Muscular System

1. Main Purposes:
    a. To help your body move.
    b. To move food through your digestive system.
    c. To keep your heart pumping blood.
    d. To allow all of your body's involuntary processes to work.

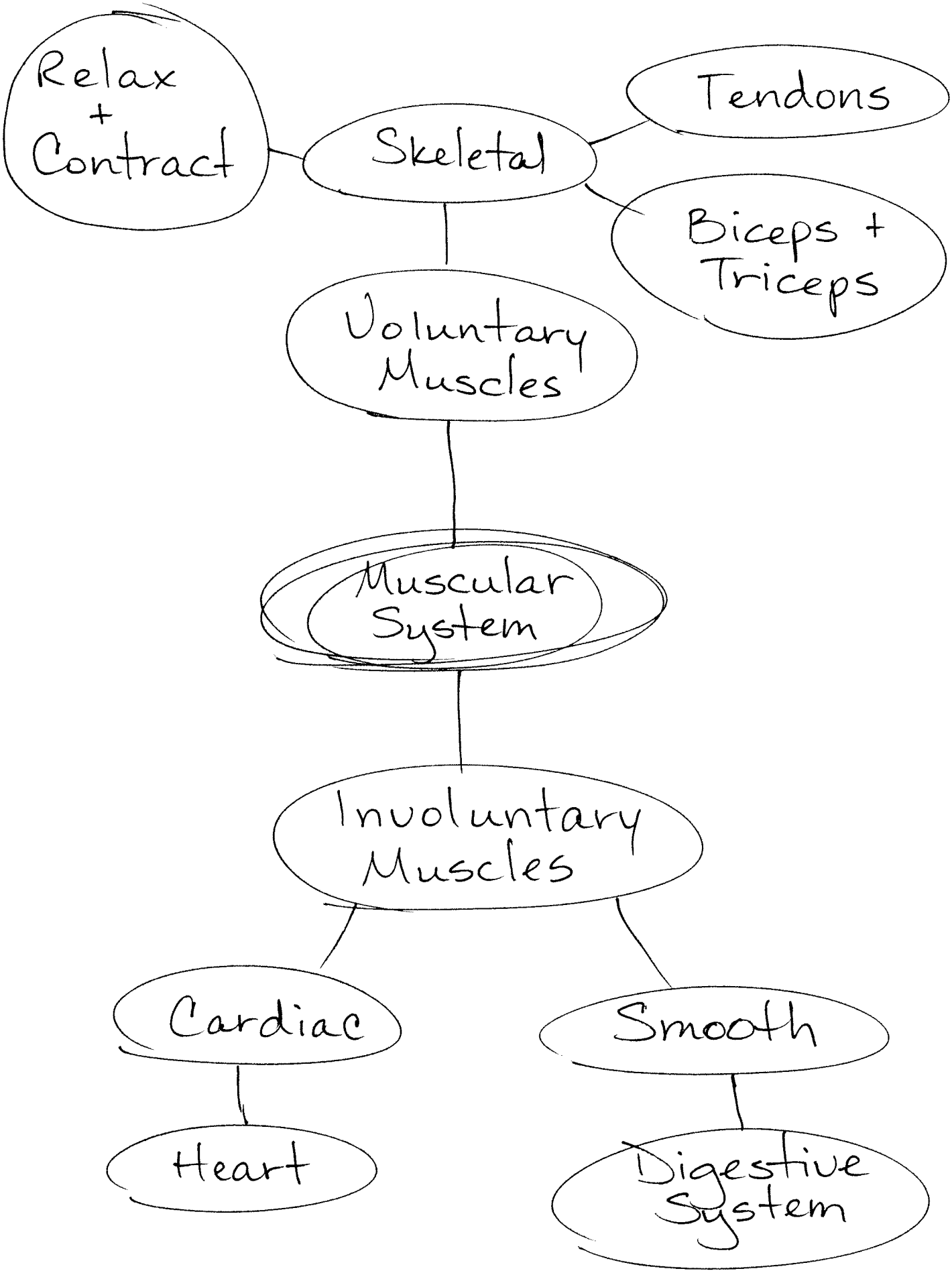
2. Main parts and terms:
    a. Voluntary Muscles
        i. Skeletal Muscles
            1. Biceps and Triceps
            2. Tendons
            3. Relax and Contract
    b. Involuntary Muscles
        i. Cardiac Muscles
            1. Heart
        ii. Smooth Muscles
            1. Digestive System

3. Best way to organize it:

Introduction Paragraph • Tell main purposes of system. • Include an interesting fact or two.

2 [redacted] Body Paragraphs based on outline above.

Conclusion Paragraph • Re-phrase main purpose of system. • Connect it with next system with transition sentence.


Relax + Contract
Skeletal
Tendons
Biceps + Triceps
Voluntary Muscles
Muscular System
Involuntary Muscles
Cardiac
Heart
Smooth
Digestive System

Muscles

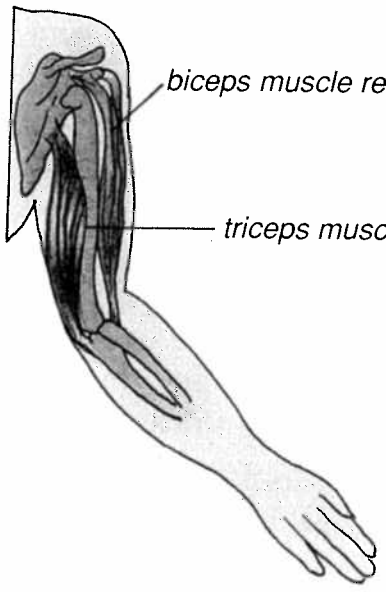
There are over 600 muscles in the human body. We need every one of them. We have three kinds, each with its own job to do.

Skeletal muscles are attached to bones and make the body move. Smooth muscles line the inside walls of many body organs, to help the digestive, circulatory, and urinary systems work. Cardiac muscle is the strong tissue that makes up the heart.

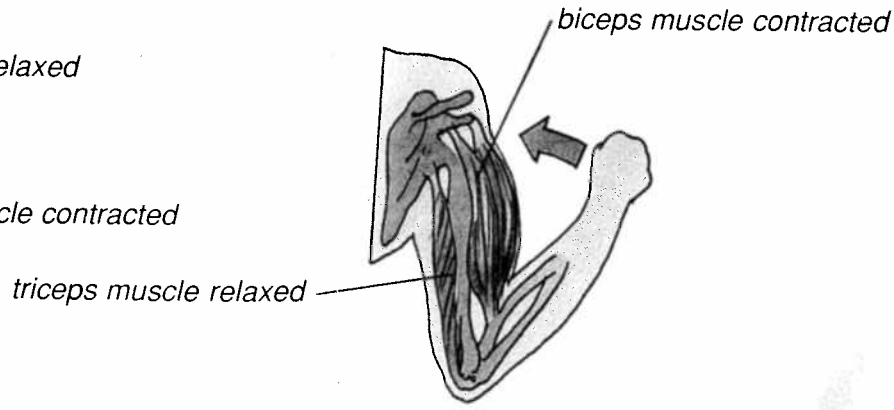
Muscles are made of millions of tiny fibers, or threads, called myofibrils. When they receive messages from nerve impulses, they slide over one another, shortening the muscle.

A single muscle does not act alone. Most skeletal muscles work in pairs, one attached to each side of a bone. One muscle shortens and pulls on a bone. The other relaxes and gets longer to allow movement to take place. Muscles never push. They do all their work by pulling.

When you bend your arm, for example, your biceps muscle shortens and your triceps muscle relaxes and gets longer. To straighten your arm, your triceps muscle gets shorter and your biceps muscle relaxes.

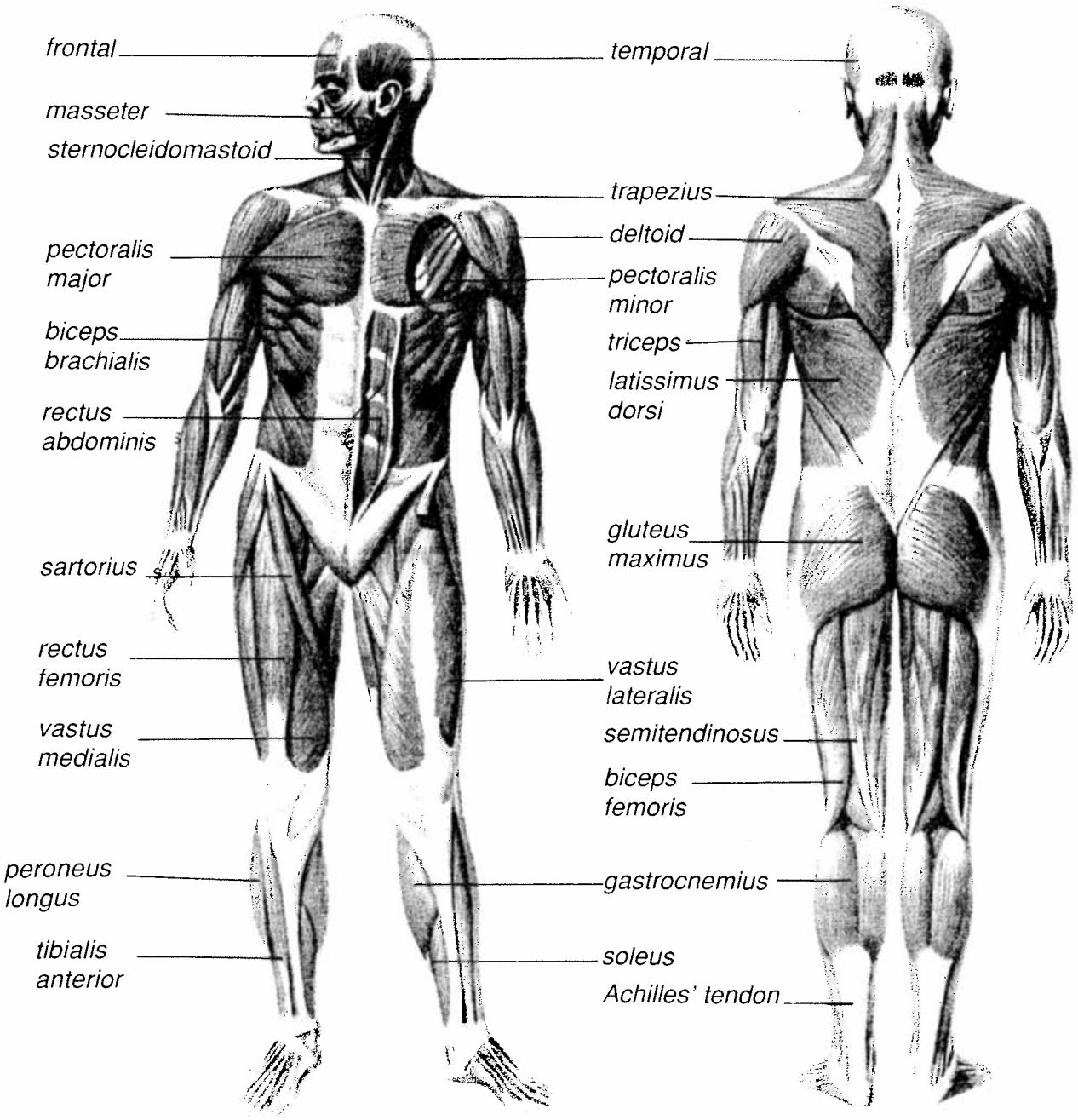


When the arm is straight the biceps relax and stretch while the triceps shorten.



