Chapter 9:
Joints
Key terms

1. Fibrous joint
2. Cartilaginous joint
3. Synovial joint
4. Syndesmosis
5. Gomphosis
6. Symphysis
7. Synchondrosis
8. Suture

- Define each term
- Find an example of structures jointed for each type of joint.
Joints (Joint Classification)

- The structural classification of joints
  - **Fibrous joints** - bones held together by dense collagen fibers
  - **Cartilaginous joints** - bones held together by cartilage
  - **Synovial joints** - bones held together by ligaments
Joints (Joint Classification)

- The functional classification of joints
  - **Synarthrosis** (an immovable joint)
  - **Amphiarthrosis** (a slightly movable joint)
  - **Diarthrosis** (a freely movable joint)
Joints (Fibrous Joints)

- **Sutures**
  - Occur only between bones of the skull
Joints (Fibrous Joints)

- **Syndesmoses**
  - Permits slight movement
  - Interosseous membrane
    - Between the tibia and
Joints (Fibrous Joints)

- **Gomphoses**
  - **Immovable joint**
  - Articulations of the **teeth** with the sockets of the...
Joints (Cartilaginous Joints)

- Lacks a synovial cavity
- Allows little or no movement
- Joint is tightly connected by cartilage
- Two types of cartilaginous joints
  - Synchondroses
  - Symphyses
Joints (Cartilaginous Joints)

- **Synchondroses**
  - Connecting tissue is hyaline cartilage
  - Epiphyseal (growth) plate

- **Symphyses**
  - Slightly movable joint
  - Ends of the articulating bones are covered with hyaline cartilage.
Joints (Cartilaginous Joints)

- **Pubic symphysis**
  - Between the anterior surfaces of the **hip bones**
  - Intervertebral joints **between the vertebrae**
Joints (Synovial Joints)

- **Articular Capsule**
  - A sleeve-like capsule encloses the synovial cavity

- **Synovial Fluid**
  - The synovial membrane secretes synovial fluid
  - Functions to reduce friction by:
    - lubricating the joint
    - absorbing shocks
    - supplying oxygen and nutrients to the cartilage
    - removing carbon dioxide and metabolic wastes from the cartilage
Joints (Synovial Joints)

- Accessory Ligaments and Articular Discs
  - ACL: Anterior cruciate ligaments
  - PCL: posterior cruciate ligaments
- Menisci
  - Pads of cartilage lie between the articular surfaces of the bones
Joints (Synovial Joints)

(a) Frontal section

(b) Sagittal section of right elbow joint

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Joints (Synovial Joints)

- **Bursae and Tendon Sheaths**
  - **Bursae**
  - Sac-like structures containing fluid similar to synovial fluid
  - Cushion the movement
- **Tendon sheaths**
  - Wrap around tendons
  - Reduce friction at joints
Joints (Types of Movements at Synovial Joints)

- Specific terminology is used to designate the movements that occur at joints
- Movements are grouped into four main categories:
  - 1) Gliding
  - 2) Angular movements
  - 3) Rotation
  - 4) Special movements
Joints (Types of Movements at Synovial Joints)

- **Gliding**
  - Simple movement back-and-forth and from side-to-side
  - There is no significant alteration of the angle between the bones
  - Limited in range
  - Intercarpal joints

- **Angular Movements**
  - Increase or a decrease in the angle between articulating bones
  - Angular movements include
    - Flexion
    - Extension
    - Lateral flexion
    - Hyperextension
    - Abduction
    - Adduction
    - Circumduction
Joints (Types of Movements at Synovial Joints)

- **Flexion**
  - Decrease in the angle between articulating bones
  - Bending the trunk forward

- **Extension**
  - Increase in the angle between articulating bones
  - Flexion and extension are opposite movements

- **Lateral flexion**
  - Movement of the trunk sideways to the right or left at the waist

- **Hyperextension**
  - Continuation of extension beyond the normal extension
  - Bending the trunk backward

- **Abduction**
  - Movement of a bone away from the midline
  - Moving the humerus laterally at the shoulder joint

- **Adduction**
  - Movement of a bone toward the midline
  - Movement that returns body parts to normal position from abduction
Joints (Types of Movements at Synovial Joints)

- **Circumduction**
  - Movement of a body part in a circle
  - Moving the humerus in a circle at the shoulder joint

- **Rotation**
  - A bone revolves around its own longitudinal axis
  - Turning the head from side to side as when you shake your head “no”
Joints (Types of Movements at Synovial Joints)

(a) Shoulder joint

(b) Hip joint

(a) Atlanto-axial joint

(b) Shoulder joint

(c) Hip joint

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Joints (Types of Movements at Synovial Joints)

