosis. I can identify the similarities and differences between mitosis and meiosis. I can explain why homologous chromosomes are homologous, or similar. I can describe the process of crossing over in homologous chromosomes and when it occurs. I can explain how crossing over produces genetic variation among offspring. I can describe how asexual and sexual reproduction are different. I can explain why asexually reproducing species are more likely to go extinct than sexually reproducing species. I can follow a multistep procedure for experiments. I can take measurements and perform technical tasks. I can use the context to determine the meaning of words.	How does cell size relate to surface area to volume ratio? How do rates of cell division vary in different body cells? What are the phases of mitosis? What events happen in each stage of mitosis? What is cytokinesis? What are chromosomes? How is the chromosome number part of the species concept? How does the chromosome number compare between mother and daughter cells in mitosis? What are critical reasons that cell division is essential to life? How is cancer related to cell division? Why is cancer more common in older organisms? What are the causes and treatments of cancer? What is meiosis? What are the phases of meiosis? What happens in meiosis I and meiosis II? Why is meiosis essential for sexual reproduction? How does the chromosome number compare between mother and daughter cells? How are meiosis and mitosis alike and how are they different? What are homologous pairs of chromosomes? What is crossing over and when does it occur? How does crossing over produce variety in offspring? What is the difference between asexual and sexual reproduction? Why are asexually reproducing species more likely to go extinct than sexually reproducing species? What is the purpose of this experiment? Based on the context, what does the key terms or domain-specific mean Based on the context, what does this symbol mean? How does the organization of the text contribute to your understanding of it? Is this an effective way to structure the text? How do you know if a source of information is credible? What criteria is used to evaluate the material? How can you combine the ideas from these sources to answer the question?

I can use the context to determine the meaning of symbols. I can evaluate how the organization of a text contributes to my understanding of a topic. I can convey the purpose of a section of the text. I can evaluate multiple sources of information. I can use multiple pieces of credible information from multiple sources to solve a problem. I can contrast ideas in a text to information presented in other formats. I can identify similarities in information between multiple sources. I can use relevant evidence to support my analysis. I can generate questions and hypotheses to guide my research. I can use research to solve a problem. I can combine multiple sources on a subject to gain understanding.	How are the ideas in the text different from those in the experiment/simulation/video/etc.? How do you determine the validity and credibility of your evidence? How can I use research to solve a problem? Does the hypothesis clearly signify a dependent and an independent variable? Is the hypothesis measurable with an objective viewpoint?
Resources/Activities *Biology*, 2017, McGraw Hill (Textbook) ConnectEd, McGraw Hill online textbook and textbook resources Smartbook reading assignments, online textbook resource, Chapter 9 & 10 *Why Are Cells Small?* (Teacher Generated Activity Sheet) Comparing Mitosis & Meiosis, teacher made worksheet (Teacher File) Chapter 9 review worksheet (Textbook Resource & Teacher File) https://www.cellsalive.com/, online resource for cell cycle, mitosis, and meiosis animations *Cell Cycle & Mitosis* online video: https://www.youtube.com/watch?v=7NM-UWFHG18&t=3s *Mitosis: Copycat Cells*, DVD, classroom resource *Chromosomes: Information For Life*, DVD (Classroom Resource) *Meiosis: Shuffling The Genetic Deck*, DVD (Classroom Resource) http://www.biology.arizona.edu/cell_bio/activities/cell_cycle/cell_cycle.html online interactive lab, mitosis and cell cycle *Cell Reproduction and Cancer*, Virtual Lab, McGraw Hill ConnectED Mitosis and Meiosis: foldables and cutouts, purchased through https://www.teacherspayteachers.com/ (Teacher File) Microviewers and microbiology supplies, classroom resource, purchased through WARD's Science supply catalog online Colored pencils, office supplies available as classroom resource	**Assessment(s)** Mitosis and Cell Cycle Quiz, teacher file Meiosis Identification Labeling Quiz, teacher file Cell Division Unit Test, teacher file Cell Division (Mitosis) project rubric, teacher file

Duration of Unit 4 5 weeks	
Unit 4 Theme ***Genetics*** describes the fundamental laws of heredity first proposed by Gregor Mendel. This unit describes how traits are passed on from parent to offspring in sexually reproducing species. The unit concludes with a discussion of human genetic diseases, including gene diseases and chromosomal syndromes.	**Essential Question(s)** How are traits passed on from parent to offspring? What are the basic principles of heredity discovered by Gregor Mendel?
End of Unit 4 Authentic Learning Task "***All in the Family***": Students are tasked with creating a pedigree of their own family, going back two generations on either the maternal line or paternal line. The pedigree is an investigation into family history, and allows students to apply the concepts of heredity and pedigree construction. Upon completion, students share their family history as part of a multimedia presentation. A checklist with criteria will be used to assess students' mastery. ● I can create a pedigree that shows my family tree and the transmission of a genetic trait. ● I can follow the rules of pedigree construction accurately. ● I can present my family pedigree to my peers. ● I can investigate my family history and apply the results in a pedigree format. **Academic Standards:** HS-LS4-2, HS-LS4-3, 9-10.LST.2-3, 9-10.LST.4-2, 9-10.LST.5-2, 9-10.LST.7-1	

Pacing: Unit 4, Chapters 10 & 11, 5 weeks	
Indiana Academic Standards HS-LS4-2, HS-LS4-3, HS-LS4-5, HS-LS1-4, HS-LS2-6, 9-10.LST.2.3, 9-10.LST.3.2, 9-10.LST.3.3, 9-10.LST.4.2, 9-10.LST.4.3, 9-10.LST.5.1, 9-10.LST.6.1, 9-10.LST.7.2	
Academic Vocabulary dominant, recessive, law of dominance, law of segregation, allele, homozygous, heterozygous, genotype, phenotype, codominance, incomplete dominance, polygenic, continuous inheritance, nondisjunction, trisomy, amniocentesis, autosome, sex chromosome, hybrid, pure, test cross, pedigree, sex-linked	
Key Concepts/Learning Targets I can give a brief summary of Gregor Mendel's biography.	**Question Stems** Who is Gregor Mendel and what did he do?

