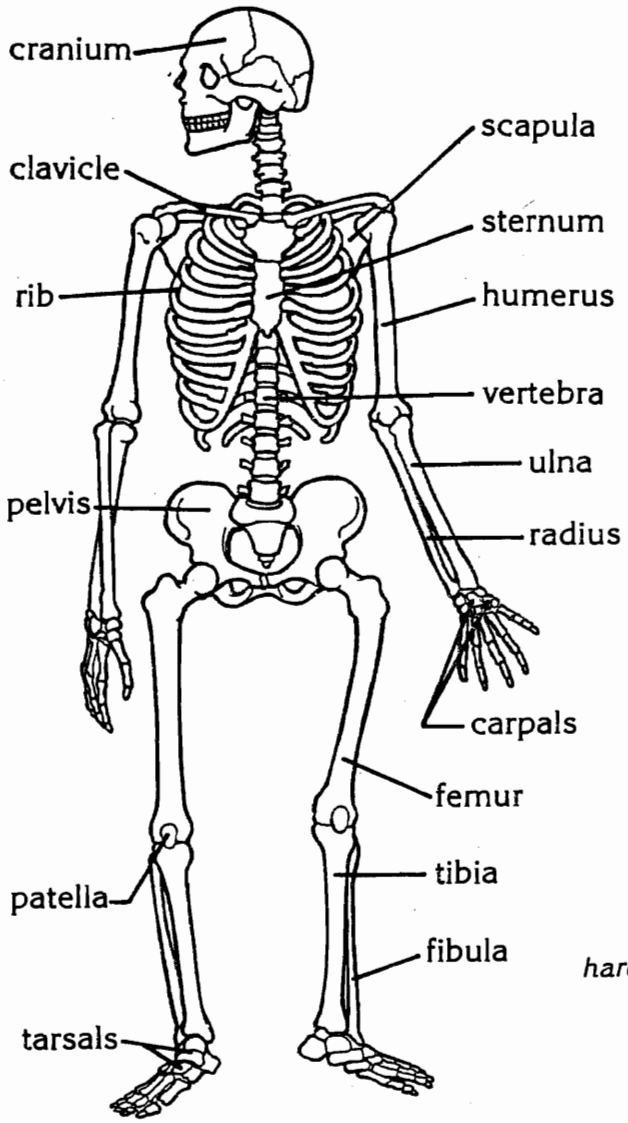
The Skeletal System

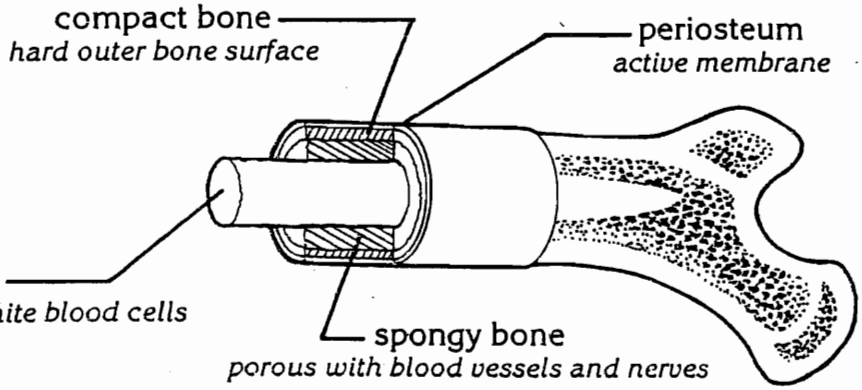
The skeletal system supports the body and gives it a shape, protects organs, and serves as an attachment for muscles. There are 206 bones in the skeletal system.



1. Give the medical name for each of the following bones.
   a. ankle bones · _____
   b. hipbone · _____
   c. skull · _____
   d. wrist bones · _____
   e. collarbone · _____
   f. kneecap · _____
   g. shoulder blade · _____
   h. backbone · _____

2. There are _____ bones in the skeletal system.

Parts of a Bone



Complete each sentence with a word that will make the sentence a true statement.

1. The _____ is the living membrane that covers a bone.
2. The hardest part of a bone is called _____ bone.
3. Most bones have a center called _____ .
4. Nerves and blood vessels are found in the part called _____ bone.
5. Blood cells are manufactured in the _____ of a bone.

