Glencoe Science

Biology

Interactive Classroom

Click the advance arrow or press the space bar to continue

Mc Graw Hill Glencoe

Chapter 32 Integumentary, Skeletal, and Muscular Systems

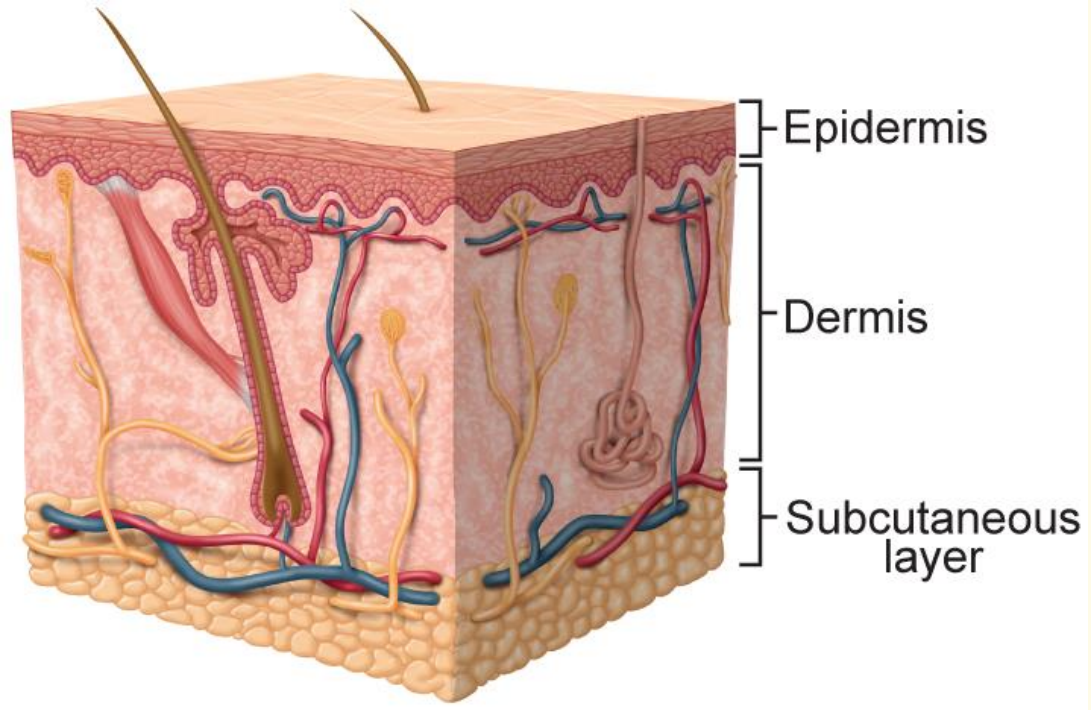
EXIT

Click on a lesson name to select.

32.1 The Integumentary System

The Structure of the Skin

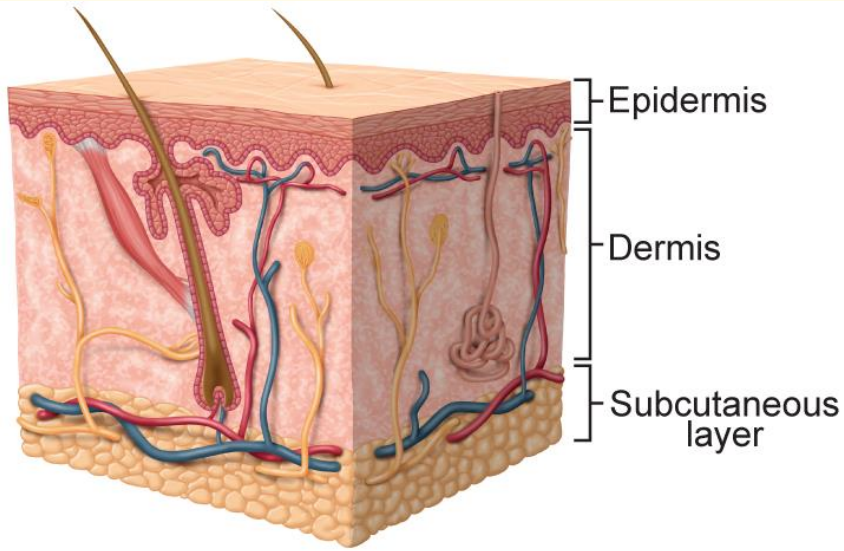
- Skin is a multilayered organ that covers and protects the body.



32.1 The Integumentary System

The Epidermis

- The outer superficial layer of skin is the epidermis.
- The outer layers of epidermal cells contain keratin, which waterproofs and protects the cells and tissues that lie underneath.



32.1 The Integumentary System

- The inner layer of the epidermis contains cells that continually are dividing by mitosis to replace cells that are lost or die.
- Some cells in the inner layer of the epidermis provide protection from harmful ultraviolet radiation by making a pigment called melanin.

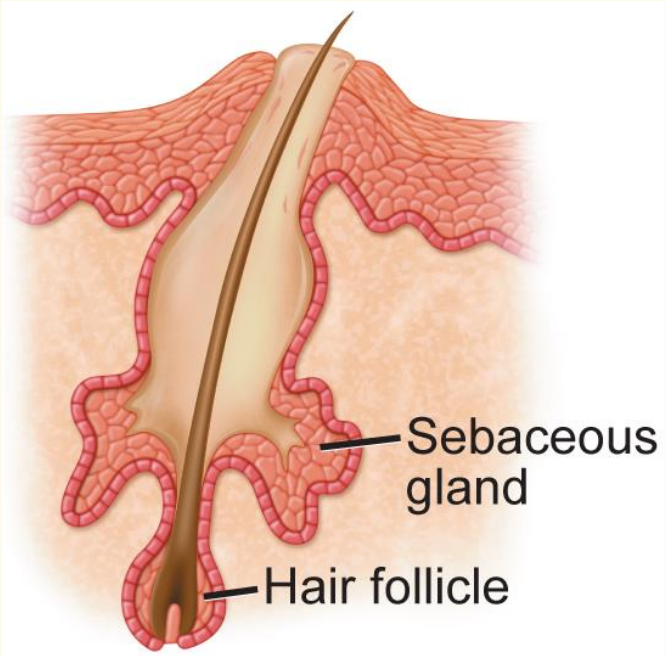
32.1 The Integumentary System

The Dermis

- Directly beneath the epidermis is the dermis.
- The dermis consists of connective tissue, nerve cells, muscle fibers, sweat glands, oil glands, and hair follicles.
- Below the dermis layer is the subcutaneous layer, a layer of connective tissue that stores fat and helps the body retain heat.

32.1 The Integumentary System

Hair and Nails



- Both hair and nails contain keratin and develop from epithelial cells.
- Hair cells grow out of narrow cavities in the dermis called hair follicles.
- Hair follicles usually have sebaceous glands associated with them that lubricate the skin and hair.

32.1 The Integumentary System

Functions of the Integumentary System

- Temperature regulation
- Vitamin production
- Protection and senses

32.1 The Integumentary System

Damage to the Skin

- Skin has remarkable abilities to repair itself.
- Without a repair mechanism, the body would be subject to invasion by microbes through breaks in the skin.

32.1 The Integumentary System

Cuts and Scrapes

- Cells deep in the epidermis divide and replace the lost or injured cells.
- When the injury is deep, blood vessels might be injured, resulting in bleeding.
- Infection-fighting white blood cells will help get rid of any bacteria that might have entered the wound.

Healing Dermis

32.1 The Integumentary System

Effects of the Sun and Burns

- Burns, whether caused by the Sun, heat, or chemicals, are classified according to their severity.