- **Special Movements**
  - Elevation
  - Depression
  - Protraction
  - Retraction
  - Inversion
  - Eversion
  - Dorsiflexion
  - Plantar flexion
  - Supination
  - Pronation
  - Opposition
Joints (Types of Movements at Synovial Joints)

- **Elevation**
  - Upward movement of a part of the body
  - Closing the mouth
  - Its opposing movement is depression

- **Depression**
  - Downward movement of a part of the body
  - Opening the mouth

- **Protraction**
  - Movement of a part of the body anteriorly
  - Thrusting the mandible outward
  - Its opposing movement is retraction

- **Retraction**
  - Movement of a protracted part of the body back to normal
Joints (Types of Movements at Synovial Joints)

- **Inversion**
  - Movement of the foot medially
  - Its opposing movement is eversion

- **Eversion**
  - Movement of the sole laterally

- **Dorsiflexion**
  - Bending of the foot at the ankle in an upward direction
  - Its opposing movement is plantar flexion

- **Plantar flexion**
  - Bending of the foot at the ankle in a downward direction

- **Supination**
  - Movement of the forearm so that the palm is turned upward
  - Its opposing movement is pronation

- **Pronation**
  - Movement of the forearm so that the palm is turned downward

- **Opposition**
  - Movement of the thumb in which the thumb moves across the palm to touch the tips of the fingers on the same hand
Joints (Types of Synovial Joints)

- **Planar Joints**
  - Primarily permit back-and-forth and side-to-side movements
  - Intercarpal joints

- **Hinge Joints**
  - Produce an opening and closing motion like that of a hinged door
  - Permit only flexion and extension
  - Knee and elbow

Figure 09.10  Tortora - PAP 12/e
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Joints (Types of Synovial Joints)

- **Pivot Joints**
  - Surface of one bone articulates with a ring formed partly by another bone
  - Joints that enable the palms to turn anteriorly and posteriorly

- **Condyloid Joints**
  - The projection of one bone fits into the oval-shaped depression of another bone
  - Wrist

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(c) Pivot joint between head of radius and radial notch of ulna
(d) Condyloid joint between radius and scaphoid and lunate bones of carpus (wrist)

Figure 09.10 Tortora - PAP 12/e
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Joints (Types of Synovial Joints)

- **Saddle Joints**
  - Articular surface of one bone is saddle-shaped, and the articular surface of the other bone fits into the “saddle”
  - Thumb

- **Ball-and-Socket Joints**
  - Ball-like surface of one bone fitting into a cuplike depression of another bone
  - Shoulder and hip

![Diagram of Saddle Joint and Ball-and- Socket Joint]

Figure 09.10 Tortora - PAP 12/e
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The selected joints described are:

- Temporomandibular joint
- Shoulder joint
- Elbow joint
- Hip joint
- Knee joint
Joints (Selected Joints of the Body)

- **Temporomandibular Joint (TMJ)**
  - Combined hinge and planar joint formed by the mandible and the temporal bone
  - Only movable joint between skull bones
  - Only the mandible moves
Joints (Selected Joints of the Body)

- **Shoulder Joint**
  - Ball-and-socket joint formed by the head of the humerus and the scapula
  - More freedom of movement than any other joint of the body
Elbow Joint

- Hinge joint formed by the humerus, the ulna, and the radius
Joints (Selected Joints of the Body)

- **Hip Joint**
  - Ball-and-socket joint formed by the femur and the hip bone
Joints (Selected Joints of the Body)

- **Knee Joint**
  - Largest and most complex joint of the body
  - Modified hinge joint
Joints (Arthroplasty)

(a) Preparation for total hip replacement

(b) Components of an artificial hip joint

(c) Radiograph of an artificial hip joint

Figure 09.16abc Tortora - PAP 12/e
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Joints (Arthroplasty)

(d) Preparation for total knee replacement

(e) Components of artificial knee joint (isolated and in place)
Questions to know

1. Give an example of a Fibrous joint.
2. Give an example of a Cartilaginous joint.
3. Explain the function of synovial fluid.
4. What does ACL stand for?
5. Explain a movement that would require circumduction.
6. Explain a movement that would require pronation.
Questions to know part 2

1. Name two bones found in the shoulder joint.

2. Name two structures (ligaments or tendons) found in the knee joint.

3. Where would you find a saddle joint.

4. Which part of the Temporomandibular Joint moves?

5. Chewing food could be named what type of motion? (provide one of the two options)
Videos

Knee replacement animation: http://www.youtube.com/watch?v=r4dbsWH6VHI

Actual Knee Replacement: http://www.youtube.com/watch?v=GRSWV57u9eg

- Hip replacement cartoon: http://www.youtube.com/watch?v=YsVln5JaCmc
- Hip replacement: http://www.youtube.com/watch?v=0-O8IFzV8Nc
- Or: http://www.youtube.com/watch?v=c0hgO8F1BCs