CHAPTER 7:4 SKELETAL SYSTEM

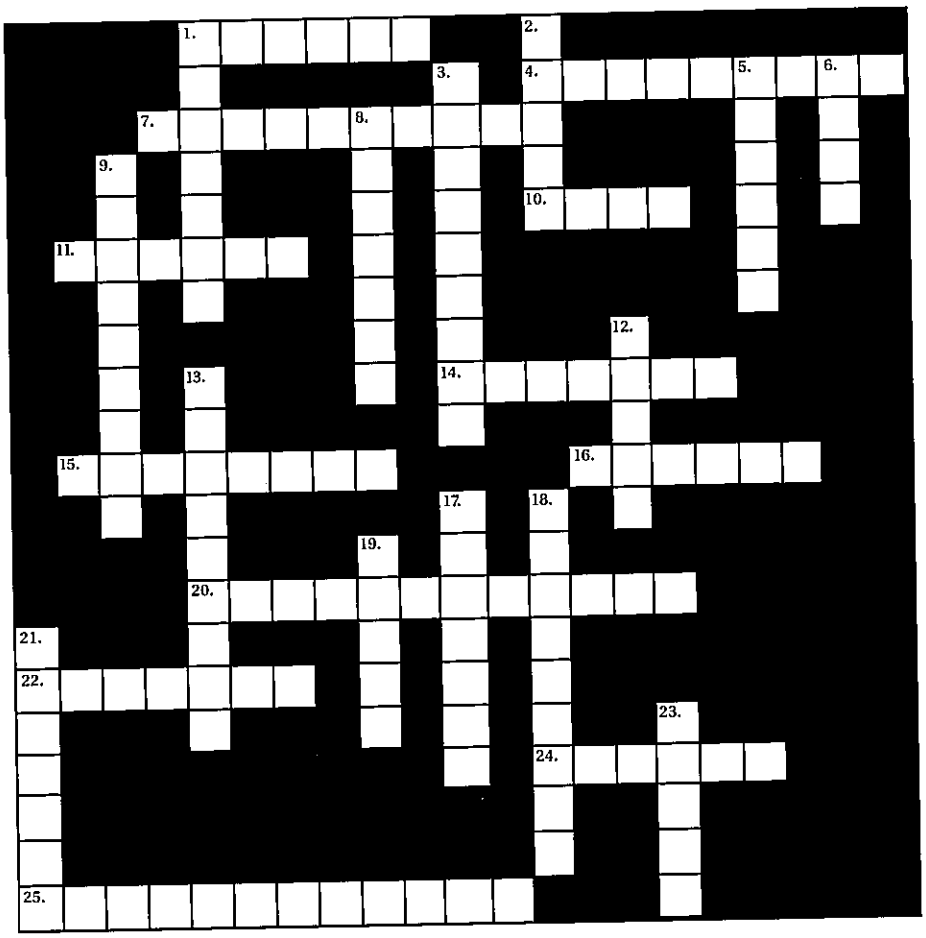
ASSIGNMENT SHEET

Grade _____ Name _____

INTRODUCTION: The skeletal system forms the framework of the entire body. This assignment will help you review the main facts about this system.

INSTRUCTIONS: Read the information on the Skeletal System. In the space provided, print the word(s) that best completes the statement or answers the question.

1. Use the Key Terms to complete the following crossword puzzle.



ACROSS

1. Area where cranial bones have joined together
4. Membrane that lines the medullary canal
7. Tough membrane on the outside of bone
10. Twelve pairs of bones that surround the heart and lungs
11. Lateral bone of the lower leg
14. Two bones that form the pelvic girdle

Name _____

5. Connective tissue band that holds bones together
6. Wrist bone
0. Material inside the medullary canal
2. Eight bones that surround and protect the brain
4. Lower arm bone on thumb side
5. Bones that form the extremities

WN

1. Breastbone
2. Thigh bone
3. Material found in some bones that produces blood cells
5. Anklebone
6. Larger bone of lower arm
3. Air spaces in the bones of the skull
9. An extremity or end of bone
2. Bones that form the main trunk of the body
3. Long shaft of bones
7. Upper arm bone
3. Twenty-six bones of the spinal column
9. Area where two or more bones join together
1. Shoulder bone or shoulder blade
3. Medial bone of the lower leg

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2. List five (5) functions of bones.

3. Name the eight (8) bones that form the cranium.

. Name the twenty-six (26) vertebrae.

