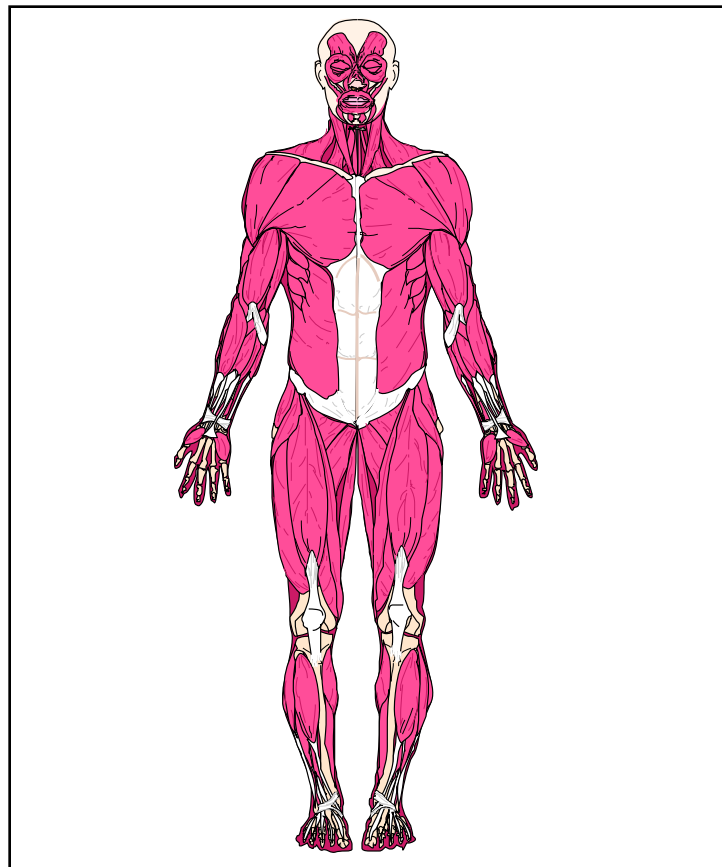


THE SKELETAL AND MUSCULAR SYSTEMS

from
The Human Body Systems Series



Teacher's Guide

*The Skeletal
and Muscular Systems*
from
The Human Body Systems Series

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THE SKELETAL AND MUSCULAR SYSTEMS

Grade levels: 6 - 9

(Review for grades 10 - 12)

Viewing Time: 25 minutes with video quiz

INTRODUCTION

This video is designed for use in grades 6 - 9 as an introduction to the major ideas and concepts associated with the human skeletal and muscular systems, and for use in grades 10 - 12 as review.

PROGRAM OBJECTIVES

After viewing the video and participating in the lesson activities, the students will be able to ...

- Describe the function and workings of the skeletal and muscular systems.
- Identify the main parts of the skeletal and muscular systems.
- Identify the way the skeletal and muscular systems work together to enable people to move.
- Define key vocabulary terms associated with the skeletal and muscular systems.

SUMMARY OF THE VIDEO

This video describes the functions of the skeletal and muscular systems. Each system plays a key role in the well-being of the human body. Working together, the two systems provide humans with mobility. The video begins with the skeletal system and concentrates on the five functions the system performs for the human body. Then the video describes the muscular system and discusses the differences between voluntary and involuntary muscles. The video

also describes how the two systems work together to provide movement for the body.

INSTRUCTIONAL NOTES

Before presenting this lesson to your students, we suggest that you preview the video and review this guide and the accompanying blackline master activities in order to familiarize yourself with their content. Duplicate any blackline masters you wish to distribute. If you plan to use the Video Quiz, which immediately follows the video presentation, you may wish to distribute Blackline Master 1, **Video Quiz**, before showing the video. Plan to pause the tape between questions if students require more time.

As you review the materials presented in this guide, you may find it necessary to make some changes, additions, or deletions to meet the specific needs of your class. We encourage you to do so, for only by tailoring this program to your class will they obtain the maximum instructional benefits afforded by the materials.

It is also suggested that the video presentation take place before the entire group under your supervision. The lesson activities grow out of the context of the video; therefore, the presentation should be a common experience for all students.

INTRODUCING THE VIDEO

Tell the students that the video they will be watching today will describe two systems of the human body that play an important role in our ability to get around. One system provides the framework and internal structure of our bodies. The other system is attached to the framework and is designed to move the parts of the first system around various joints found throughout the body. Then, working together, the two systems make movement possible.

Present the video. The viewing time is 20 minutes for the program and about 5 minutes for the Video Quiz.

BLACKLINE MASTER DESCRIPTIONS

Most of the follow-up activities for this program are designed for middle school grades. If you use this program with an older audience, you will need to adapt the materials appropriately.

