

EGG HARBOR TOWNSHIP PUBLIC SCHOOLS
CURRICULUM

**MEDICAL SCIENCE ACADEMY: FUNDAMENTALS OF ANATOMY AND
PHYSIOLOGY
High School**

Length of Course: Full Year

Elective / Required: Refer to Program of Studies

Schools: High School

Student Eligibility: Grade 12

Credit Value: 5 credits

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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 (NJSL-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: Levels of Organization

Time Frame: 8 weeks

Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Science**

Country: **USA**

Course/Grade: **MSA Anatomy & Physiology**

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

This unit will provide foundational concepts and necessary terminology for understanding anatomy and physiology. The unit is composed of 4 chapters that collectively explore levels of organization in the body, organ systems, directional terms, landmarks and body cavities along with what is located in each. The unit continues by discussing the structural and functional processes of the human body at the molecular, cellular, and histological level.

UNIT RESOURCES

- Textbook – Fundamentals of Anatomy and Physiology (2012) *Martini /Nath/ Bartholomew*; Chapters 1, 2, 3, and 4.
- Mastering Anatomy and Physiology online
- Powerpoint presentations
- Lab Manuals and materials

Internet Resource Links:

- *Masters of anatomy and physiology:* www.masteringaandp.com
- *Discovery:* www.unitedstreaming.com
- *NBC Learn Videos:* www.nbclearn.com
- *eLibrary science:* <http://science.bigchalk.com/sciweb/science/do/search>
- *Web simulators:* www.phet.colorado.edu
- *Web Video Clips:* www.Learning4mastery.com (Flipped Learning)
- *VCU lesson plans -* <http://www.sosq.vcu.edu/>
- *Case studies -* <http://sciencecases.lib.buffalo.edu/cs/>

STAGE ONE

GOALS AND STANDARDS

Next Generation Science Standards and Disciplinary Core Ideas

HS. Structure and Function

Students who demonstrate understanding can:

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.

- Systems of specialized cells within organisms help them perform the essential functions of life.
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.

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

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

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

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

ENDURING UNDERSTANDINGS

- Various levels of organization promote and maintain human life.
- Homeostatic regulation is a necessary component of the human body; feedback mechanisms are used to maintain optimal conditions.
- The human body is a complex machine that depends on the integration and interdependence of its various parts for survival.
- The structure and function of human beings and their parts is dependent on chemical makeup.
- Understanding life processes at the cellular level is basic to understanding how life processes occur at more complex levels-as in the whole organism.

- The utilization of energy and the use of genetic information are essential to controlling cellular processes.

ESSENTIAL QUESTIONS

- What is anatomy and physiology?
- How is the body organized?
- What functions does the body perform in order to maintain life?
- How are chemical reactions controlled in the human body?
- What basic molecules make up the structure and functions of the human body?
- How does the body work at the molecular, cellular and histological level to maintain homeostasis?

KNOWLEDGE AND SKILLS

Vocabulary:

Anatomy, physiology, anatomical position, frontal plane, sagittal plane, transverse plane, homeostasis, metabolism, negative feedback, positive feedback, cells, tissues, organs, organ systems, atom, molecule, carbohydrate, lipid, amino acid, protein, nucleic acid, isotope, ionic bond, covalent bond, electrolytes, enzyme, active transport, chromosomes, organelles, protein synthesis, transcription, translation, basement membrane, blood, bone, cartilage, connective tissue, epithelium, fibroblasts, gap junction, gland cells, inflammation, lymph, macrophage, mucous membrane, muscle tissue, neural tissue, neuron, serous membrane, stem cells, acute, auscultation, chemotherapy, chronic, MRI, CT, PET, ultra-sound, autoregulation, extrinsic regulation, fibrous proteins, globular proteins, substrates, enzymes, glycerides, buffers, anabolism, catabolism, nucleotides, facilitated diffusion, active transport, differentiation, stem cells, malignant, osmosis, avascular, desmosomes, carcinoma, sarcoma, graft, lesion, immunotherapy.

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
- List and describe the major characteristics of life.
- Define homeostasis and explain its importance to life.
- Name the major organ systems of the human body and define and understand their general functions.
- Use anatomical terms to describe the body sections, body regions, and relative position.
- Discuss how atomic structure is related to the ways in which atoms interact.
- Describe the types of chemical reactions that occur in the human body.
- Identify the major levels of organization in the human body.
- Describe the important role of enzymes in metabolism.
- Describe the functions of the cell membrane and structures that enable it to perform those functions.
- Summarize the process of protein synthesis.
- Describe the various mechanisms that cells use to transport substances across the cell membrane.
- Define differentiation and explain the importance of this process.
- Identify the four major tissue types and describe their roles.
- Explain how body tissues are affected by the aging process.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Online reading
- Online homework assignments

- Online test/quizzes
- Online activities
- Constructed response
- Graphic organizers or models
- Using an anatomical model, locate the body cavity, quadrant, and anatomical region each organ can be found in.
- Using an anatomical model, identify all of the major organs associated with each organ system.
- Using an anatomical model, use directional terms to describe the location of organs in comparison to other organs.
- Using a banana, be able to cut and describe the different body planes.
- Construct an anatomically correct t-shirt which illustrates the proper location and orientation of organs within a several organ systems.
- Identify and describe the proper anatomical terms for each body part.
- Identify, illustrate and label the major components of the 4 tissue types using microscopes and prepared slides.
- Case studies created by students to describe a crime scene using anatomical and directional terms.
- Develop original case studies that describe symptoms associated with clinical pathologies of body tissues.
- Design a lab using an example of negative feedback in order to explain the body's response and ability to maintain homeostasis.
- Food for thought – students will create an anatomically correct (size and shape) organ of their choice using edible materials while providing research on the organ.

OTHER EVIDENCE

- In Class activity “Simon Says” using anatomical terms.
- Objective review questions that demonstrate understanding of concepts and diagrams.
- Creating original anatomical diagrams.
- Chapter outlines
- Creating original questions for quizzes to administer to classmates
- Coloring book worksheets.
- Terminology matching worksheets.
- Mini case studies that draw on anatomical concepts and terminology.
- Think/Pair/Share explanation of concepts to partner or small group.
- Homework:
 - Vocabulary flash cards or map (word, picture, sentence, example)
 - Section Review Questions
- Exit tickets (answers to daily objective questions)
- Do-nows
- Individual, small, and large group work
- Homework
- Guided practice
- Study Guide Packets
- Visual Quiz

STAGE THREE

LEARNING PLAN

Activities, experiences, and lessons:

- PowerPoint presentation of material using key concepts, pictures, diagrams.