I can define the term gene.	What are genes?
I can describe how traits passed from parent to offspring.	How are traits passed from parent to offspring?
I can explain Mendel's Law of Dominance.	What is Mendel's Law of Dominance?
I can explain Mendel's Law of Segregation.	What is Mendel's Law of Segregation?
I can explain Mendel's Law of Independent Assortment.	What is Mendel's Law of Independent Assortment?
I can describe what a Punnett Square is and how it is used to predict the outcome of a genetic cross.	What is a Punnett Square? How is a Punnett Square used to predict the outcome of a genetic cross?
I can define the term genotype.	What is meant by the term genotype?
I can define the term phenotype.	What is meant by the term phenotype?
I can define the term heterozygous.	What is meant by the term heterozygous?
I can define the term homozygous.	What is meant by the term homozygous?
I can define the term allele.	What is meant by the term allele?
I can describe how codominant, incomplete dominant, and polygenic traits are inherited.	How are codominant, incomplete dominant, and polygenic traits inherited?
I can give examples of codominant, incomplete dominant, and polygenic traits.	What are examples of codominant, incomplete dominant, and polygenic traits?
I can explain how are sex-linked traits are inherited.	How are sex-linked traits inherited?
I can give examples of sex-linked traits.	What are examples of sex-linked traits?
I can explain what is meant by nondisjunction.	What is nondisjunction?
I can list genetic conditions that result from nondisjunction?	What kinds of genetic conditions result from nondisjunction?
I can explain what a karyotype is.	What is a karyotype?
I can prepare and diagnose a karyotype.	How are karyotypes prepared and used?
I can explain how autosomal recessive genetic diseases inherited.	How are autosomal recessive genetic diseases inherited?
I can list examples of autosomal recessive genetic diseases.	What are examples of autosomal recessive genetic diseases?
I can explain how autosomal dominant genetic diseases are inherited.	How are autosomal dominant genetic diseases inherited?
I can list examples of autosomal dominant genetic diseases.	What are examples of autosomal dominant genetic diseases?
I can explain what a pedigree is.	What is a pedigree?
I can analyze and use a pedigree to show the transmission of a genetic disease.	How are pedigrees used to show the transmission of a genetic disease?
	How do I organize information from multiple sources?
I can generate questions and hypotheses to guide my research.	How can I use research to solve a problem?
I can I use research to solve a problem.	What is the purpose of a described experiment?
I can identify what tools or instruments I need for a procedure.	Based on the experimental data, what can you conclude from the results?
I can analyze results of an experiment, including evidence and data to support my conclusion.	How do I evaluate the validity and reasonableness of the hypothesis?
I can evaluate the validity of data in scientific texts.	How do I evaluate the validity of data and conclusions?
I can find limitations, strengths and weaknesses in the data. I can find	What are the limitations, strengths, and weaknesses of the data?

other sources of information that challenge conclusions. I can verify data when possible. I can include precise descriptions and conclusions drawn from data and research in an informative text. I can write an informative text that appropriately applies to my audience. I can clearly and systematically organize my procedure/experiment or process needed.	What is the topic of your composition? What supporting information will you use to explain your topic? How will you organize and present the procedure/experiment or process you present?
Resources/Activities *Biology*, 2017, McGraw Hill (Textbook) ConnectEd, McGraw Hill online textbook and textbook resources Smartbook reading assignments, online textbook resource, Chapter 10 & 11 https://dnalc.cshl.edu/ DNA Learning Center, online resource for animations and tutorials *Should This Dog Be Called Spot?* (Teacher Generated Activity Sheet) Students as Pea Plants (Teacher Led Demonstration) Practice With Punnett Squares, teacher made worksheet (Teacher File) Genotypes & Phenotypes, teacher made activity (Teacher File) Chapter 10 review worksheet (Textbook Resource & Teacher File) https://www.youtube.com/watch?v=i-0rSv6oxSY , Punnett Squares tutorial *Probability & Punnett Squares*, teacher made activity sheet (Teacher File) http://www.biology.arizona.edu/human_bio/activities/karyotyping/karyotyping.html online interactive lab, karyotyping *Punnett Squares*, virtual lab, McGraw Hill ConnectED **REEBOPS**, teacher made lab activity (Teacher File) Karyotype Analysis & Diagnosis, teacher made activity (Teacher File) *A Case of Paternity*, teacher made activity (Teacher File) *Help Us Find Our Kids!*, teacher made activity (Teacher File) Human Genetics I, teacher made worksheet (Teacher File) Human Genetics II, teacher made worksheet (Teacher File) Human Genetics III, teacher made worksheet (Teacher File) *Practice With Pedigrees*, teacher made activity (Teacher File) PTC test paper, purchased through WARD's Science supply catalog	**Assessment(s)** Genetics & Punnett Squares quiz, teacher file Human Genetics & Chromosomal Syndromes quiz, teacher file Human Genetics & Genetic Diseases quiz, teacher file Genetics Unit Test, teacher file Pedigree project assessed with rubric, teacher file

online Materials for REEBOPS lab purchased locally	

Duration of Unit 5
3 weeks

Unit 5 Theme	**Essential Question(s)**
Protein Synthesis This unit is about how genes become traits. The central dogma of modern biology is explained: DNA is the stored information for proteins, and that information is transcribed and translated by RNA into proteins, which give rise to physical traits.	How does the genetic material DNA contain a code for proteins? How do translation and transcription turn genes into proteins?

End of Unit 5 Authentic Learning Task

DNA Model Project- Students will work in small groups to create an accurate 3 Dimensional Model of DNA. The model will be built to demonstrate the structural understanding of the composition of DNA. It will be creatively built out of ordinary household items students already have at home. The model will include accurate labels for each of the molecular components and students will describe each of these components to the class when they present their models. A rubric will be used to assess students' mastery.

- I can create an accurate 3-D representation of a DNA molecule.
- I can correctly label the bases, hydrogen bonds, base pairs and sugar backbone of the molecule by attaching labels or using a key.
- I can creatively use components I already have to make the correct shape of a DNA molecule.
- I can accurately describe each component of my DNA model to the class.

