

Great Science Adventures



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What is the skeletal system?

Human Body Concepts:

- Cells are the building blocks of all living organisms including the human body.
- Groups of similar cells form tissues and tissues form organs.
- Groups of organs working together are called systems.
- The skeletal system is made up of an organized system of bones and cartilage.
- The skeletal system provides support, protects organs, anchors muscles to provide movement, and produces blood cells.
- Two main types of joints are hinge and ball-and-socket.

Vocabulary Words: body cells skeleton joints *systems *tissues *organs *hinge *ball-and-socket

Construct and Read: Lots of Science Library Book #1.

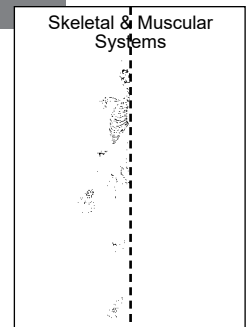
Activities:

Skeletal System – Graphic Organizer

Focus Skill: explaining a function

Paper Handouts: 12” x 18” sheet of construction paper 8.5” x 11” sheet of paper a copy of Graphics 1A - B

Graphic Organizer: Using the 12” x 18” construction paper, make a Shutter Fold. Glue/copy Graphic 1A on the left side of the cover as shown. Label the cover of the Shutter Fold *Skeletal and Muscular Systems*. Using the 8.5” x 11” paper, make a Hot Dog. Place the Hot Dog so that the fold is on the right side. Glue Graphic 1B on the front and label it *Skeletal System*. Open the Shutter Fold and glue the Hot Dog on the left part of the middle section, being sure to place the fold on the right side. Open the Hot Dog. On the top right side:

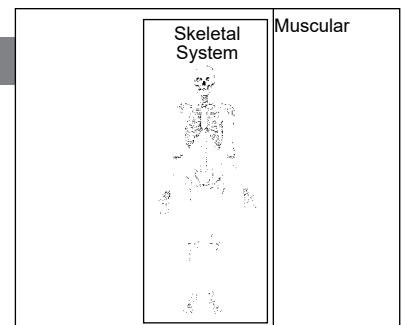


- Draw a skeleton.
- Write clue words about the four main functions of the skeletal system: *supports the body, protects organs, anchors muscles, produces blood cells.*
- Explain the four main functions of the skeletal system.

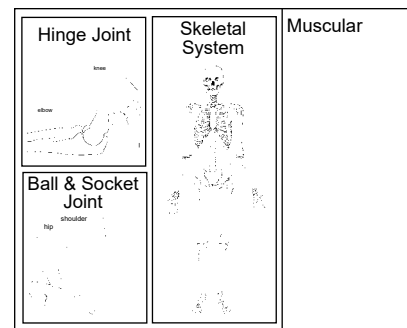
Moveable Joints – Graphic Organizer








Focus Skill: comparing and contrasting

Paper Handouts: 8.5” X 11” sheet of paper Graphics 1C - F



Graphic Organizer: Make a Hot Dog. Cut it to make a Large Question and Answer Book. Open it so that the Hot Dog's fold is on the left side. Open the *Skeletal and Muscular Systems Shutter Fold*. Glue the Hot Dog on the left section, being sure to place the fold on the left side. Glue/copy Graphics 1C on the top tab and 1D on the bottom tab. Label the tabs *Hinge Joints* and *Ball-and-Socket Joints*. Glue Graphics 1E & 1F under each tab. On the Hinge tab, using a red marker, circle the elbows and knees. On the *Ball-and-Socket* tab, using a blue marker, circle the shoulders and hip joints. Beside the Graphics:



-  Draw a picture of a hinge joint and a ball-and-socket joint accordingly.
-    Write clue words about each joint and include examples. hinge joint - *move in one direction, strong, elbow and knee.* ball and socket joint - *can be twisted like a joy stick, allows movement in many directions, rotation, shoulder and hip.*
-    Describe each joint, explain how they move, and include examples.
This *Skeletal and Muscular Systems Shutter Fold* will be used in Lessons 2-3.

How Tall Are You?

Activity Materials: butcher paper tape measure

Activity: Lie down on a piece of butcher paper and ask a partner to outline your body. Cut out the outline and fill in the details. Measure the outline.

