

MUGBERIA GANGADHAR MAHAVIDYALAYA

Dept. of Physical Education.

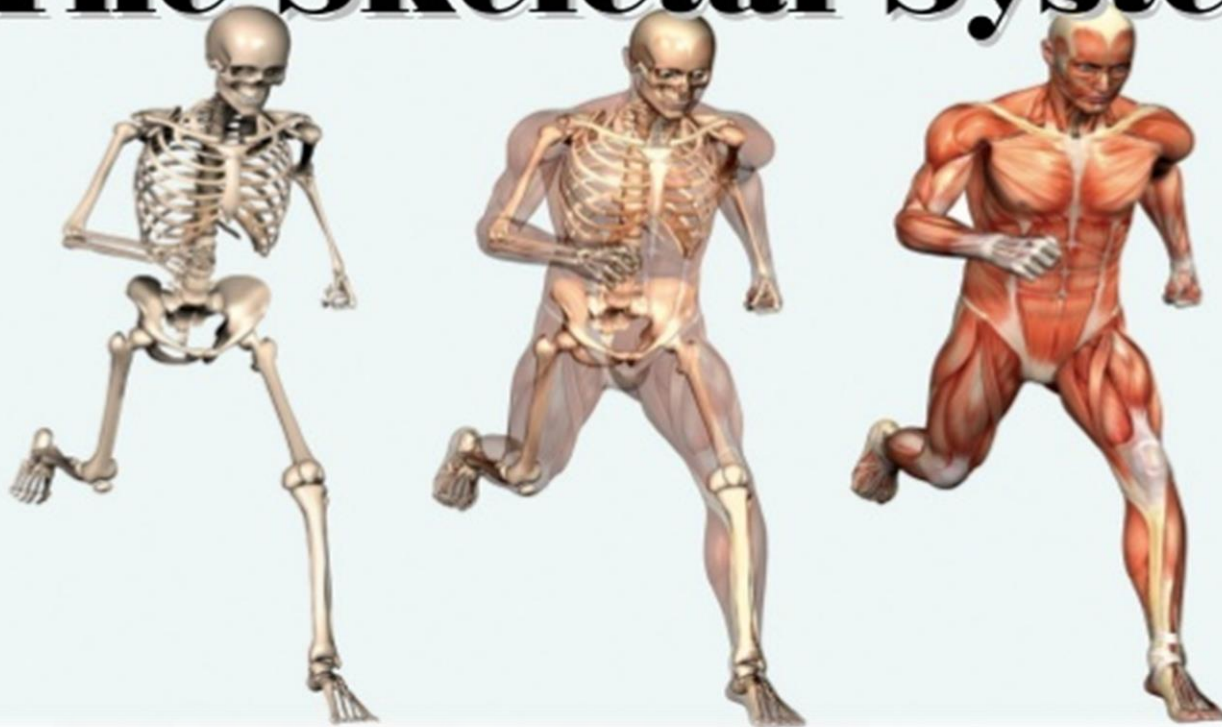
SUB: ANATOMY AND PHYSIOLOGY

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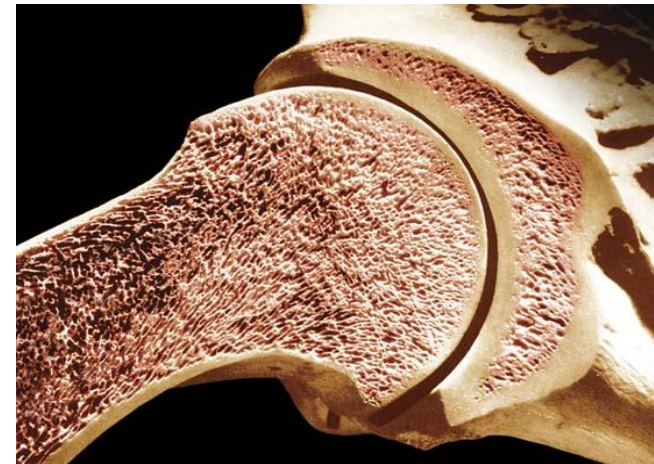
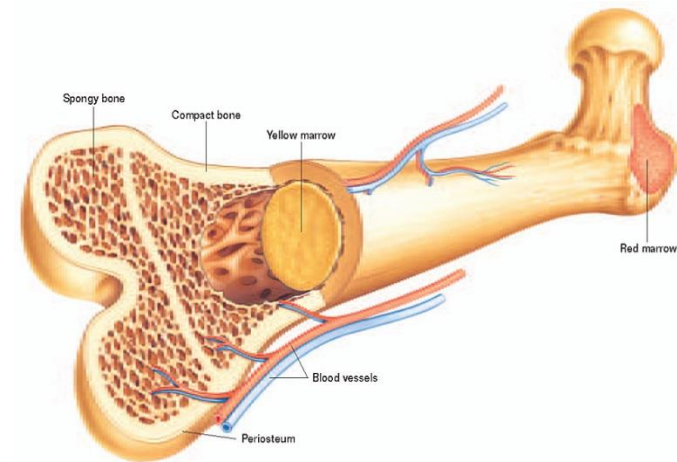
The Skeletal System