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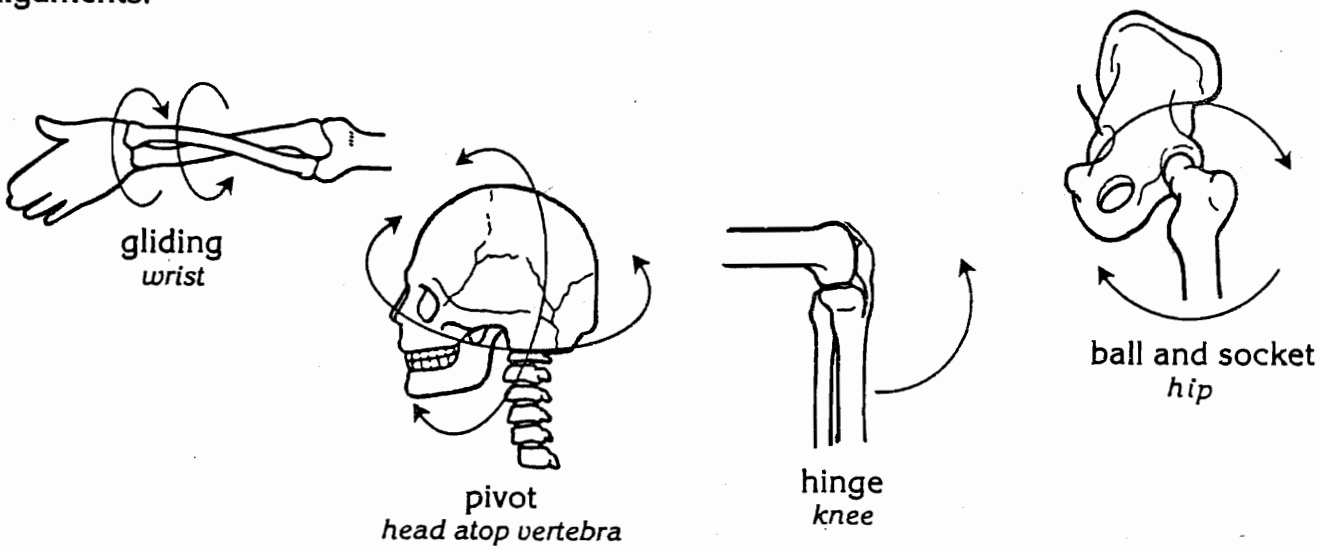
The Skeletal System

Kinds of Joints

A *joint* is the part of the skeletal system where two bones meet and are held together by ligaments.



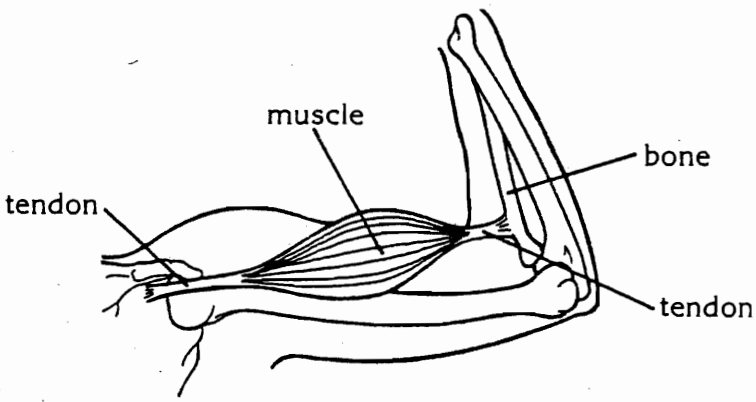
Each joint listed below is a certain kind of joint. Write the name of the kind of joint in the space provided.

a.) gliding b.) hinge c.) ball and socket d.) pivot e.) immovable

1. hip _____
2. elbow _____
3. knuckle _____
4. top of skull _____
5. ankle _____
6. neck _____
7. finger _____
8. toe _____
9. shoulder _____

Tendons

A *tendon* is a cord made of tough, white tissue that attaches muscles to bones.



Complete each sentence with a word that will make the sentence a true statement.

10. Bones are connected to each other by _____ ; muscles are connected to bones by _____ .

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Name _____ Date _____ Class _____

The Skeletal System

This section describes the skeletal system and its function. It also tells how to keep your bones strong and healthy.

Use Target Reading Skills

Before you read, preview the red headings. In the graphic organizer below, ask a what *or a* how *question for each heading. As you read, answer your questions.*

The Skeletal System

Question	Answer
What does the skeleton do?	

What the Skeletal System Does

1. List the five major functions of the skeleton.

a. _____

b. _____

c. _____

d. _____

e. _____

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The Skeletal System *(continued)*

2. Circle the letter of the bone that makes up the center of the skeleton.

a. skull
b. pelvic girdle
c. backbone
d. femur

3. The 26 small bones that make up the backbone are the _____.

4. How does the skeleton help the body move?

_____

_____

_____

5. Circle the letter of the bone that protects the brain.

a. backbone
b. pelvic girdle
c. ribs
d. skull

6. The long bones of the arms and legs make _____.

Joints of the Skeleton

7. What is a joint?

_____

_____

8. What are the two kinds of joints in the body?

a. _____ **b.** _____

9. Circle the letter of bones that are held together by immovable joints.

a. knee
b. ankle
c. skull
d. shoulder blade

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Chapter 1 Sections 2&3 Questions

Name _____ Science 1 2 3 4 5

Use your class notes to answer the following questions. Remember to use the TTQA strategy when writing your answer. Use your own words to explain your answers.

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

_____

_____

2.) How does the skeleton protect your body? (use examples) _____

_____

_____

3.) How would your life be different if your backbone consisted of just one long bone? _____

_____

_____

4.) What are four types of moveable joints?

a. _____

b. _____

c. _____

d. _____

5.) Which of your moveable joints are ball and socket joints?

_____

_____

6.) What are the three typed of tissue in bone? _____

_____

7.) How does the structure of bones make them both strong and light?

_____

_____

_____

8.) What are three common skeletal system injuries?

a. _____

b. _____

c. _____

9.) Suppose that an X-ray of your injured wrist did not show a fracture. But, after a month, your wrist is still painful and stiff. Why might a doctor order an MRI? _____

_____

_____

_____

10.) Which joints can be replaced surgically and how is it done?