Experiences, Investigations, and Research

Select one or more of the following activities for individual or group enrichment projects. Allow your students to determine the format in which they would like to report, share, or graphically present what they have discovered. This should be a creative investigation that utilizes your students' strengths.



1. Research the life of Wilhelm Conrad Roentgen and the history of the X-ray, including its uses today.







2. Examine your ears and the tip of your nose. Feel the end of your nose; wiggle it. Bend your ear. Can you do this with parts of your body such as your finger tips or toes? Why or why not?



3. Use modeling clay to make a stand-up figure. Make another figure using toothpicks as a frame. Cover the frame with clay. Which figure holds its shape better?



4. Read *Clara Barton, Founder of the American Red Cross* (The Childhood of Famous Americans Series) by Augusta Stevenson.   &  



5. Using an Internet Search Engine, research illustrations on the human body.   



6. Using an Internet Search Engine, research the skeletal system.



What do we know about bones?

Human Body Concepts:

- Bone tissue is made up of living cells.
- Bones are lightweight yet strong.
- Bone's three layers consist of a tough outer layer, compact bone, and spongy bone.
- Red bone marrow produces all red blood cells and some white blood cells.
- A fracture may be simple, complete, compound, or other.

Vocabulary Words: bones calcium *cartilage *compact bone *spongy bone
*red bone marrow *fracture

Construct and Read: *Lots of Science Library Book #2.*

Activities:


Bone Parts – Graphic Organizer


Bone Parts	
Baby and Adult Bones	


Focus Skill: comparing and contrasting

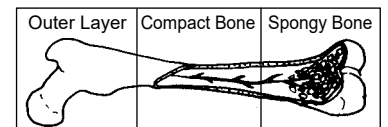
Paper Handouts: 8.5" x 11" sheet of paper a copy of Graphic 2A *Skeletal and Muscular Systems Shutter Fold*

Graphic Organizer: Make a Hot Dog. Place the Hot Dog in front of you so that the fold is on top. Glue/copy Graphic 2A on the front of the Hot Dog. Cut the Hot Dog to make a 3 Tab Book. Fold over the right and left tabs and label the cover *Bone Parts*. Open the *Skeletal and Muscular Systems Shutter Fold*. Open the *Skeletal System* book. Keeping the 3 Tab Book folded, glue it on the top left side. Open the 3 Tab Book so you are looking at Graphic 2A. Label the left tab *Outer Layer*. Label the middle tab *Compact Bone*. Label the *Spongy Bone* tab.

 Color the spongy bone in brown, color the compact bone white, and the outer layer in light brown.

 Open the tabs. Write clue words about each part of the bone.
outer layer - *tough membrane, nerves, blood vessels, special cells help repair bone injuries.* compact bones - *bone cells release minerals, very strong, have holes and channels to carry blood vessels and nerves to inner bone.* spongy bone - *at end of bone, spongy looking, tiny pieces of bones, looks like honeycomb, hollow spaces filled with bone marrow.*

 Open the tabs. Describe each part of the bone and define its function.





Baby and Adult Bones – Graphic Organizer


Focus Skill: comparing and contrasting

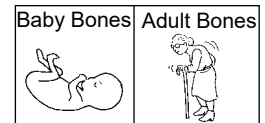
Paper Handouts: 8.5" x 11" sheet of paper a copy of Graphics 2B-C

Graphic Organizer: Make a Large Question and Answer Book. Label the cover *Baby Bones* and *Adult Bones*. Glue this in the *Skeletal and Muscular Systems Shutter Fold*, in the *Skeletal System* book, beneath the *Bone Parts* Graphic Organizer. Open the tabs.

 Under the *Baby* tab, draw a picture of yourself when you were a baby. Under the *Adult* tab, draw a picture of an adult. Circle the nose and ears to help you remember the parts that remain as cartilage.

 Under the *Baby* tab, write clue words about a baby’s bones. Under the *Adult* tab, write clue words about an adult’s bones. baby bones - *minerals make bones harder, bone tissues develop at center and grow.* adult bones - *can become brittle and break easily.*

 Under each tab, compare and contrast a baby’s bones to an adult’s bones. Define cartilage and list areas of the body that remain as cartilage throughout an adult’s life. (Refer to *Lots of Science Library Book #1* and *2*.)