FIGURE 7-15 Psoriasis is characterized by white or silver scales. *(Courtesy of Robert A. Silverman, MD, Pediatric Dermatology, Georgetown University)*

Ringworm

Ringworm (tineas) is a highly contagious fun infection of the skin or scalp. The characteris symptom is the formation of a flat or raised circ lar area with a clear central area surrounded an itchy, scaly, or crusty outer ring. Antifun medications, both oral and topical, are used treatment.

Verrucae

Verrucae, or warts, are caused by a viral infecti of the skin. Plantar warts usually occur at pre sure points on the sole of the foot. A rough, ha elevated, rounded surface forms on the sk Some warts disappear spontaneously, but othe must be removed with electricity, liquid nitroge acid, chemicals, or laser.

STUDENT: *Go to the workbook and comple the assignment sheet for 7:3, Integumenta System.*

7:4 Skeletal System

Objectives

After completing this section, you should be able to:

- List five functions of bones
- Label the parts of a bone on a diagram of a long bone
- Name the two divisions of the skeletal syste and the main groups of bones in each di sion
- Identify the main bones of the skeleton
- Compare the three classifications of joints describing the type of motion allowed each
- Give one example of each joint classificatio
- Describe at least four diseases of the skelet system
- Define, pronounce, and spell all key terms

KEY TERMS

appendicular skeleton *(ap-pen-dick'-u-lar)*
axial skeleton
carpals
clavicles *(klav'-ih-kulz)*
cranium
diaphysis *(dy-af'-eh-sis)*
endosteum *(en-dos'-tee-um)*
epiphysis *(ih-pif'-eh-sis)*
femur *(fee'-mur)*
fibula *(fib'-you-la)*
fontanels
foramina *(for-ahm'-e-nah)*
humerus *(hue'-mer-us)*
joints
ligaments
medullary canal *(med'-hue-lair-ee)*
metacarpals *(met-ah-car'-pulz)*
metatarsals *(met-ah-tar'-sulz)*
os coxae *(ahs cock'-see)*
patella *(pa-tell'-ah)*
periosteum *(per-ee-os'-tee-um)*
phalanges *(fa-lan'-jeez)*
radius
red marrow
ribs

(continue

KEY TERMS (continued)

scapula
sinuses *(sigh'-nuss-ez)*
skeletal system
sternum
sutures
tarsals
tibia
ulna
vertebrae *(vur'-teh-bray)*
yellow marrow

RELATED HEALTH CAREERS

- Athletic Trainer
- Chiropractor
- Orthopedist
- Orthoptist
- Osteopathic Physician
- Physiatrist
- Physical Therapist
- Podiatrist
- Prosthetist
- Radiologic Technologist
- Sports Medicine Physician

7:4 INFORMATION

The **skeletal system** is made of organs called *bones.* An adult human has 206 bones. These bones work as a system to perform the following functions:

- *Framework*: bones form a framework to support the body's muscles, fat, and skin
- *Protection*: bones surround vital organs to protect them (for example the skull, which surrounds the brain, and the ribs, which protect the heart and lungs)
- *Levers*: muscles attach to bones to help provide movement
- *Production of blood cells*: bones help produce red and white blood cells and platelets, a process called *hemopoiesis* or *hematopoiesis*
- *Storage*: bones store most of the calcium supply of the body in addition to phosphorus and fats

Bones vary in shape and size depending on their locations within the body. Bones of the extremities (arms and legs) are called *long bones.* The basic parts of these bones are shown in figure 7-16. The long shaft is called the **diaphysis,** and the two extremities, or ends, are each called an **epiphysis.** The **medullary canal** is a cavity in the diaphysis. It is filled with **yellow marrow,** which is mainly a storage area for fat cells. Yellow marrow also contains cells that form leukocytes, or white blood cells. The **endosteum** is a membrane that lines the medullary canal and keeps the yellow marrow intact. It also produces some bone growth. **Red marrow** is found in certain bones, such as the vertebrae, ribs, sternum, and cranium, and in the proximal ends of the humerus and femur. It produces red blood cells (erythrocytes), platelets (thrombocytes), and some white blood cells (leukocytes). Because bone marrow is important in the manufacture of blood cells and is involved with the body's immune response, the red marrow is used to diagnose blood diseases and is sometimes transplanted in people with defective immune systems. The outside of bone is covered with a tough membrane, called the **periosteum,** which contains blood vessels, lymph vessels, and *osteoblasts,* special cells that form new bone tissue. The periosteum is necessary for bone growth, repair, and nutrition. A thin layer of articular cartilage covers the epiphysis and acts as a shock absorber when two bones meet to form a joint.

The skeletal system is divided into two sections: the axial skeleton and the appendicular skeleton. The **axial skeleton** forms the main trunk of the body and is composed of the skull, spinal column, ribs, and breastbone. The **appendicular skeleton** forms the extremities and is composed of the shoulder girdle, arm bones, pelvic girdle, and leg bones.