When the arm is bent the biceps shorten and the triceps relax and stretch.

Skeletal muscles with different jobs have different shapes. Some are shaped like long straps. Others are more like flat sheets. Each muscle is enclosed by a covering that surrounds it like a bag. Where this covering narrows and ends, it looks white. This is where it becomes the tendon, the fiber that connects the muscle to a bone.



Name _____ Date _____

THE MUSCULAR SYSTEM

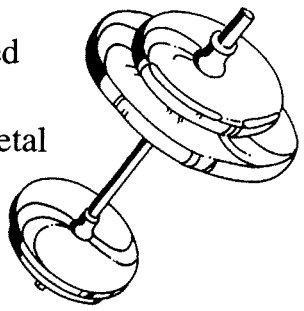
The muscular system produces movement. There are over 600 different muscles in your body. Muscles cover the skeleton. They also line the walls of some organs, such as the heart and stomach. Tendons attach muscles to bone.

Muscles can be voluntary and involuntary. Voluntary muscles are the ones that you can control. You can tell them when to move. Most voluntary muscles are attached to bones. Involuntary muscles, like those of the heart, move without your having to think about them. The muscles that control your eyelids may seem like voluntary muscles. You can blink your eyes when you want to. However, you cannot keep your eyes from blinking when they need to! You do not have complete control over them.

Muscles cause movement by contracting or getting shorter and firmer. This action pulls on the bones or other body structures. Muscles move the blood through your body. They also move food and wastes through your body.

Muscle tone is achieved through exercise. If a person has good muscle tone, the muscles do not completely relax. They are always slightly contracted. For you to have good muscle tone, plenty of blood needs to reach the muscle cells. This requires exercise.

There are three types of muscles in the body. Each type of muscle cell looks different. The **smooth muscles** are long and thin and pointed at each end. The stomach has smooth muscle cells. **Cardiac muscles** make up the heart. They branch out and weave together. **Skeletal muscles** are long and shaped like cylinders (similar to straws). Unlike the other muscle cells, the skeletal muscle cells have many nuclei. The tongue and lips are skeletal muscles, as are the biceps and triceps in your arms.



Match each description with the correct word.

_____ **1.** muscles that make up the heart	**a.** tendons
_____ **2.** muscles over which you have complete control	**b.** involuntary
_____ **3.** what muscles do to cause movement	**c.** contract
_____ **4.** necessary for muscle tone	**d.** cardiac
_____ **5.** muscle cells with many nuclei	**e.** exercise
_____ **6.** attach muscles to bone	**f.** skeletal
_____ **7.** muscles that move without conscious effort	**g.** voluntary

Three Kinds of Muscles

You have three sorts of muscles. Altogether they make up about one half of your body.

Skeletal muscles are the muscles that move your bones around, like your biceps. But they move other parts of you as well, like your eyes. These muscles are made up of straight strips of muscle fiber lying side by side. They are voluntary muscles. That is, they operate on command from your brain.

A smooth muscle is put together a little differently. It works automatically, at a slow, more continuous pace than a skeletal muscle. Smooth muscle is in charge of the body's internal movements, like pumping food around in your stomach or squeezing blood into your blood vessels.

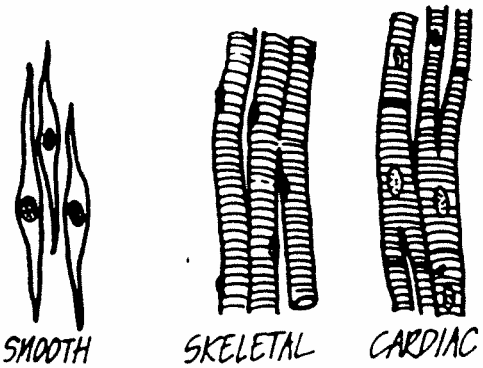
Cardiac is a special name given to the strong muscles in your heart.

All or Nothing

A single muscle fiber can either contract or remain relaxed. There is no half way for a muscle.

In a way, it's the same for a light. A light is either on or off. There is no such thing as a light that is sort of on.

For muscles this doesn't seem quite true. It seems your arm muscles have to be a lot more "on" to lift a bagful of groceries than they do to lift a glass of milk.



Remember, what you call a muscle is really a mass of muscle fibers. When you lift a glass of milk, you contract only a few fibers. However, lifting your bicycle, or a twenty-gallon can of chicken soup might contract every fiber you have.

When sustained muscle power is needed, muscle fibers take turns contracting and relaxing. No one fiber can contract for longer than a fraction of a second. A muscle group can remain contracted for a much longer time because individual fibers take turns twitching.

Tone

Muscles spend their time slightly contracted. They constantly exercise themselves. So, when they are called into action, they are warmed up and ready to work on short notice. This continuous contraction of the muscles of the body is called muscle tone.

When a person is nervous, his muscles will have a great deal of muscle tone. He will jump at the slightest noise, because his muscles are keyed up and ready to respond. A relaxed person retains a good deal of muscle tone, but not nearly so much as a nervous person. During sleep the muscles are allowed to relax almost completely, and retain very little tone.

Name _____ Date _____

MUSCULAR SYSTEM

Some Important Skeletal Muscles
Muscles help control the movement of your body.

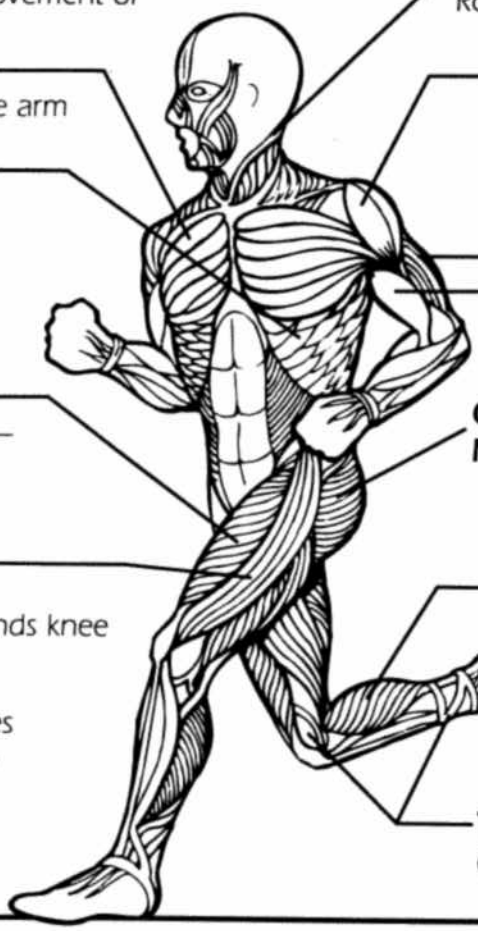
Sternocleidomastoid
Rotates the heavy head

Pectoral
Lowers the arm

Deltoid
Shoulder muscles
Raise the upper arm

Intercostals
Between ribs help you catch your breath and turn the upper half of your body

Triceps Help raise and
Biceps lower arms



Quadriceps
Help straighten your knees—useful in climbing stairs

Gluteus Maximus Strong muscles—Straightens the hip joint and holds you upright

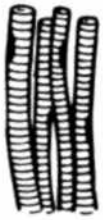
Biceps Femoris
Extends thigh or bends knee

Gastrocnemius
Helps you stand on your toes

Muscles surround your bones and body organs. They give form and support, make movement possible, and produce heat.

Tendons
Connective tissue

Three Kinds of Muscles



Skeletal—Voluntary
Move skeleton

Example:
triceps, biceps, quadriceps, gastrocnemius, tongue, pectorals

Smooth—Involuntary
Move internal organs

Example:
diaphragm, esophagus, stomach, blood vessels

Cardiac—Automatic

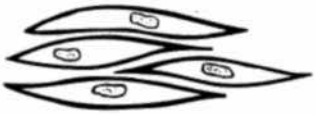
heart

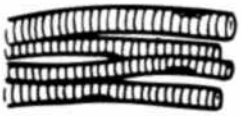
Name _____ Date _____

THREE KINDS OF MUSCLES

Write A, B, or C on the blanks to show the correct muscle type.

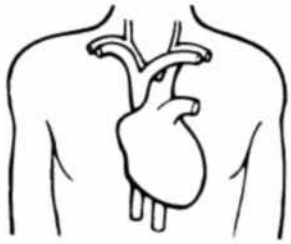
A. Smooth **B. Skeletal** **C. Cardiac**



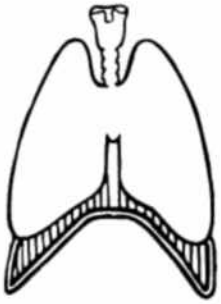


1. Bicep _____
2. Tricep _____

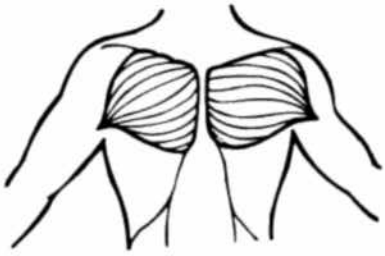
4. Tongue _____
5. Esophagus _____
6. Stomach _____



8. Heart _____
9. Blood Vessels _____



3. Diaphragm ____



7. Pectorals _____

10. Quadriceps _____
11. Gastrocnemius _____
12. Sternocleidomastoid (neck muscles) _____

Name _____ Date _____

KINDS OF MUSCLES

Complete these exercises.

A. Each of the following is a description of a type of muscle cell. Rewrite the description under the proper heading below.
Descriptions:

- Muscle cells that branch out and weave together. They make up the heart.
- Long, thin, and pointed cells.
- Long, cylinder-shaped cells.

Skeletal Muscle _____

_____

Cardiac Muscle _____

_____

Smooth Muscle _____

_____

B. Draw a diagram that shows what muscle cells from each of the following body parts would look like. You may use a reference book.

