EGG HARBOR TOWNSHIP PUBLIC SCHOOLS
CURRICULUM

GENERAL (Standard) Biology
High School

Length of Course:	Full Year
Elective / Required:	Refer to Program of Studies
Schools:	High School
Student Eligibility:	Grades 09 -12
Credit Value:	5 credits
Date Submitted:	September 2013
Date Approved:	

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This curriculum guide was prepared by:

Robyn Callahan, High School
Shana Dickerson, High School
Michelle Fitzgerald, High School
Christa Fritz, High School
Stephan Krier, High School
Christopher Olmeda, High School
Jana Reilly, **High School**
Jonelle Scardino, High School
Kristian Troster, High School
Franklin Williams, 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**

Unit Name: The Nature of Life **Time Frame: 1 week**
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** 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. Students must realize that science seeks natural causes for natural phenomena and that technology applies scientific knowledge to specific needs and purposes.

UNIT RESOURCES

- Online Textbook, Section Review Worksheets, PowerPoint presentations, educational videos, Textbook Chapter 1

Internet Resource Links:

- *www.pearsonsuccessnet.com*

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. [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.]

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

ENDURING UNDERSTANDINGS

- 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?
- What is an animal?

KNOWLEDGE AND SKILLS

Vocabulary:

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

Students will be able to:

- Develop and apply mathematical, physical, and computational tools to build evidence-based models and to pose theories
- Apply scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence
- Reflect on and revise observations as new evidence emerges
- Apply data representations and new models to revise predictions and explanations
- Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences
- Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams
- Demonstrate how to apply scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare
- Describe modern application of the regulation of cell differentiation and analyze the benefits as risks
- Investigate and describe the complementary relationship between photosynthesis and cellular respiration

STAGE TWO

PERFORMANCE TASKS

- Use scientific method to solve various environmental scenarios[C1]
- In Class activity identifying living things vs. non living things
- Metric system measurement practicum (length, volume, mass)
- Design and carry out a novel experiment (indicate all steps of scientific method and variables and use metric system to collect data)
- Use of Pasco units to conduct experiment and analyze data
- Review game
- Vocabulary Quizzes
- Chapter tests

OTHER EVIDENCE

- SpongeBob Experimental Variables Worksheets
- Characteristics of living things game
- Safety Poster/Presentation (identification of safety rule from student-designed posters)
- Following instructions - Book Cover Lab
- Homework:
    - Vocabulary flash cards or map (word, picture, sentence, example)
    - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets
- Visual Quiz

STAGE THREE

LEARNING PLAN

Activities, experiences, and lessons:

- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Foldables – organization of material (scientific method & features of living things)
- Mythbusters – examples of experiments – indicate steps of scientific method and variables
- Metric system - demonstration of instruments
- Metric system practice with instruments (meter stick – measure size of room; graduated cylinder; balance)
- Design your own experiment
- Use of pasco units to conduct experiment to gather and analyze data

Misconceptions/Teaching Tips:

- Reword steps of scientific method to achieve understanding
- Use many examples of experiments to indicate all steps of scientific method until students can identify the steps
- Use student examples and ideas to plan experiments as a class
- Allow students to critique other students' ideas until experiment is scientifically sound
- Provide multiple examples of experimental variables in different experimental situations
- Metric system units and conversions have not been taught to all students in the same capacity
    - use visual representation of sizes, mathematical computation, as well as moving decimal methods to calculate
    - peer teaching is beneficial to assist in wording to students who haven't been taught the concept yet

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: The Chemistry of Life **Time Frame: 2 weeks**
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** 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

- Online Textbook, Section Review Worksheets, PowerPoint Presentations, Textbook Chapter 2

Internet Resource Links:

- *www.pearsonsuccessnet.com*

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. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

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. [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.]

ENDURING UNDERSTANDINGS

- Biological systems utilize energy and molecular building blocks to grow, reproduce, and maintain homeostasis
- Living systems, from the organismal to the cellular level, demonstrate the complementary nature of structure and function

ESSENTIAL QUESTIONS

- How does structure relate to function in living systems?
- What is the matter in organisms made of?
- Why are the properties of water important to organisms?
- How do organisms use different types of carbon compounds?
- How do chemicals combine and break apart inside living things?
- What are the reactants and products of cellular respiration?

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, reactants, products

- 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

- Be able to identify the reactants and products of cellular respiration

STAGE TWO

PERFORMANCE TASKS

- Atomic Structure: students determine from periodic table (proton, neutron, electron, energy levels) using candy/ beads/ beans/ coins
- 3D models: students create various organic molecules using kits
- H2Olympics Lab: students demonstrate and identify properties of water (cohesion, adhesion, capillary action)
- pH Laboratory Experiment (Pasco): students use sensors to identify pH of various solutions then identify if it's an acid or base
- Acid/Base Food Lab: students hypothesize then identify pH of everyday foods using pH strips
- Affect of CO2 (breath) on Bromythymol blue Solution: students hypothesize then observe the effect of CO2 on solution
- Identify physical vs. chemical change and mixture vs. solution: students identify whether a chemical or physical change had occurred in various stations
- Review game
- Vocabulary Quizzes
- Chapter tests (multiple choice and short answer tic-tac-toe)
- Cellular Respiration lab here change in chemical color in the presence of oxygen
- Simple sample chemical reactions as demos
- Magnetic atom kits to build atoms with correct number of protons, neutrons, and electrons

OTHER EVIDENCE

- Homework:
  - Vocabulary flash cards or map (word, picture, sentence, example)
  - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Do Nows
- Study Guide Packets
- Visual Quiz Worksheet

STAGE THREE

LEARNING PLAN

Activities, experiences, and lessons:

- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Foldables – organization of material (atomic structure, chemical vs. physical changes, properties of water)
- Draw structures of atoms using periodic table (individually & using smartboard)
- Assemble protons, neutrons, electrons of individual atoms using manipulatives (candy, beads, etc.) as a group & individually
- Assemble structures of molecules in 3 dimensions using kits
- Assembly of atoms and how the addition and subtraction of protons, neutrons, or electrons change the atom
- Drop in the Bucket Demo (compares total amount of water on Earth compared to actual amount of drinkable freshwater)
- Effect of Enzyme – demo (time one at normal speed and one with enzyme)
- Water Olympics showing the various special properties of water in a lab setting
- Identifying mixtures or solutions in a lab setting