Blackline Master 1, Video Quiz, is to be used at the end of the video program. At the completion of the video, there is a short ten-question quiz. The narrator will read the questions which are displayed on the screen. Students can use this sheet to record their answers. Answers to the questions are provided in the Answer Key found on page 5.

Blackline Master 2, Vocabulary, is a collection of important vocabulary words from the video. You may want to distribute this sheet before viewing the video so students can listen for definitions.

Blackline Master 3, The Skeleton, contains a diagram of the skeletal system. At the side of the page, there is a box containing the names of key bones of the human skeletal system. Students are to place the names next to the lines on the diagram of the skeleton.

Blackline Master 4, Joints, provides information about joints with an emphasis on the hinge joint and the ball-and-socket joint. Students are asked to explore these two kinds of joints through a series of simple demonstrations.

Blackline Master 5, The Muscular System, contains a description of the human muscular system with some key words missing from the dialogue. Students are to use words from the bottom of the page to fill in the missing blanks.

Blackline Master 6, Pairs of Skeletal Muscles, demonstrates, through a series of experiments, how muscles work in pairs. Students can follow the directions on this sheet to carry out demonstrations for muscles in the arms and upper legs.

Blackline Master 7, The Way Muscles Work, concentrates on the biceps and triceps of the arm as they work together to bend and straighten the arm. Students are asked to think about what is happening for each of those two movements.

Blackline Master 8, Quiz, is the formal test for this unit of study.

INTERNET ACTIVITIES

1. Visit the **American Osteopathic Association Healthy Hints** at

<http://www.am-osteo-assn.org/health/hints.htm>
for information regarding bone health, including diet, work environment, carbon monoxide, and mattress choices.

2. The **Physical Activity and Health Network (PAHNet)** at

<http://www.pitt.edu/~pahnet>
is a site devoted to the relationship between physical activity and health, and contains recommendations, questionnaires, *The Surgeon General's Report on Physical Activity and Health*, and monthly estimates of leisure-time physical inactivity in the United States.

DISCUSSION QUESTIONS

1. Discuss the relationship of the skeletal and muscular systems.

2. Discuss the five functions that the skeletal system performs for the human body. Many students will probably be surprised to hear that blood cells are manufactured in the bone marrow of the long bones.

3. Discuss how students can maintain a healthy skeletal and muscular system.

ANSWER KEY

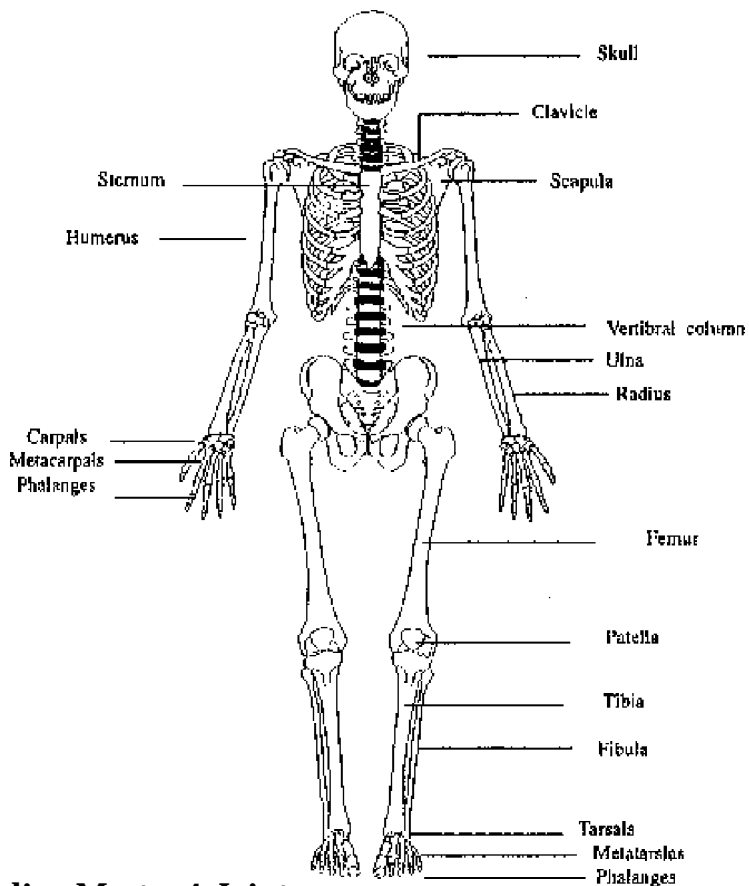
Blackline Master 1, Video Quiz

1. c
2. a
3. b
4. a
5. a
6. b
7. a
8. d
9. skeletal, smooth, cardiac or heart
10. Involuntary muscles work automatically whereas voluntary muscles respond to conscious thought.