32.1 The Integumentary System

Classification of Burns

Severity of burn	Damage	Effect
First-degree	Cells in the epidermis are injured and may die.	• Redness and swelling • Mild pain
Second-degree	Cells deeper in the epidermis die. Cells in the dermis are injured and may die.	• Blisters • Pain
Third-degree	Cells in the epidermis and dermis die. Nerve cells and muscles cells are injured.	• Skin function lost • Healthy skin needs to be transplanted • No pain because of nerve cell damage

Concepts In Motion

Table 32.1 Classification of Burns

Severity of burn	Damage	Effect
	Cells in the epidermis are injured and may die.	• Redness and swelling • Mild pain
	Cells deeper in the epidermis die. Cells in the dermis are injured and may die.	• Blisters • Pain
	Cells in the epidermis and dermis die. Nerve cells and muscles cells are injured.	• Skin function lost • Healthy skin needs to be transplanted • No pain because of nerve cell damage

Third-degree Second-degree First-degree

Drag each option to its corresponding Effect

Reset Submit Show me

32.1 The Integumentary System

Skin Cancer

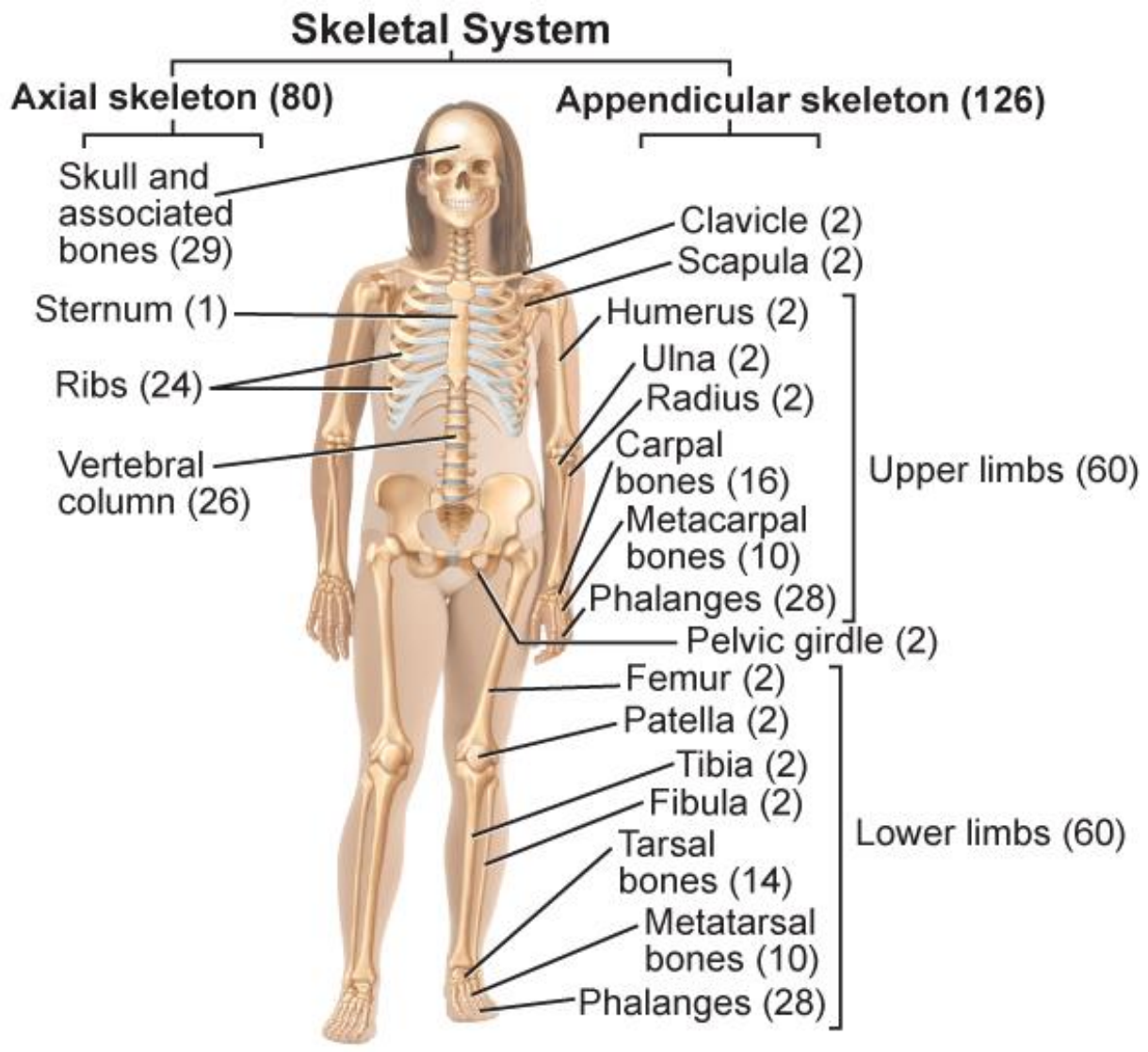
- Ultraviolet radiation can damage the DNA in skin cells, causing those cells to grow and divide uncontrollably.
- There are two main categories of skin cancer: melanoma and nonmelanoma.

32.2 The Skeletal System

Structure of the Skeletal System

- The human skeleton consists of two divisions.
- The axial skeleton includes the skull, vertebral column, the ribs, and the sternum.
- The appendicular skeleton includes the bones of the shoulders, arms, hands, hips, legs, and feet.

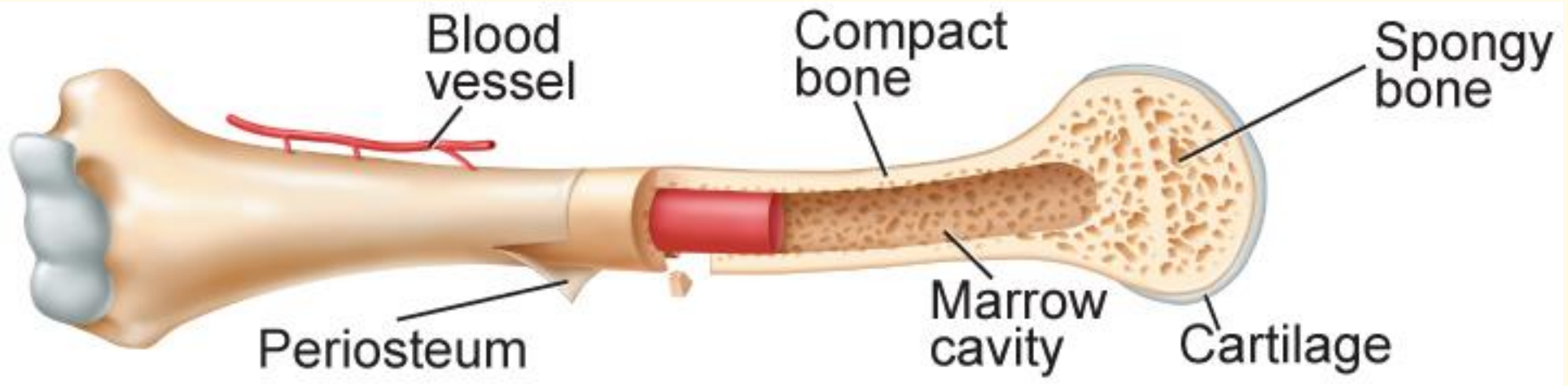
32.2 The Skeletal System



32.2 The Skeletal System

Compact and Spongy Bone

- The outer layers of all bones are composed of compact bone.
- Spongy bone is found at the center of short or flat bones and at the end of long bones.



32.2 The Skeletal System

- There are two types of bone marrow.
- Red and white blood cells and platelets are produced in red bone marrow.
- Yellow bone marrow consists of stored fat.

32.2 The Skeletal System

Formation of Bone

- During fetal development, cells in fetal cartilage develop into bone-forming cells called osteoblasts.
- Osteoblasts are the cells responsible for the growth and repair of bones.

32.2 The Skeletal System

Remodeling of Bone

- Bones constantly are being remodeled, which involves replacing old cells with new cells.
- Cells called osteoclasts break down bone cells, which are replaced by new bone tissue.

