The Articular System

CHAPTER OBJECTIVES

After studying this chapter, you should be able to:

1. Name and describe the three types of joints.
2. Name examples of the two types of synarthroses joints.
3. Name examples of the two types of amphiarthroses joints.
4. Describe and give examples of the six types of diarthroses or synovial joints.
5. Describe the capsular nature of a synovial joint.
6. Describe the three types of bursae.
7. Name some of the disorders of joints.
8. Describe the possible movements at synovial joints.
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**INTRODUCTION**

An articulation is a place of union or junction between two or more bones, regardless of the degree of movement allowed by this union. The sutures between various bones of the skull are considered as much a part of the articulatory system as the knee or elbow joint. When we think of a joint, we tend to think of the freely moving joints such as the shoulder or hip joint, but other types of joints have limited or no movement at all occurring at their site.

**THE CLASSIFICATION OF JOINTS: STRUCTURE AND FUNCTION**

Joints are classified into three major groups according to the degree of movement they allow (function) and the type of material that holds the bones of the joint together (structure).

**Synarthroses**

Synarthroses (sin-ahr-THRO-seez) are joints or unions between bones that do not allow movement. Syn as a prefix means joined together. There are three examples of synarthroses or immovable joints.

The first type is a suture (SOO-chur). A suture is an articulation in which the bones are united by a thin layer of fibrous tissue. The suture joints of the skull are examples. Recall from Chapter 7 that the bones of the skull are formed by intramembranous ossification. The fibrous tissue in the suture is the remnant of that process and helps form the suture.

The second example is a syndesmosis (sin-des-MOH-sis). Syndesmoses (plural) are joints in which the bones are connected by ligaments between the bones. Examples are where the radius articulates with the ulna and where the fibula articulates with the tibia. These bones move as
one when we pronate and supinate the forearm or rotate the lower leg. Some authors consider syndesmosis as an example of an amphiarthrosis (little movement) joint.

The third example is a gomphosis (gohm-FOH-sis). Gomphoses (plural) are joints in which a conical process fits into a socket and is held in place by ligaments. An example is a tooth in its alveolus (socket), held in place by the periodontal ligament.

Amphiarthroses

Amphiarthroses (am-fee-ahr-THRO-seez) are joints that allow only slight movement. There are two examples of amphiarthroses.

The first example of an amphiarthrosis is a symphysis (SIM-fah-sis). Symphyses (plural) are joints in which the bones are connected by a disk of fibrocartilage. An example of a symphysis is the pubic symphysis where the two pelvic bones at the pubis are joined. During delivery this joint allows the pelvic bone slight movement to increase the size of the birth canal.

The second example of an amphiarthrosis is a synchondrosis (sin-kon-DR-O-sis). Synchondroses (plural) are joints in which two bony surfaces are connected by hyaline cartilage. The cartilage is replaced by permanent bone later in life. An example of a synchondrosis is the joint between the epiphyses (flared portions) and the diaphysis (shaft) of a long bone. Remember from Chapter 7 that this is the location of the growth plate and where long bones develop longitudinally by endochondral ossification. Some authors consider a synchondrosis as an example of a synarthrosis (no movement). Another example is the hyaline cartilage connection of the ribs to the sternum.

Diarthroses or Synovial Joints

Diarthroses (dye-ahr-THRO-seez) or synovial joints are freely moving joints or articulations (Figure 8-1). They are

![FIGURE 8-1. The structure of a synovial joint.](image)
always characterized by the presence of a cavity enclosed by a capsule. This cavity may contain various amounts and concentrations of a number of tissues. The cavity may be enclosed by a capsule of fibrous articular cartilage. Ligaments can reinforce the capsule, and cartilage will cover the ends of the opposing bones. This capsule will be lined on the inside with synovial membrane, which produces synovial fluid. Most joints of the upper and lower limbs are diarthroses.

