

# **Skeletal System**

*Anatomy First Stage*

*Dr Hawraa kareem*

# The Skeletal System

- ❖ Divided into two divisions
  - Axial skeleton
  - Appendicular skeleton
- ❖ Parts of the skeletal system
  - Bones (skeleton)
  - Joints
  - Cartilage
  - Ligaments (bone to bone)
  - Tendon (bone to muscle)

# The Skeletal System

**Axial skeleton** (highlighted in blue)

Skull, Bony thorax, Vertebrae, Hyoid bone

**Appendicular skeleton** (highlighted in yellow)

Upper and lower limb , Pectoral and Pelvic girdle

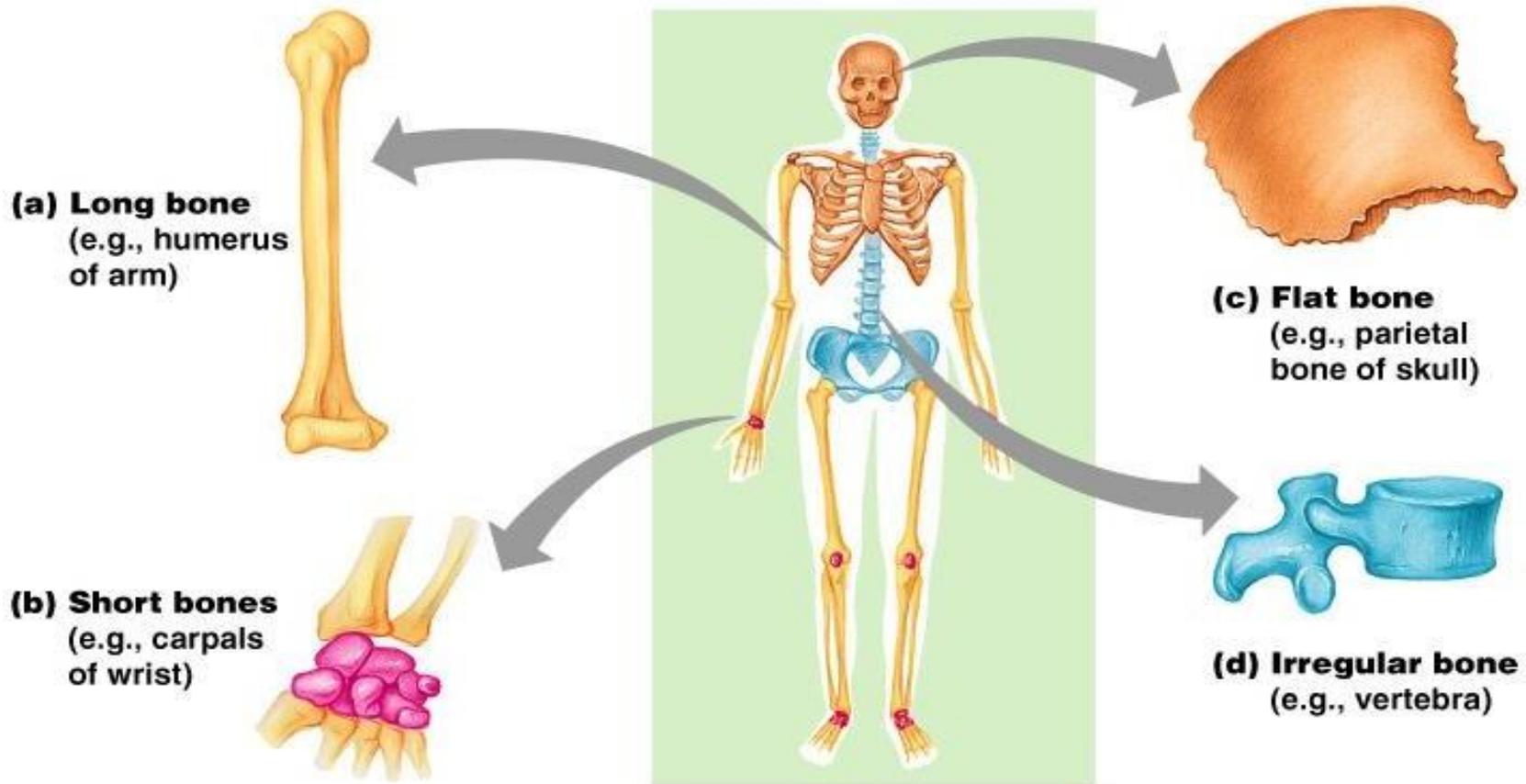


- **The skeleton has 206 bones**

# Functions of the Bones

- Support of the body
- Protection of soft organs
- Movement due to attached skeletal muscles
- Storage of minerals and fats
- Blood cell formation

# Classification of Bones on the Basis of Shape



# Classification of Bones

## 1. Long bones

- Typically longer than wide
- Have a shaft with heads at both ends
- Contain mostly compact bone

## 2. Short bones

- Generally cube-shape
- Contain mostly spongy bone

# Classification of Bones

## 3. Flat bones

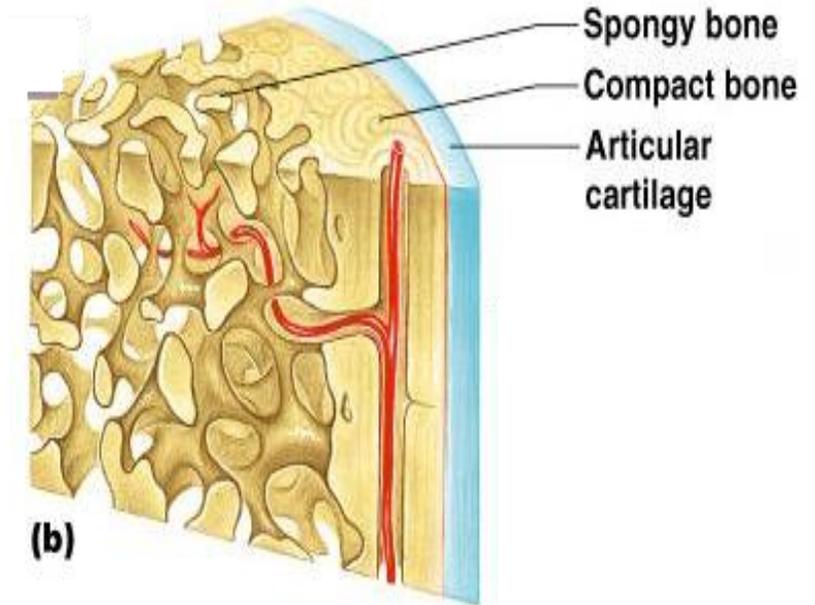
- Thin and flattened
- Usually curved
- Thin layers of compact bone around a layer of spongy bone

## 4. Irregular bones

- Irregular shape
- Do not fit into other bone

# Classification of Bones

- Two basic types depend on osseous tissue
  1. Compact bone
    - ✓ Is dense and looks smooth
    - ✓ Homogenous
  2. Spongy bone
    - ✓ Small needle-like pieces of bone
    - ✓ Many open spaces



