The Skeletal System

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Skeletal System: Made of Connective Tissue

- Three types of connective tissue
  - Bone (Osseous tissue)
  - Ligaments
  - Cartilage

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Bones – Functions

- Bones
  - hard elements of the skeleton
- Five important functions
  1. Support
  2. Protection
  3. Movement
  4. Blood cell formation
  5. Mineral storage
     - Calcium
     - Phosphate

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Bone – Structure

- **Bone**:hard inorganic matrix of calcium salts
  - **Compact**: forms shaft and ends, contains marrow space
  - **Spongy**: trabeculae
  - **Cells**: osteoblast, osteocytes, osteoclasts
  - **Types**: long, flat, irregular
- **Osteons/haversian system**
  - cellular arrangement
- **Periosteum**
  - connective tissue covering

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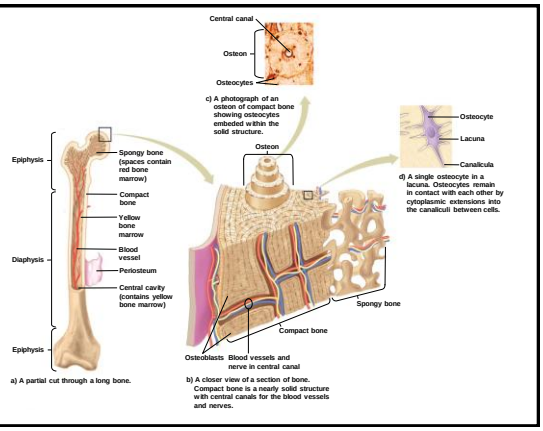

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Cartilage and Ligaments

- **Cartilage**
  - Function
    - support
  - Types
    - Fibrocartilage
    - Hyaline
    - Elastic cartilage
- **Ligaments**
  - Function
    - attach bone to bone
  - Dense fibrous connective tissue

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Bone Development

- Early fetal development
  - Formed by chondroblasts (cartilage-forming cells)
- Later fetal development
  - osteoblasts replace cartilage with bone
- Childhood
  - primary and secondary ossification sites formed
- Adolescence
  - elongation at growth plates

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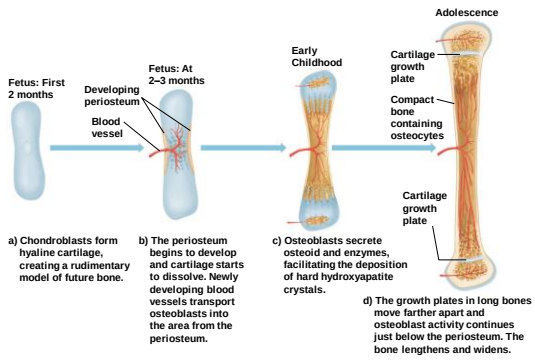

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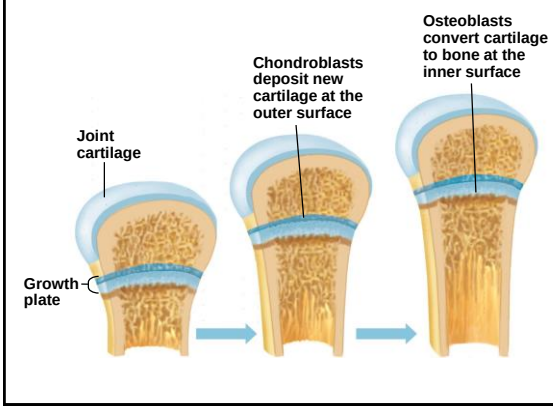

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Hormonal Control of Bone Growth

- Preadolescence
  - Growth hormone stimulates bone lengthening
- Early Adolescence
  - Estrogen and testosterone stimulate bone lengthening
- Late Adolescence
  - Estrogen and testosterone cause replacement of cartilage growth plates with bone

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Cells Involved in the Development and Maintenance of Bone

- Chondroblasts
  - cartilage-forming cells
- Osteoblasts
  - young bone-forming cells
- Osteocytes
  - mature bone cells
- Osteoclasts
  - bone-dissolving cells

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Mature Bone Remodeling and Repair

- Changes in shape, size, strength
  - Dependent on diet, exercise, age
- Bone cells regulated by hormones
  - Parathyroid hormone (PTH)
    - removes calcium from bone
  - Calcitonin
    - adds calcium to bone
- Repair
  - hematoma and callus formation