1. Biceps **2.** Heart **3.** Stomach

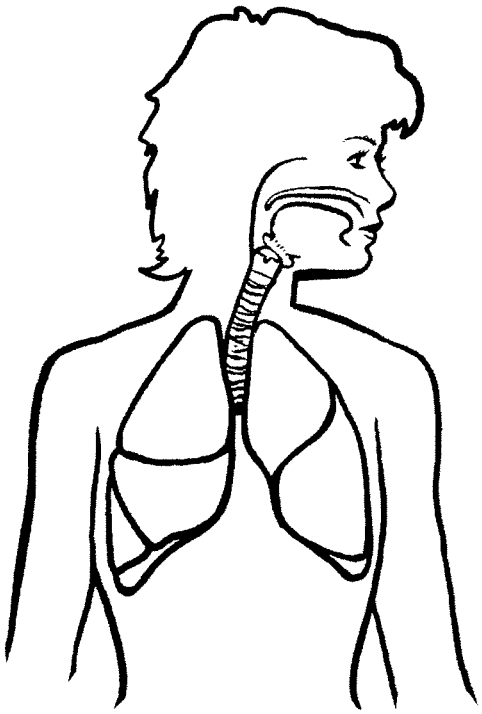
Do You Want to or Not: Classifying Muscles

Muscles are classified into two basic groups in your body: the **voluntary** muscles and the **involuntary** muscles. Let's think about those words for a minute. If the teacher asks who wants to run an errand, and you want to get out of the classroom for a few minutes, you might raise your hand. You would be *volunteering* to go for the teacher. It is something that you think about and that you want to do. Sometimes that very same teacher may tell you that you have a homework assignment. The teacher probably won't ask who wants to do it. You will probably be told that everyone must do it. It is important for you to do the homework so you can learn and move on to the next grade! You will do it *involuntarily*, but it is important for you to get it done.

Well, your muscles work in almost the same way. Sometimes there are things that you want to do. The voluntary muscles help you do them. Walking around, sitting down, jumping, running, ... the list could go on for a long time. There are other things that you have to do all the time, and your involuntary muscles do them for you. You would not be alive for long if you did not breathe and if your heart did not keep pumping. You do not even have to think about doing those things thanks to your involuntary muscles.

Some involuntary muscles can be controlled by you from time to time. Let's talk about breathing. Most of the time, you breathe without thinking. Certainly, when you are sleeping you do not have to think about breathing. Sometimes, though, you can make yourself stop breathing. You can also make yourself breathe faster or slower.

Your eyelids also have involuntary muscle action. You blink your eyes many times every day, and you probably do not really think about it. It is important to blink to keep your eyes wet. However, if you want to blink more often you can. If you want to try to stop blinking, you can stop for a while. Be careful doing that, though. It is not good for your eyes to become too dry.



The involuntary muscles that perform the breathing process can sometimes be controlled voluntarily.

Name: _____ Date: _____

Activity

Look at the list of muscles below. Try to decide if the muscles are voluntary or involuntary. If a muscle is voluntary, write a V on the line. If a muscle is involuntary, write an I on the line. (Remember, some muscles can be both!) Good luck!

_____ 1. Arm muscles

_____ 2. Heart muscles

_____ 3. Lung muscles

_____ 4. Foot muscles

_____ 5. Small intestine muscles

_____ 6. Blood vessel muscles

_____ 7. Leg muscles

_____ 8. Hand muscles

_____ 9. Eyelid muscles

_____ 10. Bladder muscles

_____ 11. Finger muscles

_____ 12. Jaw muscles

_____ 13. Large intestine muscles

_____ 14. Throat muscles

_____ 15. Eye muscles

What Kind of Muscles Are Those?

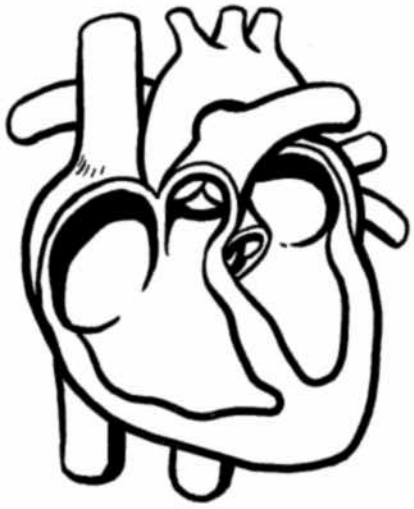
Voluntary Muscles

Okay, now let's talk some more about those voluntary muscles. They are usually called **skeletal muscles** but sometimes they might be called **striated muscles**. If you see pictures of skeletal muscles, they look like they have stripes. That is why they are called striated muscles. Skeletal muscles look like sausages! They are long muscle fibers. They are attached to bones in the skeletal system with tendons. (We will learn more about tendons later.) Skeletal muscles need lots of oxygen and lots of nutrients so they can keep working. They have blood vessels bringing the oxygen and food to them. They also have nerves connected to them, telling them what to do and when to do it. Skeletal muscles are found in parts of your body that you can move, such as your arms, legs, hands, and face. You have more skeletal muscles than any other kind of muscle in your body.

Involuntary Muscles

There are two different kinds of involuntary muscles. First, there are the **smooth muscles** that are sometimes called **visceral muscles**. They are thin muscles with cells that look like spindles. They have the nucleus right in the middle of each cell. These muscles are connected to a special part of your nervous system called the **autonomous nervous system**. They work without you thinking about it! Smooth muscles are found in your skin, your blood vessels, and in the organs inside your body.

The other kind of involuntary muscle is very special. It is called **cardiac muscle**, and it is only found in your heart. Your heart needs a constant supply of oxygen, so cardiac muscles have lots of blood vessels. Cardiac muscles are striated like skeletal muscles, but the cells branch out and weave together so they look a little bit different. This kind of muscle acts like other involuntary muscles; you have no control over the beating of your heart. Which part of the nervous system do you think the cardiac muscles are connected to? They are controlled by the autonomous nervous system.



Name: _____ Date: _____

Questions

1. What are the two basic groups of muscles?

2. Which muscles help you move when you want to?

3. Why aren't all your body muscles voluntary muscles?

4. Why can your eyelid muscles be classified as voluntary or involuntary muscles?

5. What kind of muscles could be described as striped sausages?

6. What are three places where skeletal muscles can be found?

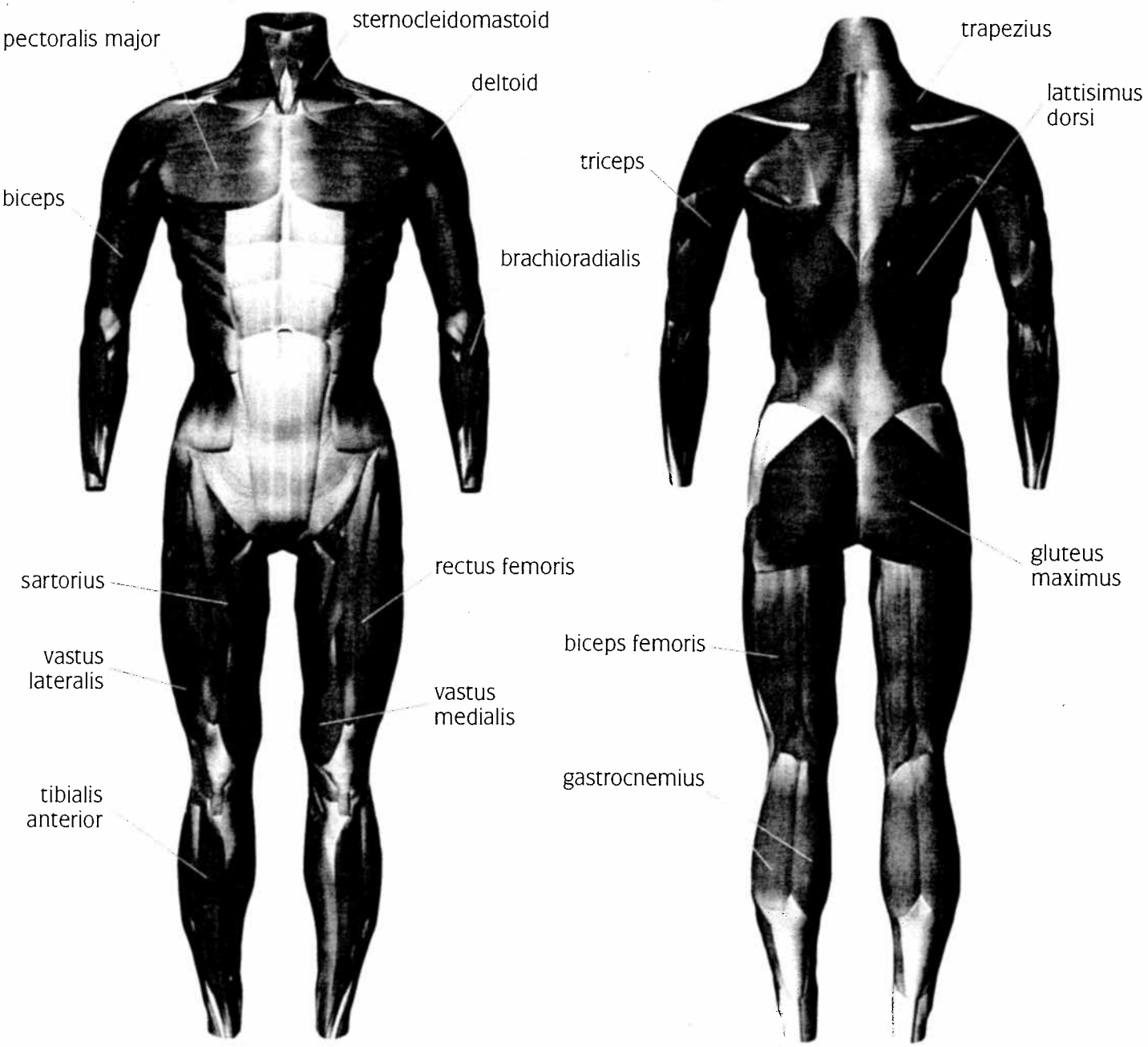
7. Which part of your nervous system controls smooth and cardiac muscles?

8. What do smooth muscles look like?

9. What are three places where smooth muscles can be found?

10. What is the only place where cardiac muscle can be found?

Muscular System



Muscles hold our skeletons together, give our bodies shape, and help us move. Muscles account for about half of our body weight and, because they warm when used, they supply about 80% of our body's heat.

Muscles are made up of threadlike cells bound together to form muscle fibers. A muscle group, like a biceps, contains bundles of these muscle fibers. Our bodies have three kinds of muscles: skeletal, smooth, and cardiac.

