EGG HARBOR TOWNSHIP PUBLIC SCHOOLS
CURRICULUM

MEDICAL SCIENCE ACADEMY: Neuroscience and Genetics
High School

Length of Course:	Full Year
Elective / Required:	Refer to Program of Studies
Schools:	High School
Student Eligibility:	Grade 9
Credit Value:	5 credits
Date Submitted:	September 2013
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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: Introduction to the Nervous System Time Frame: 4 Weeks
Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Neuroscience**
Course/Grade: **MSA 10th Grade**
School: **Egg Harbor Township High School**
Country: **USA**
State/Group: **NJ**

UNIT SUMMARY

In this introductory unit, students will be introduced to Neuroscience. A brief history of the progression of the study of the nervous system, an overview of the scope, and various deviations of and research topics of the science will be explored. This will lead into the modern understanding of Neuroscience.
This unit's primary focus is an in depth view of the cells, and fundamental physiology of the nervous system. Most of the time in this unit will focus on neurons, action potentials, and the basic structures and divisions of the Nervous System. This will serve as the foundation for the remainder of the course.

UNIT RESOURCES

PowerPoint Presentations/SMART Board
Cambell & Reese AP Biology MASTERINGBIOLOGY.com etext & problems.
Brainfacts.org & BrainFacts etext
Videos from sites such as youtube
Sheep Brain Specimen
Materials to construct/model neuron/AP

Internet Resource Links:

www.brainfacts.org
www.masteringbiology.com
www.youtube.com

STAGE ONE

GOALS AND STANDARDS

HS-LS1-2 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	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.
HS-LS1-3 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	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.]

ENDURING UNDERSTANDINGS

- *Students will understand how neurons communicate with one another.*
- *Students will understand the role of cells of the nervous system, and the various parts of neurons*
- *Students will understand the importance of cellular communication.*
- *Students will understand that the nervous system is complex can be divided into different categories.*
- *Students will discover that our understanding of the nervous system is not complete, and is constantly advancing.*
- *Students will understand that the nervous system is a complex system composed of cells, and that our ability to think, interpret, and respond all result from interactions between these cells.*

ESSENTIAL QUESTIONS

- *What is neuroscience?*
- *What is the nervous system?*
- *What cellular functions of neurons allow the nervous system to communicate?*

KNOWLEDGE AND SKILLS

Students will know:

- *What neuroscience covers and professions that study/use it.*
- *The various parts and divisions of the Nervous System*
- *The Cells of the nervous system and how they communicate*
- *How action potentials are generated and used*
- *The role of neurotransmitters*

Students will be able to:

- *Identify careers in and uses for neuroscience*
- *Identify and explain the parts and divisions of the NS*
- *Explain the roles of glial cells and neurons.*
- *Model the parts of neurons, propagation of an action potential and how neurons communicate.*
- *Describe the supporting cells of the central & peripheral nervous system and explain the blood brain barrier.*
- *Briefly describe the role of neural communication in a simple reflex and its inhibition by brain mechanisms.*
- *Describe the measurement of the action potential and explain the dynamic equilibrium that is responsible for the membrane potential.*
- *Describe the role of ion channels in action potentials and explain the all-or-none law and the rate law.*
- *Describe the structure of synapses, the release of the neurotransmitter, and the activation of postsynaptic receptors.*
- *Describe postsynaptic potentials: the ionic movements that cause them, the processes that terminate them, and their integration.*

STAGE TWO

PERFORMANCE TASKS

Students will be expected to:

- *Read, summarize, and dissect articles from popular and scientific literature relevant and/or loosely related to topics covered in this unit.*
- *Engage in discussion of current or projected research/ethical issues*
- *Create and explain a model of how neurons communicate*

OTHER EVIDENCE

Students will be given a(n):

- *Multiple choice exam on material covered*
- *Open-ended questions*
- *Application Scenarios*

STAGE THREE

LEARNING PLAN

Students will be expected to complete:

- *Assigned readings & outlines*
- *Online problems/labs*
- *In class labs*

Students will be expected to create:

- *Sample quiz questions*
- *Presentations*
- *Working Models to represent key ideas (specifically of action potential)*

The teacher will:

- *Provide lectures highlighting the most difficult topics*
- *Guide students through reading assignments with targeted questions*
- *Guide students during in-class discussions*
- *Direct students to online labs and activities to reinforce the unit.*

In order to monitor student progress, the teacher will:

- *Use 'Warm Up' (before the lesson) and 'Cool Down' (the end of class) activities to gage the classes collective understanding.*
- *Use remote response system to gage individual comprehension*
- *Use Dry Erase Boards for quick flashes of student comprehension Have students quiz one another using their sample quiz question flashcards*
- *Give weekly quizzes*

Unit Name: Evolution, Development, and Parts of the Brain Time Frame: 4 Wks
Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Neuroscience**
Course/Grade: **MSA 10th Grade**
School: **Egg Harbor Township High School**
Country: **USA**
State/Group: **NJ**

UNIT SUMMARY

In this unit, students will use comparative anatomy of modern animals to create, and then research a hypothesis about the evolution of the human brain. Students will then explore neural development and examine both genetic and environmental influences on development. This unit will conclude with neural anatomy, focused primarily on the brain.

UNIT RESOURCES

PowerPoint Presentations/SMART Board
Cambell & Reese AP Biology MASTERINGBIOLOGY.com etext & problems.
Brainfacts.org & BrainFacts etext
Videos from sites such as youtube
Sheep Brain Specimen
Cladograms
Library/Computer Lab

Internet Resource Links:
www.brainfacts.org
www.masteringbiology.com
www.youtube.com

STAGE ONE

GOALS AND STANDARDS

HS-LS1-2 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	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.
HS-LS1-3 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	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.]

ENDURING UNDERSTANDINGS

Students will understand that the human brain is a result of evolution.
Students will understand the complexity of the nervous system.
Students will understand how much is still not known about the brain.

