CHAPTER 4
MUSCULOSKELETAL SYSTEM

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MEDIA LIBRARY

Student DVD-ROM
• Twelve different interactive learning games
• Flash card generator
• Audio Glossary
• Professional Profile video—Chiropractic medicine
• Body Rhythms
• Terminology Translator

Companion Website
• Multiple Choice, True/False, and Fill-in-the-Blank practice questions
• Labeling exercises
• Case study

IRDVD
• Animations
• Muscles
• Movement of joints
• Shoulder abduction/adduction

• Additional Professional Profile information
• New York Times link for research into specific pathologies
• Web Destination activities
• Audio Glossary
• Link to VangoNotes
• Link to drug updates
OBJECTIVE 1
Identify and define the combining forms, prefixes, and suffixes introduced in this chapter.

Text page: 80; 103; PowerPoint slide: 6–14; 118–121

LECTURE NOTES

Skeletal System Combining Forms

- ankyl/o stiff joint
- arth/o joint
- articul/o joint
- burs/o sac
- carp/o wrist
- cervic/o neck
- chondr/o cartilage
- clavicul/o clavicle
- coccyg/o coccyx
- cortic/o outer portion
- cost/o rib
- crani/o skull
- femor/o femur
- fibul/o fibula
- humer/o humerus
- il/o ilium
- ischi/o ischium
- kyph/o hump
- lamin/o lamina, part of vertebra
- lord/o bent backwards
- lumb/o loin
- mandibul/o mandible
- maxill/o maxilla
- medull/o inner portion
- metacarp/o metacarpals
- metatars/o metatarsals
- myel/o bone marrow
- orth/o straight
- oste/o bone
- patell/o patella
- ped/o child, foot

TEACHING STRATEGIES

- At this point it is important to encourage students using flash cards to keep up with making the flash cards. Some students will begin to let this very important learning activity slide.

Medical Terminology Bee

- Create PowerPoint flash cards of new combining forms and suffixes presented in this chapter. Have all students stand and then define the word part. If the student is correct, he or she remains standing. If the student is wrong, he or she sits down. Continue until only one student is standing.

LEARNING ACTIVITIES

Worksheet 4A

- New Combining Form, Prefix, and Suffix Handout

Text

- Practice Exercises

Student DVD-ROM

- Learning games
- Make flash cards

CW

- Practice questions

ASSESSMENTS

Quiz 4A—New Word Parts Quiz

Text Bank—Fill-in-the-Blank questions
pelv/o  pelvis
phalang/o  phalanges
pod/o  foot
pub/o  pubis
radi/o  radius
sacr/o  sacrum
scapul/o  scapula
scoli/o  crooked, bent
spondyl/o  vertebrae
stern/o  sternum
synovi/o  synovial membrane
synov/o  synovial membrane
tars/o  ankle
thorac/o  chest
tibi/o  tibia
uln/o  ulna
vertebr/o  vertebra

**Skeletal System Suffixes**
-blast  immature, embryonic
-clasia  to surgically break
-desis  stabilize, fuse
-listhesis  slipping
-porosis  porous

**Muscular System Combining Forms**
fasci/o  fibrous band
fibr/o  fibers
kinesi/o  movement
muscul/o  muscle
my/o  muscle
myocard/i/o  heart muscle
myos/o  muscle
plant/o  sole of foot
ten/o  tendon
tend/o  tendon
tendin/o  tendon

**Muscular System Suffixes**
-asthenia  weakness
-kinesia  movement
-tonia  tone

**Muscular System Prefixes**
ab-  away from
ad-  toward
circum-  around
OBJECTIVE 2
Correctly spell and pronounce medical terms and major anatomical structures relating to the musculoskeletal system.

LECTURE NOTES
For pronunciation objective
Pronunciation for medical terms in this chapter can be found:
• In parentheses following key terms
• In Audio Glossary on Student DVD-ROM
• In Audio Glossary at Companion Website

TEACHING STRATEGIES
Emphasize to students:
• Importance of correctly spelling terms.
• How sounding out terms can assist in learning how to spell terms.
Say each new term in class and have students repeat it.

Pop Questions
• Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension of spelling strategies.

LEARNING ACTIVITIES
Worksheet 4B
• Medical Term Analysis

Terminology Checklist
• Can be used to practice pronunciation using the Audio Glossary as reference

Text
• Practice Exercises

Flash cards
• Look at definition and write out/pronounce terms

Student DVD-ROM
• Audio Glossary
• Spelling Challenge game
• Crossword and Word Search puzzles

ASSESSMENTS
Quiz 4B—Spelling Quiz
Suggested terms:
1. ossification
2. periosteum
3. trochanter
4. coccygeal
5. phalanges
6. articulation
7. intracranial
8. chiropractic
9. prosthesis
10. pathologic
11. osteoporosis
12. ankylosing
13. spondylolisthesis
14. subluxation
15. arthroscopy
16. claudication
OBJECTIVE 3
Locate and describe the major organs of the musculoskeletal system and their functions.


LECTURE NOTES

Overview
- Bones are organs; carry their own blood supply, nerves, and lymphatic vessels
- Bones connected to form skeleton
- Skeleton protects vital organs and stores minerals
- Bone marrow is site of blood cell production
- Joint is place where two bones meet and are held together by ligaments; gives flexibility to skeleton
- Skeleton, joints, and muscles work together to produce movement

Bones
- Also called osseous tissue; one of hardest materials in body
- Formed from gradual process beginning before birth called ossification; fetal skeleton is formed from cartilage model; gradually replaced by osteoblasts, immature bone cells; in adult bones, osteoblasts mature into osteocytes
- Formation of strong bones dependent on adequate supply of minerals such as calcium and phosphorus
- Four categories based on shape: long bones, short bones, flat bones, and irregular bones (see Figure 4.1)
  - Long bones are longer than wide; examples are femur and humerus
  - Short bones are roughly as long as wide; examples are carpals and tarsals
  - Irregular bones have very irregular shape; examples are vertebrae
  - Flat bones are plate-shaped bones; examples are sternum, scapulae, and pelvis

Joints
- Formed when two or more bones meet; also called articulation
- Three types of joints based on amount of movement allowed between bones: synovial joints, cartilaginous joints, and fibrous joints (see Figure 4.11)
  - Synovial joints are freely moving synovial joints; examples are shoulder, knee, and elbow
  - Fibrous joints allow almost no movement; ends of bones joined by thick fibrous tissue; may fuse into solid bone; examples are skull sutures
  - Cartilaginous joints allow slight movement but hold bones firmly in place by solid piece of cartilage; example is pubic symphysis

TEACHING STRATEGIES

Visual Aids
- Use full-size anatomical charts and models to illustrate organs.

Pop Questions
- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

IRDVD
- See PowerPoint presentation on the Instructor’s Resource DVD for an animation describing muscles.

LEARNING ACTIVITIES

Worksheet 4C
- Chapter Review

Text
- Practice Exercises

Student DVD-ROM
- Learning games

CW
- Practice questions

ASSESSMENTS

Test Bank—questions

17. pseudohypertrophic
18. electromyography
19. tenodesis
20. fibromyalgia
**Muscles**

- Bundles of parallel muscle tissue fibers; as fibers contract (shorten in length) produce movement of or within body; may bring two bones closer together, push food through digestive system, or pump blood through blood vessels
- Muscles also hold body erect and generate heat
- Name of muscle often reflects its location, origin and insertion, size, action, fiber direction, or number of attachment points, as the following examples illustrate:
  - **Location:** rectus abdominis means straight (rectus) abdominal muscle
  - **Origin and insertion:** sternocleidomastoid named for two origins (stern/o for sternum and cleid/o for clavicle) and single insertion (mastoid process)
  - **Size:** gluteus maximus—gluteus means rump area and maximus means large
  - **Action:** flexor carpi and extensor carpi muscles named because they produce flexion and extension at wrist
  - **Fiber direction:** external oblique muscle is abdominal muscle whose fibers run at oblique angle
  - **Number of attachment points:** biceps—term bi means two; refers to muscle’s two heads or connecting points

**OBJECTIVE 4**

Correctly place bones in either the axial or the appendicular skeleton.

