Unit #3: Musculo-Skeletal System

Physiology Period

Content Area:	Science
Course(s):	Anatomy and
Time Period:	First Marking
Length:	5 Week
Status:	Published

Unit Overview

This chapter begins with an overview of the many functions of bones and muscles. The features of the skeletal bones and the muscular system that contribute to body function, structural support and protection are discussed here. The components of the muscular and skeletal system that provide support and protection for tissues and function to make movements possible and maintain homeostasis is discussed further.

STAGE 1- DESIRED RESULTS

Educational Standards

2020 New Jersey Student Learning Standards- Science

Performance Expectations

Life Sciences

SCI.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.
SCI.HS-LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

SCI.HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
SCI.HS-LS1	From Molecules to Organisms: Structures and Processes
SCI.HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
SCI.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
SCI.HS-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Science and Engineering Practices

- Practice 1: Asking Questions and Defining Problems
- Practice 2: Developing and Using Models
- Practice 3: Planning and Carrying Out Information
- Practice 4: Analyzing and Interpreting Data
- Practice 5: Using Mathematics and Computational Thinking
- Practice 6: Constructing Explanations and Designing Solutions
- Practice 7: Engaging in Argument from Evidence
- Practice 8: Obtaining, Evaluating, and Communicating Information

Cross Cutting Concepts

- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Functions
- Stability and Change

Disciplinary Core Ideas

Life Sciences

• LS1.A: Structure and function

- LS1.B: Growth and development of organisms
- LS1.C: Growth and development of organisms
- LS2.A: Interdependent relationships in ecosystems
- LS2.B: Cycles of matter and energy transfer in ecosystems
- LS2.C: Ecosystem dynamics, functioning, and resilience

Essential Questions

- What are the features of the skeletal bone that contribute to body function?
- How does bone formation contribute to structural support and protection?
- How do well-known skeletal disorders affect homeostasis and bone function?
- How do articulations provide for different body movement?
- How are muscles structurally organized that allow for body movement?
- How do muscles contract?
- What are the types of muscular movements?
- How do notable muscle disorders affect homeostasis and movement?
- How do we maintain a healthy and strong musculoskeletal system?
- How does posture affect homeostasis?

Enduring Understanding

- The skeletal system is instrumental in the support, movement and protection of the human body.
- Bones are dynamic organs that interact and support other systems of the body.
- The muscular system plays a role in movement, support and homeostasis of the human organism.
- The state of an organism is maintained by the dynamic interaction of the systems that comprise it.

Students will know... Vocabulary Definitions:

axial skeleton, appendicular skeleton, long bone, short bone, flat bone, irregular bone, structure of a bone, bone formation, growth and formation, osteoclasts, osteoblasts, remodeling, vertebral column, synarthroses, amphiarthroses, diarthroses, gliding, hinge, pivot, ball and socket, saddle, condyloid, smooth muscle, cardiac muscle, skeletal muscle, epimysium, perimysium, endomysium, sliding filament theory, actin, myosin, z-lines, sarcomere, myology

Predictable misconceptions:

Students may believe that muscles alone are responsible for body movement.

Students may believe all joints work in the same manner.

Students may believe that bone growth/formation/remodeling is genetically predetermined.

Students may assume that structure and movement are the only functions of the musculoskeletal system.

Students will be able to...

- Compare and contrast the major types of bones (long, short, flat, irregular) as well as identify examples of each.
- Evaluate the importance of bone markings in understanding the function of the skeletal system.
- Analyze the bones of the skull, cranium, bony thorax, vertebral column, upper & lower extremities, relating their structure to their function.
- Compare and contrast various fractures as well as indicate scenarios/conditions which make specific types more prevalent (ex. compression fractures in osteoporosis, greenstick fractures in youth).
- Compare and contrast skeletal, cardiac & smooth muscle tissue by their structures, location & functions.
- Compare and contrast direct phosphorylation, aerobic respiration and anaerobic glycolysis in order to describe their sequence and biological conditions necessary for each.
- Suggest exercises to strengthen muscles based on their action and roles in movements.
- Describe the importance of stress on bones for maintaining strong healthy bones.
- Justify the importance of posture in maintaining homeostasis, types of muscle contractions &

fibers that maintain posture and explain factors that can positively or negatively affect our posture.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment Suggestions