The articular cartilage in the joint provides a smooth, gliding surface for opposing bone. This is made possible because of the lubrication caused by the synovial fluid. The opposing bones do not wear or erode over time due to the constant friction caused by movement at the joint. Articular cartilage has a limited blood supply. It receives its nourishment from the synovial fluid and from a small number of subsynovial blood vessels at the junction of the cartilage and the joint capsule. Synovial fluid has two functions: creating a smooth gliding surface for opposing bones and nourishing the articular cartilage. Cartilage also functions as a buffer between the vertebral column to minimize the forces of weight and shock from running, walking, or jumping.

Collagenous fibers connecting one bone to another in the synovial joint form the capsule enclosing the joint. The range of motion of the joint is related to the laxity or looseness of the joint. This is directly related to the structure of the capsule and how it is formed over the opposing bones. In the shoulder joint, which has the greatest range of movement, the capsule is loose enough to permit the head of the humerus to be drawn away from the glenoid fossa of the scapula. However, in the hip joint the range of motion is much more restricted, because the capsule is thicker and shorter and the head of the femur sits deeply in the acetabulum of the pelvic bone. The femur is also connected to the acetabulum by a number of strong ligaments. This structure is necessary because of the need for greater strength in this joint.

In addition to the above tissues that make up the capsule, muscles and their tendons can also be found as the outermost layer of the capsule. They provide an important mechanism for maintaining the stability of a diarthrosis or synovial joint. They have advantages over ligaments because during both relaxation and contraction they maintain the joint surfaces in firm contact at every position of the joint.

In summary, synovial joints have a number of functions. First, they bear weight and allow movement; second, their construction in the form of a capsule made of ligaments, tendons, muscles, and articular cartilage provides stability; and third, synovial fluid lubricates the joint and nourishes the cartilage.

**MOVEMENTS AT SYNOVIAL JOINTS**

The following movements can occur at diarthroses or synovial joints.

- **Flexion** (FLEK-shun) is the act of bending or decreasing the angle between bones.
- **Extension** (eks-TEN-shun) is the act of increasing the angle between bones and is the opposite of flexion. Refer to Figure 8-2A for flexion/extension and hyperextension.
- **Hyperextension** increases the joint angle beyond the anatomic position.
- **Abduction** (ab-DUCK-shun) is moving the bones or limb away from the midline of the body while the opposite is **adduction** (add-DUCK-shun), which is moving the bone or limb toward the midline of the body (see Figure 8-2B).
- **Rotation** (row-TAY-shun) is the act of moving the bone around a central axis; the plane of rotational motion is perpendicular to the axis, as when rotating our head.
- **Circumduction** (sir-kum-DUCK-shun) is moving the bone in such a way that the end of the bone or limb describes a circle in the air and the sides of the bone describe a cone in the air (see Figure 8-2C).
- **Supination** (sou-pin-NAY-shun) and **pronation** (proh-NAY-shun) refer to the movement of the forearm and hand (Figure 8-3A). Supination is moving the bones of the forearm so that the radius and ulna are parallel. If the arm is at the side of the body, the palm is moved from a posterior to an anterior position; if the arm is extended, the palm faces up as in carrying a bowl of soup. Pronation is moving the bones of the forearm so that the radius and ulna are not parallel. If the arm is at the side of the body, the palm is moved from an anterior to a posterior position; if the arm is extended, the palm faces down.
- **Eversion** (ee-VER-zhun) and **inversion** (in-VER-zhun) refer to movements of the foot (see Figure 8-3B). Eversion is moving the sole of the foot outward at the ankle while inversion is moving the sole of the foot inward at the ankle.
- **Protraction** (pro-TRACK-shun) is moving a part of the body forward on a plane parallel to the ground.
- **Retraction** (rih-TRACK-shun) is moving a part of the body backward on a plane parallel to the ground. Refer to Figure 8-3C for protraction and retraction of the lower jaw.
- **Elevation** is raising a part of the body; **depression** is lowering a part of the body. Refer to Figure 8-3D for elevation and depression of the shoulder.
- **Opposition** is movement that occurs only with the thumb and is unique to primates. It occurs when the tip of the thumb and the fingers are brought together. The action allows us to use tools as when writing with a pen.
- **Reposition** occurs when the digits return to their normal positions.
FIGURE 8-2. Movements at synovial joints. (A) Flexion/extension and hyperextension. (B) Abduction/adduction. (C) Circumduction.
Dorsiflexion is raising the foot up at the ankle joint and plantar flexion is pushing the foot down at the ankle joint, actions we do when walking (see Figure 8-3E).