BONE

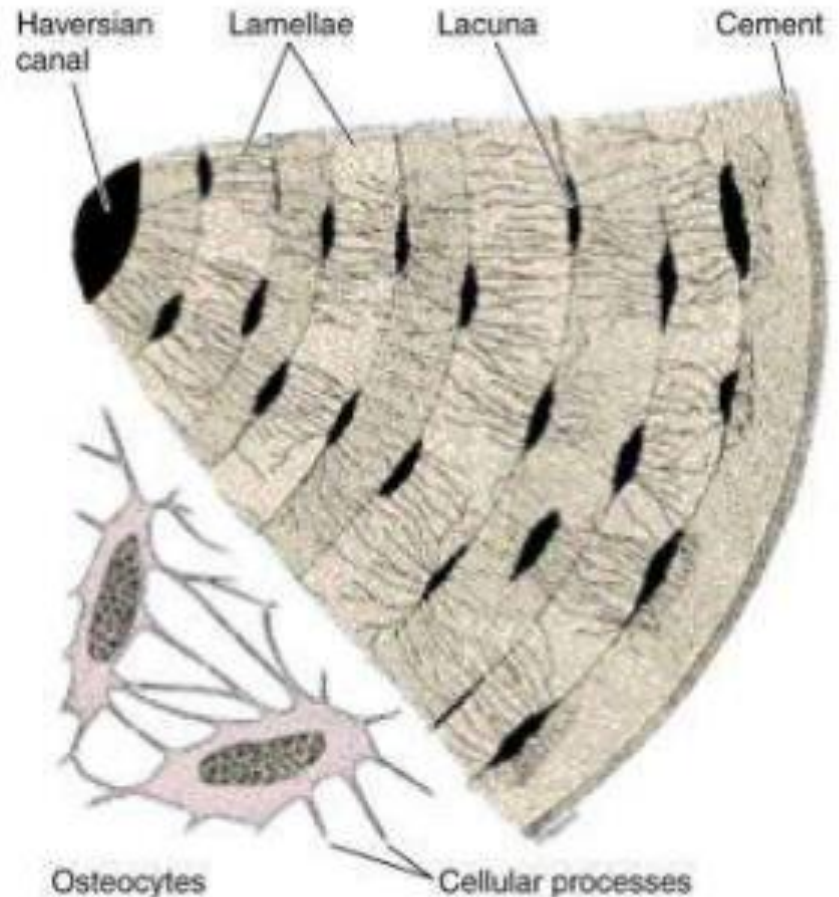
Bone is the hard, rigid form of connective tissue constituting most of the skeleton of vertebrates, composed chiefly of calcium salts.

A bone is a rigid organ that constitutes part of the vertebrate skeleton. Bones support and protect the various organs of the body, produce red and white blood cells, store minerals, provide structure and support for the body, and enable mobility. Bones come in a variety of shapes and sizes and have a complex internal and external structure. They are light weight yet strong and hard, and serve multiple functions.