Blackline Master 2, Vocabulary

1. bone - strongest material in the body; makes up the skeletal system
2. tendon - connective tissue that attaches muscles to bones
3. ligament - connective tissue that connects bones to one another
4. bone marrow - material inside bones at which blood cells are made and stored
5. cartilage - fibrous material that is strong enough to support weight but is very flexible
6. joint - places at which bones come close to other bones
7. sprain - an injury involving a stretched or torn ligament
8. fracture - a crack or break in a bone
9. skeletal muscle - voluntary muscles attached to bones capable of providing movement
10. cardiac muscle - the hardest working muscle; the heart is made of cardiac muscle
11. smooth muscle - involuntary muscles found inside most organs such as the stomach, intestines, and blood vessels

Blackline Master 3, The Skeleton



Blackline Master 4, Joints

1. The hinge joint of the elbow permits movement in only one direction. It is like the hinge on a door that allows the door to open just so far and then close again.
2. The ball-and-socket joint has a wide range of motion.
3. The hinge joint has movement in only one direction, whereas the ball-and-socket joint has movement in many directions.
4. The knee is the hinge joint, and the hip is the ball-and-socket joint.
5. It would be hard to coordinate the act of walking or running if the knee was a ball-and-socket joint. The knee would move in too many directions.

Blackline Master 5, The Muscular System

The human muscular system is made up of more than 600 muscles. Muscles are attached to bones by strong connective tissue called tendons. There are two groups of muscles. Muscles that we can control with conscious thought are called voluntary muscles. The other group of muscles are automatic. We don't have to think about their action. Muscles that move food through our digestive system or keep our hearts beating are involuntary muscles.

There are three kinds of muscles found in the human body. Voluntary muscles attached to bones and capable of permitting body movement are called skeletal muscles. In voluntary muscles found inside organs such as the stomach, intestines, and blood vessels are called smooth muscles. The third type of muscle is the hardest working muscle and is an involuntary muscle called cardiac muscle.

Voluntary muscles receive the signal to contract or relax from the brain. People make the decision to make a movement and the signal is sent from the brain down through the spinal column and to the appropriate muscles. When the muscle receives the message to contract, or relax, it does so completely. This means that there is no such thing as a partial contraction. The strength or weakness of muscle contractions is determined by the number of muscle fibers involved.

Blackline Master 6, Pairs of Skeletal Muscles

1. a. The muscle in front (biceps) is harder.
b. The muscle in front.
2. a. The muscle in back (triceps) is harder.
b. Back muscle.
3. a. The top of thigh seems to be hardest during extension of the leg.

Question: flexor is front or biceps, extensor is the back or triceps.

Blackline Master 7, The Way Muscles Work

Bending Arm: Answers will vary but might include: To bend the arm, the biceps will contract and the triceps will relax. When the biceps contract, they get smaller and pull on the arm bones to move around the hinge joint of the elbow.

Straightening Arm: Answers will vary but might include: To straighten the arm, the biceps relax and triceps contract.

Blackline Master 8, Quiz

1. It provides a framework and support, it works with the muscular system to provide movement, it protects vital tissues and organs inside the body, it provides storage for substances needed by the body, and it produces new blood cells.
2. There are 206 bones in the human body.
Tendons connect muscles to bones.
Ligaments connect bones to bones.
3. Cartilage is a fibrous material that is strong but flexible. Examples are the nose and ears.
4. Cartilage provides a slippery surface over which bones move and it supplies a cushion.
5. hinge joint - knee, elbow - moves in one direction
ball-and-socket - shoulder, hip - moves in many directions
pivot joint - first two vertebrae of neck - allows for a twisting or pivoting motion
fixed joint - skull - can't move
6. Voluntary muscles are controlled by thought. Involuntary muscles are automatic.
7. Skeletal, smooth, and cardiac
8. To bend the arm, the biceps contract and become shorter while the triceps relax. To straighten the arm, the biceps relax and the triceps contract.

SCRIPT OF VIDEO NARRATION THE SKELETAL AND MUSCULAR SYSTEMS

People are able to do things like exercise, run, play sports, and walk because of the interaction of two body systems: the skeletal and muscular systems. Today we'll take a close look at each of these systems and investigate its importance to the human body. Let's begin with the skeletal system.

Skeletal System

Our bodies' skeletal system is made up of two hundred six bones. They perform five important functions. The skeletal system is our bodies' framework. Just like a skyscraper needs a strong steel structure to act as the framework for the building, our bodies need support. The building's shape and support are provided by the steel beams. If we didn't have a skeleton, our bodies would have no support and we would be just a pool of blob. Some animals have soft bodies, like jellyfish. The water around them helps to support their bodies. Some animals have hard outer shells, like crabs or snails. They are said to have exoskeletons—skeletons on the outside. Other animals have internal skeletons or skeletons under their outer covering of skin and fur or hair. Snakes, birds, fish, monkeys, and humans are all members of the animal kingdom that have internal skeletons. Skeletons of extinct animals, such as dinosaurs, have helped scientists collect information about how these once dominant animals looked and moved.