The skull is composed of the cranial and facial bones (figure 7-17). The **cranium** is the spherical structure that surrounds and protects the

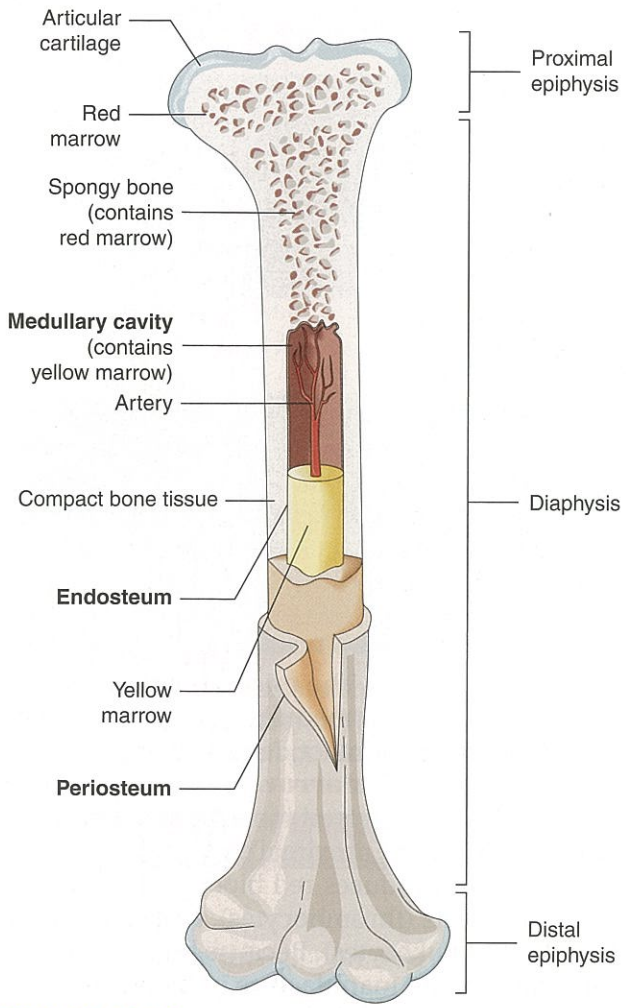


FIGURE 7-16 Anatomic parts of a long bone.

brain. It is made of eight bones: one frontal, tw parietal, two temporal, one occipital, one et moid, and one sphenoid. At birth, the cranium not solid bone. Spaces called **fontanels,** or "so spots," allow for the enlargement of the skull brain growth occurs. The fontanels are made membrane and cartilage, and turn into solid bor by approximately 18 months of age. There are facial bones: 1 mandible (lower jaw), 2 maxil (upper jaw), 2 zygomatic (cheek), 2 lacrim (inner aspect of eyes), 5 nasal, and 2 palatin (hard palate or roof of the mouth). **Sutures** a areas where the cranial bones have joine together. **Sinuses** are air spaces in the bones the skull that act as resonating chambers for th voice. They are lined with mucous membrane **Foramina** are openings in bones that allo nerves and blood vessels to enter or leave th bone.

The spinal column is composed of 26 bon called **vertebrae** (figure 7-18). These bones pr tect the spinal cord and provide support for th head and trunk. They include 7 cervical (neck 12 thoracic (chest), 5 lumbar (waist), 1 sacru (back of pelvic girdle), and 1 coccyx (tailbone Pads of cartilage tissue, called *intervertebral disk* separate the vertebrae. The disks act as shoc absorbers and permit bending and twistin movements of the vertebral column.

There are 12 pairs of **ribs,** or costae. The attach to the thoracic vertebrae on the dorsal su