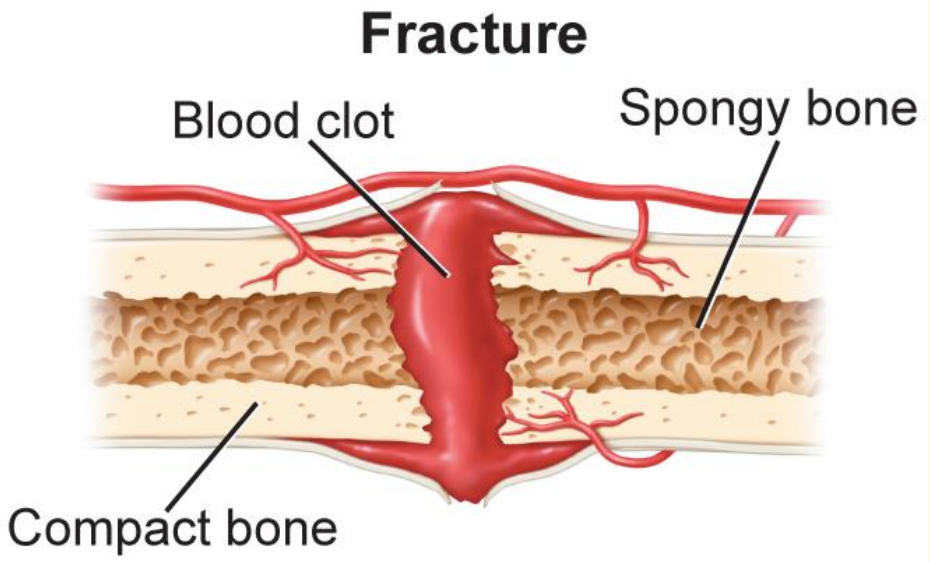
32.2 The Skeletal System

Repair of Bone

- When a bone breaks but does not come through the skin, it is a simple fracture.
- A compound fracture is one in which the bone protrudes through the skin.
- A stress fracture is a thin crack in the bone.

32.2 The Skeletal System

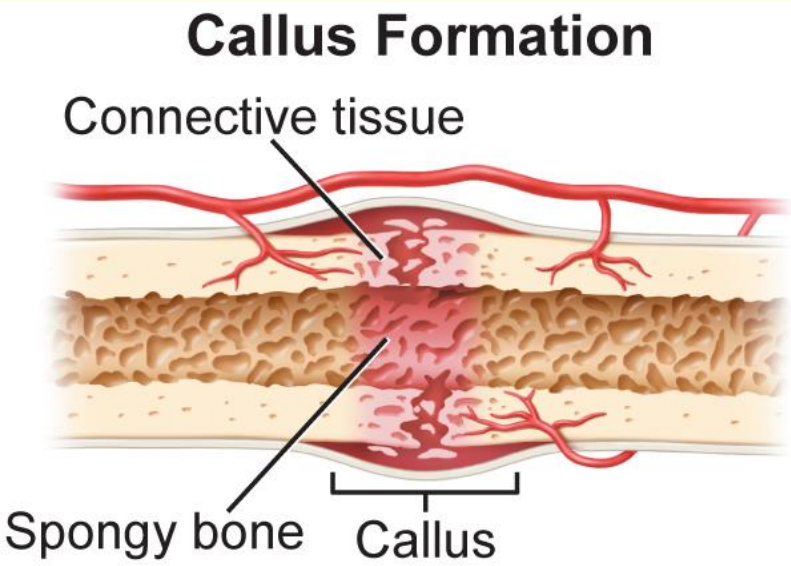
Fracture



- A blood clot forms between the broken ends of the bone and new bone begins to form.
- First, a soft callus of cartilage forms at the location of the break.

32.2 The Skeletal System

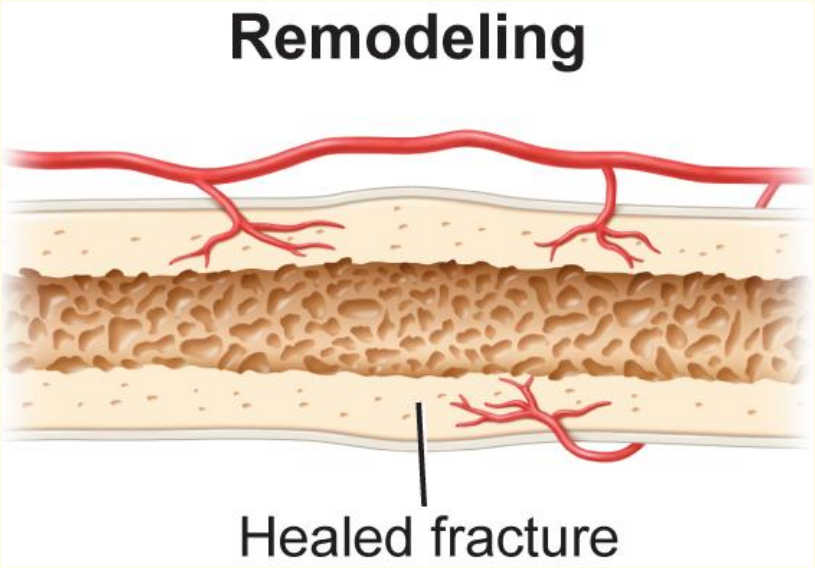
Callus Formation



- Osteoblasts form a callus made of spongy bone that surrounds the fracture.
- Osteoclasts remove the spongy bone while osteoblasts produce stronger, compact bone.

32.2 The Skeletal System

Remodeling



- Bones require different amounts of time to heal.
- Age, nutrition, location, and severity of the break are all factors.

32.2 The Skeletal System

Joints

- Joints occur where two or more bones meet.
- The bones of joints are held together by ligaments.

joint movements

32.2 The Skeletal System

Some Joints of the Skeletal System		
Name of Joint	Ball-and-Socket	Pivot
Example		
Description	In a ball-and-socket joint, the ball-like surface of one bone fits into a cuplike depression of another bone and allows the widest range of motion of any kind of joint. The joints of the hips and shoulders are ball and socket joints. They allow a person to swing his or her arms and legs.	The primary movement at a pivot joint is rotation. One example of a pivot joint is the elbow joint where two bones of the lower arm, the radius, and the ulna meet. This joint allows a person to twist the lower arm.

32.2 The Skeletal System

	Some Joints of the Skeletal System		
Name of Joint	Hinge	Gliding	Sutures
Example			
Description	In a hinge joint, the convex surface of one bone fits into the concave surface of another bone. Elbows and knees are hinge joints. They allow back-and-forth movement like that of a door hinge.	Gliding joints allow side-to-side and back-and-forth movement. The joints in wrists and ankles are gliding joints. The joints of vertibrae also are gliding joints.	Sutures are joints in the skull that are not movable. There are 22 bones in an adult skull. All skull bones except the lower jaw bone are jointed sutures.

Concepts In Motion
Interactive Table

Some Joints of the Skeletal System

Click here to proceed!

32.2 The Skeletal System

Osteoarthritis

- A painful condition that affects joints and results in the deterioration of the cartilage

Rheumatoid Arthritis

- Affected joints lose strength and function and are inflamed, swollen, and painful.

Bursitis

Sprains

32.2 The Skeletal System

Functions of the Skeletal System

- In addition to providing support for the body, bones act as a point of attachment for muscles to allow movement.
- The skeletal system provides protection for organs and bone marrow.
- Bones are reservoirs for the storage of minerals, such as calcium and phosphorus.