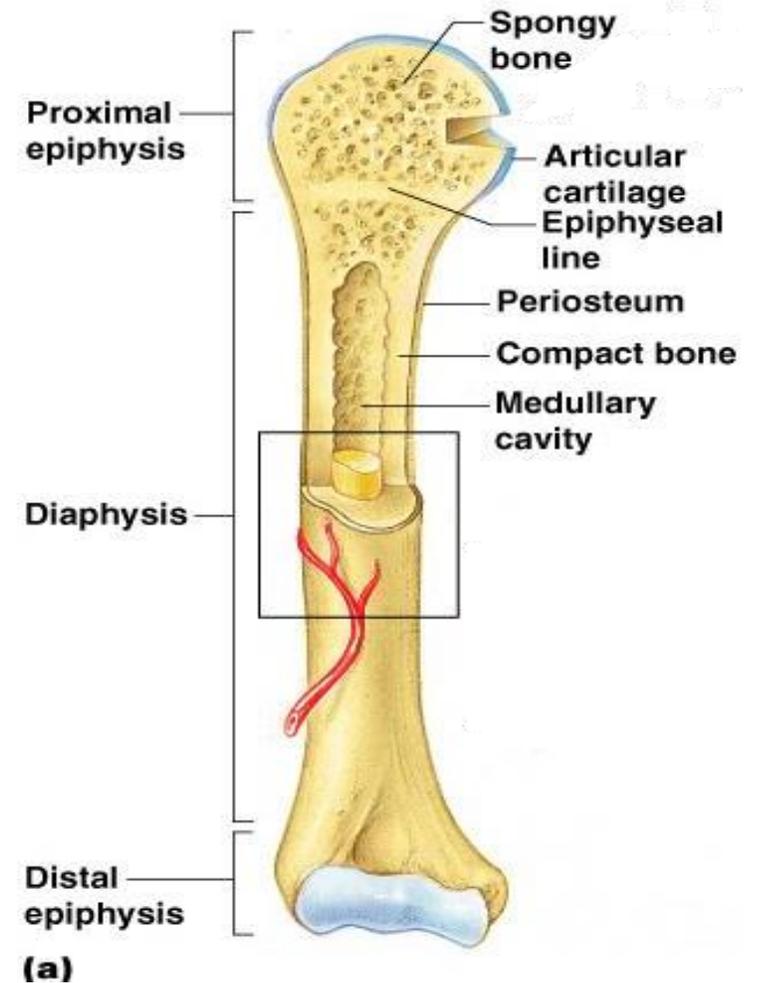
# Gross Anatomy of a Long Bone

## □ Diaphysis

- Shaft
- Composed of compact bone

## □ Epiphysis

- Ends of the bone
- Composed mostly of spongy bone



# Structures of a Long Bone

## □ Periosteum

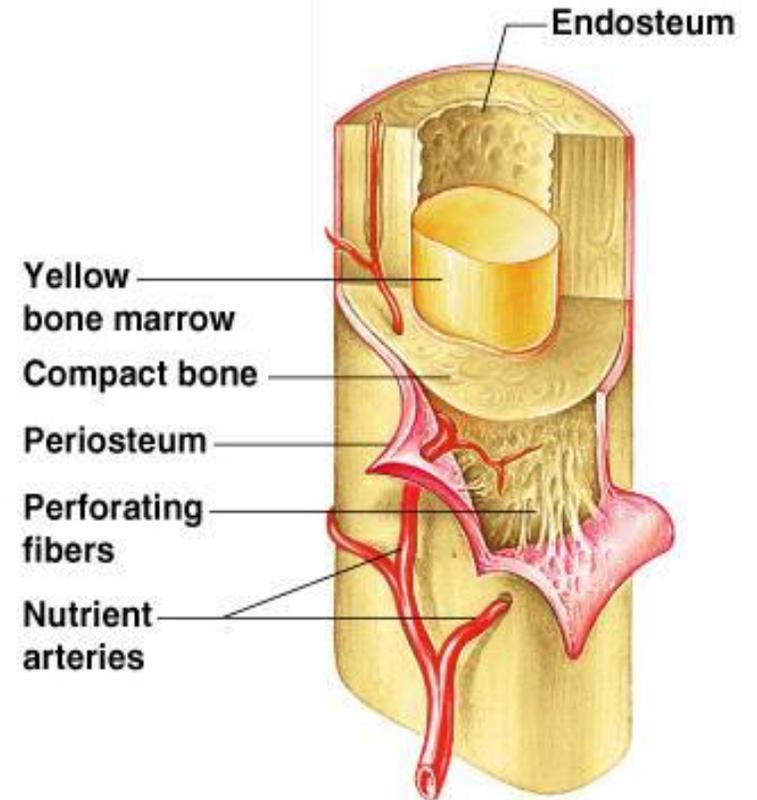
- Outside covering of the diaphysis
- Fibrous connective tissue membrane

## □ Sharpey's fibers

- Secure periosteum to underlying bone

## □ Arteries

- Supply bone cells with nutrients

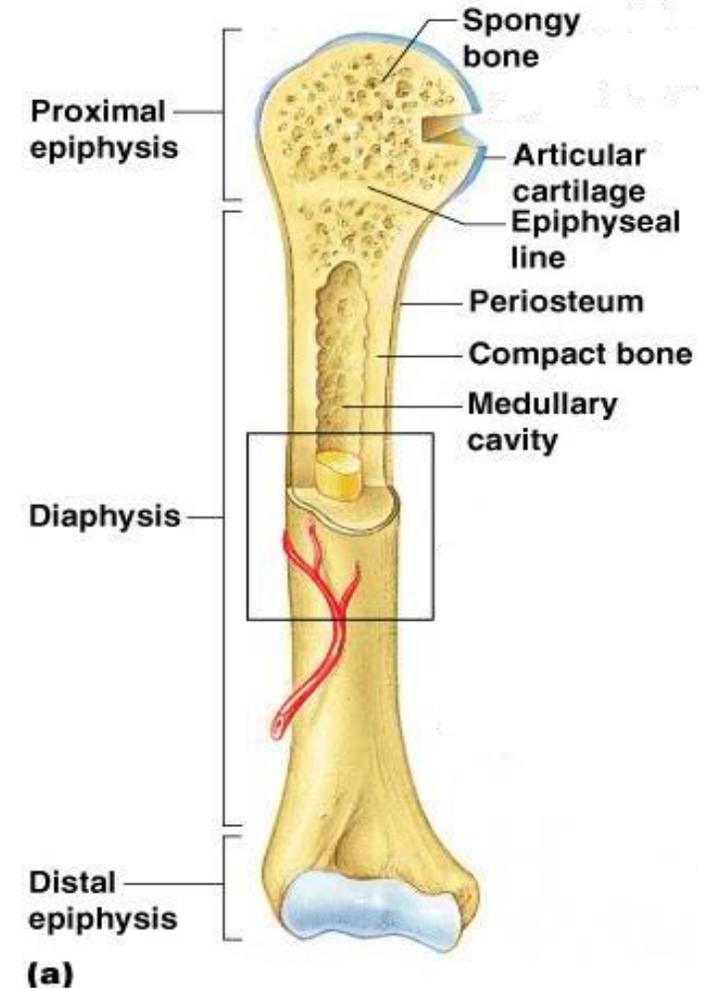


(c)

