

Chapter Content Mastery

The Musculoskeletal System

CHAPTER 9
LESSON 1

Directions: *Fill in the blanks in the paragraph using the words below.*

body	bones	cartilage	contractions
joints	muscle	musculoskeletal	skeletal

The (1) _____ system works to move the body. The (2) _____ system is made up of bones, ligaments, tendons, and (3) _____. It supports and protects the (4) _____. Muscles provide the (5) _____ necessary to move bones when signaled by the nervous system. Joints maintain flexible connections between (6) _____. The body has different types of (7) _____ that allow it to move in different directions. Opposing (8) _____ groups function together to achieve controlled and smooth motion.

Directions: *Match the type of joint with the description of its motion by writing the letter of the correct description in the space provided.*

- | | |
|---------------------------------|--|
| _____ 9. pivot joint | A. allows bones to move back and forth |
| _____ 10. hinge joint | B. allows side-to-side or front-to-back movement |
| _____ 11. saddle joint | C. only allows bones to rotate |
| _____ 12. gliding joint | D. allows bones to rotate and move in every direction |
| _____ 13. immovable joint | E. allows little or no bone movement |
| _____ 14. ball-and-socket joint | F. allows for a wide range of motion; the body only has one of these |

**Chapter Content
Mastery****The Body and Levers****CHAPTER 9
LESSON 2**

Directions: Choose the answer that completes each sentence below, and write its letter on the line provided.

- _____ 1. In describing the lever, the Greek mathematician Archimedes said, _____
A. "Give me force enough, and I will lift the Moon."
B. "Give me a place to stand, and I will move the Earth."
C. "Give me the proper pivot point, and I will move any load."
D. "Give me a long enough plank, and I will move mountains."
- _____ 2. A wheelbarrow is an example of _____
A. a fulcrum.
B. an effort force.
C. a first-class lever.
D. a second-class lever.
- _____ 3. A _____ is an example of a third-class lever.
A. shovel
B. backpack
C. bottle opener
D. pair of scissors
- _____ 4. _____ is the most common type of lever in the body.
A. The first-class lever
B. The third-class lever
C. The second-class lever
D. No one particular class of lever
- _____ 5. Mechanical advantage is expressed as _____
A. the resistance force multiplied by the effort force.
B. the ratio of the resistance force to the effort force.
C. the ratio of the distance from the fulcrum to each opposing force.
D. the resistance force plus the effort force multiplied by the distance.

Directions: Respond to each question or statement in complete sentences.

6. How do bones and muscles work together to create movement in our bodies?

7. Give an example of your body using a second-class lever.

Reinforcement The Musculoskeletal System

Directions: Define the following terms.

1. skeletal system _____
2. bone _____
3. ligament _____
4. cartilage _____
5. muscle _____

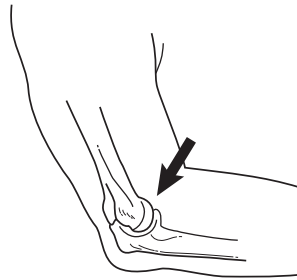
Directions: Label each illustration using the correct term below.

ball-and-socket joint

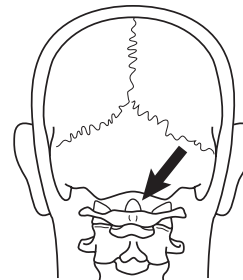
gliding joint

hinge joint

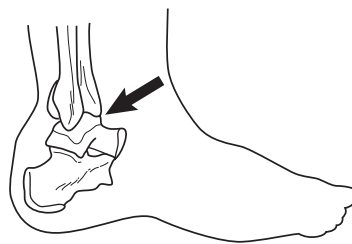
pivot joint



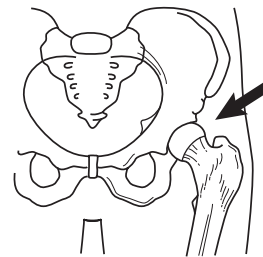
6. _____



7. _____



8. _____



9. _____

Directions: Compare and contrast the following pairs of terms, and describe their relationship to the muscular system. Write your answers on a separate sheet of paper.