Bending Bones

Activity Materials: chicken leg bone vinegar bowl

Activity: Take a chicken leg bone and put it in a bowl filled with vinegar. Leave it for two to three days. Pour away the vinegar, wash the bone with water and then try to bend it. How does it feel? Why?
The bone bends because the acidic vinegar has dissolved the calcium in it.

All Thumbs

Activity Materials: tape

Activity: Tape your partner’s thumbs down on the palm, leaving the remaining fingers free. Record your observations as your partner tries to eat, write, use the telephone, and do other activities. Trade places with your partner. Explain the importance of the skeletal structure in the hand, fingers, and thumbs in everyday activities.

Experiences, Investigations, and Research

Select one or more of the following activities for individual or group enrichment projects. Allow your students to determine the format in which they would like to report, share, or graphically present what they have discovered. This should be a creative investigation that utilizes your students’ strengths.



1. Research food labels. Discover which foods are high in calcium and explain why this is important.



2. Research osteoporosis. Answer the questions: What are the causes? Who is afflicted the most? Is there a way to prevent it? Is treatment available?



3. Read *A Picture Book of Florence Nightingale* by David A. Adler.   



4. Read *Florence Nightingale* (Young Reader’s Christian Library Series) by Kristi Lorene.   



5. Using an Internet Search Engine, research bone tissue.



What is the muscular system?

Human Body Concepts:

- Muscles are necessary for body movements.
- The three types of muscles are skeletal, smooth, and cardiac.
- Skeletal muscles are attached to bones and work in pairs.
- Smooth muscles are located in the walls of organs, arteries, and eyes.
- Cardiac muscles are found in the heart.
- The more a muscle works, the more oxygen it needs.

Vocabulary Words: muscles pairs contracts oxygen *ligaments *involuntary
*voluntary

Construct and Read: Lots of Science Library Book #3.

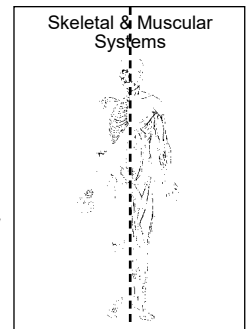
Activities:




Muscular System – Graphic Organizer

Focus Skill: defining terms

Paper Handouts: 8.5” x 11” sheet of paper a copy of Graphics 3A - B *Skeletal and Muscular Systems Shutter Fold*

Graphic Organizer: Glue 3A on the right side of the cover of the *Skeletal and Muscular Systems Shutter Fold*. Make a Hot Dog. Glue/copy Graphic 3B on the cover and label it *Muscular System*. Open the *Skeletal and Muscular Systems Shutter Fold*. Glue the Hot Dog in the middle section beside the *Skeletal System*, being sure to keep the fold on the left side. Open the Hot Dog.

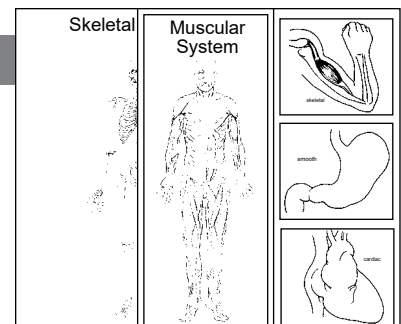


-  Draw a picture that shows you using your muscles.
-  Write clue words about the muscular system. *human skeleton is covered with over 600 muscles, muscles make bones move, muscles need good food and exercise.*
-  Define muscles, ligaments, and tendons. Compare and contrast voluntary and involuntary muscles and give examples of each.


