

5

PART A

The Skeletal System

PowerPoint® Lecture Slide Presentation by Jerry L. Cook, Sam Houston University



ESSENTIALS OF HUMAN ANATOMY & PHYSIOLOGY

EIGHTH EDITION

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The Skeletal System

- Parts of the skeletal system
 - Bones (skeleton)
 - Joints
 - Cartilages
 - Ligaments
- Divided into two divisions
 - Axial skeleton
 - Appendicular skeleton

Functions of Bones

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

Bones of the Human Body

- The adult skeleton has 206 bones
- Two basic types of bone tissue
 - Compact bone
 - Homogeneous
 - Spongy bone
 - Small needle-like pieces of bone
 - Many open spaces

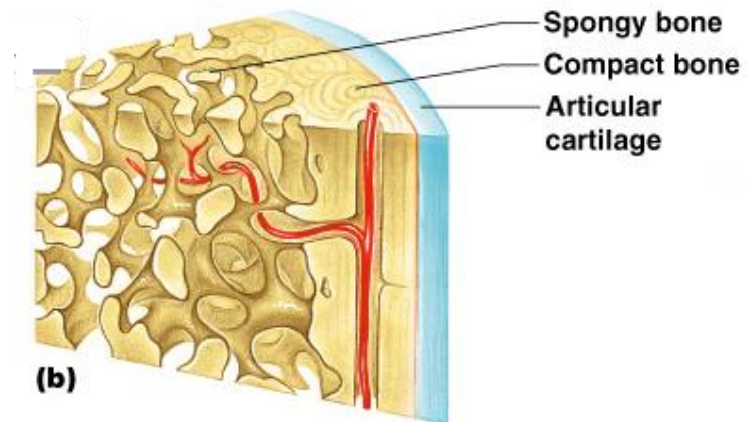


Figure 5.2b

Classification of Bones on the Basis of Shape

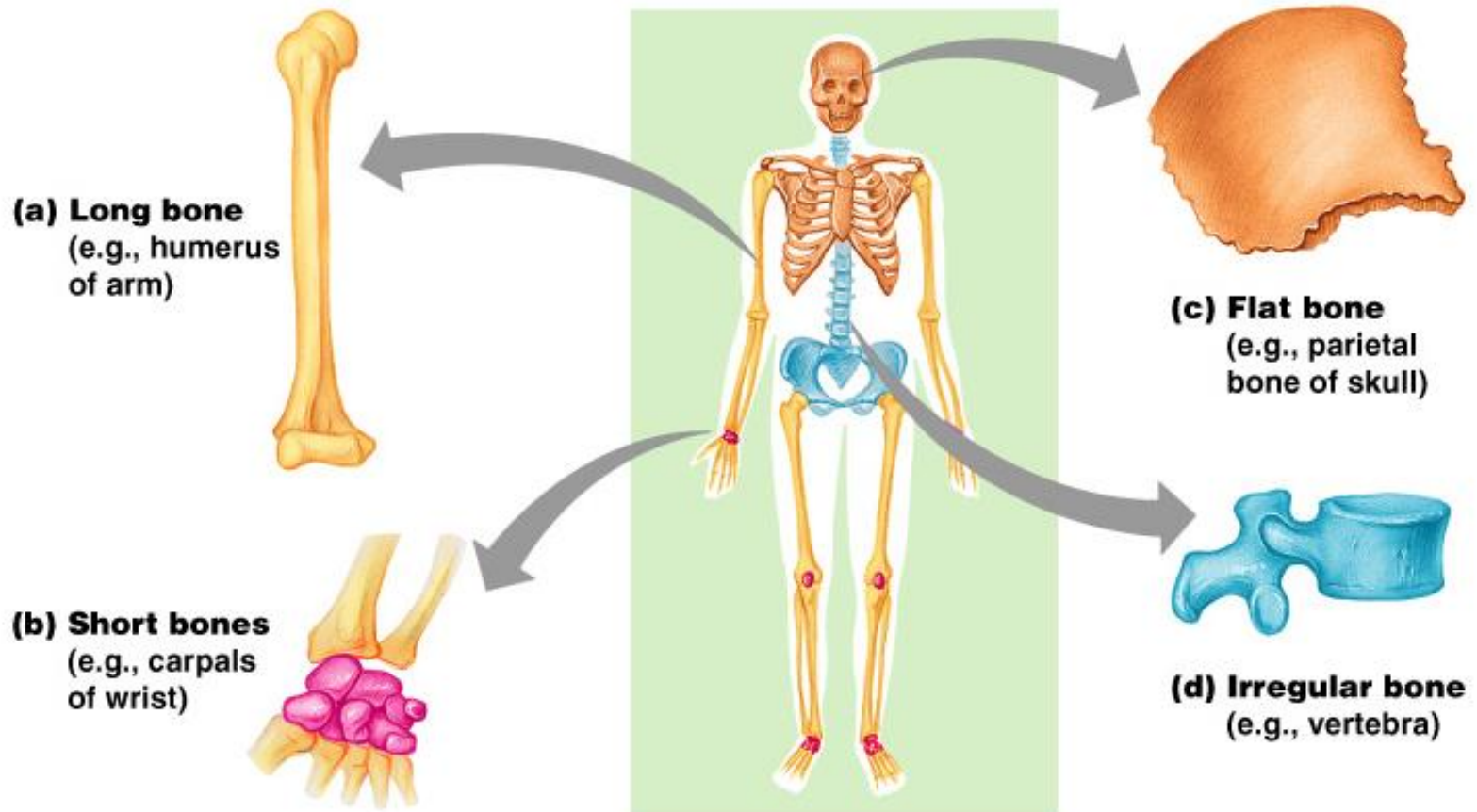


Figure 5.1

Classification of Bones

- Long bones
 - Typically longer than wide
 - Have a shaft with heads at both ends
 - Contain mostly compact bone
 - Examples: Femur, humerus

Classification of Bones

- Short bones
 - Generally cube-shape
 - Contain mostly spongy bone
 - Examples: Carpals, tarsals

Classification of Bones

- Flat bones
 - Thin and flattened
 - Usually curved
 - Thin layers of compact bone around a layer of spongy bone
 - Examples: Skull, ribs, sternum

Classification of Bones

- Irregular bones
 - Irregular shape
 - Do not fit into other bone classification categories
 - Example: Vertebrae and hip