Misconceptions/Teaching Tips:

- Atomic structure (especially energy levels) –
    - practice drawing and assembling with manipulatives and explaining to a partner, class, instructor
- Use demonstrations to introduce and reinforce properties of water
- Use multiple examples of acids/bases (taste-safe examples)
- Multiple examples (visual) of chemical vs. physical changes
- Multiple examples (visual) of mixtures vs. solutions
- Breakdown origin of words and use alliteration to help remember endothermic(enter) vs. exothermic(exit) reactions

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: Ecology **Time Frame: 7 weeks**
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** 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, including human impacts; aquatic biomes, both marine and freshwater, are discussed; the distribution of terrestrial biomes is primarily determined by temperature and rainfall.

UNIT RESOURCES

- Online Textbook, Section Review Worksheets, PowerPoint Presentations, Textbook Chapters 3, 4, 5, 6

Internet Resource Links:

- *www.pearsonsuccessnet.com*

STAGE ONE

GOALS AND STANDARDS

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

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. [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.]

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. [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.]

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

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. [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.]

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. [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.]

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]

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

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. [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.]

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. [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.]

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

ENDURING UNDERSTANDINGS

- Organisms interact with one another and with the environment in which they live.
- Continual input of energy from sunlight keeps matter and energy flowing through ecosystems.
- Each recombination of matter and energy results in storage and dissipation of energy into the environment as heat.
- As matter cycles and energy flows through different levels of organization chemical elements are recombined into different products.
- Biological communities in ecosystems are based on stable interrelationships and interdependence of organisms.
- Stability in an ecosystem can be disrupted by natural or human interactions.

ESSENTIAL QUESTIONS

- How do we study life?
- What is driving the flow of matter and energy through ecosystems?
- Why is the cycling of energy and matter important to life on earth?
- How are biological communities structured to ensure their stability through time?
- How have human activities shaped local and global ecology?

KNOWLEDGE AND SKILLS

Vocabulary

- Biosphere, species, population, community, ecology, ecosystem, biome, biotic factor, abiotic factor, herbivore, carnivore, scavenger, producer, ,monoculture, renewable resource, nonrenewable resource, sustainable, development, desertification, deforestation, pollutant, biological magnification, smog, acid rain, biodiversity, ecosystem diversity, species diversity, genetic diversity , habitat fragmentation, ecological hot spot, ecological footprint, ozone layer, aquaculture, global warming

Skills:

- Reflect on and revise observations as new evidence emerges
- Apply data representations and new models to revise predictions and explanations
- Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences
- Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams
- Cite evidence that the transfer and transformation of matter and energy links organisms to one another and to their physical setting.
- Apply mathematical formulas to justify the concept of an efficient diet.
- Predict what would happen to an ecosystem if an energy source was removed.
- Analyze the interrelationships and interdependencies among different organisms, and explain how these relationships contribute to the stability of the ecosystem
- Model how natural and human-made changes in the environment will affect individual organisms and the dynamics of populations.
- Describe human activities that can affect the biosphere.
- Describe the relationship between resource use and sustainable development.
- Describe how human activities affect soil and land, water resources, and air resources.
- Define biodiversity and explain its value.
- Identify current threats to biodiversity.
- Describe how biodiversity can be preserved.
- Explain the concept of ecological footprint.
- Identify the role of ecology in a sustainable future.

STAGE TWO

PERFORMANCE TASKS

- Food Web Research Project: students research relationships between various producers and consumers in tropical rainforest provided. Organize organisms into an accurate food web, showing flow of energy
- Owl Pellet Dissection: students assemble skeletons found in the owl pellet, identify organism using dichotomous key, create food web using data

- Biome Research Project: students identify a major problem and solution in that area of the world. Create a persuasive brochure/ poster/ presentation to convince others that your biome is worth saving.
- "Oh Deer" Lab (outdoors): students enact predator-prey relationships and population dynamics
- Population Biology Virtual Lab: students observe and interpret the simulation of varied population growth in bacteria under different conditions using laboratory procedures
- Demography Internet Activity: students collect cemetery data and interpret change in human population growth over time
- Human Population Research Project: students research the population growth of the country of their choice then identify type of human population growth according to current population characteristics. Explain why that population is growing in that way
- Review game
- Vocabulary Quizzes
- Chapter Tests

OTHER EVIDENCE

- Climatogram Development: students create climatograms based on precipitation and temperature information provided. Identify biome based on this information.
- Water Cycle game: students follow a drop of water through various physical changes, write a story/comic strip showing the drop's changes over time
- Ecosystem Worksheet: students identify various characteristics of an ecosystem
- Similarities between spread of an infectious disease and population growth – interactive class activity: students are all given a cup with a clear liquid to represent their body. Students exchange fluids with several other classmates. Teacher applies indicator to see how many students are "infected." Then compare this growth the exponential growth in bacteria. Create a growth curve of both scenarios.
- Random Sample Worksheet: students interpret map of sunflower population using random sampling
- Interpreting Ecological Data Worksheet: students interpret various graphs and tables of ecological data
- The Lesson of the Kaibab Worksheet: students graph data of a deer population. Determine factors responsible for change in populations. Determine carrying capacity from their data.
- Are zebra mussels really invading? Worksheet: Students read article and interpret information to create an argument about invading species.
- Deer: Predation or Starvation? Worksheet: students use data provided to graph population change then interpret data to discover the cause of population change

- Human Population Growth Worksheet: students create graph from data of human population growth on entire earth over time. Interpret data to predict world human population in the future
- Lion King Video Worksheet: students identify and describe ecological terms using examples from the Lion King movie
- Homework:
    - Vocabulary flash cards or map (word, picture, sentence, example)
    - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets
- Visual Quiz