# Structures of a Long Bone

## □ Articular cartilage

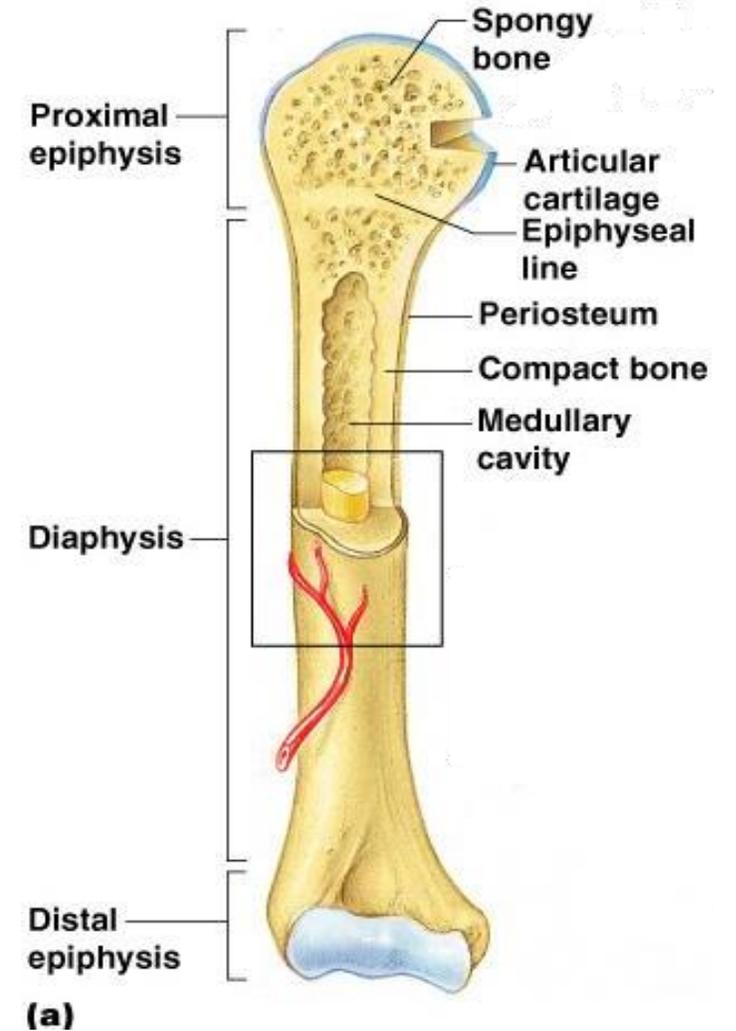
- Covers the external surface of the epiphyses
- Made of hyaline cartilage
- Decreases friction at joint surfaces



# Structures of a Long Bone

## □ Medullary cavity

- Cavity of the shaft
- Contains yellow marrow (mostly fat) in adults
- Contains red marrow (for blood cell formation) in infants



# Supporting Connective Tissue: I. Bone (osseous tissue)

## ❖ Bone (osseous tissue)

### • Function

- Support
- Protection
- Stores calcium and other minerals
- stores fat
- Forms blood cells (hematopoiesis)

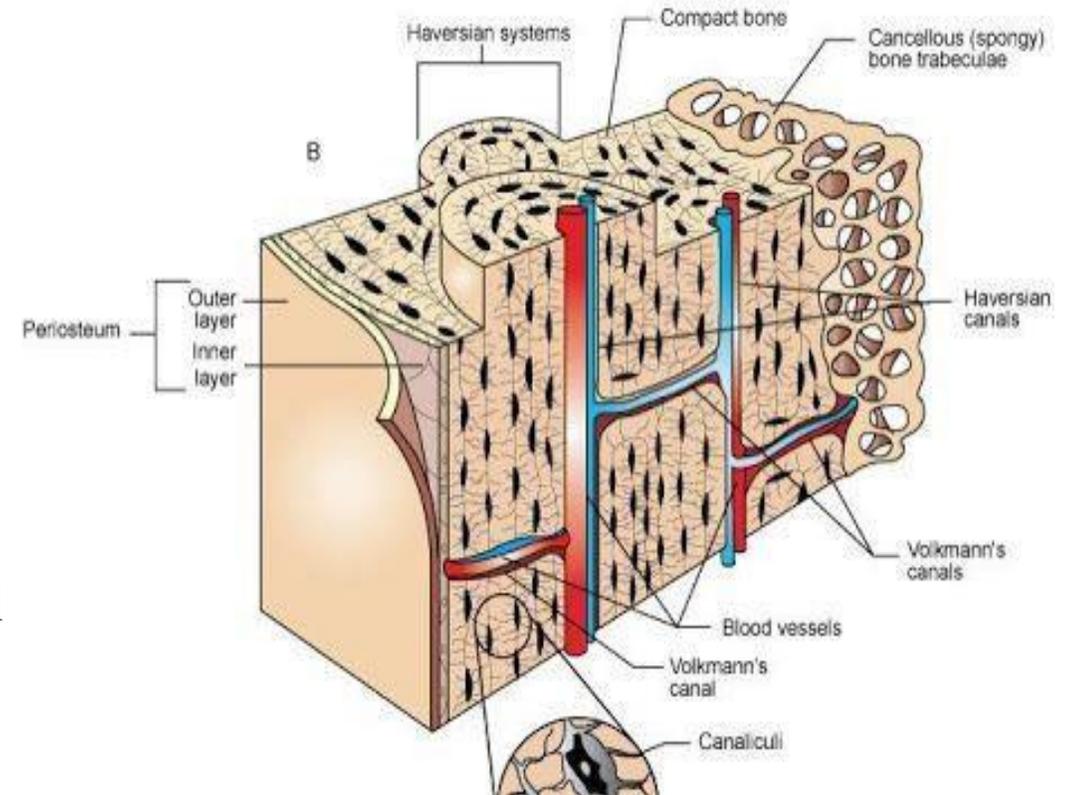
## ❖ Types of bone:

- 1- Compact bone
- 2- Spongy bone.