Classification of Bones on the Basis of Shape

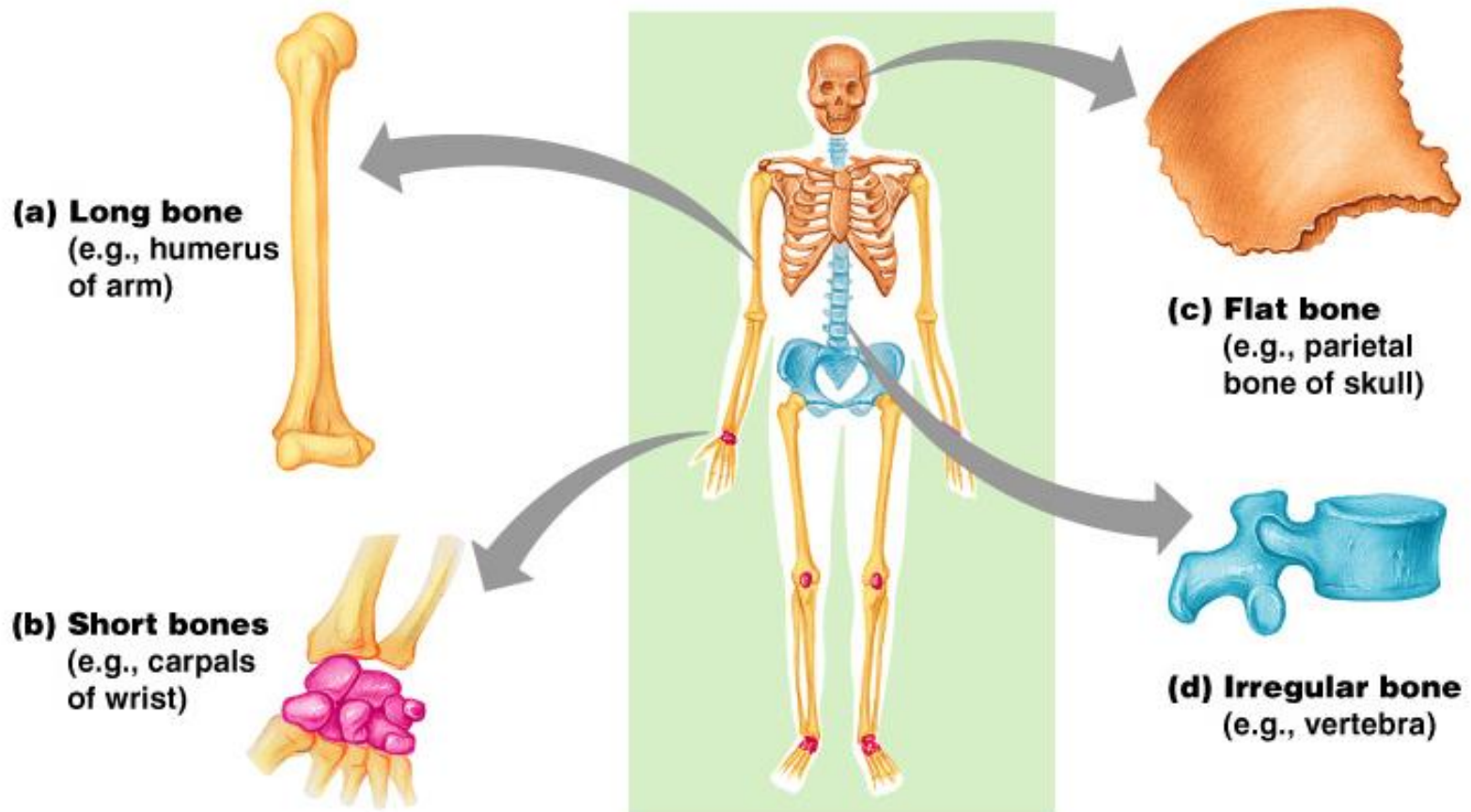
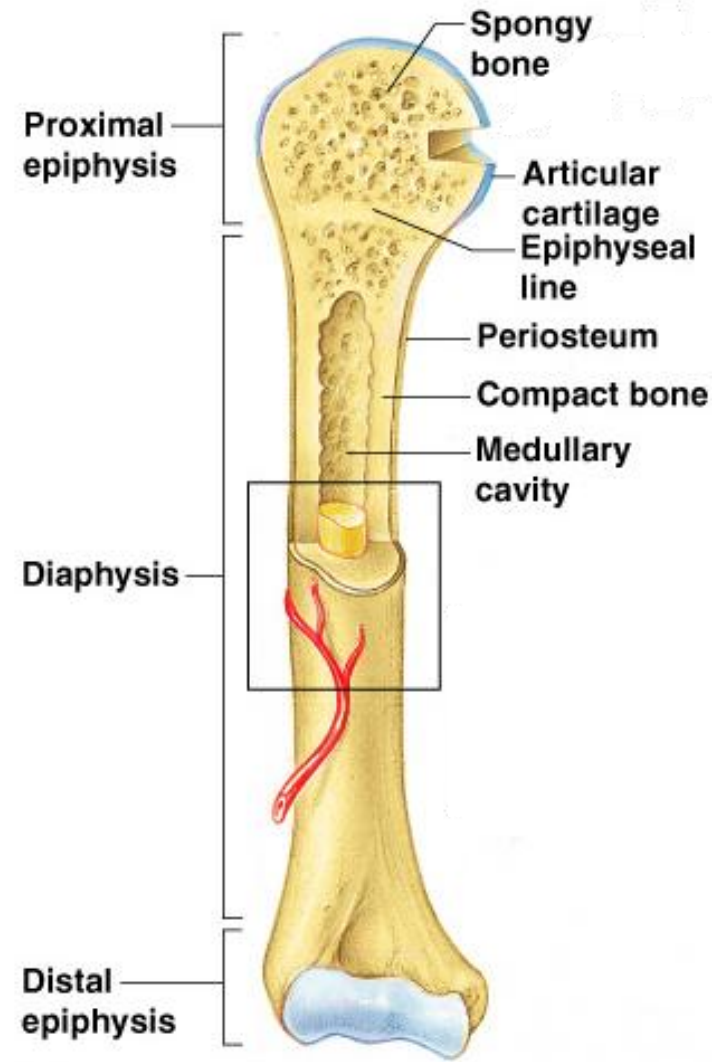


Figure 5.1

Gross Anatomy of a Long Bone

- Diaphysis
 - Shaft
 - Composed of compact bone
- Epiphysis
 - Ends of the bone
 - Composed mostly of spongy bone