STAGE THREE

LEARNING PLAN

Activities, experiences, and lessons:

- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Foldables – organization of material (biotic vs. abiotic, types of succession, weather vs. climate, major biome types)
- Identify biotic and abiotic factors in pictures of various biomes
- Predator-Prey Card game: students use cards with various organisms in an ecosystem to show relationships between predators, prey, decomposers, and producers.
- Who eats Whom? (kit): students enact predator-prey relationships using manipulatives
- Food chains and food webs color coded pyramid: students color, label, define, and draw an example of each type of organism in ecological pyramids using vocabulary. Then assemble pyramids into pyramid shape
- Water Carbon, Nitrogen, Phosphorous Cycles Diagrams: Students draw, label, color diagrams using examples of their own for each stage.
- "Musical Chairs" – in-class activity: students demonstrate relationship between population size and resources available in an ecosystem
- Analyzing symbiotic relationships lab
- Succession Scenarios: students listen to or read various scenarios of damage to an ecosystem (volcanic eruption, clear cutting a forest, etc.) then attempt explain how different ecosystems will recover after various levels of disturbance
- Biome color map of US: Students color each different biome found in the United States a different color.

- Biome Persuasive Presentations: Students use research and brochures to attempt to persuade other students that their biome is the most important to save
- Planet Earth & Blue Planet: students describe factors & identify relationships in each biome
- Human population growth Worksheet: students compare different countries and limiting factors; identify stage of growth for each country

Misconceptions/Teaching Tips:

- Biotic vs. Abiotic – use multiple examples (pictures, classroom, outdoors)
- Direction of arrows in food web – reinforce that arrows show flow of energy and not which animal eats the other
- 3 types of ecological pyramids – may want to cover with a break between each one so they do not meld together. Have students create an example of each and use different types of examples in each one.
- Carbon, Nitrogen, and Phosphorus cycles – do not seem to hold value to the students because they do not know what these elements are. Give these elements meaning to the students by giving examples of where they are found in the students' daily lives and why they are important.
- Symbiotic Relationships – show multiple examples. Have students identify their own example of each type.
- Types of succession – practice with many scenarios (individual, groups, as a class) – be sure students understand the significance of they type of disturbance on how the ecosystem recovers
- Biomes – there are varieties of each type of biome due to its location in the world. Even though several places may be classified into the same biome, they are not exactly the same, and do not contain the same species of plants or animals. Be specific when assigning biomes to students.
- Population growth – be sure students use the vocabulary in their responses: logistic, exponential, carrying capacity, limiting factors, etc. to increase their capability to explain their reasoning.

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: Cell Structure and Function **Time Frame: 2 weeks**
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** 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.

UNIT RESOURCES

- Online Textbook, Section Review Worksheets, PowerPoint Presentations, Textbook Chapter 7

Internet Resource Links:

- *www.pearsonsuccessnet.com*

STAGE ONE

GOALS AND STANDARDS

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

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. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

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. [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.]

ENDURING UNDERSTANDINGS

- Living organisms are composed of cellular units that carry out functions required for life.
- Living systems demonstrate the complementary nature of structure and function.
- Cells respond to their environment to maintain the proper conditions necessary for survival.
- Multicellular organisms grow and develop from a single cell.
- A cell is the basic unit of life: the processes that occur at the cellular level provide the energy and basic structure organisms need to survive

ESSENTIAL QUESTIONS

- How does the structure of a molecule relate to its function in a living thing?
- 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?
- How are cell structures adapted to their functions?

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

- Apply scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence
- Reflect on and revise observations as new evidence emerges
- Apply data representations and new models to revise predictions and explanations
- Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences
- Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams
- Predict a cell's response in a given set of environmental conditions.

- Distinguish between the processes of cellular growth (cell division) and development (differentiation).
- Describe modern applications of the regulation of cell differentiation and analyze the benefits and risks (e.g. stem cells, sex determination).

STAGE TWO

PERFORMANCE TASKS

- Cellular Models: students identify cellular organelles using 3D models in groups
- Microscope Lab: students examine plant and animal cells to identify organelles
- Cell City Poster: students draw a city, school, etc. representing all organelles as parts of that structure. Label part of cell, part of city/school. Explain how their functions are related.
- Cell analogy activity and labeling the cell's parts and functions
- Review game
- Vocabulary Quizzes
- Chapter Tests

OTHER EVIDENCE

- Organelle roles in Protein Synthesis Enactment: students are assigned an organelle and carry out the role in protein synthesis using legos as a manipulative
- Egg Osmosis Demonstration: students observe and measure changes in eggs without their shells as they are placed in different types of solutions
- Scientists Worksheet: students cut, arrange, and glue scientists, their discovery, and the year of their discovery in the proper order that led to the cell theory
- Protein Synthesis Story: students write a creative story about how proteins are made using the proper organelles and their functions
- Lipid Bi-layer Manipulatives: students identify parts and features of each section of the lipid bilayer of the cell membrane
- Homework:
    - Vocabulary flash cards or map (word, picture, sentence, example)
    - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets
- Visual Quiz

STAGE THREE

LEARNING PLAN

- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Foldables – organization of material (prokaryotes vs. eukaryotes, types of microscopes, plant vs. animal organelles, function of organelles, passive vs. active transport)
- Microscope Lab
- Designing a cell
- Labelling a cell
- Cell analogy activity
- Using 3d cells to identify parts
- Use of magnetic classroom cell to identify parts and function as class and individually

Misconceptions/Teaching Tips:

- Reword the cell theory in order to ensure understanding. Have students write the discoveries of each scientist in their own words and how each one helped in the development of the cell theory
- Repetition as class, in a group, and with a partner in order to memorize functions of each organelle inside a cell
- Relate each cell part to a part of a city, school, etc., but be sure to use the same example through the entire presentation of all organelles.
- Use video or animation to reinforce difference between active and passive transport
- Use illustration or animation to reinforce difference between isotonic, hypertonic, and hypotonic solutions.
- Use alliteration to help remember differenced between prokaryotes and eukaryotes. Perhaps the students could find a way to remember this.