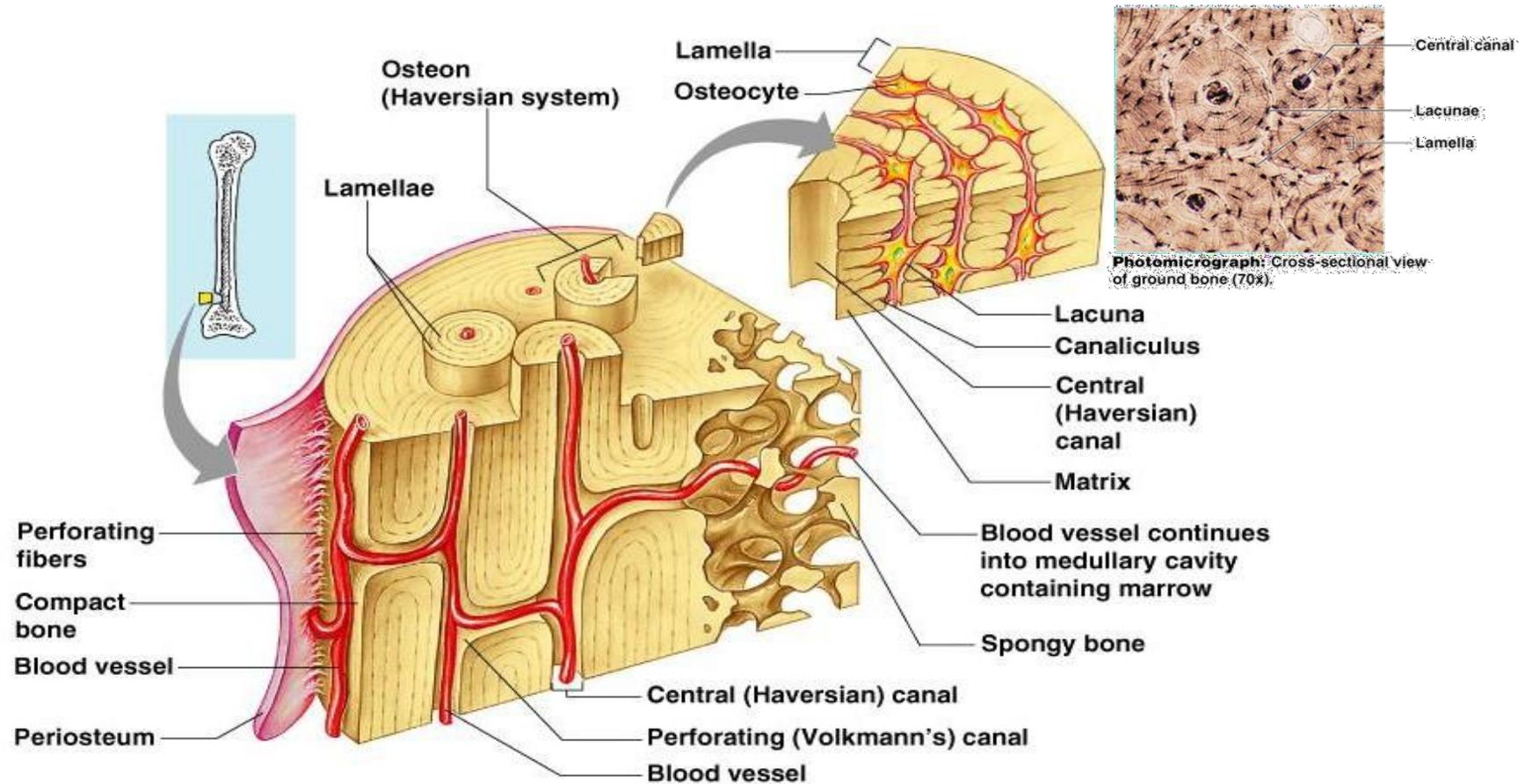
# I. compact bone

## Microscopic Anatomy of compact bone:

- **Osteon (Haversian System)**
  - A unit of bone
- **Central (Haversian) canal**
  - Opening in the center of an osteon
  - Carries blood vessels nerves
- **Perforating (Volkman's) canal**
  - Canal perpendicular to the central canal
  - Carries blood vessels and nerves

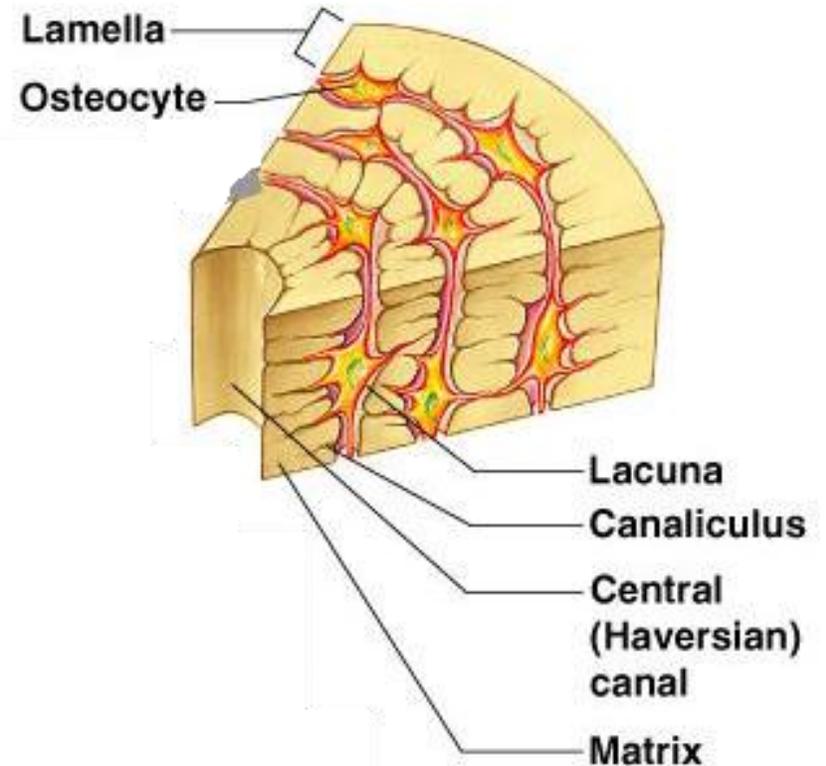


# Microscopic Anatomy of compact bone



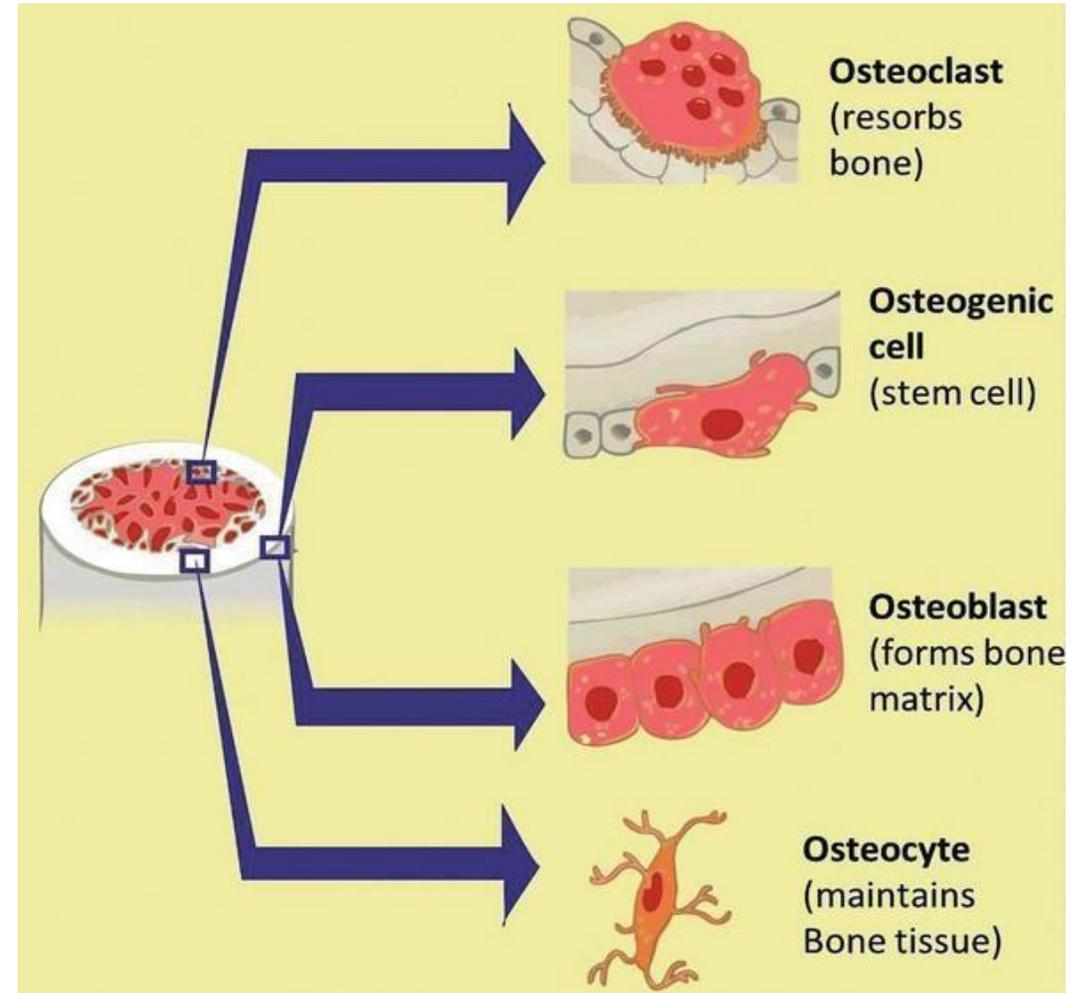
# Microscopic Anatomy of compact bone

- **Lacunae**
  - Cavities containing bone cells (osteocytes)
  - Arranged in concentric rings
- **Lamellae**
  - Rings around the central canal
  - Sites of lacunae
- **Canaliculi**
  - Tiny canals
  - Radiate from the central canal to lacunae
  - Form a transport system



