EGG HARBOR TOWNSHIP PUBLIC SCHOOLS
CURRICULUM

Honors (HN) Biology
High School

Length of Course:	Full Year
Elective / Required:	Refer to Program of Studies
Schools:	High School
Student Eligibility:	Grades 9 – 12
Credit Value:	5 credits
Date Submitted:	September 2016
Date Approved:	

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This curriculum guide was prepared by:

Ashle Cocca – High School
Michael Dannenhauer – High School
Christa Delaney – High School
Michelle Fitzgerald – High School
Kimberly Herman – High School
Kyle Herman – High School
Jonelle Scardino – High School

Coordinated by: **Rodney Velardi – Supervisor of Science, K-12**

DISTRICT MISSION STATEMENT

Our mission in the Egg Harbor Township School District is to partner with the student, family, school, and community to provide a safe learning environment that addresses rigorous and relevant 21st Century standards and best practices which will develop academic scholarship, integrity, leadership, citizenship, and the unique learning style of students, while encouraging them to develop a strong work ethic and to act responsibly in their school community and every day society.

SCIENCE – PHILOSOPHY

We believe that ALL students regardless of race, ethnicity, socio-economic status, religious background, and/or any other classification are deserving of a holistic science education. This holistic approach would include an education that will allow them to fully discover themselves, their strengths and weaknesses, and benefit from science instruction.

> Scientific literacy assumes an increasingly important role in the context of globalization. The rapid pace of technological advances, access to an unprecedented wealth of information, and the pervasive impact of science and technology on day-to-day living require a depth of understanding that can be enhanced through quality science education. In the 21st century, science education focuses on the practices of science that lead to a greater understanding of the growing body of scientific knowledge that is required of citizens in an ever-changing world (NJCCCS-Science).

Science curricula are designed to reinforce 21st Century Learning, to maximize rigor, relevance, and relationships, and to engage students individually through differentiated instruction.

SCIENCE - STATEMENT OF PURPOSE

Education exists for the purpose of enabling each individual to realize and maintain her/his full potential. Scientifically literate students possess the knowledge and understanding of scientific concepts and processes required for personal decision-making, participation in civic and cultural affairs, and economic productivity.

> Science, engineering, and technology influence and permeate every aspect of modern life. Some knowledge of science and engineering is required to engage with the major public policy issues of today as well as to make informed everyday decisions, such as selecting among alternative medical treatments or

> determining how to invest public funds for water supply options. In addition, understanding science and the extraordinary insights it has produced can be meaningful and relevant on a personal level, opening new worlds to explore and offering lifelong opportunities for enriching people's lives. In these contexts, learning science is important for everyone, even those who eventually choose careers in fields other than science or engineering (NJSLS-Science)
>
> All students engage in science experiences that promote the ability to ask, find, or determine answers to questions derived from natural curiosity about everyday things and occurrences. The underpinning of the revised standards lies in the premise that science is experienced as an active process in which inquiry is central to learning and in which students engage in observation, inference, and experimentation on an ongoing basis, rather than as an isolated a process. When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others in their community and around the world. They actively develop their understanding of science by identifying their assumptions, using critical and logical thinking, and considering alternative explanations (NJCCCS-Science).

Our school district provides an extensive science program, which will enable students to succeed and compete in the global marketplace using the New Jersey Student Learning Standards in Science as well as the Next Generation Science Standards.

INTRODUCTION

The most precious resource teachers have is time. Regardless of how much time a course is scheduled for, it is never enough to accomplish all that one would like. Therefore, it is imperative that teachers utilize the time they have wisely in order to maximize the potential for all students to achieve the desired learning.

High quality educational programs are characterized by clearly stated goals for student learning, teachers who are well-informed and skilled in enabling students to reach those goals, program designs that allow for continuous growth over the span of years of instruction, and ways of measuring whether students are achieving program goals.

THE EGG HARBOR TOWNSHIP SCHOOL DISTRICT CURRICULUM TEMPLATE

The Egg Harbor Township School District has embraced the backward-design model as the foundation for all curriculum development for the educational program. When reviewing curriculum documents and the Egg Harbor Township curriculum template, aspects of the backward-design model will be found in the stated enduring *understandings/essential questions, unit assessments,* and *instructional activities*. Familiarization with backward-design is critical to working effectively with Egg Harbor Township's curriculum guides.

GUIDING PRINCIPLES: WHAT IS BACKWARD DESIGN?
WHAT IS UNDERSTANDING BY DESIGN?

"Backward design" is an increasingly common approach to planning curriculum and instruction. As its name implies, "backward design" is based on defining clear goals, providing acceptable evidence of having achieved those goals, and then working 'backward' to identify what actions need to be taken that will ensure that the gap between the current status and the desired status is closed.

Building on the concept of backward design, Grant Wiggins and Jay McTighe (2005) have developed a structured approach to planning programs, curriculum, and instructional units. Their model asks educators to state goals; identify deep understandings, pose essential questions, and specify clear evidence that goals, understandings, and core learning have been achieved.

Programs based on backward design use desired results to drive decisions. With this design, there are questions to consider, such as: What should students understand, know, and be able to do? What does it look like to meet those goals? What kind of program will result in the outcomes stated? How will we know students have achieved that result? What other kinds of evidence will tell us that we have a quality program? These questions apply regardless of whether they are goals in program planning or classroom instruction.

The backward design process involves three interrelated stages for developing an entire curriculum or a single unit of instruction. The relationship from planning to curriculum design, development, and implementation hinges upon the integration of the following three stages.

Stage I: Identifying Desired Results: Enduring understandings, essential questions, knowledge and skills need to be woven into curriculum publications, documents, standards, and scope and sequence materials. Enduring understandings identify the "big ideas" that students will grapple with during the course of the unit. Essential questions provide a unifying focus for the unit and students should be able to answer more deeply and fully these questions as they proceed through the unit. Knowledge and skills are the ***"stuff"*** upon which the understandings are built.

Stage II: Determining Acceptable Evidence: Varied types of evidence are specified to ensure that students demonstrate attainment of desired results. While discrete knowledge assessments (e.g.: multiple choice, fill-in-the-blank, short answer, etc…) will be utilized during an instructional unit, the overall unit assessment is performance-based and asks students to demonstrate that they have mastered the desired understandings. These culminating (summative) assessments are authentic tasks that

students would likely encounter in the real-world after they leave school. They allow students to demonstrate all that they have learned and can do. To demonstrate their understandings students can explain, interpret, apply, provide critical and insightful points of view, show empathy and/or evidence self-knowledge. Models of student performance and clearly defined criteria (i.e.: rubrics) are provided to all students in advance of starting work on the unit task.

Stage III: Designing Learning Activities: Instructional tasks, activities, and experiences are aligned with stages one and two so that the desired results are obtained based on the identified evidence or assessment tasks. Instructional activities and strategies are considered only once stages one and two have been clearly explicated. Therefore, congruence among all three stages can be ensured and teachers can make wise instructional choices.

At the curricular level, these three stages are best realized as a fusion of research, best practices, shared and sustained inquiry, consensus building, and initiative that involves all stakeholders. In this design, administrators are instructional leaders who enable the alignment between the curriculum and other key initiatives in their district or schools. These leaders demonstrate a clear purpose and direction for the curriculum within their school or district by providing support for implementation, opportunities for revision through sustained and consistent professional development, initiating action research activities, and collecting and evaluating materials to ensure alignment with the desired results. Intrinsic to the success of curriculum is to show how it aligns with the overarching goals of the district, how the document relates to district, state, or national standards, what a high quality educational program looks like, and what excellent teaching and learning looks like. Within education, success of the educational program is realized through this blend of commitment and organizational direction.

INTENT OF THE GUIDE

This guide is intended to provide teachers with course objectives and possible activities, as well as assist the teacher in planning and delivering instruction in accordance with the New Jersey Core Curriculum Content Standards. The guide is not intended to restrict or limit the teacher's resources or individual instruction techniques. It is expected that the teacher will reflectively adjust and modify instruction and units during the course of normal lessons depending on the varying needs of the class, provided such modified instruction attends to the objectives and essential questions outlined below.