- 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)
- Flashcards and/or drill and practice
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators
- Banana Lab – students dissect a banana using anatomical terms, identify body planes, create and label diagrams to describe location of organs and practice observation skills.
- What is Cancer? – VCU developed interactive video clip/case study/open ended constructed response that students complete to review concepts of cellular division.
- Stem Cells – clicker cast study that summarizes cellular components and processes while introducing students to the concept of stem cells and how they might be used.
- Teach each other lesson- students create mini lessons to review information about the chemical level of organization.
- Histology lab – identify and label different types of body tissue

LEARNING Activities

- Foldables – organization of material (4 different types of tissue)
- Simon Says – with partners, use anatomical terms to describe body parts and vice versa.
- Pictionary – students draw organs to be identified by a partner as well as the system they are found in.

- Tissue matching – memory type game where students match the image of a body tissue with the correct name and type of tissue.
- The Power of Genes (Discovery) – questions, answers and extension problem solving.
- Student developed quizzes to use with partners or small groups.

Misconceptions/Teaching Tips:

- Encourage students to adopt the use of flash cards to retain large amounts of information (ie. vocabulary words, anatomical terms, etc.)
- Encourage students to use study area on Mastering A & P website for extra practice.
- Students often think they can “cram” for tests but are often surprised by the amount of information that is covered which can be overwhelming. Students are encouraged and reminded to keep up with material and review in small increments.
- Use student examples and ideas to explain difficult concepts
- Use flow charts particularly with tissue chapter to show relationships and division of concepts.

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 and reinforce concepts drawn from previous science courses (i.e. biology, chemistry). 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 honors anatomy students.

Unit Name: Support and Movement

Time Frame: 8 Weeks

Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Science**

Country: **USA**

Course/Grade: **MSA Anatomy & Physiology**

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

This unit will provide an understanding of the major body systems that contribute to support and movement of the human body. The unit is composed of 7 chapters that explore the micro and macro anatomy and physiology of three body systems; the integumentary system, the skeletal system and the muscular system. The skeletal system is comprised of 4 chapters which explore osseous tissue, the axial and appendicular skeleton, and articulations. The muscular system is divided into two chapters: muscle tissue and the muscular system. The systems are presented individually in order to understand the intricate structures and functions of each organizational level. The unit continues by discussing how these systems relate to each other and collectively contribute to the support and movement of the body.

UNIT RESOURCES

- Textbook – Fundamentals of Anatomy and Physiology (2012) *Martini /Nath/ Bartholomew*; Chapters 5, 6, 7, 8, 9, 10, 11.
- Mastering Anatomy and Physiology online
- Essentials of A&P Study Guide
- Powerpoint presentations
- Lab Manuals and materials

Internet Resource Links:

- *Discovery*: www.unitedstreaming.com
- *NBC Learn Videos*: www.nbclearn.com
- *eLibrary science*: <http://science.bigchalk.com/sciweb/science/do/search>
- *Mastering A & P website*: www.masteringaandp.com

- *Web simulators:* www.pHET.colorado.edu
- *Web Video Clips:* www.Learning4mastery.com(*Flipped Learning*)
- *McGraw-Hill Video Clips:* <http://highered.mcgraw-hill.com/sites/>
- *Pearson Video Clips:* <http://wps.aw.com/>
- *Case studies -* <http://sciencecases.lib.buffalo.edu/cs/>

STAGE ONE

GOALS AND STANDARDS

Next Generation Science Standards and Disciplinary Core Ideas

HS. Structure and Function

Students who demonstrate understanding can:

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.

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.

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

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

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

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.
- Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

ENDURING UNDERSTANDINGS

- The integumentary system is the body's first layer of protection of underlying tissue and organs from impacts, chemicals, and infection.
- The integumentary system is instrumental in maintaining homeostasis within the human body which includes the prevention of fluid loss, temperature maintenance, synthesis and storage of nutrients, and regulating secretions and excretions.
- The integumentary system provides important sensory receptors which provide information to the nervous system.
- Movement is a characteristic of living things. A study of the skeletal system is necessary to understand how a complex organism, like the human, is organized to accomplish movement.
- Bones of the skeletal system are connected together to form joints. An understanding of how joints work is basic to understanding how the body moves.
- Bones support and protect body organs; serve as levers for the muscles to pull on to cause movements at joints; store calcium, fats, and other substances for the body; and contain red marrow, the site of blood cell production.
- The muscular system is the active partner to the more passive skeletal system. Muscles interact with bones to maintain posture and produce movement.
- All skeletal muscles are stimulated by motor neurons. When the neuron releases a neurotransmitter the permeability of the sarcolemma changes, allowing sodium ions to enter the muscle. This produces an electric current (action potential), which flows across the entire sarcolemma, resulting in contraction of the muscle cell.
- On the basis of their general functions in the body, muscles are classified as prime movers, antagonists, synergists, and fixators.

ESSENTIAL QUESTIONS

- What are the main structural features of skin and what are their functional significances?
- What factors contribute to skin color and how are they affected by UV radiation?
- How does the integumentary system help maintain homeostasis?

- How does skin respond to injury and repair itself?
- How is the structure of bones related to their function?
- What factors affect the development of the various types of bones?
- How is the skeletal system organized in order to allow for complex movements?
- How are the various types of joints held together?
- How do muscle cells utilize energy and interact with bones to accomplish complex, diverse movements?
- How is action potential initiated in a muscle cell?
- What are the similarities and differences in the three types of muscle tissue and where are they found in the body?
- What are the different types of movements produced by the skeletal muscles?