Bone Matrix

- 25% Water
- 25% Protein or organic matrix
 - 95% Collagen Fibers
 - 5% Chondroitin Sulfate
- 50% Crystallized Mineral Salts Hydroxyapatite (Calcium Phosphate) Other substances: Lead, Gold, Strontium, Plutonium, etc.
- Combination provides strength and rigidity
 - Laid down by osteoblasts



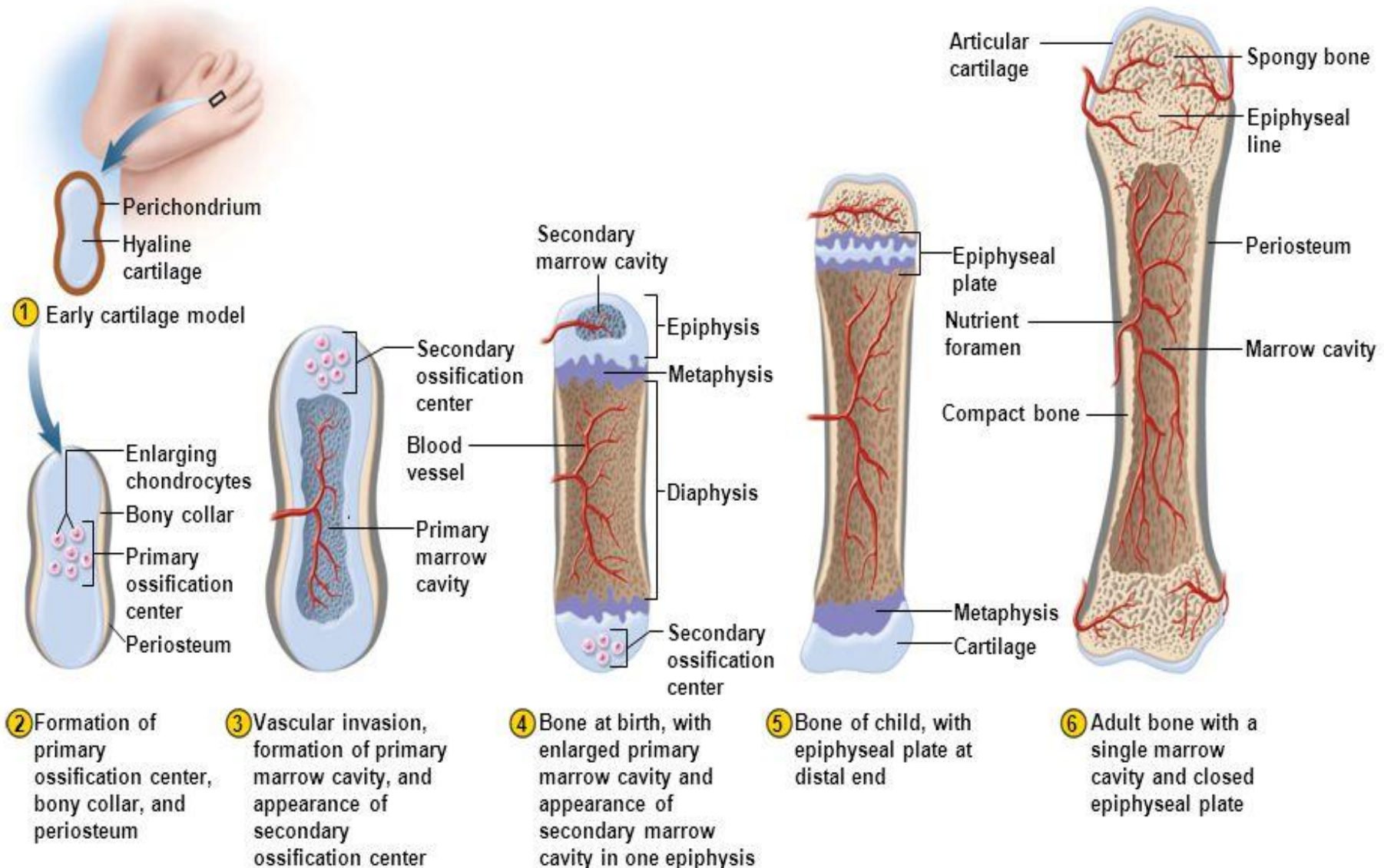
CLASSIFICATION OF BONE

- ✘ Bone may be classified in several ways:

Developmentally	Histologically	By shape
Endochondral bone	Compact (Cortical) Bone	Long bones
Intramembranous bone	Spongy (Cancellous) Bone	Short bones
		Flat bones
		Irregular bones