N.J.A.C. 6A:8-3.1 Required Curriculum Components

Code Language	Evident in Curriculum YES/NO	Comments
Interdisciplinary Connections	**Yes**	**Via lab activities. STEM units in development 1 per marking period**
A pacing guide	**Yes**	**By Unit approximately 2-4 units per marking period**
A list of core instructional materials, including various levels of text at each grade level	**Yes**	**Suggested Activities Labs**
Benchmark assessments	**Yes**	**Teacher-developed and common via pre/post and benchmark assessments**
Modifications for special education students, for ELLs in accordance with N.J.A.C. 6A:15, and for gifted students. (As appropriate) – See Appendix A	**Yes**	**As directed by student's Individual Education Plan**

1Unit Name:** **Exploring Life** **Time Frame:** *1 week (summer work)*

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology Country: **USA**

Course/Grade: 9th State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

Students must understand that life encompasses a hierarchy of organization, living things interact with their environment, and that all life shares common features. Evolution by natural selection is the core theme of biology that students are introduced to here. Students must realize that science seeks natural causes for natural phenomena and that technology applies scientific knowledge to specific needs and purposes.

UNIT RESOURCES

Textbook, sections from study guide manual, student designed outline, practice test, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint

STAGE ONE

GOALS AND STANDARDS

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

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.

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.

ENDURING UNDERSTANDINGS

Students will understand that…

- Living things share certain characteristics that differentiate them from the nonliving world.

ESSENTIAL QUESTIONS

- What is life?
- What is science?
- What is the best way for biologists to organize living things?
- What role does science play in the study of life?

KNOWLEDGE AND SKILLS

- Vocabulary:

Stimulus, asexual reproduction, sexual reproduction, homeostasis, hypothesis, controlled experiment, independent variable, dependent variable, control group, autotroph, heterotroph

- Skills:

  - Use tools, evidence and data to observe, measure, and explain phenomena in the natural world
  - Construct and refine explanations, arguments or models of the natural world through the use of quantitative and qualitative evidence and data
  - Ask a question and decide what to measure in order to answer the question
  - Develop strategies for obtaining measurements, then systematically collecting data
  - Gather, interpret, and evaluate data
  - Use the empirical results to determine causal/correlational relationships
  - Recognize that predictions and explanations can be revised on the basis of seeing new data and evidence
  - Use data and evidence to modify and extend investigations
  - Following directions (general=book cover) (scientific lab procedures)
  - Metric Measurement techniques
  - Internet Research techniques (how to: log in to computer, access textbook online, available online resources, maneuver teacher websites, Edmodo, research using search engine, find scientific sources, paraphrase and cite properly)
  - Citing scientific sources
  - Outline

STAGE TWO

PERFORMANCE TASKS

- In class review of Independent Summer work in groups
- Successfully complete practice test in groups
- Make a foldable of the current classification system to ensure understanding
- Book Cover
- Measurement
- Computer lab
- Experiment Design
- Stones Article
- Lab Safety Meme
- Chapter Test

OTHER EVIDENCE

- Design Your Own Experiment Activity to determine understanding of concepts

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings

Misunderstandings/Teaching Tips

- Current descriptions of classification may be contrary to what students understand
- Revisions in classification is an opportunity to reflect on the nature of science noting new information is used to revise our understandings

2Unit Name: The Chemical Basis of Life**

Time Frame: 5 *weeks (1-week summer work and 4 weeks in-school learning)*

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology

Country: **USA**

Course/Grade: 9th

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

Living things are made of chemical elements and the arrangement of electrons determines chemical properties. Acids and bases are important chemicals in living systems and the pH scale describes how acidic/basic a solution is. Living things carry out a myriad of chemical reactions. Carbon compounds of life (carbohydrates, lipids, proteins, and nucleic acids) all have unique properties that all help construct living things for survival.

UNIT RESOURCES

Textbook Chs. 2-3), sections from study guide manual, student designed outline, practice test, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint

STAGE ONE

GOALS AND STANDARDS

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.

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.

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter 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.

ENDURING UNDERSTANDINGS

Students will understand that…

- Biological systems utilize energy and molecular building blocks to grow, reproduce, and maintain homeostasis.

ESSENTIAL QUESTIONS

- How can the same compounds make up living and non-living things?
- How do chemicals combine and break apart inside living things?

KNOWLEDGE AND SKILLS

- Vocabulary:

hydrogen bond, cohesion, adhesion, mixture, solution, solute, solvent, suspension, pH scale, acid, base, buffer, monomer, polymer, carbohydrate, monosaccharide, lipid, nucleic acid, nucleotide, protein, amino acid

- Skills:

  - Create a model of the four major categories of organic molecules (carbohydrates, fats, proteins, and nucleic acids) using unique characteristics and primary functions
  - Determine why each major category of organic molecule is essential to life
  - Identify the six elements most common to biological organisms: carbon, hydrogen, oxygen, nitrogen, phosphorous and sulfur
  - Analyze and explain how cells carry out a variety of chemical transformations that allow conversion of energy from one form to another, the breakdown of molecules into smaller units, and the building of larger molecules from smaller ones
  - Explain how molecules are used to assemble larger molecules with biological activity (including proteins, DNA, sugars and fats)
  - Recognize that food molecules are taken into cells and react to provide the chemical constituents needed to synthesize other molecules, and knowing that the breakdown and synthesis are made possible by enzymes
  - Recognize that most chemical transformations are made possible by protein catalysts called enzymes
  - Identify enzymes as proteins, and determine how they catalyze biochemical reactions
  - Demonstrate that the activities of enzymes are affected by the temperature, ionic conditions, and the pH of the surroundings

STAGE TWO

PERFORMANCE TASKS

- In class review of Independent Summer work in groups
- Successfully complete practice test in groups
- Activity demonstrating ability to differentiate between atomic number, mass number, numbers of protons, neutrons and electrons.
- Draw atomic model of various atoms
- Distinguish between various bonds and how they function and be able to draw the bonds
- Essays and Application Question practice in groups
- Balloon Activity
- pH scenario
- Data Collection
- Model building
- Calculations of calories
- Chapter Tests
- Open Ended Responses
- Review Game
- Water Olympics Lab: Students will create various hypotheses regarding different properties of water such as cohesion (ex. how many drops on a penny), adhesion, capillary action, hydrophobic properties, etc.
- pH Lab: Comparing unknowns to standard pH values
- Organic Model Lab: Students construct organic compound model using kits

OTHER EVIDENCE

- Complete Exercise 3 and 4 from Study Guide
- Functional Group Flashcards
- "Bug Nutrition" Article: Students read and interpret a National Geographic article regarding how bugs are used for nutrition in various areas of the world.
- Exercise 10: Concept Map of Macromolecules
- Exercise 2: Identifying Functional groups
- Exercise 8: Protein Structure
- "Organic Macromolecules Worksheets": Identifying features, uses and structure of macromolecules

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings
- PowerPoint Presentation of material
- Online Chapter Assignments
- Assembly of 3-D models

- Reaction Activity
- Nutrition – food labels, create diet, calculate calories in and calories burned

Misunderstandings/Teaching Tips

- Chemical Bonding: Students are unfamiliar with bonding and electrons. Differentiating between covalent and ionic bonding a source of confusion.
    - Students will draw atoms showing ionic bonding and covalent bonding in order to identify the difference between the two.
- The concept of molecular building blocks that cannot be seen can be abstract and difficult to comprehend for students
    - Students will assemble 3-D models of functional groups and aid memorization using flash cards
- **[Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]**
- **[Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]**

3Unit Name: Life of Cells** **Time Frame: 5** *weeks*

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology Country: **USA**

Course/Grade: 9th State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

Cell size is limited by the amount of surface area required for exchange with the environment; Eukaryotic and prokaryotic cells are different structurally; plasma membranes are structurally and functionally important for cells; cell structures serve specific roles for the cell. Membranes are fluid mosaics of phospholipids and proteins; different transport processes are used by cells; ATP is important for processes involving cellular work; enzymes speed up chemical reactions for the cell.