Academic Standards: SEP.2, LS1.A, CC.4, HS-LS1-1. HS-LS1-6, HS-LS3-1, 9-10LS3-3, 9-10LST2.3, 9-10LST3.1, 9-10LST3.2, 9-10.LST4.1, 9-10LST7.2

Pacing: Unit 5, Chapter 12
Quarter 3, 7 block days, 14 school calendar days

Indiana Academic Standards
9-10LST2.1, 9-10LST2.2, 9-10LST2.3, 9-10LST3.1, 9-10LST3.2, 9-10LST3.3, 9-10.LST4.1, 9-10.LST4.3, 9-10LST7.2, HS-LS1-1. HS-LS1-6, HS-LS3-1, HS-LS3-3

Academic Vocabulary

double helix, nucleosome, semiconservative replication, DNA polymerase, Okazaki fragments, RNA, messenger RNA, ribosomal RNA, transfer RNA, transcription, RNA polymerase, intron, exon, codon, translation, gene regulation, operon, mutagen, mutation, missense mutation, nonsense mutation, deletion, insertion, duplication, frameshift

Key Concepts/Learning Targets	Question Stems
I can explain the experiments that led to the discovery of DNA as the genetic material.	How did experiments lead to the discovery of DNA as the genetic material?
I can explain the basic structure of DNA.	What is the basic structure of DNA like?
I can explain the basic structure of eukaryotic chromosomes.	What is the basic structure of eukaryotic chromosomes?
I can explain the role of enzymes in the replication of DNA.	What are the roles of enzymes in the replication of DNA?
I can describe how leading and lagging strands of DNA are synthesized differently.	How are leading and lagging strands of DNA synthesized differently?
I can compare the process of DNA replication in eukaryotic cells to that of prokaryotic cells.	How does the process of DNA replication in eukaryotic cells compare to that of prokaryotic cells?
I can describe how messenger RNA, ribosomal RNA, and transfer RNA are involved in the transcription and translation of genes.	How are messenger RNA, ribosomal RNA, and transfer RNA involved in the transcription and translation of genes?
I can describe the role of RNA polymerase in the synthesis of messenger RNA.	What is the role of RNA polymerase in the synthesis of messenger RNA?
I can describe how the code of DNA is translated into messenger RNA and is used to synthesize a protein.	How is the code of DNA translated into messenger RNA and is used to synthesize a protein?
I can describe how bacteria are able to regulate their genes by 2 types of operons.	How are bacteria able to regulate their genes by 2 types of operons?
I can describe how eukaryotes regulate the transcription of genes.	How do eukaryotes regulate the transcription of genes?
I can describe the various types of mutations.	What are the various types of mutations and how do they affect organisms?
I can determine the central ideas of a text. I can determine the conclusions of a text.	What is the central idea of this text? What is the purpose of this experiment?
I can follow a multistep procedure for experiments. I can take measurements and perform technical tasks.	What comes first? What are the steps?
I can identify what tools or instruments I need for a procedure. I can analyze results of an experiment, including evidence and data to support my conclusion.	What is the best unit of measurement to use? What instruments or tools are used?
I can use the context to determine the meaning of words.	Based on the context, what does the key terms or domain-specific mean?
I can use the context to determine the meaning of symbols.	Based on the context, what does this symbol mean?
I can analyze the relationship among concepts in a text.	How did the author structure the text?

I can analyze the structure of a text. I can analyze how specific sections contribute to my understanding of the topic. I can convey the purpose of a section of the text. I can determine why an author provided an explanation. I can determine why an author described a procedure, or discussed an experiment. I can determine what question an author is addressing in a text. I can translate quantitative or technical information from words into a visual like a table or chart. I can translate information expressed visually or mathematically into words. I can compare ideas in a text to information presented in other formats. I can contrast ideas in a text to information presented in other formats. I can identify similarities in information between multiple sources. I can identify discrepancies in information between multiple sources. I can cite specific textual evidence to support my analysis. I can identify useful specific textual evidence for its use in analysis of science and technical texts. I can cite specific textual evidence for its use in supporting the main idea, supporting details, conclusion, and purpose. I am using precise details or explanations or descriptions in my citation.	What is the relationship between the concept of _____ and _____ in the text? What question(s) is the author answering in the text? Why did the author explain _____ in the text? Why did the author describe the procedure? What was the author demonstrating with the description of this procedure? How can you summarize the information? How can you summarize the table or chart? How can you express this information mathematically? How can you express this information in a table or chart? How are the ideas in the text similar to those in the experiment/simulation/video/etc.? How are the ideas in the text different from those in the experiment/simulation/video/etc.? What ideas from the text are supported by previous explanations or the other accounts (experiment/simulation/video/etc.)? What ideas from the text are contradicted by previous explanations or the other accounts (experiment/simulation/video/etc.)? What specific text evidence or data is used to support the main idea? How does the text evidence or data support the supporting details of this text? How does the specific text evidence or data from the text support your conclusion? What was the purpose of citing the specific text evidence or data at the time of publication? What is the precise details or explanations or descriptions I am looking to address?
Resources/Activities Amoebas Sisters Videos (youtube.com) Simulations (Teacher Led) Diagramming (Teacher Led) Protein synthesis Flip Book Activity (Teacher Files) Creature Feature Lab (Teacher Files) Transcription Translation Races Activity (Teacher Files) Chapter 12 Knowledge Checks (Textbook Site) Online Review Activities (Kahoot, Quizlet)	**Assessment(s)** DNA Replication Quiz Protein Synthesis Quiz Chapter 12 Test DNA Model Project Daily Bellringer Questions

Schoology Vocabulary Comprehension Assignment (Schoology) Chapter 12 Interactive Presentations (Teacher Files)	

Duration of Unit 6 2 weeks	
Unit 6 Theme Genetics and Biotechnology	**Essential Question(s)** What are some potential uses for technology that allow a gene for a protein to be inserted into an organism?

End of Unit 6 Authentic Learning Task

Gel Electrophoresis Lab- Students will work in small groups to create an accurate representation of the process of gel electrophoresis. All students will have specific traits that are represented by particular DNA sequences. Those pieces of DNA will be cut and placed in appropriate positions due to their specific sequence. This pattern will be possibly matched with the DNA found at a crime scene. A rubric will be used to assess students' mastery.

- I can demonstrate the cutting of DNA with restriction enzymes.
- I can sequence those segments of DNA in an appropriate pattern and compare it with other DNA fingerprints.
- I can analyze the results and tell if any two individuals in the class are genetically identical
- I can explain the importance of the process of gel electrophoresis when studying heredity and forensic science.