Movement

Another important function of the skeletal system is to help the body move. Almost all bones have muscles attached to them. When the muscles contract, or get smaller, they pull on the bones and the bones move. Connective tissues called tendons connect the muscles to the bones. Bones are attached to each other by tissue called ligaments. Muscles and bones work together to allow our bodies to move. The movement of our arm is a result of one muscle contracting

or getting smaller and another muscle relaxing and stretching out. We will discuss this in greater detail later.

Protection

Another very important function of the skeletal system is to provide protection to tissues and organs inside our bodies. The skull protects the brain. The rib cage protects the heart and lungs and other organs found in the trunks of our bodies. But probably the best example of how important the skeletal system is to protection is the way the vertebral column, or backbone, protects the delicate spinal cord of nerves. You can feel your backbone by rubbing your finger along the center of your back. The bumps you feel are individual vertebrae that run the length of your back to the skull. The spinal cord is the delicate network of nerves that run from the brain to all parts of the body. Messages to and from the brain travel along this network. It is a very fragile network of nerve fibers that needs to be completely protected.

Storage

The skeletal system, besides providing support, movement, and organ protection, is also the storage area for substances that are needed for blood clotting, nerve function, and muscle activity. When the body runs low of any of these substances, they are released from storage.

Blood Manufacture

The final main function of the skeletal system is the manufacturing of blood cells. Humans have about 27 trillion red blood cells in their bodies. These cells only live from 30 to 120 days and then they break up. Inside some of the bones of your skeletal system is a soft tissue called marrow. This is where new blood cells are made.

So the skeletal system performs five functions for the human body. It provides a framework and support. It works

with the muscular system to allow for movement. It protects vital tissues and organs inside the body. It is the storage area for some substances needed in body activity. And the skeletal system produces new blood cells.

Bones and Cartilage

Bones are the strongest materials in the body but only represent about 14 percent of a body's weight. When a person is born, many of his or her bones are made up primarily of cartilage. Cartilage is a fibrous material that is strong enough to support weight but, at the same time, is very flexible. Cartilage is what your nose and ears are made of. You can bend and twist them easily. As a person grows from seven months before birth until about age 25, cartilage in the skeletal system is gradually replaced by bone. In fact, a human at birth has many more bones than he or she will in adulthood. The skull is divided into many parts that will gradually come together to form one solid protective cap. So usually by the age of 25, a person has stopped growing. However, bone will continue to reform throughout life.

Most of the cartilage will have changed to bone, but in some places, the cartilage remains to provide a slippery surface for bones to move over. These are places like the knee, ankle, and elbow where bones come in contact with bones. Cartilage is about three times more slippery than ice, so it is perfect for these places where bones need to move around each other. The cartilage also provides a cushion for bones when a person jumps or runs.

Joints

Areas where bones come close to other bones are called joints. Joints have two main jobs to perform. One is to keep bones far enough apart that they don't rub together. The other job is to hold the bones in place as they move or rotate.

There are different kinds of joints, based on the type of movement required. Strong fibers called ligaments are what hold bones together in these joints. A hinge joint allows movement in only one direction. Your elbow or your knee are examples of hinge joints. A ball-and-socket joint, like that found in the shoulder and upper arm, allows for movement in many directions. The end of the upper arm is rounded and it fits nicely into the socket of the shoulder blade.

A pivot joint, such as found in the first two vertebrae of the neck, allows for a twisting or pivoting motion. You can turn your head and look up and down because of this joint.

Some joints can't move. They are called fixed joints. The bones in the skull are connected but can't move. The skeleton is moveable because of the many joints it contains. However to move the bones, another body system is required.

Muscular System

This is the muscular system. It is made up of over 600 muscles that are composed of strong soft tissue. As you can see in this illustration, the muscular system covers the entire skeletal system. Muscles are attached to bones by strong connective tissue called tendons.

Types of Muscles

There are two groups of muscles. Voluntary muscles are muscles we can control. They allow us to stand up, sit down, walk, run, and jump. They are muscles that are connected to bones and allow us to move those bones through conscious thought.

The other group of muscle is called involuntary and includes muscles that cannot be controlled. These muscles keep our hearts beating or move food through the diges-

tive system. We don't think about these actions; they are automatic.

There are three kinds of muscles found in the human being. Skeletal muscles are voluntary muscles attached to the bones and capable of permitting body movement. Skeletal muscles are also referred to as striated or banded muscles. Notice the bands on these muscles as viewed under a microscope. Smooth muscles are involuntary and are found inside most body organs, such as the stomach, intestines, and blood vessels. They are called smooth muscles because they have no bands like the striated muscles.

The third kind of muscle is heart muscle. It is what the heart is made of and it is the hardest working muscle in the body. It never rests and beats between 2 and 3 billion times in a person's lifetime. It is an involuntary muscle.