Concepts In Motion

Table 32.3 Functions of the Skeletal System

Function	Description
	• Legs, pelvis, and vertebral column hold up the body • Mandible supports the teeth • Almost all bones support muscles
	• Skull protects the brain • Vertebrae protect the spinal column • Rib cage protects the heart, lungs, and other organs
	• Red bone marrow produces red blood cells, white blood cells, and platelets
	• Stores calcium and phosphorus
	• Attached muscles pull on bones of arms and legs • Diaphragm allows normal breathing

Formation of blood cells | Reservoir | Movement

Support | Protection

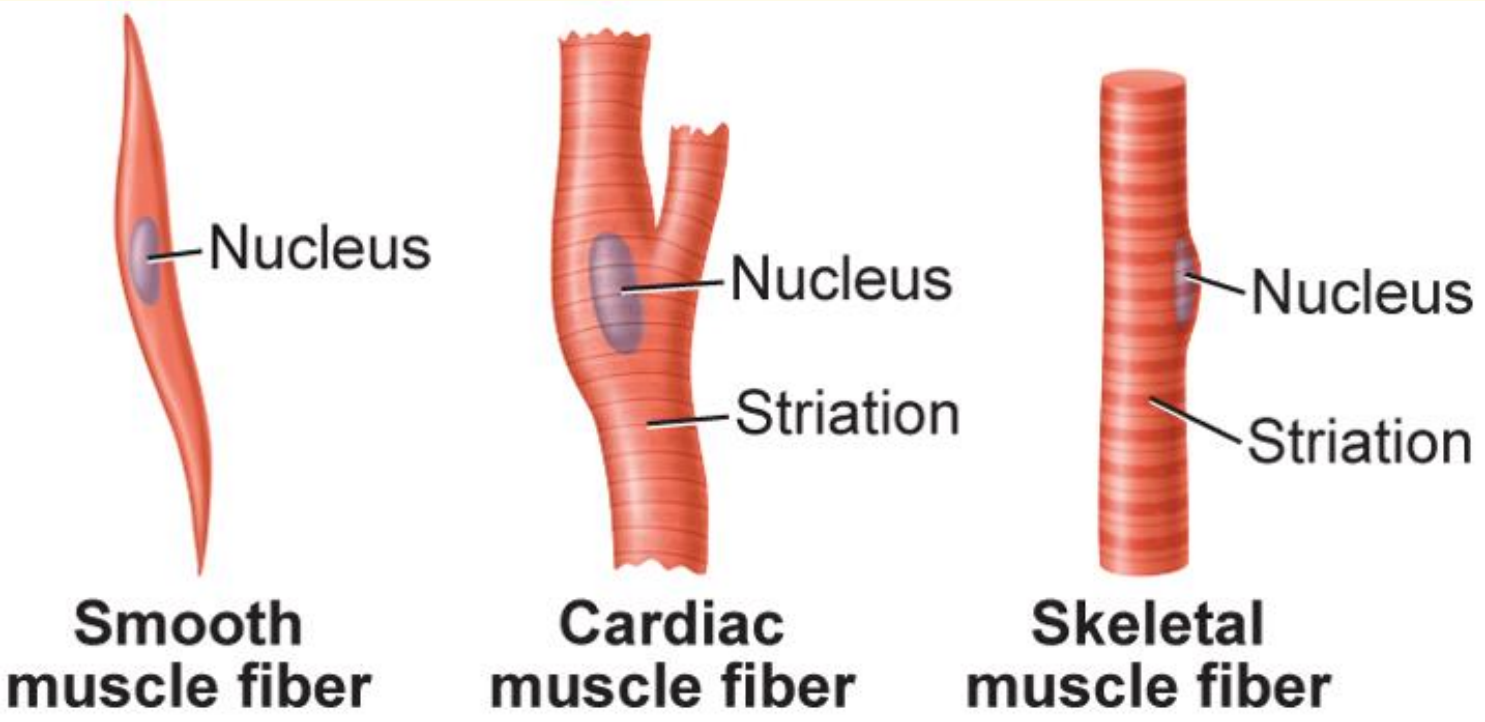
Drag each option to its corresponding Descriptiion

Reset Submit Show me

32.3 The Muscular System

Three Types of Muscle

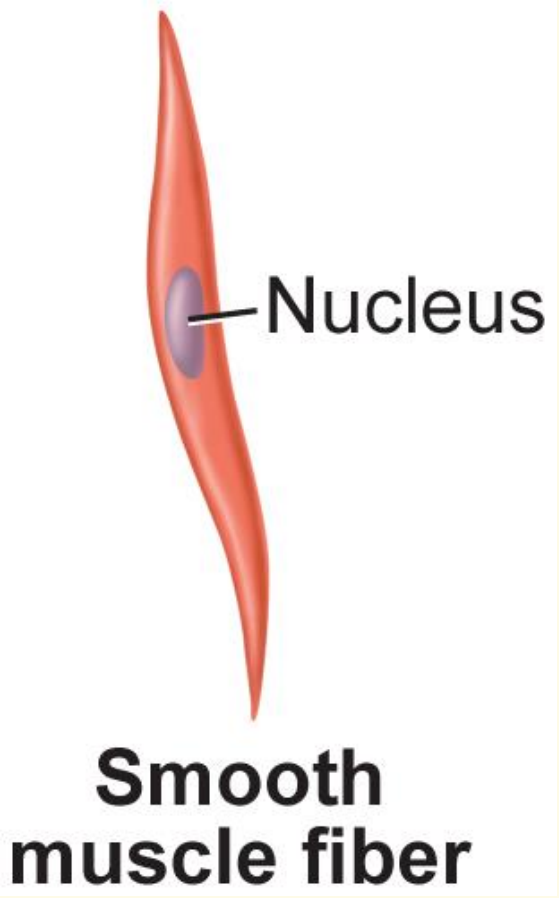
- Muscles are classified according to their structure and function.



32.3 The Muscular System

Smooth Muscle

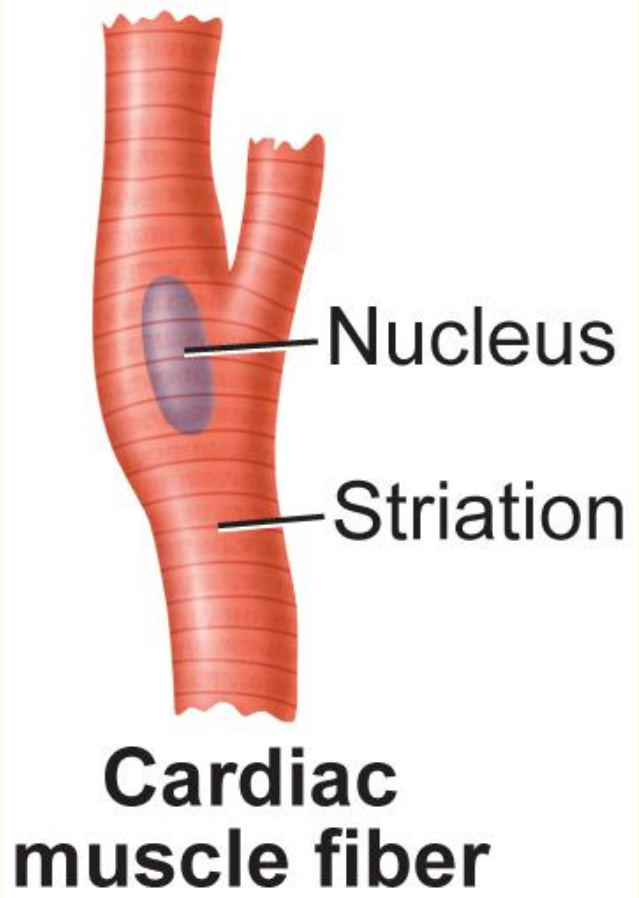
- Many hollow internal organs such as the stomach, intestines, bladder, and uterus are lined with smooth muscle, a type of involuntary muscle.



32.3 The Muscular System

Cardiac Muscle

- The involuntary muscle present only in the heart is called cardiac muscle.