KNOWLEDGE AND SKILLS

Vocabulary:

- Cutaneous membrane, dermis, epidermis, hair, integument, keratin, melanin, nail, sebaceous gland, stratum germinativum, subcutaneous layer, appendicular skeleton, articulation, axial skeleton, cartilage, diaphysis, epiphysis, compact bone, spongy bone, fracture, ligament, marrow, ossification, osteoblast, osteoclast, osteocyte, osteon, periosteum, endosteum, synarthrosis, anaerobic, complete tetanus, cross-bridges, glycolysis, insertion, isometric, isotonic, lactic acid, motor unit, myofilament, myoglobin, neuromuscular junction, origin, insertion, sarcomere, sarcoplasmic reticulum, synergist, tendon, transverse tubule, acetylcholine, actin, myosin, medulla, cortex, arrector pili, stretch marks, plexus, carbuncle, comedo, furuncle, gangrene, keratinocytes, trabeculae, osteoprogenitor cells, calcification, central canal, perforating canal, metaphyses, achondroplasia, bone marrow transplant, bone scan, open reduction, closed reduction, DEXA, bone mineral density test, lambdoid, craniotomy, deviated septum, herniated disc, laminectomy, jugular notch, bone graft, rheumatism, monaxial, biaxial, triaxial, flexion, extension, abduction, adduction, rotation, arthroplasty, Bouchard's nodes, chondromalacia, Heberden's nodes, arthroscopy, ankylosing spondylitis, hypertrophy, botulism, muscular dystrophy, fibromyalgia, myopathy, RICE, fibromyositis, impingement syndrome, torticollis, plantar fasciitis,

tenosynovitis.

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
- Describe the general structures and functions of the integumentary system.
- Explain what accounts for individual differences in skin, such as skin color.
- Describe how the integumentary system maintains homeostasis, such as regulating body temperature.
- Explain how the skin responds to injury and repairs itself.
- Describe the general structure of a bone and list the functions of its parts.
- Describe the effects of sunlight, nutrition, hormonal secretions, and exercise on bone development.
- Distinguish between the axial and appendicular skeletons, and name the major bones of each.
- Explain how joints can be classified according to the type of tissue that binds the bones together.
- Explain how the locations of skeletal muscles are related to the movements they produce and how muscles interact in producing such movements.
- Describe the similarities and differences in the three types of muscle tissue and note where they are found in the body.
- Describe the events of muscle cell contraction.
- Demonstrate and identify the different types of body movements.
- Name and locate the major muscles of the body and state the action of each.

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Design and construct a 3-dimensional model that illustrates and identifies the major components of integument in great detail.
- Skin Lab –investigate the different characteristics of the integumentary system and provide explanations for these characteristics by exploring their own skin. Apply knowledge of skin and accessory structures to in class observations. Identify and label layers of skin as viewed under a microscope.
- Construct a model of any body organ out of edible contents, identify the major structures, and explain the importance of the organ.
- Chicken Wing Lab – while dissecting a chicken wing, identify the corresponding bones, joints, muscles, connective tissues, integument and accessory structures and explain their functions.
- Sherlock Bones Lab – observe, measure, compare and identify different bones and their anatomical components in order to match the bones to a fictitious victim.
- Bone Song – create an original song that uses the names of the major bones in a way that demonstrates the location and/or function of the bone.
- Design and construct a 3-dimensional working model of a sarcomere that demonstrates the interaction and movement between actin and myosin filaments.
- Muscle Fatigue Lab – demonstrate the effects of movement and exercise on muscle performance and explain the concept of muscle fatigue as experienced.
- Physical Therapy – Students are presented with case studies of clients with injuries and must create a rehabilitation plan including exercises that target injured muscles/joints/bones.
- Mirror Dance – students will develop a coordinated dance facing a partner demonstrating all of the different types of moveable joints.

OTHER EVIDENCE

- Pathology report – in depth research on pathologies of the skin including decubitus ulcers, liposuction, burns and grafts, skin abnormalities
- Bone pathologies – research of diseases and conditions associated with osseous tissue.
- Muscle pathologies – research and report on diseases associated with them muscular system.
- Web quest – find facts and explain different ways bones can be used for forensic evidence.
- Web quest – observe microanatomy images of muscle contractions, explain interactions and label the components of a sarcomere image.
- Experience of the neurotransmitter – create a story that demonstrates the path of acetylcholine at the neuromuscular junction.
- Spill at Parson’s Case Study– application of knowledge about skin, tissue, bones, joints and muscles is used to explain symptoms, diagnose and suggest treatment for a ski injury.
- Thermoregulation Case Study – explanation of the symptoms, diagnosis, and treatment for the body’s response to hypothermia.
- Skin Cancer Lab – identify risk factors and recognize different forms of skin cancer while suggesting treatment to different scenarios.
- Homework:
 - Vocabulary flash cards or map (word, picture, sentence, example)
 - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Do nows
- Individual, small, and large group work
- Homework
- Guided practice
- Study Guide Packets
- Visual Quiz

STAGE THREE

LEARNING PLAN

Activities, experiences, and lessons:

- PowerPoint presentation of material
- Group discussion
- Mini-quizzes – develop and submit questions about topics that are redistributed to class.
- Comparison charts
- Flow charts or concept maps
- Think/know/want to know
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Flashcards and/or drill and practice
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators

LEARNING Activities

- Foldables – organization of material (scientific method & features of living things)
- Student created case studies
- Clicker case studies
- Simon Says – use the names of bones and muscles to identify location
- Anatomy of Movement – autopsy video showing skin, bone and muscle.

- Guest speaker(s) – physical therapist/ chiropractor.
- Bone/joint practical – identification of different bones and joints located at different stations.
- Coloring/labeling worksheets.
- Joint activity – demonstrate the types and movements of different joints by self exploration.
- Creating and labeling diagrams
- Pushing the Limits – video about muscle use and response in crisis
- The Power of Strength – united streaming presentation with questions on muscle use.

Misconceptions/Teaching Tips:

- Frequently use partners to have students explain concepts in their own words. This is useful both in teaching the information to others and learning it for themselves.
- Have students learn names of bones/muscles in smaller segments rather than all at once.
- Encourage students to ask each other questions for clarification.
- Remind students to use different diagrams (including online resources) to learn anatomy terms. This helps them learn the actual names and locations of anatomical parts as opposed to just memorizing one specific diagram.
- Use student examples and ideas to plan experiments as a class
- Relate concepts in class to students' own experiences as often as possible.

This unit is sequenced to draw from concepts learned in the previous unit and apply them to new topics. It begins by identifying information that is already known and addressing any misconceptions about possible new information. The unit chapters are first learned independently and ultimately integrated. Students will learn concrete blocks of new information while applying it to previous concepts to master the unit. Students will use this information to evaluate higher level problems. This unit will end with a formal assessment common to all honors anatomy students.