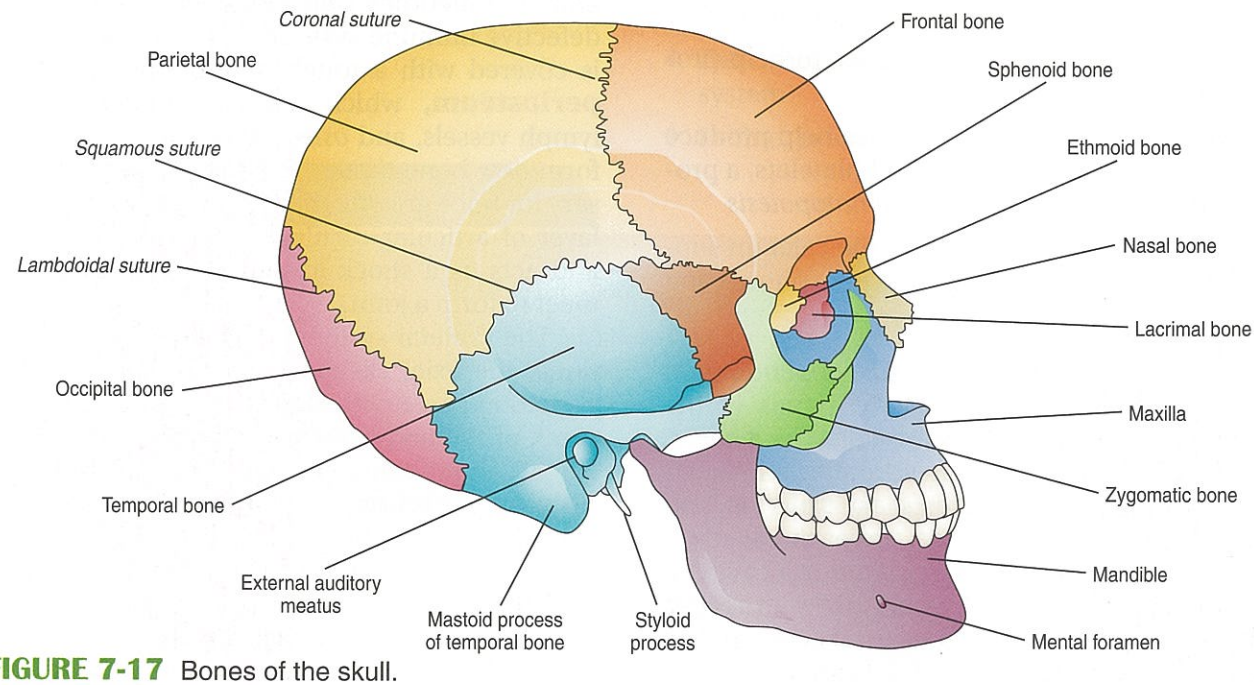


FIGURE 7-17 Bones of the skull.

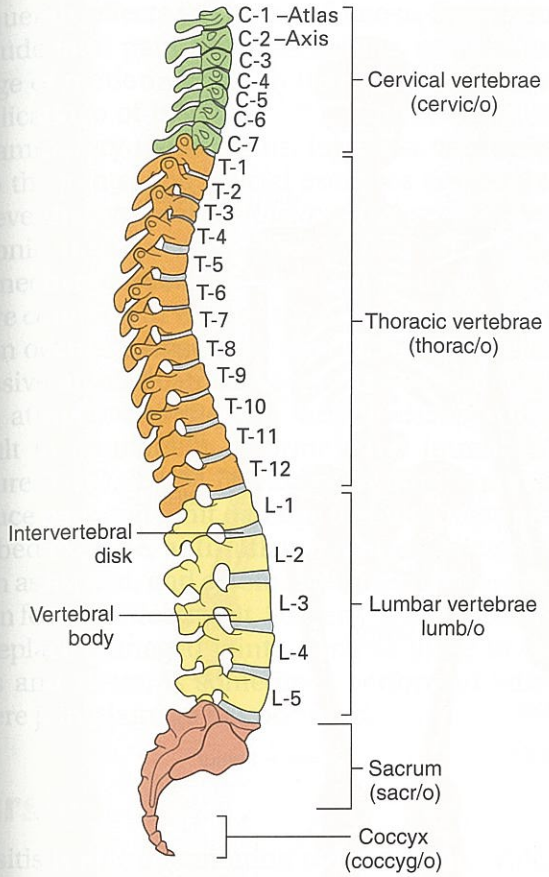


FIGURE 7-18 Lateral view of the vertebral, or spinal, column.

face of the body. The first seven pairs are called *true ribs* because they attach directly to the sternum, or breastbone, on the front of the body. The next five pairs are called *false ribs.* The first three pairs of false ribs attach to the cartilage of the rib above. The last two pairs of false ribs are called *floating ribs* because they have no attachment on the front of the body.

The **sternum,** or breastbone, is the last bone of the axial skeleton. It consists of three parts: the manubrium (upper region), the gladiolus (body), and the xiphoid process (a small piece of cartilage at the bottom). The two collarbones, or clavicles, are attached to the manubrium by ligaments. The ribs are attached to the sternum with costal cartilages to form a "cage" that protects the heart and lungs.

The shoulder, or pectoral, girdle is made of two **clavicles** (collarbones) and two **scapulas** (shoulder bones). The scapulas provide for attachment of the upper arm bones.