Academic Standards: HS-LS1-1, HS-LS3-1, HS-LS3-3, 9-10LST2.3, 9-10LST3.1, 9-10LST3.2, 9-10.LST4.1, 9-10LST7.2

Pacing: Unit 6, Chapter 13 Quarter 3, 6 class periods, 12 school calendar days
Indiana Academic Standards 9-10LST2.1, 9-10LST2.2, 9-10LST2.3, 9-10LST3.1, 9-10LST3.2, 9-10LST3.3, 9-10.LST4.1, 9-10.LST4.3, 9-10LST7.2, HS-LS1-1, HS-LS3-1, HS-LS3-3
Academic Vocabulary selective breeding, inbreeding, test cross, genetic engineering, genome, restriction enzymes, gel electrophoresis, recombinant DNA, plasmid, DNA ligase, transformation, cloning, polymerase chain reaction, transgenic organism, DNA sequencing, gene cloning, The Human Genome Project, DNA fingerprinting, bioinformatics, DNA microarray, single nucleotide polymorphism, haplotype, pharmacogenomics, gene therapy, genomics, proteomics

Key Concepts/Learning Targets	Question Stems
I can explain how selective breeding is used to produce organisms with desired traits. I can describe the similarities and differences between inbreeding and hybridization. I can explain how a punnett square test cross helps assess the genotypes of organisms. I can describe the different tools and processes used in genetic engineering. I can explain how genetic engineering manipulates recombinant DNA. I can describe the similarities between selective breeding and genetic engineering. I can explain how genetic engineering and biotechnology can be used to improve human life. I can list the components of the human genome. I can describe the ways in which forensic scientists use DNA fingerprinting. I can explain how the information from the human genome can be used to treat human diseases. I can determine the central ideas of a text. I can determine the conclusions of a text. I can follow a multistep procedure for experiments. I can take measurements and perform technical tasks. I can identify what tools or instruments I need for a procedure. I can analyze results of an experiment, including evidence and data to support my conclusion. I can use the context to determine the meaning of words. I can use the context to determine the meaning of symbols. I can analyze the relationship among concepts in a text. I can analyze the structure of a text. I can analyze how specific sections contribute to my understanding of the topic. I can convey the purpose of a section of the text. I can determine why an author provided an explanation. I can determine why an author described a procedure, or discussed an experiment. I can determine what question an author is addressing in a text.	How is selective breeding used to produce organisms with desired traits? What are similarities and differences between inbreeding and hybridization? How does a punnett square test cross help assess the genotypes of organisms? What are the different tools and processes used in genetic engineering? How does genetic engineering manipulate recombinant DNA? What are the similarities between selective breeding and genetic engineering? How can genetic engineering and biotechnology be used to improve human life? What are the components of the human genome? How do forensic scientists use DNA fingerprinting? How can information from the human genome be used to treat human diseases? What is the central idea of this text? What is the purpose of this experiment? What comes first? What are the steps? What is the best unit of measurement to use? What instruments or tools are used? Based on the context, what does the key terms or domain-specific mean? Based on the context, what does this symbol mean? How did the author structure the text? What is the relationship between the concept of _____ and _____ in the text? What question(s) is the author answering in the text? Why did the author explain _____ in the text? Why did the author describe the procedure? What was the author demonstrating with the description of this procedure? How can you summarize the information? How can you summarize the table or chart?

I can translate quantitative or technical information from words into a visual like a table or chart. I can translate information expressed visually or mathematically into words. I can compare ideas in a text to information presented in other formats. I can contrast ideas in a text to information presented in other formats. I can identify similarities in information between multiple sources. I can identify discrepancies in information between multiple sources. I can cite specific textual evidence to support my analysis. I can identify useful specific textual evidence for its use in analysis of science and technical texts. I can cite specific textual evidence for its use in supporting the main idea, supporting details, conclusion, and purpose. I am using precise details or explanations or descriptions in my citation.	How can you express this information mathematically? How can you express this information in a table or chart? How are the ideas in the text similar to those in the experiment/simulation/video/etc.? How are the ideas in the text different from those in the experiment/simulation/video/etc.? What ideas from the text are supported by previous explanations or the other accounts (experiment/simulation/video/etc.)? What ideas from the text are contradicted by previous explanations or the other accounts (experiment/simulation/video/etc.)? What specific text evidence or data is used to support the main idea? How does the text evidence or data support the supporting details of this text? How does the specific text evidence or data from the text support your conclusion? What was the purpose of citing the specific text evidence or data at the time of publication? What is the precise details or explanations or descriptions I am looking to address?
Resources/Activities Amoebas Sisters Videos (youtube.com) Simulations (Teacher Led) Diagramming (Teacher Led) Insulin Gene Lab (Teacher Files) Chapter 13 Knowledge Checks (Textbook Site) Online Review Activities (Kahoot, Quizlet) Schoology Vocabulary Comprehension Assignment (Schoology) Chapter 13 Interactive Presentations (Teacher Files)	**Assessment(s)** Gene Technology Test Daily Bellringer Questions Laboratory Activity Questions Exit tickets

Duration of Unit 7 4 weeks	
Unit 7 Theme Evolution	**Essential Question(s)** How does natural selection work?
End of Unit 7 Authentic Learning Task	

Spoons Lab- Students will work in small groups to demonstrate variation in a population of birds. Specific students are given certain traits to either increase their fitness or decrease their fitness in the environment. Students then compete for limited resources to see who can survive and have offspring. Only the most fit "birds" will survive and reproduce therefore causing the evolution of the population. A rubric will be used to assess students' mastery.

- I can demonstrate Darwin's concept of survival of the fittest.
- I can explain how variation in a population can cause the evolution of a species.
- I can describe different essential resources and explain why, when they are limited, it may cause populations to evolve.
- I can explain the concept of natural selection and give a current example of this process.