**Healthy Joints**

When we think of our joints, it is the freely moving diarthroses or synovial joints that come to mind, such as the shoulder, elbow, hip, and knee joints. Although the construction of these joints permits a wide range of movements, consistent or excessive movements can cause injuries to them. These injuries are referred to as repetitive motion injuries and can affect the associated structure of the joint such as muscles, nerves, tendons, ligaments, and the bursae.

Injuries that can develop quickly due to excessive mechanical stress include “tennis elbow” or “canoeist elbow.” Tennis athletes in competition frequently develop this type of overuse injury. Those of us who insist on paddling down a river in a canoe for a weekend, 8 hours a day, frequently develop canoeist elbow. Water skiers who consistently ski barefoot can, over time, cause major damage to the meniscus cartilage in the knee. These injuries are acute and can be temporary if the athlete gives the elbow or knee time to recuperate and return to normal motions.

Other types of injuries that develop over a long period are other repetitive motion injuries. In our technological age of computers, carpal tunnel syndrome, affecting the wrist, develops in individuals who regularly use the keyboard for long periods. Early symptoms include mild discomfort in the joint, tingling sensations, and muscle fatigue. If caught early and treated, this syndrome can be prevented. To maintain healthy joints, moderate exercise and movement is essential to maintain joint stability and lubrication. If, however, an occupation requires repetitive motion, the joint should be given frequent rest and good body posture and positioning should be maintained. This can help relieve stress on a constantly working joint.

**The Six Types of Diarthroses or Synovial Joints**

There are six types of freely moving or synovial joints. Refer to Figure 8-4 for the geometric structure and examples of these joints that permit certain types of movements.

A ball-and-socket joint is an example of a multiaxial joint. In this type of joint, a ball-shaped head fits into a concave socket. Two examples are the ball-shaped head of the femur fitting into the concave socket of the acetabulum of the pelvic bone and the head of the humerus fitting into the glenoid fossa of the scapula. This type of joint provides the widest range of motion. Movement can occur in all planes and directions. Of the two ball-and-socket joints, the hip and the shoulder, the shoulder has the widest range of movement.

The hinge joint is structured in such a way that a convex surface fits into a concave surface. In this type of a joint, motion is limited to flexion and extension in a single plane. Two examples are the elbow and knee joint. Because motion is restricted to one plane these joints are also called uniaxial hinge joints. Refer to Figure 8-5 to see the structure of the uniaxial knee joint. Other uniaxial hinge joints are the middle and distal phalanges of the fingers and toes.

The pivot joint is another uniaxial joint because motion is limited to rotation in a single plane. The joint is constructed in such a way that a pivot-like process rotates within a bony fossa around a longitudinal axis. One example is the joint between the atlas vertebra (the pivot process) that rotates within the bony fossa of the axis vertebra.

The condyloid (KON-dih-loyd) joint, sometimes called an ellipsoidal joint, is a biaxial joint that consists of an oval-shaped condyle that fits into an elliptical cavity. Motion is possible in two planes at right angles to each other. The wrist joint between the radius of the forearm and some of the carpal bones of the wrist is a condyloid joint. The hand can be flexed and extended in one plane.
like raising your hand in a sign to stop and returning it to a downward position. It can also be abducted and adducted like waving good-bye when moving the hand from side to side.

The **saddle joint**, another biaxial joint, is a bit more complex in its structure. In this type of a joint, one articular surface is concave in one direction and convex in the other (the trapezium, a carpal bone of the wrist), while the other articular surface is reciprocally convex and concave (the metacarpal bone in the thumb). Thus, the two bones fit together. Refer to Figure 8-4 to study its construction. Movement is possible in two planes at right angles to each other: flexion and extension plus abduction and adduction. This construction also permits opposition of the thumb, an evolutionary advancement allowing phenomenal dexterity of the hand to grasp and use tools.