The skeletal muscles are the ones that give our bodies movement. For them to perform a movement, they actually work in pairs. For instance, if you were to bend your arm at the elbow, the following sequence of events would take place. The biceps contracts and bulges and at the same time the triceps relaxes. You can see the bulge in your arm as the biceps contract. To lower the arm to the original position, the muscles work in reverse of what was just described. The biceps relax while the triceps contract. Voluntary muscles receive the signal to contract or relax from the brain. People make the decision to make movements and the signals are sent from the brain down through the spinal column and to the appropriate muscles to carry out the tasks. When a muscle receives the message to contract or relax, it does so completely. This means that there is no such thing as a partial contraction. What determines the strength or weakness of muscle contractions is the number of muscle fibers involved. To lift a heavy object, the brain sends con-

traction and relaxation messages to many muscle fibers. The same effort wouldn't be required when lifting something that is much lighter.

Injury

Bones and muscles can be injured. A fracture is a crack or break in a bone. A simple fracture is when a bone breaks but doesn't tear through muscle or skin tissue. A compound fracture, however, pushes through muscle and skin. You can often see the end of the broken bone sticking out of the skin. Bones are composed of living cells so they can repair themselves. A doctor would push the parts back in place so that the bone can repair itself in the correct position. A cast is often used to hold the bone in place as it is repairing itself.

Ligaments that connect bones can also be injured. A sprain is an injury in which a ligament is stretched or torn. A muscle can also be strained if it is overstretched. This can happen when people don't lift things correctly. Many people hurt their back muscles when they bend over to lift heavy objects. The proper way to lift something heavy is with the legs. Bend the legs and then take hold of the object to be lifted. Then straighten the legs and lift the object to the proper height.

A sudden strong contraction of a muscle is called a cramp. You may have felt a cramp at night in bed. A leg or foot cramp can be very painful. Rubbing the muscle can often relieve a cramp.

Care of the Skeletal and Muscular Systems

To take proper care of your skeletal and muscular systems, there are three things you can do. You should have a healthy diet, get plenty of exercise, and plenty of rest. A proper diet will insure that the bones and muscles of your body are getting the proteins, minerals, and vitamins needed for

healthy growth and operation. Meats supply proteins needed for cell growth and the creation of new cells. Dairy products supply minerals, such as calcium, that are needed to make bones strong and hard. Fruits and vegetables provide vitamins. Breads and cereals provide energy for muscles to move the bones.

Exercise is needed to help muscles grow and develop. When muscles are not used, they shrink and become weaker and smaller. Exercise helps to keep muscles strong. Rest is also critical to good health. When muscles are exercised, food is burned and waste products are left behind in the muscles. Rest helps get rid of these wastes, as it provides an opportunity for the circulatory system and excretory system to remove wastes. Rest also helps prevent muscles from being overused.

Summary

Today we have taken a brief look at the skeletal and muscular systems of the human body. Each of these systems is important to the functioning of our complex bodies. The skeletal system carries out five important functions. It provides structure and framework for the entire body. It works with the muscular system to allow for movement. It protects vital tissues and organs inside the body. It is the storage area for some substances needed in body activity. And, the skeletal system produces new blood cells.

The muscular system makes movement possible. Working with the skeletal system, the six hundred muscles in the body provide the ability for a human being to move. Skeletal muscles are voluntary muscles that will respond to commands from the brain to contract or relax. This gives the body the ability to move as bones are pulled one way or another.

Smooth muscles in organs, such as the esophagus or stomach, are used to move food through the digestive system. These involuntary muscles are found in most body organs.

Involuntary muscles keep the heart working as it sends blood cells throughout the circulatory system delivering food and oxygen and collecting waste products for elimination from the body.

The skeletal and muscular systems are critical to the proper functioning of human beings.

VIDEO QUIZ

Students may write the answers to the following questions on a separate piece of paper or on the duplicating master entitled **Video Quiz**.

Questions 1: An adult has how many bones in their skeletal system?

- a. 100 b. 300 c. 206 d. 210

Question 2: Some animals have skeletons on the outside of their bodies. This kind of skeleton is called an _____.

- a. exoskeleton b. internal skeleton c. endoskeleton

Question 3: Connective tissues connect muscles to bones. These connective tissues are called _____.

- a. ligaments b. tendons c. exoskeletons d. cartilage

Question 4: Bones are attached to one another with a tissue called _____.

- a. ligaments b. tendons c. exoskeletons d. cartilage

Question 5: A soft tissue found inside some of the bones of our skeletal system is where new blood cells are made. The name of this tissue is _____.

- a. marrow b. tendon c. cartilage d. ligament

Question 6: The elbow is an example of which kind of joint?