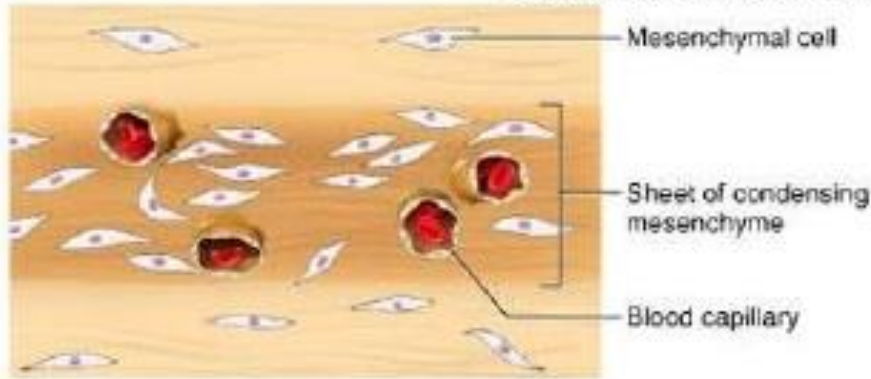
Stages of Endochondral Ossification

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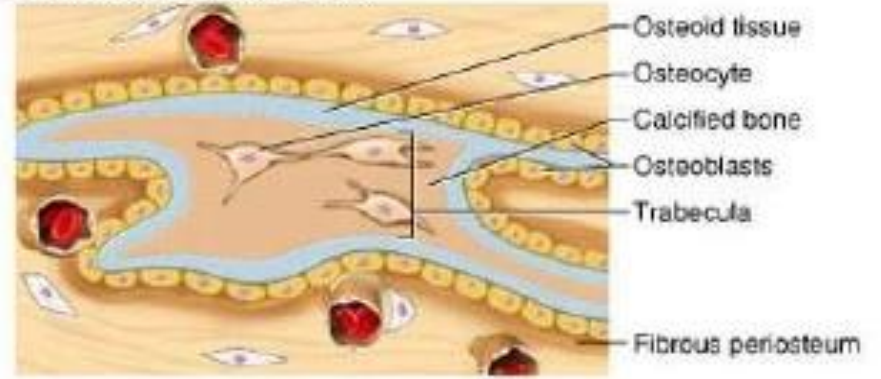


Intramembranous Ossification

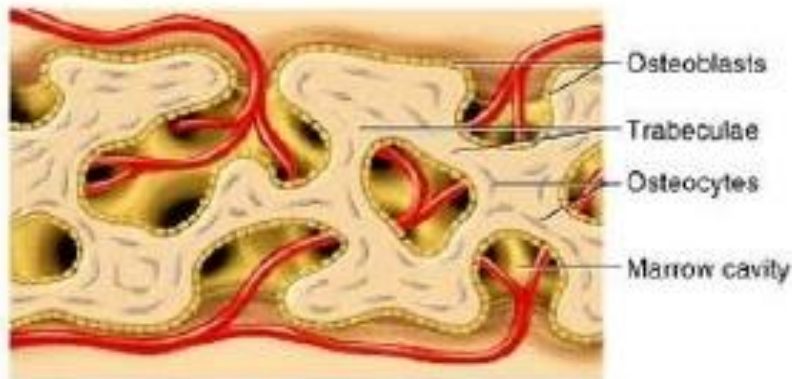
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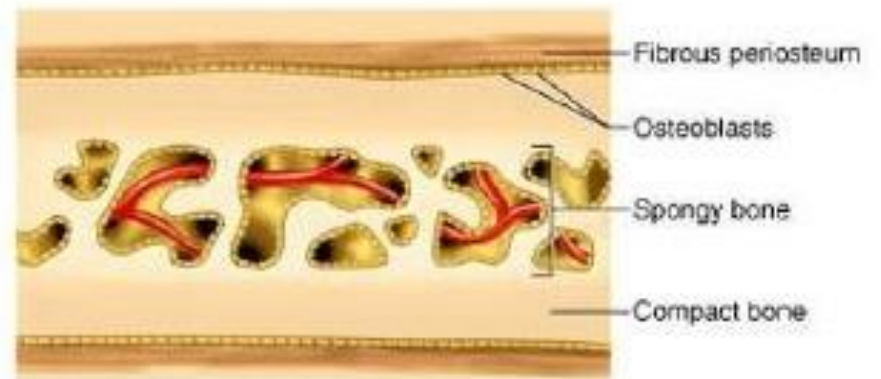
- ① Condensation of mesenchyme into soft sheet permeated with blood capillaries