Text pages: 85–91; PowerPoint slides: 34–60

**LECTURE NOTES**

Human skeleton has two divisions: **axial skeleton** and **appendicular skeleton**

**Axial Skeleton**

- Includes bones in head, neck, spine, chest, and trunk body (see Figure 4.4); forms central axis for body; protects many internal organs such as brain, lungs, and heart
- Head or skull is divided into two parts—cranial and facial bones; surround and protect brain, eyes, ears, nasal cavity, and oral cavity; muscles for chewing and moving head are attached to cranial bones; cranium encases brain and consists of frontal, parietal, temporal, ethmoid, sphenoid, and occipital bones; facial bones surround mouth, nose, and eyes and include mandible, maxilla, zygomatic, vomer, palatine, nasal, and lacrimal bones; cranial and facial bones are illustrated in Figure 4.5 and described in Table 4.1.
- **Hyoid bone**—single U-shaped bone suspended in neck between mandible and larynx; point of attachment for swallowing and speech muscles
- **Trunk consists of vertebral column, sternum, and rib cage**
- Vertebral or spinal column—divided into five sections: cervical vertebrae, thoracic vertebrae, lumbar vertebrae, sacrum, and coccyx (see Figure 4.6 and Table 4.2); between each pair of vertebrae is an intervertebral disc composed of fibrous cartilage to provide cushion between vertebrae

**TEACHING STRATEGIES**

**Visual Aids**
- Use full-size anatomical charts and models to illustrate axial vs. appendicular skeleton.

**IRDVD**
- See PowerPoint presentation on the Instructor’s Resource DVD for a drag-and-drop anatomy of skeleton labeling activity; display on screen and have students discuss and place labels during class.

**Pop Questions**
- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

**LEARNING ACTIVITIES**

**Worksheet 4C—Chapter Review**

**Text**
- Labeling exercise 4.A
- Practice Exercises

**Student DVD-ROM**
- Labeling exercises
- Learning games
• Rib cage—12 pairs of ribs attached at back to vertebral column; 10 pairs are also attached to sternum in front (see Figure 4.7); lowest two pairs are called floating ribs and are attached only to vertebral column; serves to provide support for organs, such as heart and lungs.

Appendicular Skeleton
• Consists of pectoral girdle, upper extremities, pelvic girdle, and lower extremities (see Figure 4.8); bones for appendages or limbs
• Pectoral girdle—consists of clavicle and scapula bones; attaches upper extremity, or arm, to axial skeleton; articulates with sternum anteriorly and vertebral column posteriorly
• Upper extremity—includes humerus, ulna, radius, carpals, metacarpals, and phalanges; illustrated in Figure 4.9 and described in Table 4.3
• Pelvic girdle—also called os coxae or innominate bone or hipbone; contains ilium, ischium, and pubis; articulates with sacrum posteriorly; attaches lower extremity, or leg, to axial skeleton
• Lower extremity—includes femur, patella, tibia, fibula, tarsals, metatarsals, and phalanges; illustrated in Figure 4.10 and described in Table 4.4

OBJECTIVE 5
List and describe the components of a long bone.
Text pages: 82–83; PowerPoint slides: 22–29

LECTURE NOTES
• Majority of bones in body are long bones
• Have central shaft or diaphysis that widens at each end, called epiphysis; each epiphysis covered by layer of cartilage called articular cartilage to prevent bone from rubbing directly on bone; remaining surface of each bone is covered with thin connective tissue membrane called peristeme, which contains numerous blood vessels, nerves, and lymphatic vessels
• Dense and hard exterior surface bone called cortical or compact bone
• Cancellous or spongy bone found inside bone; has spaces in it, giving it sponge-like appearance; spaces contain red bone marrow; marrow manufactures blood cells and is found in some parts of all bones
• Center of diaphysis contains open canal called medullary cavity; contains yellow bone marrow; mainly fat
• Figure 4.2 contains an illustration of long bone structure

TEACHING STRATEGIES
Visual Aids
• Use a full-size anatomical chart or an actual long bone such as the femur to illustrate the parts of a long bone as you describe them.

IRDVD
• See PowerPoint presentation on the Instructor’s Resource DVD for a drag and drop anatomy of a long bone labeling activity. Display on the screen and have students discuss and place the labels during class.

Pop Questions
• Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

LEARNING ACTIVITIES
Text
• Labeling exercise 4.B1
• Practice Exercises

Student DVD-ROM
• Labeling exercise
• Learning games

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OBJECTIVE 6
Identify bone projections and depressions.
Text pages: 83–84; PowerPoint slides: 30–33

LECTURE NOTES
Projections
- Bones have projections; some rounded and smooth to articulate with another bone in joint; others rough to provide muscles with attachment points; general term for any bony projection is process; specific terms describe different shapes and locations of various processes
  1. Head—large, smooth, ball-shaped end on long bone; may be separated from shaft of bone by a narrow area called neck
  2. Condyle—smooth, rounded portion at end of bone
  3. Epicondyle—located above or on a condyle
  4. Trochanter—large, rough process for attachment of muscle
  5. Tubercle—small, rough process; provides attachment for tendons and muscles
  6. Tuberosity—large, rough process; provides attachment for tendons and muscles
- See Figure 4.3 for illustration of processes found on femur

Depressions
Hollow regions or depressions; most common depressions:
  1. Sinus—hollow cavity within bone
  2. Foramen—smooth, round opening for nerves and blood vessels
  3. Fossa—shallow cavity or depression on surface of bone
  4. Fissure—slit-type opening

TEACHING STRATEGIES
Visual Aids
- Use a full-size anatomical chart or actual bones to illustrate different processes and depressions as you describe them.

Pop Questions
- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

LEARNING ACTIVITIES
Worksheet 4C
- Chapter Review

Text
- Practice Exercises

Student DVD-ROM
- Learning games

CW
- Practice questions

ASSESSMENTS
Test Bank—questions

OBJECTIVE 7
Identify the parts of a synovial joint.
Text page: 92; PowerPoint slides: 62–64

LECTURE NOTES
- Most joints are synovial joints
- See Figure 4.12 for typical synovial joint structure; enclosed by elastic joint capsule; joint capsule lined with synovial membrane, which secretes synovial fluid to lubricate joint; ends of bones in

TEACHING STRATEGIES
Visual Aids
- Use a full-size anatomical chart or model of knee joint to illustrate parts of synovial joint as you describe them.
OBJECTIVE 8
Describe the characteristics of the three types of muscle tissue.

Text page: 106; PowerPoint slides: 124–132

LECTURE NOTES

• Three types of muscle tissue—skeletal muscle, smooth muscle, and cardiac muscle (see Figure 4.21)
• Muscles may be either voluntary or involuntary; voluntary muscles mean that person consciously chooses which muscles to contract, how long and how hard to contract; skeletal muscles of the leg are examples; involuntary muscles are under control of subconscious regions of brain; examples are smooth muscles found in internal organs and cardiac muscles

Skeletal Muscle
• Directly or indirectly attached to bones; produce voluntary movement of skeleton; also called striated muscle because of striped appearance under microscope (see Figure 4.22)
• Wrapped in layers of fibrous connective tissue called fascia; tapers at each end of skeletal muscle to form very strong tendon; tendon then inserts into periosteum covering bone to anchor muscle to bone
• Stimulated by motor neurons; point at which motor nerve contacts muscle fiber is called myoneural junction

Smooth Muscle
• Found in association with internal organs; also called visceral muscle; refers to muscle’s microscopic appearance—lacks striations of skeletal muscle (see Figure 4.22); found in walls of hollow

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organs, such as stomach, tube-shaped organs, such as respiratory airways, and blood vessels

- Responsible for involuntary muscle action associated with movement of internal organs; such as churning food, constricting blood vessel, and uterine contractions

### Cardiac Muscle

- Also called myocardium; makes up wall of heart (see Figure 4.22); with each involuntary contraction the heart squeezes to pump blood out of its chambers and through blood vessels

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### OBJECTIVE 9

**Use movement terminology correctly.**


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### LECTURE NOTES

- Skeletal muscles attached to two different bones and overlap joint; when muscle contracts, two bones move, but not usually equally
- **Origin**—less movable of two bones considered to be starting point of muscle and is called origin
- **Insertion**—more movable bone considered to be where muscle ends and is called insertion
- **Action**—type of movement muscle produces called its **action**
- Muscles often arranged around joints in **antagonistic pairs**; means they produce opposite actions; for example, one muscle will bend joint while its antagonist straightens joint

### Action

**Grouped by antagonistic pairs**

- **abduction**
  - Movement away from midline (see Figure 4.23)
- **adduction**
  - Movement toward midline (see Figure 4.23)
- **flexion**
  - Act of bending or being bent (see Figure 4.24)
- **extension**
  - Movement that brings limb into or toward a straight condition (see Figure 4.24)
- **dorsiflexion**
  - Backward bending, as of hand or foot (see Figure 4.25A)
- **plantar flexion**
  - Bending sole of foot; pointing toes downward (see Figure 4.25B)
- **eversion**
  - Turning outward (see Figure 4.26)
- **inversion**
  - Turning inward (see Figure 4.26)
- **pronation**
  - To turn downward or backward as with hand or foot
- **supination**
  - Turning the palm or foot upward
- **elevation**
  - To raise body part, as in shrugging shoulders

---

### TEACHING STRATEGIES

- Have students perform each action as it is described.
- Write sentences on the board using common words; have students substitute correct directional terms.