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: Photosynthesis and Cellular Respiration Time Frame: 4 weeks
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

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. 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.

UNIT RESOURCES

- Online Textbook, Section Review Worksheets, PowerPoint Presentations, Textbook Chapters 8 & 9

Internet Resource Links:

- *www.pearsonsuccessnet.com*

STAGE ONE

GOALS AND STANDARDS

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

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

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. [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.]

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. [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.]

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. [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.]

ENDURING UNDERSTANDINGS

- All organisms require energy to perform the cellular functions necessary to support life
- Plants have the capability to take energy from light to form sugar molecules containing carbon, hydrogen, and oxygen.
- In both plant and animal cells, sugar is a source of energy and can be used to make other carbon-containing (organic) molecules.

ESSENTIAL QUESTIONS

- What is the source of energy in living things?
- How does light energy get converted to the chemical energy that organisms can use?
- How do organisms store and carry energy?

KNOWLEDGE AND SKILLS

Vocabulary:

- Adenosine Triphosphate, heterotrophy, autotroph, photosynthesis, pigment, chlorophyll

Skills

- Apply scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence
- Reflect on and revise observations as new evidence emerges

- Apply data representations and new models to revise predictions and explanations
- Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences
- Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams
- Demonstrate how sunlight's energy supports the vast majority of living things on the planet.
- Describe the process of photosynthesis with special attention given to the light dependent and light independent reactions.
- Describe the process of cellular respiration with special attention given to glycolysis, the Krebs Cycle, and the electron transport chain.
- Construct and describe the function of Adenosine Triphosphate (ATP).

STAGE TWO

PERFORMANCE TASKS

- Chromatography Lab Activity: Students identify pigments in different plants and describe their function in the process of photosynthesis.
- Photosynthesis Lab Activity (Pasco): Using elodea, students will examine how the amount of light affects the oxygen level (rate of photosynthesis) in an enclosed environment
- Order of Photosynthesis: Students arrange index cards with steps of photosynthesis chronologically.
- Heart Rate and CO2 Production (Pasco): students obtain heart rate and CO2 data from a subject under various levels of stress. Students interpret data to find relationship between heart rate and CO2 production rate.
- Muscle Fatigue Lab: students demonstrate muscle fatigue by squeezing clothes pins. Students explain the reason for muscle fatigue in terms of cellular respiration
- Yeast Fermentation Lab: students prepare solutions of yeast and various levels of sugar with balloon on Erlenmeyer flasks. Students observe varying levels of fermentation. Student explain the reaction and why it varied between solutions
- Review game
- Vocabulary Quizzes
- Chapter Test
- Glucose Story: Students write a story indicating each step of cellular respiration
- Flip book

OTHER EVIDENCE

- Photosynthesis Internet Activity: students visit pbs.org to observe and manipulate the rate of photosynthesis under various conditions

- Homework:
    - Vocabulary flash cards or map (word, picture, sentence, example)
    - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets
- Visual Quiz

STAGE THREE

LEARNING PLAN

- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Foldables – organization of material
- Photosynthesis Flip Book: students draw and label each step of photosynthesis (2 different books for light-dependent and light-independent reactions)
- Cellular Respiration Poster: students draw and label each step of the cellular respiration as it occurs near and within the mitochondria

Misconceptions/Teaching Tips:

- Photosynthesis chemical formula must be explained in terms of what the symbols represent (O2, CO2, H2O), and how the equation is balanced because students may not have studied chemistry at this point.
- Every atom must be accounted for in photosynthesis flip books and cellular respiration poster when reviewing the processes step-by-step
- Do not forget to revisit the big picture of what the reactants and products are after breaking the processes down into individual steps.
- Reinforce that cellular respiration occurs in most living things, while photosynthesis only occurs in those with light-absorbing pigments

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: Cell Growth, Division and Reproduction Time Frame: 2 weeks
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** 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.

UNIT RESOURCES

- Online Textbook, Section Review Worksheets, PowerPoint Presentations, Textbook Chapter 10 & Section 11.4

Internet Resource Links:

- *www.pearsonsuccessnet.com*

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. [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.]

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]

ENDURING UNDERSTANDINGS

- Organisms reproduce, develop, and have predictable life cycles
- Cells divide through the process of mitosis, resulting in daughter cells that have the same genetic composition as the original cell.

- Cell differentiation is regulated through the expression of different genes during the development of complex multicellular organisms.

ESSENTIAL QUESTIONS

- How do organisms grow and repair tissue?
- How do cells differentiate into different cell types?
- What are organs? How do they develop? What are organ systems and how do they work together to form a multicellular organism?

KNOWLEDGE AND SKILLS

Vocabulary

- Cell division, mutation, chromosome, cytokinesis, prophase, metaphase, anaphase, telophase

Skills

- Reflect on and revise observations as new evidence emerges
- Apply data representations and new models to revise predictions and explanations
- Distinguish between the processes of cellular growth and development.
- Describe modern applications of the regulation of cell differentiation and analyze the benefits and risks.
- Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions.

STAGE TWO

PERFORMANCE TASKS

- Mitosis Microscope Slides Lab: students observe pre-prepared slides of onion root tip. Students indicate which phase of mitosis each slide shows. Students describe what is occurring during each phase
- Surface Area vs. Volume Cubes: Students may create their own cubes of indicated sizes or they may use prepared cubes to measure their surface area and volume. Students combine cubes then compare the surface area : volume ratio as the cube grows larger. Students compare this process to a cell as it grows larger
- Mitosis Plates – drawing and labeling the stages and cell parts involved
- Division differences in cancer cells compared to normal cells (paper lab)
- Review game
- Vocabulary Quizzes

- Chapter Test

OTHER EVIDENCE

- Mitosis Flip Book: students create a flipbook indicating a step-by-step knowledge of what occurs during each phase of mitosis.
- Microslide Viewer Lab: Students observe each slide then draw and describe what is occurring in each phase of mitosis
- Homework:
    - Vocabulary flash cards or map (word, picture, sentence, example)
    - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets
- Visual Quiz