Skeletal muscles attach to bones by tendons and move bones by pulling, not pushing. Skeletal muscles work as pairs (e.g., your biceps raises your forearm while your triceps lowers it) or as larger groups (e.g., you use about 17 muscles to smile). Skeletal muscles are called "voluntary" muscles because you choose when to use them. However, skeletal muscles may also react involuntarily (e.g., to pull your hand away from a hot object). Skeletal muscles tire when used for long periods of time. Our bodies have about 660 skeletal muscles.

Smooth muscle is found in most internal organs. Cardiac muscle is found only in the heart. Both smooth and cardiac muscles work involuntarily and do not tire like skeletal muscles.

Muscle growth continues until full development is reached. Exercise also contributes to muscle growth. The fastest-working muscles open and close the eyelids. The busiest muscle is the heart.

Every Time You Move

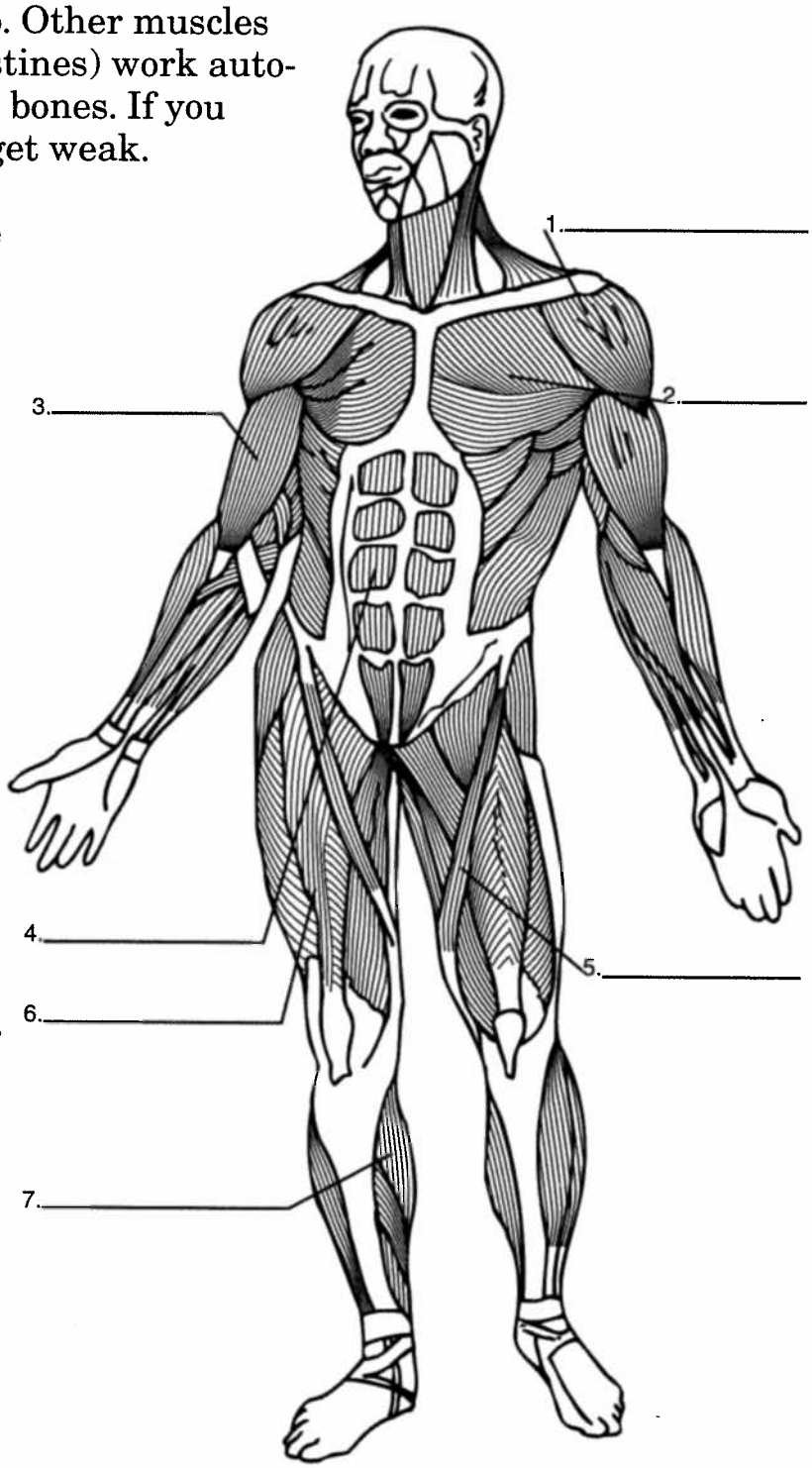
Every time you move, you move a muscle. There are about 650 muscles in your body.

The biggest and one of the most powerful muscles is the *gluteus maximus* in each *buttock*. Your smallest muscles are in your ear.

Some muscles (like those in your arms and legs) work only when you want them to. Other muscles (like those in your heart and intestines) work automatically. *Tendons* join muscles to bones. If you don't use your muscles, they will get weak.

Directions: Use the number code to label and color the **front** view of the muscular system.

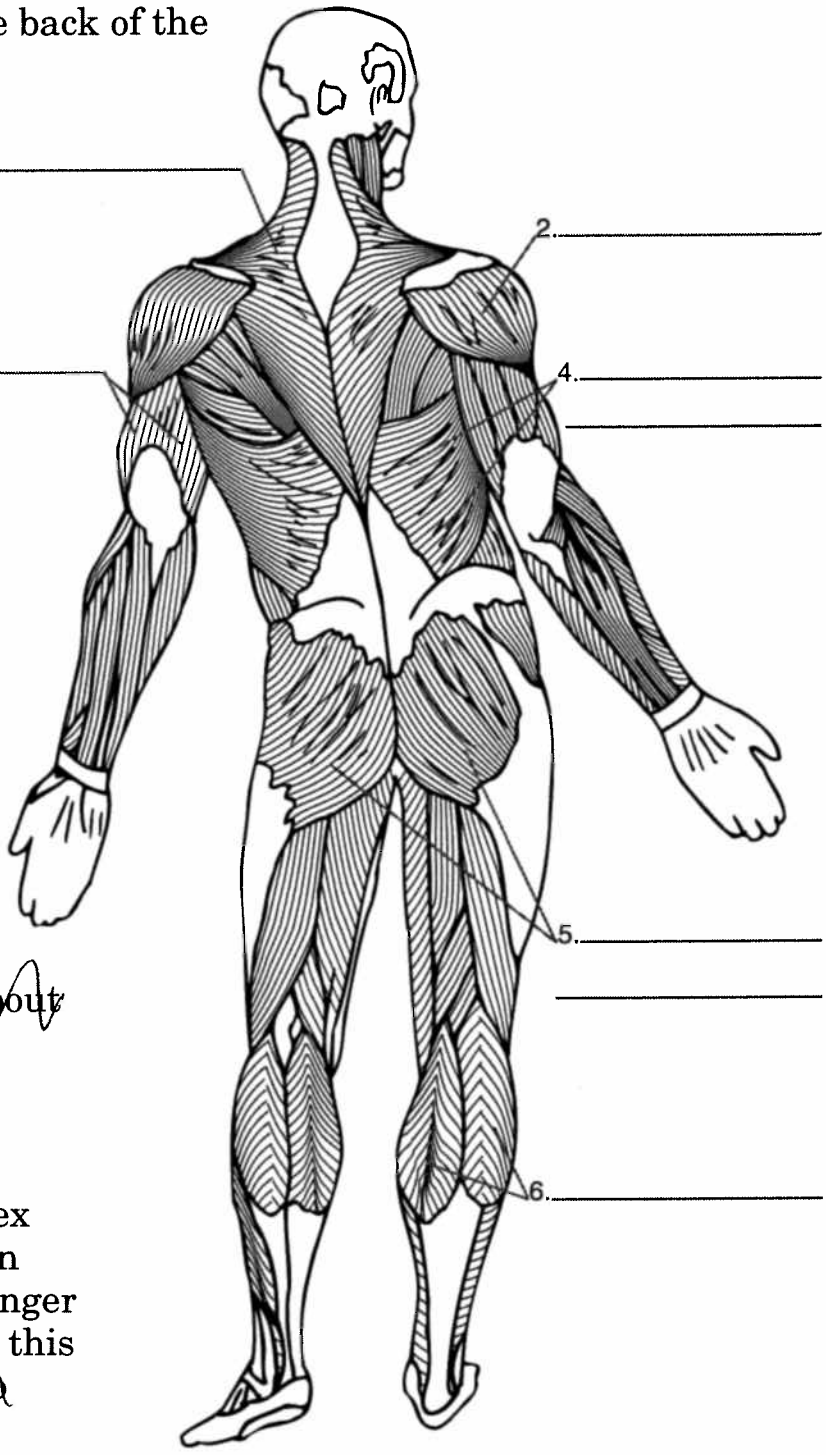
1. The **deltoid** is a large muscle covering the joint of the shoulder. Color it blue.
2. **Pectoral muscles** are the two muscles on either side of the chest wall. Color them red.
3. The **biceps** are the muscles in the upper arm. Color them purple.
4. The **rectus abdominis** muscles are the straight muscles of the abdomen and thigh. Color them yellow.
5. The **sartorius** is a long, flat, narrow muscle extending from the front of the hip to the inner side of the leg. Color it orange.
6. The **quadriceps**, a large, four-part muscle at the front of the thigh, extends the leg or bends it at the hip joint. Color it green.
7. The **gastrocnemius** is the largest muscle in the calf of the leg. Color it brown.



Every Time You Move

Directions: Use the number code to label and color the diagram of the **back** view of the muscular system.

1. The **trapezius** is a broad, flat muscle on each side of the upper back. Color it red.
2. The **deltoid** is a large, triangular muscle covering the joint of the shoulder. Color it blue.
3. The **triceps** are muscles at the back of the upper arm. Color them yellow.
4. The **latissimus dorsi** is a broad, flat muscle on each side of the middle of the back. Color it purple.
5. The **gluteus maximus** is the broad, thick, outermost muscle on each buttock. Color it green.
6. The **gastrocnemius** is the largest muscle in the calf of the leg. Color it brown.



Research: Find out how muscles contract. Write a few sentences about how muscles contract.

Bonus: Make a fist and feel the muscle in your forearm. Flex your right arm and feel your biceps. Flex your left arm and feel the biceps in that arm. Is one of your arms stronger than the other? Why do you think this is true? Use complete sentences to explain this.

Holding it All Together: Tendons

When you read about the skeletal system, you learned that bones are attached to other bones by ligaments. Ligaments are special connective tissues that are stretchy, allowing bones to move. You also read that the skeletal system works with the muscular system to move the body. Well, muscles also need to be attached to the bones to get them moving.