UNIT RESOURCES

Textbook Chs. 4-5), sections from study guide manual, student designed outline, practice test, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint

STAGE ONE

GOALS AND STANDARDS

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

ENDURING UNDERSTANDINGS

Students will understand that…

- Living organisms are composed of cellular units that carry out functions required for life.

ESSENTIAL QUESTIONS

- How do cells maintain conditions necessary for survival?
- How do multicellular organisms grow and develop from a single cell?
- Why is it important to study cells?

KNOWLEDGE AND SKILLS

- Vocabulary:

homeostasis, passive transport, diffusion, osmosis, active transport, ion pumps, differentiation, specialization, stem cells, cell theory, cell membrane, nucleus, prokaryote, eukaryote

- Skills:

- Model how processes are regulated both internally and externally by environments in which cells exist
- Model how cells are enclosed within semi-permeable membranes that regulate their interaction with their surroundings, including the transport of materials into and out of the cell
- Describe the relationships within multi-cellular organisms, where cells perform specialized functions as parts of sub-systems (e.g., tissues, organs, and organ systems), which work together to maintain optimum conditions for the benefit of the whole organism
- Analyze and explain how cells carry out a variety of chemical transformations that allow conversion of energy from one form to another, the breakdown of molecules into smaller units, and the building of larger molecules from smaller ones

STAGE TWO

PERFORMANCE TASKS

- In class review of Independent Summer work in groups
- Successfully complete practice test in groups
- Essays and Application Question practice in groups
- Chapter Test
- Open Ended Responses
- Review Game
- 1st Quarterly Exam and Open Ended Response
- Construction of 3-D Models
- Team teach aspects of Endomembrane System
- Experimentation of active and passive transport through a semi permeable membrane
- Team Teach Thermodynamics and Enzyme Structure and function
- Project: Cell Newspaper (create, design and write a newspaper about cells, for cells)
- Comparing Plant and Animal Cells Lab: Students view various cells under a microscope in order to identify organelles, size, and function.
- Magna cell Lab: Students use magnetized pieces to construct a cell
- Cell Membrane Lab: Students use crafts to design a 3-D model of a cell membrane
- Diffusion and Osmosis Lab: Students set up and witness the diffusion of various substance through a semi permeable membrane

- Toothpickase Lab: Students use the hands (enzyme) to break toothpicks (substrate) to examine how an enzyme operates under various conditions.
- Organic Molecule Models
- Reaction Activity
- Nutrition – food labels, create diet, calculate calories in and calories burned

OTHER EVIDENCE

- Introduction to the Cell Worksheet
- Cell Structure and Function Packet: Overview of organelles, structure and function; structure and function of cell membrane
- Chapter 4
    - Exercise 2: Surface Area to Volume
- Chapter 5
    - Exercise 3: Osmosis
    - Exercise 6: Differences between words or phrases in specific sets (ex. Potential and kinetic energy)

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings
- PowerPoint Presentations
- Online Chapter Assignments
- Team teaching
- Inquiry Based Activities

Misunderstandings/Teaching Tips

- Students easily confuse hypertonic and hypotonic solutions.
    - Egg Experiment to visually observe movement of water/molecules
- Energy coupling at the cellular level
    - Relate to real world examples (ex. Money)
- Induced fit/ Enzyme Substrate complex
    - Relate to fit of a glove on a hand
    - Toothpickase Lab
- [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.]
- [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]
- [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.]
- [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

4Unit Name: Never Ending Cycle – Respiration and Photosynthesis**

Time Frame: 3 *weeks*

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology

Country: **USA**

Course/Grade: 9th

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

There is potential energy in the arrangement of electrons; cellular respiration allows electrons to fall from their higher-energy positions in food to oxygen, where they have lower energy. Cellular respiration occurs in 3 main stages; the inner mitochondrial membrane carries out oxidative phosphorylation; many foods can be burned in cellular respiration to make ATP. Photoautotrophs carry out photosynthesis, a redox process, occurring in chloroplasts in plants; In light reactions, light excites electrons in chlorophyll; in the Calvin Cycle, the synthesis of sugars occurs; C4 and CAM plants utilize adaptive strategies to avoid water loss yet still fix sugar; photosynthesis could mitigate the CO2 (greenhouse gas) increase, but deforestation and fossil fuel consumption contributes to global warming.

UNIT RESOURCES

Textbook Chs. 6-7), sections from study guide manual, student designed outline, practice test, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint

STAGE ONE

GOALS AND STANDARDS

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.

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter 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.

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.

ENDURING UNDERSTANDINGS

Students will understand that…

- All organisms require energy to perform the cellular functions necessary to support life.

ESSENTIAL QUESTIONS

- What is the source of energy in living things?
- How can sunlight be considered a nutrient?
- How do organisms store and carry energy?

KNOWLEDGE AND SKILLS

- Vocabulary:

Adenosine Triphosphate, alcohol fermentation, cellular respiration, chemiosmosis, citric acid cycle, electron transport chain, lactic acid fermentation, oxidative phosphorylation, redox reaction, reduction, substrate-level phosphorylation, heterotrophy, autotroph, photosynthesis, pigment, chlorophyll, Calvin cycle, electromagnetic spectrum, global warming, greenhouse effect, light reactions, mesophyll, photon, photophosphorylation, photorespiration, photosystem, reaction center complex, stoma, stroma, thylakoid, wavelength.

- Skills:

- Explain how the fundamental life processes of organisms depend on a variety of chemical reactions that occur in specialized areas of the organism's cells
- Recognize that the chemical bonds of food molecules contain energy, which is released when the bonds of food molecules are broken and new compounds with lower energy bonds are formed
- Recognize that the process of photosynthesis as provides a vital connection between the sun and the energy needs of living systems
- Describe how plants capture energy by absorbing light and use it to form strong chemical bonds between the atoms of carbon-containing molecules
- Design independent investigations to determine the effects of changing environmental factors on photosynthesis
- Examine how the breakdown of some food molecules enables the cell to store energy in specific molecules that are used to carry out the many functions of the cell
- Trace the process in which nutrients are transported to cells to serve as building blocks for the synthesis of structures and as reactants for cellular respiration
- Recognize that food molecules are taken into cells and react to provide the chemical constituents needed to synthesize other molecules, and knowing that the breakdown and synthesis are made possible by enzymes

STAGE TWO

PERFORMANCE TASKS

- Essays and Application Question practice in groups
- Chapter Test
- Open Ended Responses
- Review Game
- Vocabulary Quiz
- Muscle Fatigue Lab**:** Relationship between respiration and ATP production; charting and interpreting results
- Online Photosynthesis Simulation: Students change light wavelengths and intensity to see the effect on the rate of photosynthesis
- **CR Breathing in straw activity**
- **Muscle Fatigue**
- **CR "Racetrack Activity"**
- **CR Game Design**
- **Show white light using prisms**
- **Energized e- simulation (roller coaster)**
- **Photosynthesis lab**
- **Scavenger hunt questions in groups**
- **Photosynthesis flip book**

OTHER EVIDENCE

- Membrane Structure and Function Packet
- Cell Transport Packet
- Diffusion and Osmosis affect our everyday lives: Group Activity discussing various scenarios
- Marathon Run Article: Students read and analyzed article and answered questions using terminology and concepts from chapter
- Review worksheet comparing photosynthesis and cellular respiration
- Chapter 6
    - Exercise 7: Affect of poisons on the ETC
    - Exercise 8: Stages of Cellular Respiration
- Chapter 7:
    - Exercise 3: Photosynthesis Equation
    - Exercise 4: Diagram over viewing photosynthesis
    - Exercise 9: greenhouse Effect

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings
- Powerpoint Presentations
- Online Chapter Assignments
- Team teaching
- Inquiry Based Activities
- Use of online resources

Misunderstandings/Teaching Tips

- Students focus too much on the details and devote little attention to the overall process
    - General diagram of overall process
    - Act out overall inputs and outputs
- Confusion regarding when fermentation occurs vs. aerobic respiration
    - Real world scenarios to discuss
    - Have students demonstrate how aerobic exercise leads to fermentation (ex. Prolonged jumping jacks)
    - Muscle Fatigue Lab
- Relate plant growth to Carbon Fixation
    - Relate to how heterotrophs eat food to grow; plants use CO2 from the air to make the compounds for growth
- Differentiating between light and dark reaction and understanding how they work together
    - General diagram of overall process
- [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.]
- [Assessment Boundary: Assessment does not include specific biochemical steps.]
- [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.]
- [Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.]
- [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.]
- [Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.]
- [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.]
- [Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.]
- [Clarification Statement: Examples of models could include simulations and mathematical models.]
- [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]

5Unit Name: The Cellular Basis of Reproduction and Inheritance**

Time Frame: 2 *weeks*

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology

Country: **USA**

Course/Grade: 9th

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

Cell division plays many important roles in the lives of organisms; prokaryotes reproduce by binary fission; the eukaryotic cell cycle and mitosis occurs as cells divide; meiosis and crossing over are ways that new combinations of traits result in organisms; alterations of chromosome number and structure play roles in speciation, adaptation, birth defects and cancer.