STAGE THREE

LEARNING PLAN

- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Foldables – organization of material (surface area vs. volume, movement of materials across cell membrane, phases of mitosis)
- Mitosis Plates: Students draw and label each organelle present in the proper location in each phase on a different plate
- Mitosis Worksheet: Label phase and indicate organelles involved in process of mitosis
- Analyze Cyclins Activity: students analyze and interpret graph of cyclins present in each phase of mitosis and answer analysis questions
- Analyze Differentiation Activity: students complete data table and interpret the data in order to answer analysis questions
- Mitosis Wheel: students draw and label each organelle present in the proper location during each phase on a different plate

Misconceptions/Teaching Tips:

- Mitosis Rap Video will reinforce stages of mitosis and what occurs in each
- Students should explain this process in their own words in several different contexts (drawn and labeled, orally, written on paper) to assist in retaining knowledge
- Be sure to reinforce that this occurs in only somatic cells (“mi-toe-sis” since mitosis occurs in your toes and other body cells; not sex cells)
- Cancer has reached many of these students either their friends or families, so tread lightly when approaching this subject. However, sharing personal stories is something some of

the students would like to do, and by sharing one of your own personal stories may make them feel more comfortable doing so. Also, a confidential journal entry may make others feel more comfortable. This could lead to a great discussion about how cancer occurs with a scientific explanation. They have many questions, and once the personal association is made, they will be more willing to ask these questions.

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: Genetics and DNA **Time Frame: 7 weeks**
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** 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. 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

- Online Textbook, Section Review Worksheets, PowerPoint Presentations, Textbook Chapter 11, 12, 13 & 14 (1 section)

Internet Resource Links:

- *www.pearsonsuccessnet.com*

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. [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.]

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. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

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.

[Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

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. [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.]

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

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. [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.]

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. [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.]

ENDURING UNDERSTANDINGS

- Organisms contain genetic information that influence their traits, and they pass this onto their offspring during reproduction
- Living systems, from the organism to the cellular level, demonstrate the complementary nature of structure and function.
- DNA mutations that cause disease can be passed from one generation to the next.
- There are predictable patterns of inheritance, and the variation that exists within a species is related to its mode of reproduction (sexual or asexual).

- Sorting and recombination of genes in sexual reproduction result in a great variety of possible gene combinations in the offspring of any two parents.
- New traits may result from new combinations of existing genes or from mutations of genes in reproductive cells within a population.

ESSENTIAL QUESTIONS

- How does the structure of a molecule relate to its function in a living thing?
- How is genetic information passed from one generation to the next?
- How do changes in genetic information affect organisms?
- How does sexual reproduction produce more diversity within a population?
- How do new traits affect an organism and a population?

KNOWLEDGE AND SKILLS

Vocabulary

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

Skills

- Account for the appearance of a novel trait that arose in a given population.
- Reflect on and revise observations as new evidence emerges
- Apply data representations and new models to revise predictions and explanations
- Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences
- Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams
- Predict the potential impact on an organism given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations.
- Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions.
- Demonstrate through modeling how the sorting and recombination of genes during sexual reproduction has an effect on variation in offspring (meiosis, fertilization).

STAGE TWO

PERFORMANCE TASKS

- Review game
- Vocabulary Quizzes

- Chapter Test

Chapter 11

- Design a Species (long-term project): Students, individually, are responsible for designing a novel species by describing their phenotypic characteristics, genotypes that correspond to each trait, different types of inheritance, DNA and RNA sequences. Students will have a different task as new information is presented in each chapter.
- Genetics and Chance – Coin Flip: students, in groups, predict the outcome for varying numbers of coin tosses. Students observe and record actual coin tosses. Students compare results with other groups. Then offer reasoning using probability concepts for the observed outcomes. Then relate to outcomes of monohybrid crosses and predict outcomes for dihybrid and other crosses.
- Design a Dragon Activity: individually, students use genetic information provided about genotype and phenotype for various traits of a dragon. Then assemble the various parts to create a dragon model with the proper traits. Students explain how they determined the traits for their dragon.
- Segregation and Fertilization Lab: in partners, students create paper chromosomes, each designated with a different trait. Students determine their genotype for each trait and add it to the chromosomes. Pairs of students throw their chromosomes together to simulate fertilization then record the genotypes of their hypothetical children and explain the process of fertilization.
- Meiosis Clay Model Creation: Students use clay to demonstrate the organelles involved in each phase of meiosis and describe what occurs during each phase

Chapter 12

- DNA Structure Activities: in each activity listed, students use manipulatives to demonstrate the structure of DNA, including base pairing, 5' to 3' arrangement of sugars and phosphates, etc.
    - Cut and paste
    - Jewelry
    - Origami
    - Plastic models

Chapter 13

- Monster CHNOPS: students determine traits of a monster using base pairing, transcription and translation concepts.
- Transcription & Translation – cut-out add-on: students use cut and past manipulatives from chapter 12 DNA activity to demonstrate transcription and translation processes.

Chapter 14 (Section 1)

- Construct a Family Pedigree: students choose a trait, record this trait in their family members, design a pedigree diagram to indicate how the trait was passed from parents to offspring according to the pattern of inheritance they determine.

Genetics Open Ended Assessment: students interpret data from a genetics experiment scenario to determine the pattern of inheritance in venus flytraps. Students explain their reasoning using Punnett squares and paragraph format.

OTHER EVIDENCE

Chapter 11

- Hardy-Weinberg Taste Test Lab: students hypothesize on the predominance of PTC Taste test in classroom population as well as pattern of inheritance. Students attempt to taste PTC, record results, combine results of class, and interpret to determine wild type in population and pattern of inheritance. Add on: students take PTC papers home to determine phenotype of family members, determine pattern of inheritance, and create a pedigree.
- Meiosis Flip Book: students create a flipbook indicating a step-by-step knowledge of what occurs during each phase of meiosis

Chapter 12

- DNA Extraction from Strawberry: Students use detergent to remove DNA from crushed strawberries, then make observations of the physical characteristics and predictions of the structure of DNA.
- DNA cut and paste reproduction add-on: Students use manipulatives to display the structure of DNA. Then use these manipulatives to demonstrate the process of DNA reproduction.