Academic Standards: HS-LS3-2, 9-10LS3-3,HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4, 9-10LST2.3, 9-10LST3.1, 9-10LST3.2, 9-10.LST4.1, 9-10LST7.2

Pacing: Unit 7, Chapter 14, 15,and 17
Quarter 3, 10 class periods, 20 school calendar days

Indiana Academic Standards

HS-LS3-2, 9-10LS3-3,HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4, 9-10, 9-10LST2.1, 9-10LST2.2, 9-10LST2.3, 9-10LST3.1, 9-10LST3.2, 9-10LST3.3, 9-10.LST4.1, 9-10.LST4.2, 9-10.LST4.3, 9-10LST7.2

Academic Vocabulary

fossil, paleontologist, relative dating, law of superposition, radiometric dating, half-life, geologic time scale, epoch, period, era, eon, cambrian explosion, K-T boundary, plate tectonics, spontaneous generation, theory of biogenesis, endosymbiont theory, artificial selection, natural selection, evolution, derived trait, ancestral trait, homologous structure, vestigial structure, analogous structure. embryo, biogeography, fitness, camouflage, mimicry, Hardy-Weinberg Principle, genetic drift, founder effect, bottleneck, stabilizing selection, directional selection, disruptive selection, sexual selection, prezygotic isolating mechanism, postzygotic isolating mechanism, allopatric speciation, sympatric speciation, adaptive radiation, gradualism, punctuated equilibrium, classification, taxonomy, binomial nomenclature, taxon, genus, family, order, class, phylum, division, kingdom, domain, phylogeny, character, molecular clock, cladistics, cladogram, archaea, protist, fungus

Key Concepts/Learning Targets	**Question Stems**
I can explain similarities and differences between Earth's early environment and Earth's current environment.	What are the similarities and differences between Earth's early environment and Earth's current environment?
I can describe a typical sequence of events in fossilization.	What is a typical sequence of events in fossilization?
I can describe the different techniques for dating fossils and explain how they are used.	How are the different techniques for dating fossils used?
I can list the major events on a geologic time scale.	What are the major events on the geologic time scale?
I can describe the differences between spontaneous generation and	What are the differences between spontaneous generation and

biogenesis. I can list the sequence of events that led to cellular life. I can describe the endosymbiont theory. I can list the evidence which convinced Darwin that species could change over time. I can describe the four principles of natural selection. I can explain how natural selection changes a population. I can explain how fossils provide evidence of natural selection. I can explain why morphology provides evidence of evolution. I can describe why biochemistry provides evidence of evolution. I can list the conditions of the Hardy-Weinberg principle. I can describe the patterns that can be observed in evolution. I can list the factors that influence speciation. I can describe the similarities and differences between Aristotle's and Linnaeus's method of classification. I can describe how scientific names are written using binomial nomenclature. I can list the categories used in biological classification. I can describe the similarities and differences between species concepts. I can list the methods used to reveal phylogeny. I can demonstrate how to construct a cladogram. I can describe the major characteristics of the three domains. I can describe the differences among the six kingdoms. I can describe how organisms are classified at the kingdom level. I can determine the central ideas of a text. I can determine the conclusions of a text. I can follow a multistep procedure for experiments. I can take measurements and perform technical tasks. I can identify what tools or instruments I need for a procedure. I can analyze results of an experiment, including evidence and data to support my conclusion. I can use the context to determine the meaning of words. I can use the context to determine the meaning of symbols. I can analyze the relationship among concepts in a text.	biogenesis? What might have been the sequence of events that led to cellular life? What is the endosymbiont theory? What evidence convinced Darwin that species could change over time? What are the four principles of natural selection? How can natural selection change a population? How do fossils provide evidence of natural selection? How does morphology provide evidence of evolution? How does biochemistry provide evidence of evolution? What are the conditions of the Hardy-Weinberg principle? What patterns can be observed in evolution? What factors influence speciation? What are the similarities and differences between Aristotle's and Linnaeus's method of classification? Using binomial nomenclature, how are scientific names written? What are the categories used in biological classification? What are the similarities and differences between species concepts? What are the methods used to reveal phylogeny? How is a cladogram constructed? What are the major characteristics of the three domains? What are the differences among the six kingdoms? How are organisms classified at the kingdom level? What is the central idea of this text? What is the purpose of this experiment? What comes first? What are the steps? What is the best unit of measurement to use? What instruments or tools are used? Based on the context, what does the key terms or domain-specific mean? Based on the context, what does this symbol mean? How did the author structure the text? What is the relationship between the concept of _____ and _____ in the text? What question(s) is the author answering in the text? Why did the author explain _____ in the text?

I can analyze the structure of a text. I can analyze how specific sections contribute to my understanding of the topic. I can convey the purpose of a section of the text. I can determine why an author provided an explanation. I can determine why an author described a procedure, or discussed an experiment. I can determine what question an author is addressing in a text. I can translate quantitative or technical information from words into a visual like a table or chart. I can translate information expressed visually or mathematically into words. I can compare ideas in a text to information presented in other formats. I can contrast ideas in a text to information presented in other formats. I can identify similarities in information between multiple sources. I can identify discrepancies in information between multiple sources. I can cite specific textual evidence to support my analysis. I can identify useful specific textual evidence for its use in analysis of science and technical texts. I can cite specific textual evidence for its use in supporting the main idea, supporting details, conclusion, and purpose. I am using precise details or explanations or descriptions in my citation. I can recognize and identify the author's claim. I can evaluate the evidence an author uses to support a claim.	Why did the author describe the procedure? What was the author demonstrating with the description of this procedure? How can you summarize the information? How can you summarize the table or chart? How can you express this information mathematically? How can you express this information in a table or chart? How are the ideas in the text similar to those in the experiment/simulation/video/etc.? How are the ideas in the text different from those in the experiment/simulation/video/etc.? What ideas from the text are supported by previous explanations or the other accounts (experiment/simulation/video/etc.)? What ideas from the text are contradicted by previous explanations or the other accounts (experiment/simulation/video/etc.)? What specific text evidence or data is used to support the main idea? How does the text evidence or data support the supporting details of this text? How does the specific text evidence or data from the text support your conclusion? What was the purpose of citing the specific text evidence or data at the time of publication? What are the precise details or explanations or descriptions I am looking to address? How does the author explain how the evidence relates to their claim? How does the author use evidence to support their recommendation for solving a problem?
Resources/Activities Amoebas Sisters Videos (youtube.com) Simulations (Teacher Led) Diagramming (Teacher Led) Chapter 14, 15 and 17 Knowledge Checks (Textbook Site) Geologic Timeline Activity with significant biological events (Teacher Files) Fossil Foods Lab (Teacher Files) Online Review Activities (Kahoot, Quizlet) Schoology Vocabulary Comprehension Assignment (Schoology)	**Assessment(s)** Daily Bellringer Questions Evolution Quiz Timeline Lab Exit Tickets Evolution Test Classification Quiz

Taxonomy research assignment (Teacher Files) Evolution and Taxonomy Interactive Presentations (Teacher Files) Cladogram construction Activity (Teacher Files) Genetic Variation Height Lab (Teacher Files) Peppered Moth scenario with activity (Teacher Files) Darwin's Dangerous Idea Background Video with Comprehension Questions (Teacher Files)	

Duration of Unit 3 weeks	
Unit 8 Theme Bacteria	**Essential Question(s)** How does the structure and cellular processes of bacteria differ from eukaryotic cells?