### Visual Aids

- Use articulated skeleton to demonstrate each movement as you describe it.

### IRDVD

- See PowerPoint presentation on the Instructor’s Resource DVD for an animation of joint movements with each different muscle action
- See PowerPoint presentation on the Instructor’s Resource DVD for animated videos illustrating different muscle actions:
  - Elbow flexion/extension
  - Ankle dorsiflexion/plantar flexion
  - Ankle eversion/inversion
  - Forearm pronation/supination
  - Shoulder circumduction
  - Thumb opposition
  - Shoulder rotation

### Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

### LEARNING ACTIVITIES

- Have each student select a sport and then a specific movement from that sport (e.g., swing a bat, throw a ball, take a free throw); have each student describe each movement necessary using appropriate movement terminology.
**Lecture Notes**

**Skeletal System**

<table>
<thead>
<tr>
<th>Medical Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>arthralgia</td>
<td>joint pain</td>
</tr>
<tr>
<td>arthrocentesis</td>
<td>puncture to withdraw fluid from joint</td>
</tr>
<tr>
<td>arthroclasia</td>
<td>surgically breaking a joint</td>
</tr>
<tr>
<td>arthrodesis</td>
<td>fusion of joint</td>
</tr>
<tr>
<td>arthrogram</td>
<td>record of joint</td>
</tr>
<tr>
<td>arthrosis</td>
<td>joint inflammation</td>
</tr>
<tr>
<td>arthroplasty</td>
<td>incision into joint</td>
</tr>
<tr>
<td>arthroscopy</td>
<td>visual examination of inside joint</td>
</tr>
<tr>
<td>arthrocentesis</td>
<td>puncture to withdraw fluid from joint</td>
</tr>
<tr>
<td>arthritis</td>
<td>joint inflammation</td>
</tr>
<tr>
<td>arthroplasty</td>
<td>incision into joint</td>
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<tr>
<td>arthrosis</td>
<td>fusion of joint</td>
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<td>arthrogram</td>
<td>record of joint</td>
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<tr>
<td>arthroplasty</td>
<td>incision into joint</td>
</tr>
<tr>
<td>arthroscopy</td>
<td>visual examination of inside joint</td>
</tr>
<tr>
<td>bursa</td>
<td>removal of bursa</td>
</tr>
<tr>
<td>bursitis</td>
<td>inflammation of bursa</td>
</tr>
<tr>
<td>chondroma</td>
<td>cartilage tumor</td>
</tr>
<tr>
<td>chondroplasty</td>
<td>surgical repair of cartilage</td>
</tr>
<tr>
<td>chondromalacia</td>
<td>cartilage softening</td>
</tr>
<tr>
<td>cortical</td>
<td>pertaining to the outer portion</td>
</tr>
<tr>
<td>craniotomy</td>
<td>incision into skull</td>
</tr>
<tr>
<td>medullary</td>
<td>pertaining to inner portion</td>
</tr>
<tr>
<td>myeloma</td>
<td>bone marrow tumor</td>
</tr>
<tr>
<td>ostealgia</td>
<td>bone pain</td>
</tr>
<tr>
<td>osteochondroma</td>
<td>bone and cartilage tumor</td>
</tr>
<tr>
<td>osteoclasia</td>
<td>to surgically break bone</td>
</tr>
<tr>
<td>osteomyelitis</td>
<td>inflammation of bone and bone marrow</td>
</tr>
<tr>
<td>osteotomy</td>
<td>incision into bone</td>
</tr>
<tr>
<td>osteopathy</td>
<td>bone disease</td>
</tr>
</tbody>
</table>

**Teaching Strategies**

- Read aloud musculoskeletal words that are made up of word parts; have students identify parts and define terms, either aloud or individually on paper.
- Write sentences on the board using common words; have students substitute correct medical terms.

**Pop Questions**

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

**Learning Activities**

**Worksheet 4B**
- Medical Term Analysis

**Worksheet 4C**
- Chapter Review

**Quiz 4E**
- May be used as a worksheet

**Text**
- Practice Exercises
- Terminology Checklist

**Student DVD-ROM**
- Learning games
- Flash cards

**CW**
- Practice questions
Adjective Suffix | Combined With | Adjective Form | Noun Form
---|---|---|---
-ac | ili/o | iliac | ilium
-al | carp/o | carpal | carpus
 | cervic/o | cervical | neck
 | cost/o | costal | rib
 | cran/i/o | cranial | cranium
 | femor/o | femoral | femur
 | humer/o | humeral | humerus
 | ischi/o | ischial | ischiium
 | metacarp/o | metacarpal | metacarpus
 | metatars/o | metatarsal | metatarsus
 | radi/o | radial | radius
 | sacr/o | sacral | sacrum
 | stern/o | sternal | sternum
 | tars/o | tarsal | tarsus
 | tibi/o | tibial | tibia
-ar | clavicul/o | clavicular | clavicle
 | fibul/o | fibular | fibula
 | lumb/o | lumbar | low back
 | mandibul/o | mandibular | mandible
 | patell/o | patellar | patella
 | scapul/o | scapular | scapula
 | uln/o | ulnar | ulna
-ary | maxill/o | maxillary | maxilla
-cal | coccyg/o | coccygeal | coccyx
 | phalang/o | phalangeal | phalanges
-ic | pelv/o | pelvic | pelvis
 | pub/o | pubic | pubis
 | thorac/o | thoracic | thorax

Muscular System

Combining Form | Medical Term | Definition
---|---|---
fasci/o | fascial | pertaining to fascia
 | fasciitis | inflammation of fascia
 | fasciotomy | incision into fascia
kinesi/o | kinesiology | study of movement
 | muscular | pertaining to muscles
 | myalgia | muscle pain
 | myasthenia | muscle weakness
 | electromyogram (EMG) | record of muscle electricity
 | myocardial | pertaining to heart muscle
 | myopathy | muscle disease
 | myoplasty | surgical repair of muscle
 | myorraphy | suture a muscle
 | myorrhesis | muscle rupture
OBJECTIVE 11
Identify and define musculoskeletal system vocabulary terms.

Text pages: 95–96; 111; PowerPoint slides: 76–80; 160–162

### Suffix Medical Term Definition

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Medical Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>-kinesia</td>
<td>bradykinesia</td>
<td>slow movement</td>
</tr>
<tr>
<td></td>
<td>dyskinesia</td>
<td>difficult or painful movement</td>
</tr>
<tr>
<td></td>
<td>hyperkinesia</td>
<td>excessive movement</td>
</tr>
<tr>
<td></td>
<td>hypokinesia</td>
<td>insufficient movement</td>
</tr>
<tr>
<td>-tonia</td>
<td>atonia</td>
<td>lack of tone</td>
</tr>
<tr>
<td></td>
<td>dystonia</td>
<td>abnormal tone</td>
</tr>
<tr>
<td></td>
<td>hypertonia</td>
<td>excessive tone</td>
</tr>
<tr>
<td></td>
<td>hypotonia</td>
<td>insufficient tone</td>
</tr>
<tr>
<td></td>
<td>myotonia</td>
<td>muscle tone</td>
</tr>
</tbody>
</table>

### Term Definition

- **callus**: mass of bone tissue that forms at fracture site during healing
- **cast**: solid material to immobilize extremity as result of fracture, dislocation, or severe injury; may be made of plaster of Paris or fiberglass
- **chiropractic**: healthcare profession concerned with diagnosis and treatment of malalignment conditions of spine and musculoskeletal system with intention of affecting nervous system and improving health; professional is **chiropractor**
- **crepitation**: noise produced by bones or cartilage rubbing together; also called **crepitus**
- **exostosis**: bone spur
- **kyphosis**: abnormal increase in outward curvature of thoracic spine; also called **hunchback or humpback**; see Figure 4.13
- **lordosis**: abnormal increase in forward curvature of lumbar spine; also called **swayback**; see Figure 4.13
- **orthopedics**: branch of medicine specializing in diagnosis and treatment of conditions of musculoskeletal system; also called **orthopedic surgery**; physician is **orthopedist** or **orthopedic surgeon**; name derived from straightening (**orth/o**) deformities in children (**ped/o**)
orthotic | brace or splint used to prevent or correct deformities; person skilled in making and adjusting orthotics is an orthotist
---|---
podiatry | healthcare profession specializing in diagnosis and treatment of disorders of the feet and lower legs; professional is a podiatrist
prosthesis | artificial device used as substitute for body part that is either congenitally missing or absent as result of accident or disease; example is artificial leg
prosthetics | healthcare profession specializing in making artificial body parts; person skilled in making and adjusting prostheses is prosthetist