UNIT RESOURCES

Textbook Ch. 8), sections from study guide manual, student designed outline, practice test, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint

STAGE ONE

GOALS AND STANDARDS

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

ENDURING UNDERSTANDINGS

Students will understand that…

- Living systems store, retrieve, transmit, and respond to information essential to life processes.
- Organisms reproduce, develop, and have predictable life cycles.

ESSENTIAL QUESTIONS

- How can you tell what the offspring is going to be like of 2 specific parents?
- How is genetic information passed from one generation to the next?
- How do changes in genetic information affect organisms?
- Why is it that in any organism certain genes are turned on or off?
- How do new traits affect an organism and a population?

KNOWLEDGE AND SKILLS

- Vocabulary:

nucleic acids, DNA, RNA, nucleotides, replication, protein synthesis, transcription, translation, mutation, cell division, chromosome, cytokinesis, prophase, metaphase, anaphase, telophase, cloning, sex-linked, crossing over

- Skills:

  - Identify genes as a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism
  - Recognize that the instructions for specifying the characteristics of the organism are carried in DNA, a large polymer formed from subunits of four kinds (adenine, thymine, guanine, and cytosine)
  - Explain how the chemical and structural properties of DNA allow for genetic information to be both encoded in genes and replicated
  - Recognize that changes in DNA (mutations) occur spontaneously at low rates, and some of these changes make no difference to the organism, whereas others can change cells and organisms
  - Explain how the many cells in an individual can be very different from one another, even though they are all descended from a single cell and thus have essentially identical genetic instructions
  - Trace the general process where the progeny from a single cell form an embryo in which the cells multiply and differentiate to form the many specialized cells, tissues and organs that comprise the final organism
  - Present evidence that supports the concept that complex multicellular organisms are formed as a highly organized arrangement of differentiated cells
  - Relate the specialization of cells in multicellular organisms to the different patterns of gene expression rather than to differences of the genes themselves
  - Recognize that certain chemicals, pathogens, and high-energy radiation can seriously impair normal cell functions and the health of the organism
  - Explain the process where an egg and sperm unite to begin the development of a new individual, and how that new individual receives genetic information from its parents
  - Explain how sexually produced offspring are never identical to either of their parents
  - Understand how new heritable characteristics can result from new combinations of existing genes in reproductive cells

STAGE TWO

PERFORMANCE TASKS

- Essays and Application Question practice in groups
- Chapter Test

- Open Ended Responses
- Review Game
- Vocabulary Quiz
- Alterations of Chromosome Number and Structure: Describe various mutations and their effects on the body
- Model building
- Calculations (surface area, volume, ratios)
- Internet research (cancer & stem cells)
- Debate (stem cells)
- Cell Division Model
- Surface Area to Volume Ratio Cubes
- Microscope prepared slides
- Cancer Research Project
- Clay/Bead Models
- Internet Simulations
- Meiosis and Fertilization representation
- Interpret abnormal karyotypes
- Nondisjunction clay simulation lab

OTHER EVIDENCE

- Observing Mitosis Lab: Students use microscope to view and identify various stages of Mitosis
- Modeling Meiosis Lab: Students use clay and paper plates to model the stages of Meiosis
- Exercise 3: The Cell Cycle
- Exercise 9: Differentiation between pairs of terms
- Exercise 11: Comparing Mitosis and Meiosis
- Exercise 14: Identifying problems and effects of Chromosomal Abnormalities

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings
- Powerpoint Presentations
- Online Chapter Assignments
- Team teaching
- Inquiry Based Activities
- Model chromosome structure and movement in stages of Meiosis
- Developing microscope skills by identifying stages of cell cycle

Misconceptions

- Students confuse "daughter" with gender and offspring
    - Clarify during lesson
- Students confuse the various forms of DNA and why they are in different forms
    - Repetition with visual aides
- [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]

6Unit Name: Patterns of Inheritance and Molecular Biology of the Gene**

Time Frame: 5 *weeks*

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology

Country: **USA**

Course/Grade: 9th

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

Mendel's laws and variations of Mendel's laws help explain patterns of inheritance; the chromosomal basis of inheritance, sex chromosomes and sex-linked genes are also explained. The structure of genetic material; DNA replication; and the flow of genetic information from DNA to RNA to protein are established.

UNIT RESOURCES

Textbook Chs. 9-10), sections from study guide manual, student designed outline, practice test, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint, www.sosq.vcu.edu/videos.aspx (Genetics Videos)

STAGE ONE

GOALS AND STANDARDS

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.

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.

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

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.

ENDURING UNDERSTANDINGS

Students will understand that…

- Living systems store, retrieve, transmit, and respond to information essential to life processes.
- Organisms reproduce, develop, and have predictable life cycles.

ESSENTIAL QUESTIONS

- How can you tell what the offspring is going to be like of 2 specific parents?
- How is genetic information passed from one generation to the next?
- How do changes in genetic information affect organisms?

KNOWLEDGE AND SKILLS

- Vocabulary:

inheritance, dominance and recessives, genotype, phenotype, point, frameshift, and chromosomal mutations, meiosis, crossing-over, nondisjunction

- Skills:

  - Provide examples of how different parts of the genetic instructions are influenced by the cell's environment
  - Identify that hereditary information is contained in genes, located in the chromosomes of each cell, and each gene carries a single unit of information
  - Provide specific examples of how an inherited trait of an individual can be determined by one or many genes and a single gene can influence more than one trait
  - Identify genes as a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism
  - Recognize that the instructions for specifying the characteristics of the organism are carried in DNA, a large polymer formed from subunits of four kinds (adenine, thymine, guanine, and cytosine)
  - Explain how the chemical and structural properties of DNA allow for genetic information to be both encoded in genes and replicated
  - Recognize that changes in DNA (mutations) occur spontaneously at low rates, and some of these changes make no difference to the organism, whereas others can change cells and organisms

STAGE TWO

PERFORMANCE TASKS

- Essays and Application Question practice in groups
- Chapter Test
- Open Ended Responses
- Review Game

- Meiosis and Fertilization Lab: Student relate Meiosis to how traits are inherited in chromosomes
- Dragon Genetics Lab: Using popsicle sticks to represent chromosomes, students will model how genes are inherited
- Modeling DNA: Cut out and glue together DNA strands; model replication
- DNA Model Kit lab: Demonstrates DNA structure, components and base pairing rules
- Origami DNA Lab
- DNA Extraction Lab: Students use common household products to extract DNA Cheek Cells
- DNA Comic Strip: Students must use their knowledge of DNA Replication to create a comic strip describing the process in an artistic fashion.
- **Design a species (DNA to protein to trait) Lab**
- **Classroom survey of traits**
- **Problem practice (SpongeBob, oompa loompa)**
- **Dragon Design**
- **Analyze a pedigree**
- **Genetic Disorder Research**
- **Model DNA Replication**
- **Jewelry**
- **DNA Alias**
- **Add on to DNA model**
- **CHNOPS**
- **DNA Chain letter**
- **Snork**
- **Coloring Diagrams**