End of Unit 8 Authentic Learning Task

Bacteria are Everywhere Lab- Students will work in small groups to describe how bacteria are classified and grouped based on shape and arrangement of cells. The functions of specific bacterial cells are also analyzed and related to their effect on humans. Bacteria are observed under a microscope to observe their structure and special characteristics. A rubric and lab report will be used to assess students' mastery.

- I can identify and name bacteria based on their shape and arrangement.
- I can list the uses of both helpful and harmful bacteria that humans interact with.
- I can describe how different types of bacteria reproduce and the advantages of each.

Academic Standards: HS-LS1-3, 9-10LST2.3, 9-10LST3.1, 9-10LST3.2, 9-10.LST4.1, 9-10LST7.2

Pacing: Unit 8, Chapter 18
Quarter 4, 8 class periods, 16 school calendar days

Indiana Academic Standards

HS-LS1-3, 9-10LST2.1, 9-10LST2.2, 9-10LST2.3, 9-10LST3.1, 9-10LST3.2, 9-10LST3.3, 9-10.LST4.1, 9-10.LST4.3, 9-10LST7.2

Academic Vocabulary

bacteria, nucleoid, capsule, pilus, binary fission, conjugation, endospore, virus, capsid, lytic cycle, lysogenic cycle, retrovirus, prion

Key Concepts/Learning Targets	**Question Stems**
I can explain the differences between archaea and bacteria and their subcategories.	What are the differences between archaea and bacteria and their subcategories?

I can describe the survival methods of bacteria at both the individual and population levels. I can list the ways that bacteria are beneficial to humans. I can describe the general structure of a virus. I can list the similarities and differences between the lytic, the lysogenic cycle and retroviral replication. I can describe the relationship between a prion's structure, replication, and action and its ability to cause disease. I can determine the central ideas of a text. I can determine the conclusions of a text. I can follow a multistep procedure for experiments. I can take measurements and perform technical tasks. I can identify what tools or instruments I need for a procedure. I can analyze results of an experiment, including evidence and data to support my conclusion. I can use the context to determine the meaning of words. I can use the context to determine the meaning of symbols. I can analyze the relationship among concepts in a text. I can analyze the structure of a text. I can analyze how specific sections contribute to my understanding of the topic. I can convey the purpose of a section of the text. I can determine why an author provided an explanation. I can determine why an author described a procedure, or discussed an experiment. I can determine what question an author is addressing in a text. I can translate quantitative or technical information from words into a visual like a table or chart. I can translate information expressed visually or mathematically into words. I can compare ideas in a text to information presented in other formats. I can contrast ideas in a text to information presented in other formats. I can identify similarities in information between multiple sources. I can identify discrepancies in information between multiple sources. I can cite specific textual evidence to support my analysis. I can identify useful specific textual evidence for its use in analysis of science and technical texts. I can cite specific textual evidence for its use in supporting the main idea, supporting details, conclusion, and purpose.	What are the survival methods of bacteria at both the individual and population levels? How are bacteria beneficial to humans? What is the general structure of a virus? What are similarities and differences between the lytic, the lysogenic cycle and retroviral replication? What is the relationship between a prion's structure, replication, and action and its ability to cause disease? What is the central idea of this text? What is the purpose of this experiment? What comes first? What are the steps? What is the best unit of measurement to use? What instruments or tools are used? Based on the context, what does the key terms or domain-specific mean? Based on the context, what does this symbol mean? How did the author structure the text? What is the relationship between the concept of _____ and _____ in the text? What question(s) is the author answering in the text? Why did the author explain _____ in the text? Why did the author describe the procedure? What was the author demonstrating with the description of this procedure? How can you summarize the information? How can you summarize the table or chart? How can you express this information mathematically? How can you express this information in a table or chart? How are the ideas in the text similar to those in the experiment/simulation/video/etc.? How are the ideas in the text different from those in the experiment/simulation/video/etc.? What ideas from the text are supported by previous explanations or the other accounts (experiment/simulation/video/etc.)?

I am using precise details or explanations or descriptions in my citation.	What ideas from the text are contradicted by previous explanations or the other accounts (experiment/simulation/video/etc.)? What specific text evidence or data is used to support the main idea? How does the text evidence or data support the supporting details of this text? How does the specific text evidence or data from the text support your conclusion? What was the purpose of citing the specific text evidence or data at the time of publication? What are the precise details or explanations or descriptions I am looking to address?
Resources/Activities Amoebas Sisters Videos (youtube.com) Simulations (Teacher Led) Diagramming (Teacher Led) Identify the Disease Lab (Teacher Files) Chapter 18 Knowledge Checks (Textbook Site) Online Review Activities (Kahoot, Quizlet) Schoology Vocabulary Comprehension Assignment (Schoology) Chapter 18 Interactive Presentations (Teacher Files)	**Assessment(s)** Bacteria Test Daily Bellringer Questions Laboratory Activity Questions Exit Tickets

Duration of Unit 9 3 weeks	
Unit 9 Theme Ecology	**Essential Question(s)** How do biotic and abiotic factors affect populations within an ecosystem?
End of Unit 9 Authentic Learning Task **Biomes Project**- Students will work in pairs to research one of the 8 biomes discussed during this unit and create a presentational piece for the class. This piece will be in the form of either a pamphlet, website or poster which will include all the essential components of a biome such as climate, average temperature, average precipitation amounts, and their seasons. Plants, animals and locations of the biome will also be included and applied to a map. A rubric will be used to assess students' mastery. ● I can identify the characteristics of the 8 different biomes. ● I can describe the types of organisms that live in each of the biomes present on earth. ● I can identify the locations of each of the biomes on earth. ● I can explain how the conditions present in a biome affect the organisms that inhabit it.	

- I can describe some of the adaptations present in organisms that enable them to survive in specific biomes.