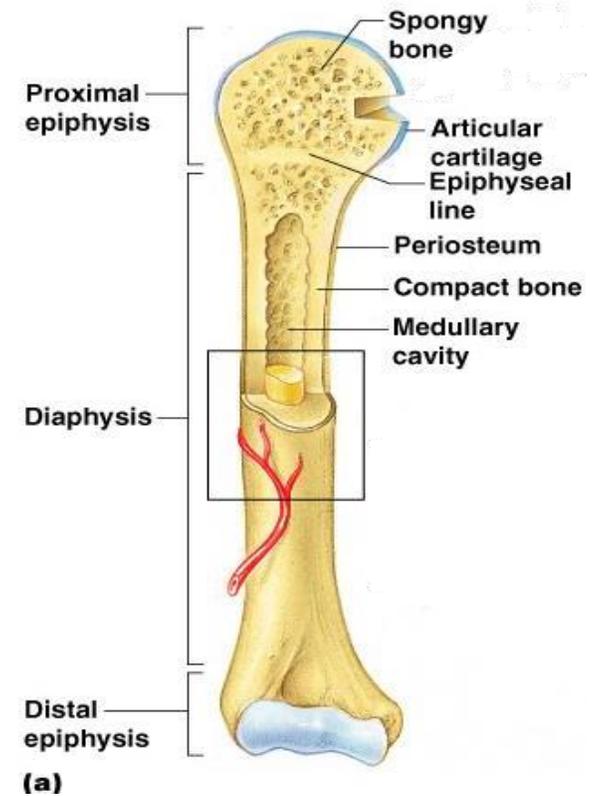
# Types of Bone Cells

- **Osteocytes**
  - Mature bone cells
- **Osteoblasts**
  - Bone-forming cells
- **Osteoclasts**
  - Bone-destroying cells
  - Break down bone matrix for remodeling and release of calcium
- Bone remodeling is a process controlled by both osteoblasts and osteoclasts



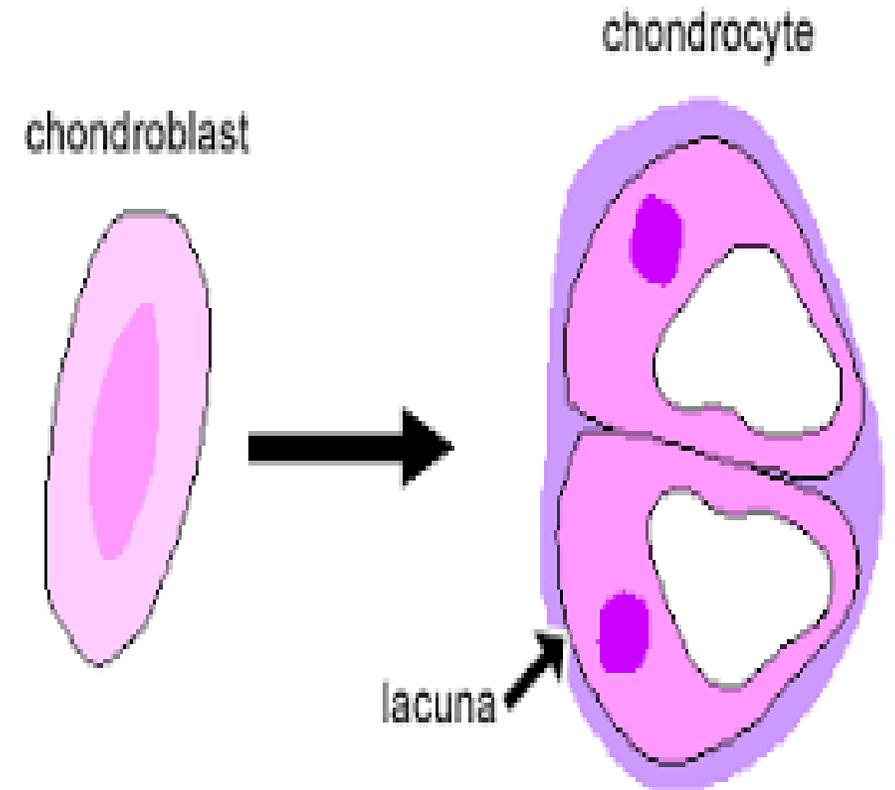
## 2. Spongy bone (cancellous)

- **Spongy bone (cancellous):**
- forms the sides of long bones
- Thin plates of collagen fibers (trabeculae)



# Supporting Connective Tissue: Cartilage

- Cartilage
  - Structure
    - Chondroblasts: produce the matrix
    - Chondrocytes: mature cartilage cells
    - Lacks direct blood supply, nerve fibers
    - lymphatic vessels; supplied by diffusion



- Types:

- 1) Hyaline cartilage

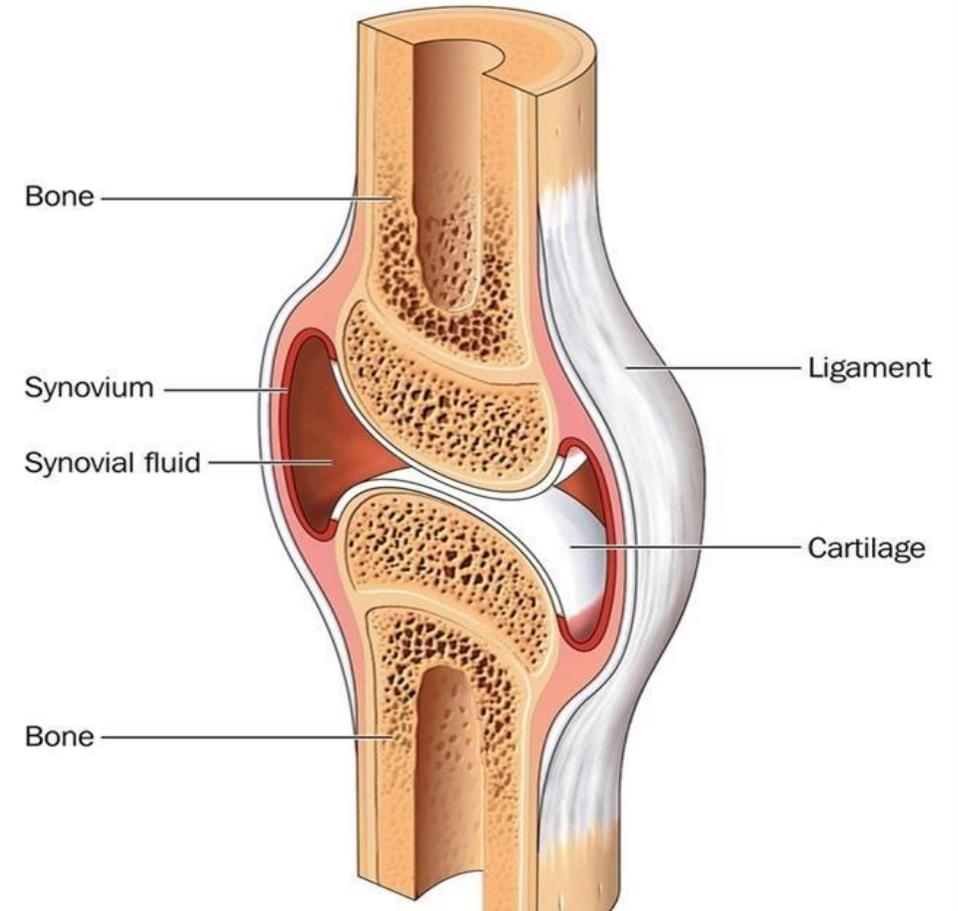
- 2) Elastic cartilage

- 3) Fibrocartilage

# Cartilage

## 1. Hyaline cartilage (Most common cartilage)

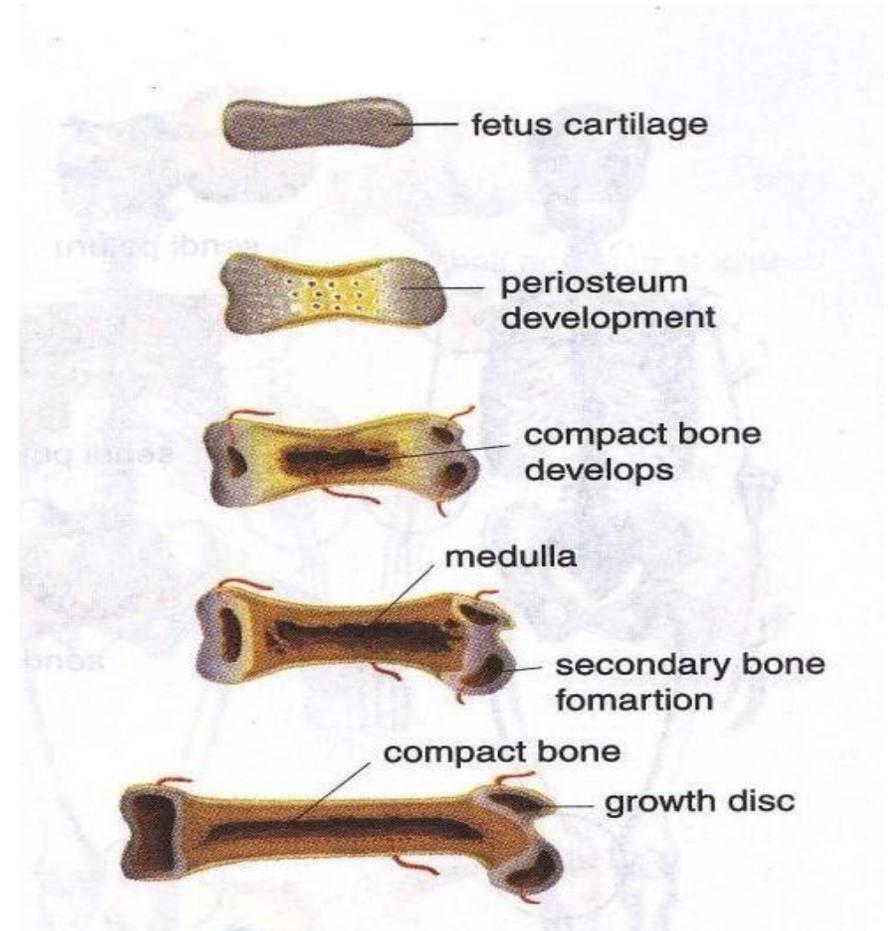
- Structure
  - collagen and elastic fibers
  - Rubbery matrix
- Function
  - a. Bone Development (growth of long bones)
  - b. Support (able to tolerate weight)



# Cartilage

- Location

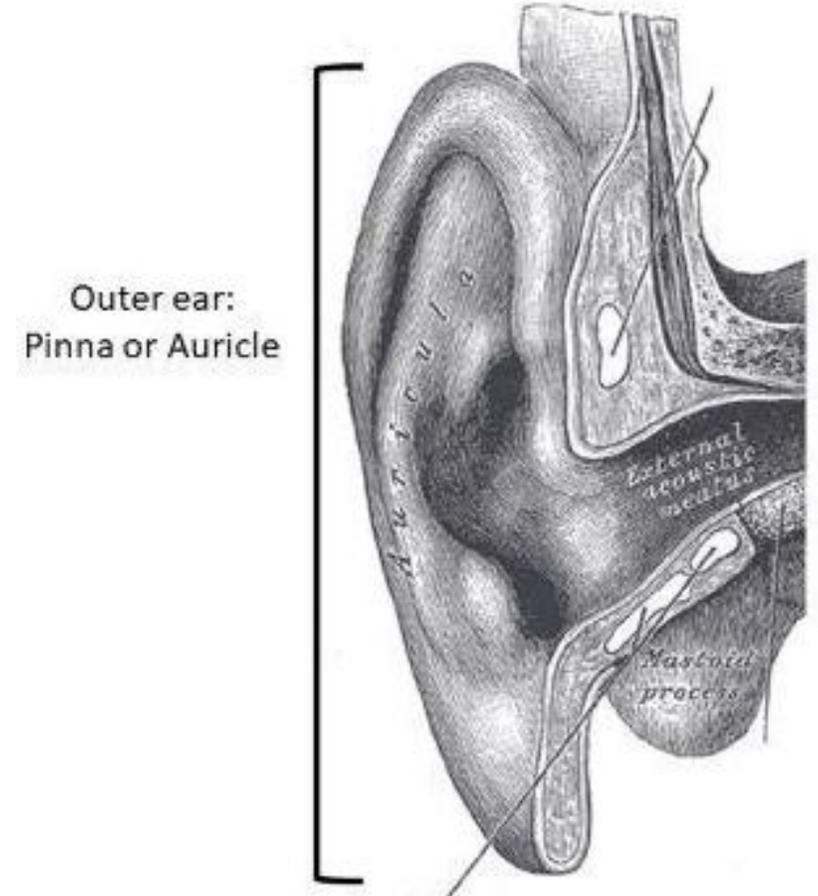
- Tracheal and bronchial cartilage
- Nasal septum
- Forms supporting structure of larynx (voicebox)
- Attaches ribs to breastbone (costal cartilage)
- Covers ends of long bones (joint cavities)
- Composes most of the fetal/ embryonic skeleton



# Cartilage

## 2. Elastic cartilage

- Structure
  - Dark in color
  - Contains both elastic and collagen fibers but more Elastic fibers
- Function
  - Provides elasticity and flexibility
- Location
  - Entrance of larynx (Epiglottis)
  - External ear (ear pinna)