The **gliding joint** is the last type of synovial joint and is a multiaxial joint. This type of joint is formed by either opposing plane surfaces or slightly convex and concave surfaces. This type of joint only allows gliding movement. Examples of gliding joints are those between the superior and inferior articular processes of the vertebrae in the spine.

Table 8-1 shows the classification of the three types of joints, including examples of each.
### Table 8-1
Classification of the Three Types of Joints with Examples

<table>
<thead>
<tr>
<th>Type of Joint</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Synarthroses: No movement possible</strong></td>
<td></td>
</tr>
<tr>
<td>a. Suture (bones united by a thin layer</td>
<td>Sutures of the skull</td>
</tr>
<tr>
<td>of fibrous tissue)</td>
<td></td>
</tr>
<tr>
<td>b. Syndesmosis (bones connected by ligaments</td>
<td>Borders of the radius and ulna; tibia and fibula articulations</td>
</tr>
<tr>
<td>between bones)</td>
<td></td>
</tr>
<tr>
<td>c. Gomphosis (joints in which a conical process</td>
<td>Tooth in its alveolus</td>
</tr>
<tr>
<td>fits into a socket held in place by ligaments)</td>
<td></td>
</tr>
<tr>
<td><strong>2. Amphiarthroses: Slightly movable articulations</strong></td>
<td></td>
</tr>
<tr>
<td>a. Symphysis (bones connected by a disk of</td>
<td>Pubic symphysis</td>
</tr>
<tr>
<td>fibrocartilage)</td>
<td></td>
</tr>
<tr>
<td>b. Synchondrosis (two bony surfaces connected by</td>
<td>Joint between the epiphyses (flared portion) and the</td>
</tr>
<tr>
<td>cartilage)</td>
<td>diaphysis (shaft) of a long bone; pubic synchondroses;</td>
</tr>
<tr>
<td></td>
<td>sternocostal synchondrosis;</td>
</tr>
<tr>
<td></td>
<td>sternal synchondrosis</td>
</tr>
<tr>
<td><strong>3. Diarthroses or synovial: Freely moving</strong></td>
<td></td>
</tr>
<tr>
<td>a. Ball-and-socket</td>
<td>Shoulder, hip</td>
</tr>
<tr>
<td>b. Hinge</td>
<td>Knee, elbow, fingers, toes</td>
</tr>
<tr>
<td>c. Pivot</td>
<td>Neck</td>
</tr>
<tr>
<td>d. Condyloid</td>
<td>Wrist joint between the radius and carpal bones</td>
</tr>
<tr>
<td>e. Saddle</td>
<td>Carpal-metacarpal articulation in the thumb</td>
</tr>
<tr>
<td>f. Gliding</td>
<td>Intervertebral joints</td>
</tr>
</tbody>
</table>
Bursae (burr-SEE) are closed sacs with a synovial membrane lining. Bursae can be found in the spaces of connective tissue between tendons, ligaments, and bones. Bursae are found wherever friction could develop during movement. They facilitate the gliding of either muscle over muscle or tendons over bony ligamentous surfaces. Bursae are classified into three types based on where they are found.

Subcutaneous bursae are found under (sub) the skin (cutaneous) wherever the skin is on top of an underlying bony process (e.g., the knee joint). Between the patella or kneecap and its overlying skin is a subcutaneous bursa preventing friction between bone and skin. See Figure 8-6 for bursae of the knee joint.
Subfascial (sub-FASH-ee-al) bursae are located between muscles. They are found above the fascia (FASH-ee-ah) of one muscle and below the fascia of another. The fascia is the fibrous connective tissue that covers the epimysium of a muscle bundle. We will discuss fascia in Chapter 9.

Subtendinous bursae are found where one tendon overlies another tendon or where one tendon overlies some bony projection, as in the shoulder.