### Muscular System

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>adhesion</td>
<td>scar tissue forming in fascia surrounding muscle, making it difficult to stretch muscle</td>
</tr>
<tr>
<td>atrophy</td>
<td>poor muscle development as result of muscle disease, nervous system disease, or lack of use; commonly called muscle wasting</td>
</tr>
<tr>
<td>contracture</td>
<td>abnormal shortening of muscle fibers, tendons, or fascia making it difficult to stretch muscle</td>
</tr>
<tr>
<td>hypertrophy</td>
<td>increase in muscle bulk as result of using it, as in lifting weights</td>
</tr>
<tr>
<td>intermittent claudication</td>
<td>attacks of severe pain and lameness caused by ischemia of muscles, typically the calf muscles; brought on by walking even short distances</td>
</tr>
<tr>
<td>spasm</td>
<td>sudden, involuntary, strong muscle contraction</td>
</tr>
<tr>
<td>torticollis</td>
<td>severe neck spasms pulling the head to one side; commonly called wryneck or crick in the neck</td>
</tr>
</tbody>
</table>

### Objective 12

**Identify and define selected musculoskeletal system pathology terms.**

Text pages: 96–99; 111; PowerPoint slides: 81–98; 163–167

### LECTURE NOTES

**Skeletal System**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fractures</strong></td>
<td></td>
</tr>
<tr>
<td>closed fracture</td>
<td>fracture with no open skin wound; also called <em>simple fracture</em> (see Figure 4.14B)</td>
</tr>
<tr>
<td>Colles' fracture</td>
<td>common type of wrist fracture (see Figure 4.15)</td>
</tr>
<tr>
<td>comminuted fracture</td>
<td>fracture in which bone is shattered, splintered, or crushed into many small pieces or fragments</td>
</tr>
<tr>
<td>compound fracture</td>
<td>fracture in which skin has been broken through to fracture; also called <em>open fracture</em> (see also Figure 4.14A)</td>
</tr>
<tr>
<td>compression fracture</td>
<td>fracture involving loss of height of vertebral body; may be result of trauma; but in older persons, especially women, it may be caused by conditions like osteoporosis</td>
</tr>
<tr>
<td>fracture (FX, Fx)</td>
<td>broken bone</td>
</tr>
</tbody>
</table>

### TEACHING STRATEGIES

- Obtain a copy of X-rays of such pathologies as fractures and arthritis to show in class
- Select two students to do 5-minute presentation of their internet research in class
- Write sentences on the board using common words; have students substitute correct medical terms.

### IRDVD

- See PowerPoint presentation on the Instructor's Resource DVD for videos on the topic of:
  - Osteoporosis
  - Arthritis
  - Muscle atrophy
  - Muscular dystrophy
  - Carpal tunnel syndrome
greenstick fracture - fracture in which there is incomplete break; one side of bone is broken and other side is bent; this type of fracture is commonly found in children due to softer and more pliable bone structure.

impacted fracture - fracture in which bone fragments are pushed into each other.

oblique fracture - fracture at an angle to bone (see Figure 4.16).

pathologic fracture - fracture caused by diseased or weakened bone.

spiral fracture - fracture in which fracture line spirals around shaft of bone; can be caused by twisting injury; often slower to heal than other types of fractures.

stress fracture - slight fracture caused by repetitive low-impact forces, like running, rather than single forceful impact.

transverse fracture - complete fracture that is straight across bone at right angles to long axis of bone (see Figure 4.17).

Ewing's sarcoma - malignant growth found in shaft of long bones; spreads through periosteum; removal is treatment of choice, because tumor metastasizes.

osteogenic sarcoma - most common type of bone cancer; usually begins in osteocytes found at ends of long bones.

osteomalacia - softening of bones caused by deficiency of calcium; in children cause is insufficient sunlight and vitamin D.

osteoporosis - decrease in bone mass; results in thinning and weakening of bone with resulting fractures; bone becomes more porous, especially in spine and pelvis.

Paget's disease - fairly common metabolic disease of bone from unknown causes; usually attacks middle-aged and elderly people; characterized by bone destruction and deformity.

rickets - deficiency in calcium and vitamin D found in early childhood; results in bone deformities, especially bowed legs.

Spinal Column

ankylosing spondylitis - inflammatory spinal condition; resembles rheumatoid arthritis; gradual stiffening and fusion of vertebrae; more common in men than women.

herniated nucleus pulposus (HNP) - herniation or protrusion of intervertebral disk; also called herniated disk or ruptured disk (see Figure 4.18).

scoliosis - abnormal lateral curvature of spine; see Figure 4.13.

spina bifida - congenital anomaly; occurs when vertebra fails to fully form around spinal cord.

spinal stenosis - narrowing of spinal canal causing pressure on cord and nerves.

spondylolisthesis - forward sliding of lumbar vertebra over vertebra below it.

Jeopardy Game
- Have students create questions for terms in this section for a Jeopardy game to be played in class—may be combined with Vocabulary, Diagnostic, and Therapeutic terms.

Pop Questions
- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

LEARNING ACTIVITIES

Internet Research
- Have students select a specific pathology and use Internet resources to research its symptoms, diagnosis, and treatments.

Worksheet 4C
- Chapter Review

Text
- Practice Exercises
- Terminology Checklist
- Medical Record Analysis
- Chart Note Transcription

Student DVD-ROM
- Learning games
- Flash cards

CW
- Practice questions
- Case Study
- Web Destination activity on osteoporosis and muscular dystrophy
- New York Times link for research into specific pathologies

ASSESSMENTS

Quiz 4G—Chapter Review
Test Bank—questions
### Joints

- **bunion**: inflammation of bursa of first metatarsophalangeal joint (base of the big toe)
- **dislocation**: bones in joint are displaced from their normal alignment; ends of bones are no longer in contact
- **osteoarthritis (OA)**: arthritis resulting in degeneration of bones and joints, especially those bearing weight; results in bone rubbing against bone
- **rheumatoid arthritis (RA)**: chronic form of arthritis with inflammation of joints, swelling, stiffness, pain, and changes in cartilage that can result in crippling deformities; autoimmune disease (see Figure 4.19)
- **sprain**: damage to ligaments surrounding joint due to overstretching; no dislocation of joint or fracture of bone
- **subluxation**: incomplete dislocation; joint alignment is disrupted, but ends of bones remain in contact
- **systemic lupus erythematosus (SLE)**: chronic inflammatory autoimmune disease of connective tissue; affects many systems including joints and arthritis; may be mistaken for rheumatoid arthritis

### Muscular System

#### Term | Definition
--- | ---
**Muscles**
- **fibromyalgia**: widespread aching and pain in muscles and soft tissue
- **lateral epicondylitis**: inflammation of muscle attachment to lateral epicondyle of elbow; caused by strongly gripping; commonly called *tennis elbow*
- **muscular dystrophy (MD)**: inherited disease; progressive muscle degeneration, weakness, and atrophy
- **pseudohypertrophic muscular dystrophy**: one type of inherited muscular dystrophy; muscle tissue is gradually replaced by fatty tissue, making the muscle look strong; also called *Duchenne's muscular dystrophy*

#### Tendons, Muscles, and/or Ligaments

- **carpal tunnel syndrome (CTS)**: repetitive motion disorder with pain caused by compression of finger flexor tendons and median nerve as they pass through carpal tunnel of wrist
- **ganglion cyst**: cyst that forms on tendon sheath, usually on hand, wrist, or ankle
- **repetitive motion disorder**: group of chronic disorders involving the tendon, muscle, joint, and nerve damage; resulting from the tissue being subjected to pressure, vibration, or repetitive movements for prolonged periods
- **rotator cuff injury**: rotator cuff consists of joint capsule of shoulder joint reinforced by tendons from several shoulder muscles; high degree of flexibility at shoulder joint puts rotator cuff at risk for strain and tearing
- **strain**: damage to muscle, tendons, or ligaments due to overuse or overstretching
### LECTURE NOTES