Unit Name: Control and Regulation

Time Frame: 5 weeks

Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Science**

Country: **USA**

Course/Grade: **MSA Anatomy & Physiology**

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

This unit will provide an understanding of the major body systems that contribute to control and regulation of the human body. The unit is comprised of 7 chapters. The first 5 focus on the nervous system which includes neural tissue; the spinal cord, spinal nerves and spinal reflexes; the brain and cranial nerves; neural integration I-Sensory pathways and the somatic nervous system; and neural integration II-the autonomic nervous system and higher order functions. The unit continues with a chapter on the special senses, and finishes with the endocrine system. After mastering each individual chapter, the chapters are viewed collectively as a way to emphasize how the components are integrated in a way that contributes to control and regulation of the body.

UNIT RESOURCES

- Textbook – Fundamentals of Anatomy and Physiology (2012) *Martini /Nath/ Bartholomew*; Chapters 12, 13, 14, 15, 16, 17, 18.
- Mastering Anatomy and Physiology online
- Essentials of A&P Study Guide
- Powerpoint presentations
- Lab Manuals and materials

Internet Resource Links:

- *Mastering Anatomy and Physiology*: www.masteringaandp.com
- *Discovery*: www.unitedstreaming.com
- *NBC Learn Videos*: www.nbclearn.com

- eLibrary science: <http://science.bigchalk.com/sciweb/science/do/search>
- Online textbook: *Essentials of A&P*
- Web simulators: www.pHET.colorado.edu
- Web Video Clips: www.Learning4mastery.com (Flipped Learning)
- McGraw-Hill Video Clips: <http://highered.mcgraw-hill.com/sites/>
- Pearson Video Clips: <http://wps.aw.com/>
- Case studies - <http://sciencecases.lib.buffalo.edu/cs/>

STAGE ONE

GOALS AND STANDARDS

Next Generation Science Standards and Disciplinary Core Ideas

HS. Structure and Function

Students who demonstrate understanding can:

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.

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.

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

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

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

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.
- Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

ENDURING UNDERSTANDINGS

- Various levels of organization promote and maintain human life.
- The nervous and endocrine systems are instrumental in the body's ability to maintain homeostatic conditions in response to changing environmental conditions.
- An understanding of the somatic and special senses is necessary to knowing how the nervous system receives input and responds to support life.
- A knowledge of the function of the endocrine system is basic to the understanding of how metabolic processes are regulated to meet the changing needs of the human body.
- The mechanisms of the nervous system and endocrine system differ, however, they complement each other to maintain life.
- Knowledge of the cellular components of the nervous system is necessary for understanding how the nervous system coordinates body functions.
- Cellular communication is paramount to providing the foundational level of organization in the human body.

ESSENTIAL QUESTIONS

- How does the body assess and adjust to the external environment?
- How do special senses function to process and act on sensory information?
- What physiological methods does the endocrine system use to control body activities in order to maintain a relatively constant internal environment?
- How does structure relate to function of the nervous system at the cellular level?

- How do the levels of organization contribute to control and regulation of the human body?

KNOWLEDGE AND SKILLS

Vocabulary:

- Action potential, autonomic nervous system, axon, cerebellum, cerebrospinal fluid, cerebrum, cranial nerves, diencephalon, ganglia, hypothalamus, limbic system, medulla oblongata, membrane potential, meninges, midbrain, myelin, neuroglia, neurotransmitter, parasympathetic division reflex, pons, somatic nervous system, spinal nerves, sympathetic division, synapse, thalamus, accommodation, cochlea, fovea, gustation, iris, macula, nociceptors, olfaction, proprioception, pupil, retina, sclera, adrenal cortex, somatic, endocrine cell, static equilibrium, dynamic equilibrium, exocrine, hormone, steroid, stress, gland, hormonal dysfunction, pituitary, prostaglandins, olfactory, histamine, insulin, pancreas, peptide hormone, hypophyseal portal system, adrenal medulla, steroid hormone, first messenger, second messenger, general adaptation syndrome, hypophysis, neuroblastoma, atropine, dysthymia, excitotoxicity, neurotoxin, wallerian degeneration, schwann cells, satellite cells, continuous and salutatory propagation, neuromodulators, IPSP, EPSP, nerve growth factor, divergence, convergence, parallel processing, areflexia, equinovarus, hemiparesis, melography, tabes dorsalis, quadripalegia, parapalegia, meninges, Babinski sign, reinforcement, psychosis, myoclonus, migraine, prosopagnia, analgesia, pain threshold, pain tolerance, syphilis, solitary nucleus, spinothalamic pathway, ageusia, anosmia, hyposmia, umami, rhodopsin, aqueous humor, gustatory cells, Snellen chart, vertigo, ophthalmologist, optometrist, strabismus, scala vestibule, circadian rhythm, adrenalectomy, hirsutism, paracrine communication, endocrine communication, target cells, regulatory hormones, endocrine reflexes, releasing hormones, inhibiting hormones, TSH, ACTH, FSH, LH, PRL, GH, ADH, PTH, beta cells, alpha cells, pancreatic islets, delta cells, calcitriol, testosterone, progestin, estrogen, antagonistic effects, synergistic effects, permissive effects, integrative effects, stress.

Skills:

- Explain the general structures and functions of the nervous system.
- Examine the difference between neurons and neuroglia with respect to structure and function.
- Discuss event that generate action potentials in the membranes of cells and explain the mechanism of nerve impulse transmission.

- Describe the components of a reflex arc.
- Identify sensory and motor pathways.
- Compare the functions and structures of the sympathetic and parasympathetic divisions.
- Name the various kinds of receptors and explain the function of each.
- Distinguish between somatic and special senses.
- Describe the receptors associated with the senses of touch, pressure, temperature, and pain.
- Identify the main structures and functions of the special senses.
- Discuss how hormonal secretions are regulated by negative feedback mechanisms.
- Name and describe the location of the major endocrine glands of the body, and list the hormones they secrete.
- Explain the general mechanisms of hormonal action.
- Describe how endocrine glands are controlled.
- Examine the effects of aging on the nervous and endocrine systems.
- Identify potential diseases and disorders of the nervous and endocrine systems.
- Discuss the interrelationships between the nervous and endocrine systems with other body systems.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Nervous System Disease Project – students create a brochure and accompanying presentation based on their research about a nervous system disease.