OTHER EVIDENCE

- Bikini Bottom Genetics worksheets: Punnett Squares and terminology in Mendelian Genetics
- Human Pedigree Worksheet
- Human Disorder Case Studies: Groups read specific cases and identify symptoms, how its inherited and possible treatments
- DNA Structure Packet: Reviews structure, terms, scientists, rules and replication
- DNA and Genes Packet: reviews DNA, RNA, Transcription, Translation and genetic code
- Chapter 9
    - Exercise 7: Pedigree Analysis of Sickle Cell Disease
    - Exercise 10: Patterns of inheritance
- Chapter 10
    - Exercise 7: Flow of Genetic Information

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings
- PowerPoint Presentations
- Online Chapter Assignments
- Team teaching
- Inquiry Based Activities
- Genetics Videos

- Artistically observing DNA structure, acting out replication, transcription and translation all with manipulatives, models and themselves

Misconceptions

- Punnett squares show expected results, NOT absolutes
    - Connect to card playing, chance of winning lottery
- Students think dominant also means more common in nature.
    - Reinforce the idea of "Wild-Type Traits"
- Deviations from Mendel's Laws
    - Identify examples of the exceptions to the rules
- Students often confuse terms nucleic acids, nucleotides, and bases
    - Note the hierarchy of relationships: nucleic acids consist of long chains of nucleotides (poly nucleotides), while nucleotides include nitrogenous bases.
- Students get caught in the details of transcription and translation
    - Consider a gradual approach to the subjects, beginning quite generally and testing comprehension often.
- [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]
- [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
- [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.]
- [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
- [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.]
- [Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.]

7Unit Name: How Genes Are Controlled and DNA Technology**

Time Frame: 2 *weeks (+1-week independent learning if possible)*

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology

Country: **USA**

Course/Grade: 9th

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

Control of gene expression, cloning of plants and animals, and the genetic basis of cancer are discussed. As an independent chapter, students learn more about gene cloning, genetically modified organisms, DNA profiling, and genomics.

UNIT RESOURCES

Textbook Chs. 11-12), sections from study guide manual, student designed outline, practice test, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint

STAGE ONE

GOALS AND STANDARDS

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.

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

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.

ENDURING UNDERSTANDINGS

Students will understand that…

- Organisms contain genetic information that influences their traits, and they pass this onto their offspring during reproduction.

ESSENTIAL QUESTIONS

- Why is it that in any organism certain genes are turned on or off?
- How do new traits affect an organism and a population?
- How can a variety of laboratory techniques be used to copy and combine DNA molecules?
- How do humans take advantage of naturally occurring variation among organisms?
- When does interfering with nature go too far?

KNOWLEDGE AND SKILLS

- Vocabulary:

nucleic acids, DNA, RNA, nucleotides, replication, protein synthesis, transcription, translation, mutation, cell division, chromosome, cytokinesis, prophase, metaphase, anaphase, telophase, cloning, sex-linked, crossing over

Selective breeding, hybridization, inbreeding, biotechnology, gene therapy, DNA fingerprinting, forensics

- Skills:

    - Explain how the many cells in an individual can be very different from one another, even though they are all descended from a single cell and thus have essentially identical genetic instructions
    - Trace the general process where the progeny from a single cell form an embryo in which the cells multiply and differentiate to form the many specialized cells, tissues and organs that comprise the final organism
    - Present evidence that supports the concept that complex multicellular organisms are formed as a highly organized arrangement of differentiated cells
    - Relate the specialization of cells in multicellular organisms to the different patterns of gene expression rather than to differences of the genes themselves
    - Recognize that certain chemicals, pathogens, and high-energy radiation can seriously impair normal cell functions and the health of the organism
    - Explain the process where an egg and sperm unite to begin the development of a new individual, and how that new individual receives genetic information from its parents
    - Explain how sexually produced offspring are never identical to either of their parents
    - Understand how new heritable characteristics can result from new combinations of existing genes in reproductive cells
    - Apply genetics understandings to analyze, support and/or critique current and emerging biotechnologies
    - Identify emerging biotechnology that shows promise in preventing and treating disease

- Analyzing the current and potential impact of genome projects on human health (e.g. pathogenic bacteria or disease vectors) or species with commercial importance (e.g. livestock and crop plants)

STAGE TWO

PERFORMANCE TASKS

- Essays and Application Question practice in groups
- Chapter Test
- Open Ended Responses
- Review Game
- Gel Electrophoresis Lab: Students separate and sort DNA fragments
- **Model an Operon**
- **Nova's "Ghost in your Genes" video**
- **Group presentations of different epigenetic gene controls**
- **Watch and review Videos**

OTHER EVIDENCE

- "The Quest Resumes": Article on Stem Cell Research from Time Magazine. Read, summarize, reflect and predict about Stem Cell Research and technology.
- Reading DNA Fingerprints Activity: Students analyze different DNA profiles and answer questions.
- Assemble students in "Expert Groups" to teach and review sections on: lac Operons, DNA Packing, Chemical Modification, X-Chromosome Inactivation.
- Chapter 11:
    - Exercise 4 & 5: Identifying/Labeling various processes of gene control
    - Exercise 8: Use of Stem Cells
- Chapter 12:
    - Exercise 3: Visualizing how Recombinant DNA is used
    - Exercise 7: Use of PCR technologies
    - Exercise 8: DNA Profiling

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings
- PowerPoint Presentations
- Online Chapter Assignments
- Team teaching
- Inquiry Based Activities

- Students will be forming expert groups to learn and teach the class about specific section of the chapter
    - Chapter 11: lac Operons, DNA Packing, Chemical Modification, X-Chromosome Inactivation.
    - Chapter 12: Gene cloning, Genetically Modified Organisms, DNA Profiling, Genomics

Misconceptions

- Students do not understand how operons can be turned on and off depending on environmental conditions
    - Relate to a light switch
- Methods of RNA Splicing
    - Relate to editing movies or songs to change them
- Visualizing, on a molecular level, the different points of gene regulation
    - Have students act out the different types
- Differences between key terms: Proto-Oncogenes, Oncogenes and tumor suppressor genes
    - Notecards, review and repetition.
- Students do not understand the timeframe needed to process DNA due to television programs
- Students believe non-coding regions of DNA are useless
    - Non-coding sequences are used for gene control (re-teach if necessary)
- **[Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]**
- **[Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]**
- **[Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.]**
- **[Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]**

8Unit Name: Concepts of Evolution Time Frame: 6** *weeks*

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology Country: **USA**

Course/Grade: 9th State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

The fossil record and radiometric dating establish a geologic record of key events in life's history; continental drift, mass extinctions, adaptive radiations, and changes in developmental genes have all contributed to macroevolution; the evolutionary history of species is reconstructed using fossils, homologies, and molecular systematics. Darwin's theory of evolution explains the adaptations of organisms and the unity and diversity of life; genetic variation makes evolution possible within a population; natural selection, genetic drift, and gene flow can alter gene pools; natural selection leads to adaptive radiation. A species can be defined as a group of populations whose members can produce fertile offspring; and speciation can take place with or without geographic isolation, as long as reproductive barriers evolve that keep species separate.

UNIT RESOURCES

Textbook Chs. 15, 13, and 14), sections from study guide manual, student designed outlines, practice test, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint, http://www.ucmp.berkeley.edu/education/explotime.html

STAGE ONE

GOALS AND STANDARDS

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.

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

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.

ENDURING UNDERSTANDINGS

Students will understand that…

- The process of evolution drives the diversity and unity of life.

ESSENTIAL QUESTIONS

- How can we determine that all living things on earth descended from one single cell?