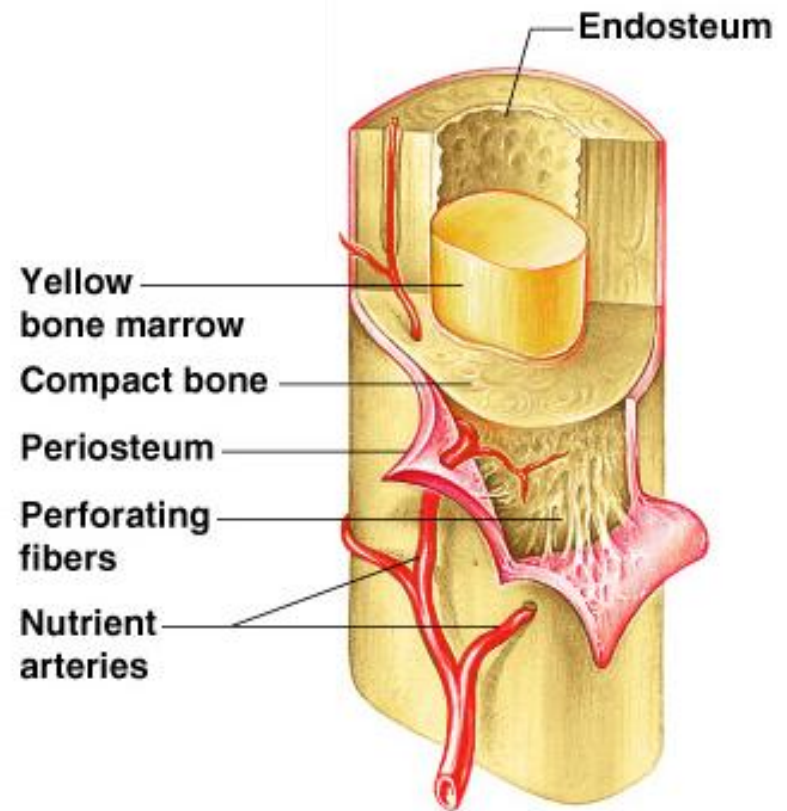


(a)

Figure 5.2a

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)

Figure 5.2c

Structures of a Long Bone