### Disorders of Joints

#### Bursitis

Bursitis (burr-SIGH-tis) is an inflammation of the synovial bursa that can be caused by excessive stress or tension placed on the bursa. Playing tennis for long periods of time causes tennis elbow. It is an example of bursitis in the elbow joint caused by excessive stress. You may experience canoeist elbow if you go canoeing and paddle for long hours. This is, of course, temporary. The elbow and the shoulder are common sites of bursitis. It can also be caused by a local or systemic inflammatory process. If bursitis persists, as in chronic bursitis, the muscles in the joint can eventually degenerate or atrophy and the joint can become stiff even though the joint itself is not diseased.

#### Arthritis

Arthritis (ahr-THRY-tis) is an inflammation of the whole joint. It usually involves all the tissues of the joint: cartilage, bone, muscles, tendons, ligaments, nerves, blood supply, and so on. There are well over 100 varieties of arthritis, and 10% of the population experiences this disorder, which has no cure. Pain relief is common through analgesics but these only relieve a symptom of arthritis, the pain.

#### Rheumatic Fever

Rheumatic fever is a disease involving a mild bacterial infection. If undetected in childhood, the bacterium can be carried by the bloodstream to the joints, resulting in possible development of rheumatoid arthritis later on in life.

#### Rheumatoid Arthritis

Rheumatoid arthritis is a connective tissue disorder resulting in severe inflammation of small joints. It is severely debilitating and can destroy the joints of the hands and feet. The cause is unknown. A genetic factor may be involved, or an autoimmune reaction may be involved in which an immune reaction develops against a person’s own tissues. The synovial membranes of the joints and connective tissues grow abnormally to form a layer in the joint capsule. This layer grows into the articulating surfaces of the bones, destroying cartilage and fusing the bones of the joint.

#### Primary Fibrositis

Primary fibrositis is an inflammation of the fibrous connective tissue in a joint. It is commonly called rheumatism by the layman. If it is in the lower back, it is commonly called lumbago.

#### Osteoarthritis

Osteoarthritis, sometimes referred to as degenerative joint disease, occurs with advancing age especially in people in their 70s. It is more common in overweight individuals and affects the weight-bearing joints. Mild exercising can prevent joint deterioration and increases the ability to maintain movement at joints.
Chapter 8 The Articular System

Common Disease, Disorder, or Condition

Disorders of Joints

Gout

Gout (GOWT) is an accumulation of uric acid crystals in the joint at the base of the large toe and other joints of the feet and legs. It is more common in men than in women. These waste product crystals can also accumulate in the kidneys, causing kidney damage.

Sprain

A sprain occurs when a twisting or turning action tears ligaments associated with a joint. The most common sites for sprains are the ankle and wrist.

Slipped Disk

A slipped disk, also referred to as a ruptured or herniated disk, develops when the fibro-cartilagenous intervertebral disk protrudes or moves out of place and puts pressure on the spinal cord. It can occur anywhere, but the most common areas are the lumbar and sacral regions of the spine. This results in severe pain. If a slipped disk does not respond to physical therapy and medications, a laminectomy, the surgical removal of the protruding disk, may have to be performed.

Dislocation

A dislocation is a temporary displaced bone from a joint caused by excessive strain on the joint. Dislocations occur most frequently in the shoulder and hip but also can occur in the fingers and knees. A physician treats this condition by forcing the bone back into the joint and then immobilizing it with a cast or splint while it heals.

Gingivitis

Gingivitis (jin-ja-VI-tis) is an inflammation of the tissues of the gum (the gingiva). It is caused by poor oral hygiene resulting in a bacterial infection with symptoms of swelling and reddish bleeding gums. Bacterial plaque builds up on the teeth and the infection can spread to the alveolus in the tooth socket. This will destroy the periodontal ligaments and cause the bone of the tooth sockets to degenerate, resulting in the loss of teeth. Daily brushing after meals and flossing along with visits to the dentist for semiannual cleanings will help prevent tooth loss and the development of gingivitis.

Hyperextension

Hyperextension is defined as the movement at a joint to a position well beyond the maximum normal extension of the joint. This is a forced movement like that caused by a fall and using your hands to cushion the fall resulting in a hyperextension of the wrist joint. This can cause either a severe sprain or broken bones. Hyperextension of the neck can occur in a rear-end collision in an automobile.