Chapter 13

- RNA diagram: Students draw and label the processes of transcription and translation, then explain steps of each process with a partner/group.
- Gene of Fortune – Codons and Amino Acids with Dice: Students in groups roll amino acid dice to create codon then determine the corresponding amino acid.
- DNA, RNA, and Snorks: Students use codons to determine amino acids, protein, and trait. Students then use this information to draw an example of these hypothetical alien organisms.

Chapter 14 (Section 1)

- Pedigree Analysis: Students are given several scenarios of pedigrees for different traits. They are to determine dominance of the trait, which individuals are affected, and where trait originated in the family, etc.
- Study a genetically inherited disease of your choice
- Use of magnetic pedigree pieces to assemble them as a class
- Homework:
    - Vocabulary flash cards or map (word, picture, sentence, example)
    - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets
- Visual Quiz

STAGE THREE

LEARNING PLAN

- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Foldables – organization of material (phases of meiosis, transcription vs. translation, DNA vs. RNA

Chapter 11

- Classroom Survey: students hypothesize about predominance of several traits, survey classmates for phenotypes and record in data table, total results, determine percentages of each trait. Students predict which traits are determined by dominant and recessive alleles and explain their reasoning.
- SpongeBob problems: Students practice creating and interpreting Punnett squares given various scenarios using spongebob characters.
- Oompa Loompa problems: Students practice creating and interpreting Punnett squares given various scenarios using characteristics oompa loompas may have.
- Reindeer problems: Students practice creating and interpreting Punnett squares given various scenarios using reindeer characters.
- Blood Type Problems: Students practice creating and interpreting Punnett squares given various blood type scenarios
- Meiosis Plates: students draw and label each organelle present in the proper location in each phase on a different plate
- Meiosis Worksheet: Label phase and indicate organelles involved in meiosis
- Meiosis Internet Activity: Students observe animation of meiosis and answer analysis questions

Chapter 12

- Decoding DNA Worksheet: Students practice base pairing in DNA using letters and colors in picture format.
- Gene of Fortune Game – Bingo Base Pairing: Students practice base pairing using bingo game format

Chapter 13

- Coloring Transcription and Translation Worksheet: Students color and label parts of the transcription and translation processes
- Codon Worksheet: Students use codon wheel to determine amino acids that correspond to codons.

Chapter 14 (Section1)

- Clues from the Karyotype – cut-out: Students cut out chromosomes and arrange in a karyotype. Then interpret karyotype to determine any chromosomal disorders
- Pedigree Analysis Problems: Students analyze various pedigrees to determine inheritance pattern of several phenotypes.
- Research into a specific genetic disorder and the effects on the individual

Misconceptions/Teaching Tips:

- Vocabulary – many of these words are new to these students, so use the words in your explanation and insist that the students use the words in their verbal and written explanations of their work.
- Punnett squares – some students will pick this up right away and some may need extra time. Pairing a student who is struggling with a person who understands the concept may assist in attainment of this concept.
- Genotypic and phenotypic ratios – use many examples and do frequent individual checks to ensure students understand how to determine ratios, percentages, and the difference between genotype and phenotype.
- Meiosis vs. Mitosis – which type of cells each process occurs in, number of cells each process creates, ploidy of each cell at beginning at the end – review with terms, pictures, and verbally as a class, with a partner, in groups.
- DNA – students relate to visual pictures and manipulatives of the structure of DNA, also use color coding for each part of the molecule. Also use manipulatives to show the process of replication.
- RNA – use same types of manipulatives that were used for DNA when explaining structure for RNA to show similarities and differences.
- Transcription/Translation – draw, label, and explain both in order on the same diagram. Use the meaning of the root words of each process to help students remember the differences between them.
- Pedigrees – Give students many examples with varying amounts of given information. Allow them to interpret individually, discuss in groups, and do individual checks for understanding verbally.
- Karyotypes – use various examples of chromosomal disorders. Be sure you know the symptoms of each because the students may not have ever heard of these disorders.

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: Genetic Engineering **Time Frame: 2 weeks**
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** 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

- Online Textbook, Section Review Worksheets, PowerPoint Presentations, Textbook Chapter 15

Internet Resource Links:

- *www.pearsonsuccessnet.com*

STAGE ONE

GOALS AND STANDARDS

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

ENDURING UNDERSTANDINGS

- The development of technological applications for biology has resulted in advanced research and medicine
- DNA is the universal code for life; it enables an organism to transmit hereditary information and, along with the environment, determines an organisms characteristics
- Genetics are used to study human inheritance
- Biotechnology is used to not only determine what the extent of the human genome is, but hot to identify and ultimately cure genetic disorders.

ESSENTIAL QUESTIONS

- How do humans take advantage of naturally occurring variation among organisms?
- How do scientists study and work with specific genes?
- How do humans use genetic engineering?
- What are the ethical issues raised by genetic engineering?

KNOWLEDGE AND SKILLS

Vocabulary

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

Skills

- Apply scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence
- Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories
- Reflect on and revise observations as new evidence emerges
- Use data representations and new models to revise predictions and explanations
- Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences
- Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams
- Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions
- Explain the value and potential applications of genome projects
- Provide a scientific explanation for the history of life on Earth using scientific evidence

STAGE TWO

PERFORMANCE TASKS

- Create a transgenic organism: Students describe a hypothetical transgenic organism they would create by combining the genomes of 2 animals. Then explain how the process could occur using genetic engineering concepts.
- GM Research: Students research a type of GM food, animal, or plant, and describe the process in which it was created and the benefits and risks.