- a. ball-and-socket b. hinge c. pivot d. fixed

Question 7: The shoulder and upper arm are an example of which kind of joint?

- a. ball-and-socket b. hinge c. pivot d. fixed

Question 8: The bones of the skull are an example of which kind of joint?

- a. ball-and-socket b. hinge c. pivot d. fixed

Question 9: Name the three kinds of muscles found in human beings.

Question 10: How are involuntary and voluntary muscles different from each other?

THE SKELETAL AND MUSCULAR SYSTEMS
Video Quiz

Directions: At the conclusion of the videotape, there will be a short quiz with these questions. Write your answers in the space provided. Use the back of this sheet if necessary.

Questions 1: An adult has how many bones in his/her skeletal system?

- a. 100 b. 300 c. 206 d. 210

Question 2: Some animals have skeletons on the outside of their bodies. This kind of skeleton is called an _____.

- a. exoskeleton b. internal skeletons c. endoskeletons

Question 3: Connective tissues connect muscles to bones. These connective tissues are called _____.

- a. ligaments b. tendons c. exoskeletons d. cartilage

Question 4: Bones are attached to one another with a tissue called _____.

- a. ligaments b. tendons c. exoskeletons d. cartilage

Question 5: A soft tissue found inside some of the bones of the skeletal system is where new blood cells are made. The name of this tissue is _____.

- a. marrow b. tendon c. cartilage d. ligament

Question 6: The elbow is an example of which kind of joint?

- a. ball-and-socket b. hinge c. pivot d. fixed

Question 7: The joint between the shoulder and upper arm is an example of which kind of joint?

- a. ball-and-socket b. hinge c. pivot d. fixed

Question 8: The bones of the skull are an example of which kind of joint?

- a. ball-and-socket b. hinge c. pivot d. fixed

Question 9: Name the three kinds of muscles found in human beings.

Question 10: How are involuntary and voluntary muscles different from each other?

THE SKELETAL AND MUSCULAR SYSTEMS**Vocabulary**

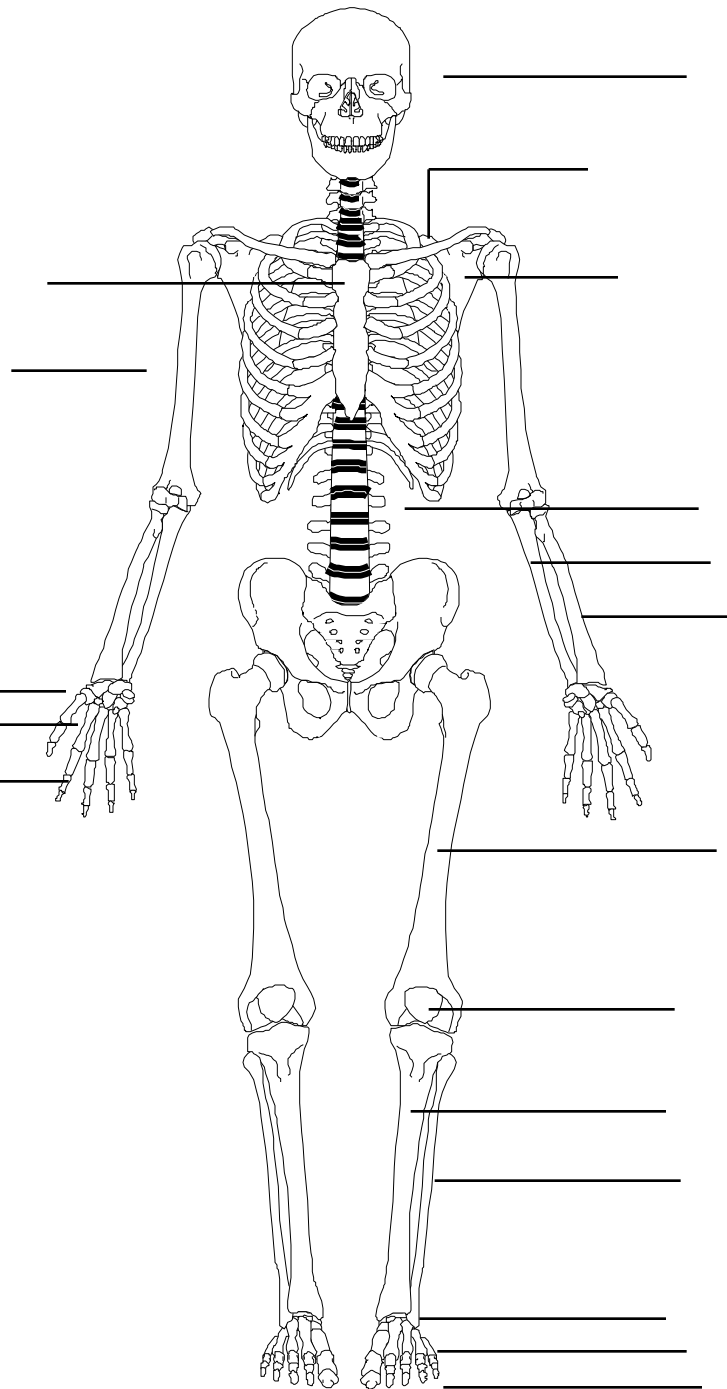
Directions: Write a definition for each of the terms listed below. Use the back of this sheet if necessary.