KNOWLEDGE AND SKILLS

- Vocabulary:

Evolution, artificial selection, adaptation, fitness, natural selection, biogeography, homologous structure, analogous structure, vestigial structure

- Skills:

  - Recognize that changes in DNA (mutations) occur spontaneously at low rates, and some of these changes make no difference to the organism, whereas others can change cells and organisms
  - Explain that only mutations in germ cells can create the variation that changes an organism's offspring
  - Trace the progression of conditions that result from genetic mutation in a variety of different organisms
  - Recognize how heritable characteristics can strongly influence what capabilities an organism will have, therefore influencing how likely it is to survive and reproduce
  - Recognize how heritable characteristics can strongly influence how likely an individual is to survive and reproduce
  - Describe how evolution involves changes in the genetic make-up of whole populations over time, not changes in the genes of an individual organism
  - Analyze natural selection simulations and use the data generated to describe how environmentally favored traits are perpetuated over generations resulting in species survival, while less favorable traits decrease in frequency or may lead to extinction
  - Recognize that a change in a species over time does not follow a set pattern or timeline
  - Explaining how the millions of different species on Earth today are related by common ancestry using evidence

STAGE TWO

PERFORMANCE TASKS

- Essays and Application Question practice in groups
- Chapter Test
- Open Ended Responses
- Review Game
- Cladogram analysis (18)
- Simulations

- Design a Species – after a natural disaster (describe changes and relationships in DNA, RNA, proteins, characteristics and how they relate to environment)
- Design and Build a structure that performs a specific function to allow survival in a specific environment (hummingbird – STEM)
- Evolution of the Horse Lab: Students study various species of horse over time and examine their physiological similarities and difference which they then use to study their evolution over time.
- Woolyboogers Lab**:** Using mythical creatures, students analyze the evolution of feeding adaptations.
- Dichotomous Key Lab: Students use plastic frogs and lizards to practice reading and creating dichotomous keys.
- Cladogram/Phylogenetic Trees: Interpret a cladogram using traits; create their own cladogram; identify Mutations in a DNA sequence.
- Hardy-Weinberg Lab: Students use Starburst to trace selection patterns in a population.
- Evolution of the Human Thumb: Students attempt to complete several tasks (i.e. Zipper, tie a shoe, etc.) without opposable thumbs.
- Musical Chairs Activity: Simulation of Natural Selection/Survival of the Fittest
- 3rd Quarterly Assessment: Multiple Choice and Open-ended Assessment
- Chapter 15 Test (performance Assessment)
    - Create Taxonomic Scheme using Kingdom, Phylum, genus and species
    - Create Latin sounding scientific names
    - Prepare a dichotomous key for their organisms
    - Prepare a cladogram showing evolutionary relationships

OTHER EVIDENCE

Chapter 13

- "Name that Adaptation" Game: Students are shown pictures of various animals and they have to identify various adaptations that organisms have that allow each to thrive in its environment.
- Evidence for evolution Worksheets: Compilation of worksheets examining mechanisms of evolution.
- Evolution: A History and a Process Packet: Overall review of Chapter 13
- "Around the World in 300 Million Years" Article: Article describes 10 areas around the world described as 'evolutionary hotspots' and explains the evolutionary significance of each and how each displays examples of evolution. Students answer questions from the article.
- "Native Lizards Evolve to Escape Attacks by Fire Ants" Article: Students read and summarize article

Chapter 14

- In groups, students compare and contrast the 4 different Species Concepts (make a chart or diagram)
- Exercise 1: Descriptions of Species Concepts

- Exercise 2: Using scenarios to understand the problems of applying the Biological Species Concept
- Exercise 3: Review of pre- and post-zygotic barriers
- Sections for Independent Review: 14.5, 14.7, 14.9

Chapter 15

- Design a timeline depicting important changes in the history of life on the planet.
- Sections for Independent Review: 15.2, 15.3, 15.5, 15.6, 15.8, 15.10, 15.11
- Exercise 9: Cladistics

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings
- PowerPoint Presentations
- Online Chapter Assignments
- Team teaching
- Inquiry Based Activities
- Computer Discovery Activity

Misconceptions

- Students must understand the Environment does the selecting; species do not evolve out of need
    - Scenarios describing the animals changing in response to the environment
- Populations evolve, not individuals
    - Explain that an individual does not have genetic diversity to choose from; only a population does.
- Students have trouble comprehending the length of time it takes for major events to happen in earth history.
    - Use comparisons such as if we put Earths history into an hour, humans would have appeared .2 seconds ago.
- **[Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.]**
- **[Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.]**
- **[Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]**
- **[Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]**

9Unit Name: Ecology Time Frame: 5** *weeks*

Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Honors Biology** Country: **USA**

Course/Grade: **9th** State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

Population ecology is concerned with the characteristics that describe populations, changes in population size, and factors that regulate populations over time; Principles of population ecology can be used to describe the growth of the human population and its limits. Community ecologists examine factors that influence the species composition and distribution of communities that affect community stability; ecosystem ecology emphasizes energy flow and chemical cycling. The distribution and abundance of life in the biosphere is influenced by living and nonliving components in the environment; aquatic biomes, both marine and freshwater, are discussed; the distribution of terrestrial biomes is primarily determined by temperature and rainfall.

UNIT RESOURCES

Textbook Chs. 36, 37, 34), sections from study guide manual, student designed outline, practice test, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint

STAGE ONE

GOALS AND STANDARDS

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.

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

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.

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

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.

HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

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.

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

ENDURING UNDERSTANDINGS

Students will understand that…

- Organisms interact with one another and with the environment in which they live.

ESSENTIAL QUESTIONS

- How do humans impact the living and non-living environment?
- Why is the cycling of energy and matter important to life on earth?

KNOWLEDGE AND SKILLS

- Vocabulary:

Biosphere, species, population, community, ecology, ecosystem, biome, biotic factor, abiotic factor, herbivore, carnivore, scavenger, producer

- Skills:

    - Explain how food webs are limited and how pyramidal relationships exist
    - Recognize that all matter tends toward more disorganized states, and that living systems require a continuous input of energy to maintain their chemical and physical organizations
    - Calculate the trends in production, use and transfer of energy from one trophic level to another using data
    - Trace the path that energy entering ecosystems as sunlight follows when being transferred by producers into chemical energy through photosynthesis, and then being passed from organism to organism through food webs
    - Recognize that living systems require a continuous input of energy to maintain their chemical and physical organizations and also understanding that with death (the cessation of energy input), living systems rapidly disintegrate
    - Analyze and describe how the process of photosynthesis provides a vital connection between the sun and the energy needs of living systems
    - Explain how plants and many microorganisms use solar energy to combine molecules of carbon dioxide and water into complex, energy rich organic compounds and release oxygen to the environment

- Trace the cycling of atoms and molecules on Earth among the living and nonliving components of the biosphere
- Follow the transfer of matter (molecules) from one organism to another repeatedly and between organisms and their physical environment
- Identify how the total amount of matter in a system remains constant, even though its form and location change
- Predict how natural disasters such as hurricanes, floods, volcanoes will affect population dynamics in a given ecosystem based on data and accepted mathematical models
- Identify situations where humans intentionally and unintentionally modify ecosystems as a result of population growth, technology, and consumption
- Provide evidence of how human destruction of habitats threatens current local and global ecosystem stability
- Predict how direct harvesting, pollution, atmospheric changes, and other factors will affect population dynamics in a given ecosystem based on data and accepted mathematical models

STAGE TWO

PERFORMANCE TASKS

- Essays and Application Question practice in groups
- Chapter Test
- Open Ended Responses
- Review Game
- Oh Deer Lab: Students demonstrate predator prey interactions and population change over time according to habitat and resource availability.
- Ecological Pyramids Lab: Students create their own ecological pyramid according to specific parameters
- Lion King Lab: Identify various ecological principles evident in the movie.
- Random Sampling Lab: Estimates size of a population by collecting data in random samples.
- Human Demography Lab: Students study survivorship and mortality rates based on information collected from an online cemetery database.
- Biome Lab: Students color a world map identifying the locations of different terrestrial biomes according to climate zones.