- ② Deposition of osteoid tissue by osteoblasts on mesenchymal surface; entrapment of first osteocytes; formation of periosteum



- ③ Honeycomb of bony trabeculae formed by continued mineral deposition; creation of spongy bone



- ④ Surface bone filled in by bone deposition, converting spongy bone to compact bone. Persistence of spongy bone in the middle layer.

- Produces flat bones of skull and clavicle.

COMPACT BONE AND SPONGY BONE

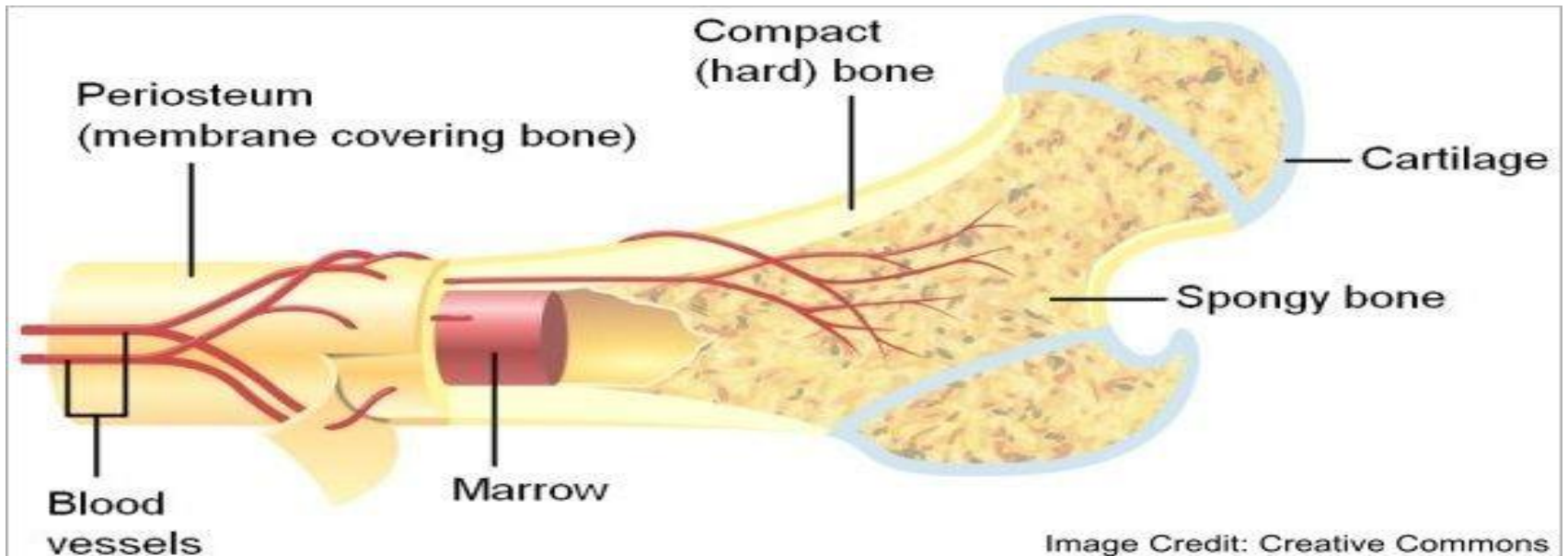
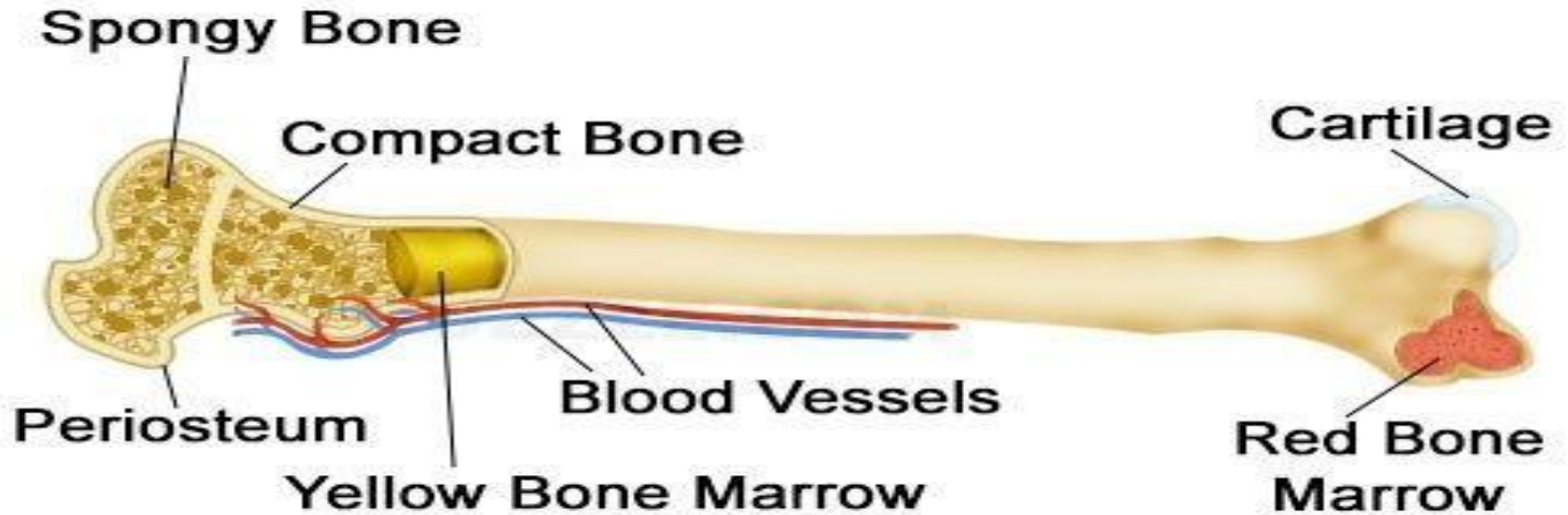
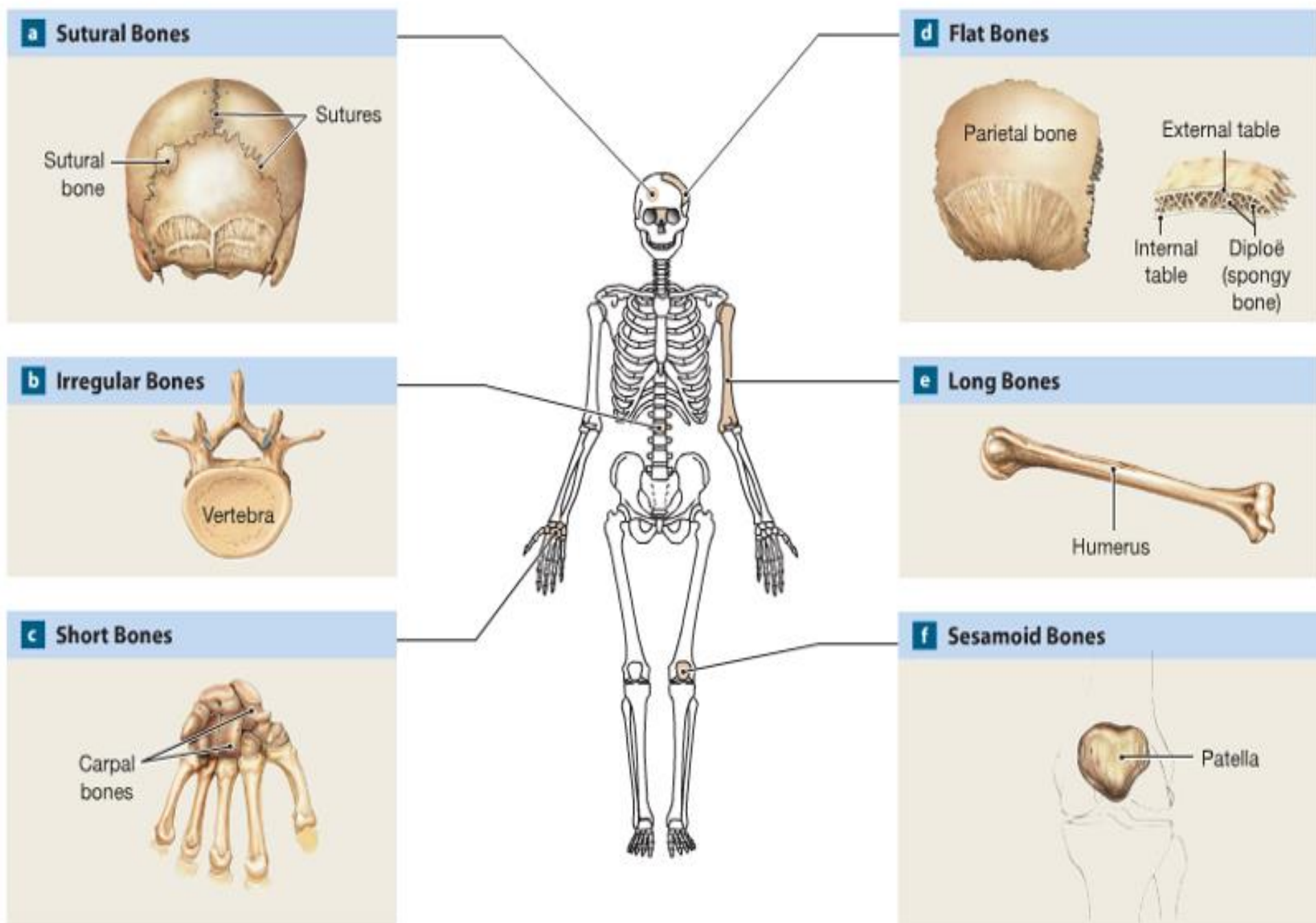
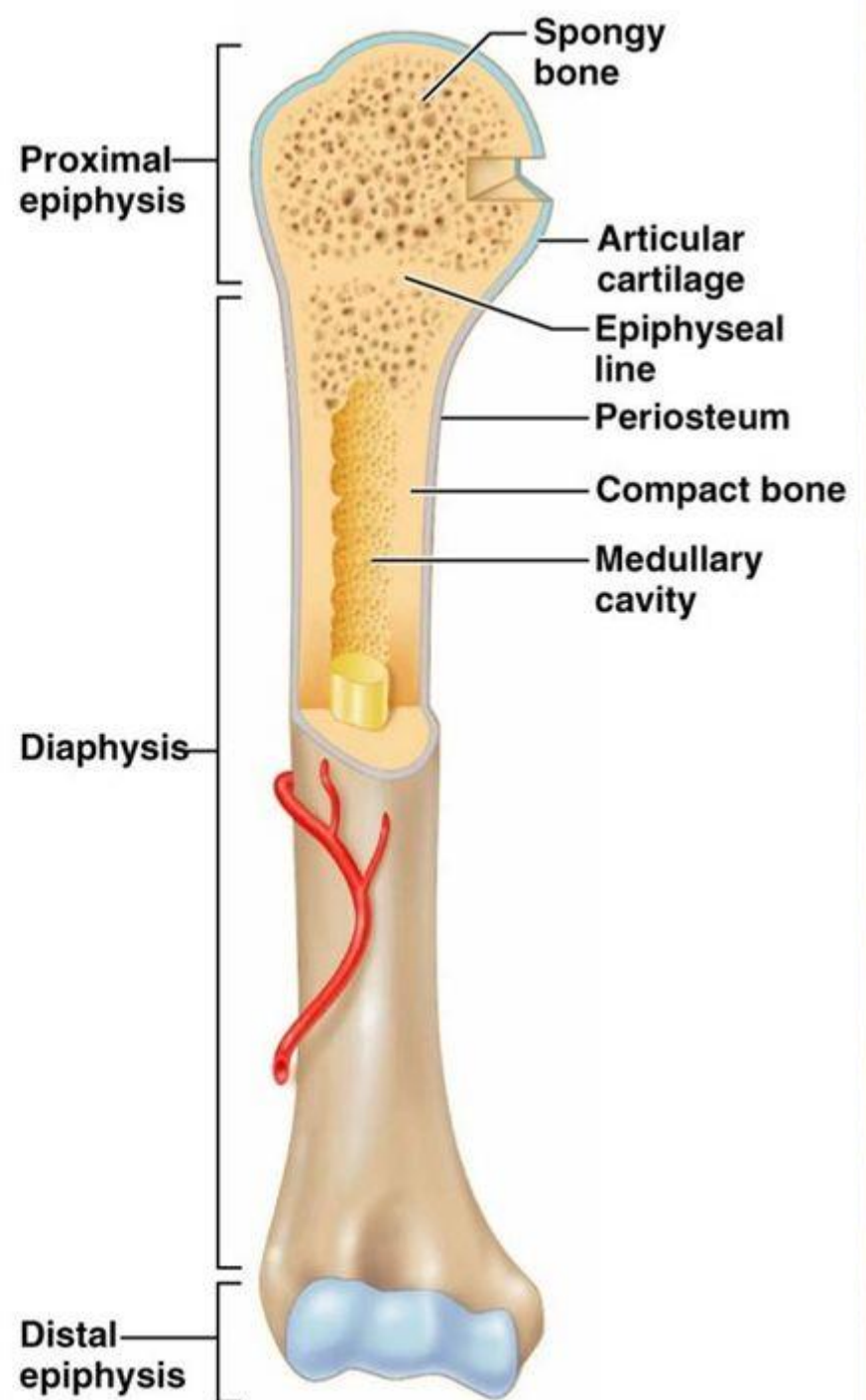