Academic Standards: HS-LS2-1, HS-LS2-2, HS-LS2-3,HS-LS2-3, HS-LS2-4, HS-LS2-5, HS-LS2-6, HS-LS2-7, HS-LS2-8, 9-10LST2.3, 9-10LST3.1, 9-10LST3.2, 9-10.LST4.1, 9-10LST7.2

Pacing: Unit 9, Chapters 2, 3, 4, and 5
Quarter 4, 8 class periods, 16 school calendar days

Indiana Academic Standards

HS-LS2-1, HS-LS2-2, HS-LS2-3,HS-LS2-3, HS-LS2-4, HS-LS2-5, HS-LS2-6, HS-LS2-7, HS-LS2-8, 9-10LST2.1, 9-10LST2.2, 9-10LST2.3, 9-10LST3.1, 9-10LST3.2, 9-10LST3.3, 9-10.LST4.1, 9-10.LST4.3, 9-10LST7.2

Academic Vocabulary

ecology, biosphere, biotic factor, abiotic factor, population, biological community, ecosystem, biome, habitat, niche, predation, symbiosis, mutualism, commensalism, parasitism, autotroph, heterotroph, herbivore, carnivore, omnivore, detritivore, trophic level, food chain, food web, biomass, matter, nutrient, biogeochemical cycle, nitrogen fixation, denitrification, community, limiting factor, tolerance, ecological succession, primary succession, climax community, secondary succession, weather, latitude, climate, tundra, boreal forest, temperate forest, woodland, grassland, desert, tropical savanna, tropical seasonal forest, tropical rain forest, sediment, littoral zone, limnetic zone, plankton, profundal zone, wetlands, estuary, intertidal zone, photic zone, aphotic zone, benthic zone, abyssal zone, population density, dispersion, density-independent factor, density-dependent factor, population growth rate, emigration, immigration, carrying capacity, demography, demographic transition, zero population growth, age structure, extinction, biodiversity, genetic diversity, species diversity, ecosystem diversity, background extinction, mass extinction, natural resource, overexploitation, habitat fragmentation, edge effect, biological magnification, eutrophication, introduced species, renewable resource, nonrenewable resource, sustainable use, endemic, bioremediation, biological augmentation

Key Concepts/Learning Targets

- I can explain the difference between abiotic factors and biotic factors.
- I can describe the interactions between the levels of biological communities.
- I can explain the difference between an organism's habitat and its niche.
- I can list the producers and consumers in an ecosystem.
- I can describe the energy flow through an ecosystem.
- I can describe why food chains, food webs, and ecological pyramids are models.
- I can describe how nutrients move through biotic and abiotic parts of an ecosystem.

Question Stems

- What is the difference between abiotic factors and biotic factors?
- What are the interactions between the levels of biological communities?
- What is the difference between an organism's habitat and its niche?
- What are the producers and consumers in an ecosystem?
- How does energy flow through an ecosystem?
- What are food chains, food webs, and ecological pyramid models?
- How do nutrients move through biotic and abiotic parts of an ecosystem?
- Why are nutrients important to living organisms?

• I can describe why nutrients are important to living organisms. • I can describe the biogeochemical cycling of nutrients and how the systems are alike. • I can describe how abiotic and biotic factors affect species. • I can explain how ranges of tolerance affect the distribution of organisms. • I can list the stages of primary and secondary succession. • I can explain how latitude is related to the three major climate zones. • I can list the major abiotic factors that determine the location of a terrestrial biome. • I can describe how terrestrial biomes are distinguished based on climate and biotic factors. • I can list the major abiotic factors that determine aquatic ecosystems. • I can describe the transitional aquatic ecosystems and explain why they are important. • I can describe the zones of marine ecosystems. • I can explain the characteristics of populations and how they are distributed. • I can explain the differences between density-independent and density-dependent limiting factors. • I can list the similarities between the different models used to quantify the growth of a population. • I can explain how carrying capacity affects reproductive rates. • I can list some aspects that affect human population growth. • I can describe the trends in human population growth. • I can describe the age structures of representative nongrowing, slowly growing, and rapidly growing countries. • I can describe the possible consequences of continued population growth. • I can describe the three types of biodiversity. • I can explain why biodiversity is important. • I can describe the direct and indirect values of biodiversity. • I can list the threats to biodiversity. • I can explain why the current extinction rate is different from the	• What are the biogeochemical cycles of nutrients and how are they alike? • How do unfavorable abiotic and biotic factors affect species? • How do ranges of tolerance affect the distribution of organisms? • What are the stages of primary and secondary succession? • How is latitude related to the three major climate zones? • What are the major abiotic factors that determine the location of a terrestrial biome? • How are terrestrial biomes distinguished based on climate and biotic factors? • What are the major abiotic factors that determine aquatic ecosystems? • What are transitional aquatic ecosystems and why are they important? • What are the zones of marine ecosystems? • What are the characteristics of populations and how are they distributed? • What are the differences between density-independent and density-dependent limiting factors? • What are the similarities between the different models used to quantify the growth of a population? • How does carrying capacity affect reproductive rates? • What aspects affect human population growth? • What are the trends in human population growth? • What are the age structures of representative nongrowing, slowly growing, and rapidly growing countries? • What might be the consequences of continued population growth? • What are the three types of biodiversity? • Why is biodiversity important? • What are the direct and indirect values of biodiversity? • What are the threats to biodiversity? • How is the current extinction rate different from the background extinction rate? • How can the decline of a single species affect an entire ecosystem?