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

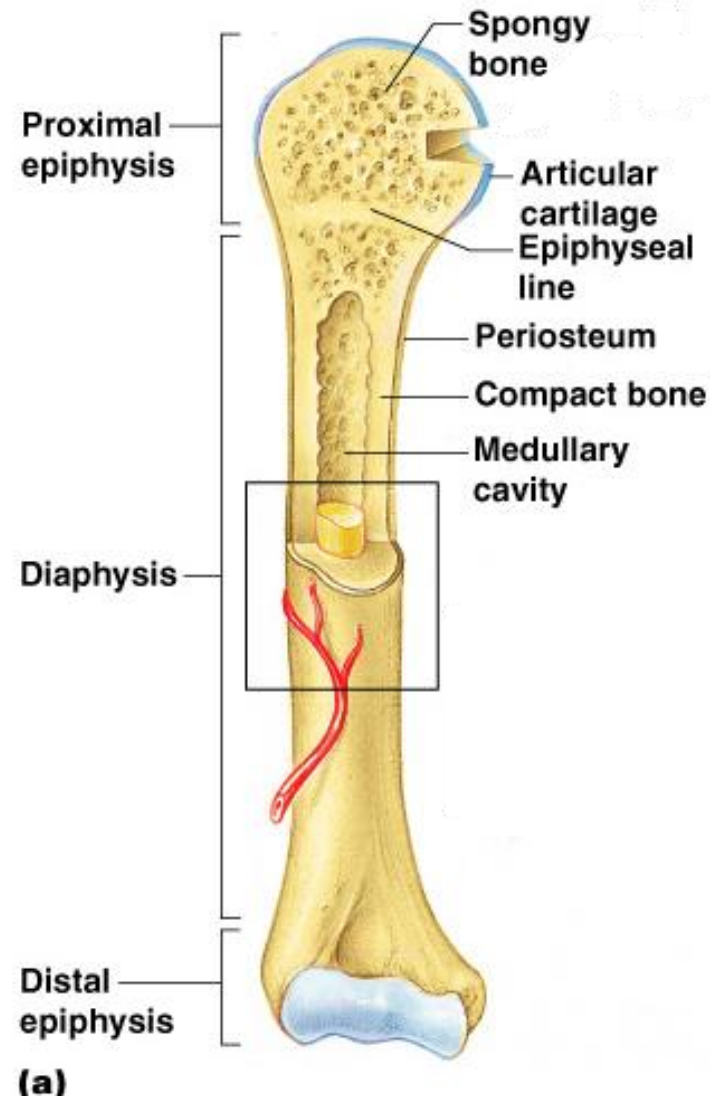
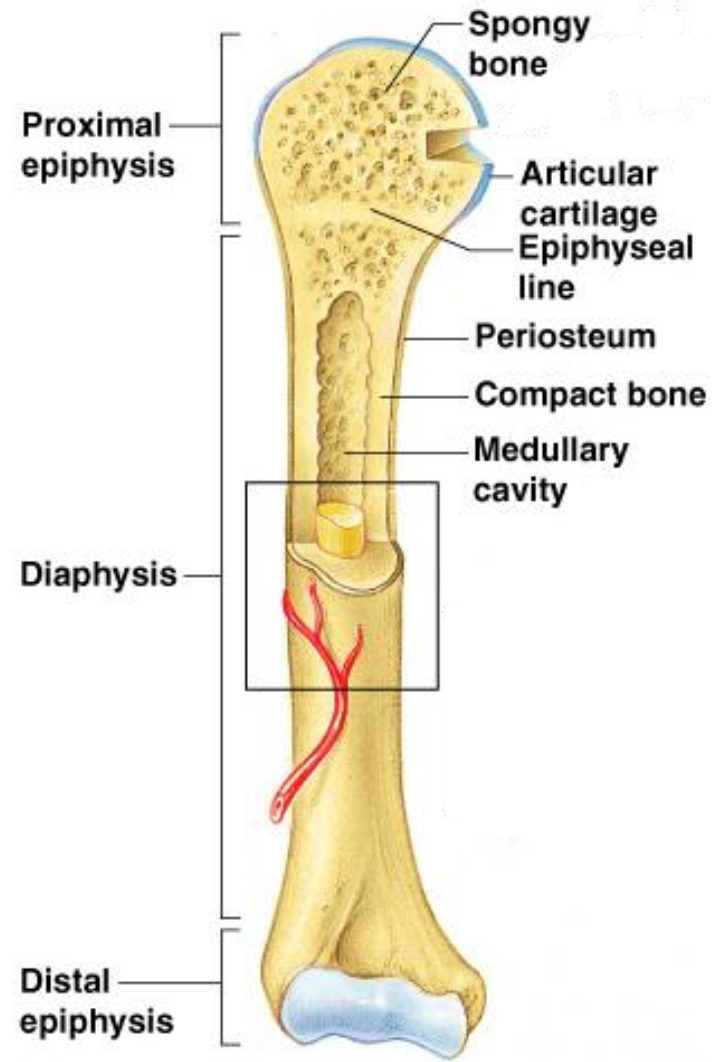