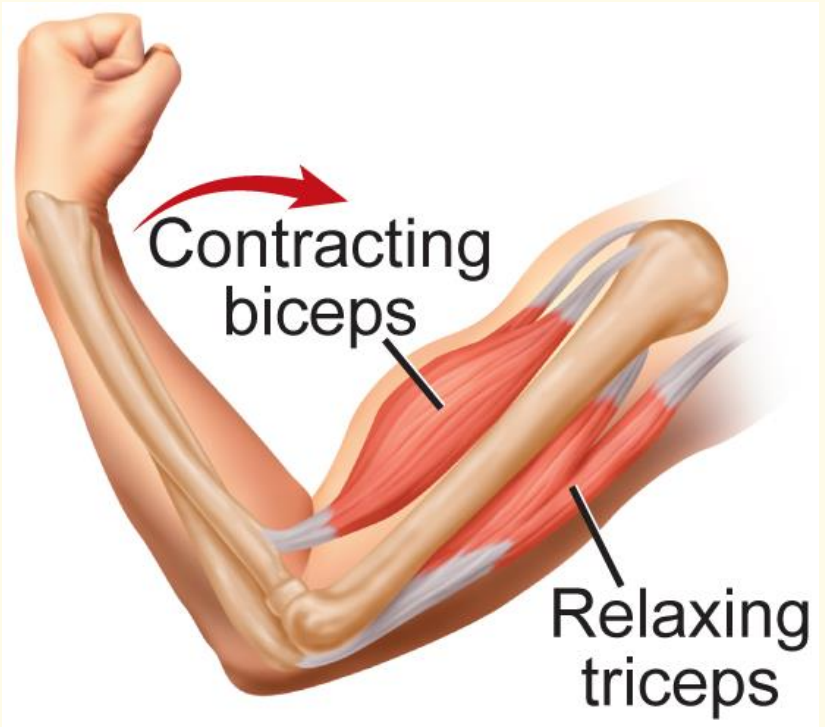


- Cardiac muscle cells are arranged in a network that allows the heart muscle to contract efficiently and rhythmically.

32.3 The Muscular System

Skeletal Muscle

- Skeletal muscles are voluntary muscles that cause movement.



- Tendons connect muscles to bones.

32.3 The Muscular System

Skeletal Muscle Contraction

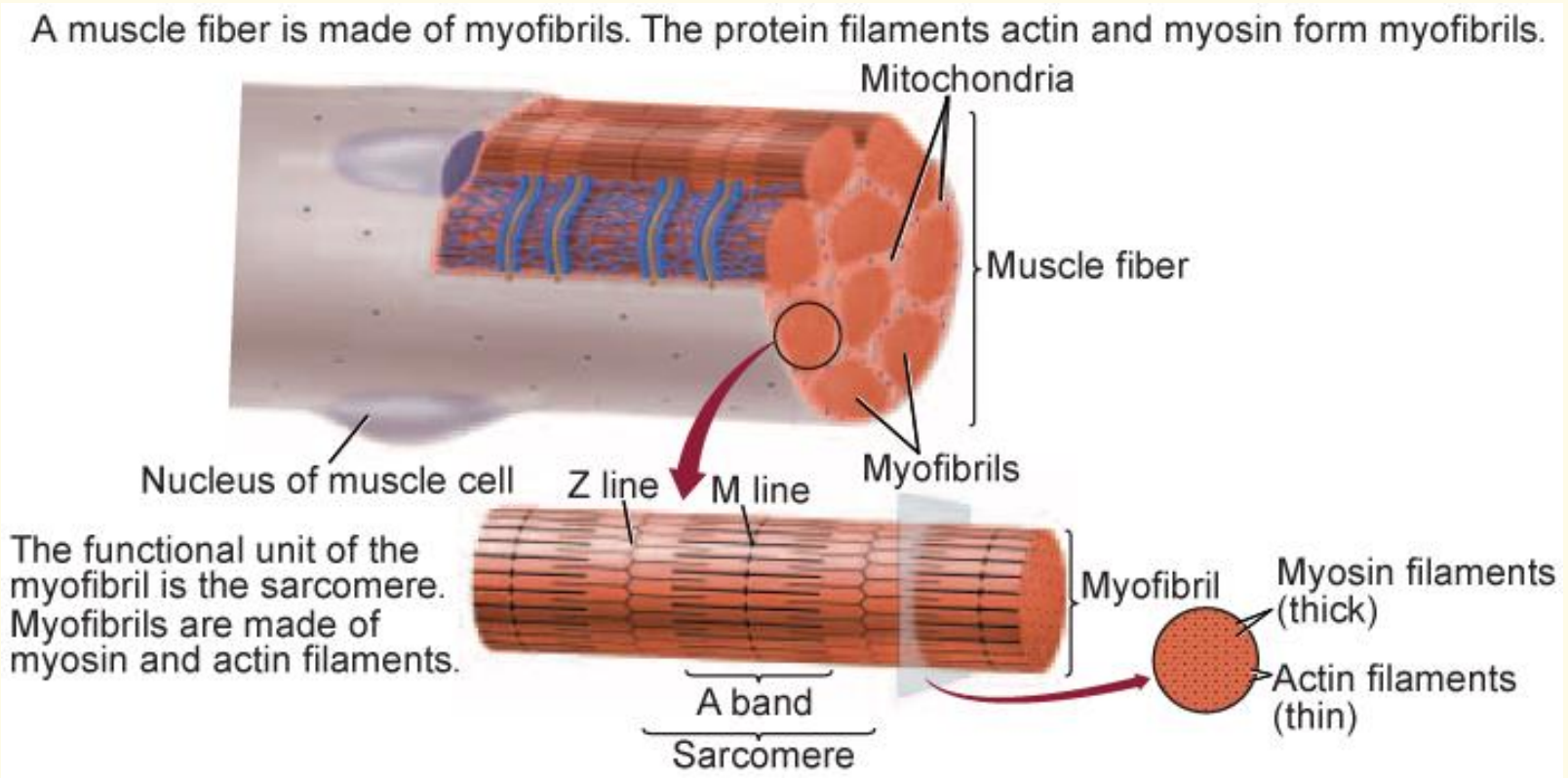
- Most skeletal muscles are arranged in opposing, or antagonistic pairs.

Muscle Contraction

32.3 The Muscular System

- Skeletal muscle is arranged into fibers, which consist of many smaller units called myofibrils.
- Myofibrils consist of even smaller units, myosin and actin.
- Myofibrils are arranged in sections called sacromeres.

32.3 The Muscular System



Concepts In Motion Animation

Visualizing Muscle Contraction

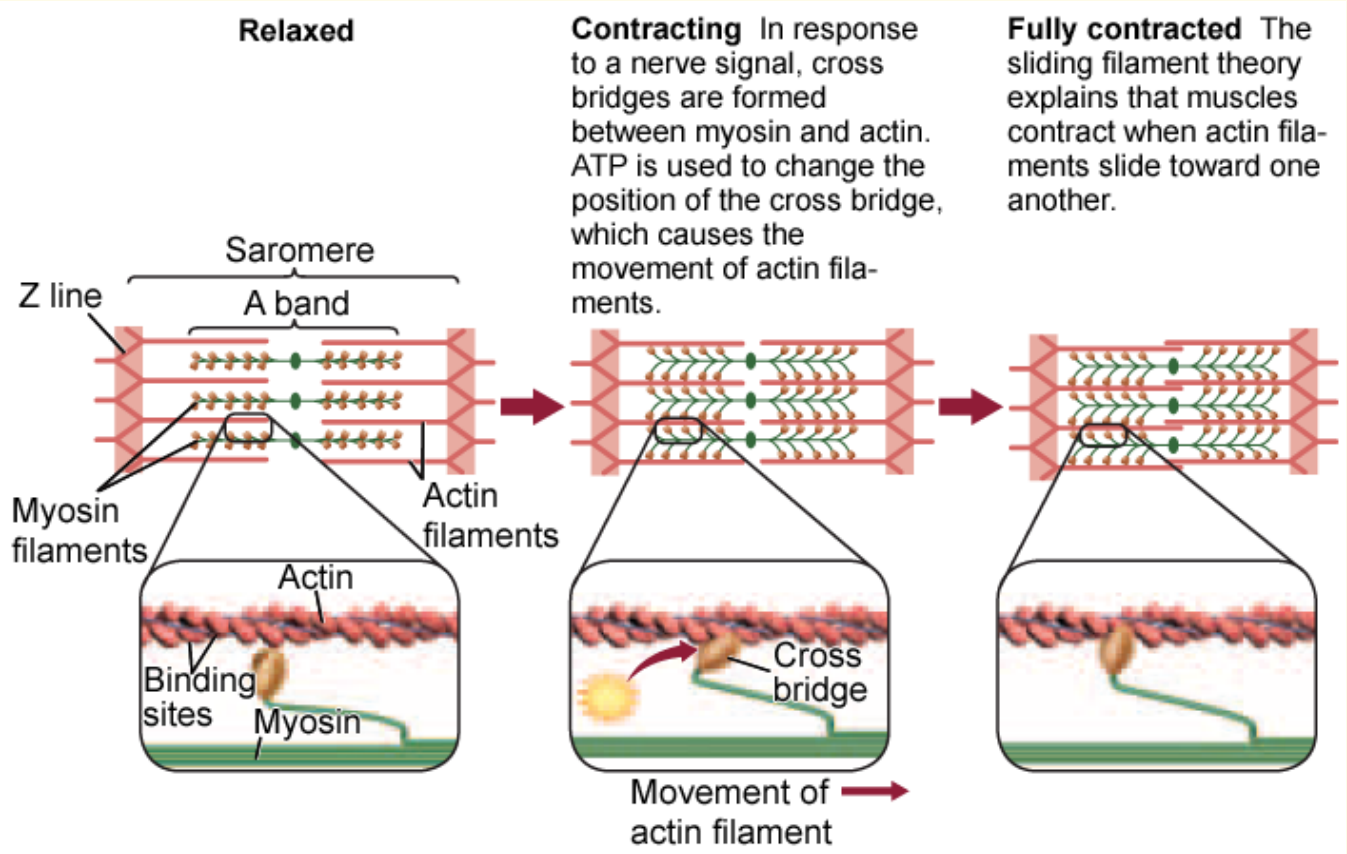
Click here to proceed!