Bones of each arm include one **humerus** (upper arm), one **radius** (lower arm on thumb side that rotates around the ulna to allow the hand to turn freely), one **ulna** (larger bone of lower arm with a projection called the *olecranon process* at its upper end, forming the elbow), eight **carpals** (wrist), five **metacarpals** (palm of the hand), and fourteen **phalanges** (three on each finger and two on the thumb).

The pelvic girdle is made of two **os coxae** (coxal, or hip, bones), which join with the sacrum on the dorsal part of the body (figure 7-19). On the ventral part of the body, the os coxae join together at a joint called the *symphysis pubis.* Each os coxae is made of three fused sections: the ilium, the ischium, and the pubis. The pelvic girdle contains two recessed areas, or sockets. These sockets, called *acetabula,* provide for the attachment of the smooth rounded head of the femur (upper leg bone). An opening between the ischium and pubis, called the *obturator foramen,* allows for the passage of nerves and blood vessels to and from the legs.

Each leg consists of one **femur** (thigh), one **patella** (kneecap), one **tibia** (the larger weight-bearing bone of the lower leg commonly called the *shin bone*), one **fibula** (the slender smaller bone of the lower leg that attaches to the proximal end of the tibia), seven **tarsals** (ankle), five **metatarsals** (instep of foot), and fourteen phalanges (two on the great toe and three on each of the other four toes). The heel is formed by the large tarsal bone called the *calcaneous.* The bones of the skeleton are shown in figure 7-20.

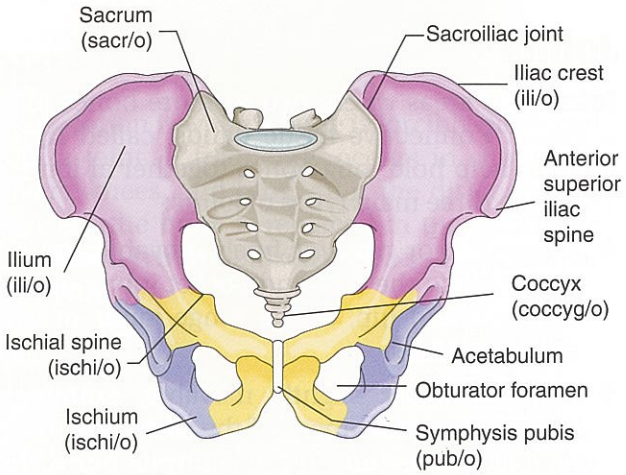


FIGURE 7-19 Anterior view of the pelvic girdle.