Each muscle is attached to bone at two ends. At one end of the muscle, the attachment is firm; it does not move. This may be called the **origin** of the muscle. The muscle is attached directly to the bone at that end. At the other end of the muscle, which is called the **insertion**, the attachment can move. At that end, the muscle is attached with a connective tissue called a **tendon**.

As a muscle works, or contracts, it gets smaller. The insertion end of the muscle gets closer to the origin end of the muscle. The tendon stretches to let the muscle shorten. When the muscle relaxes, it gets longer again. The tendon shortens back to its original length. A tendon reminds me of a big, thick rubber band!

You need to be careful with your tendons, and the rest of your muscular system. If you work your muscles too hard or too suddenly without warming them up properly, you can injure yourself. The covering around the tendons may become swollen and very sore in a condition called **tendonitis**. Sometimes tendons are actually torn away from the bone where they are supposed to be attached. You may need to have surgery to fix that kind of problem! Have you ever heard of anyone having a **sprain**? A sprain is a ligament, tendon, or muscle that has been stretched too much. It can take a long time for some of these injuries to get better.

Name: _____ Date: _____

Questions

1. [redacted]

2. [redacted]

3. [redacted]

4. What is the difference between a ligament and a tendon?

5. Why do tendons need to be stretchy?

6. [redacted]

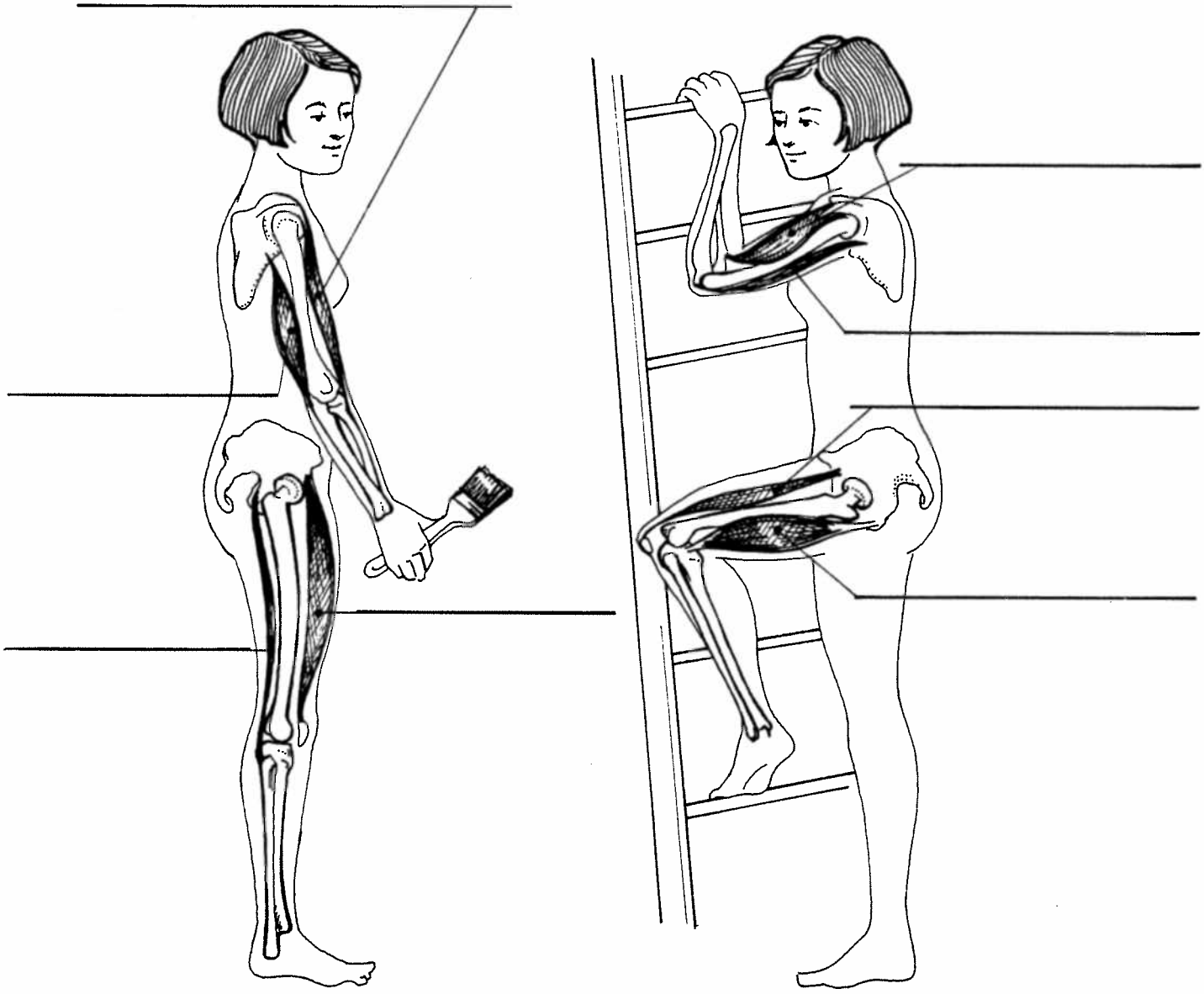
7. [redacted]

8. Why is it important to warm up before you exercise?

Working Pairs

Name _____

The muscles in both your upper arms and upper legs are very much alike. They both work in pairs to help raise and lower the limbs. Label the parts of these "working pairs" using the words from the **WORD BANK.**



WORD BANK

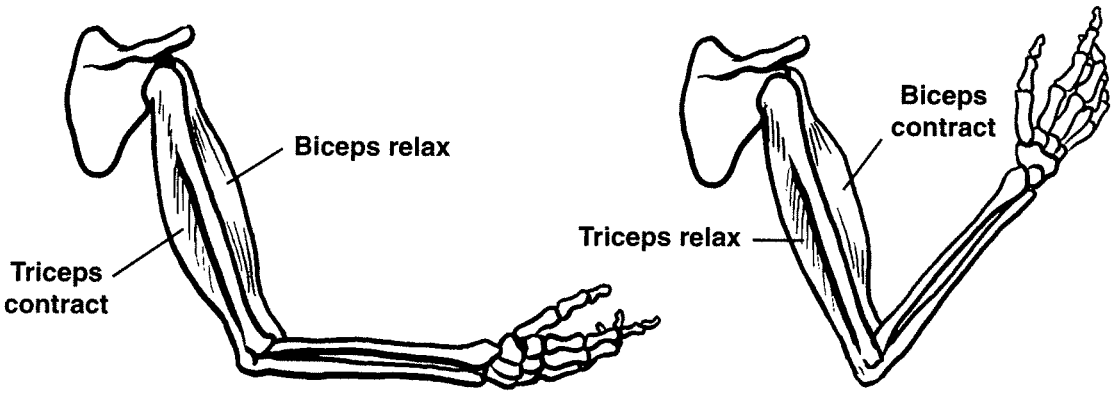
biceps relaxed	biceps contracted
triceps relaxed	triceps contracted
quadriceps relaxed	quadriceps contracted
hamstring relaxed	hamstring contracted

Which Way Are You Going?

Now you know that the muscular system is made up of muscles and tendons. You also know that it is responsible for giving your body its final shape. The other job of the muscular system is that it is responsible for moving your body parts. Your muscular system needs a little help from your skeletal system to do some of the moving.

Remember we said that you have voluntary muscles, called skeletal muscles, attached to bones in your body. How do those muscles get your bones into motion? Well, they work in pairs. One muscle in the pair starts to contract. When that muscle is done contracting, it starts to relax. The actin and myocin filaments begin sliding back, away from each other. The muscle becomes thinner and longer.

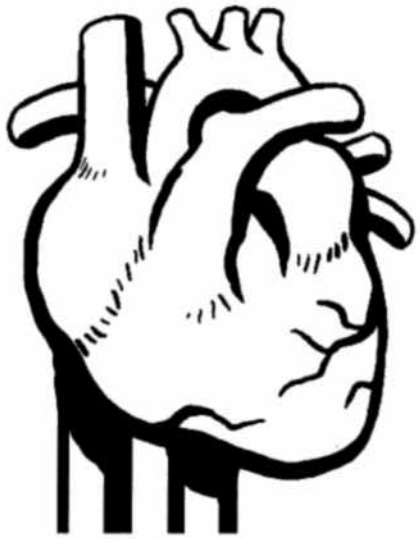
Don't forget we said that the muscles work in pairs. When one muscle is contracting, or getting shorter and thicker, the other muscle in the pair is relaxing, or getting longer and thinner. Here's a little experiment you can do to learn how muscles work in pairs. Put your right arm out at your side, straight out from your shoulder with the palm of your hand facing up. Lift your hand toward your ear, without moving your shoulder. Concentrate on the muscles in your upper arm when you move your hand. The muscle on the underside of your arm will get longer and thinner. It is relaxing. The muscle on the top of your upper arm will get shorter and thicker. It is contracting. The two muscles work together. Now put your hand back down so your arm goes straight out from your shoulder. Concentrate on the same upper arm muscles when you do that. The muscle on the top of your arm will be relaxing this time. Do you notice it getting longer and thinner? The muscle on the underisde of your arm will be contracting. You should be able to feel it getting shorter and thicker.



Why do your muscles move? How do they know what to do? Remember we said that your muscles are attached to nerves? Your brain sends messages through your nerves to your muscles. The nerves tell the muscles when it is time to contract and when it is time to relax. Skeletal muscles wait until you decide you want to move. You make your brain send the messages to the muscles. Skeletal muscles contract very quickly, but they tire out very quickly, too. They control your posture and your body movements.

Smooth muscles are involuntary muscles, so you do not control them directly. These muscles contract and relax slowly. Smooth muscles are responsible for pushing materials through passages in your body. For example, they push food through your digestive system. Smooth muscles also remove materials from body parts. Bile is a liquid used in the digestive system. It is expelled by smooth muscles of the gall bladder, and it is moved into the small intestines. Smooth muscles also make body openings larger and smaller. If you turn off the lights in a room, smooth muscles in your eye will make the pupil in the center of your eye larger. If you walk outside into the bright sunshine, the muscles in the eye will make the pupil very small. Finally, smooth muscles contract and restrict tubes inside your body. Smooth muscles are responsible for moving blood through the blood vessels in your body.

Cardiac muscles also contract and relax. You can feel the effects of the cardiac muscle movements if you put your finger on your pulse. (You should be able to find your pulse on your wrist or on the side of your throat.) Everyone's heart beats differently, but most of the time, hearts beat about 70 times per minute.