_____

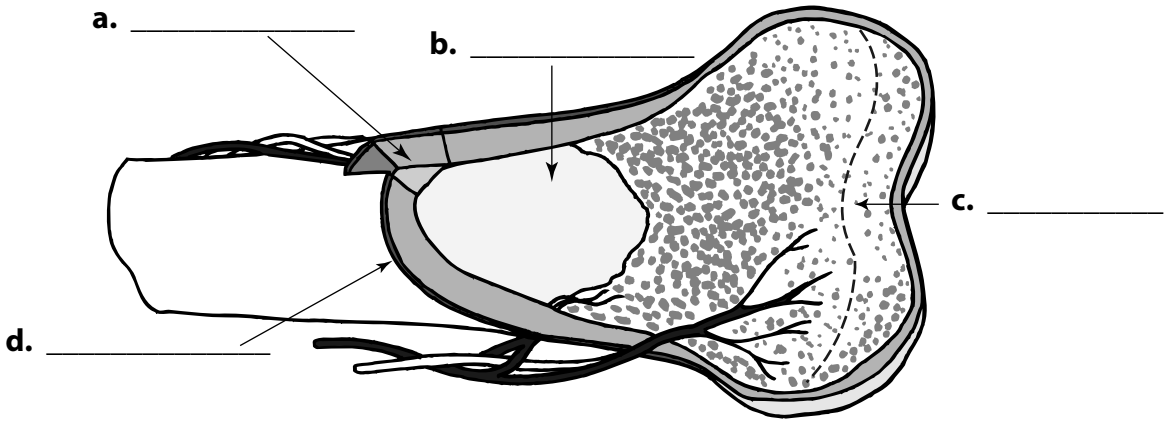
_____

_____

_____

The Skeletal System *(continued)*

14. Label the parts of the bone in the diagram below.



Match each part of a bone with its characteristics.

	Bone Parts	Characteristics
____	**15.** marrow	**a.** Where blood vessels and nerves enter and leave the bone
____	**16.** outer membrane	**b.** Has small canals with blood vessels running through
____	**17.** compact bone	**c.** Strong, but lightweight because it has many small spaces within it
____	**18.** spongy bone	**d.** Soft connective tissue in the spaces in bone

19. A connective tissue that is more flexible than bone is called _____.

20. Circle the letter of each sentence that is true about how bones form.

a. Much of an infant's skeleton is bone.
b. As the body grows, the cartilage in the skeleton is replaced with hard bone tissue.
c. By the time the body stops growing, all of the cartilage has been replaced with bone.
d. Cartilage covers the ends of many bones in the body of an adult.

Taking Care of Your Bones

21. What can you do to keep your bones healthy? _____

_____

_____

22. A condition in which the body's bones become weak and break easily is called _____.

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10. Complete the table to show the four types of movable joints.

Movable Joints		
Joint	**Kind of Motion**	**Where It's Found in the Body**
Hinge		
Ball-and-socket		
Pivot		
Gliding		

11. The bones in movable joints are held together by strong connective tissues called _____.

Bones—Strong and Living

12. Circle the letter of each sentence that is true about bones.

a. Bones are very strong and lightweight.
b. Concrete can absorb more force without breaking than bone can.
c. Bones make up over half of an adult's body weight.
d. Bones are hard because they contain minerals.

13. When do bone cells form new bone tissue?

_____

_____

_____

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The Skeletal System

Guide for Reading

- What are the functions of the skeleton?
- What role do joints play in the body?
- What are the characteristics of bone, and how can you keep your bones strong and healthy?

The **skeleton** is made up of all the bones in one's body. **Your skeleton has five major functions. It provides shape and support, enables you to move, protects your organs, produces blood cells, and stores minerals and other materials until your body needs them.** The backbone, or vertebral column, is the center of the skeleton. The backbone is made up of 26 small bones, or **vertebrae** (singular *vertebra*). If your backbone were just one bone, you would not be able to bend or twist.

A **joint** is a place in the body where two bones come together. **Joints allow bones to move in different ways.** Immovable joints connect bones in a way that allows little or no movement. Movable joints allow the body to make a wide range of movements. The bones in movable joints are held together by a strong connective tissue called a **ligament. Cartilage** is a connective tissue that is more flexible than bone.

Bones are complex living structures that undergo growth and development. A thin, tough membrane covers all of a bone except the ends. Blood vessels and nerves enter and leave the bone through the membrane. Beneath the membrane is a layer of **compact bone,** which is hard and dense, but not solid. Small canals run through the compact bone, carrying blood vessels and nerves from the bone's surface to the living cells within the bone. Just inside the compact bone is a layer of **spongy bone,** which has many small spaces within it. Spongy bone is also found at the ends of the bone. The spaces in bone contain a soft connective tissue called **marrow.** There are two types of marrow—red and yellow. Red bone marrow produces blood cells. Yellow marrow stores fat that serves as an energy reserve.

The bones of your skeleton are both strong and lightweight. Bones are hard because they are made up of two minerals—phosphorus and calcium. New bone tissue forms continually throughout your life.

A combination of a balanced diet and regular exercise are important for a lifetime of healthy bones. As people become older, their bones begin to lose some minerals. Mineral loss can lead to **osteoporosis,** a condition in which the body's bones become weak and break easily. Regular exercise and a diet rich in calcium can help prevent osteoporosis.

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Name _____ Date _____ Class _____

The Skeletal System

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. Name the five functions of the skeleton.
2. What lifestyle choices help keep bones healthy and strong?
3. What do movable joints enable the body to do? What are the four types of movable joints?