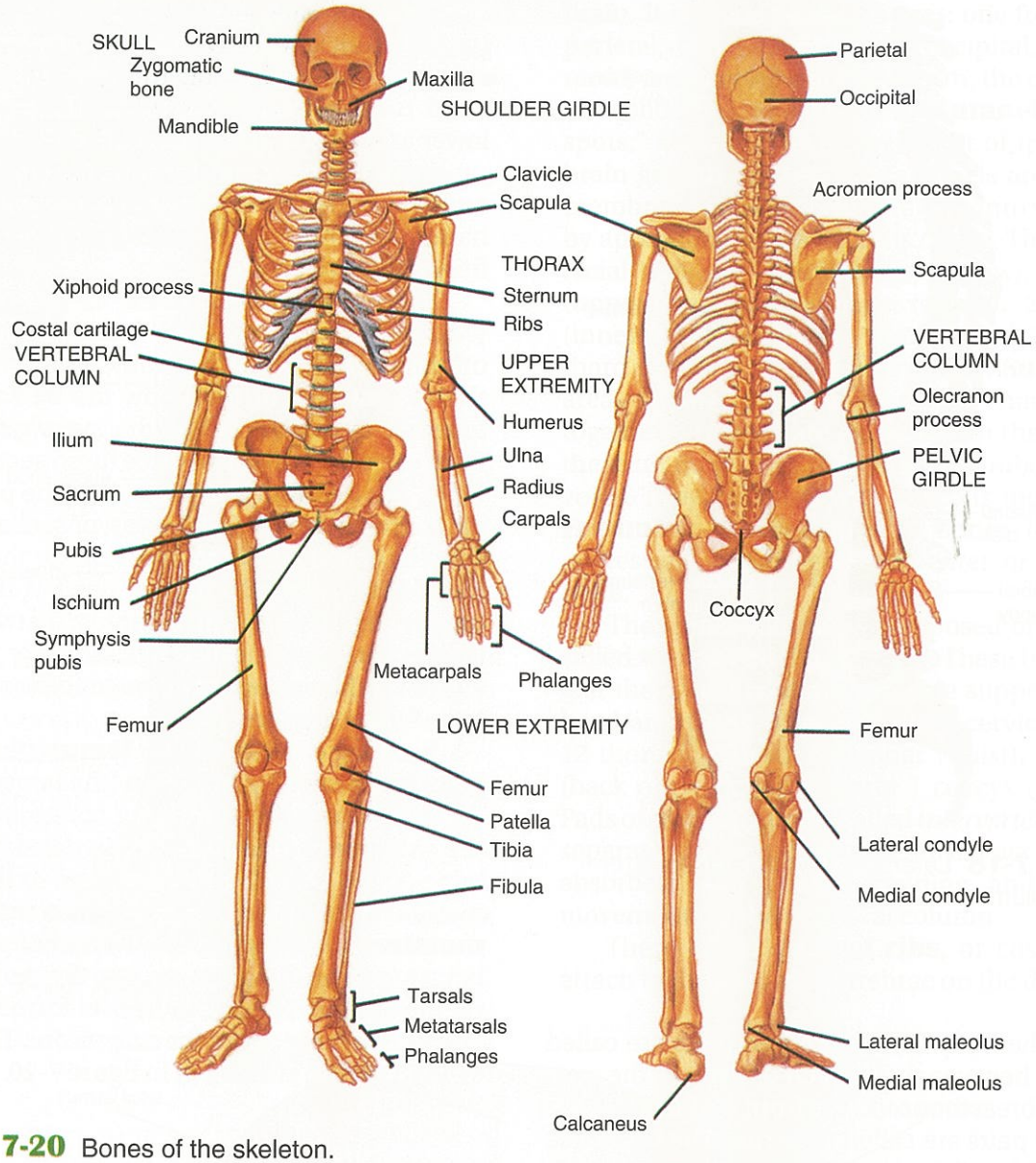


FIGURE 7-20 Bones of the skeleton.

Joints

Joints are areas where two or more bones join together. Connective tissue bands, called **ligaments,** help hold long bones together at joints. There are three main types of joints:

- *Diarthrosis* or *synovial*: freely movable; examples include the ball-and-socket joints of the shoulder and hip, or the hinge joints of the elbow and knee
- *Amphiarthrosis*: slightly movable; examples include the attachment of the ribs to the thoracic vertebrae and the symphysis pubis, or joint between the two pelvic bones
- *Synarthrosis*: immovable; examples are the suture joints of the cranium

DISEASES AND ABNORMAL CONDITIONS

Arthritis

Arthritis is actually a group of diseases involving inflammation of the joints. Two main types are osteoarthritis and rheumatoid arthritis. *Osteoarthritis*, the most common form, is a chronic disease that usually occurs as a result of aging. It

frequently affects the hips and knees. Symptoms include joint pain, stiffness, aching, and limited range of motion. Although there is no cure, rest, applications of heat and cold, aspirin and anti-inflammatory medications, injection of steroids into the joints, and special exercises are used to relieve the symptoms. *Rheumatoid arthritis* is a chronic inflammatory disease that affects the connective tissues and joints. It is three times more common in women than in men, and onset often occurs between the ages of 35 and 45. Progressive attacks can cause scar tissue formation and atrophy of bone and muscle tissue, which result in permanent deformity and immobility (figure 7-21). Early treatment is important to reduce pain and limit damage to joints. Rest, prescribed exercise, anti-inflammatory medications such as aspirin, and careful use of steroids are the main forms of treatment. Surgery, or arthroplasty, to replace damaged joints, such as those in the hips and knees, is sometimes performed when severe joint damage has occurred.

Bursitis

Bursitis is an inflammation of the bursae, which are small, fluid-filled sacs surrounding the joints. It frequently affects the shoulders, elbows, hips, or knees. Symptoms include severe pain, limited movement, and fluid accumulation in the joint. Treatment consists of administering pain medications, injecting steroids and anesthetics into the affected joint, rest, aspirating (withdrawing fluid with a needle) the joint, and physical therapy to preserve joint motion.

FIGURE 7-21 Rheumatoid arthritis can cause permanent deformity and immobility.

Fractures

A fracture is a crack or break in a bone. Types of fractures, shown in figure 7-22, include:

- *Greenstick*: bone is bent and splits, causing a crack or incomplete break; common in children
- *Simple* or *closed*: complete break of the bone with no damage to the skin
- *Compound* or *open*: bone breaks and ruptures through the skin; creates an increased chance of infection
- *Impacted*: broken bone ends jam into each other
- *Comminuted*: bone fragments or splinters into more than two pieces
- *Spiral*: bone twists, resulting in one or more breaks; common in skiing and skating accidents
- *Depressed*: a broken piece of skull bone moves inward; common with severe head injuries
- *Colles*: breaking and dislocation of the distal radius that causes a characteristic bulge at the wrist; caused by falling on an outstretched hand

Before a fracture can heal, the bone must be put back into its proper alignment. This process is called *reduction*. *Closed reduction* involves positioning the bone in correct alignment, usually with traction, and applying a cast or splint to maintain the position until the fracture heals. *Open reduction* involves surgical repair of the bone. In some cases, special pins, plates, or other devices are surgically implanted to maintain correct position of the bone.