ESSENTIAL QUESTIONS

- *What makes the human nervous system unique?*
- *How does the NS form?*
- *How is the brain organized?*

KNOWLEDGE AND SKILLS

Students will know:

- *The general sequence of in evolutionary history of the human nervous system*
- *Fundamental differences between mammalian nervous systems and those of other animals.*
- *How both genetic and environmental factors can influence NS development.*
- *Major regions of the brain and some of their associated functions*

Students will be able to:

- *Create a cladogram showing the emergence of the human brain from early chordates*
- *Identify differences between mammalian nervous systems and those of other animals.*
- *Explain how nature and nurture both play a role in neural development.*
- *Summarize the development of the central nervous system and the evolution of the human brain.*
- *Describe the appearance of the brain and the terms used to indicate directions and planes of section.*
- *Identify major regions and sites of the brain and be able to describe their function.*

STAGE TWO

PERFORMANCE TASKS

Students will be expected to:

- *Read, summarize, and dissect articles from popular and scientific literature relevant and/or loosely related to topics covered in this unit.*
- *Engage in discussion of current or projected research/ethical issues*
- *Create a cladogram based on neuro evolution*
- *Dissect and identify regions of a sheep brain*

OTHER EVIDENCE

Students will be given a(n):

- *Multiple choice exam on material covered*
- *Open-ended questions*
- *Application Scenario(s)*

STAGE THREE

LEARNING PLAN

Students will be expected to complete:

- *Assigned readings & outlines*
- *Online problems/labs*
- *In class labs*

Students will be expected to create:

- *Sample quiz questions*
- *Presentations*
- *Working Models to represent key ideas*

The teacher will:

- *Provide lectures highlighting the most difficult topics*
- *Guide students through reading assignments with targeted questions*
- *Guide students during in-class discussions*
- *Direct students to online labs and activities to reinforce the unit.*

In order to monitor student progress, the teacher will:

- *Use 'Warm Up' (before the lesson) and 'Cool Down' (the end of class) activities to gage the classes collective understanding.*
- *Use remote response system to gage individual comprehension*
- *Use Dry Erase Boards for quick flashes of student comprehension Have students quiz one another using their sample quiz question flashcards*
- *Give weekly quizzes*

Unit Name: Sensation & Movement Time Frame: 4 Wks
Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Neuroscience**
Course/Grade: **MSA 10th Grade**
School: **Egg Harbor Township High School**
Country: **USA**
State/Group: **NJ**

UNIT SUMMARY

In this unit, students will explore how the nervous system interacts with extranervous tissues. A major focus of this unit will be on the physiology of vision, and movement. Time will be devoted to the other senses as well

UNIT RESOURCES

PowerPoint Presentations/SMART Board
Cambell & Reese AP Biology MASTERINGBIOLOGY.com etext & problems.
Brainfacts.org & BrainFacts etext
Videos from sites such as youtube
Library/Computer Lab
Sensation evaluation apparatus

Internet Resource Links:

www.brainfacts.org
www.masteringbiology.com
www.youtube.com

STAGE ONE

GOALS AND STANDARDS

HS-LS1-2 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	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.
HS-LS1-3 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	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.]

ENDURING UNDERSTANDINGS

Students will understand our senses are our nervous system detecting stimuli..
Students will understand the basic physiology of vision.
Students will understand each sense uses receptors and to detect stimuli and neurons to send signals to the brain.
Students will understand that the nervous system directs muscle contraction.

ESSENTIAL QUESTIONS

- *How do we detect the world around us?*
- *How do we move?*

KNOWLEDGE AND SKILLS

Students will know:

- *How light energy can be used to see*
- *How the nervous system detects stimuli*
- *How the nervous system causes movement*

Students will be able to:

- *Create a model of light detection in the human eye*
- *Describe the characteristics of light and color, outline the anatomy of the eye and its connections with the brain, and describe the transduction of visual information.*
- *Identify differences between how different types of stimuli can be detected by the nervous system*
- *Explain how the nervous system causes muscle contraction*
- *Describe the three types of muscles found in the bodies of mammals, and explain the physical basis of muscular contraction.*
- *Explain the monosynaptic stretch reflex, the gamma motor system, and the contribution of the Golgi tendon organ.*
- *Describe the organization of motor cortex, and describe the four principal motor tracts and the movements they control*
- *Describe the symptoms and causes of limb apraxia and constructional apraxia.*
- *Discuss the anatomy and function of the basal ganglia, and its role in Parkinson's disease and Huntington's disease*
- *Discuss the role of the cerebellum and the reticular formation in the control of movement.*
- *Make predictions about the consequences of anomalies in sensory and motor control.*

STAGE TWO

PERFORMANCE TASKS

Students will be expected to:

- *Read, summarize, and dissect articles from popular and scientific literature relevant and/or loosely related to topics covered in this unit.*
- *Engage in discussion of current or projected research/ethical issues*
- *Create a model/diagram of vision*
- *Work in groups to create a lesson on a sense (other than vision)*
- *Design experiments to test sensation*

OTHER EVIDENCE

Students will be given a(n):

- *Multiple choice exam on material covered*
- *Open-ended questions*
- *Application Scenario(s)*

STAGE THREE

LEARNING PLAN

Students will be expected to complete:

- *Assigned readings & outlines*
- *Online problems/labs*
- *In class labs*

Students will be expected to create:

- *Sample quiz questions*
- *Presentations*
- *Working Models to represent key ideas*

The teacher will:

- *Provide lectures highlighting the most difficult topics*
- *Guide students through reading assignments with targeted questions*
- *Guide students during in-class discussions*
- *Direct students to online labs and activities to reinforce the unit.*

In order to monitor student progress, the teacher will:

- *Use 'Warm Up' (before the lesson) and 'Cool Down' (the end of class) activities to gage the classes collective understanding.*
- *Use remote response system to gage individual comprehension*
- *Use Dry Erase Boards for quick flashes of student comprehension Have students quiz one another using their sample quiz question flashcards*
- *Give weekly quizzes*

Unit Name: Learning/Memory/Sleep Time Frame: 2 Wks
Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Neuroscience**
Course/Grade: **MSA 10th Grade**
School: **Egg Harbor Township High School**
Country: **USA**
State/Group: **NJ**

UNIT SUMMARY

In this unit, students will learn about the prevailing theories on learning, memory, and sleep. This unit will cover factual and theoretical concepts in these topics.