Figure 5.2a

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



(a)

Figure 5.2a

Bone Markings

- Surface features of bones
- Sites of attachments for muscles, tendons, and ligaments
- Passages for nerves and blood vessels
- Categories of bone markings
 - Projections and processes – grow out from the bone surface
 - Depressions or cavities – indentations

Microscopic Anatomy of Bone

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

Microscopic Anatomy of Bone

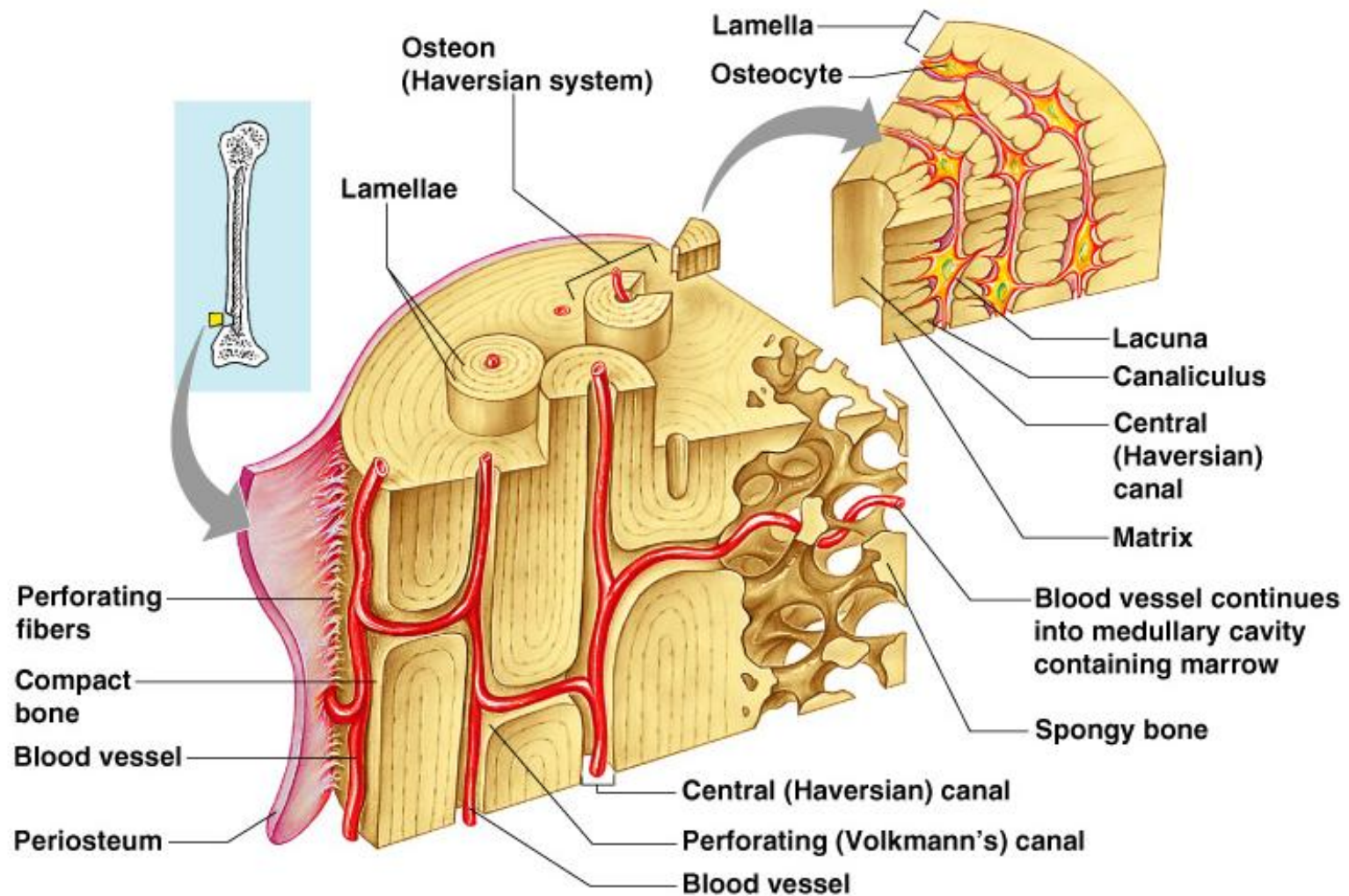
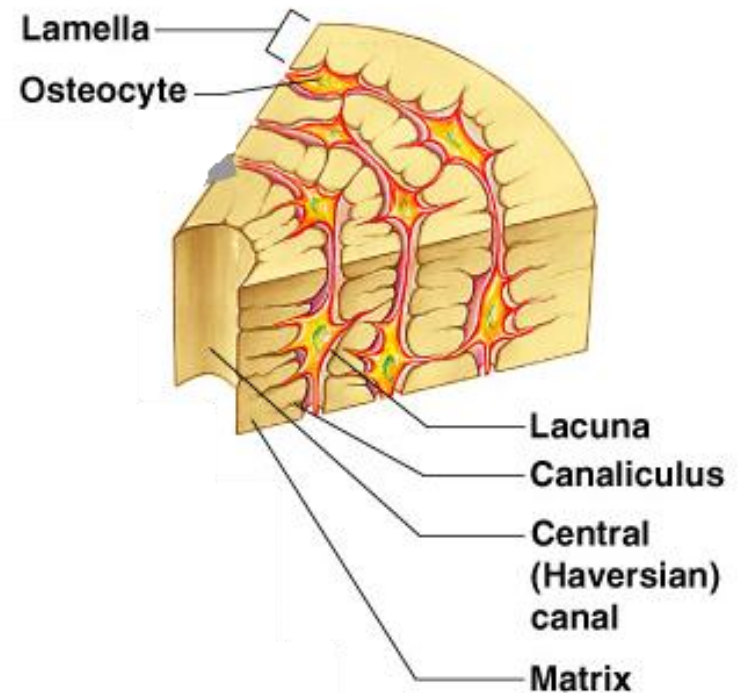