- Reflexes and Reactions Lab – students investigate how their bodies respond differently to reflexes versus reactions and propose explanations for these differences.
- Sensory Lesson – students will create a lesson plan, complete with assessment, to teach to a partner that explains one of the special senses.
- What’s Wrong With John? Case Study – students are presented with symptoms indicative of a neurological disorder and must present possible explanations for the symptoms, a potential diagnosis and subsequent treatment suggestions.
- Testing Your Sense Organs Lab – Students will investigate how different sensory information is experienced and processed while providing explanations for these experiences.
- Endocrine System Project – students will create a presentation in the format of their choice (i.e. powerpoint, prezi, etc.) to present to the class on a specific endocrine gland and corresponding hormones with accompanying lesson plan.
- Student designed case study presenting symptoms of an endocrine disorder, diagnosis, and subsequent treatment plan.

OTHER EVIDENCE

- Webquest – characteristics and functions of the brain and nervous system.
- Awakenings – movie and worksheet about neurological disorder.
- Wearing On Her Nerves Case Study – students provide explanations for MS related symptoms.
- Corneal Transplant Case Study – Extension questions that explore corneal transplants and assess the risks involved.

- Is There a 6th Sense? –Documentary and worksheet that explores the possibility of a 6th sense.
- Feedback mechanisms worksheet – identifying and explaining examples of positive and negative feedback
- Endocrine Diagram – students will create their own diagram that identifies endocrine glands, their location, and shows the pathway of some of the hormones they secrete.
- Homework:
 - Vocabulary flash cards or map (word, picture, sentence, example)
 - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Do nows
- Individual, small, and large group work
- Homework
- Guided practice
- Study Guide Packets
- Visual Quiz
- Vocabulary Quiz
- Diagram Quizzes

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)
- Flashcards and/or drill and practice
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators
- Drawing diagrams
- Webquests
- Reading for meaning – students read information and extract the most important points.
- Foldables – organization of material
- Concept maps
- Charts and tables – particularly with endocrine glands and hormones
- Objective packet review questions and diagrams.

Misconceptions/Teaching Tips:

- Students tend to view each system as independent of the others. It is important to continue to draw connections between systems and enforce the idea that they are all integrated.

- Continue to use student examples and explanations to explain difficult concepts to classmates.

This unit is sequenced to continue drawing from concepts learned in previous units and apply them to new topics. It begins by identifying information that is already known and addressing any misconceptions about possible new information. The unit chapters are first learned independently and then integrated accordingly. Students will learn concrete blocks of new information while applying to previous concepts in order to master the unit. Students will use this information to evaluate higher level problems. This unit will end with a formal assessment common to all honors anatomy students.

Unit Name: Fluid and transport

Time Frame: 8 weeks

Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Science**

Country: **USA**

Course/Grade: **MSA Anatomy & Physiology**

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

This unit will give students information on how the cardiovascular system and the lymphatic system function to protect and provide nutrients and oxygen to the human body. The unit is composed of 4 chapters that collectively explore the components of the cardiovascular system, components of the blood, heart structure and cycle, capillary and arterial exchange, and the body's defense mechanism. The circulatory system is a network of vessels and organs that maintain homeostasis in the body, transports valuable nutrients to cells throughout the body, and removes waste produced. The unit continues by discussing the importance of interaction of all of these components in proper functioning.

UNIT RESOURCES

- Textbook – Fundamentals of Anatomy & Physiology (2012) *Martini / Nath/Bartholomew*; Chapters 19, 20, 21, and 22
- Fundamentals of A&P Study Guide
- Mastering A and P
- PowerPoint presentations
- Online assignments
- Lab Manuals and materials

Internet Resource Links:

- *Mastering A and P:* www.masteringaandp.com
- *Discovery:* www.unitedstreaming.com
- *NBC Learn Videos:* www.nbclearn.com
- *eLibrary science:* <http://science.bigchalk.com/sciweb/science/do/search>
- *Online textbook: Mastering A and P etext*

- *Web simulators:* www.pHET.colorado.edu
- *Web Video Clips:* www.Learning4mastery.com(*Flipped Learning*)
- *VCU lesson plans* - <http://www.sosq.vcu.edu/>
- *Case studies* - <http://sciencecases.lib.buffalo.edu/cs/>

STAGE ONE

GOALS AND STANDARDS

Next Generation Science Standards and Disciplinary Core Ideas

HS. Structure and Function

Students who demonstrate understanding can:

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.

- Systems of specialized cells within organisms help them perform the essential functions of life.
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.

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

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

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

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

ENDURING UNDERSTANDINGS

- Knowledge of the blood and its components including the factors that influence a person's blood type
- Knowledge of the origins and production of the formed elements in the blood
- Ability to categorize the white blood cells by structure and function

- Ability to explain the importance of blood typing and the basis for ABO and RH incompatibilities
- The cardiovascular system is essential for determining how each part of the body is supplied with the materials necessary to sustain life.
- Knowledge of the components and functions of the conducting system of the heart, including the cardiac cycle
- Ability to identify the layers of the heart wall and trace the pathway of blood
- Explain the mechanisms of regulate blood flow through the arteries, capillaries, and veins
- Knowledge of the immune mechanisms of the lymphatic system is the basis for understanding how the body defends itself against specific kinds of threats.
- The lymphatic system helps maintain fluid balance in the tissues of the body.
- Various types of immune responses are critical for the health and well-being of the human body

ESSENTIAL QUESTIONS

- How does the structure of blood help meet oxygenation needs?
- What are the various types of blood cells and the functions of each?
- How do the various circuits of the cardiovascular system work together to sustain life?
- What mechanisms reduce blood loss after an injury?
- What are the major organs of the cardiovascular system and the function of each?
- What are the major events and activities of the cardiac cycle?
- What factors affect blood flow and pressure?
- What are the major arteries and veins served by the heart?

- What functions does the lymphatic system perform in order to maintain a healthy internal environment?
- How does the lymphatic system respond to injury and infection?
- What triggers the different types of immune responses?
- What is autoimmunity and what effects does it have on the human body?