1. bone-
2. tendon-
3. ligament-
4. bone marrow-
5. cartilage-
6. joint-
7. sprain-
8. fracture-
9. skeletal muscle-
10. cardiac muscle-
11. smooth muscle-

THE SKELETAL AND MUSCULAR SYSTEMS
The Skeleton

Directions: Place the words listed below next to the lines on the skeletal diagram.

- | |
|------------------|
| Clavicle |
| Humerous |
| Sternum |
| Vertebral column |
| Tibia |
| Femur |
| Patella |
| Fibula |
| Skull |
| Scapula |
| Ulna |
| Radius |
| Phalanges |
| Metacarpals |
| Carpals |
| Phalanges |
| Metatarsals |
| Tarsals |



THE SKELETAL AND MUSCULAR SYSTEMS

Joints

A joint is a place at which two bones meet. There are two kinds of joints, called movable and immovable. Immovable joints are found where bones have fused together, such as in the skull. Moveable joints allow for some kind of movement between the two bones. Bones do not bend, so movement can only occur at the joints.

There are different kinds of moveable joints. The most common are the ball-and-socket joint, the hinge joint, the pivot joint, and the ellipsoid joint. The pivot joint in the neck is responsible for our ability to raise and lower our heads or turn our heads from side to side. The ellipsoid joint in your wrist allows you to wave your hand. The hinge joint of the elbows allows for forward and backward motion. The ball-and-socket joint of the shoulders allows for movement in many directions.

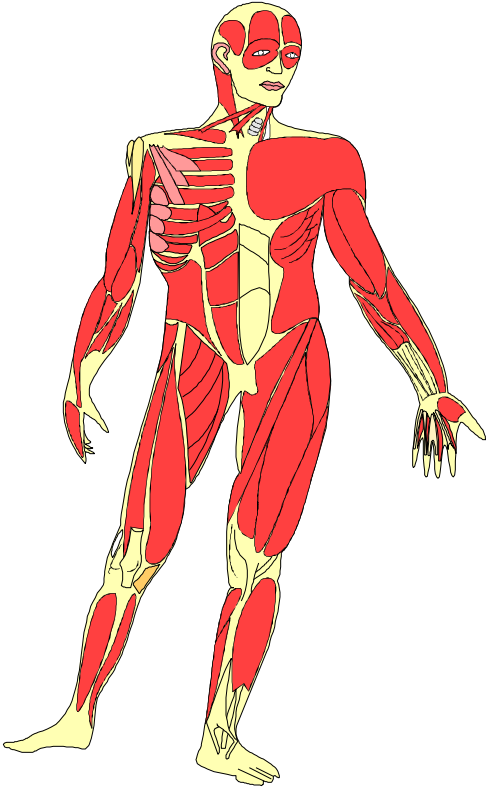
Directions: Compare the movement of the hinge and ball-and-socket joints.

1. Move your arm without moving the upper arm at the shoulder. Describe the kind of movement permitted by the hinge joint of your elbow.
2. Now move your arm, concentrating on the variety of movements permitted by the ball-and-socket joint of the shoulder. Write down observations of the kinds of movements possible.
3. How does the movement of the hinge joint of the elbow compare with the movement of the ball-and-socket of the shoulder?
4. The knees and hips are similar to the arms and shoulders. Which represents the hinge joint and which represents the ball-and-socket joint?
5. Why would a ball-and-socket joint at the knees create problems for walking?

THE SKELETAL AND MUSCULAR SYSTEMS

The Muscular System

Directions: Use the words from the box at the bottom of the page to fill in the blanks in the following paragraphs. Not all the words in the box will be used in the selection.



The human muscular system is made up of more than _____ muscles. Muscles are attached to bones by strong connective tissue called _____. There are two groups of muscles. Muscles that we can control with conscious thought are called _____ muscles. The other group of muscles are automatic. We don't have to think about their action. Muscles that move food through our digestive system or keep our hearts beating are _____ muscles.

There are three kinds of muscles found in the human body. Voluntary muscles attached to bones and capable of permitting body movement are called _____ muscles. Involuntary muscles found inside organs such as the stomach, intestines, and blood vessels are called _____ muscles. The third type of muscle is the hardest working muscle and is an involuntary muscle called _____ muscle.