UNIT RESOURCES

PowerPoint Presentations/SMART Board
Cambell & Reese AP Biology MASTERINGBIOLOGY.com etext & problems.
Brainfacts.org & BrainFacts etext
Videos from sites such as youtube
Library/Computer Lab
Sensation evaluation apparatus

Internet Resource Links:

www.brainfacts.org
www.masteringbiology.com
www.youtube.com

STAGE ONE

GOALS AND STANDARDS

HS-LS1-2 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	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.
HS-LS1-3 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	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.]

ENDURING UNDERSTANDINGS

Students will understand learning and memories are the result of interactions between neurons.
Students will understand that humans operate on a sleep/wake cycle that is regulated by the nervous system.
Students will understand that there is a growing body of research into both learning & memory, and sleep. They will further understand that many of the prevailing ideas in these areas are just theories.

ESSENTIAL QUESTIONS
- *How do we learn?*
- *Why do we sleep?*

KNOWLEDGE AND SKILLS
Students will know:
- *There is a relationship between neuron interactions and learning.*
- *Sleep is necessary.*
- *There are many theories and loads of research into these areas.*

Students will be able to:
- *Decipher between fact and theory regarding learning and sleep.*
- *Identify conditions that interfere with learning and memory-building.*
- *Identify consequences of sleeplessness.*
- *Describe the four basic forms of learning: perceptual learning, stimulus-response learning, motor learning, and relational learning.*
- *Discuss the mechanisms responsible for the increase in synaptic strength that occurs during long-term potentiation.*
- *Describe the role of dopamine in reinforcing brain stimulation.*
- *Discuss how the reinforcement system may detect reinforcing stimuli and strengthen synaptic connections.*

STAGE TWO

PERFORMANCE TASKS
Students will be expected to:
- *Read, summarize, and dissect articles from popular and scientific literature relevant and/or loosely related to topics covered in this unit.*
- *Engage in discussion of current or projected research/ethical issues*
- *Design experiments to test learning and memory*

OTHER EVIDENCE
Students will be given a(n):
- *Multiple choice exam on material covered*
- *Open-ended questions*
- *Application Scenario(s)*

STAGE THREE

LEARNING PLAN
Students will be expected to complete:
- *Assigned readings & outlines*
- *Online problems/labs*
- *In class labs*

Students will be expected to create:

- *Sample quiz questions*
- *Presentations*
- *Working Models to represent key ideas*

The teacher will:

- *Provide lectures highlighting the most difficult topics*
- *Guide students through reading assignments with targeted questions*
- *Guide students during in-class discussions*
- *Direct students to online labs and activities to reinforce the unit.*

In order to monitor student progress, the teacher will:

- *Use 'Warm Up' (before the lesson) and 'Cool Down' (the end of class) activities to gage the classes collective understanding.*
- *Use remote response system to gage individual comprehension*
- *Use Dry Erase Boards for quick flashes of student comprehension Have students quiz one another using their sample quiz question flashcards*
- *Give weekly quizzes*

Unit Name: Conditions affecting the Nervous System Time Frame: 2 Wks
Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Neuroscience**
Course/Grade: **MSA 10th Grade**
School: **Egg Harbor Township High School**
Country: **USA**
State/Group: **NJ**

UNIT SUMMARY

In this unit, students will learn about conditions resulting in or from abnormalities in the nervous system. This will be a culminating unit that challenges students to apply what they have learned in a diagnostic role.

UNIT RESOURCES

PowerPoint Presentations/SMART Board
Cambell & Reese AP Biology MASTERINGBIOLOGY.com etext & problems.
Brainfacts.org & BrainFacts etext
Videos from sites such as youtube
Library/Computer Lab
Sensation evaluation apparatus

Internet Resource Links:

www.brainfacts.org
www.masteringbiology.com
www.youtube.com

STAGE ONE

GOALS AND STANDARDS

HS-LS1-2 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	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.
HS-LS1-3 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	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.]

ENDURING UNDERSTANDINGS

Students will understand that there are various conditions that can affect the nervous system.
Students will understand that there is a biological reason for these conditions.
Students will understand that many nervous system disorders can only be treated (to various degrees), but rarely cured

ESSENTIAL QUESTIONS

- *What happens when various parts of the nervous system don't operate properly?*
- *What can be done to correct or treat disorders of the nervous system?*

KNOWLEDGE AND SKILLS

Students will know:

- *Various common neurological disorders*
- *The biological basis of many disorders*
- *Potential treatments of many disorders*

Students will be able to:

- *Identify a disorder based on symptoms*
- *Identify a disorder based on pathology*
- *Identify a treatment based on the disorder*

STAGE TWO

PERFORMANCE TASKS

Students will be expected to:

- *Read, summarize, and dissect articles from popular and scientific literature relevant and/or loosely related to topics covered in this unit.*
- *Engage in discussion of current or projected research/ethical issues*
- *Role play disorder and diagnostician (House)*

OTHER EVIDENCE

Students will be given a(n):

- *Multiple choice exam on material covered*
- *Open-ended questions*
- *Application Scenario(s)*

STAGE THREE

LEARNING PLAN

Students will be expected to complete:

- *Assigned readings & outlines*
- *Online problems/labs*
- *In class labs*

Students will be expected to create:

- *Sample quiz questions*
- *Presentations*
- *Working Models to represent key ideas*

The teacher will:

- *Provide lectures highlighting the most difficult topics*
- *Guide students through reading assignments with targeted questions*
- *Guide students during in-class discussions*
- *Direct students to online labs and activities to reinforce the unit.*

In order to monitor student progress, the teacher will:

- *Use 'Warm Up' (before the lesson) and 'Cool Down' (the end of class) activities to gage the classes collective understanding.*
- *Use remote response system to gage individual comprehension*
- *Use Dry Erase Boards for quick flashes of student comprehension Have students quiz one another using their sample quiz question flashcards*
- *Give weekly quizzes*

Unit Name: *Cell Division* **Time Frame:** *2 Weeks*
Author: *Egg Harbor Township High School Science Department*

UNIT

Subject: *GENTICS* **Country**: *USA*
Course/Grade: *MSA 10th* **State/Group**: *NJ*
School: *Egg Harbor Township High School*

UNIT SUMMARY

In this unit, students will review independent study on mitosis and the cell cycle, and carry that information over as they learn meiosis. Students should already be familiar with these topics from a pre-requisite biology course (HNR BIO).