# Cartilage

## 3. Fibrocartilage

- Structure
  - mainly collagen fibers
  - very little matrix
  - No perichondrium (no capsule)
  - Highly compressible (tough)
- Function
  - Shock absorber
- Location
  - Intervertebral disks
  - Cushions the knee joint
  - Pubic symphysis



# The Axial Skeleton

Divided into four parts:

- Skull
- Bony thorax
- Vertebral column
- Hyoid bone

# The Axial Skeleton

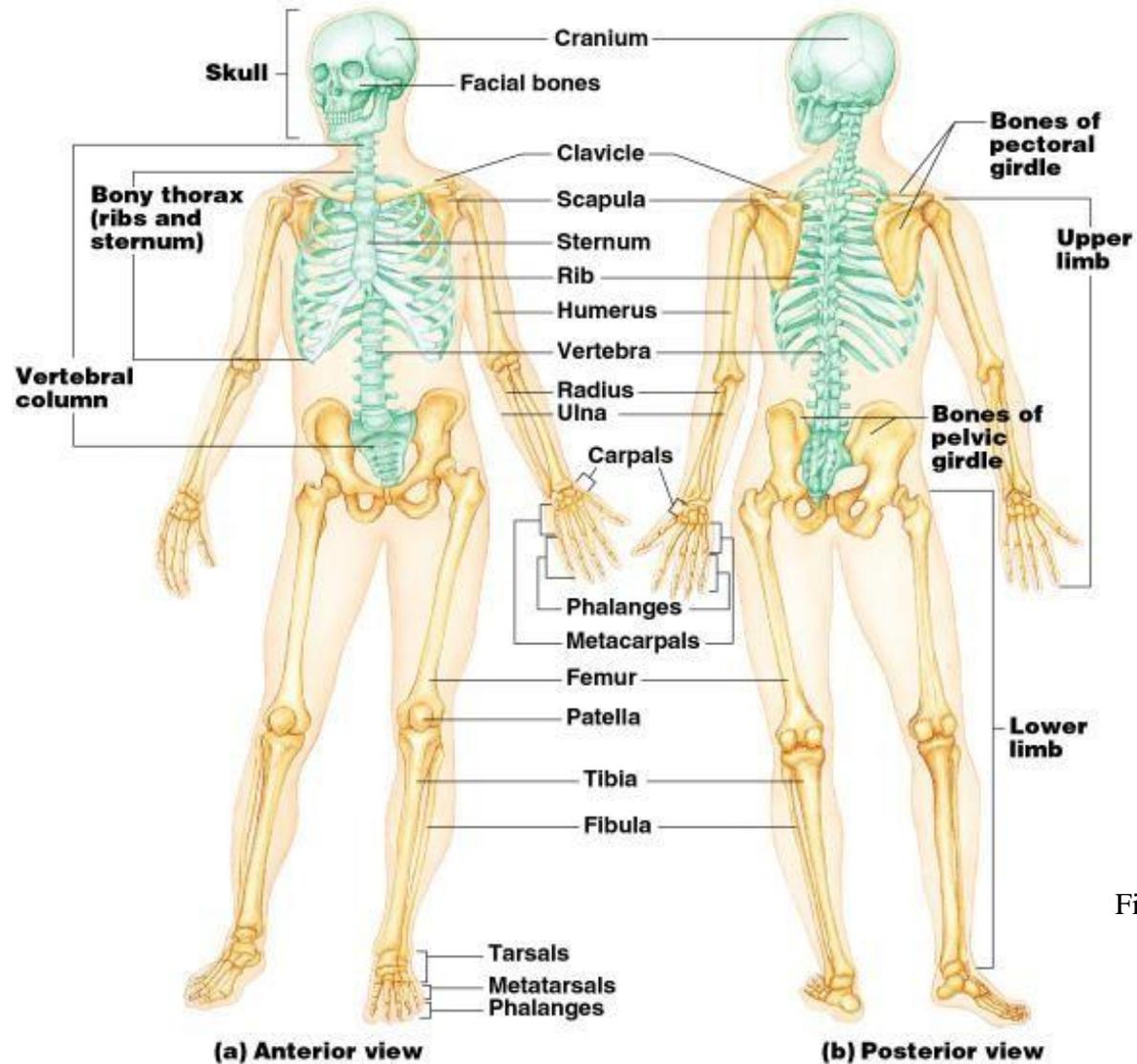
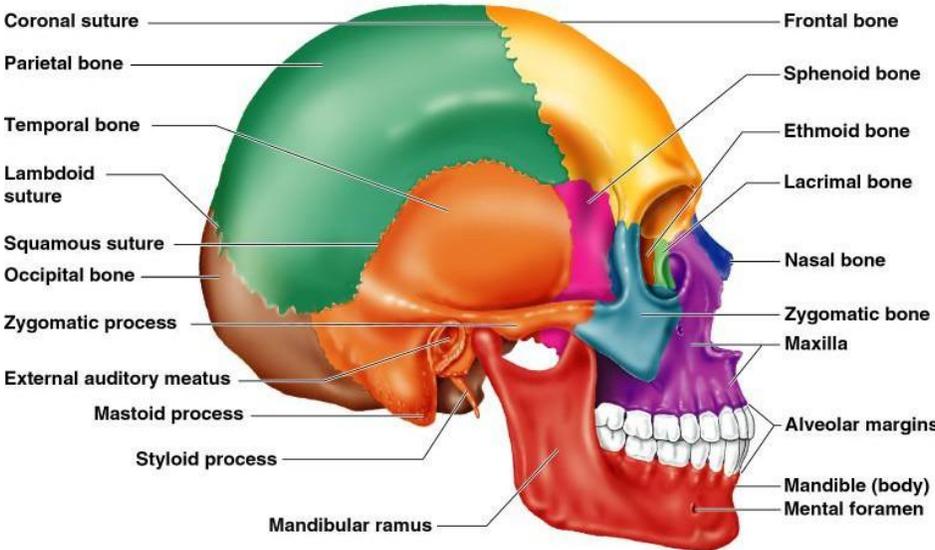
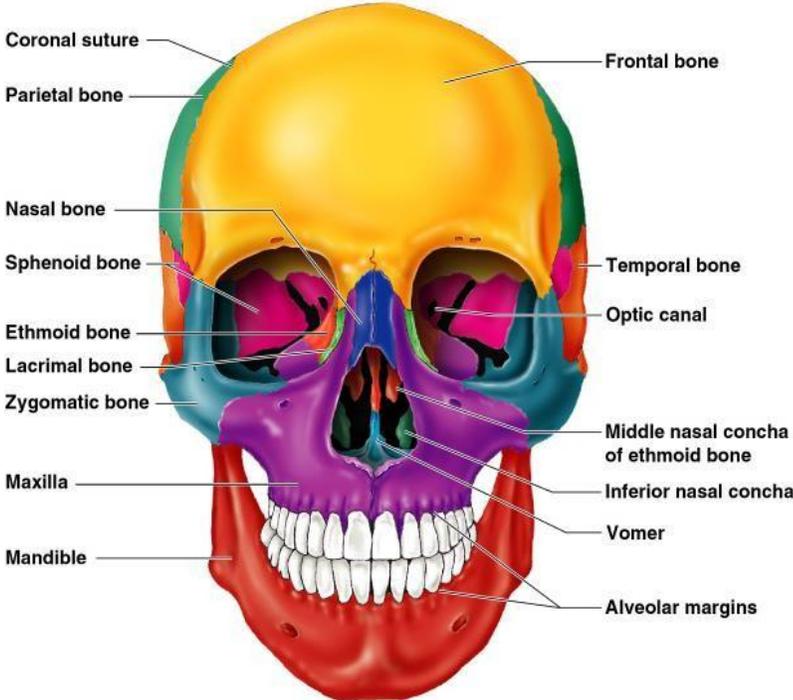