Dislocation

A dislocation is when a bone is forcibly displaced from a joint. It frequently occurs in shoulders, fingers, knees, and hips. After the dislocation is reduced (the bone is replaced in the joint), the dislocation is immobilized with a splint, a cast, or traction.

Sprain

A sprain is when a twisting action tears the ligaments at a joint. The wrists and ankles are common sites for sprains. Symptoms include pain,

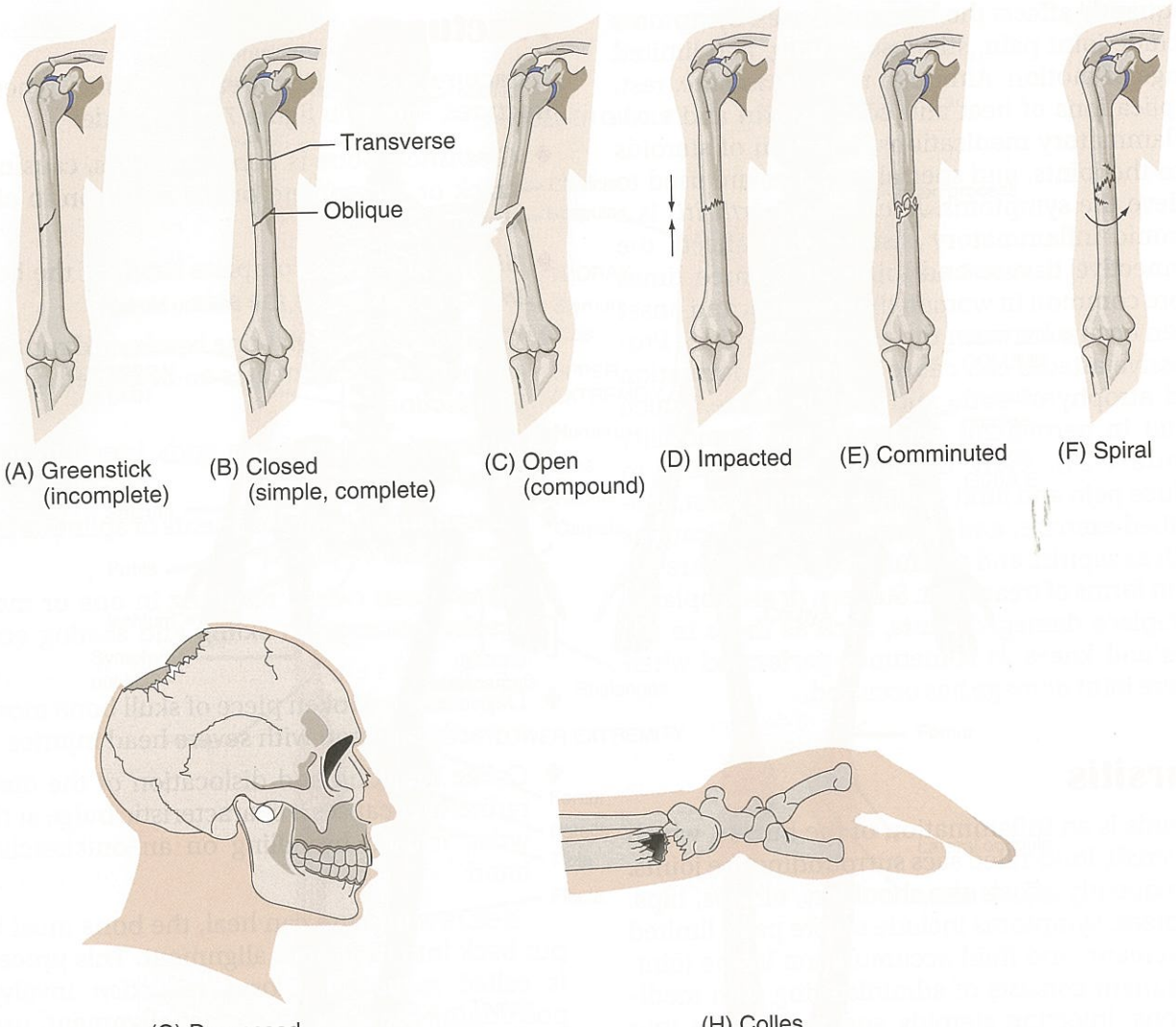


FIGURE 7-22 Types of fractures.