OTHER EVIDENCE

- Population Ecology Packet: Questions regarding characteristics of populations, population growth, dependent and independent factors and age structure.
- Ecosystem Packet: Reviews ecological terms, trophic levels, food chains and webs, and ecological pyramids
- Expert Groups: Biogeochemical Cycles
- Food Web Activity: Students use given animals to construct a food web
- Jigsaw: Terrestrial Biomes Activity
    - Students migrate to various stations to learn about terrestrial biomes around the world.
- Artistically represent aspects of Aquatic Biome
- Symbiosis Packet: Students must identify and label various types of symbiosis based on pictures and descriptions of plants and animals that work together in some way

- Chapter 36:
    - Exercise 3: Types of population curves
    - Exercise 4: Limits to Population Growth
- Chapter 37**:**
    - Exercise 1: Types of Symbioses
- Chapter 34:
    - Exercise 1: Concept Map of terms

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings
- PowerPoint Presentations
- Online Chapter Assignments
- Team teaching
- Inquiry Based Activities
- Outdoor investigation
- Use of Computer Lab
- Review continents, longitude, latitude and overall map reading skills

Misconceptions

- Students generally have trouble differentiating between density dependent and density independent factors
    - Relate density independent factors to abiotic factors
- Understanding ecological niche
    - Relate it to a human's address and occupation (combined)
- Students have trouble identifying a keystone species and understanding that though they have a relatively small population size, they have a huge impact on their community.
    - Show picture on page 747 in book
- **[Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.]**
- **[Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.]**
- **[Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]**
- **[Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation,**

fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]

- **[Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.]**
- **[Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]**
- **[Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.]**
- **[Assessment Boundary: Assessment is limited to provided data.]**

- **[Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.]**
- **[Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.]**
- **[Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]**
- **[Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]**

10Unit Name: Evolution of Biological Diversity**

Time Frame: *5 weeks (mostly independent)*

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology

Country: **USA**

Course/Grade: 9th

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

Prokaryotes, the smallest known organisms, are extraordinarily diverse; Protists are eukaryotes; though most are unicellular, microscopic organisms, some protists are multicellular. A variety of adaptations enable plants to live on land; plant life cycles alternate haploid and diploid generations; fungi are a diverse group of organisms that acquire nutrients through absorption; many fungi have complex life cycles. Animal body plans can be used to build a phylogenetic tree; scientists are using molecular data to revise the phylogenetic tree for animals. The major clades of chordates are distinguished by traits such as hinged jaws, two pairs of limbs, fluid-filled eggs with shells, and milk. Humans have many characteristics in common with other primates. Finally, the unit wraps up discussing Hominins, species that are on the human branch of the evolutionary tree, which include approximately 20 extinct species.

UNIT RESOURCES

Textbook Chs. 16-19 and Ch. 38, end of year project assignment, Internet, videos.

Internet Resource Links:

On-Line textbook, PowerPoint

STAGE ONE

GOALS AND STANDARDS

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity**.**

ENDURING UNDERSTANDINGS

Students will understand that…

- *The connectedness and the sheer diversity of life are what make the study of biology such an amazing science.*

ESSENTIAL QUESTIONS

- ***How is the diversity of life and ecology important to maintain a world where life can thrive?***
- ***How can we develop projects and strategies to protect biodiversity?***

KNOWLEDGE AND SKILLS

- Vocabulary (may be used to teach biodiversity but not mandatory):

Algae, alternation of generations, amoebas, autotroph, bacteria, biofilm, bioremediation, cellular slime molds, chemoautotroph, chemoheterotroph, chlamydias, ciliates, cyanobacteria, diatoms, Endospore foramoniferans, gametophyte,
Gram stain, heterotrophy, kelp, methanogens, mixotrophs, parasite, pathogen, plasmodium, protist, radiolarians, spirochetes, sprorophyte, symbiosis, water molds

Absorption, angiosperm, anther, apical meristem, ascomycete, basidiomycete, carpel, chytrid, fossil fuel, fruit, fungus, gametangium, gymnosperm, hyphae, lichen, mold, mycelium, mycorrhizae, ovary, petal, phloem, pollen grain, pollination, seed, sepal, sporangium, spore, stamen, vascular plant, xylem, yeast, xygomycete.

Amoebocytes, annelid, arachnid, arthropod, bilateral symmetry, bivalve, blastula, body cavity, cephalopod, chelicerate, cnidarians, metamorphosis, crustacean, deuterostome, dorsal, echinoderm, ectoderm, endoderm, endoskeleton, exoskeleton, flatworm, gastropod, gastrula, hydrostatic skeleton, invertebrate, mollusk, molting, notochord, polyp, posterior, protostome, radial symmetry, segmentation, sessile, sponge, tapeworm, true coelom, tunicate, ventral

Amniote, amphibian, anthropoid, birds, craniates, ectothermic, endothermic, eutherian, hominins, mammal, marsupial, monotreme, operculum, paleoanthropology, placenta, reptile, tetrapod, vertebra, vertebrate.

- Skills:

- ***Students will work in groups to identify an ecotone with specific groups of organisms from the 5 kingdoms, and develop ways to protect them.***
- ***Explain how the different organism relationships are important for biological diversity.***
- ***Argue how the ecosystems must be maintained to reduce any negative human impact.***
- ***Develop a service learning project to include the community and to help raise money for the plan.***
- ***Be able to "sell" the plan to a group of investors (classmates) via a presentation.***

STAGE TWO

PERFORMANCE TASKS

For all Chapters:

- Students will work in groups to identify an ecotone with specific groups of organisms from the 5 kingdoms, and develop ways to protect them.
- Explain how the different organism relationships are important for biological diversity.
- Argue how the ecosystems must be maintained to reduce any negative human impact.
- Develop a service learning project to include the community and to help raise money for the plan.
- Be able to "sell" the plan to a group of investors (classmates) via a presentation.

OTHER EVIDENCE

- Apply biological diversity learning concepts and ecology

STAGE THREE

LEARNING PLAN

- Team Inquiry based activities

Misconceptions:

- Students get caught up in the details; our goal is for them to understand the main themes of the chapters in this unit while planning.
- [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]
- [Clarification Statement: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]

11Unit Name: Animals: Form and Function** **Time Frame: 2** *weeks*

(If time permits)

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology Country: **USA**

Course/Grade: 9th State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

The structural hierarchy in an animal begins with cells and tissues, whose forms correlate with their functions; tissues are arranged into organs, which may be functionally coordinated in organ systems; complex animals have internal surfaces that facilitate exchange with the environment; feedback control maintains homeostasis in many animals. Animals ingest food, digest it in specialized compartments, absorb nutrients, and eliminate wastes; a healthy diet fuels activities, provides organic building blocks, and provides nutrients. Gas exchange occurs across thin, moist surfaces in respiratory organs such as gills, tracheal systems, and lungs; air travels through branching tubes to lungs, where gases are exchanged with the blood; the circulatory system is a transportation network. Internal transport systems carry materials between exchange surfaces and body cells; the heart pumps blood through the pulmonary and systemic circuits; the structure and function of blood vessels and blood are discussed. All animals have immune defenses that are always at the ready; vertebrates' custom-tailor the immune response to specific pathogens; and malfunctions of the immune response can cause problems that range from mild to severe. The nature of chemical regulation, the vertebrate endocrine system, hormones and homeostasis are described. The unit reviews the nervous system structure and function, how nerve signals work, and the human brain. The senses, locomotion, the vertebrate skeleton, muscle contraction and movement are finally discussed in this unit.

UNIT RESOURCES

Textbook (Chs. 20-24, 26-30), sections from study guide manual, student designed outline, practice test, online resources, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint

STAGE ONE

GOALS AND STANDARDS

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

ENDURING UNDERSTANDINGS

Students will understand that…

- How is animal form related to the many functions needed for survival?
- How do different adaptations help diverse organisms maintain homeostasis?