#### Skeletal System

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnostic Imaging</strong></td>
<td></td>
</tr>
<tr>
<td>arthrography</td>
<td>X-ray of joint after injection of contrast medium into joint space</td>
</tr>
<tr>
<td>bone scan</td>
<td>nuclear medicine procedure; patient is given radioactive dye and then scanning equipment is used to visualize bones; especially useful in identifying stress fractures, observing progress of treatment for osteomyelitis, and locating cancer metastases to bone</td>
</tr>
<tr>
<td>dual-energy absorptiometry (DXA)</td>
<td>measurement of bone density using low dose X-ray for the purpose of detecting osteoporosis</td>
</tr>
<tr>
<td>myelography</td>
<td>X-ray of spinal column after injecting opaque contrast material; particularly useful in identifying herniated nucleus pulposus</td>
</tr>
<tr>
<td>radiography</td>
<td>X-rays to study internal structure of body; especially useful for visualizing bones and joints</td>
</tr>
<tr>
<td><strong>Endoscopic Procedures</strong></td>
<td></td>
</tr>
<tr>
<td>arthroscopy</td>
<td>examination of interior of joint by entering joint with arthroscope; arthroscope contains a small television camera that allows physician to view interior of joint on monitor during procedure; joint conditions can be repaired during arthroscopy</td>
</tr>
</tbody>
</table>

#### Muscular System

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical Laboratory Test</strong></td>
<td></td>
</tr>
<tr>
<td>creatine phosphokinase (CPK)</td>
<td>muscle enzyme found in skeletal muscle and cardiac muscle; blood levels become elevated in disorders such as heart attack, muscular dystrophy, and other skeletal muscle pathologies</td>
</tr>
<tr>
<td><strong>Additional Diagnostic Procedures</strong></td>
<td></td>
</tr>
<tr>
<td>deep tendon reflexes (DTR)</td>
<td>muscle contraction in response to stretch caused by striking muscle tendon with reflex hammer; used to determine if muscles are responding properly</td>
</tr>
<tr>
<td>electromyography (EMG)</td>
<td>study and record of strength and quality of muscle contractions as result of electrical stimulation</td>
</tr>
<tr>
<td>muscle biopsy</td>
<td>removal of muscle tissue for pathological examination</td>
</tr>
</tbody>
</table>

### OBJECTIVE 13

**Identify and define selected musculoskeletal system diagnostic procedures.**

Text pages: 100; 112; PowerPoint slides: 99–102; 168–169

### TEACHING STRATEGIES

- Write sentences on the board using common words; have students substitute correct medical terms.
- Obtain actual diagnostic images such as bone scan.

### IRDVD

- See PowerPoint presentation on the Instructor’s Resource DVD for a video on the topic of arthroscopy.

### Jeopardy Game

- Have students create questions for terms in this section for a Jeopardy game to be played in class—may be combined with Vocabulary, Pathology, and Therapeutic terms.

### Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

### LEARNING ACTIVITIES

- **Worksheet 4C**
  - Chapter Review

- **Text**
  - Practice Exercises
  - Terminology Checklist
  - Medical Record Analysis
  - Chart Note Transcription

- **Student DVD-ROM**
  - Learning games
  - Flash cards

- **CW**
  - Practice questions
  - Case Study
  - New York Times link for research into specific diagnostic procedures

### ASSESSMENTS

- **Quiz 4G**—Chapter Review
- **Test Bank**—questions
OBJECTIVE 14

Identify and define selected musculoskeletal system therapeutic procedures.

Text pages: 100–101; 112; PowerPoint slides: 103–107; 170

LECTURE NOTES

Skeletal System

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical Procedures</td>
<td></td>
</tr>
<tr>
<td>amputation</td>
<td>partial or complete removal of limb for variety of reasons, including tumors, gangrene, intractable pain, crushing injury, or uncontrollable infection</td>
</tr>
<tr>
<td>arthroscopic surgery</td>
<td>performing surgical procedure while using arthroscope to view internal structure, such as joint</td>
</tr>
<tr>
<td>bone graft</td>
<td>piece of bone taken from patient used to take place of removed bone or bony defect at another site</td>
</tr>
<tr>
<td>bunionectomy</td>
<td>removal of bursa at joint of great toe</td>
</tr>
<tr>
<td>laminectomy</td>
<td>removal of vertebral posterior arch to correct severe back problems and pain caused by compression of spinal nerve</td>
</tr>
<tr>
<td>percutaneous diskectomy</td>
<td>thin catheter tube is inserted into intervertebral disk through skin and herniated or ruptured disk material is sucked out or a laser is used to vaporize it</td>
</tr>
<tr>
<td>spinal fusion</td>
<td>surgical immobilization of adjacent vertebrae; may be done for several reasons, including correction for herniated disk</td>
</tr>
<tr>
<td>total hip arthroplasty (THA)</td>
<td>surgical reconstruction of hip by implanting prosthetic or artificial hip joint; also called total hip replacement (THR) (see Figure 4.20)</td>
</tr>
<tr>
<td>total knee arthroplasty (TKA)</td>
<td>surgical reconstruction of knee joint by implanting prosthetic knee joint; also called total knee replacement (TKR)</td>
</tr>
</tbody>
</table>

Fracture Care

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>fixation</td>
<td>procedure to stabilize fractured bone while it heals; external fixation includes casts, splints, and pins inserted through the skin; internal fixation includes pins, plates, screws, and wires that are applied during an open reduction</td>
</tr>
<tr>
<td>reduction</td>
<td>correcting fracture by realigning bone fragments; closed reduction is doing this manipulation without entering body; open reduction is process of making surgical incision at site of fracture to do reduction; necessary when bony fragments need to be removed or internal fixation such as plates or pins are required</td>
</tr>
<tr>
<td>traction</td>
<td>applying pulling force on fractured or dislocated limb or vertebral column in order to restore normal alignment</td>
</tr>
</tbody>
</table>

TEACHING STRATEGIES

- Write sentences on the board using common words; have students substitute correct medical terms.
- Jeopardy Game
  - Have students create questions for terms in this section for a Jeopardy game to be played in class—may be combined with Vocabulary, Pathology, and Diagnostic terms.
- Pop Questions
  - Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

LEARNING ACTIVITIES

Worksheet 4C
- Chapter Review

Text
- Practice Exercises
- Terminology Checklist
- Medical Record Analysis
- Chart Note Transcription

Student DVD-ROM
- Learning games
- Flash cards

CW
- Practice questions
- Case Study
- New York Times link for research into specific treatment procedures

ASSESSMENTS

Quiz 4G—Chapter Review
Test Bank—questions
Muscular System

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical Procedures</td>
<td></td>
</tr>
<tr>
<td>carpal tunnel release</td>
<td>surgical cutting of ligament in wrist to relieve nerve pressure caused by carpal tunnel syndrome; can result from repetitive motion such as typing</td>
</tr>
<tr>
<td>tenodesis</td>
<td>surgical procedure to stabilize joint by anchoring down tendons of muscles that move joint</td>
</tr>
</tbody>
</table>

Objective 15

Identify and define selected medications relating to the musculoskeletal system.

Text pages: 101; 112; PowerPoint slides: 108–109; 171

Lecture Notes

Skeletal System

<table>
<thead>
<tr>
<th>Classification</th>
<th>Action</th>
<th>Generic and Brand Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>bone reabsorption inhibitors</td>
<td>reduces reabsorption of bones; treats osteoporosis</td>
<td>alendronate, Fosamax; ibandronate, Boniva</td>
</tr>
<tr>
<td>calcium supplements and vitamin D therapy</td>
<td>maintains high blood levels of calcium with vitamin D strong anti-inflammatory properties; help with arthritis</td>
<td>calcium carbonate, Oyster-Cal; calcium citrate, Cal-Citrate, Citracal; prednisone; methylprednisolone, Medrol; dexamethasone, Decadron</td>
</tr>
<tr>
<td>corticosteroids</td>
<td>provide mild pain relief and anti-inflammatory benefits</td>
<td>ibuprofen, Advil, Motrin; naproxen, Aleve, Naprosyn; salicylates, aspirin</td>
</tr>
</tbody>
</table>

Muscular System

<table>
<thead>
<tr>
<th>Classification</th>
<th>Action</th>
<th>Generic and Brand Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>skeletal muscle relaxants</td>
<td>relaxes skeletal muscles to reduce muscle spasms</td>
<td>cyclolenzaprin, Flexeril; carisoprodol, Soma</td>
</tr>
</tbody>
</table>

Teaching Strategies

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

Learning Activities

Internet Research

- Have students use a PDR and/or the Internet to look up additional information regarding these medications, such as dosage, side effects, and contraindications.