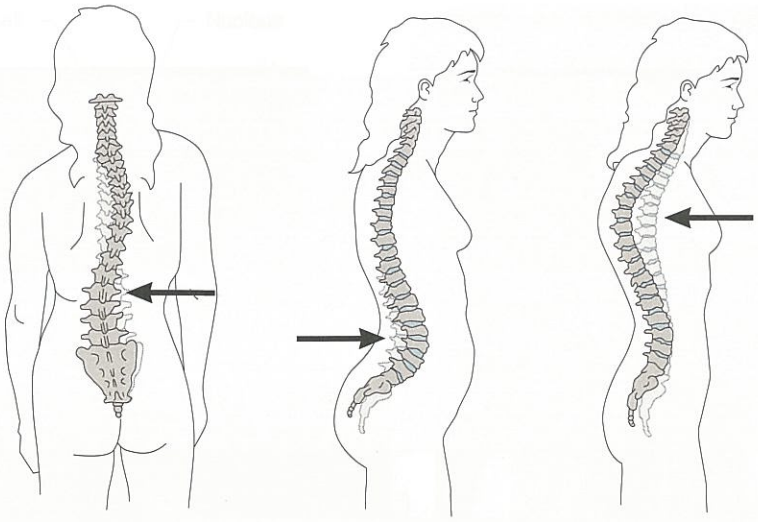
swelling, discoloration, and limited movement. Treatment methods include rest, elevation, immobilization with an elastic bandage or splint, and/or cold applications.

Osteomyelitis

Osteomyelitis is a bone inflammation usually caused by a pathogenic organism. The infectious organisms cause the formation of an abscess within the bone and an accumulation of pus in the medullary canal. Symptoms include pain at the site, swelling, chills, and fever. Antibiotics are used to treat the infection.

Osteoporosis

Osteoporosis, or increased porosity or softening of the bones, is a metabolic disorder caused by a hormone deficiency (especially estrogen in women), prolonged lack of calcium in the diet, and a sedentary lifestyle. The loss of calcium and phosphate from the bones causes the bones to become porous, brittle, and prone to fracture. Bone density tests lead to early detection and preventative treatment for osteoporosis. Treatment methods include increased intake of calcium and vitamin D, medications such as Fosamax and Citracel to increase bone mass, exercise, and/or estrogen replacement.



A. Scoliosis B. Lordosis C. Kyphosis

FIGURE 7-23 Abnormal curvatures of the spinal column.

Ruptured Disk

A ruptured disk, also called a *herniated* or *slipped disk*, occurs when an intervertebral disk (pad of cartilage separating the vertebrae) ruptures or protrudes out of place and causes pressure on the spinal nerve. The most common site is at the lumbar–sacral area, but a ruptured disk can occur anywhere on the spinal column. Symptoms include severe pain, muscle spasm, impaired movement, and/or numbness. Pain, anti-inflammatory, and muscle relaxant medications may be used as initial forms of treatment. Other treatments include rest, traction, physical therapy, massage therapy, chiropractic treatment, and/or heat or cold applications. A laminectomy, surgical removal of the protruding disk, may be necessary in severe cases that do not respond to conservative treatment. If pain persists, a spinal fusion may be performed to insert a screw/rod assembly into the spine to permanently immobilize the affected vertebrae.

Spinal Curvatures

Abnormal curvatures of the spinal column include kyphosis, scoliosis, and lordosis (figure 7-23). *Kyphosis*, or "hunchback," is a rounded bowing of the back at the thoracic area. *Scoliosis* is a side-to-side, or lateral, curvature of the spine. *Lordosis*, or "swayback," is an abnormal inward curvature of the lumbar region. Poor posture, congenital (at birth) defects, structural defects of the vertebrae, malnutrition, and degeneration of the vertebrae can all be causes of these defects. Therapeutic exercises, firm mattresses, and/or braces are the main forms of treatment. Severe deformities may require surgical repair.

STUDENT: *Go to the workbook and complete the assignment sheet for 7:4, Skeletal System.*

7:5 Muscular System

Objectives

After completing this section, you should be able to:

- Compare the three main kinds of muscle by describing the action of each
- Differentiate between voluntary muscle and involuntary muscle
- List at least three functions of muscles
- Describe the two main ways muscles attach to bones
- Demonstrate the five major movements performed by muscles
- Describe at least three diseases of the muscular system
- Define, pronounce, and spell all key terms