Name: _____ Date: _____

Questions

1. What happens when actin and myocin filaments begin sliding together?

2. Muscles work in pairs. When one muscle is contracting, what is the other muscle doing?

3. How do your muscles know when it is time to move?

4. Why do skeletal muscles tire very easily?

5. What are four types of movement controlled by smooth muscles?

6. What is your pulse (definition)?

7. Where can you feel your pulse?

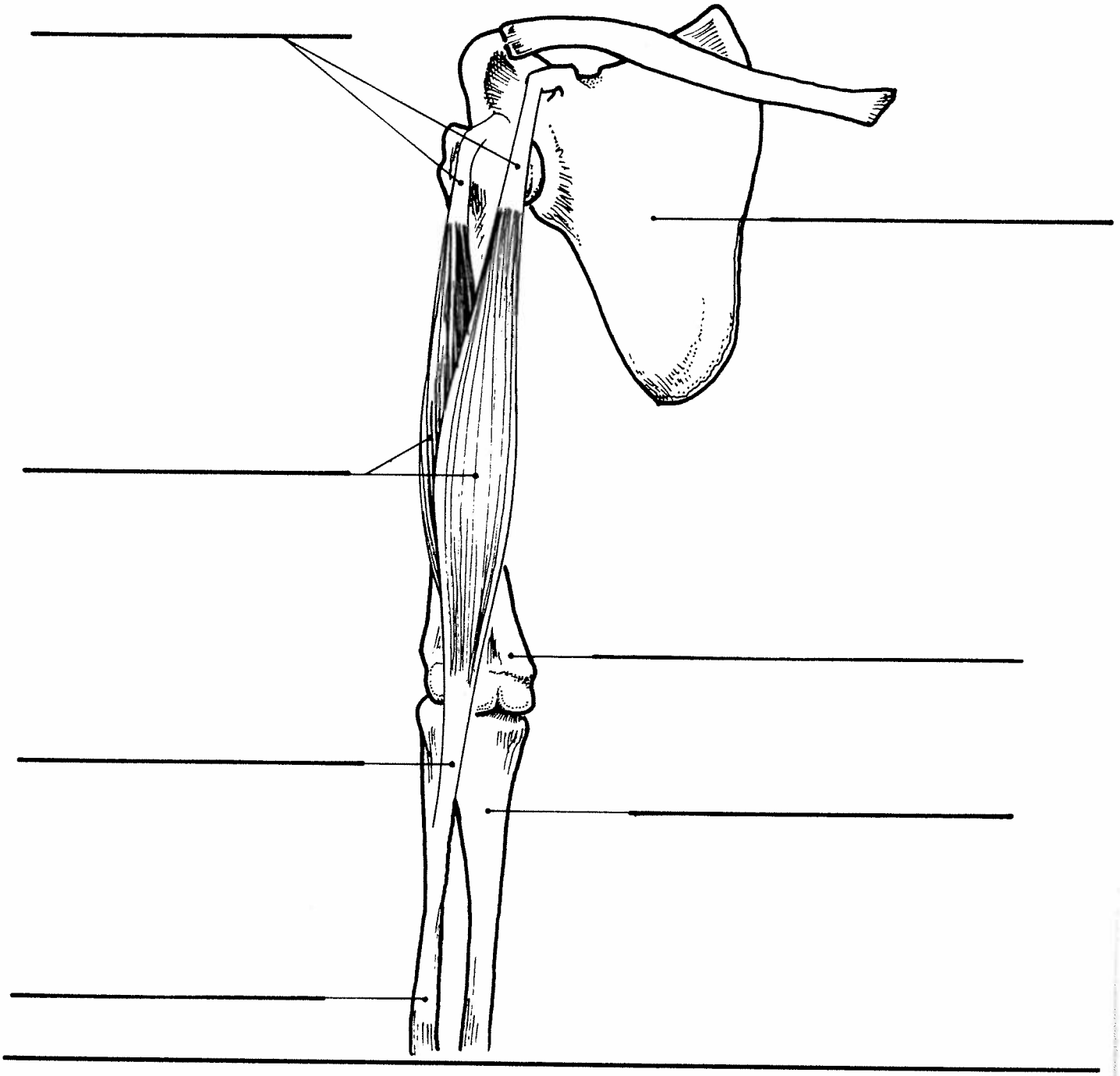
8. About how many times does a person's heart beat in one minute?

Skeletal Muscles

Name _____

Skeletal muscles are attached to the skeleton by means of **tendons**.

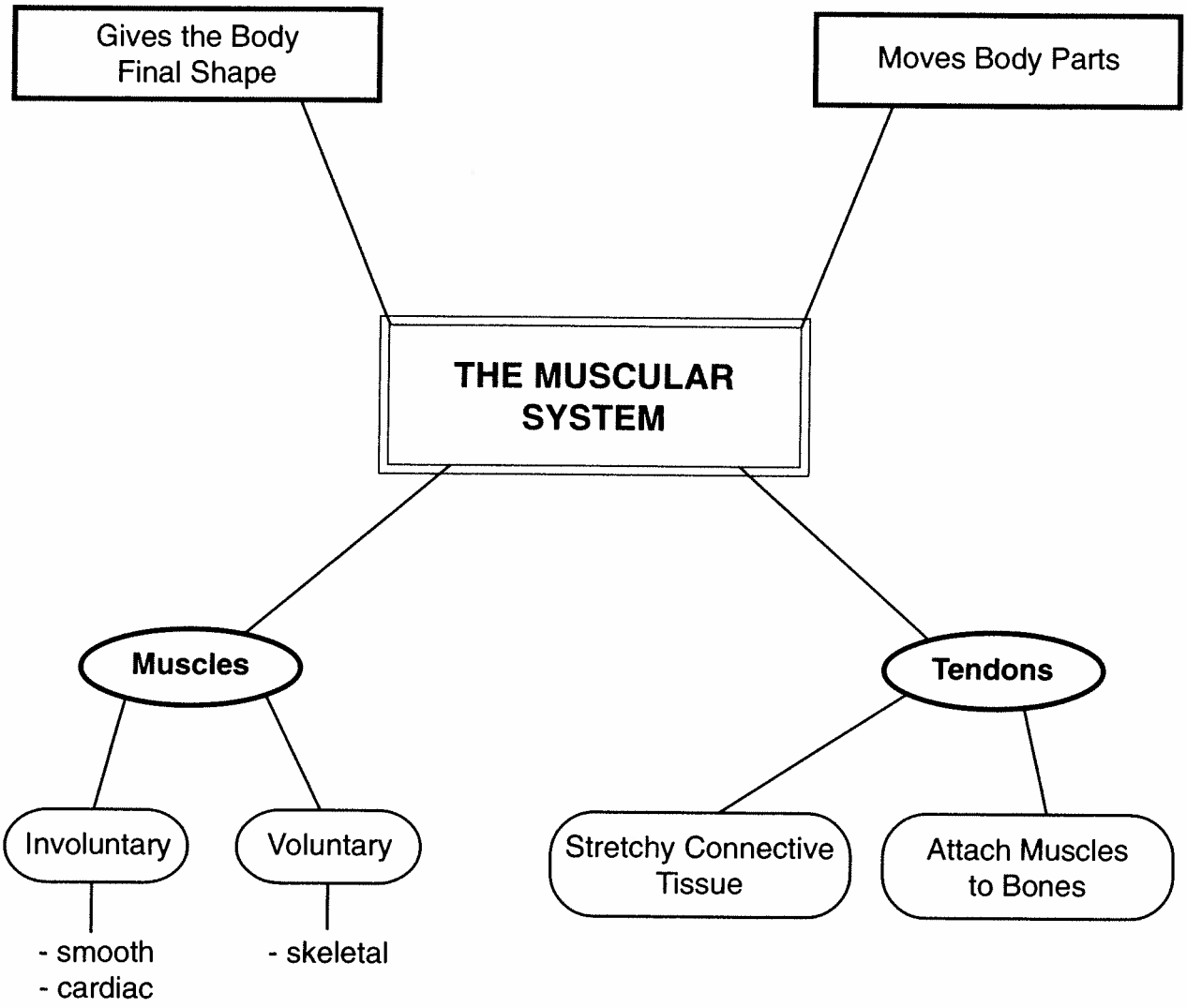
Label the parts of the arm pictured below.



WORD BANK

tendons
biceps muscle
radius
shoulder blade
humerus
ulna

A Graphic Organizer: The Muscular System



Critical Thinking → CONCEPT FILE

Muscles

Types of Muscles

There are three kinds of muscles in the human body:

Cardiac muscles

These are the muscles of the heart.

Smooth muscles

These are the muscles that act automatically.

Most are found in the digestive system. They move food through the system.

Skeletal muscles

These are the muscles that move bones.

They usually occur in pairs. When one muscle contracts, the other one in the pair relaxes.

Examples would be the biceps and the triceps of the upper arm.

Vocabulary

- ❒ **strain**—the tearing of tendons and skeletal muscles
- ❒ **tendons**—strong, ropelike fibers that connect skeletal muscles to bones