KNOWLEDGE AND SKILLS

Vocabulary:

Agglutinins, Erythrocytes, leukocytes, platelets, coagulation, blood, vasodilation, embolus, thrombosis, pulmonary, artery, vein, hypertension, atria, ventricle, fibrin, fibrinolysis, hematocrit, hemoglobin, hemopoiesis, hemostasis, plasma, platelets, serum, neutrophils, eosinophils, basophils, atrioventricular valve, atrium, cardiac cycle, cardiac output, diastole, electrocardiogram, endocardium, epicardium, intercalated disc, myocardium, pericardium, Purkinje fibers, sinoatrial node, systole, ventricle, anastomosis, arteriole, artery, blood pressure, capillary, hepatic portal system, peripheral resistance, pulmonary circuit, pulse pressure, respiratory pump, systemic circuit, vasoconstriction, vasodilation, vein, venule, haima, hypo, karyon, leukos, megas, myelos, osis, ox, penia, poiesis, puncture, stasis, thrombus, vena, Specific and nonspecific immunity, active and passive immunity, autoimmune, allergy, lymphocytes, immunoglobulins, spleen, inflammation, phagocytes, antibodies, antigens, B cells, chemotaxins, cytokines, interferon, plasma cells, pyrogen, T cells, thymus, anastomosis, atrion, auris, bi, bradys, cuspis, diastole, gram, luna, mitre, papilla, semi, septum, systole, tachys, tricuspid, ventricle, angina pectoris, balloon angioplasty, bradycardia, cardiac arrhythmias, cardiac tamponade, coronary artery bypass graft (CABG), coronary artery disease (CAD), coronary ischemia, defibrillator, tachycardia, valvular heart disease (VHD), rheumatic heart disease (RHD), edema, hypervolemic, hypovolemic, phlebitis, pulmonary embolism, proenzymes, tissue factor, and proconvertin

Skills:

- Describe the general characteristics of blood and discuss its major functions.
- Distinguish among the various types of cells found in blood.
- Explain the basis and procedure for blood typing.
- Discuss the cardiac cycle and explain how it is controlled
- Describe events of action potential in cardiac muscle
- Explain factors effecting cardiac output
- Compute cardiac output
- Create and interpret EKG graphs
- Explain how blood pressure is generated and controlled.
- Compare the structures and functions of the major types of blood vessels
- Describe the general functions of the lymphatic system.
- Explain how lymphatic circulation is maintained and describe the consequences of lymphatic obstruction.
- Distinguish between specific and nonspecific immunity.
- Explain how different types of lymphocytes are formed and how they function in immune mechanisms.
- Explain how allergic reactions occur

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Using an anatomical model, locate the different parts of the heart and major veins and arteries served
- Using a sheep heart to correctly dissect and label the different parts of the heart
- Construct a chart and model of the blood components

- Complete a blood typing lab in which they determine blood type
- Color code pathways of the blood to/from the heart
- Learn how to take blood pressure using sphygmomanometers
- Use Pasco units and sensors to graph heart movement
- Case studies created by students to diagnose possible conditions

OTHER EVIDENCE

- Objective review questions that demonstrate understanding of concepts and diagrams.
- Drawing, tracing and coloring components of the circulatory system
- Coloring book worksheets.
- Terminology matching worksheets.
- Mini case studies that draw on anatomical concepts and terminology.
- Think/Pair/Share explanation of concepts to partner or small group.
- Homework:
 - Vocabulary flash cards or map (word, picture, sentence, example)
 - Section Review Questions
- Exit tickets (answers to daily objective questions)
- Online assignments and independent work
- Do-nows
- Individual, small, and large group work
- Homework
- Guided practice

- Study Guide Packets
- Visual Quiz

STAGE THREE

LEARNING PLAN

Activities, experiences, and lessons:

- PowerPoint presentation of material using key concepts, pictures, diagrams.
- 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)
- Flashcards and/or drill and practice
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators
- Blood transfusion simulation-learning different blood types
- Blood Typing Lab– students will model the different blood types using foam and clay. They will then solve the mystery by doing a blood typing lab
- Heart Dissection Lab – Students will dissect a sheep’s heart and have to identify all the parts. They will also have to explain movement using the heart and directional terms. There will be a supplemental computer program as well
- Exercise and heart rate lab-compare and analyze data, discuss what happened
- Pasco Lab – EKG simulation lab

- Blood Pressure lab- students learn how to measure blood pressure using sphygmomanometers and stethoscopes. They will also learn the other types of pressure effecting the heart

LEARNING Activities

- Concept maps – map of blood flow and of involvement of all systems
- Documentary Blood detectives-gives real scenarios and explores various blood disorders
- Case studies of different blood disorders
- Microscopic slides– with partner’s they will look at slides of blood, arteries and veins. They will be able to distinguish between the two and also be able to count the blood composition
- Stories/poems – Life of a blood cell, students choose what type of blood cell they are and write a narrative story or poem from that point of view
- The Heart (Discovery) – questions, answers and extension problem solving.
- Research project-heart disease and treatments
- Interpret an ECG graph and label/explain
- Guest speaker(s) – Cardiac specialist/Dr
- Jeopardy review game
- Student developed quizzes to use with partners or small groups.

Misconceptions/Teaching Tips:

- Encourage students to adopt the use of flash cards to retain large amounts of information (ie. vocabulary words, anatomical terms, etc.)
- Students often think they can “cram” for tests but are often surprised by the amount of information that is covered which can be overwhelming. Students are encouraged and reminded to keep up with material and review in small increments.
- Students are encouraged to keep up with the reading ad to use the clinical note to make the material more applicable
- Use student examples and ideas to explain difficult concepts

- Use anatomy coloring sheets as study tools especially to review pathways of the blood

This unit will build on the student's prior knowledge up to this point and in this class and will require those skills. They will have various vocabulary quiz checks, practical assessments i.e. identifying parts of the heart, and chapter quizzes. They will be expected to know all terms and clinical diagnosis dealing with the circulatory system. They will be asked to use this information to evaluate higher level problems when given case studies. They will also be expected to not only know and label every structure associated with the heart but will apply these terms to simulations of real cases. This unit will end with a formal assessment common to all honors anatomy students.

Unit Name: Environmental Exchange

Time Frame: 6 Weeks

Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Science**

Country: **USA**

Course/Grade: **MSA Anatomy & Physiology**

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

The respiratory and cardiovascular systems are closely linked. The exchange of oxygen carbon dioxide is essential in allowing the efficient creation of energy in aerobic respiration. This unit will examine the homeostatic regulation of respiratory activities as levels of physical activity change. It will also relate how humans obtain and digest energy needed for those processes. Students will understand how the digestive system processes food so that nutrients can be absorbed and utilized by cells. The last chapter of this unit will highlight excretion and the urinary system. All of the systems discussed refer to the exchange of necessary nutrients.