ESSENTIAL QUESTIONS

- ***How does animal structure relate to function?***
- ***How does regulation of main organ systems in animals relate to homeostasis and survival of the organism?***

KNOWLEDGE AND SKILLS

- Vocabulary (for reference only):

Adipose tissue, anatomy, blood, bone, cardiac muscle, cartilage, connective tissue, epithelial tissue, connective tissue, homeostasis, interstitial fluid, muscle tissue, negative feedback, nervous tissue, organ, physiology, tissue

Absorption, alimentary canal, appendix, bile, bolus, carnivores, cecum, chyme, colon, crop, digestion, elimination, esophagus, feces, gallbladder, gastrovascular cavity, gizzard, herbivores, ingestion, intestine, liver, microvilli, mineral, mouth, omnivores, pancreas, peristalsis, pharynx, ruminants, salivary glands, sphincter, stomach, vitamin

Anemia, aorta, artery, atherosclerosis, atrium, blood, capillary, cardiac cycle, circulatory system, diastole, erythrocyte, heart, hypertension, leukemia, leukocyte, phagocyte, plasma, platelet, pulse, stem cell, stroke, systole, vein, ventricle

Active immunity, adaptive immunity, allergens, antibody, antigen, antihistamine, autoimmune disease, clonal selection, humoral immune response, innate immunity, lymph, macrophage, memory cell, neutrophil, passive immunity, pathogens, vaccination

Adrenal cortex, adrenal gland, androgen, endocrine system, endorphin, epinephrine, estrogen, glucagon, goiter, gonad, hormone, hypothalamus, insulin, pancreas, progestin, steroid hormone, target cell, testosterone, thyroid gland

Autonomic nervous system, axon, cerebellum, corpus callosum, dendrites, forebrain, gray matter, hindbrain, hippocampus, integration, midbrain, motor neurons, nerve, neurotransmitter, stimulus, sympathetic division, synaptic terminal, threshold, white matter

Auditory canal, chemoreceptor, cornea, eardrum, inner ear, iris, lens, pupil

Actin, appendicular skeleton, axial skeleton, endoskeleton, exoskeleton, hydrostatic skeleton, motor unit, muscle fibers, myosin, sarcomere

- Skills:

- ***Explain nutrition and digestion***
- ***Describe gas exchange***
- ***Describe circulation***
- ***Explain details and importance of the immune system***
- ***Review major hormones and the purpose of the endocrine system***
- ***Review the nervous system, the senses, how animals move and how they each relate to homeostasis***

STAGE TWO

PERFORMANCE TASKS

For all Chapters:

- Students assigned to groups and broken up specific sections of a chosen chapter. On a given day, each group highlighted their chapter concepts and teach it to the rest of the class.
    - Create a power point presentation
    - Find an appropriate video to show about their information
    - Create video or skit to teach aspect of chapter
- Create a 3-D Human Body
    - Each group will be assigned an organ system and they are responsible for constructing the organs accurately
    - All groups assemble their organs on the bones built by the skeletal system
    - Create posters describing their system

OTHER EVIDENCE

- Apply the Concepts Questions and Essays
- Groups design review questions for class to answer at the conclusion of their presentations

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings
- Online Chapter Assignments
- Team teaching
- Inquiry Based Activities

Misconceptions:

- Students get caught up in the details; our goal is for them to understand the main themes of the chapters in this unit.
- **[Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth**

muscle to regulate and deliver the proper amount of blood within the circulatory system.]

- **[Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]**
- **[Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]**

12Unit Name: Plant Form and Function Time Frame: 1** *week*

(If time permits)

Author: Egg Harbor Township High School Science Department

UNIT

Subject: Honors Biology Country: **USA**

Course/Grade: 9th State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

Plant bodies contain specialized cells grouped into tissues, organs, and organ systems. All plants increase their length via primary growth, and wood plants thicken via secondary growth. Sexual reproduction in angiosperms involves, pollination, development of fruit and seeds, seed dispersal, germination, and growth.

UNIT RESOURCES

Textbook (Ch. 31), sections from study guide manual, student designed outline, practice test, online PowerPoint.

Internet Resource Links:

On-Line textbook, PowerPoint

STAGE ONE

GOALS AND STANDARDS

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

ENDURING UNDERSTANDINGS

Students will understand that…

- Plant structure is related to function, the importance of plant growth, as well as how reproduction in flowering plants occurs.

ESSENTIAL QUESTIONS

- How are plant structures related to their functions?
- How is primary growth different from secondary growth in plants?

- Why is reproduction in flowering plants so beneficial to their survival?

KNOWLEDGE AND SKILLS

- Vocabulary (for reference only):

Annual, anther, apical meristem, biennial, collenchyma cell, cork, cortex, cotyledon, cuticle, dermal tissue system, dicot, endodermis, endosperm, eudicot, fiber, fruit, germinate, ground tissue system, guard cell, leaves, meristem, mesophyll, monocot, ovary, parenchyma cell, perennial, petal, phloem, pistil, pollination, primary growth, root system, sclerenchyma cell, secondary growth, sepal, stamen, stem, stigma, stoma, tendril, tissue, tuber, vascular bundle, vein, wood, xylem

Skills:

- Compare the structure of monocots and eudicots
- Compare the structures and functions of roots, stems, and leaves
- Distinguish between a taproot, stolon, rhizome, tuber, bulb, petiole, and tendril, and indicate example of each.
- Define a tissue system
- Describe the 3 unique structures found in most plant cells, and describe structures of 5 major types of plant cells
- Distinguish between annuals, biennials, and perennials
- Describe and compare primary and secondary growth.
- Describe the parts of a flower and their functions
- Explain how a seed forms.
- Describe the structure and function of fruit
- Describe and compare germination in bean and corn plants
- Describe 4 examples of cloning plants
- Describe plant adaptations that permit very long lives

STAGE TWO

PERFORMANCE TASKS

For all Chapters:

- Students assigned to groups and broken up specific sections of a chosen chapter. On a given day, each group highlighted their chapter concepts and teach it to the rest of the class.
- Create a power point presentation
- Find an appropriate video to show about their information
- Create video or skit to teach aspect of chapter
- At the conclusion of each chapter, students completed an individual project including:
  - An imaginative brochure about each chapter
- Create a diagram/model of plant form and function
- Plant Identification Lab: Students will go outside to identify plants according to their forms and characteristics.

OTHER EVIDENCE

- Apply the Concepts Questions and Essays

- "Private life of Plants": Life Series video
    - Watch and analyze plant adaptations to various environments

STAGE THREE

LEARNING PLAN

- At home individual reading and outlining of chapter
- In class group discussion of material to identify misunderstandings
- Online Chapter Assignments
- Team teaching
- Inquiry Based Activities

Misconceptions:

- Students get caught up in the details; our goal is for them to understand the main themes of the chapters in this unit
- **[Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.]**
- **[Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]**
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- **[Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]**

Curriculum Resources - Differentiated Instruction

Special Education Interventions in General Education

Visual Supports
Extended time to complete tests and assignments
Graphic Organizers
Mnemonic tricks to improve memory
Study guides
Use agenda book for assignments
Provide a posted daily schedule
Use of classroom behavior management system
Use prompts and model directions
Use task analysis to break down activities and lessons into each individual step needed to complete the task
Use concrete examples to teach concepts
Have student repeat/rephrase written directions
Heterogeneous grouping

Resources:

Do to Learn:
http://www.do2learn.com/

Sen Teacher:
http://www.senteacher.org/

Intervention Central:
http://www.interventioncentral.org/

Learning Ally:
https://www.learningally.org/

English Language Learners Interventions in Regular Education
Resources:

FABRIC - Learning Paradigm for ELLs (NJDOE)
www.nj.gov/education/bilingual/pd/**fabric**/**fabric**.pdf

Guide to Teaching ELL Students
http://www.colorincolorado.org/new-teaching-ells

Edutopia - Supporting English Language Learners
https://www.edutopia.org/blog/strategies-and-resources-supporting-ell-todd-finley

Reading Rockets
http://www.readingrockets.org/reading-topics/english-language-learners

Gifted and Talented Interventions in Regular Education
Resources:

Who are Gifted and Talented Students
http://www.npr.org/sections/ed/2015/09/28/443193523/who-are-the-gifted-and-talented-and-what-do-they-need

Hoagies Gifted Education Page
http://www.hoagiesgifted.org/programs.htm

21st Century Learning
Resources:

Partnership for 21st Century Learning
http://www.p21.org/

Career Ready Practices (NJDOE)
http://www.nj.gov/education/cte/hl/CRP.pdf