UNIT RESOURCES

Mitosis/Meiosis Models; Genetics Text Books; SMART Board; Microscopes; Prepared Slides
Material for creating Slides; Videos; Student Response Remotes
White Boards; Modeling Clay; Model Chromosomes

Internet Resource Links:

Genetics Online Text
Masteringbiology.com; Masteringgenetics.com
www.youtube.com
Virtual lab (meiosis Labs)
Clinical genetic Education Resources (Courses and Lectures) – Curricula / Courses / Cases / Exams / Conferences / Glossaries / Other / Cancer / Cytogenetics / Embryology / Metabolism / Genetic Conditions / Professional / High School / Public / Undergraduate / Primary Care / References – multiple links within multiple links – various levels and topics - http://www.kumc.edu/gec/prof/genecour.html#undergrad
Genetics Education Center – Univeristy of Kansas Medical Center - for educators interested in human genetics and the human genome project– Human Genome Project / Resources: books, videos, curricula / Lesson Plans / Networking / Genetic Conditions / Careers / Programs, Activities, Resources / Museum Exhibits / Plays / Glossaries / News / Portrayal & Writing / Feedback / FAQ / Search – www.kumc.edu/gec
Learn. Genetics: Genetics Science Learning Center - University of Utah – Basics of Genetics – Basics: Tour the Basics, DNA to Protein, Heredity & Traits, Amazing Cells / Genetic Technology: Stem Cells, Cloning, Gene Therapy, Transgenic Mice / Virtual Labs: DNA Extraction, PCR, Gel Electrophoresis, DNA Microarray / Epigenetics / The New Science of Addiction / Variation, Selection, & Time / Genetics & Health: Personalized Medicine, Family Health History, Genetic Disorders Library / Great Salt Lake Ecology / Archive - http://learn.genetics.utah.edu/
Scitable: by nature education – A collaborative Learning Space for Science – Essentials of Genetics: (multiple topics under each question) – What is DNA? What does DNA do? / How does DNA move from cell to cell? / How is genetic information passed between organisms? / How do scientists study and manipulate the DNA inside cells? / How does inheritance operate at the level of whole populations? - http://www.nature.com/scitable/study-center

STAGE ONE

GOALS AND STANDARDS

HS-LS1-4 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS3-1 Heredity: Inheritance and Variation of Traits	HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS-LS3-2 Heredity: Inheritance and Variation of Traits	**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 Heredity: Inheritance and Variation of Traits	**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.]

ENDURING UNDERSTANDINGS

Students will understand that…

- *All life comes from other life*
- *Cell division is the mechanism of life propagation*
- *Meiosis allows for sexual reproduction*
- *Sexual reproduction results in genetic variation*
- *Meiosis and mitosis are separate processes with similar, but different steps.*

ESSENTIAL QUESTIONS

How and why do cells create more cells?

KNOWLEDGE AND SKILLS

Students will know…

- *The steps of the cell cycle*
- *The reasons cells divide*
- *The process and results of mitosis*
- *The process and results of meiosis*
- *The Differences between mitosis and meiosis*
- *How genetic recombination occurs*

Students will be able to…
- *Illustrate and explain the cell cycle, and the processes of mitosis & meiosis*
- *Identify stages of cell division under a microscope*
- *Model crossing over*
- *Determine probability of various genetic outcomes*

STAGE TWO

PERFORMANCE TASKS

Students will be expected to:
- *Read, summarize, and dissect articles from popular and scientific literature relevant and/or loosely related to topics covered in this unit.*
- *Engage in discussion of current or projected research/ethical issues*
- *Illustrate and narrate the various stages of cell division*
- *Use a microscope to find cells in various stages of mitosis, and then identify those stages of cell division.*
- *Model genetic recombination and crossing over*
- *Create an artistic presentation of an aspect of cell division*

OTHER EVIDENCE

Students will be given a(n):
- *Multiple choice exam on material covered*
- *Open-ended questions*
- *Application Scenario(s)*

STAGE THREE

LEARNING PLAN

Students will be expected to complete:
- *Assigned readings & outlines*
- *Online problems/labs*
- *In class labs*

Students will be expected to create:
- *Sample quiz questions*
- *Presentations*
- *Working Models to represent key ideas*

The teacher will:
- *Provide lectures highlighting the most difficult topics*
- *Guide students through reading assignments with targeted questions*
- *Guide students during in-class discussions*
- *Direct students to online labs and activities to reinforce the unit.*

In order to monitor student progress, the teacher will:
- *Use 'Warm Up' (before the lesson) and 'Cool Down' (the end of class) activities to gage the classes collective understanding.*
- *Use remote response system to gage individual comprehension*
- *Use Dry Erase Boards for quick flashes of student comprehension Have students quiz one another using their sample quiz question flashcards*
- *Give weekly quizzes*

Unit Name: *Inheritance & Heredity* **Time Frame:** *3 Weeks*
Author: *Egg Harbor Township High School Science Department*

UNIT

Subject: *GENTICS* **Country**: *USA*
Course/Grade: *MSA 10th* **State/Group**: *NJ*
School: *Egg Harbor Township High School*

UNIT SUMMARY

In this unit, students will examine Mendelian Rules of Heredity, exceptions to those rules, and the role of chromosomes in inheritance of traits. Students should already be familiar with these topics from a pre-requisite biology course (HNR BIO).

UNIT RESOURCES

Genetics Text Books;	*SMART Board;*	*Student Response Remotes;*	*Videos;*
White Boards;	*Modeling Clay;*	*Model Chromosomes;*	*Karyotypes;*
Pedigrees;	*Problem sets;*	*Computer Lab;*	*Library*

Internet Resource Links:

Genetics Online Text
Masteringbiology.com; Masteringgenetics.com
www.youtube.com
Virtual lab (meiosis Labs)
Clinical genetic Education Resources (Courses and Lectures) – Curricula / Courses / Cases / Exams / Conferences / Glossaries / Other / Cancer / Cytogenetics / Embryology / Metabolism / Genetic Conditions / Professional / High School / Public / Undergraduate / Primary Care / References – multiple links within multiple links – various levels and topics - http://www.kumc.edu/gec/prof/genecour.html#undergrad
Genetics Education Center – Univeristy of Kansas Medical Center - for educators interested in human genetics and the human genome project– Human Genome Project / Resources: books, videos, curricula / Lesson Plans / Networking / Genetic Conditions / Careers / Programs, Activities, Resources / Museum Exhibits / Plays / Glossaries / News / Portrayal & Writing / Feedback / FAQ / Search – www.kumc.edu/gec
Learn. Genetics: Genetics Science Learning Center - University of Utah – Basics of Genetics – Basics: Tour the Basics, DNA to Protein, Heredity & Traits, Amazing Cells / Genetic Technology: Stem Cells, Cloning, Gene Therapy, Transgenic Mice / Virtual Labs: DNA Extraction, PCR, Gel Electrophoresis, DNA Microarray / Epigenetics / The New Science of Addiction / Variation, Selection, & Time / Genetics & Health: Personalized Medicine, Family Health History, Genetic Disorders Library / Great Salt Lake Ecology / Archive - http://learn.genetics.utah.edu/
Scitable: by nature education – A collaborative Learning Space for Science – Essentials of Genetics: (multiple topics under each question) – What is DNA? What does DNA do? / How does DNA move from cell to cell? / How is genetic information passed between organisms? / How do scientists study and manipulate the DNA inside cells? / How does inheritance operate at the level of whole populations? - http://www.nature.com/scitable/study-center

STAGE ONE

GOALS AND STANDARDS

HS-LS1-4 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS3-1 Heredity: Inheritance and Variation of Traits	HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS-LS3-2 Heredity: Inheritance and Variation of Traits	**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 Heredity: Inheritance and Variation of Traits	**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.]

ENDURING UNDERSTANDINGS

Students will understand that…

- *Traits are the result of heritable units called genes*
- *Genes are inherited by offspring from parents during reproduction*
- *Traits can be passed from one generation to the next in predictable patterns*
- *The probability of inheriting certain traits can be calculated*
- *Not all traits are governed by the same rules of inheritance*
- *Gender differences are the result of Sex Chromosomes*
- *Genes are made up of DNA and are carried on chromosomes*
- *Pedigrees can be used to predict the probability of a family passing on certain traits.*
- *Karyotypes can be used to examine chromosomes and make predictions based on the chromosomes present.*
- *Changes in chromosomes (called mutations) can have varying effects on organisms*

ESSENTIAL QUESTIONS

How are traits passed from one generation to the next?
How can we predict the probability of passing on certain traits?
What are chromosomes and what is their role in heredity?
Why are boys boys and girls girls?

What are pedigrees and karyotypes used for?
How can mutations affect an organism?

KNOWLEDGE AND SKILLS

Students will know…

- *The consequences of independent assortment of chromosomes*
- *Mendelian genetics (dominant/recessive)*
- *Exceptions to Mendelian rules*
- *The relationship between DNA, Genes, and Chromosomes*
- *How to use Punnett squares for mono & dihybrid crosses*
- *How to calculate the probability of an offspring inheriting certain traits*
- *Sex chromosomes and their differences*
- *The consequences of various chromosomal mutations*

Students will be able to…

- *Determine probability of various genetic outcomes*
- *Create, read, and use pedigrees*
- *Create and use Punnett squares*
- *Use karyotypes*
- *Identify various patterns of inheritance and predict parentage/offspring characteristics*
- *Predict outcomes of various crosses*
- *Predict outcomes of various chromosomal combinations and mutation*
- *Identify Sex-linked traits*

STAGE TWO

PERFORMANCE TASKS

Students will be expected to:

- *Read, summarize, and dissect articles from popular and scientific literature relevant and/or loosely related to topics covered in this unit.*
- *Engage in discussion of current or projected research/ethical issues/genetic disorders*
- *Work through scenarios/pedigrees to calculate probable outcomes of various traits*
- *Create a presentation on a genetic disorder of their choice and explain the inheritance pattern*
- *Create a family pedigree*

OTHER EVIDENCE

Students will be given a(n):

- *Multiple choice exam on material covered*
- *Open-ended questions*
- *Application Scenario(s)*

STAGE THREE

LEARNING PLAN

Students will be expected to complete:

- *Assigned readings & outlines*
- *Online problems/labs*
- *In class labs*

Students will be expected to create:

- *Sample quiz questions*
- *Presentations*
- *Working Models to represent key ideas*

The teacher will:

- *Provide lectures highlighting the most difficult topics*
- *Guide students through reading assignments with targeted questions*
- *Guide students during in-class discussions*
- *Direct students to online labs and activities to reinforce the unit.*

In order to monitor student progress, the teacher will:

- *Use 'Warm Up' (before the lesson) and 'Cool Down' (the end of class) activities to gage the classes collective understanding.*
- *Use remote response system to gage individual comprehension*
- *Use Dry Erase Boards for quick flashes of student comprehension Have students quiz one another using their sample quiz question flashcards*
- *Give weekly quizzes*

Unit Name: *DNA: Structure, Replication, & Variation* **Time Frame:** *03 Weeks*
Author: *Egg Harbor Township High School Science Department*

UNIT

Subject: *GENTICS* **Country**: *USA*
Course/Grade: *MSA 10th* **State/Group**: *NJ*
School: *Egg Harbor Township High School*

UNIT SUMMARY

In this unit, students will examine the molecular structure and nature of DNA and chromosomes. This unit will cover the processes of DNA structure, replication & recombination, and how DNA is organized in chromosomes. Throughout this (and all future) unit(s), emphasis will be placed on practical application and biotechnology. Students should already be familiar with the content from a pre-requisite biology course (HNR BIO). New to the students will be the application of biotechnology. This unit will use large-scale models to allow students to visualize the mechanisms involved in the biotechnology. Once demonstrating their understanding of the science, students will be exposed to PCR, transformation, gel electrophoresis and various other forms of biotechnology.