background extinction rate. ● I can explain how the decline of a single species affects an entire ecosystem. ● I can describe the two classes of natural resources. ● I can describe the methods used to conserve biodiversity. ● I can describe the two techniques used to restore biodiversity. ● I can determine the central ideas of a text. I can determine the conclusions of a text. ● I can follow a multistep procedure for experiments. I can take measurements and perform technical tasks. ● I can identify what tools or instruments I need for a procedure. I can analyze results of an experiment, including evidence and data to support my conclusion. ● I can use the context to determine the meaning of words. ● I can use the context to determine the meaning of symbols. ● I can analyze the relationship among concepts in a text. ● I can analyze the structure of a text. I can analyze how specific sections contribute to my understanding of the topic. I can convey the purpose of a section of the text. ● I can determine why an author provided an explanation. I can determine why an author described a procedure, or discussed an experiment. ● I can determine what question an author is addressing in a text. ● I can translate quantitative or technical information from words into a visual like a table or chart. ● I can translate information expressed visually or mathematically into words. ● I can compare ideas in a text to information presented in other formats. ● I can contrast ideas in a text to information presented in other formats. I can identify similarities in information between multiple sources. ● I can identify discrepancies in information between multiple sources. ● I can cite specific textual evidence to support my analysis.	● What are the two classes of natural resources? ● What are the methods used to conserve biodiversity? ● What are two techniques used to restore biodiversity? ● What is the central idea of this text? ● What is the purpose of this experiment? ● What comes first? ● What are the steps? ● What is the best unit of measurement to use? ● What instruments or tools are used? ● Based on the context, what does the key terms or domain-specific mean? ● Based on the context, what does this symbol mean? ● How did the author structure the text? ● What is the relationship between the concept of _____ and _____ in the text? ● What question(s) is the author answering in the text? ● Why did the author explain _____ in the text? ● Why did the author describe the procedure? ● What was the author demonstrating with the description of this procedure? ● How can you summarize the information? ● How can you summarize the table or chart? ● How can you express this information mathematically? ● How can you express this information in a table or chart? ● How are the ideas in the text similar to those in the experiment/simulation/video/etc.? ● How are the ideas in the text different from those in the experiment/simulation/video/etc.? ● What ideas from the text are supported by previous explanations or the other accounts (experiment/simulation/video/etc.)? ● What ideas from the text are contradicted by previous explanations or the other accounts (experiment/simulation/video/etc.)? ● What specific text evidence or data is used to support the main idea?

• I can identify useful specific textual evidence for its use in analysis of science and technical texts. I can cite specific textual evidence for its use in supporting the main idea, supporting details, conclusion, and purpose. • I am using precise details or explanations or descriptions in my citation.	• How does the text evidence or data support the supporting details of this text? How does the specific text evidence or data from the text support your conclusion? • What was the purpose of citing the specific text evidence or data at the time of publication? What are the precise details or explanations or descriptions I am looking to address?
Resources/Activities • Amoebas Sisters Videos (youtube.com) • Chapters 2-5 Knowledge Checks (Textbook Site) • Online Review Activities (Kahoot, Quizlet) • Schoology Vocabulary Comprehension Assignment (Schoology) • Chapter 2-5 Interactive Presentations (Teacher Files) • Data Analysis Lab Chapter 2-1 Energy Flow (Textbook Site) • Chapter 2 Venn Diagram Autotrophs vs Heterotrophs (textbook site) • Chapter 2 Webqwest- To Dam or not to Dam (Textbook Site) • BioLab Habitat Size and Diversity (Textbook) • Marine Ecosystem Lab 3-3 (Textbook Site) • Describing Populations Mapping Activity Chapter 4 (Textbook Site) • Population Density Paramecium Lab 4-1 (Textbook Site) • Human Population Growth and Climate Change Study (Teacher Files) (Netlogo site) • Lynx Endangered Species Study (Teacher Files) • Deer Predation Starvation Analysis (Teacher Files) • Zebra Mussels Case Study (Teacher Files) • Water Quality Lab 5-2 (Textbook Site) • Missouri Botanical Garden Site with Biome Info (mbgnet.net) • Element Cycling Diagramming (Teacher Files)	**Assessment(s)** • Ecology Test • Daily Bellringer Questions • Laboratory Activity Questions • Exit tickets

Indiana Academic Standards Addressed and Assessed Each Term
Biology
(A=assessed; I=introduced; P=practiced; R=reviewed)
(Green=high priority; Yellow=moderate priority; Blue=low priority)

Standard	Standard Statement	Term 1	Term 2	Term 3	Term 4
From Molecules to Organisms: Structures and Processes					
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.			I, A, P	R
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	I, P, A	R		
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.	I, P, A			
HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.		I, P, A	R	
HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	I, P, A	R		R
HS-LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.	I	P, A, R		R
HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	I	P, A, R		R
Ecosystems: Interactions, Energy and Dynamics					
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.				I, P. A, R
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.				I, P. A, R
HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter				I, P. A, R

	and flow of energy in aerobic and anaerobic conditions.				
HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.				I, P. A, R
HS-LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.	I			P, A, R
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.				I, P. A, R
HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.				I, P. A, R
HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.			I, P, A	R
Heredity: Inheritance and Variation of Traits					
HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.		I, P, A, R	R	R
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors		I	P, A, R	
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.		I, P, A, R		R
Biological Evolution: Unity and Diversity					
HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.			I, P. A, R	

HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.			I, P. A, R	
HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.			I, P. A, R	R
HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.			I, P. A, R	R
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.			I, P. A, R	R
HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.				I, P. A, R
Literacy in Science and Technical Subjects					
9-10.LST.2.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.	I, P, A	R	R	R
9-10.LST.2.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.	I, P, A	R	R	R
9-10.LST.2.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.	I, P, A, R	P, R	P, R	P, R

9-10.LST.3.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.	I, P, A, R	P, R	P, R	P, R
9-10.LST.3.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).	I, P, A	R	R	R
9-10.LST.3.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.	I	P		
9-10.LST.4.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	I, P	P	P, A	R
9-10.LST.4.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.	I	P		
9-10.LST.4.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.	I, P, A, R			
9-10.LST.5.1	Write arguments focused on discipline-specific content.	I	P		
9-10.LST.5.2	Write informative texts, including scientific procedures/experiments or technical processes that include precise descriptions and conclusions drawn from data and research.	I, P, A, R	P, R	P, R	P, R
9-10.LST.6.1	Plan and develop; draft; revise using appropriate reference materials; rewrite; try a new approach, focusing on addressing what is most significant for a specific purpose and audience; and edit to produce and strengthen writing that is clear and coherent.	I, P, A		R	

9-10.LST.6.2	Use technology to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	I, P, A	R	R	R
9-10.LST.7.1	Conduct short as well as more sustained research assignments and tasks to answer a question (including a self-generated question), test a hypothesis, or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.		I, P, A	R	R
9-10.LST.7.2	Gather relevant information from multiple authoritative sources, using advanced searches effectively; annotate sources; assess the usefulness of each source in answering the research question; synthesize and integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation (e.g., APA or CSE).	I, P, A	R	R	R