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments Suggestions

- articulate a human skeleton model
- interpret x-rays which will include identification of fractures, joints, and their appropriate

locations

- analyze muscle tissue specimens under the microscope in order to sketch and interpret their findings
- create a model of a muscle demonstrating the macroscopic structures and layers and judge each others for accuracy
- muscle fatigue lab determine which factors influence muscle fatigue
- demonstration/poster/movie suggesting exercises that will strengthen muscles and maintain bone density in the upper extremity, lower extremity & trunk
- "body movement Simon Says" lead/respond by using only anatomically correct directions and structures
- organize muscles by actions at specific locations (ie. flexors of the shoulder, extensors of the knee), identify synergists and antagonists for each prime mover
- individual research to investigate the effects of sleep, rest & activity on their height on a daily basis

Benchmark Assessments

- chapter 5 test: skeletal system
- chapter 6 presentation: muscular system presentation

STAGE 3- LEARNING PLAN

Instructional Map

- muscle types: cardiac, skeletal & smooth
- microscopic anatomy
- muscle contractions
- myology & movement

- structure & function of skeleton and bones
- axial & appendicular gross anatomy
- joints & movements
- developmental aspects of skeletons

Modifications/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products

- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just singlesubject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support

- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-Direct
- Repeated Drill / Practice
- Shortened Assignments
- Teacher Notes
- Tutorials
- Use of Additional Reference Material
- Use of Audio Resources

High Preparation Differentiation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles

- Menu Assignments
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation Differentiation

- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Extend Skills
- Mini Workshops to Re-teach
- Open-ended Activities
- Think-Pair-Share by Interest
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Readiness
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Integration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

- Prerequisites: Students who wish to take Honors Anatomy & Physiology should have earned and A or B in both Biology and Chemistry courses.
- Students who have successfully completed Honors Anatomy & Physiology are encouraged to enroll in: Physics, Zoology, Forensics or Human Impact on the Environment

Additional Materials

Textbook : Essentials of Human Anatomy & Physiology 11e, Elaine N. Marieb masteringaandp.com

Internet Resources

Teacher Resources – e-Textbook – Essentials of Human Anatomy and physiology by Marieb,

http://nj.pbslearningmedia.org/resource/lsps07.sci.life.stru.bodysystems/all-systems-are-go/

Bone Growth http://www.natgeoeducationvideo.com/film/1087/bone-growth

How to Grow a Bone - Nina Tandon

https://www.youtube.com/watch?v=yJoQj5-TIvE

How x-rays see through your Skin - Ge Wang

https://www.youtube.com/watch?v=gsV7SJDDCY4

The Benefits of Good Posture - Murat Dalkininç

https://www.youtube.com/watch?v=OyK0oE5rwFY

What makes muscles grow? - Jeffrey Siegel

https://www.youtube.com/watch?v=2tM1LFFxeKg

The Skeletal System: Crash Course A & P #19

https://www.youtube.com/watch?v=2tM1LFFxeKg

Joints: Crash Course A & P #20

https://www.youtube.com/watch?v=DLxYDoN634c&index=20&list=PL8dPuuaLjXtOAKed_MxxWBN aPno5h3Zs8

Muscles, part 1 - Muscle Cells: Crash Course A & P #21

https://www.youtube.com/watch?v=DLxYDoN634c&index=20&list=PL8dPuuaLjXtOAKed_MxxWBN aPno5h3Zs8

Muscles, part 2 - Organismal Level: Crash Course A & P #22

https://www.youtube.com/watch?v=DLxYDoN634c&index=20&list=PL8dPuuaLjXtOAKed_MxxWBN aPno5h3Zs8

The Deal with Protein - SciShow

https://www.youtube.com/watch?v=Chbm84sCBAw

Are Sore Muscles Growing? SciShow

https://www.youtube.com/watch?v=6HnZnhwOuag

Can Pickles and Bananas Really Help Athletes? SciShow

https://www.youtube.com/watch?v=00QS3zRzGho

Why do Birds Have White and Dark Meat? (And do we?) - SciShow

https://www.youtube.com/watch?v=aLs8f-iDneo

Why Don't We Have Elbowcaps?

https://www.youtube.com/watch?v=i3vVKgDgk68

Whack-a-Bone game

http://www.anatomyarcade.com/games/WAB/WAB.html

Poke-a-Muscle game

http://www.anatomyarcade.com/games/PAM/PAM.html

Are You Sitting Too Much?

https://www.youtube.com/watch?v=uiKg6JfS658

Get Body Smart

https://www.getbodysmart.com