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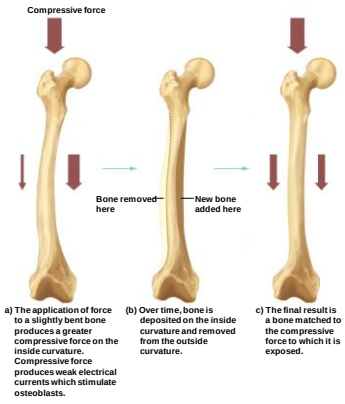

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Human Skeleton

- 206 bones
- **Axial skeleton**
  - Skull, vertebral column, sternum
- **Appendicular skeleton**
  - Pectoral girdle, pelvic girdle, limbs

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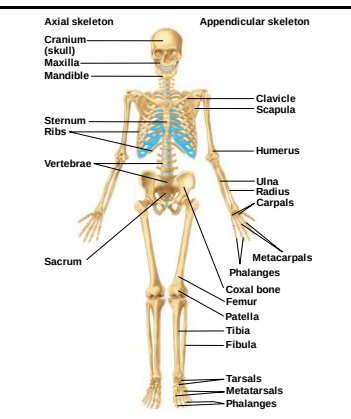

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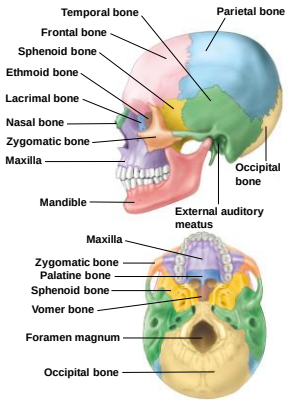

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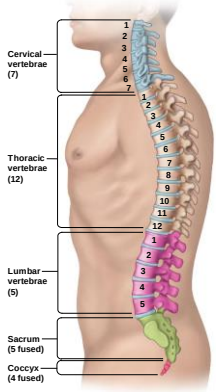

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Axial Skeleton: Vertebral Column (cont.)

- Vertebral column
  - Regions: cervical, thoracic, lumbar, sacral, coccygeal
  - Intervertebral disks: cushion vertebrae; assist in movement and flexibility
- Ribs
  - Twelve pairs
  - Bottom two pair floating
- Sternum
  - Three bones fused together

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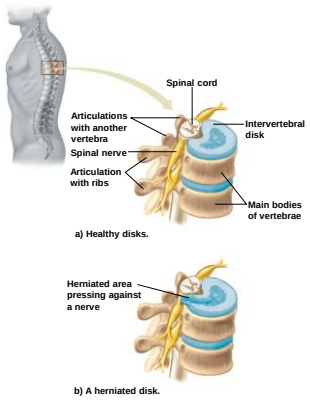

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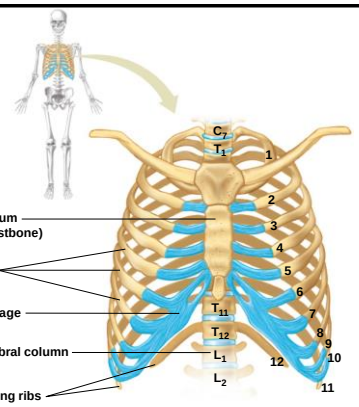

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Appendicular Skeleton

- Pectoral girdle: shoulder
  - Clavicle and scapulas
- Pelvic girdles: hip
  - Coxal bones, sacrum
- Arms
  - humerus, radius, ulna, carpals, metacarpals and phalanges
- Legs
  - femur, tibia, fibula, tarsals, metatarsals and phalanges

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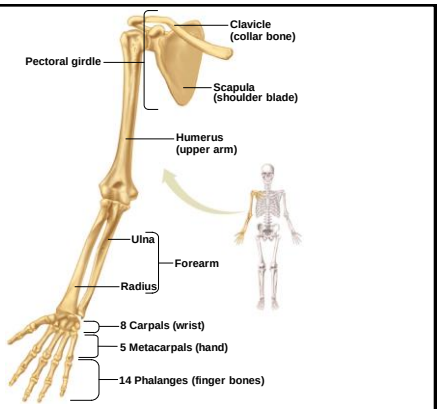