Figure 5.3

Microscopic Anatomy of Bone

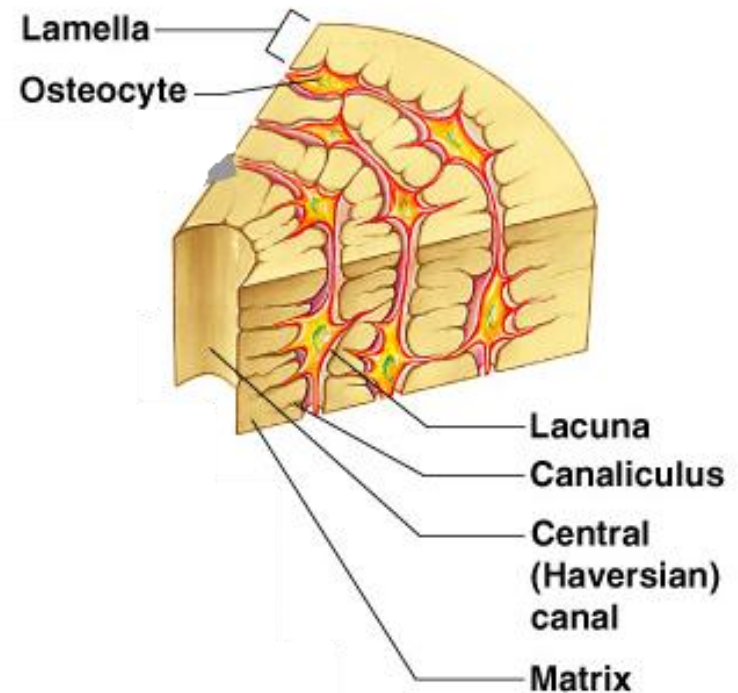
- Lacunae
 - Cavities containing bone cells (osteocytes)
 - Arranged in concentric rings
- Lamellae
 - Rings around the central canal
 - Sites of lacunae



Detail of Figure 5.3

Microscopic Anatomy of Bone

- Canaliculi
 - Tiny canals
 - Radiate from the central canal to lacunae
 - Form a transport system