Worksheet 4C

- Chapter Review

Text

- Practice Exercises
- Terminology Checklist

Student DVD-ROM

- Learning games
- Flash cards

CW

- Practice questions

Assessments

Test Bank—questions
**OBJECTIVE 16**

Define selected abbreviations associated with the musculoskeletal system.

Text pages: 102; 112; PowerPoint slides: 110–114; 172

---

**LECTURE NOTES**

**Skeletal System**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE</td>
<td>above elbow</td>
</tr>
<tr>
<td>AK</td>
<td>above knee</td>
</tr>
<tr>
<td>BDT</td>
<td>bone density testing</td>
</tr>
<tr>
<td>BE</td>
<td>below elbow</td>
</tr>
<tr>
<td>BK</td>
<td>below knee</td>
</tr>
<tr>
<td>BMD</td>
<td>bone mineral density</td>
</tr>
<tr>
<td>C1, C2, etc.</td>
<td>first cervical vertebra, second cervical vertebra, etc.</td>
</tr>
<tr>
<td>Ca</td>
<td>calcium</td>
</tr>
<tr>
<td>DJD</td>
<td>degenerative joint disease</td>
</tr>
<tr>
<td>DXA</td>
<td>dual-energy absorptiometry</td>
</tr>
<tr>
<td>FX, Fx</td>
<td>fracture</td>
</tr>
<tr>
<td>HNP</td>
<td>herniated nucleus pulposus</td>
</tr>
<tr>
<td>JRA</td>
<td>juvenile rheumatoid arthritis</td>
</tr>
<tr>
<td>L1, L2, etc.</td>
<td>first lumbar vertebra, second lumbar vertebra, etc.</td>
</tr>
<tr>
<td>LE</td>
<td>lower extremity</td>
</tr>
<tr>
<td>LLE</td>
<td>left lower extremity</td>
</tr>
<tr>
<td>LUE</td>
<td>left upper extremity</td>
</tr>
<tr>
<td>NSAID</td>
<td>nonsteroidal anti-inflammatory drug</td>
</tr>
<tr>
<td>OA</td>
<td>osteoarthritis</td>
</tr>
<tr>
<td>ORIF</td>
<td>open reduction–internal fixation</td>
</tr>
<tr>
<td>Orth, ortho</td>
<td>orthopedics</td>
</tr>
<tr>
<td>RA</td>
<td>rheumatoid arthritis</td>
</tr>
<tr>
<td>RLE</td>
<td>right lower extremity</td>
</tr>
<tr>
<td>RUE</td>
<td>right upper extremity</td>
</tr>
<tr>
<td>SLE</td>
<td>systemic lupus erythematosus</td>
</tr>
<tr>
<td>T1, T2, etc.</td>
<td>first thoracic vertebra, second thoracic vertebra, etc.</td>
</tr>
<tr>
<td>THA</td>
<td>total hip arthroplasty</td>
</tr>
<tr>
<td>THR</td>
<td>total hip replacement</td>
</tr>
<tr>
<td>TKA</td>
<td>total knee arthroplasty</td>
</tr>
<tr>
<td>TKR</td>
<td>total knee replacement</td>
</tr>
<tr>
<td>UE</td>
<td>upper extremity</td>
</tr>
</tbody>
</table>

**Muscular System**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTS</td>
<td>carpal tunnel syndrome</td>
</tr>
<tr>
<td>CPK</td>
<td>creatine phosphokinase</td>
</tr>
<tr>
<td>DTR</td>
<td>deep tendon reflex</td>
</tr>
<tr>
<td>EMG</td>
<td>electromyogram</td>
</tr>
<tr>
<td>IM</td>
<td>intramuscular</td>
</tr>
<tr>
<td>MD</td>
<td>muscular dystrophy</td>
</tr>
</tbody>
</table>

---

**TEACHING STRATEGIES**

- Emphasize importance of learning abbreviations and their full meanings; point out how some abbreviations, such as LE, UE, HNP, NSAID, and DXA typically used rather than the full terms.
- Encourage students to add abbreviations to their flash cards.
- Write sentences on the board using medical terms; have students substitute correct abbreviations for the terms.

**Memory Game**

- Have students assist in creating a memory game to play in class.

**Pop Questions**

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

---

**LEARNING ACTIVITIES**

**Worksheet 4C**

- Chapter Review

**Quiz 4F**

- May be used as a worksheet

**Text**

- Practice Exercises

**Student DVD-ROM**

- Learning games
- Flash cards

**CW**

- Practice questions

---

**ASSESSMENTS**

**Quiz 4F**—Abbreviations Quiz

**Quiz 4G**—Chapter Review

**Test Bank**—questions
### Worksheet 4A
**New Combining Form, Prefix, and Suffix Handout**

Directions: For each combining form, prefix, and suffix below write out its meaning. Then locate a new term from the chapter that uses the word part and its meaning.

<table>
<thead>
<tr>
<th>Combining Forms</th>
<th>Meaning</th>
<th>Chapter Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ankylo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. arthr/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. articul/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. burs/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. carp/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. cervic/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. chondr/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. clavul/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. coccyg/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. cortic/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. cost/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. crani/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. femor/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. fibul/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. humer/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. ili/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. ischi/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. kyph/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. lamin/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. lord/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. lumb/o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. mandibul/o</td>
<td></td>
<td></td>
<td></td>
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<td>23. maxill/o</td>
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<th>Combining Forms</th>
<th>Meaning</th>
<th>Chapter Term</th>
<th>Meaning</th>
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<tr>
<td>24. medull/o</td>
<td>_______</td>
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<td>25. metacarp/o</td>
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<td>26. metatars/o</td>
<td>_______</td>
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<td>27. myel/o</td>
<td>_______</td>
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<td>28. orth/o</td>
<td>_______</td>
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<td>29. oste/o</td>
<td>_______</td>
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<td>30. patell/o</td>
<td>_______</td>
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<td>31. ped/o</td>
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<td>32. pelv/o</td>
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<td>33. phalang/o</td>
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<td>34. pod/o</td>
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<td>35. pub/o</td>
<td>_______</td>
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<td>36. radi/o</td>
<td>_______</td>
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<td>37. sacr/o</td>
<td>_______</td>
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<td>38. scapul/o</td>
<td>_______</td>
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<td>39. scoli/o</td>
<td>_______</td>
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<td>40. spondyl/o</td>
<td>_______</td>
<td>_______</td>
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<td>41. stern/o</td>
<td>_______</td>
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<td>42. synovi/o</td>
<td>_______</td>
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<td>43. synov/o</td>
<td>_______</td>
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<td>44. tars/o</td>
<td>_______</td>
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<td>45. thorac/o</td>
<td>_______</td>
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<td>46. tibi/o</td>
<td>_______</td>
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<td>47. uln/o</td>
<td>_______</td>
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<td>48. vertebr/o</td>
<td>_______</td>
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<td>49. fasci/o</td>
<td>_______</td>
<td>_______</td>
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<tr>
<td>50. fibr/o</td>
<td>_______</td>
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<table>
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<th>Combining Forms</th>
<th>Meaning</th>
<th>Chapter Term</th>
<th>Meaning</th>
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</thead>
<tbody>
<tr>
<td>51. kinesi/o</td>
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<tr>
<td>52. muscul/o</td>
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<td>53. my/o</td>
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<td>54. myocardi/o</td>
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<td>55. myos/o</td>
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<td>56. plant/o</td>
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<td>57. ten/o</td>
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<td>58. tend/o</td>
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<td></td>
<td></td>
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<tr>
<td>59. tendin/o</td>
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<thead>
<tr>
<th>Suffixes</th>
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<tbody>
<tr>
<td>60. -blast</td>
<td></td>
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<tr>
<td>61. -clasia</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>62. -desis</td>
<td></td>
<td></td>
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<tr>
<td>63. -listhesis</td>
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<tr>
<td>64. -porosis</td>
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<tr>
<td>65. -asthenia</td>
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<tr>
<td>66. -kinesia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67. -tonia</td>
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<tr>
<th>Prefixes</th>
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</thead>
<tbody>
<tr>
<td>68. ab-</td>
<td></td>
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<td></td>
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<tr>
<td>69. ad-</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>70. circum-</td>
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</tbody>
</table>
Worksheet 4B
Medical Term Analysis

Directions: Below are terms built from word parts used in this chapter that are not analyzed in the Word Building Table. Many are built from word parts you have learned in previous chapters. Analyze each term presented below and list and define the word parts used to build each term.