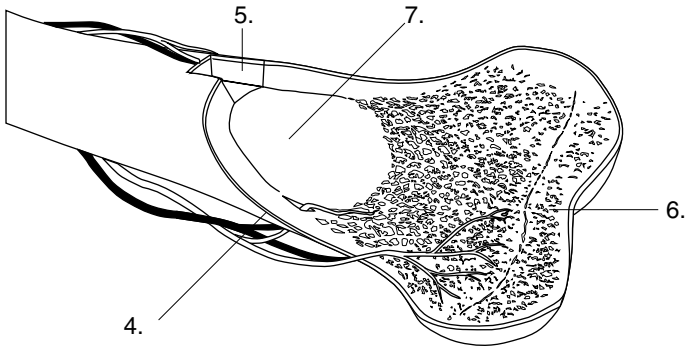
Label the numbered parts of the femur below in the spaces provided.

4. _____

5. _____

6. _____

7. _____



Building Vocabulary

Fill in the blank to complete each statement.

8. A place in the body where two bones come together is a(n) _____.
9. _____ is a condition in which the body's bones become weak and break easily.
10. A(n) _____ is one of the 26 small bones that make up your backbone.
11. The tip of your nose is able to move from side to side because it is made up of a connective tissue that is more flexible than bone. This type of tissue is called _____.
12. A(n) _____ is the strong connective tissue that holds the bones together in a movable joint.

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Diagnosing Bone and Joint Injuries

Guide for Reading

- What are some injuries of the skeletal system and how can they be identified?
- How can bone and joint injuries be treated?

Three common skeletal system injuries are fractures, dislocations, and sprains. A **fracture,** or a break in a bone, can occur when you fall so that all of your weight is placed on only a few bones. A **dislocation** occurs when a bone comes out of its joint. A **sprain** occurs when ligaments are stretched too far and tear in places. Sprains are the most common joint injuries.

Two ways to identify injuries of the skeletal system are X-rays and magnetic resonance imaging. X-ray images can determine whether bones have been broken. **X-rays** are a form of energy that travels in waves. Because most X-rays pass through the skin and other body tissues, the X-rays strike the photographic film beneath the area. Unlike other body tissues, bone absorbs X-rays. Absorbed X-rays do not reach the film. After the film is developed, it shows bones as clearly defined white areas. X-rays cannot be used to view injuries to soft tissues, such as muscle, and internal organs.

A more recently developed method for taking clear images of both the bones and soft tissues of the body is called **magnetic resonance imaging,** or MRI. In MRI, a person is exposed to short bursts of magnetic energy. This magnetic energy causes atoms within the body to vibrate, or resonate. A computer then analyzes the vibration patterns and produces an image of the area. MRI can show clear images of muscles and other soft tissues that an X-ray image cannot show.

If a doctor determines that you have a broken bone, you will usually have to wear a cast. **In addition to wearing a cast, two other ways to treat skeletal system injuries include surgical procedures such as joint replacement and arthroscopy.** People who have **arthritis,** a disease of the joints that makes movement painful, may benefit from joint replacement. During surgery, the natural joint is removed and an artificial one is cemented in its place. Joint injuries can also be treated by arthroscopy. Doctors make a small incision and insert a slim, tubelike instrument called an **arthroscope** into the joint. This allows doctors to look inside the joint to see what is wrong. After the problem is diagnosed, tiny instruments are inserted through one or more additinal small incisions to make the necessary repairs.

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Name _____ Date _____ Class _____

Diagnosing Bone and Joint Injuries

Understanding Main Ideas

Answer the following questions in the space provided.

1. How are X-ray images produced? What type of injuries can X-rays be used to diagnose?

_____

_____

_____

2. What are some disadvantages of X-rays? Some advantages?

_____

_____

_____

3. How are MRI images produced? What type of injuries can MRI be used to diagnose?

_____

_____

_____

4. What are some advantages of MRIs? Some disadvantages?

_____

_____

_____

Building Vocabulary

Write a definition for each of the following terms on the lines provided.

5. fracture _____

_____

_____

6. sprain _____

_____

_____

7. arthritis _____

_____

_____

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The Muscular System

Guide for Reading

- What types of muscles are found in the body?
- Why do skeletal muscles work in pairs?

There are about 600 muscles in your body. The muscles that are not under your conscious control are called **involuntary muscles.** Involuntary muscles are responsible for activities such as breathing and digesting food. The muscles that are under your control are called **voluntary muscles.** Smiling and turning the pages in a book are actions of voluntary muscles.

Your body has three types of muscle tissue—skeletal muscle, smooth muscle, and cardiac muscle. Some of these muscle tissues are involuntary, and some are voluntary. Skeletal muscles are attached to the bones of your skeleton. At the end of a skeletal muscle is a tendon. A **tendon** is a strong connective tissue that attaches muscle to bone. Because you have conscious control of skeletal muscles, they are classified as voluntary muscles. These muscles provide the force that moves your bones. Skeletal muscles react quickly and tire quickly. Skeletal muscle cells appear banded, or striated. For this reason, they are sometimes called **striated muscles.**

Smooth muscles are called involuntary muscles because they work automatically. They are inside many internal organs of the body, and control many types of movements inside your body, such as those involved in the process of digestion. Smooth muscles react more slowly and tire more slowly than skeletal muscles. **Cardiac muscles** are involuntary muscles found only in the heart. Cardiac muscles do not get tired.

Muscles work by contracting, or becoming shorter and thicker. **Because muscle cells can only contract, not extend, skeletal muscles must work in pairs. While one muscle contracts, the other muscle in the pair relaxes to its original length.** For example, in order to move the lower arm, the biceps muscle on the front of the upper arm contracts to bend the elbow. This lifts the forearm and hand. As the biceps contracts, the triceps on the back of the upper arm returns to its original length. To straighten the elbow, the triceps muscle contracts while the biceps returns to its original length.