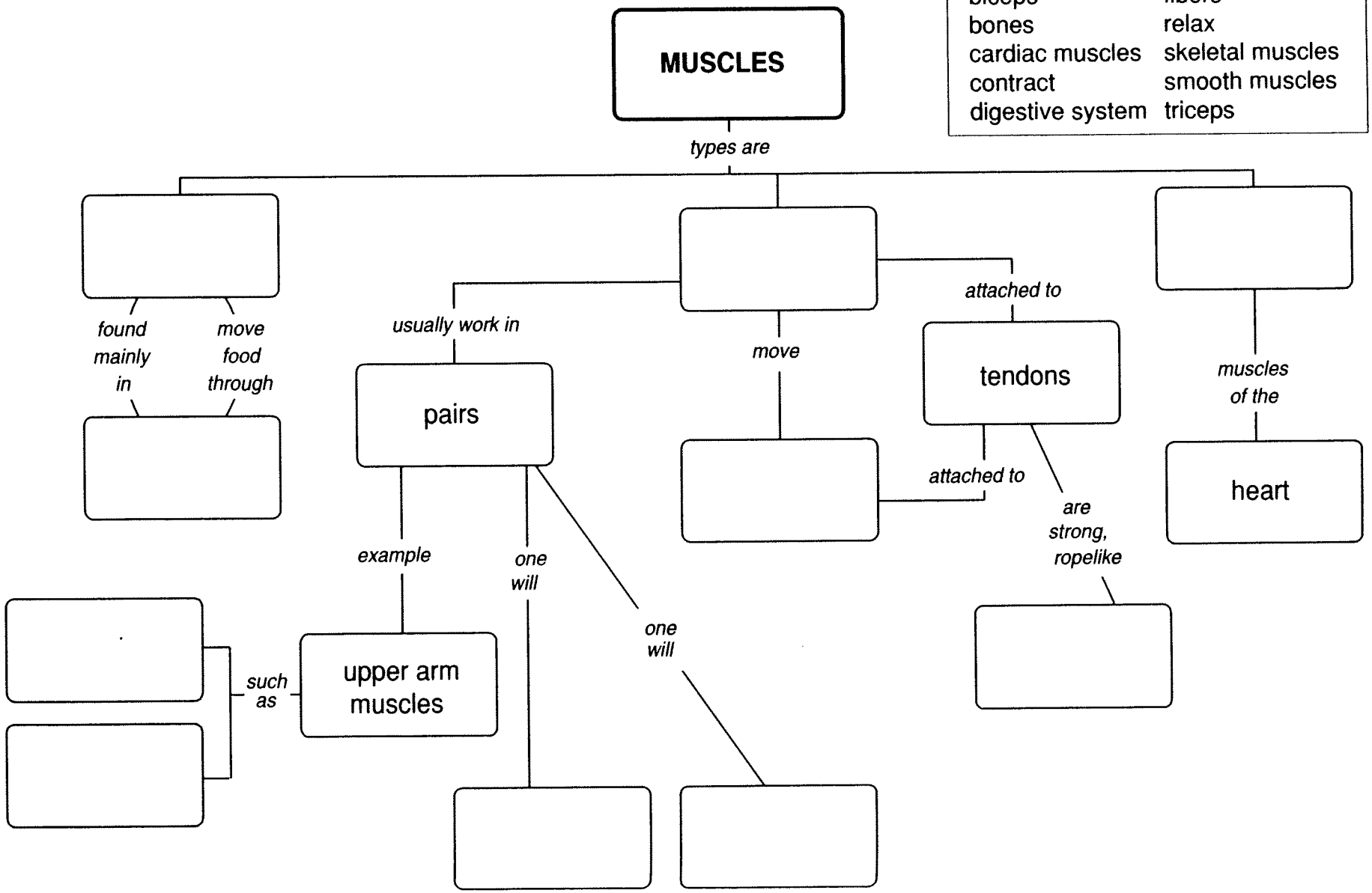
Concept Map: Muscles

Name _____

Date _____ Period ____

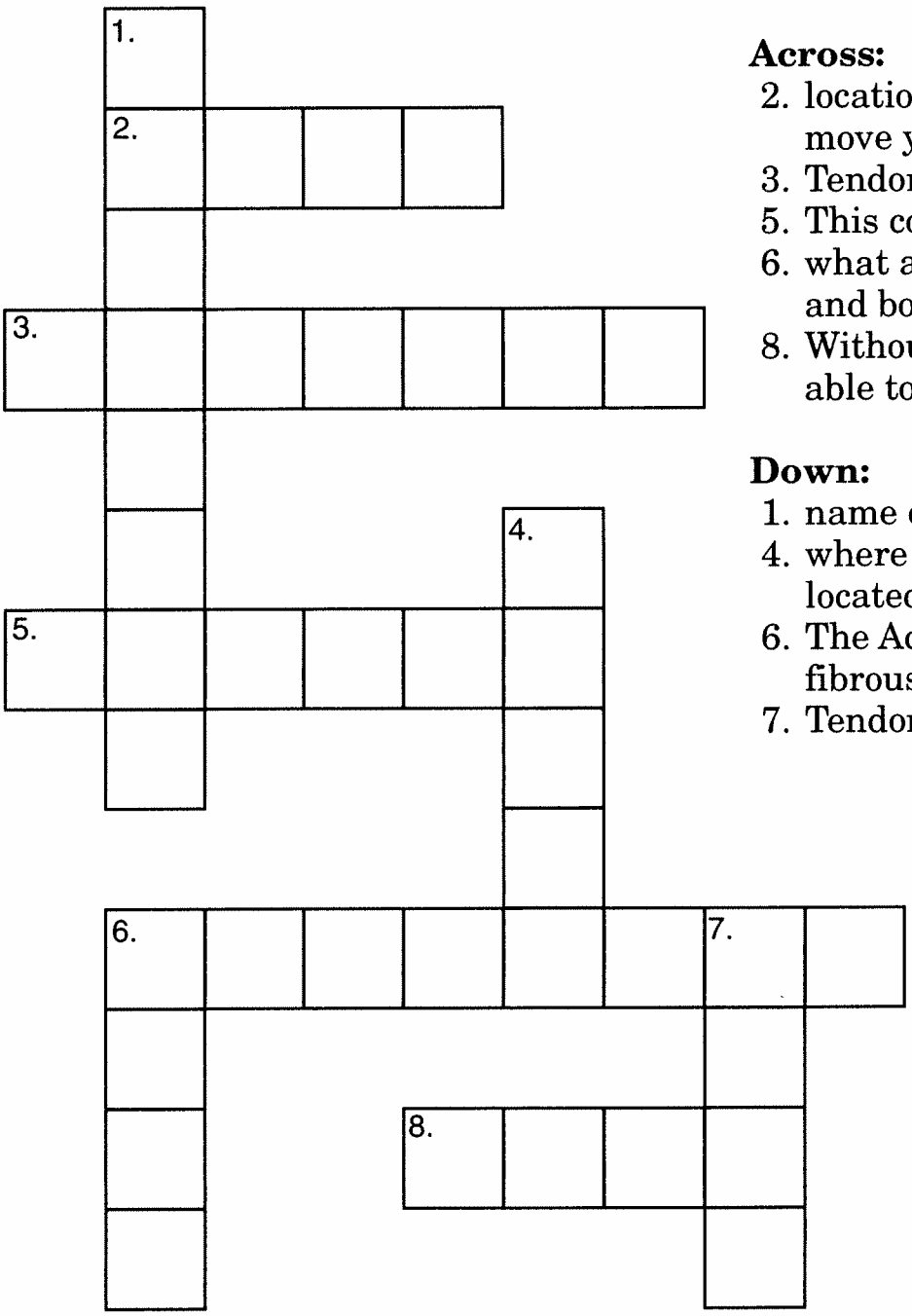
Directions: Select words from the word list and fill in the blank map items. Use each word only once, and use all the words on the list.

WORD LIST	
biceps	fibers
bones	relax
cardiac muscles	skeletal muscles
contract	smooth muscles
digestive system	triceps



Connecting Muscle And Bone

Directions: Use the clues to solve the crossword puzzle.



Across:

2. location of the muscles that move your toes
3. Tendons are long, _____ cords.
5. This connects a muscle to a bone.
6. what a tendon does to muscles and bones
8. Without tendons we wouldn't be able to do this.

Down:

1. name of the largest tendon
4. where your largest tendon is located
6. The Achilles tendon is a long, fibrous _____.
7. Tendons help you move these.

Research: Muscles get their energy from *glucose,* which comes from the carbohydrates you eat. Find out which foods are carbohydrates. Make a list of at least 15 carbohydrate foods.

Bonus: Pretend you are a string puppet or a *marionette* without tendons, muscles, and bones. Imagine the puppeteer pulling your strings. Then imagine that a fairy uses magic to turn you into a real boy or girl. Write a paragraph that tells how it feels to have muscles that work.

Name _____ Date _____

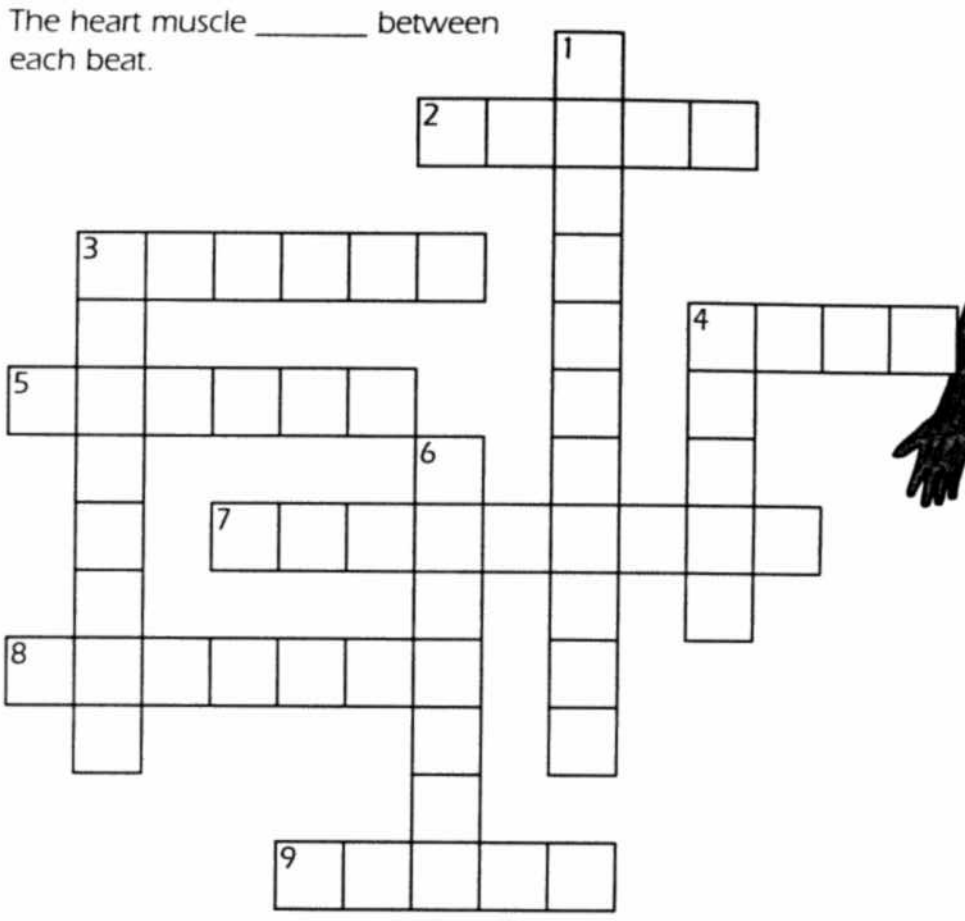
MUSCLE PUZZLE

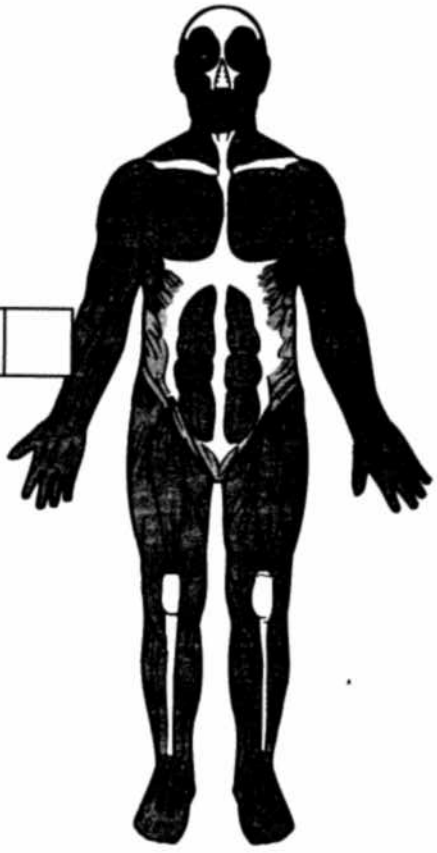
ACROSS

2. Muscles surround your _____ and body organs.
3. This type of muscle tissue moves internal organs.
4. Muscles, when moving, produce body _____.
5. Connective tissue of muscles
7. You control the movement of these muscles.
8. _____ muscle tissue moves the heart.
9. The heart muscle _____ between each beat.