<table>
<thead>
<tr>
<th>Medical Term</th>
<th>Word Part Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. osteocyte</td>
<td></td>
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<tr>
<td>2. osteoblast</td>
<td></td>
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<tr>
<td>3. articular</td>
<td></td>
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<tr>
<td>4. kyphosis</td>
<td></td>
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<tr>
<td>5. scoliosis</td>
<td></td>
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<tr>
<td>6. orthotic</td>
<td></td>
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<tr>
<td>7. osteogenic</td>
<td></td>
</tr>
<tr>
<td>8. osteomalacia</td>
<td></td>
</tr>
<tr>
<td>9. osteoporosis</td>
<td></td>
</tr>
<tr>
<td>10. spondylolisthesis</td>
<td></td>
</tr>
<tr>
<td>11. osteoarthritis</td>
<td></td>
</tr>
</tbody>
</table>

(Continued)
12. systemic

13. arthrography

14. arthroscopy

15. arthroplasty

16. myoneural

17. electromyography

18. atrophy

19. pseudohypertrophic

20. fibromyalgia
Worksheet 4C
Chapter Review

Anatomy and Physiology

1. The four classifications of bones by their shape are ____________, ____________, ____________, and ____________.

2. Dense and hard exterior surface bone is called ____________ or ____________ bone.

3. A ____________ is a large, smooth, ball-shaped process on the end of a long bone.

4. The bones that form the central axis for the whole body are part of the ____________ skeleton.

5. The pectoral girdle consists of the ____________ and ____________.

6. The most common type of joint in the body is a ____________ joint.

7. Visceral muscle is another name for ____________ muscle.

8. ____________ muscles are voluntary.

9. ____________ is movement away from the midline.

10. A ____________ anchors a muscle to the bone.

Word Building

Directions: Build a term that means:

1. cartilage softening

2. fusion of a joint

3. pertaining to between vertebrae

4. bone and cartilage tumor

5. pertaining to the femur

6. pertaining to the breast bone

7. lack of tone

8. study of movement

9. incision into fascia

10. record of muscle electricity

(Continued)
Matching

<p>| | | |</p>
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<tr>
<th></th>
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<tbody>
<tr>
<td>____</td>
<td>1. clavicle</td>
<td>a. brace or splint</td>
</tr>
<tr>
<td>____</td>
<td>2. phalanges</td>
<td>b. realigning bones in a fracture</td>
</tr>
<tr>
<td>____</td>
<td>3. exostosis</td>
<td>c. fracture commonly seen in children</td>
</tr>
<tr>
<td>____</td>
<td>4. orthotic</td>
<td>d. procedure to stabilize a joint</td>
</tr>
<tr>
<td>____</td>
<td>5. comminuted</td>
<td>e. loss of bone mass</td>
</tr>
<tr>
<td>____</td>
<td>6. greenstick</td>
<td>f. abnormal shortening of muscle fibers</td>
</tr>
<tr>
<td>____</td>
<td>7. HNP</td>
<td>g. bone spur</td>
</tr>
<tr>
<td>____</td>
<td>8. subluxation</td>
<td>h. sudden, strong muscle contraction</td>
</tr>
<tr>
<td>____</td>
<td>9. RA</td>
<td>i. fracture with shattered bone</td>
</tr>
<tr>
<td>____</td>
<td>10. spina bifida</td>
<td>j. wryneck</td>
</tr>
<tr>
<td>____</td>
<td>11. osteoporosis</td>
<td>k. noise from two bones rubbing together</td>
</tr>
<tr>
<td>____</td>
<td>12. prosthesis</td>
<td>l. inherited muscle degeneration disease</td>
</tr>
<tr>
<td>____</td>
<td>13. crepitation</td>
<td>m. considered an autoimmune disease</td>
</tr>
<tr>
<td>____</td>
<td>14. DXA</td>
<td>n. damage to ligaments around a joint</td>
</tr>
<tr>
<td>____</td>
<td>15. reduction</td>
<td>o. fingers</td>
</tr>
<tr>
<td>____</td>
<td>16. NSAIDs</td>
<td>p. aching and pain in muscles and soft tissue</td>
</tr>
<tr>
<td>____</td>
<td>17. contracture</td>
<td>q. collarbone</td>
</tr>
<tr>
<td>____</td>
<td>18. spasm</td>
<td>r. scar tissue in the fascia</td>
</tr>
<tr>
<td>____</td>
<td>19. fibromyalgia</td>
<td>s. device to substitute a missing body part</td>
</tr>
<tr>
<td>____</td>
<td>20. carpal tunnel syndrome</td>
<td>t. protruding intervertebral disk</td>
</tr>
<tr>
<td>____</td>
<td>21. torticollis</td>
<td>u. provide mild pain relief</td>
</tr>
<tr>
<td>____</td>
<td>22. adhesion</td>
<td>v. measures bone density</td>
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<tr>
<td>____</td>
<td>23. MD</td>
<td>w. congenital anomaly</td>
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<tr>
<td>____</td>
<td>24. sprain</td>
<td>x. a repetitive motion disorder</td>
</tr>
<tr>
<td>____</td>
<td>25. tenodesis</td>
<td>y. incomplete dislocation</td>
</tr>
</tbody>
</table>
Quiz 4A
New Word Parts Quiz

Directions: Define the combining form or suffix in the spaces provided.

1. arth/o ________________________________
2. carp/o ________________________________
3. cost/o ________________________________
4. lord/o ________________________________
5. scoli/o ________________________________
6. medull/o ______________________________
7. myel/o ________________________________
8. lumb/o ________________________________
9. thorac/o ______________________________
10. spondyl/o ____________________________
11. fasci/o ______________________________
12. myos/o ______________________________
13. plant/o ______________________________
14. tend/o ______________________________
15. kinesi/o ______________________________
16. fibr/o ________________________________
17. my/o _________________________________
18. synovi/o ______________________________
19. orth/o ______________________________
20. circum- ______________________________
21. -tonia ________________________________
22. -asthenia ______________________________
23. -desis ________________________________
24. -clasia ________________________________
25. -listhesis ______________________________
Quiz 4B
Spelling Quiz

Directions: Write each term as your instructor pronounces it.

1. ________________________________________________________________________
2. ________________________________________________________________________
3. ________________________________________________________________________
4. ________________________________________________________________________
5. ________________________________________________________________________
6. ________________________________________________________________________
7. ________________________________________________________________________
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12. ________________________________________________________________________
13. ________________________________________________________________________
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15. ________________________________________________________________________
16. ________________________________________________________________________
17. ________________________________________________________________________
18. ________________________________________________________________________
19. ________________________________________________________________________
20. ________________________________________________________________________
Quiz 4C
Labeling Diagram

Directions: Label the bones of the skeleton.

1. ______________
2. ______________
3. ______________
4. ______________
5. ______________
6. ______________
7. ______________
8. ______________
9. ______________
10. _____________
11. _____________
12. _____________
13. _____________
14. _____________
15. _____________
16. _____________
17. _____________
18. _____________
19. _____________
20. _____________
21. _____________
22. _____________
23. _____________
24. _____________
25. _____________
26. _____________
27. _____________
Quiz 4D
Labeling Diagram

Directions: Label the parts of a long bone.

1. __________________
2. __________________
3. __________________
4. __________________
5. __________________
6. __________________
7. __________________
8. __________________
Quiz 4E
Word Building Quiz

Directions: Build a single medical term for each phrase below.

1. fusion of a joint __________________________________________

2. inflammation of a bursa _______________________________________

3. surgical repair of cartilage ___________________________________

4. incision into the skull _________________________________________

5. surgically break a bone ________________________________________

6. surgical removal of synovial membrane __________________________

7. pertaining to wrist ____________________________________________

8. pertaining to ilium ____________________________________________

9. pertaining to kneecap _________________________________________

10. pertaining to upper jaw ________________________________________

11. pertaining to tailbone _________________________________________

12. pertaining to chest __________________________________________

13. abnormal condition of hump ___________________________________

14. porous bone __________________________________________________

15. vertebra slipping _____________________________________________

16. inflammation of bone and joint _________________________________

17. process of recording a joint ____________________________________

18. inflammation of fascia _________________________________________

19. pertaining to muscle __________________________________________

20. muscle disease ______________________________________________

21. inflammation of many muscles _________________________________

22. abnormal tone ______________________________________________

23. slow movement ______________________________________________

24. excessive development ________________________________________

25. inflammation of a tendon ______________________________________
Quiz 4F
Abbreviations Quiz

Directions: Write the medical term for which each abbreviation stands.