- Review game
- Vocabulary Quizzes
- Chapter Test

OTHER EVIDENCE

- Genetics Articles: Students read and discuss how genetic engineering has been used in various plants and animals. Students explain whether or not they support these uses of genetic engineering citing examples/reasoning from the articles.
- Homework:
  - Vocabulary flash cards or map (word, picture, sentence, example)
  - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets

Visual Quiz **STAGE THREE**

LEARNING PLAN

- Selective Breeding Corn Activity – Students collect and interpret data from given samples of corn to determine prevalence of yellow and blue kernels. Then explain how a farmer could use selective breeding to create a crop of corn with mostly yellow kernels.
- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Foldables – organization of material (types of GE processes, uses of GE)
- GATTACA – students watch movie and answer questions to review genetic engineering concepts. Students describe misconceptions implied in the movie. Students express opinion of living in the scenario presented in movie.

Misconceptions/Teaching Tips:

- Students have not heard much about genetic engineering, so use many examples of foods/animals/plants that are familiar to them. The examples will also allow you to be able to grab their attention because GE is used very frequently and for very interesting purposes.
- Students will also have many questions about these items, so being well versed in older and new techniques will be helpful.

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this

information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: Evolution and Diversity **Time Frame: 4 weeks**
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** 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

- Online Textbook, Section Review Worksheets, PowerPoint Presentations, Textbook Chapter 16 & 17

Internet Resource Links:

- *www.pearsonsuccessnet.com*

STAGE ONE

GOALS AND STANDARDS

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

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. [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.]

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. [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.]

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

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. [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.]

ENDURING UNDERSTANDINGS

- The process of evolution drives the diversity and unity of life.
- The diversity and changing of life forms over many generations is the result of natural selection, in which organisms with advantageous traits survive, reproduce, and pass those traits to offspring .

ESSENTIAL QUESTIONS

- What is natural selection and how is it different than artificial selection?
- How can populations evolve to form new species?
- What is the goal of biologists who classify living things?

KNOWLEDGE AND SKILLS

Vocabulary:

- Evolution, artificial selection, adaptation, fitness, natural selection, biogeography, homologous structure, analogous structure, Vestigial structure

Skills

- Apply data representations and new models to revise predictions and explanations
- Predict the potential impact on an organism given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations
- Demonstrate through modeling how the sorting and recombining of genes during sexual reproduction has an effect on variation in offspring
- Account for the appearance of a novel trait that arose in a given population
- Estimate how closely related species are, based on scientific evidence
- Provide a scientific explanation for the history of life on Earth using scientific evidence
- Account for the evolution of a species by citing specific evidence of biological mechanisms

STAGE TWO

PERFORMANCE TASKS

- Woolybooger Natural Selection Simulation: Students simulate natural selection process in groups, each student using a different utensil to "obtain food." If not enough food is obtained, they are eliminated because they are not as "fit" as the others. Students explain how this activity demonstrates natural selection.
- Measured Evolutionary Timeline: Students create a scale of time from the beginning of the solar system to present in meters and measure a length of register tape. Students arrange major events in the history of earth at the corresponding length on the tape. Students explain how each event occurred.
- Amino Acid Comparison: Students compare amino acids and cytochrome c found in several mammals. Students explain how this data supports evolution.
- Review game
- Vocabulary Quizzes
- Chapter Test

OTHER EVIDENCE

- Adaptation No-Thumbs Lab: students simulate natural selection by carrying out tasks with their thumbs taped and not taped. Discuss how the simulation represents natural selection in a natural environment.
- Peppered Moth Internet Activity: Students simulate natural selection in online activity using moths of different colors in environments of different colors.

- Homework:
    - Vocabulary flash cards or map (word, picture, sentence, example)
    - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets

STAGE THREE

LEARNING PLAN

- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Foldables – organization of material (homologous vs. analogous structures)
- Scientist Timeline: Students arrange pictures, years, and contributions of scientists who contributed to evolutionary theory.
- Fitness evaluation lab – who lives who dies?
- Darwin vs Lamarck Lab
- Evidence of Evolution Poster: Students arrange pictures that corresponds to each point of Darwin's evolutionary concepts on a poster, and use the pictures as examples in an explanation of the supporting evidence for evolution.
- Skull observation: Students observe similarities and differences in bone structure of skulls of human ancestors then hypothesize about why and how these changes occurred over time.
- Polygenic Trait Height Activity: Students measure height of classmates, record data, find average, plot data on a graph. Students explain how range of height represents polygenic trait.

Misconceptions/Teaching Tips:

- Make as many concepts into physical activities and manipulatives as often as possible because evolution is a difficult concept to grasp.
- Use pictures, concept maps, and diagrams to assist in organizing information.

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: Plant Structure and Function Time Frame: 1 week
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** 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

- Online Textbook, Section Review Worksheets, PowerPoint Presentations, Textbook Chapter 22 & 23

Internet Resource Links:

- *www.pearsonsuccessnet.com*

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. [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.]

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

ENDURING UNDERSTANDINGS

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

ESSENTIAL QUESTIONS

- How are cells. tissues and organs organized into systems that carry out the basic functions of a seed plant?
- How do changes in the environment affect the reproduction, development, and growth of plants?

KNOWLEDGE AND SKILLS

- Vocabulary:

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, 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

- Plant Scavenger Hunt: Students, in groups, search school campus for plant items to demonstrate understanding of plant structure then arrange them on a poster and label each item. Teacher asks each student about function of each item displayed.
- Grow plant in lab groups – measuring growth rate and visible plant parts
- Review game
- Vocabulary Quizzes
- Chapter Test

OTHER EVIDENCE

- Homework:
    - Vocabulary flash cards or map (word, picture, sentence, example)
    - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets

STAGE THREE

LEARNING PLAN

- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Foldables – organization of material (monocots vs. dicots, plant parts and functions, types of plant cells, plant adaptations)
- Plant Cell Worksheet: Students color and label organelles in a plant cell diagram.
- Moss life Cycle Diagram: Students draw and label moss life cycle diagram
- Fern Life Cycle Diagram: Students draw and label fern life cycle
- Conifer Life Cycle diagram: Students draw and label conifer life cycle
- Flower Worksheet: Students color and label parts of flower.
- Life: Plants: Students watch Life: Plants video and summarize facts discussed in class as well as interesting new information introduced. Discuss as review.
- Grow your own plant lab

Misconceptions/Teaching Tips:

- Students have studied some introductory information about plants, but must be reviewed.
- More time must be spent conceptualizing unfamiliar plants (mosses and ferns) as well as parts of plants that cannot be seen readily (chloroplasts, meristems, etc.)