32.3 The Muscular System

Sliding Filament Theory

- Once a nerve signal reaches a muscle, the actin filaments slide toward one another, causing the muscle to contract.

32.3 The Muscular System



Concepts In Motion Animation

Visualizing Muscle Contraction

Click here to proceed!

32.3 The Muscular System

Skeletal Muscle Strength

- Slow-twitch muscles
  - Slow-twitch muscle fibers have more endurance than fast-twitch muscle fibers.
  - They contain myoglobin, a respiratory molecule that stores oxygen and serves as an oxygen reserve.

32.3 The Muscular System

Fast-Twitch Muscles

- Fast-twitch muscle fibers fatigue easily but provide great strength for rapid, short movements.
- They rely on anaerobic metabolism, which causes a buildup of lactic acid.

Chapter Resource Menu

Click on a hyperlink to view the corresponding lesson.

Chapter Diagnostic Questions

CheckPoint

What are the living bone cells?

A. osteoclasts

B. osteocytes

C. cartilage

D. bone marrow

Chapter Diagnostic Questions

CheckPoint

Wrists and ankles have which type of joint?

A. hinge

B. pivot

C. gliding

D. ball-and-socket

Chapter Diagnostic Questions

CheckPoint

Which part of the muscle contracts?

A. tendon

B. myofibril

C. sacromere

D. ligament

32.1 Formative Questions

CheckPoint

What protective protein is contained in the outer layers of epidermal cells?

A. collagen

B. keratin

C. fibrinogen

D. melanin

32.1 Formative Questions

CheckPoint

How do cells in the skin protect the skin from ultraviolet radiation?

A. They secrete oils.

B. They store cutin.

C. They absorb calcium.

D. They produce melanin.

32.1 Formative Questions

CheckPoint

Where are sebaceous glands located?

A. epidermis

B. hair follicles

C. sweat pores

D. subcutaneous tissue

32.1 Formative Questions

CheckPoint

For which type of burn is there usually no pain?

A. first-degree

B. second-degree

C. third-degree

32.1 Formative Questions

CheckPoint

Why is exposure to ultraviolet radiation a significant risk factor for the development of skin cancer?

A. It damages the DNA in skin cells.

B. It causes excess vitamin D production.

C. It mutates melanin molecules in the skin.

D. It causes irregular freckles and moles to appear.

32.2 Formative Questions

CheckPoint

Which division of the skeleton is related to the movement of limbs?

A. axial skeleton

B. appendicular skeleton

32.2 Formative Questions

CheckPoint

What type of tissue is bone?

A. connective tissue

B. epithelial tissue

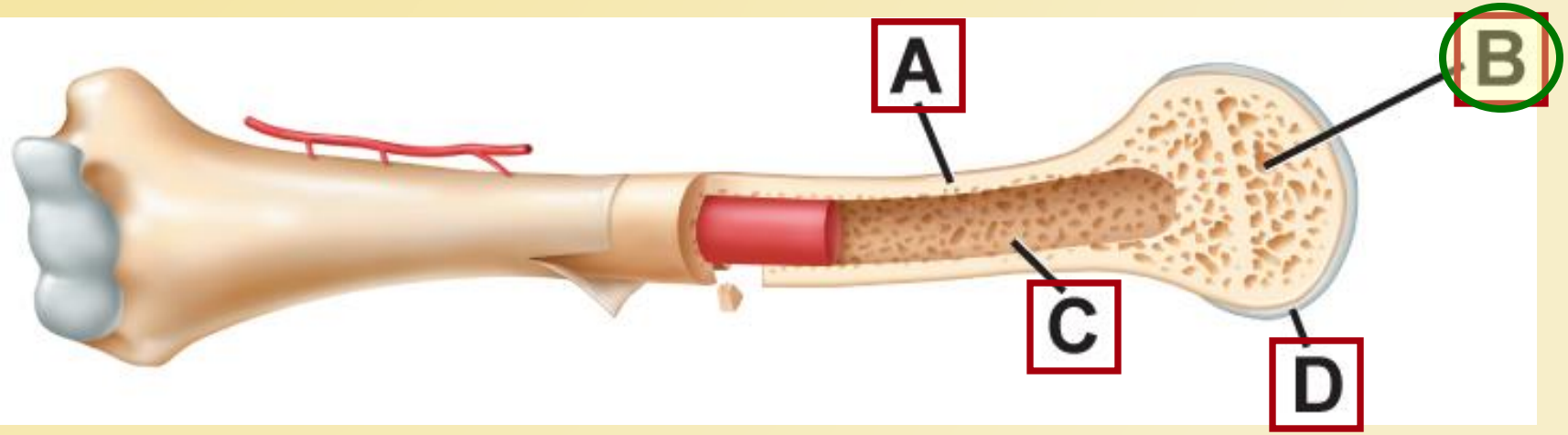
C. integumentary tissue

D. ligamentary tissue

32.2 Formative Questions

CheckPoint

Where in this bone is the spongy bone tissue?



32.2 Formative Questions

CheckPoint

Where in the bone is fat stored?

A. osteons

B. spongy bone

C. bone marrow

D. Haversian canals

32.2 Formative Questions

CheckPoint

How are children's bones different than adult bones?

A. Children's bones have fewer osteoblasts.

B. Children's bones have more red bone marrow.

C. Ossification is slower in children's bones.

D. The osteon system in children's bones is not fully developed.

32.2 Formative Questions

CheckPoint

What results from damage to the ligaments that hold joints together?

A. bursitis

B. tendonitis

C. osteoarthritis

D. a sprain

32.3 Formative Questions

CheckPoint

Which is *not* a characteristic of smooth muscle?

A. It is an involuntary muscle.

B. It has one nucleus per cell.

C. It has striations and stripes.

D. It lines organs of the digestive tract.

32.3 Formative Questions

CheckPoint

Which represents the levels of organization of skeletal muscle from larger to smaller units?

A. fibers → myofibrils → sacromeres → filaments

B. filaments → myofibrils → sacromeres → fibers

C. myofibrils → filaments → fibers → sacromeres

D. sacromeres → myofibrils → filaments → fibers

32.3 Formative Questions

CheckPoint

When a muscle is stimulated by a nerve impulse, what electrolyte is released into the myofibrils?

A. calcium

B. oxygen

C. potassium

D. sodium

32.3 Formative Questions

CheckPoint

What is the main cause of rapid breathing, muscle pain, and muscle fatigue during intense exercise?