Three Types of Muscles – Graphic Organizer



Focus Skill: describing

Paper Handouts: 8.5” x 11” sheet of paper a copy of Graphics 3C - E

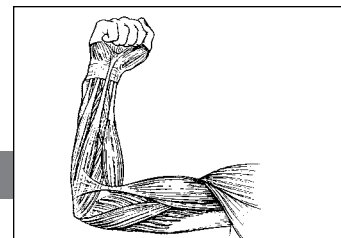


Graphic Organizer: Make a Hot Dog 3 Tab Book with the fold on the right side. Glue/copy Graphics 3C - E on each tab. Label it *Three Types of Muscles*. Label each tab *Cardiac Muscle*, *Skeletal Muscle*, and *Smooth Muscle* accordingly. Open the *Skeletal and Muscular Systems Shutter Fold*. Glue the *Three Types of Muscles Graphic Organizer* on the right side. Open the tabs.

 On the *Cardiac* tab, draw a heart; on the *Skeletal* tab, draw muscle attached to a bone; on the *Smooth* tab, draw a blood vessel.

  Under each tab, write clue words about each type of muscle. skeletal muscles - *you control these muscles, used to move, are long, thin, strands*. smooth muscles - *found in walls of internal organs and arteries, you do not control*. cardiac muscles - *in the heart, strong, works 24 hours a day*.

   Under each tab, describe each muscle and list examples.



Investigative Loop - Muscles Need Rest

Focus Skill: predicting an outcome

Lab Materials: watch with a second hand

Paper Handouts: 8.5" x 11" sheet of paper Lab Record Cards (index cards or 1/4 sheets of paper)
Lab Graphic 3-1

Graphic Organizer: Make a Pocket Book. This is the student's Lab Book. In future lessons, Pocket Books will be made and glued side-by-side to this one. Glue Lab Graphic 3-1 on the left pocket.

Question: Do muscles need rest to function at their best?

Research: Read *Lots of Science Library Book #3* and review what you know about muscles.

Prediction: Predict whether muscles perform better after rest. Write your prediction on a Lab Record Card labeled "Lab 3-1."

Procedure: Make a fist and open it with fingers extended. Do this as many times as you can within 15 seconds. With no rest in between, complete this 5 more times. Take a 15-minute rest period. Clench and unclench your fist 5 more times.

Observations: Make quantitative observations to compare muscles before and after rest.

Record the Data: Label a Lab Record Card "Lab 3-1." Record the data after the first session of opening and closing your fist. Record the data after each of the 5 sessions. Record the data after the 15-minute rest.

Conclusions: Explain why your performance differed from the first session through to the last session. Draw conclusions about the relationship between muscles and rest.

Communicate the Conclusions: Write your conclusions on a Lab Record Card labeled "Lab 3-1." Compare your observations and conclusions with your predictions. Share your Lab Record Cards with one person who did not participate in the Lab. Place the Lab Record Cards in the Lab Book for Lab 3-1.

Spark Questions: Discuss questions sparked by this lab.

New Loop: Choose one question to investigate further. Or, repeat the same procedure using a different activity or a shorter or longer rest period.

Muscle Power

Activity: Sit in front of a table. Place one hand under the table, palm up. Press up on the table. With your free hand, feel the biceps and triceps in your working arm. Now, place your hand on top of the table, palm up. Press down on the table and feel your biceps and triceps. When you pressed up on the table, which muscle was harder, the biceps or triceps? **The biceps was harder.** When you pressed down on the table, which muscle was harder? **The triceps was harder.**

Voluntary and Involuntary Muscles

Activity: Raise your right arm. Extend your left arm. Jump. In these activities, do your muscles move on their own (involuntary), or did you decide to make them move (voluntary)? Now, place your hand over your heart. Can you feel your heart beating? Is your cardiac muscle moving on its own or do you decide to make it move? Discuss similarities and differences between arm muscles and cardiac muscles.

Tendons

Activity Materials: chicken leg with foot (available from a butcher) tweezers

Activity: Locate the tendons at the top of the leg. They look like cords. Using tweezers, pull one tendon. What happened? **The foot will move.**

Experiences, Investigations, and Research

Select one or more of the following activities for individual or group enrichment projects. Allow your students to determine the format in which they would like to report, share, or graphically present what they have discovered. This should be a creative investigation that utilizes your students' strengths.



1. Make a list of voluntary and involuntary muscles.



2. Read *The Magic School Bus: Inside the Human Body* by Joanna Cole.



3. Using an Internet Search Engine, research sports – physiology.