Exercise is important for maintaining both muscular strength and flexibility. Exercise makes individual muscle cells grow wider, thicker, and stronger. Sometimes, muscle injuries such as strains and cramps, can occur. Resting the injured area can help it heal.

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Name _____ Date _____ Class _____

Bones, Muscles, and Skin ▪ *Skills Lab*

A Look Beneath the Skin

Problem

What are some characteristics of skeletal muscles? How do skeletal muscles work?

Skills Focus

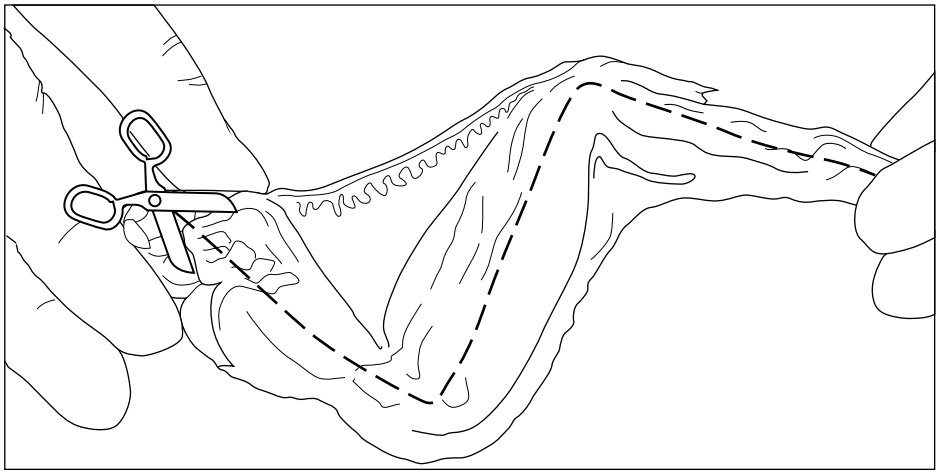
observing, inferring, classifying

Materials

water
paper towels
scissors
dissecting tray
uncooked chicken wing, treated with bleach

Procedure

1. Put on goggles, an apron, and protective gloves. **CAUTION:** *Wear gloves whenever you handle the chicken.*
2. Your teacher will give you a chicken wing. Rinse it well with water, dry it with paper towels, and place it in a dissecting tray.
3. Carefully extend the wing to find out how many major parts it has. Draw a diagram of the external structure. Label the upper arm, elbow, lower arm, and hand (wing tip).
4. Use scissors to remove the skin. Cut only through the skin. **CAUTION:** *Cut away from your body and your classmates.*



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5. Examine the muscles, the bundles of pink tissue around the bones. Find the two groups of muscles in the upper arm. Hold the arm down at the shoulder, and alternately pull on each muscle group. Observe what happens.
6. Find the two groups of muscles in the lower arm. Hold down the arm at the elbow, and alternately pull on each muscle group. Then make a diagram of the wing's muscles.
7. Find the tendons—shiny white tissue at the ends of the muscles. Notice what parts the tendons connect. Add the tendons to your diagram.
8. Remove the muscles and tendons. Find the ligaments, which are the whitish ribbon-shaped structures between bones. Add them to your diagram.
9. Dispose of the chicken parts according to your teacher's instructions. Wash your hands.

Analyze and Conclude

Write your answers on a separate sheet of paper.

1. **Observing** How does a chicken wing move at the elbow? How does the motion compare to how your elbow moves? What type of joint is involved?
2. **Inferring** What happened when you pulled on one of the arm muscles? What muscle action does the pulling represent?
3. **Classifying** Categorize the muscles you observed as smooth, cardiac, or skeletal.
4. **Communicating** Why is it valuable to record your observations with accurate diagrams? Write a paragraph in which you describe what your diagrams show.

More to Explore

Use the procedures from this lab to examine an uncooked chicken thigh and leg. Compare how the chicken leg and a human leg move. *Obtain your teacher's permission before carrying out your investigation.*

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Name _____ Date _____ Class _____

Sun Safety

Problem

How well do different materials protect the skin from the sun?

Skills Focus

observing, predicting, interpreting data, drawing conclusions

Materials

scissors
photosensitive paper
metric ruler
white construction paper
stapler
pencil
resealable plastic bag
plastic knife
2 sunscreens with SPF ratings of 4 and 30
staple remover
3 different fabrics

Procedure

PART 1 Sunscreen Protection

1. Read over the procedure for Part 1. Then, write a prediction about how well each of the sunscreens will protect against the sun.
2. Use scissors to cut two strips of photosensitive paper that measure 5 cm by 15 cm.
3. Divide each strip into thirds by drawing lines across the strips.
4. Cover one third of each strip with a square of white construction paper. Staple each square down.