UNIT RESOURCES

Genetics Text Book Chapters 10, 11, 12, 19; *SMART Board;*
Student Response Remotes; *Videos;* *White Boards;*
Model DNA; *Model Chromosomes;* *Cutouts;*
Problem sets; *Computer Lab;* *Magnetic Manipulatives;* *String & craft supplies*
Thermocyler; *Incubator;* *Petri Dishes & medium;* *Hot-water bath*
PCR equipment; *DNA;* *Bacteria & plasmids;* *UV lamp*
Gel Electrophoresis setup

Internet Resource Links:

Genetics Online Text
Masteringbiology.com; Masteringgenetics.com
www.youtube.com
Virtual lab (meiosis Labs)
Clinical genetic Education Resources (Courses and Lectures) – Curricula / Courses / Cases / Exams / Conferences / Glossaries / Other / Cancer / Cytogenetics / Embryology / Metabolism / Genetic Conditions / Professional / High School / Public / Undergraduate / Primary Care / References – multiple links within multiple links – various levels and topics - http://www.kumc.edu/gec/prof/genecour.html#undergrad
Genetics Education Center – Univeristy of Kansas Medical Center - for educators interested in human genetics and the human genome project– Human Genome Project / Resources: books, videos, curricula / Lesson Plans / Networking / Genetic Conditions / Careers / Programs, Activities, Resources / Museum Exhibits / Plays / Glossaries / News / Portrayal & Writing / Feedback / FAQ / Search – www.kumc.edu/gec
Learn. Genetics: Genetics Science Learning Center - University of Utah – Basics of Genetics – Basics: Tour the Basics, DNA to Protein, Heredity & Traits, Amazing Cells / Genetic Technology: Stem Cells, Cloning, Gene Therapy, Transgenic Mice / Virtual Labs: DNA Extraction, PCR, Gel Electrophoresis, DNA Microarray / Epigenetics / The New Science of Addiction / Variation, Selection, & Time / Genetics & Health: Personalized Medicine, Family Health History, Genetic Disorders Library / Great Salt Lake Ecology / Archive - http://learn.genetics.utah.edu/
Scitable: by nature education – A collaborative Learning Space for Science – Essentials of Genetics: (multiple topics under each question) – What is DNA? What does DNA do? / How does DNA move from cell to cell? / How is genetic information passed between organisms? / How do scientists study and manipulate the DNA inside cells? / How does inheritance operate at the level of whole populations? - http://www.nature.com/scitable/study-center

STAGE ONE

GOALS AND STANDARDS

HS-LS1-4 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS3-1 Heredity: Inheritance and Variation of Traits	HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS-LS3-2 Heredity: Inheritance and Variation of Traits	**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 Heredity: Inheritance and Variation of Traits	**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.]

ENDURING UNDERSTANDINGS

Students will understand that…

- *Traits are the result of heritable units called genes*
- *Genes are made up of DNA and are carried on chromosomes*
- *DNA & RNA are both nucleic acid polymers*
- *DNA must be replicated in order for cells to reproduce*
- *DNA has set base pairing (Chargoff's) rules*
- *DNA replication is a precise process utilizing many enzymes*
- *Changes in genes (called mutations) can occur in various ways*
- *DNA has safeguards to protect against and fix mutations*
- *DNA Recombinant Technology requires a set of basic tools (restriction enzymes, vectors…)*

ESSENTIAL QUESTIONS

- *What are genes made of?*
- *How can DNA stay intact if cells divide?*
- *Why does DNA replicate?*
- *How does DNA replicate?*
- *How can we apply molecular genetics to real world applications?*
- *What can biotechnology be used for?*

KNOWLEDGE AND SKILLS

Students will know…

- *Genes are composed of DNA*
- *The monomers of DNA*
- *How & why DNA replicates*
- *Enzymes involved in replication*
- *How DNA self-checks for mutations, and then fixes them.*
- *The role of restriction enzymes, vectors, & PCR in Biotechnology*

Students will be able to…

- *Create visual representations of DNA replication*
- *Determine the primary structure of a polypeptide based on DNA sequence*
- *Design a DNA template to create a particular polypeptide*
- *Use PCR to amplify DNA*
- *Insert DNA templates into known plasmids*
- *Use plasmids to transform bacteria in order to create desired polypeptide*
- *Use gel electrophoresis to evaluate PCR yield*

STAGE TWO

PERFORMANCE TASKS

Students will be expected to:

- *Read, summarize, and dissect articles from popular and scientific literature relevant and/or loosely related to topics covered in this unit.*
- *Engage in discussion of current or projected research/ethical issues*
- *Create visual representations of DNA replication,*
- *Complete a series of lab activities and keep a detailed lab journal that includes both successes and failures, with potential reasons for and solutions to the latter.*
- *Complete lab practicals*
- *Use various lab procedures to create a protocol to synthesis artificial insulin*

OTHER EVIDENCE

Students will be given a(n):

- *Multiple choice exam on material covered*
- *Open-ended questions*
- *Application Scenario(s)*

STAGE THREE

LEARNING PLAN

Students will be expected to complete:

- *Assigned readings & outlines*
- *Online problems/labs*
- *Prelab investigations/assignments*
- *In class/after school labs*

Students will be expected to create:

- *Working Models to represent key ideas*
- *Biotechnology lab journals*

The teacher will:

- *Provide lectures highlighting the most difficult topics*
- *Guide students through reading assignments with targeted questions*
- *Guide students during in-class discussions*
- *Demonstrate the use of biotechnology*
- *Direct students to online labs and activities to reinforce the unit.*
- *Provide guidance and critique lab journals and lab protocols*

In order to monitor student progress, the teacher will:

- *Use 'Warm Up' (before the lesson) and 'Cool Down' (the end of class) activities to gage the classes collective understanding.*
- *Use remote response system to gage individual comprehension*
- *Use Dry Erase Boards for quick flashes of student comprehension Have students quiz one another using their sample quiz question flashcards*
- *Give weekly quizzes/practicals*
- *Check the progress of the lab journal*

Unit Name: *Gene Expression & Regulation* **Time Frame:** *07 Weeks*
Author: *Egg Harbor Township High School Science Department*

UNIT

Subject: *GENTICS* **Country**: *USA*
Course/Grade: *MSA 10th* **State/Group**: *NJ*
School: *Egg Harbor Township High School*

UNIT SUMMARY

In this unit, students will examine how the code in DNA is used to create proteins, which ultimately make up our phenotype. This unit will cover the processes of protein synthesis (transcription translation), gene regulation, mutation and mutation repair. Throughout this unit, emphasis will be placed on practical application and biotechnology. Students should already be familiar with the content from a pre-requisite biology course (HNR BIO). This unit will continue the application of biotechnology. Students will be expected to use PCR, transformation, gel electrophoresis and various other forms of biotechnology.