Dislocated Hip

A dislocated hip occurs when the head of the femur becomes displaced from the socket or acetabulum of the hip. This condition can be acquired during an automobile accident or can be congenital. It is accompanied by swelling, pain, stiffness, and loss of movement. A dislocation can also occur at any other joint of the body.
SUMMARY OUTLINE

INTRODUCTION
An articulation or joint is a place of union between two or more bones regardless of the degree of movement allowed by the union.

THE CLASSIFICATION OF JOINTS

1. Joints are classified into three main groups based on the degree of movement they allow and their structure: synarthroses, amphiarthroses, and diarthroses.

Synarthroses

1. Synarthroses do not allow movement. The three examples of synarthroses are suture, syndesmosis, and gomphosis.
2. A suture is a joint in which the bones are joined by a thin layer of fibrous connective tissue, like the sutures of the skull.
3. A syndesmosis is a joint in which the bones are connected by ligaments between the bones, like the radius and ulna articulations and the tibia and fibula articulations. Some authors classify this as an amphiarthrosis.
4. A gomphosis consists of a conical process in a socket held together by ligaments, like a tooth in its socket.

Amphiarthroses

1. Amphiarthroses only allow slight movement. The two examples are a symphysis and a synchondrosis.

2. A symphysis is a joint in which the bones are joined by a disk of fibrocartilage, as in the pubic symphysis.
3. A synchondrosis is a joint where two bony surfaces are joined by hyaline cartilage, like the growth plate between the diaphysis and epiphysis of a long bone. Some authors classify this as a synarthrosis.

Diarthroses or Synovial Joints

1. Diarthroses or synovial joints are freely moving joints.
2. They are characterized by having a capsular structure with an internal cavity.
3. The capsule of the joint can be made up of a number of different kinds of tissue: fibrous cartilage, ligaments, tendons, muscle, and synovial membranes.
4. The diarthroses or synovial joints have several functions. They bear weight and allow movement; the ligaments, tendons, muscles, and articular cartilage provide stability; and the synovial fluid lubricates surfaces and nourishes the cartilage.

MOVEMENTS AT SYNOVIAL JOINTS

1. Flexion decreases the angle between bones.
2. Extension increases the angle between bones.
3. Hyperextension increases the joint angle beyond the anatomic position.
4. Dorsiflexion raises the foot upward at the ankle joint.
5. Plantar flexion pushes the foot down at the ankle joint.

Older adults experience some major changes in the articular system, particularly in the synovial joints. Elastin and collagen fibers in a joint become less flexible and tissue repair declines. The articular cartilage surfaces wear and decline because older adults are not able to replace cartilage as quickly as when they were younger. Many individuals in their 50s take glucosamine chondroitin pills to supplement cartilage buildup and help repair and lubricate stiff joints. This nutritional supplement comes from sharks. The production of synovial fluid also declines with age, as does the flexibility of tendons and ligaments, thus decreasing the range of motion in synovial joints. This is why moderate but regular exercising is so important as we age to help keep joints as flexible as possible.
6. Abduction moves a bone away from the midline.
7. Adduction moves a bone toward the midline.
8. Rotation moves a bone around a central axis, perpendicular to the axis.
9. Circumduction moves a bone so the end of it describes a circle and the sides of it describe a cone.
10. Supination moves the palm of the hand to an upright position or from a posterior to an anterior position if at the side of the body.
11. Pronation moves the palm of the hand to a downward position or from an anterior position to a posterior position if at the side of the body.
12. Eversion moves the sole of the foot outward at the ankle.
13. Inversion moves the sole of the foot inward at the ankle.
14. Protraction moves a part of the body forward on a plane parallel to the ground.
15. Retraction moves a part of the body backward on a plane parallel to the ground.
16. Elevation raises a part of the body.
17. Depression lowers a part of the body.
18. Opposition, unique to the thumb, allows the tip of the thumb and the fingers to be brought together.
19. Reposition is the opposite of opposition.