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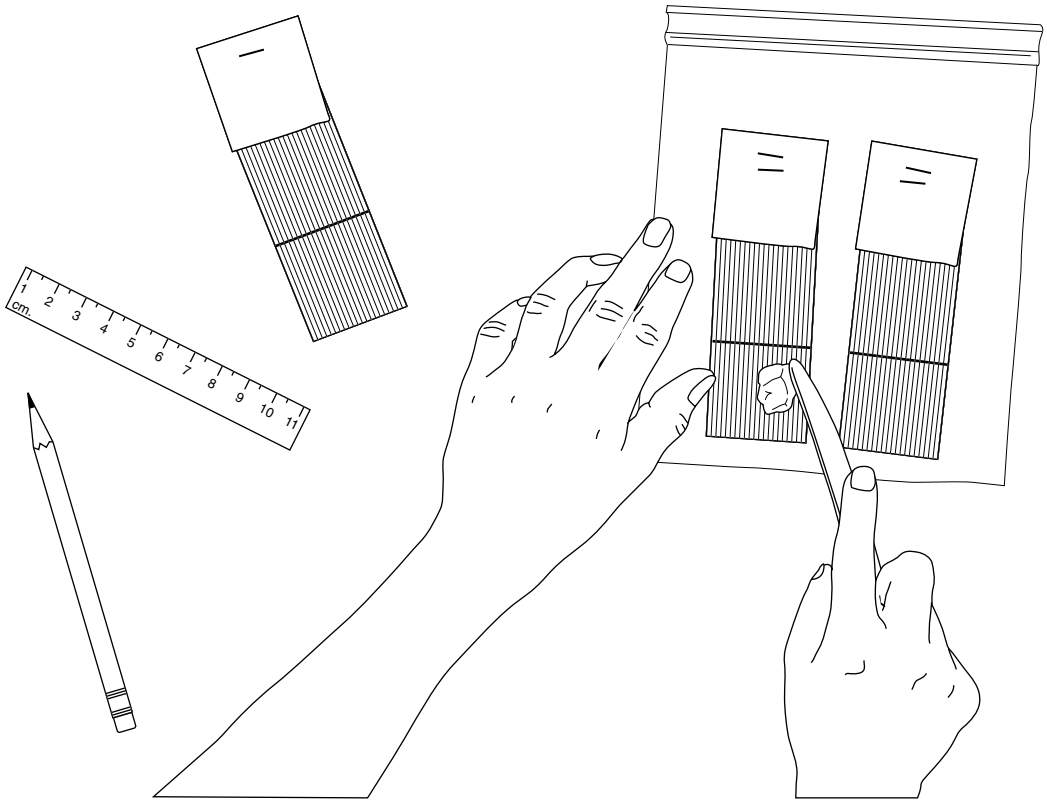

5. Use a pencil to write the lower SPF rating on the back of the first strip. Write the other SPF rating on the back of the second strip.
6. Place the two strips side by side in a plastic bag. Seal the bag, then staple through the white squares to hold the strips in place.
7. With a plastic knife, spread a thin layer of each sunscreen on the bag over the bottom square of its labeled strip. This is shown in the diagram above. Make certain each strip has the same thickness of sunscreen. Be sure not to spread sunscreen over the middle squares.
8. Place the strips in sunlight until the color of the middle squares stops changing. Make sure the bag is sunscreen-side up when you place it in the sunlight.
9. Remove the staples from the bag, and then take out the strips. Take off the construction paper. Rinse the strips for one minute in cold water, then dry them flat.
10. Observe all the squares. Then, record your observations.

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Sun Safety *(continued)*

PART 2 Fabric Protection

11. Your teacher will provide three fabric pieces of different thicknesses.

12. Based on the procedure in Part 1, design an experiment to test how effective the three fabrics are in protecting against the sun. Write a prediction about which fabric you think will be most effective, next most effective, and least effective.

13. Obtain your teacher's approval before carrying out your experiment. Record all of your observations.

Analyze and Conclude

Write your answers on a separate sheet of paper.

1. **Observing** Did the sunscreens protect against sun exposure? How do you know?
2. **Predicting** Which sunscreen provided more protection? Was your prediction correct? How would you predict a sunscreen with an SPF of 15 would compare to the sunscreens you tested?
3. **Interpreting Data** Did the fabrics protect against sun exposure? How do you know?
4. **Drawing Conclusions** Which of the fabrics provided the most protection? The least protection? How did your results compare with your predictions?
5. **Communicating** What advice would you give people about protecting their skin from the sun? Create a pamphlet in which you address this question by comparing the different sunscreens and fabrics you tested.

More to Explore

Design another experiment, this time to find out whether ordinary window glass protects skin against sun exposure. *Obtain your teacher's permission before carrying out your investigation.*

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The Skin

Guide for Reading

- What are the functions and the structures of skin?
- What habits can help keep your skin healthy?

The skin performs several major functions in the body. **The skin covers and protects the body from injury, infection, and water loss. The skin also helps regulate body temperature, eliminate wastes, gather information about the environment, and produce vitamin D.**

The skin is organized into two main layers, the epidermis and the dermis. The **epidermis** is the outermost layer of the skin. The epidermis does not have nerves or blood vessels. Cells in the epidermis have a definite life cycle. New cells form deep in the epidermis, gradually mature, and move upward. When these cells die, they become part of the surface layer of the epidermis. Soon, these cells are shed and replaced by the dead cells below them. Cells deep in the epidermis produce **melanin,** a pigment, or colored substance, that gives skin its color. The more melanin in your skin, the darker it is. Melanin production helps to protect the skin from burning.

The **dermis** is the inner layer of the skin. It contains nerves, blood vessels, sweat glands, hairs, and oil glands. Sweat glands produce perspiration, which reaches the surface through openings called **pores.** Strands of hair grow within the dermis in structures called **follicles.** Oil produced in glands around the hair follicles waterproofs the hair. In addition, oil helps to keep the skin moist.