Voluntary muscles receive the signal to contract or relax from the brain. People make the decision to make a movement and the signal is sent from the brain down through the _____ and to the appropriate muscles. When the muscle receives the message to contract or relax, it does so completely. This means that there is no such thing as a partial contraction. The strength or weakness of muscle contractions is determined by the number of muscle _____ involved.

tendons ligaments voluntary involuntary 200 600 tissue skeletal
smooth cardiac triceps biceps spinal column bulge contract
fibers fracture cramp

THE SKELETAL AND MUSCULAR SYSTEMS

Pairs of Skeletal Muscles

Muscles work in pairs to move bones and provide the skeletal system with motion. You can locate some of the pairs of muscles in your arms and legs.

Directions: Sit in a chair and follow the directions below:

1. Put one hand under the chair and lift up. With your other hand, feel the muscles lifting up in the front and back of the arm.

a. Describe how the two muscles feel. Which one is harder, the one in front or the one in back?

b. Which muscle pulls the arm up?

2. Put your hand on top of the chair and push down. Use your other hand to feel the muscles again.

a. Which muscle, front or back, feels harder?

b. Which muscle is used to straighten your arm?

3. With the help of a friend, test the muscles in your upper leg. Have the friend hold your foot while you try to lift the leg. With one hand under your thigh and the other hand on top of the same thigh, compare the muscles.

a. Which muscle, underside of thigh or top of thigh, is hardest during extension of the leg?

A muscle that bends bones at the joint are called flexors. A muscle that straightens bones at a joint are called extensors.

QUESTION: Looking back at the experiments with the arm, which muscle, front or back, is the flexor and which is the extensor?

Flexor - _____

Extensor - _____

Name _____

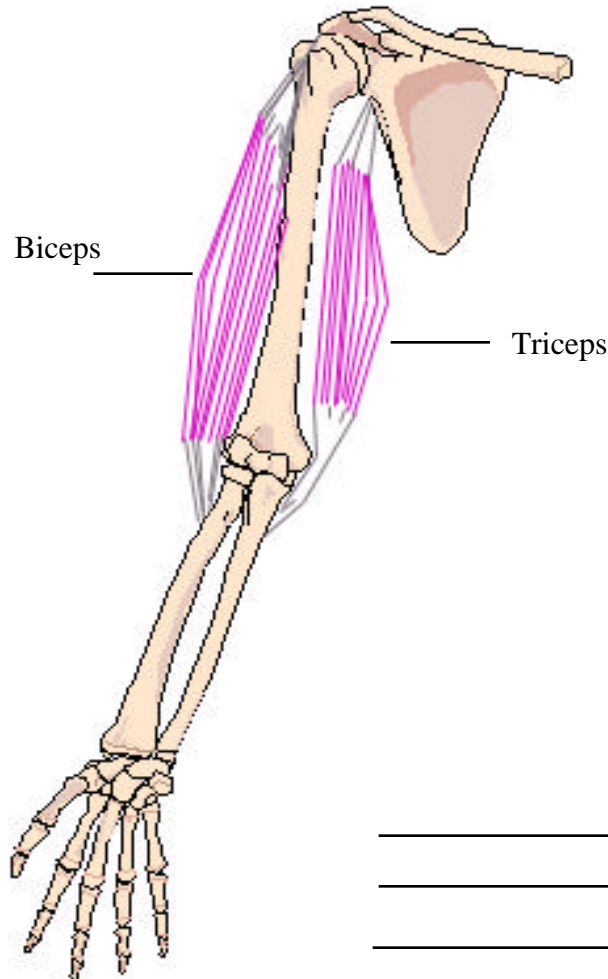
Date _____

THE SKELETAL AND MUSCULAR SYSTEMS

The Way Muscles Work

Muscles work in pairs to move bones and provide the skeletal system with motion. A good example of the way this works is found in the arm. When we bend our arms up and down, the tricep and bicep muscles are working together to perform the movement.

Directions: Describe how the biceps and triceps work together to straighten and bend the arm.



Bending Arm

Straightening Arm

THE SKELETAL AND MUSCULAR SYSTEMS
Quiz

Directions: Use the space provided to answer the following questions. Use the back of this sheet if necessary.

1. What are the five functions of the skeletal system?

2. Approximately how many bones are there in an adult body?
Ligaments and tendons are connective tissues that work with bones. What job does each perform?

3. What is cartilage? Where in the human body can we find examples of cartilage?

4. Cartilage in the knee and elbow performs two very important jobs. What are those jobs?

5. Joints are very important to the skeletal system. Describe how the following joints listed here move, and give an example of the joint in the skeletal system.
 - hinge joint -
 - ball-and-socket joint -
 - pivot joint -
 - fixed joint -

6. Describe how voluntary and involuntary muscles are different from each other.

7. What are the three kinds of muscles found in the human being?

8. Muscles work in pairs. Describe how the biceps and triceps work together to bend and straighten your arm.