10. contraction/relaxation
11. voluntary/involuntary
12. flexion/extension

Reinforcement **The Body and Levers**

Directions: *Answer each question and respond to each statement.*

1. How would you interpret Archimedes' famous quotation, "Give me a place to stand, and I will move the Earth"?

2. What is force?

3. Name and describe the two kinds of force in a lever.

A. _____

B. _____

Directions: *For each description, choose the class of lever that fits, and write the corresponding letter in the blank provided.*

A. first-class lever B. second-class lever C. third-class lever

- _____ 4. the resistance force is between the fulcrum and the effort force
- _____ 5. the effort force is between the resistance force and the fulcrum
- _____ 6. the resistance force and the effort force are on opposite sides of the fulcrum
- _____ 7. a see-saw
- _____ 8. a baseball bat
- _____ 9. a wheelbarrow
- _____ 10. bicep contraction

Content Vocabulary

The Musculoskeletal System and Levers

CHAPTER 9

Directions: *Unscramble the terms in italics to complete the sentences below. Write the terms on the lines provided.*

- | | | | | |
|---------|-------------|-------------|-----------|-----------|
| bone | cartilage | contraction | extension | flexion |
| fulcrum | involuntary | joint | lever | ligaments |
| muscle | relaxation | tendons | voluntary | |

- _____ 1. Bones come together at a *tijno*.
- _____ 2. The smooth layer of tissue at the ends of bones is *gealcatri*.
- _____ 3. Bones are attached at joints by *sgilteman*.
- _____ 4. *deTonns* attach muscles to bones.
- _____ 5. A *revel* pivots around a fixed point.
- _____ 6. You consciously control *ytarnoluv* muscles.
- _____ 7. A *rumcluf* is also known as a pivot point.
- _____ 8. The hard tissue in the skeletal system is *enbo*.
- _____ 9. *noleFix* decreases the angle between the bones of a limb.
- _____ 10. You can't consciously control *varltoinnuy* muscles.
- _____ 11. The muscle shortens during *toncarontci*.
- _____ 12. The straightening of a limb is called *nestoixen*.
- _____ 13. In *laronexati*, muscle filaments move away from each other.
- _____ 14. *celsMu* is tissue made of long cells that contract.

Directions: *Define the following terms using complete sentences.*

15. skeletal system _____

16. mechanical advantage _____

Content **Vocabulary** CONTINUED

Directions: Write the class of lever being described in each space provided.

first-class lever

second-class lever

third-class lever

17. The effort force is between the resistance force and the fulcrum.

18. The fulcrum is between the effort force and the resistance force.

19. The resistance force is between the fulcrum and the effort force.

20. You use this type of lever when you nod your head.

21. Most sports equipment, including baseball bats, are this type of lever.

22. In luggage with wheels, the wheels act as a fulcrum for this type of lever.

23. This type of lever is the most common in the body.

Chapter Review

The Musculoskeletal System and Levers

CHAPTER 9

Part A. Vocabulary Review

Directions: Write the term from the term bank that matches each description in the space provided.

- | | | | |
|-----------|-----------|---------------------|-------------------|
| cartilage | fulcrum | involuntary muscles | joint |
| lever | ligaments | tendons | voluntary muscles |
- _____ 1. the fixed point around which a lever pivots
 - _____ 2. any muscles that you consciously control
 - _____ 3. thick, smooth layer of tissue that covers the ends of bones
 - _____ 4. a simple machine that pivots around a fixed point
 - _____ 5. tough bands of tissue that hold bones together
 - _____ 6. any muscles that you do not consciously control
 - _____ 7. thick bands of tissue that attach muscles to bones
 - _____ 8. any place where two bones meet

Part B. Concept Review

Directions: Identify the type of joint used in each of the body parts below, and write it in the space provided. You will use some types of joints more than once.

- | | |
|------------------------|--------------------|
| 1. skull _____ | 6. ankles _____ |
| 2. forearm bones _____ | 7. knees _____ |
| 3. hip _____ | 8. knuckles _____ |
| 4. thumb _____ | 9. wrists _____ |
| 5. fingers _____ | 10. shoulder _____ |

Directions: Respond to each question or statement in complete sentences.

11. **Evaluate** the role of the skeletal system in the body.

Chapter **Review** CONTINUED

12. **Compare** and **contrast** the three types of levers.

13. **Choose** a motion in your body that uses one of the three types of levers. Which class of lever is used, and what supplies the lever, fulcrum, effort force, and resistance force?

14. **Generalize** about how multiple levers increase speed in parts of your body.

15. **Solve** the following problem. What is the mechanical advantage of a lever in which the resistance force is 75 N and the effort force is 25 N?