Figure 5.6

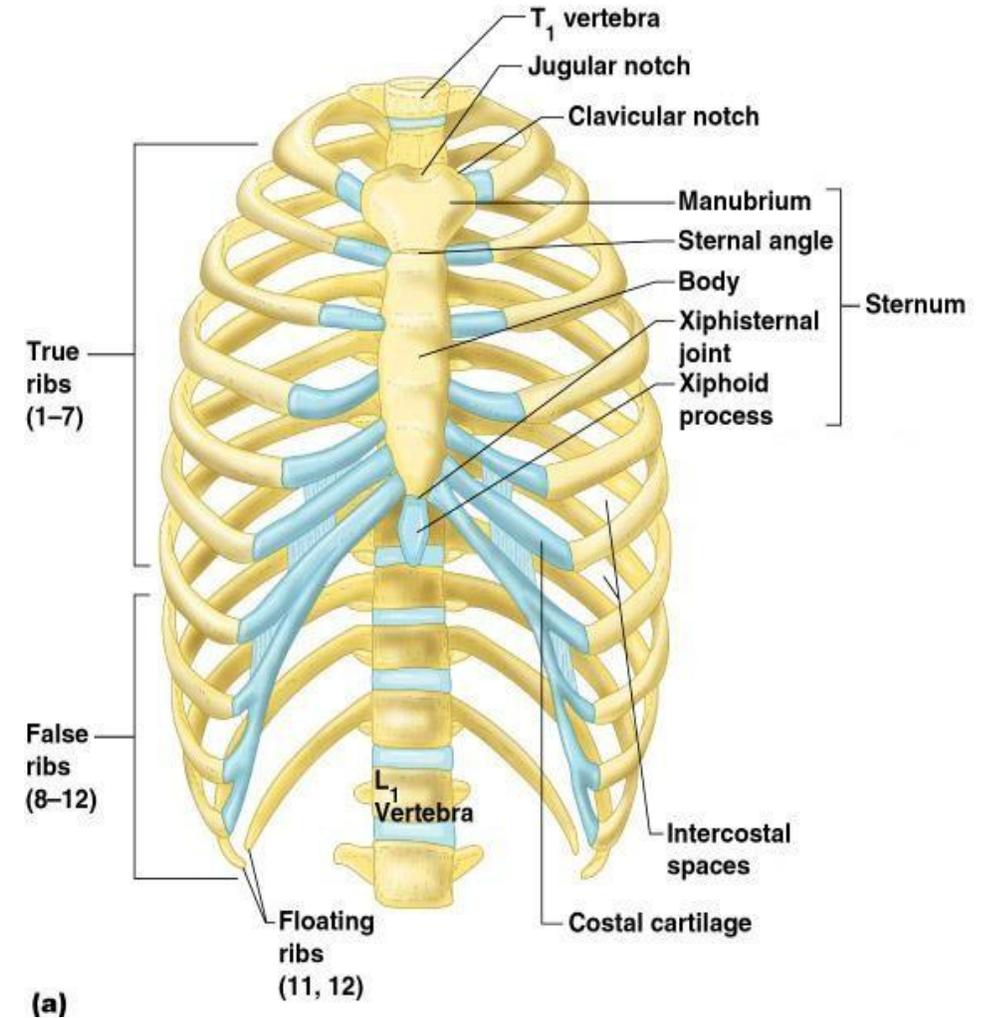
# Bones of the Skull

Skull (divided into Two sets of bones: **Cranial** and **Facial** bones). Bones are joined by **sutures**



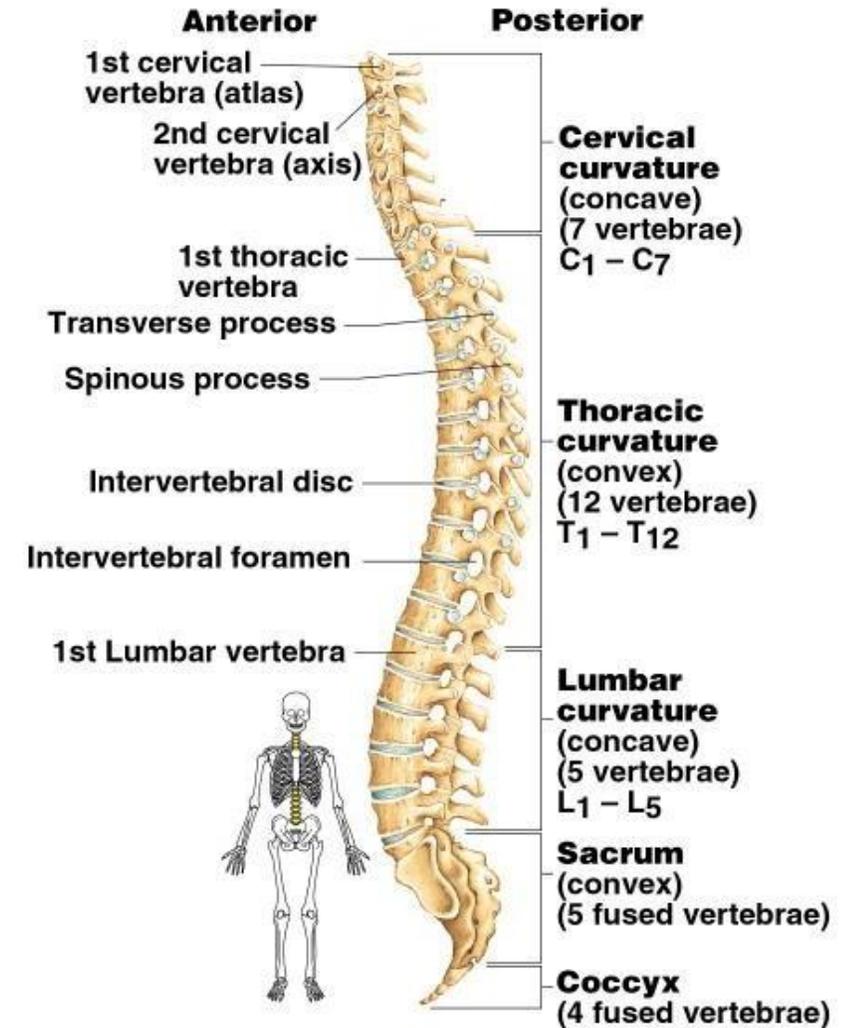
# The Bony Thorax

- Forms a rib cage to protect major organs (like heart, lungs)
- 12 pairs of ribs
- 12 thoracic vertebrae
- Sternum



# The Vertebral Column

- 33 vertebrae
- 24 individual vertebrae
- 9 fused vertebrae
- Irregular bones
- Vertebrae separated by intervertebral discs (fibrocartilage)
- Each vertebrae is given a name according to its location: cervical, thoracic, lumbar, sacral (sacrum), coccygeal (coccyx).



# The Hyoid Bone

- C-shaped bone
- The only bone that does not articulate with another bone
- Serves as a moveable base for the tongue
- The hyoid bone also helps to keep the larynx (voice box) open at all times