Detail of Figure 5.3

Changes in the Human Skeleton

- In embryos, the skeleton is primarily hyaline cartilage
- During development, much of this cartilage is replaced by bone
- Cartilage remains in isolated areas
 - Bridge of the nose
 - Parts of ribs
 - Joints

Bone Growth

- Epiphyseal plates allow for growth of long bone during childhood
 - New cartilage is continuously formed
 - Older cartilage becomes ossified
 - Cartilage is broken down
 - Bone replaces cartilage

Bone Growth

- Bones are remodeled and lengthened until growth stops
 - Bones change shape somewhat
 - Bones grow in width

Long Bone Formation and Growth

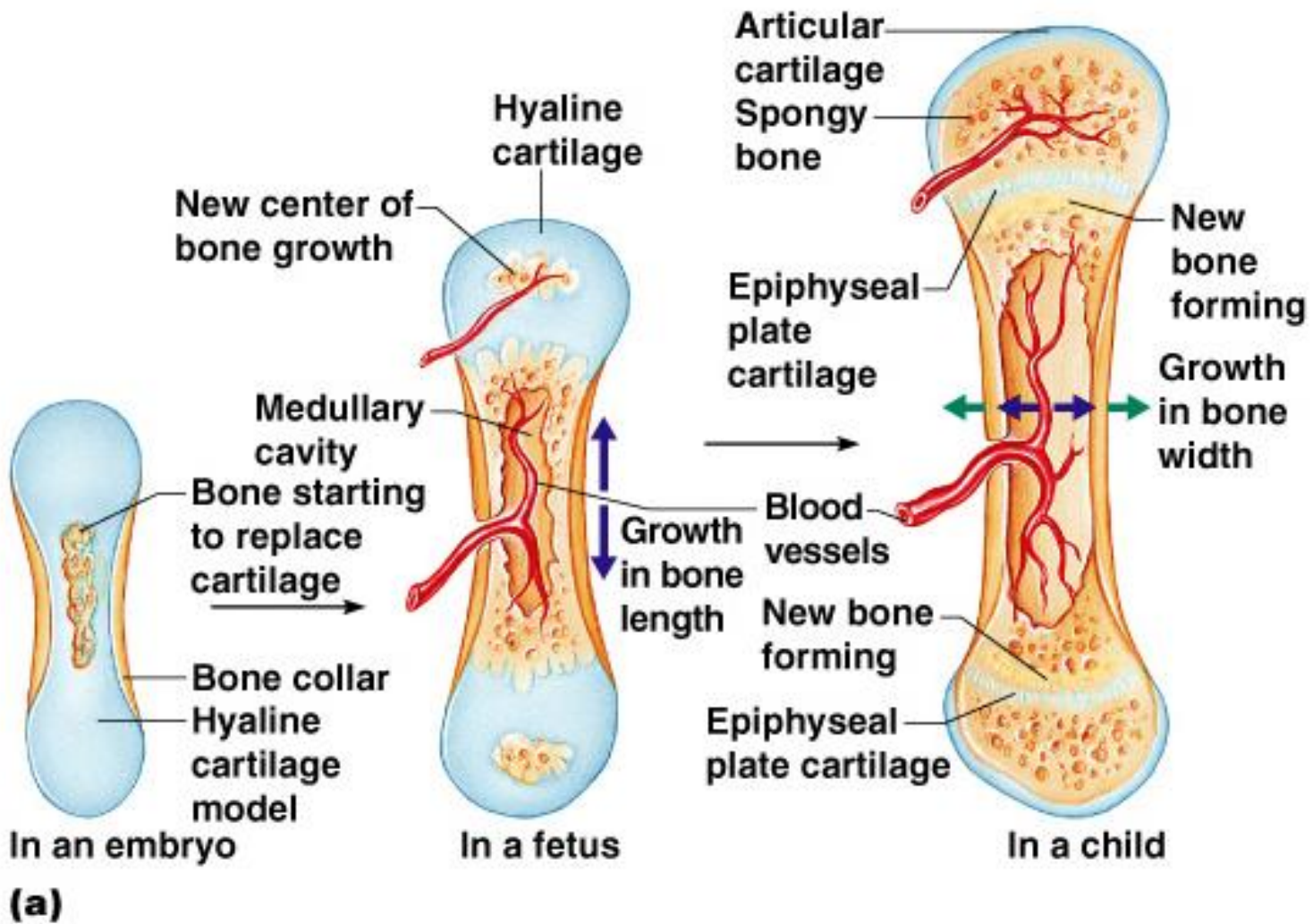


Figure 5.4a

Long Bone Formation and Growth

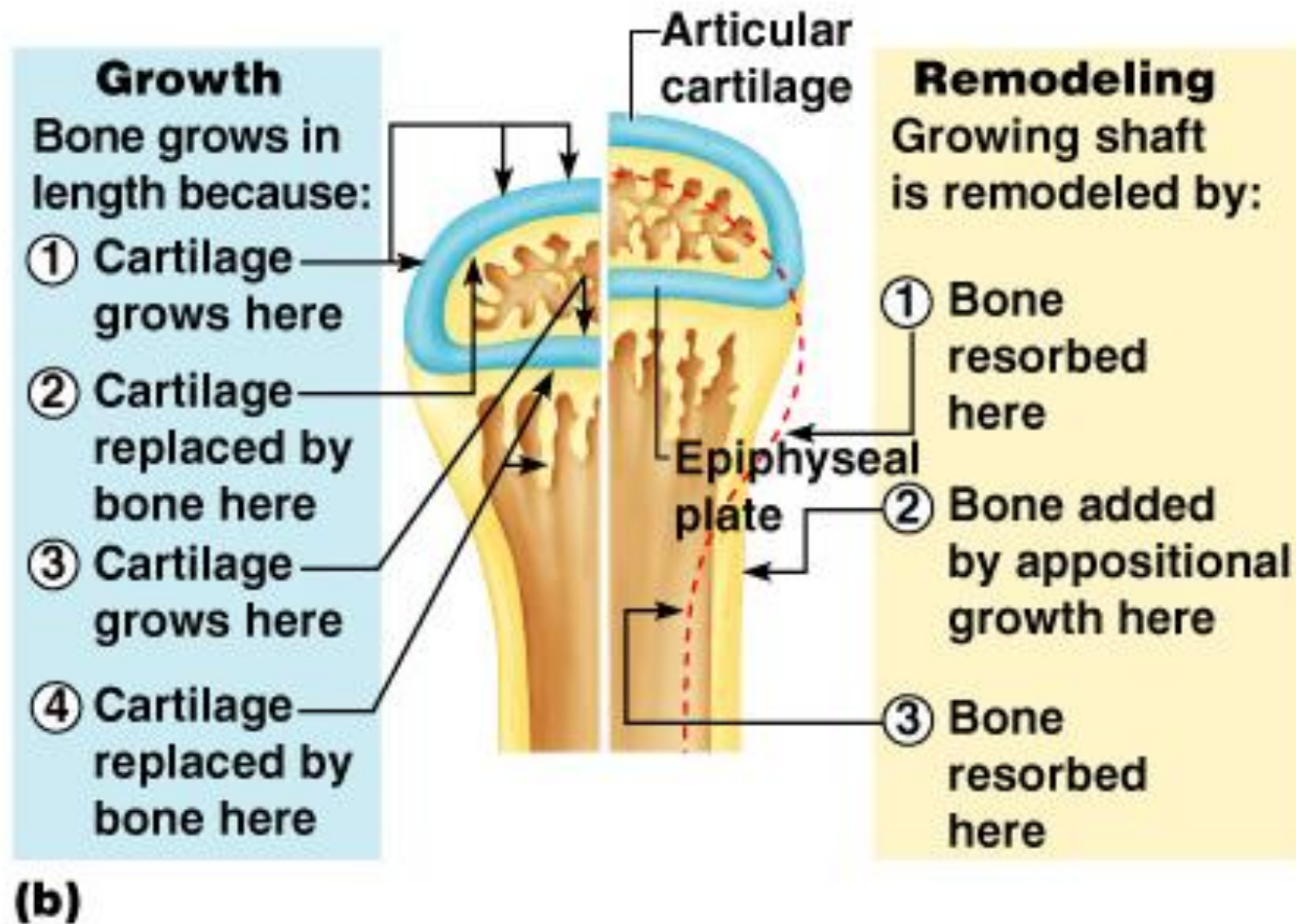


Figure 5.4b

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 by both osteoblasts and osteoclasts

Bone Fractures

- A break in a bone
- Types of bone fractures
 - Closed (simple) fracture – break that does not penetrate the skin
 - Open (compound) fracture – broken bone penetrates through the skin
- Bone fractures are treated by reduction and immobilization
 - Realignment of the bone

Common Types of Fractures





Fracture type	Illustration	Description	Comment
Comminuted		Bone breaks into many fragments.	Particularly common in the aged, whose bones are more brittle.
Compression		Bone is crushed.	Common in porous bones (i.e., osteoporotic bones).
Depressed		Broken bone portion is pressed inward.	Typical of skull fracture.
Impacted		Broken bone ends are forced into each other.	Commonly occurs when one attempts to break a fall with outstretched arms.
Spiral		Ragged break occurs when excessive twisting forces are applied to a bone.	Common sports fracture.
Greenstick		Bone breaks incompletely, much in the way a green twig breaks.	Common in children, whose bones are more flexible than those of adults.

Table 5.2