Chapter Outline

The Musculoskeletal System and Levers

CHAPTER 9

Lesson 1: The Musculoskeletal System

A. The hard, supportive structure in our bodies is the _____ system.

1. The human body has over 200 _____ made of cells, collagen, and calcium.
2. The skeletal system provides _____, protection, and movement for the body.
 - a. _____ vessels and nerves enter and leave through holes in bones.
 - b. The skull, _____, and ribs protect the brain, spinal cord, and heart and lungs, respectively.
 - c. The skeletal system provides attachment points for _____, which allow movement.
 - d. The _____ in the middle of some bones is where blood cells are formed.
3. Bones connect at _____.
 - a. _____, which hold bones together at joints, are **flexible** because they have less calcium.
 - b. _____, found in ears and noses, is a flexible elastic tissue made of collagen.
 - c. _____ joints, found in fingers, elbows, and knees, allow back-and-forth movement.
 - d. The thumb, the only _____ joint in the body, allows a wider range of motion.
 - e. _____ joints, such as in shoulders and hips, can rotate and move in every direction.
 - f. An _____ joint, such as in knuckles, is similar to a ball-and-socket but cannot move in as many directions.
 - g. In a _____ joint, the cylindrical region of one bone fits into a ring-shaped structure of another joint. The joint between the first two neck _____ is a pivot joint.
 - h. Two bones that connect at flat surfaces form a _____ joint, such as in ankles and wrists.

Chapter Outline CONTINUED

- i. An _____ joint holds two bones firmly together, allowing little or no movement. The _____ contains immovable joints.
- B.** The _____ system allows the body to move.
- Muscle tissue is made of bundles of long muscle cells called muscle _____.
 - Muscle fibers contain bundles of tubes that contain muscle _____.
 - When a muscle _____, the muscle filaments move closer to each other and the muscle shortens.
 - When a muscle _____, the muscle filaments move away from each other.
 - Muscles contract when they receive chemical signals from the _____ system.
 - Muscle cells contain more _____ than other cells to produce _____ needed for contraction.
 - Muscles have a large network of _____ vessels that supplies them with oxygen for cellular _____.
 - Muscles can be either voluntary or _____.
 - A voluntary muscle, such as those in hands, arms, and legs, is one you can _____.
 - An involuntary muscle, such as the heart or _____, works without you having to think about it.
 - Muscle cells form three types of muscle _____ in the human body.
 - _____ muscle tissue causes movement.
 - Cardiac muscle tissue is found only in the _____.
 - _____ muscle tissue, found in internal organs such as your stomach and blood vessels, _____ contracts and relaxes.
- C.** The muscular system must interact with the skeletal system to produce _____.

Chapter **Outline** CONTINUED

1. _____ connect bones to muscles and do not stretch as much as ligaments.
 2. Tendons, ligaments, and cartilage are all _____ tissue.
 3. The body moves through _____ and **extension**.
 - a. In flexion, the bending of a limb _____ the angle between the bones of the limb.
 - b. In _____, the limb straightens and increases the angle between bones of the limb.
- D. The _____ system works to move the body.

Lesson 2: The Body and Levers

- A. A _____ is a simple machine made of anything rigid that pivots around a fixed point.
1. The _____ is the fixed point around which a lever pivots.
 2. The ancient Greek mathematician _____ (287–212 B.C.) first described levers.
- B. Three _____ of levers are determined by location of the fulcrum, load, and applied force.
1. _____ force is the force needed to move an object over a distance.
 2. _____ force is the force that opposes the effort force.
 3. The _____ the effort force is to the fulcrum, the more effort force it will take to use the lever.
 4. The closer the resistance force is to the fulcrum, the _____ resistance force it will take.
 5. In a _____ **lever**, the resistance force and the effort force are on opposite sides of the fulcrum. A _____, pliers, and scissors are examples of these.
 6. In a **second-class lever**, the _____ force is between the fulcrum and the effort force. _____ are examples of these.

Chapter Outline CONTINUED

7. In a **third-class lever**, the effort force is between the resistance force and the _____, shovels, and rakes are examples of these.
8. Although _____ levers require more effort force, they are the most common levers in the body.
- First- and second-class levers could perform the same task using _____ force.
 - _____ levers make a much better arrangement for muscle attachment.
 - In biceps, a _____ lever would require a counter-balance if the pivot point was the elbow.
 - In biceps, a second-class lever would require that muscles attach at the _____ if the pivot point was the elbow.
- C. _____ are used to lift heavy objects or to move objects faster and farther.
- _____ is the ability of a machine to increase the amount of force put into the machine.
 - Mathematically, mechanical advantage (MA) is the _____ of the resistance force (F_R) to the effort force (F_E).
 - First- and second-class levers, such as see-saws and car jacks, make it easier to _____ heavy objects.
 - Third-class levers, such as baseball bats, make it easier to move objects _____ and faster.
 - Arrangements of muscles and bones in your body function in the same way as mechanical _____.
 - In our bodies, multiple bones and joints act as levers and fulcrums, and muscles provide _____.
 - _____ in your legs and arms allow you to move farther and faster.
 - The _____ of levers in the body affects body strength.
 - In activities such as arm wrestling or gymnastics, _____ men and women have a natural advantage because the effort force and resistance force are closer together.