THE SIX TYPES OF DIARTHROSES OR SYNOVIAL JOINTS
1. The ball-and-socket joint (multiaxial) allows the widest range of movement, as in the shoulder and hip joint.
2. The hinge joint (uniaxial) limits movement to flexion and extension; examples are the knee, elbow, and the middle and distal phalanges of the fingers and toes.
3. The pivot joint (uniaxial) limits movement to rotation in one plane, such as the atlas and axis articulation in the spine.
4. The condyloid joint or ellipsoidal (biaxial) joint allows motion in two planes at right angles to each other, as in the wrist joint between the radius and carpal bones.
5. The saddle joint (biaxial), found only in the thumb, allows movement in two planes at right angles to one another and is located at the carpal-metacarpal articulation in the thumb.
6. The gliding joint (multiaxial) allows only gliding motion, as the intervertebral joints in the spine.

BURSAE
1. There are three types of bursae. Bursae are closed sacs with a synovial membrane lining that prevents friction between overlapping tissues.
2. Subcutaneous bursae are found between skin and underlying bony processes.
3. Subfascial bursae are found where muscles overlie one another.
4. Subtendinous bursae are found where one tendon overlies another or overlies a bony projection.

REVIEW QUESTIONS
1. Name and describe the three types of joints found in the human body.
2. Name two types of synarthroses and give an example of each.
3. Name two types of amphiarthroses and give an example of each.
4. Why must diarthroses or synovial joints be constructed like a capsule for maximum function?
5. Name the six types of diarthroses and give an example of each.
6. Name and define the three types of bursae found in the human body.
7. How can an individual try to prevent the occurrence of osteoarthritis?
8. Name the movements that can occur at the synovial joints.

Critical Thinking Questions
Write about a family member or someone you know that has one of the common diseases, disorders, or conditions introduced in this chapter, and tell about the disease.
Mabel, a 42-year-old woman, is having a checkup with her arthritis specialist. She tells the specialist that she is experiencing more joint pain and stiffness than usual. The specialist examines Mabel and notes that her hands and feet are becoming more deformed in appearance due to severe joint inflammation. It is also harder for Mabel to perform activities of daily living. Mabel states that it is difficult for her to open bottles, turn doorknobs, and put on her socks and shoes. She also experiences pain and tires easily when walking short distances.

Questions

1. Given her symptoms, what type of arthritis might Mabel have?
2. What are the major characteristics of this disorder?
3. What is the cause of this condition and the resulting joint damage?
4. How widespread is arthritis?
LABORATORY EXERCISE:

THE ARTICULAR SYSTEM

Materials needed: An articulated skeleton, anatomic models of the shoulder joint and hip joint that can be disarticulated showing muscles, tendons, bones, and cartilage

1. Examine the ball-and-socket joint of the hip and shoulder. Identify the capsular nature of the joints by viewing the muscle, tendon, ligaments, and cartilage. If possible, pop out the head of the femur from the acetabulum and view the structure of the joint.

2. Examine the bones of the elbow and knee joint on the skeleton, noting how the bones fit together to allow flexion and extension.

3. Study the hand. Note the flexion and extension hinge joints of the fingers, and the saddle joint of the thumb.

4. Examine the wrist joint and the ankle joint. On the wrist, note the condyloid joint where the radius articulates with the carpal bones.

5. Your instructor will show you either a DVD or a videotape on the anatomy of human joints.

LABORATORY EXERCISE:

THE ARTICULAR SYSTEM

Materials needed: An articulated skeleton, anatomic models of the shoulder joint and hip joint that can be disarticulated showing muscles, tendons, bones, and cartilage

1. Examine the ball-and-socket joint of the hip and shoulder. Identify the capsular nature of the joints by viewing the muscle, tendon, ligaments, and cartilage. If possible, pop out the head of the femur from the acetabulum and view the structure of the joint.

2. Examine the bones of the elbow and knee joint on the skeleton, noting how the bones fit together to allow flexion and extension.

3. Study the hand. Note the flexion and extension hinge joints of the fingers, and the saddle joint of the thumb.

4. Examine the wrist joint and the ankle joint. On the wrist, note the condyloid joint where the radius articulates with the carpal bones.

5. Your instructor will show you either a DVD or a videotape on the anatomy of human joints.