DOWN

1. Muscles that move and work without our control
3. This muscle tissue moves the skeleton.
4. Cardiac muscle controls the _____.
6. Biceps, triceps, and deltoids are all _____.





Use reference sources to find out and explain why you shiver when you are cold.

_____

_____

Human Body

This puzzle has two lists—words and definitions. Match the words with their definition by drawing a line between them.

ligaments	Small circular bones that make up the backbone.
socket	The large muscle on the back of the upper arm.
heart	The flexible part of the nose is supported by this tissue.
vertebrae	A muscle that contracts regularly every day of your life.
nerve	The tissue in the center of bones; produces blood cells.
triceps	The hip joint is a ball and _____ joint.
marrow	The tissue that directs how and when muscles move.
cartilage	Strong bands of connective tissue that hold bones in place.

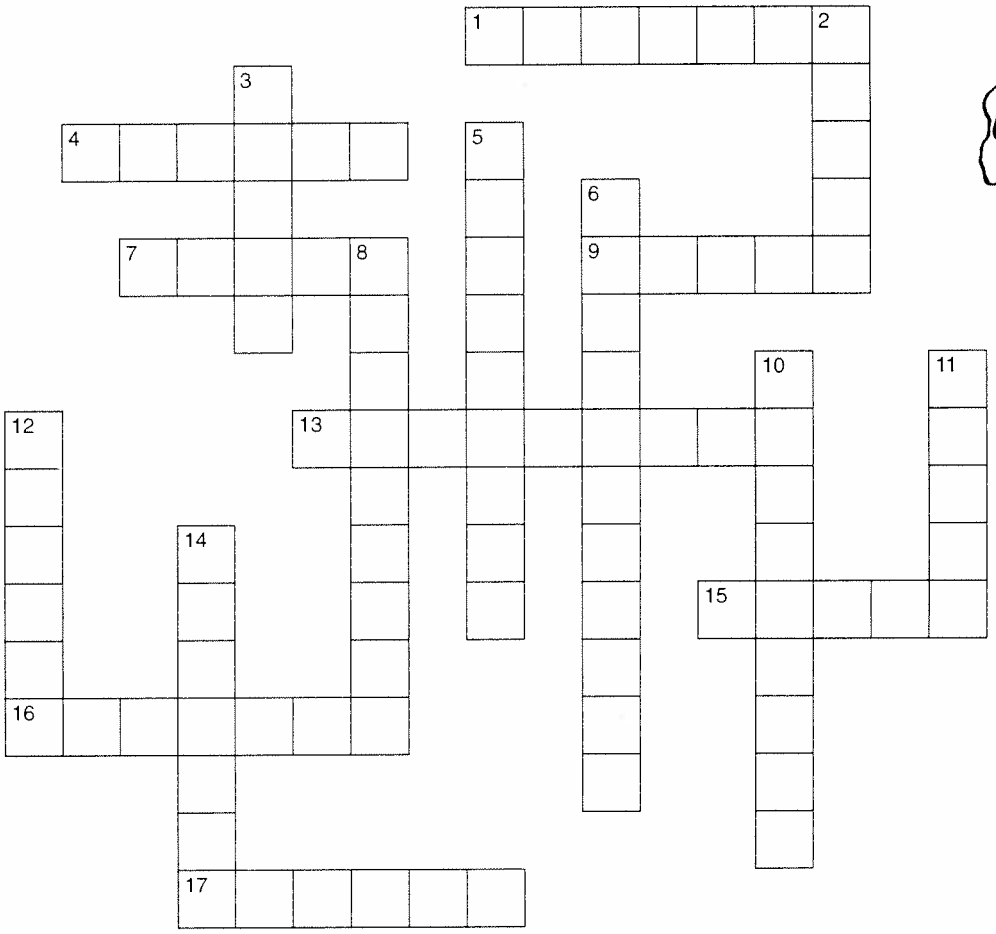
Human Body — Skeletal-Muscular System

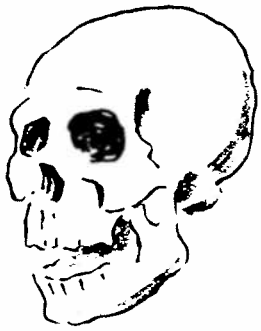
Across

1 Tough tissue that connects a muscle to a bone.
4 The large muscles on your upper arm.
7 A collection of bones fused together that protect the brain.
9 The tissue that directs how and when muscles move.
13 The flexible part of the nose is supported by this tissue.
15 A muscle that contracts regularly every day of your life.
16 The large muscle on the back of the upper arm.
17 The tissue in the center of bones; produces blood cells.

Down

2 Vertebrae stacked on each other make up this.
3 The large bone in your upper leg.
5 Muscles that we can control are called _____ muscles.
6 _____ muscles are those that contract automatically.
8 Strong bands of connective tissue that hold bones in place.
10 Small circular bones that make up the backbone.
11 The point where two bones meet.
12 The hip joint is a ball and _____ joint.
14 A chemical element that is essential to strong bones.

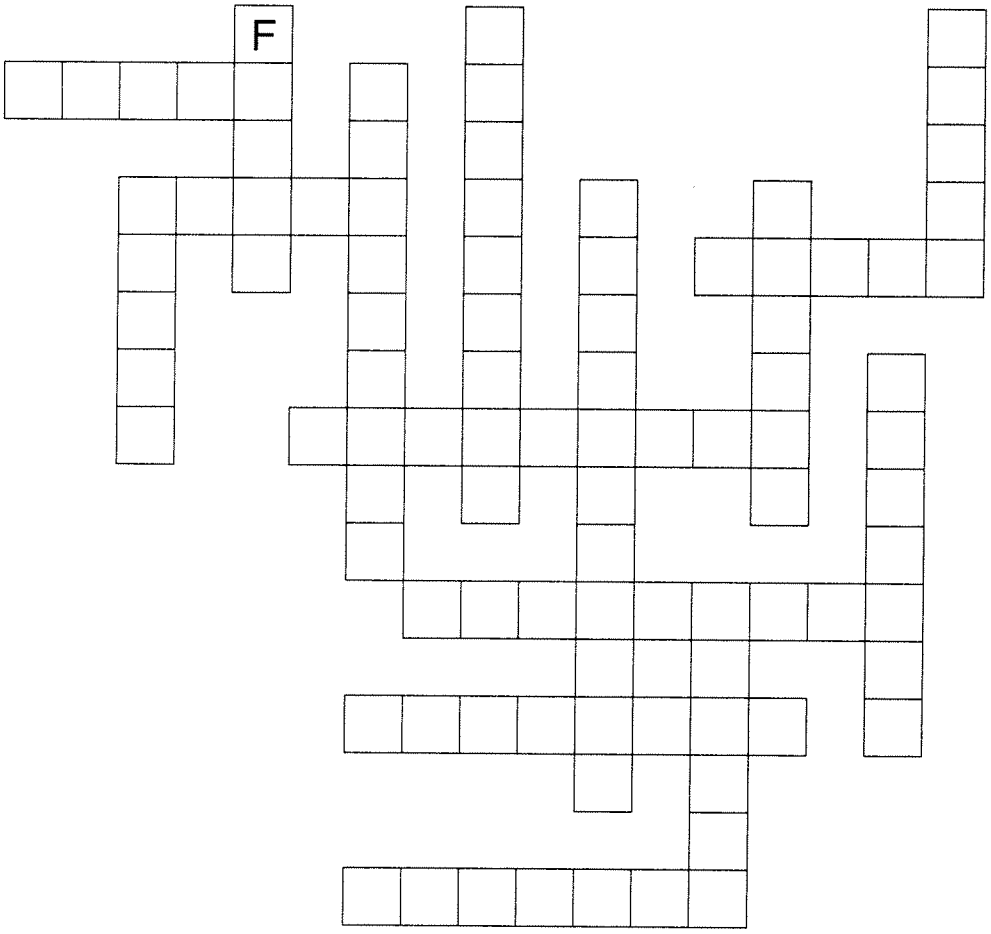




Human Body

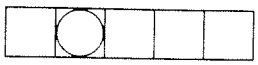
Using the words in the list, you can build your own crossword puzzle. Start with the letter printed at the top and count the number of letters in its word. Now you know what letter that word begins with and how many letters it has. Look at the list and find the word. Write it in and build from there.

Nerve	Triceps	Heart	Tendons
Skull	Contract	Femur	Voluntary
Joint	Vertebrae	Spine	Cartilage
Socket	Ligaments	Biceps	Involuntary

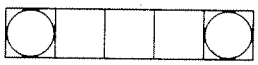


Human Body

Unscramble the letters into words and write them in the boxes to the left. Now unscramble the letters in the boxes with circles to find the last word.



KULSL



NIPES

IBPSEC

SOENDTN

ACTOCRTN

The hip joint is a ball and _____ joint.

Skeletal-Muscular System

This puzzle contains hidden words. They can go up and down, across, at an angle, forward, or back. All the hidden words are in the list below the puzzle. When you find one, circle it and look for another.

P O L U T R I C E P S Y H S E R
R V V H V E M G C S P V E O W I
F T H Z M B N Q N L F C A C M J
O Y N C B O C D K Q S U R K M G
O W E H O X A Q O P S U T E W O
G Y W E J N R L E N M C A T B S
S K U L L O T C R E S R U O Z P
Y Q O M I D I R F P B V Z Z L I
J C P H G B L N A E V M G X V N
H R J K A U A M T C U Q M D O E
H P V D M X G R K I T J A V E R
I S W S E W E E C C O H R V N P
P A B I N V O L U N T A R Y X T
K U X D T M A G Q Y M E O L D Q
F D Y Y S C T B N P N O W W W D
W Q N A G I I F O R A K B A J L

Involuntary
Cartilage
Voluntary
Calcium
Tendons
Biceps
Femur
Spine
Skull
Vertebrae
Ligaments
Contract
Triceps
Marrow
Socket
Heart
Joint
Nerve