A. ATP

B. CO_2

C. iodine

D. lactic acid

32.3 Formative Questions

CheckPoint

Which athlete is most likely to have the highest proportion of slow-twitch muscle fibers?

A. long-distance swimmer

B. mountain-biker

C. sprint runner

D. weight-lifter

32.3 Formative Questions

CheckPoint

Which type of muscle fibers respond to exercise by producing more mitochondria?

A. fast-twitch muscle fibers

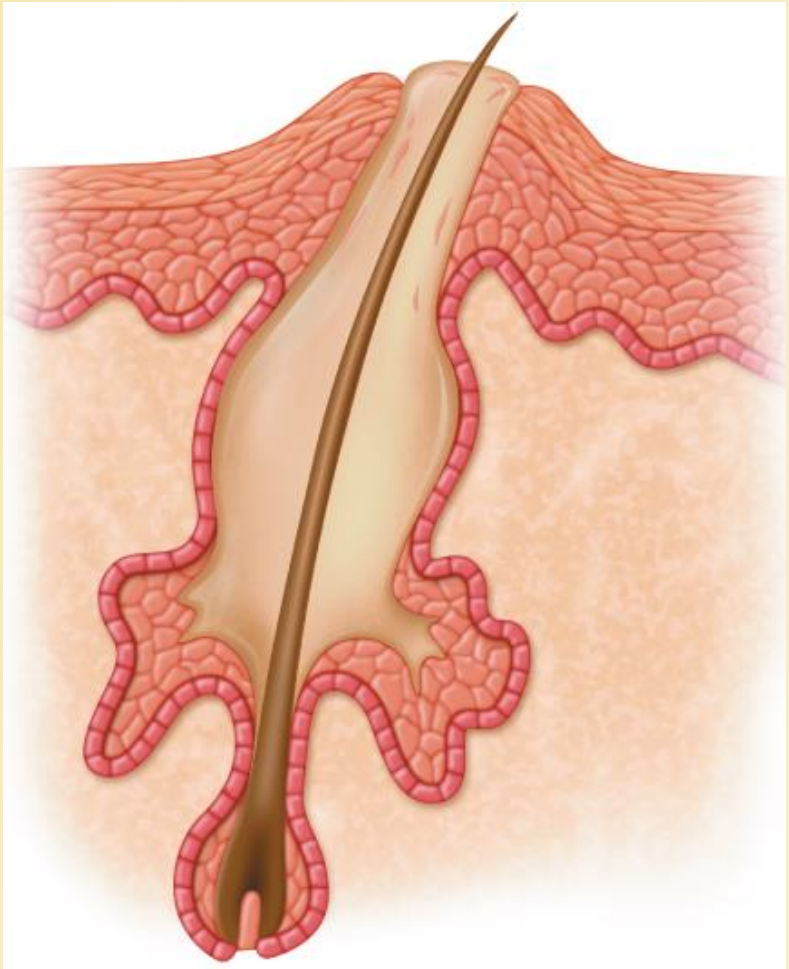
B. slow-twitch muscle fibers

Chapter Assessment Questions

CheckPoint

What might result from a blocked sebaceous gland?

A. acne
B. sweat
C. baldness
D. ingrown hair



Chapter Assessment Questions

CheckPoint

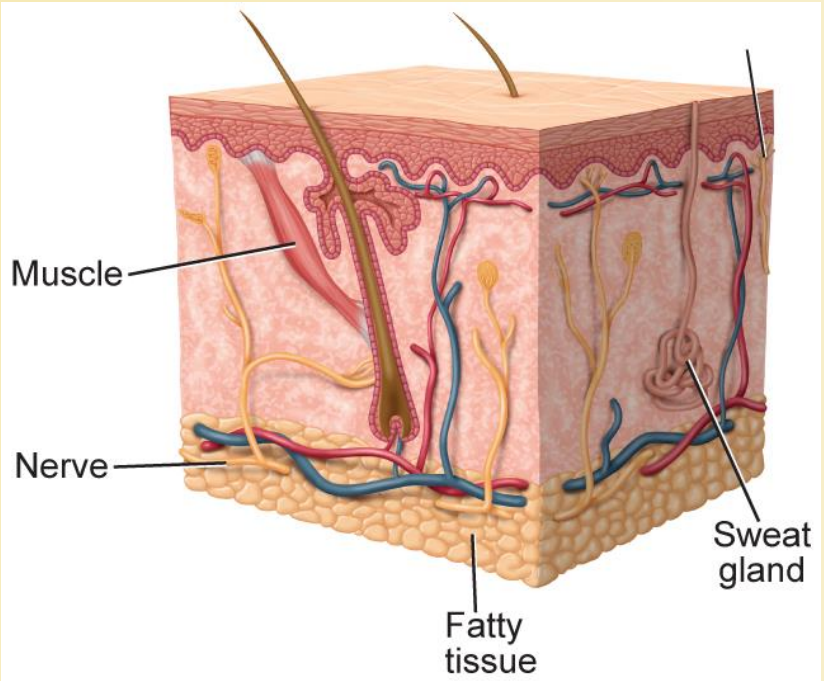
Which structure causes goose bumps?

A. nerves

B. fat

C. sweat glands

D. muscles



Chapter Assessment Questions

CheckPoint

Describe how a cut on the skin heals.

Answer: Blood flows out of the skin and forms a clot and scab. Under the scab, cells multiply to fill the wound. Infection-fighting white blood cells get rid of bacteria.

Standardized Test Practice

CheckPoint

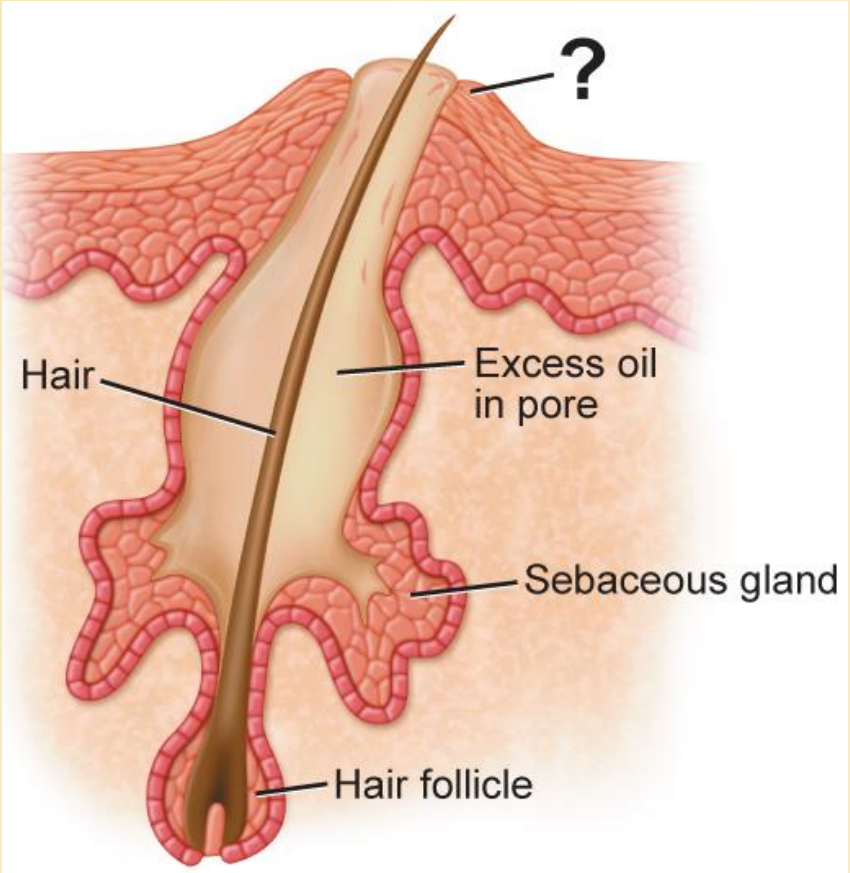
What is this bump in the skin?