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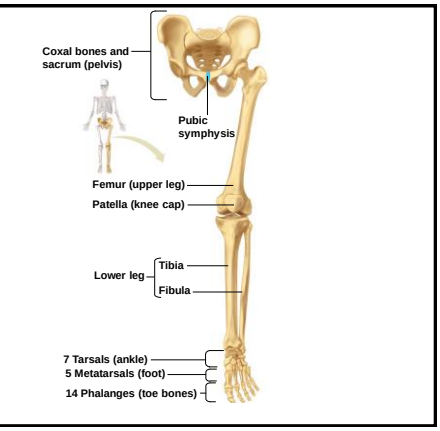

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Joints (Articulations)

- Classified by degree of movement
  - **Fibrous joint**
    - immovable (e.g., fontanels)
  - **Cartilaginous joint**
    - slightly movable, cartilage connection (e.g., backbone)
  - **Synovial joint**
    - freely movable (e.g., shoulder, hip)

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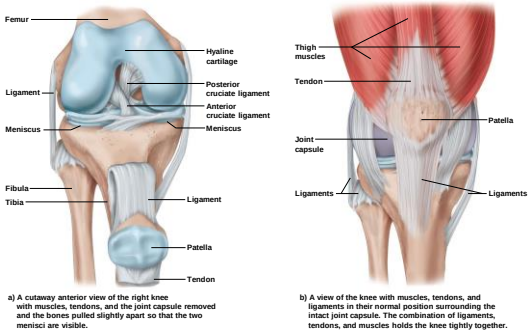

a) A cutaway anterior view of the right knee with muscles, tendons, and the joint capsule removed and the bones pulled slightly apart so that the two menisci are visible.

b) A view of the knee with muscles, tendons, and ligaments in their normal position surrounding the intact joint capsule. The combination of ligaments, tendons, and muscles holds the knee tightly together.

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Synovial Joints

- Joint capsule
  - synovial membrane + hyaline cartilage
- Synovial membrane secretes synovial fluid as a lubricant
- Hyaline cartilage acts as a cushion
- Types of synovial joints
  - Hinge joint
  - Ball and socket joint
- Tendons – join bone to muscle

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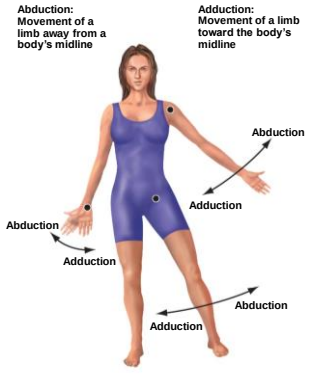

a) Abduction and adduction.

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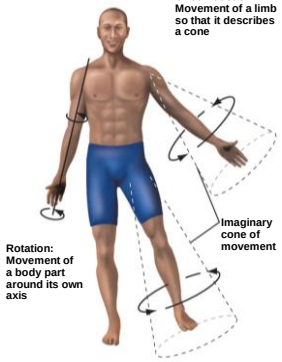

b) Rotation and circumduction.

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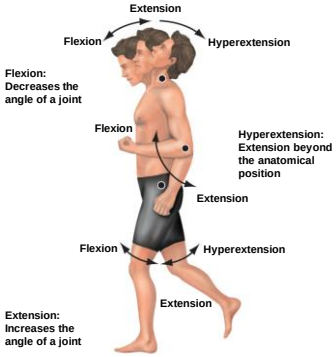

c) Flexion, extension, and hyperextension.

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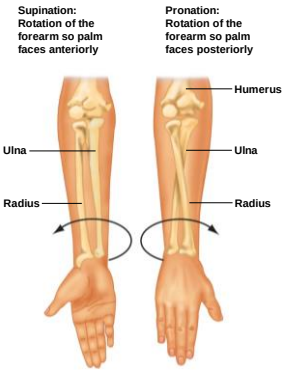

d) Supination and pronation.

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Diseases and Disorders of the Skeletal System

- **Sprains**
  - stretched or torn ligaments
- **Bursitis** and **tendinitis**
  - inflammations
- **Arthritis**
  - inflammation of joints
    - Osteoarthritis
    - Rheumatoid arthritis

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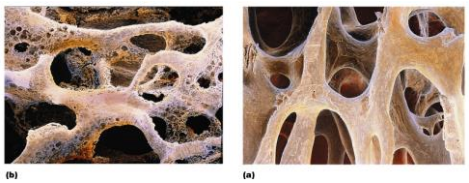
Diseases and Disorders of the Skeletal System

- **Osteoporosis**
  - excessive bone loss



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