Three simple habits can help you keep your skin healthy. Eat a healthful diet. Keep your skin clean and dry. Limit your exposure to the sun.

Eating a well-balanced diet and drinking plenty of water are important for healthy skin. Good washing habits can get rid of dirt and harmful bacteria, and can help control oiliness.

Repeated exposure to sunlight can damage skin cells and cause them to become cancerous. **Cancer** is a disease in which some body cells divide uncontrollably. Wearing sunscreen and limiting sun exposure can protect skin from sun damage.

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Name _____ Date _____ Class _____

The Skin

Understanding Main Ideas

Answer the following questions in the spaces provided.

1. List the functions of the skin.

_____

_____

_____

2. How do the dead cells of the epidermis help the body?

_____

_____

3. What structures does the dermis contain?

_____

_____

4. How can you help to keep your skin healthy?

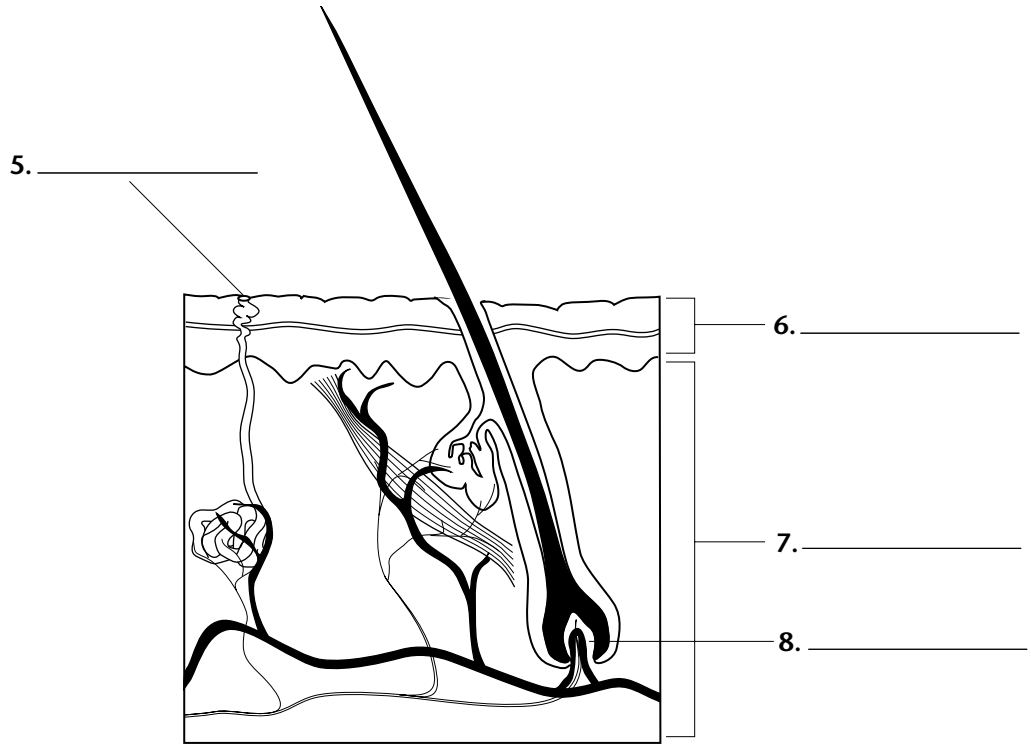
_____

_____

Building Vocabulary

Use the vocabulary below to label the following diagram.

pore epidermis hair follicle dermis



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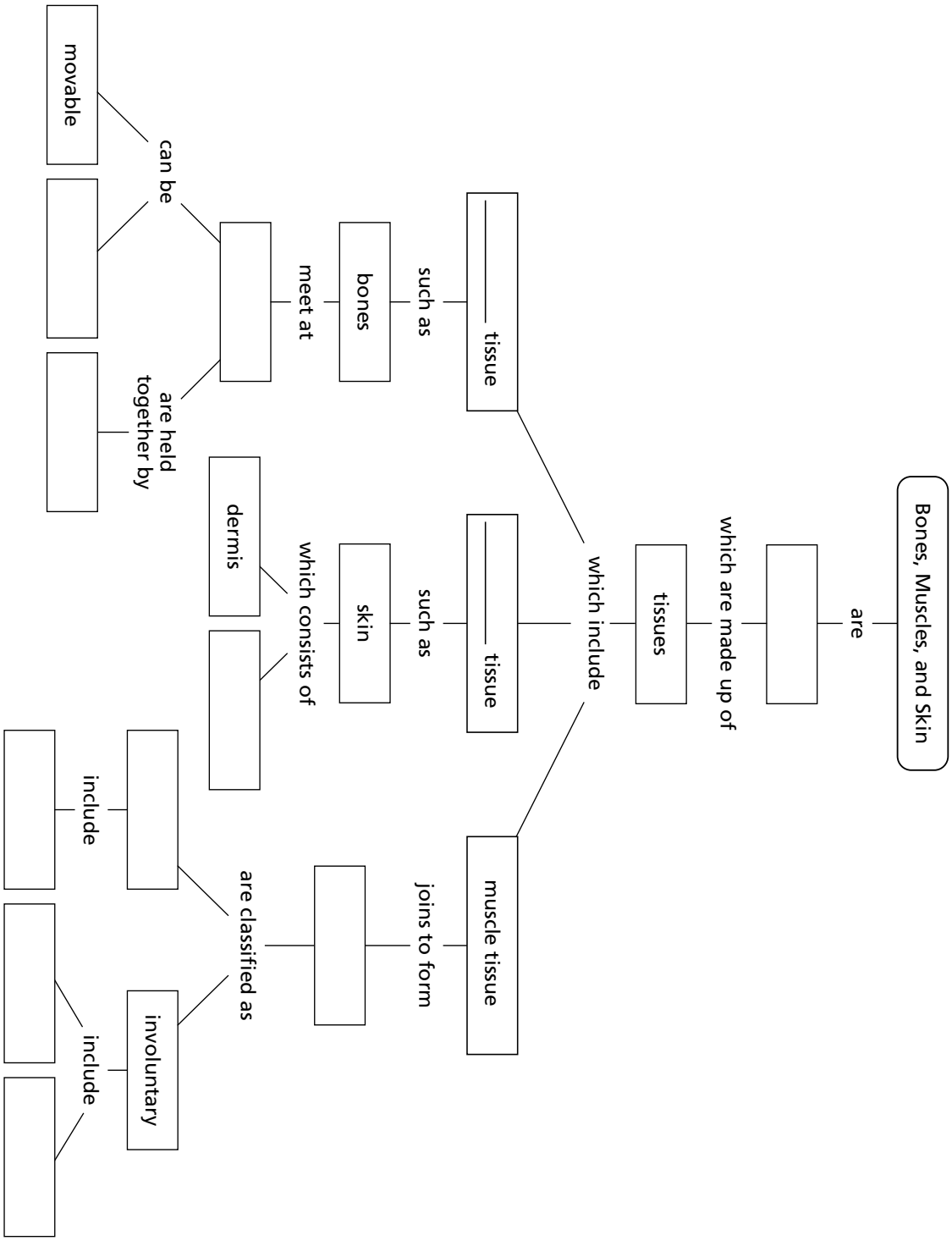
Name _____ Date _____ Class _____