UNIT RESOURCES

- Textbook – Fundamentals of Anatomy & Physiology (2012) *Martini / Nath/Bartholomew*; Chapters 23, 24, 25, 26, and 27
- Fundamentals of A&P Study Guide
- Mastering A and P website
- Online assignments and book component
- PowerPoint presentations
- Lab Manuals and materials

Internet Resource Links:

- *Mastering A and P:* www.masteringaandp.com
- *Discovery:* www.unitedstreaming.com
- *NBC Learn Videos:* www.nbclearn.com
- *eLibrary science:* <http://science.bigchalk.com/sciweb/science/do/search>

- Online textbook: *Essentials of A&P*
- Web simulators: www.pHET.colorado.edu
- <http://www.getbodysmart.com/>
- <http://www.nhlbi.nih.gov/health/dci/animate/howlungswork.swf>
- Web Video Clips: www.Learning4mastery.com (Flipped Learning)
- McGraw-Hill Video Clips: <http://highered.mcgraw-hill.com/sites/>
- Pearson Video Clips: <http://wps.aw.com/>
- Case studies - <http://sciencecases.lib.buffalo.edu/cs/>

STAGE ONE

GOALS AND STANDARDS

Next Generation Science Standards and Disciplinary Core Ideas

HS. Structure and Function

Students who demonstrate understanding can:

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.

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.

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

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

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

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.
- Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

ENDURING UNDERSTANDINGS

- An understanding of events that occur in the respiratory system and how they interact is basic to understanding how cells produce the energy necessary for life.
- The respiratory system is composed of the nose, nasal cavity, paranasal sinuses, pharynx, larynx, trachea, bronchial tree, and lungs.
- Understanding of structure of the larynx and the production of sound
- Breathing is due to the action of muscles and bones of the thorax and is controlled by the autonomic and somatic nervous systems.
- The partial pressure in the air depends on the direction of diffusion during breathing.
- Interactions of the respiratory system with other systems
- Diseases of the respiratory system can be genetic, developmental or, infectious.
- Aging of the respiratory system can be measured as different aspects of breathing capacity and, it can be manifested as reduction in the ability to carry out inspiration or expiration of diffusible gases
- Knowledge of the organs in the digestive tract and accessory organs that are involved
- The digestive system processes food so that nutrients can be absorbed and utilized by cells.
- Knowledge of what foods to select and in what quantities provide a firm foundation for proper nutrition.
- The nephrons are the functioning units of the kidney and are composed of blood vessels and renal tubules.

- Urine formation is under the influence of hormonal control.
- Pathology of the urinary system may include congenital factors, infections, hormonal fluctuations, malignancies, and immune system disorders.
- Aging or pathology of this system can impact food digestion and/or absorption which can limit the available resources to the rest of the body.
- The kidneys are positioned on either side of the midline of the superior abdominal cavity and are responsible for all aspects of urine formation.

ESSENTIAL QUESTIONS

- What are the mechanics of breathing and how is air exchange accomplished?
- What diseases affect this system and what is the impact of aging?
- What are the developmental and histologic aspects of the respiratory system?
- What factors influence the rate of respiration?
- How is the respiratory system interrelated with the other systems?
- What are the main and accessory organs of the digestive tract?
- What is the histology of each organ of the digestive tract and how does this relate to its function?
- What are the impacts of aging in the digestive system?
- What are the components and functions of the urinary system?
- What is the structure of the kidneys?
- How does the urinary system interact with other systems to maintain homeostasis in body fluids
- What is the importance of the body's buffering system?

KNOWLEDGE AND SKILLS

Vocabulary:

- alveolus, bronchial tree, bronchus, larynx, lungs, nasal cavity, partial pressure, pharynx, respiratory membrane, respiratory rhythmicity centers, respiratory system, surfactant, trachea, vital capacity, bile, chylomicrons, chyme, defecation reflex, digestions, duodenum, esophagus, gallbladder, gastric glands, lacteal, liver, mesentery, mucosa, pancreas, pancreatic juice, peristalsis, stomach, teeth, villus villi, acidosis, aldosterone, alkalosis, angiotensin II, buffer system, filtrate, glomerular filtration rate glomerulus, juxtaglomerular apparatus, kidney, loop of henle, micturition, nephron, peritubular capillaries, renin, ureters, urinary bladder, urine, asbestosis, asphyxia, aspirate, bronchography, bronchoscope, Cheyne-Stokes breathing, Dyspnea, endotracheal tube, hemotypsis, orthopnea, glottis, biphosphoglycerate (BPG), carbaminohemoglobin, apneustic centers, deglutition, chime, fundas, rugae, somatostatin, plicae, Kupffer, emulsification, borborygmus, cathartics

Skills:

- Name and describe the location of the organs of the digestive system and the general functions of each.
- Identify component parts of digestive system and describe their impact on digestion and excretion.
- Analyze the effect that amylase has on carbohydrates.
- Predict the effect that aging and pathological changes have on both systems.
- Correlate component parts of the urinary system with their function in urine formation.
- Investigate the effects that hormones have on the formation of urine.
- Define nutrition, nutrients, and essential nutrients.
- Explain how the products of digestion are absorbed.
- Explain how macromolecules are used by cells.
- List the general functions of the respiratory system.
- Explain how oxygen is utilized by cells.
- Name the organs of the urinary system and describe their general functions

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Think, pair, share-read through sections and compare outlines with a partner
- Graphic organizers or models
- Color the path of digestion.
- What happens when you eat lab- These activities will show students what organs aid in digestion and how digestion occurs in the human body.
- Breathing and Holding Your Breath activity- students will create a respiratory model and examine what happens to their breathing after holding their breath
- Medical imaging Lab – Students will learn how to read x-rays, mri, cat scans and be able to identify various systems

OTHER EVIDENCE

- Videos clips of digestion
- Modeling – create a model that portrays the digestive tract
- Homework:
 - Vocabulary flash cards or map (word, picture, sentence, example)
 - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Do nows
- Individual, small, and large group work
- Homework
- Guided practice
- Study Guide Packets

- Visual Quiz

STAGE THREE

LEARNING PLAN

Activities, experiences, and lessons:

- PowerPoint presentation of material
- Group discussion
- Mini-quizzes – develop and submit questions about topics that are redistributed to class.
- Comparison charts
- Flow charts or concept maps
- Think/know/want to know
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Flashcards and/or drill and practice
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators

LEARNING Activities

- Models – make and use as demos of digestion process
- Animal intestines to show the parts of the digestive system
- Case studies
- Coloring/labeling worksheets.