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: Introduction to Animals Evolution and Diversity
Time Frame: 2 weeks
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** 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

- Online Textbook, Section Review Worksheets, PowerPoint Presentations, Textbook Chapter 25 & 26

Internet Resource Links:

- *www.pearsonsuccessnet.com*

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.
[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.]

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

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

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. [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.]

ENDURING UNDERSTANDINGS

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

ESSENTIAL QUESTIONS

- What characteristics and traits define animals?
- How have animals descended from earlier forms through the process of evolution?

KNOWLEDGE AND SKILLS

- Characteristics of animals
- Differences between invertebrates, chordates and vertebrate chordates
- Trends in animal evolution
- Understand what fossil evidence can tell us about the evolution of the first animals
- Interpret and understand a cladogram of animals
- Identify adaptations that allow hominine species to walk upright

STAGE TWO

PERFORMANCE TASKS

- Dichotomous Key: Students create a dichotomous key that will allow the user differentiate between different types of animals according to the characteristics discussed.
- Animal Conservation Research project: Students choose vertebrate/arthropod animal in decline, describe reasons for decline, role of animal in environment, and offer at least one course of action to assist the animals' return to a healthy state.
- Dissection (if materials can be provided) or Virtual Dissections: Students identify similarities and differences in structures of various types of invertebrates and vertebrates. Explain differences in terms of evolutionary change. Create a cladogram that demonstrates these observations.
- Classify the animal lab – labeling as vertebrate and invertebrate and also identifying the specific type of vertebrate or invertebrate
- Review game
- Vocabulary Quizzes
- Chapter Test

OTHER EVIDENCE

- Mealworm observation: students observe characteristics of mealworms in various stages of development and describe their life cycle.
- Hydra Observation: students observe hydra to see how it will react to stimuli, then describe observations in terms of invertebrate characteristics.
- Cladogram: interpret cladograms of invertebrate and vertebrate evolution.
- Homework:
    - Vocabulary flash cards or map (word, picture, sentence, example)
    - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets

STAGE THREE

LEARNING PLAN

- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)

- Foldables – organization of material (invertebrate characteristics, chordate characteristics)
- Cladogram worksheet: students use animal and characteristic information provided and arrange on cladogram then explain how evolution occurred.
- Research Animal traits and its classification
- Traits similar among all animals and the specific classifications of invertebrates and vertebrates
- Identify the type of animal lab – based on known physical features

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

Unit Name: Classification **Time Frame: 1 week**
Author: Egg Harbor Township High School Science Department

UNIT

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

Course/Grade: **Standard** State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

Students will understand how we classify living things. They will understand Binomial Nomenclature and what parameters taxonomists use to name organisms and group them together. Students will also practice reading and interpreting cladograms.

UNIT RESOURCES

- Online Textbook, Section Review Worksheets, PowerPoint presentations, educational videos, Textbook Chapter 18

Internet Resource Links:

- *www.pearsonsuccessnet.com*

STAGE ONE

GOALS AND STANDARDS

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

ENDURING UNDERSTANDINGS

- Understand the goals of biologists who classify living organisms.

ESSENTIAL QUESTIONS

- What are the goals of binomial nomenclature and systematics?
- What is the goal of evolutionary classification?
- What is a cladogram?
- How are DNA sequences used in classification?
- What are the six kingdoms of life as they are now identified?

KNOWLEDGE AND SKILLS

Students will be able to:

- Understand why scientists classify organisms
- Understand how evolutionary relationships affect the way scientists classify organisms
- Understand and describe the major groups in the modern classification system.

STAGE TWO

PERFORMANCE TASKS

- Dichotomous Key Lab (sharks) (donuts) (protist drawings): students use dichotomous key provided to identify various species of an animal
- Classification of Animals Lab: Students observe traits of various animals, look for similarities and differences, then use a dichotomous key to determine the species.
- Review game
- Vocabulary Quizzes
- Chapter tests
- Project Asssessment (in class): Students are given a scenario in which only specific species have survived a natural disaster. Their objective is to use the traits of each organism to create a taxonomic scheme, names for each organism, illustration of each organism, dichotomous key to identify each, and a cladogram to show evoluationary path of development.

OTHER EVIDENCE

- Are they related Game: Students are given cutouts of various animals. Based on looks alone, they are to match the creatures that look related. Later, as a class we will review which are really related to explain how physical appearance is not enough to determine relationship.
- Homework:
    - Vocabulary flash cards or map (word, picture, sentence, example)
    - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Study Guide Packets
- Visual Quiz

STAGE THREE

LEARNING PLAN

Activities, experiences, and lessons:

- Kingdom Objects: Students are given an envelope with random items inside. They are to work together to categorize these items into phyla and classes according to common characteristics, then describe their classification system to the class, and discuss differences in each group's system.
- Cladogram Handout: Students identify evolutionary differences on a cladogram, then create their own cladogram using information they gather
- PowerPoint presentation of material
- Group discussion
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Finding Order in Diversity WebSearch: Students use internet and textbook/notes to answer questions about classification systems. They also classify 2 animals and compare and contrast their taxonomy. Then infer characteristics they may share and definitely do not share, and relate to taxonomic scheme of the 2 animals.

Misconceptions/Teaching Tips:

- Cladogram: students struggle making the association between similar characteristics between organisms and evolutionary relationship between organisms
    - They say "we came from monkeys"
    - Teacher response should include evidence of common ancestors (verbal and visual) (possibly manipulative: human, gorilla, common ancestor, and possibly some leading up to *Homo sapien* will show similarities and differences and the progression from each)
- 5 Kingdom Classification System vs. 6 Kingdom Classification system.
    - Have students make foldables to clarify the difference

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.

This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all general biology students.

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