A. a mole

B. a wart

C. a goosebump

D. an acne pimple



Standardized Test Practice

CheckPoint

What protein do hair and nails contain?

A. chitin

B. cutin

C. keratin

D. myosin

Standardized Test Practice

CheckPoint

What is the function of osteoclasts?

A. They break down bone cells.

B. They produce blood cells and platelets.

C. They are responsible for growth and repair of bones.

D. They form a callus of cartilage at the location of a break.

Standardized Test Practice

CheckPoint

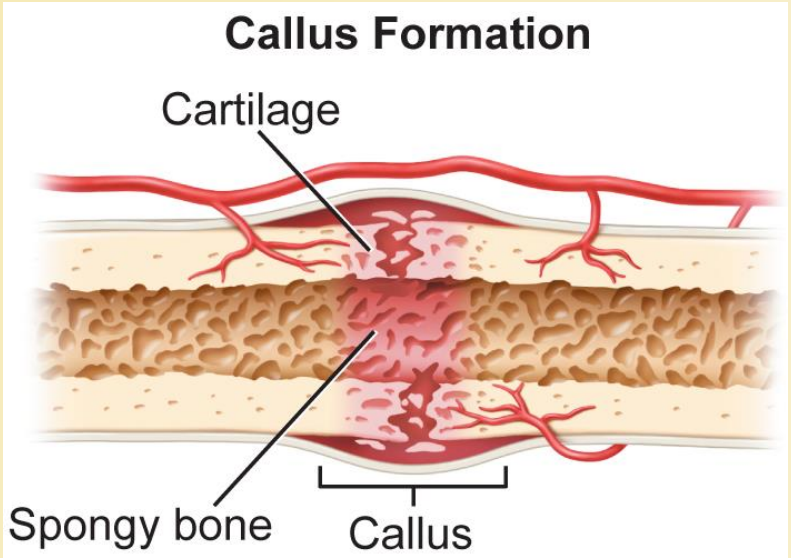
What cells produce spongy bone at the site of this fracture?

A. osteoblasts

B. osteocytes

C. periostium cells

D. red marrow cells



Standardized Test Practice

CheckPoint

What causes bursitis?

A. Cartilage in moveable joints deteriorates.

B. Fluid-filled sacs surrounding joints become inflamed.

C. Joints lose strength and function and become swollen.

D. Ligaments that hold joints together become overstretched.

Standardized Test Practice

CheckPoint

What is one way that bones help the body maintain homeostasis?

A. They are constantly being remodeled.

B. They provide divisions of movement.

C. They provide framework for the skin.

D. They store and release calcium.

Standardized Test Practice

CheckPoint

Which joint provides the widest range of motion?

A	B	C	D
			

Standardized Test Practice

CheckPoint

What causes lactic acid production in muscle cells?

A. calcium pumping

B. cellular respiration

C. oxygen deprivation

D. rigor mortis

Standardized Test Practice

CheckPoint

How do fast-twitch muscles respond to exercise?

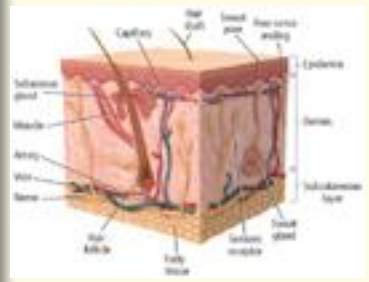
A. They produce less lactic acid.

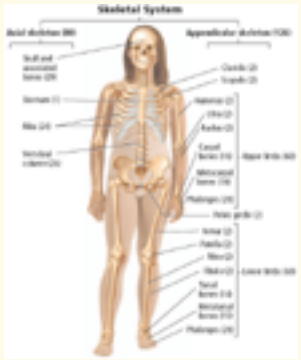
B. They produce more myoglobin.

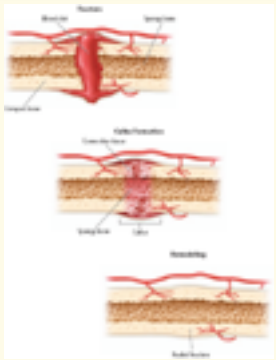
C. The amount of myosin increases.

D. The number of myofibrils increases.

Glencoe Biology Transparencies

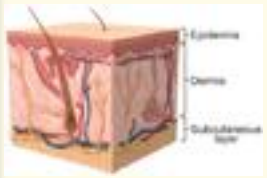






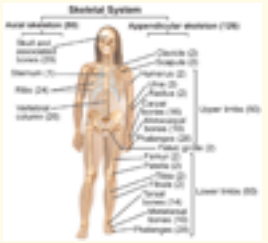
Home Resources

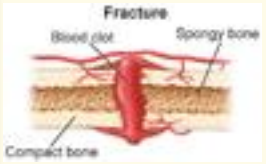
Image Bank

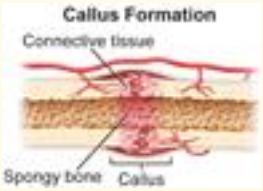

Epidermis
Dermis
Subcutaneous layer

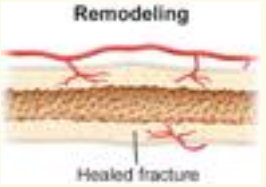

Sebaceous gland
Hair follicle

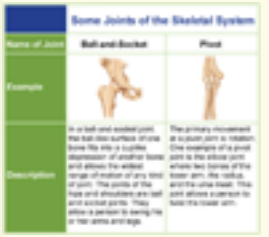

Classification of Bones

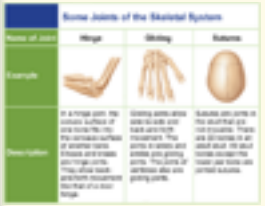

Skeletal System

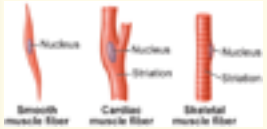

Fracture
Blood clot
Spongy bone
Compact bone

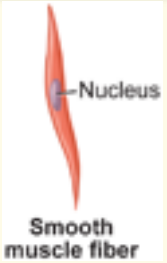

Callus Formation
Connective tissue
Spongy bone
Callus

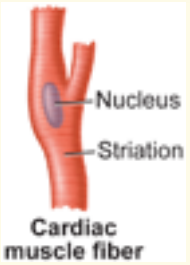

Remodeling
Healed fracture


Some Joints of the Skeletal System
Name of Joint
Ball-and-Socket
Pivot
Example
Description


Some Joints of the Skeletal System
Name of Joint
Hinge
Gliding
Rotary
Example
Description


Nucleus
Striation
Smooth muscle fiber
Cardiac muscle fiber
Skeletal muscle fiber


Nucleus
Smooth muscle fiber


Nucleus
Striation
Cardiac muscle fiber

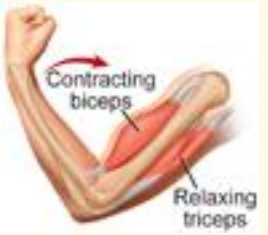
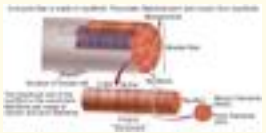
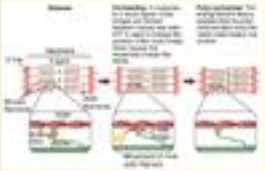

Contracting biceps
Relaxing triceps

Image Bank





Vocabulary

Section 1

- epidermis
- keratin
- melanin
- dermis
- hair follicle
- sebaceous gland

Vocabulary

Section 2

- axial skeleton
- appendicular skeleton
- compact bone
- osteocyte
- spongy bone
- red bone marrow
- yellow bone marrow
- osteoblast
- ossification
- osteoclast
- ligament

Vocabulary

Section 3

- smooth muscle
- involuntary muscle
- cardiac muscle
- skeletal muscle
- voluntary muscle
- tendon
- myofibril
- myosin
- actin
- sacromere

Animation

Concepts In MOtion

- Healing Dermis
- Joint Movements
- Muscle Contraction
- Visualizing Muscle Contraction