- Creating and labeling diagrams

Misconceptions/Teaching Tips:

- Frequently use partners to have students explain concepts in their own words. This is useful both in teaching the information to others and learning it for themselves.
- Encourage students to ask each other questions for clarification.
- Remind students to use different diagrams and models to learn the different components of the respiratory and digestive tracts
- Use student examples and ideas to plan experiments as a class
- Relate concepts in class to students' own experiences as often as possible.

This unit is sequenced to draw from concepts learned in the previous unit and apply them to new topics. It begins by identifying information that is already known and addressing any misconceptions about possible new information. The unit chapters are first learned independently and ultimately integrated. Students will learn concrete blocks of new information while applying it to previous concepts to master the unit. Students will use this information to evaluate higher level problems. This unit will end with a formal assessment common to all honors anatomy students.

Unit Name: Continuity of Life

Time Frame: 2 weeks

Author: Egg Harbor Township High School Science Department

UNIT

Subject: **Science**

Country: **USA**

Course/Grade: **MSA Anatomy & Physiology**

State/Group: **NJ**

School: **Egg Harbor Township High School**

UNIT SUMMARY

This unit will provide a deep understanding of the importance of the reproductive aspect of the human body. It will also give an overview of inheritance, development, and tie on all of the chapters that have been covered up to this point.

UNIT RESOURCES

- Textbook – Fundamentals of Anatomy & Physiology (2007) *Martini / Nath/Bartholomew*; Chapters 28 and 29.
- Mastering A and P website
- Powerpoint presentations
- Lab Manuals and materials

Internet Resource Links:

- *Mastering A and P*: www.masteringaandp.com
- *Discovery*: www.unitedstreaming.com
- *NBC Learn Videos*: www.nbclearn.com
- *eLibrary science*: <http://science.bigchalk.com/sciweb/science/do/search>
- *Online textbook: Essentials of A&P*
- *Web simulators*: www.pHET.colorado.edu
- *Web Video Clips*: www.Learning4mastery.com (Flipped Learning)
- *McGraw-Hill Video Clips*: <http://highered.mcgraw-hill.com/sites/>
- *Pearson Video Clips*: <http://wps.aw.com/>

- Case studies - <http://sciencecases.lib.buffalo.edu/cs/>

STAGE ONE

GOALS AND STANDARDS

Next Generation Science Standards and Disciplinary Core Ideas

HS. Structure and Function

Students who demonstrate understanding can:

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.

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.

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

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

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

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.
- Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

ENDURING UNDERSTANDINGS

- Knowledge of the anatomy and physiology of the male and female reproductive systems is basic to the study of human sexuality and the process of reproduction.

- The reproductive system is unique because it is essential for the survival of the species rather than for the survival of the individual.
- Human growth and development complement the reproductive system and the understanding of how the species survives
- Genetics explains the similarities and differences between parents and their offspring.
- Deviations in chromosome number or arrangement can produce birth defects.
- Both heredity and environment can influence the development of individual characteristics.

ESSENTIAL QUESTIONS

- How do the male and female reproductive systems differ and how do they complement each other?
- What are the major events that occur in the birth process?
- Are patterns of growth and development consistent enough from one individual to another to allow for the prediction of behavior?
- What are the stages of development from birth to death?
- How is it possible to modify the health outcomes of your genetic makeup?
- How does the process of gene therapy work?
- What effect does gender have on gene expression?
- How are gene discoveries relevant to the study of anatomy and physiology and to health care?

KNOWLEDGE AND SKILLS

Vocabulary:

- Ductus deferens, endometrium, estrogens, lactation, meiosis, menses, oogenesis, ovarian follicles, ovary, ovulation, perineum, prepuce, progesterone, seminiferous tubules, spermatogenesis, spermatozoa, testes, testosterone, vulva, amnion, blastocyst, embryo, fetus, genotype, gestation, heterozygous, homozygous, implantation, neonate, parturition, phenotype, placenta, trimester, trophoblast

Skills:

- Name the parts of the male reproductive system and describe the general functions of each.
- Name the parts of the female reproductive system and describe the functions of each.
- Describe how hormones control the activities of the male and female reproductive systems and how they are related to the development of secondary sexual characteristics.

- Distinguish between growth and development.
- Describe the major events that occur during the various stages of growth and development
- Distinguish between genes and chromosomes.
- Outline the process of meiosis.
- Describe how alleles interact.
- Explain how gene expression varies among individuals.
- Describe the challenges that the ability to diagnose inherited diseases presents

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Reproductive system diagrams
- Board game lab-pick a system to create a game about

OTHER EVIDENCE

- Webquest – Genetic characteristics/ virtual lab
- Genetic disorder videos and case studies-students must be able to identify what chromosome was affected as well as what other systems were effected.
- Homework:
 - Vocabulary flash cards or map (word, picture, sentence, example)
 - Section Review Questions
- Exit Cards (answer to daily objective questions)
- Do nows

STAGE THREE

LEARNING PLAN

Activities, experiences, and lessons:

- PowerPoint presentation of material
- Group discussion
- Mini-quizzes – develop and submit questions about topics that are redistributed to class.
- Comparison charts
- Flow charts or concept maps
- Think/know/want to know
- Think, pair, share (read assigned section of text individually, discuss with a partner, present material in pairs to class – use PowerPoint as a reference)
- Flashcards and/or drill and practice
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators
- Final project
- Final dissection

LEARNING Activities

- Students will perform the final dissection of a cat to integrate all of the systems learned.

- Students will create a final project including a lesson plan and activities on any subject of their choice based on one of the systems learned throughout the year.
- Case studies
- Coloring/labeling worksheets.
- Creating and labeling diagrams

Misconceptions/Teaching Tips:

- Frequently use partners to have students explain concepts in their own words. This is useful both in teaching the information to others and learning it for themselves.
- Encourage students to ask each other questions for clarification.
- Remind students to use different diagrams and models to learn the different components of the respiratory and digestive tracts
- Use student examples and ideas to plan experiments as a class
- Relate concepts in class to students' own experiences as often as possible.

The purpose of this unit is to integrate all of the information from systems learned throughout the year. Students are expected to apply their knowledge and skills from each unit while investigating and performing the final dissection. They are also required to develop a lesson plan and activity to demonstrate their mastery of the material and ability to teach it to others.

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>