Connecting Concepts

Develop a concept map that uses the Key Concepts and Key Terms from this chapter. Keep in mind the big idea of this chapter. The concept map shown is one way to organize how the information in this chapter is related. You may use an extra sheet of paper.



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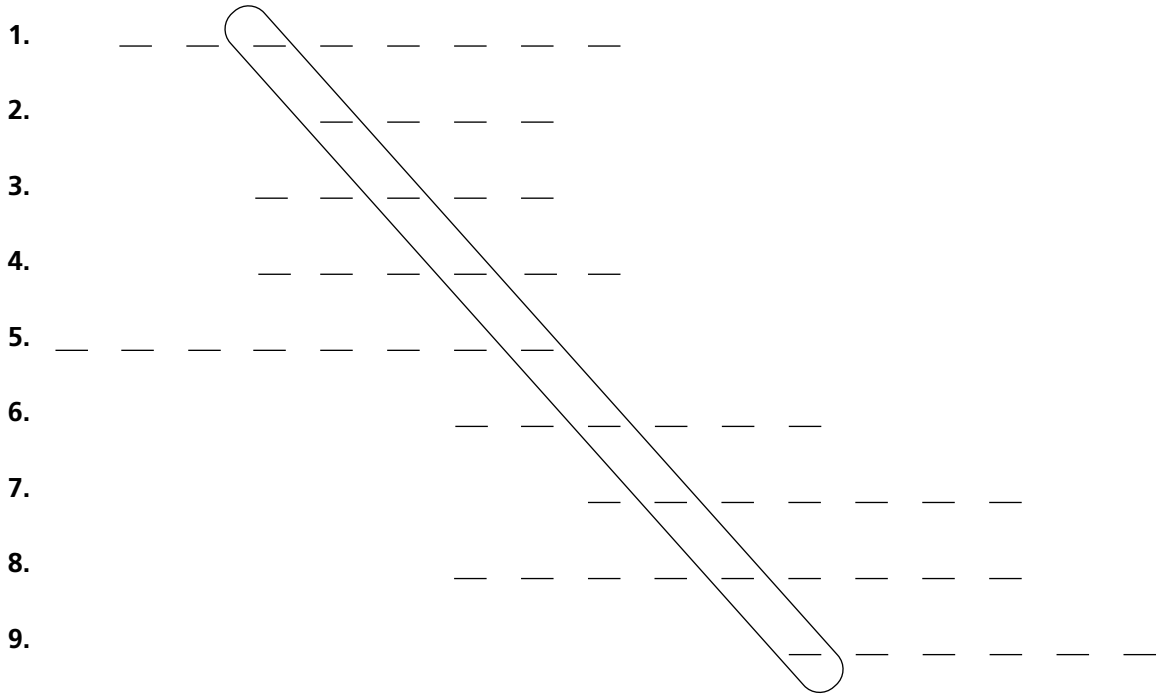
Name _____ Date _____ Class _____

Key Terms

Use the clues below to identify Key Terms from the chapter. Write the terms on the lines, putting one letter in each blank. When you finish, the word enclosed in the diagonal circle will reveal the name of the outermost layer of skin.

Clues

1. Muscles attached to the bones of the skeleton are _____ muscles.
2. An opening in the dermis through which perspiration reaches the surface of the skin
3. A place in the body where two bones come together
4. A strong connective tissue that attaches muscle to bone
5. A break in a bone
6. A soft connective tissue found in the spaces in bone
7. A method for taking clear images of bones and soft tissues is magnetic resonance _____.
8. A connective tissue that makes up the skeleton that is more flexible than bone
9. A torn or stretched ligament



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