UNIT RESOURCES

Genetics Text Book Chapters 13, 14, 15, 17; *SMART Board;*
Student Response Remotes; *Videos;* *White Boards;*
Model DNA; *Model Chromosomes;* *Cutouts;*
Problem sets; *Computer Lab;* *Magnetic Manipulatives;* *String & craft supplies*
Thermocyler; *Incubator;* *Petri Dishes & medium;* *Hot-water bath*
PCR equipment; *DNA;* *Bacteria & plasmids;* *UV lamp*
Gel Electrophoresis setup

Internet Resource Links:

Genetics Online Text
Masteringbiology.com; Masteringgenetics.com
www.youtube.com
Virtual lab (meiosis Labs)
Clinical genetic Education Resources (Courses and Lectures) – Curricula / Courses / Cases / Exams / Conferences / Glossaries / Other / Cancer / Cytogenetics / Embryology / Metabolism / Genetic Conditions / Professional / High School / Public / Undergraduate / Primary Care / References – multiple links within multiple links – various levels and topics - http://www.kumc.edu/gec/prof/genecour.html#undergrad
Genetics Education Center – Univeristy of Kansas Medical Center - for educators interested in human genetics and the human genome project– Human Genome Project / Resources: books, videos, curricula / Lesson Plans / Networking / Genetic Conditions / Careers / Programs, Activities, Resources / Museum Exhibits / Plays / Glossaries / News / Portrayal & Writing / Feedback / FAQ / Search – www.kumc.edu/gec
Learn. Genetics: Genetics Science Learning Center - University of Utah – Basics of Genetics – Basics: Tour the Basics, DNA to Protein, Heredity & Traits, Amazing Cells / Genetic Technology: Stem Cells, Cloning, Gene Therapy, Transgenic Mice / Virtual Labs: DNA Extraction, PCR, Gel Electrophoresis, DNA Microarray / Epigenetics / The New Science of Addiction / Variation, Selection, & Time / Genetics & Health: Personalized Medicine, Family Health History, Genetic Disorders Library / Great Salt Lake Ecology / Archive - http://learn.genetics.utah.edu/
Scitable: by nature education – A collaborative Learning Space for Science – Essentials of Genetics: (multiple topics under each question) – What is DNA? What does DNA do? / How does DNA move from cell to cell? / How is genetic information passed between organisms? / How do scientists study and manipulate the DNA inside cells? / How does inheritance operate at the level of whole populations? - http://www.nature.com/scitable/study-center

STAGE ONE

GOALS AND STANDARDS

HS-LS1-4 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS3-1 Heredity: Inheritance and Variation of Traits	HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS-LS3-2 Heredity: Inheritance and Variation of Traits	**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 Heredity: Inheritance and Variation of Traits	**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.]

ENDURING UNDERSTANDINGS

Students will understand that…

- *Traits are the result of heritable units called genes*
- *Genes are made up of DNA and are carried on chromosomes*
- *DNA & RNA are both nucleic acid polymers*
- *Changes in genes (called mutations) can occur in various ways*
- *DNA has safeguards to protect against and fix mutations*
- *Genes are expressed through the creation of proteins*
- *Gene expression/protein synthesis is regulated in various ways and stages*
- *DNA provides the master plan for protein synthesis*
- *mRNA is utilized to carry information from inside the nucleus to the site of protein synthesis*
- *mRNA is the result of a process known as transcription and splicing (editing)*
- *Multiple types of RNA are utilized in protein synthesis and regulation*
- *Translation of polypeptides is governed by set codon sequences*

- *Amino acids are the **monomers** of **polypeptides** which are the **polymers** of **proteins***
- *Biotechnology can be used for commercial purposes and in scientific research.*

ESSENTIAL QUESTIONS

- *What are genes made of?*
- *How can DNA stay intact if cells divide?*
- *Why does DNA replicate?*
- *How does DNA replicate?*
- *Why don't all cells with the same DNA express the same traits?*
- *How do we go from genotype to phenotype?*
- *How can we apply molecular genetics to real world applications?*
- *What can biotechnology be used for?*

KNOWLEDGE AND SKILLS

Students will know…

- *Genes are composed of DNA*
- *How DNA self-checks for mutations, and then fixes them.*
- *The processes of transcription and translation*
- *How gene expression is regulated*
- *The role RNA plays in gene expression*

Students will be able to…

- *Create visual representations of protein synthesis*
- *Determine the primary structure of a polypeptide based on DNA sequence*
- *Design a DNA template to create a particular polypeptide*
- *Use PCR to amplify DNA*
- *Insert DNA templates into known plasmids*
- *Use plasmids to transform bacteria in order to create desired polypeptide*
- *Use gel electrophoresis to evaluate PCR yield*
- *Design a lab protocol for the creation of artificial insulin*

STAGE TWO

PERFORMANCE TASKS

Students will be expected to:

- *Read, summarize, and dissect articles from popular and scientific literature relevant and/or loosely related to topics covered in this unit.*
- *Engage in discussion of current or projected research/ethical issues/genetic disorders*
- *Create visual representations of transcription, translation, the lac. operon, and eukaryotic gene regulation.*
- *Complete a series of lab activities and keep a detailed lab journal that includes both successes and failures, with potential reasons for and solutions to the latter.*
- *Complete lab practicals*
- *Use various lab procedures to create a protocol to synthesis artificial insulin*

OTHER EVIDENCE

Students will be given a(n):

- *Multiple choice exam on material covered*
- *Open-ended questions*
- *Application Scenario(s)*

STAGE THREE

LEARNING PLAN

Students will be expected to complete:

- *Assigned readings & outlines*
- *Online problems/labs*
- *Prelab investigations/assignments*
- *In class/after school labs*

Students will be expected to create:

- *Working Models to represent key ideas*
- *Biotechnology lab journals*
- *Lab protocols*

The teacher will:

- *Provide lectures highlighting the most difficult topics*
- *Guide students through reading assignments with targeted questions*
- *Guide students during in-class discussions*
- *Demonstrate the use of biotechnology*
- *Direct students to online labs and activities to reinforce the unit.*
- *Provide guidance and critique lab journals and lab protocols*

In order to monitor student progress, the teacher will:

- *Use 'Warm Up' (before the lesson) and 'Cool Down' (the end of class) activities to gage the classes collective understanding.*
- *Use remote response system to gage individual comprehension*
- *Use Dry Erase Boards for quick flashes of student comprehension Have students quiz one another using their sample quiz question flashcards*
- *Give weekly quizzes/practicals*
- *Check the progress of the lab journal*

Unit Name: *Student Genetics* **Time Frame:** *3 Weeks*
Author: *Egg Harbor Township High School Science Department*

UNIT

Subject: *GENTICS* **Country**: *USA*
Course/Grade: *MSA 10th* **State/Group**: *NJ*
School: *Egg Harbor Township High School*

UNIT SUMMARY

In this final unit, students will choose the topics they wish to learn about. Students may choose from ***cancer genetics; proteomics; genomics; developmental genetics; immunogenetics; population genetics; & evolutionary genetics****. Groups of four will create a 2 period lesson on their topic of choice. The lessons must include a powerpoint presentation, a relevant article, a homework assignment, a hands-on/quadrant D activity, and an assessment. Although groups may overlap on the general topic, each group must teach a different aspect of a given topic. This unit is designed to allow students choice and to take ownership of their learning, and to expose students to many topics in a short amount of time.*

UNIT RESOURCES

Genetics Text Books; SMART Board; Student Response Remotes; Videos; White Boards; Computer Lab; To be determined by student groups

Internet Resource Links:

Genetics Online Text
Masteringbiology.com; Masteringgenetics.com
www.youtube.com
Virtual lab
Clinical genetic Education Resources (Courses and Lectures) – Curricula / Courses / Cases / Exams / Conferences / Glossaries / Other / Cancer / Cytogenetics / Embryology / Metabolism / Genetic Conditions / Professional / High School / Public / Undergraduate / Primary Care / References – multiple links within multiple links – various levels and topics - http://www.kumc.edu/gec/prof/genecour.html#undergrad
Genetics Education Center – Univeristy of Kansas Medical Center - for educators interested in human genetics and the human genome project– Human Genome Project / Resources: books, videos, curricula / Lesson Plans / Networking / Genetic Conditions / Careers / Programs, Activities, Resources / Museum Exhibits / Plays / Glossaries / News / Portrayal & Writing / Feedback / FAQ / Search – www.kumc.edu/gec
Learn. Genetics: Genetics Science Learning Center - University of Utah – Basics of Genetics – Basics: Tour the Basics, DNA to Protein, Heredity & Traits, Amazing Cells / Genetic Technology: Stem Cells, Cloning, Gene Therapy, Transgenic Mice / Virtual Labs: DNA Extraction, PCR, Gel Electrophoresis, DNA Microarray / Epigenetics / The New Science of Addiction / Variation, Selection, & Time / Genetics & Health: Personalized Medicine, Family Health History, Genetic Disorders Library / Great Salt Lake Ecology / Archive - http://learn.genetics.utah.edu/
Scitable: by nature education – A collaborative Learning Space for Science – Essentials of Genetics: (multiple topics under each question) – What is DNA? What does DNA do? / How does DNA move from cell to cell? / How is genetic information passed between organisms? / How do scientists study and manipulate the DNA inside cells? / How does inheritance operate at the level of whole populations? - http://www.nature.com/scitable/study-center

STAGE ONE

GOALS AND STANDARDS

HS-LS1-4 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS3-1 Heredity: Inheritance and Variation of Traits	HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS-LS3-2 Heredity: Inheritance and Variation of Traits	**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 Heredity: Inheritance and Variation of Traits	**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.]

ENDURING UNDERSTANDINGS

Students will understand that…

- *There are many sub-fields that fall under genetics*
- *One of the best ways to learn a topic is to teach it*
- *Collaboration on a project involves teamwork and compromise*
- *As a part of a collaborating group, each member has a responsibility to more than themselves. Everyone is counted on.*

ESSENTIAL QUESTIONS

- *What field in genetics may I be interested in?*
- *How do I create a lesson to captivate and educate an audience?*
- *What can I assume my classmates already know? What have we learned this year?*
- *How can I find a relevant article my peers will understand?*
- *How can I take complicated information, and communicate it in a clear, concise manner?*
- *How will I know if my classmates learned from my lesson? What could I have done to improve it?*

KNOWLEDGE AND SKILLS

Students will know…

- *The material relevant to their topic*
- *To anticipate questions about their topic*
- *What works or does not work when collaborating with a group*
- *If their lesson was effective*

Students will be able to…

- *Create a captivating presentation*
- *Learn from their peers*
- *Explain complicated information to their peers*
- *Plan for a lesson*

STAGE TWO

PERFORMANCE TASKS

Students will be expected to:

- *Find, read, summarize, and dissect articles from popular and scientific literature relevant and/or loosely related to topics covered in their chosen topic, or the topic chosen by their peers.*
- *Engage in discussion of current or projected research/ethical issues*
- *Create visual representations/presentations*
- *Design a hands-on activity that will help their peers to understand an aspect of their chosen topic.*
- *Teach a lesson on a topic of interest*
- *Create a group 'Bill of Rights' that all members can agree to.*
- *Work with, and evaluate a group.*
- *Assess what their peers learned from the lesson.*
- *Self-reflect on what they could have done to make the experience better.*

OTHER EVIDENCE

Students will be given a(n):

- *Evaluation of their teammates*
- *Evaluation of their lesson*
- *Evaluation of the lessons of other groups*
- *Rubric for their lesson*

STAGE THREE

LEARNING PLAN

Students will be expected to create:

- *A 'Bill of Rights' for their group*
- *A detailed lesson plan and pacing guide (rough draft & final copy)*
- *A PowerPoint/Prezi presentation on their chosen topic*
- *An article summary and explanation of how it will be used for the lesson*
- *A step by step procedures of a Hands-on activity and explanation of how it applies to the lesson*
- *An assessment to find out what their peers learned from their lesson*

The teacher will:

- *Provide templates for lesson plans and pacing guides*
- *Review articles chosen by students*
- *Provide a detailed rubric of the group assignment*
- *Provide group and self-reflecting surverys*

In order to monitor student progress, the teacher will:

- *Request daily updates to students projects*

- *Collect rough drafts of lesson plans*
- *Preview PPT/prezi lecture*
- *Preview Hands-on activity & assessment*
- *Complete a rubric for each project*

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