1. AE  
2. BK  
3. BDT  
4. DJD  
5. DXA  
6. Fx  
7. HNP  
8. NSAID  
9. ORIF  
10. RA  
11. THA  
12. TKR  
13. UE  
14. LE  
15. ortho  
16. JRA  
17. Ca  
18. L1  
19. C2  
20. T3  
21. MD  
22. IM  
23. EMG  
24. DTR  
25. CTS
Quiz 4G
Chapter Review

PART I: Multiple Choice
Directions: Circle the correct answer.

1. The medical term for the end region of a long bone is
   a. diaphysis.
   b. epiphysis.
   c. periosteum.
   d. bursa.

2. Which bone is NOT found in the appendicular skeleton?
   a. tibia
   b. phalanges
   c. clavicle
   d. sternum

3. Most of the joints found in the human body are what type?
   a. bursa joints
   b. ball and socket joints
   c. synovial joints
   d. suture joints

4. The medical term for a fracture that does not break through the skin is
   a. closed.
   b. complete.
   c. comminuted.
   d. compound.

5. The term meaning movement toward the midline is
   a. abduction.
   b. circumduction.
   c. eversion.
   d. adduction.

6. A specialist in treating disorders of the feet is a(n)
   a. orthopedist.
   b. orthotist.
   c. podiatrist.
   d. physiatrist.

7. An inherited disease causing progressive muscle weakness and atrophy is
   a. myasthenia gravis.
   b. carpal tunnel syndrome.
   c. rheumatoid arthritis.
   d. muscular dystrophy.

8. The medical term for the removing of muscle tissue for pathological examination is
   a. myelography.
   b. muscle biopsy.
   c. dual-energy absorptiometry.
   d. polymyositis.

9. The surgical term *arthrodesis* is defined as
   a. surgical fusion of a joint.
   b. surgical breaking of a joint.
   c. incision into a joint.
   d. excision of a joint.

10. The condition that involves an abnormal lateral curve of the spine is
    a. lordosis.
    b. ankylosis.
    c. kyphosis.
    d. scoliosis.

(Continued)
PART II: Matching
Directions: Match the term with its definition.

____ 1. fixation     a. procedure that uses radioactive dye
____ 2. laminectomy  b. fracture at an angle to the bone
____ 3. bone scan    c. muscle wasting
____ 4. osteoarthritis d. stabilize a broken bone while it heals
____ 5. talipes       e. tennis elbow
____ 6. oblique       f. clubfoot
____ 7. Collé        g. forms on a tendon sheath
____ 8. atrophy      h. results in degeneration of bones and joints
____ 9. lateral epicondylitis i. wrist fracture
____ 10. ganglion     j. used to correct severe back problems

PART III: Abbreviations
Directions: Write the full meaning of the following abbreviations.

1. DXA
2. C2
3. RUE
4. DTR
5. OA

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Chapter 4 Answer Keys

Worksheet 4A Answer Key

1. stiff joint
2. joint
3. joint
4. sac
5. wrist
6. neck
7. cartilage
8. clavicle
9. coccyx
10. outer portion
11. rib
12. skull
13. femur
14. fibula
15. humerus
16. ilium
17. ischium
18. hump
19. lamina, part of vertebra
20. bent backwards
21. loin
22. mandible
23. maxilla
24. inner portion
25. metacarpals
26. metatarsals
27. bone marrow
28. straight
29. bone
30. patella
31. child, foot
32. pelvis
33. phalanges
34. foot
35. pubis
36. radius
37. sacrum
38. scapula
39. crooked, bent
40. vertebra
41. sternum
42. synovial membrane
43. synovial membrane
44. ankle
45. chest
46. tibia
47. ulna
48. vertebra
49. fibrous band
50. fibers
51. movement
52. muscle
53. muscle
54. heart muscle
55. muscle
56. sole of foot
57. tendon
58. tendon
59. tendon
60. immature cell
61. to surgically break
62. stabilize, fuse
63. slipping
64. porous
65. weakness
66. movement
67. tone
68. away from
69. toward
70. around

Worksheet 4B Answer Key

1. oste/o = bone; -cyte = cell
2. oste/o = bone; -blast = embryonic cell
3. articul/o = joint; -ar = pertaining to
4. kyph/o = hump; -osis = abnormal condition
5. scoli/o = crooked; -osis = abnormal condition
6. orth/o = straight; -tic = pertaining to
7. oste/o = bone; -genic = producing
8. oste/o = bone; -malacia = softening
9. oste/o = bone; -porosis = porous
10. spondyl/o = vertebra; -listhesis = slipping
11. oste/o = bone; arthr/o = joint; -itis = inflammation
12. system/o = system; -ic = pertaining to
13. arthr/o = joint; -graphy = process of recording
14. arthr/o = joint; -scopy = process of viewing inside
15. arthr/o = joint; -plasty = surgical repair

16. my/o = muscle; neur/o = nerve; -al = pertaining to
17. electr/o = electricity; my/o = muscle; -graphy = process of recording
18. a- = lack of; -trophy = development
19. pseudo- = false; hyper- = excessive; -trophic = development
20. fibr/o = fibers; my/o = muscle; -algia = pain

Worksheet 4C Answer Key
Anatomy and Physiology
1. long, short, irregular, flat
2. compact, cortical
3. head
4. axial
5. clavicle, scapula
6. synovial
7. smooth
8. skeletal
9. abduction
10. tendon

Word Building
1. chondromalacia
2. arthrodesis
3. intervertebral
4. osteochondroma
5. femoral
6. sternal
7. atonia
8. kinesiology
9. fasciotomy
10. electromyogram

Matching
1. q
2. o
3. g
4. a
5. i
6. c
7. t
8. y
9. m
10. w
11. e
12. s
13. k
14. v
15. b
16. u
17. f
18. h
19. p
20. x
21. j
22. r
23. l
24. n
25. d

Quiz 4A Answer Key
1. joint
2. wrist
3. rib
4. bent backwards
5. crooked, bent
6. inner portion
7. bone marrow
8. loin
9. chest
10. vertebra
11. fibrous band
12. muscle
13. sole of foot
14. tendon
15. movement
16. fibers
17. muscle
18. synovial membrane
19. straight

20. around
21. tone
22. weakness
23. stabilize, fuse
24. surgically break
25. slipping

Quiz 4B Answer Key

1. ossification
2. periosteum
3. trochanter
4. coccygeal
5. phalanges
6. articulation
7. intracranial
8. chiropractic
9. prosthesis
10. pathologic

11. osteoporosis
12. ankylosing
13. spondylolisthesis
14. subluxation
15. arthroscopy
16. claudication
17. pseudohypertrophic
18. electromyography
19. tenodesis
20. fibromyalgia

Quiz 4C Answer Key

1. skull
2. cervical vertebrae
3. sternum
4. ribs
5. thoracic vertebrae
6. lumbar vertebrae
7. ilium
8. pubis
9. ischium
10. femur
11. patella
12. tibia
13. fibula
14. tarsals

15. metatarsals
16. phalanges
17. maxilla
18. mandible
19. scapula
20. humerus
21. ulna
22. radius
23. sacrum
24. coccyx
25. carpals
26. metacarpals
27. phalanges

Quiz 4D Answer Key

1. proximal epiphysis
2. diaphysis
3. distal epiphysis
4. articular cartilage

5. epiphyseal line
6. spongy bone
7. compact bone
8. medullary cavity

Quiz 4E Answer Key

1. arthrodesis
2. bursitis

3. chondroplasty
4. craniotomy
Quiz 4F Answer Key

1. above elbow 14. lower extremity
2. below knee 15. orthopedics
3. bone density testing 16. juvenile rheumatoid arthritis
4. degenerative joint disease 17. calcium
5. dual-energy absorptiometry 18. first lumbar vertebra
6. fracture 19. second cervical vertebra
7. herniated nucleus pulposus 20. third thoracic vertebra
8. nonsteroidal anti-inflammatory drug 21. muscular dystrophy
9. open reduction internal fixation 22. intramuscular
10. rheumatoid arthritis 23. electromyogram
11. total hip arthroplasty 24. deep tendon reflexes
12. total knee replacement 25. carpal tunnel syndrome
13. upper extremity

Quiz 4G Answer Key

Multiple Choice
1. B 6. C
2. D 7. D
3. C 8. B
4. A 9. A
5. D 10. D

Matching
1. d 6. b
2. j 7. i
3. a 8. c
4. h 9. e
5. f 10. g

Abbreviations
1. dual-energy absorptiometry 4. deep tendon reflexes
2. second cervical vertebra 5. osteoarthritis
3. right upper extremity