Figure 6-1 A Classification of Bones by Shape.



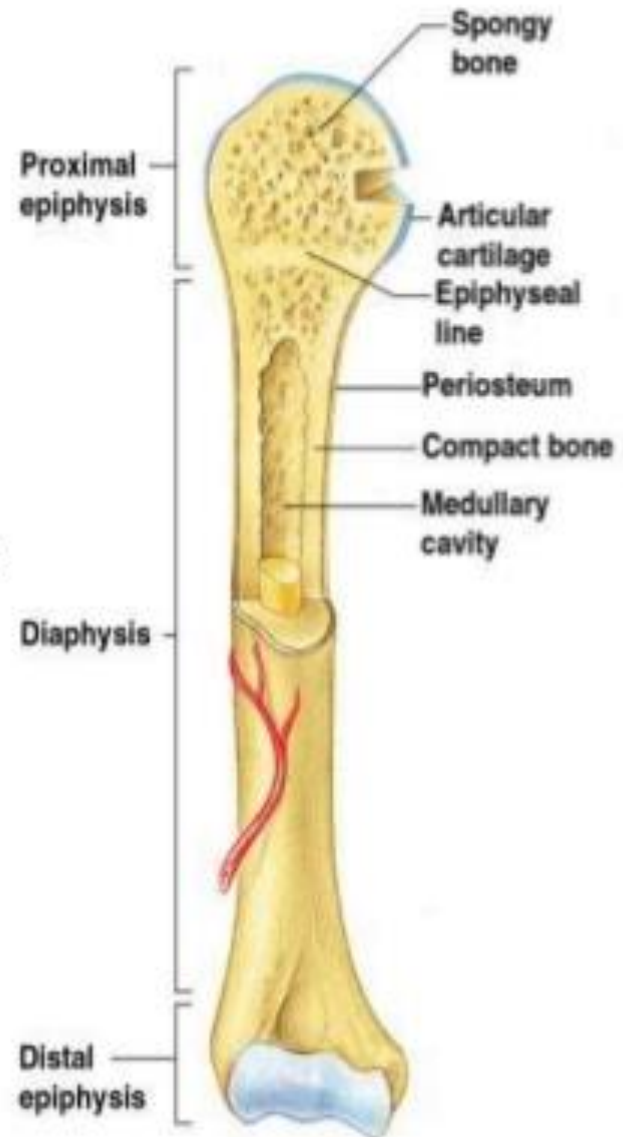
Macroscopic Bone Structure

- **Diaphysis**
 - the shaft of a long bone
 - contains medullary or marrow cavity
 - infants have red (hematopoietic) bone marrow
 - red marrow gradually replaced by yellow (fatty) bone marrow throughout life
- **Epiphysis (epiphyses)**
 - ends of a long bone
 - epiphyseal plate - growth plate made of cartilage
 - nutrient foramen - site of blood vessel entry into bone
 - articular cartilage - hyaline cartilage covering epiphysis



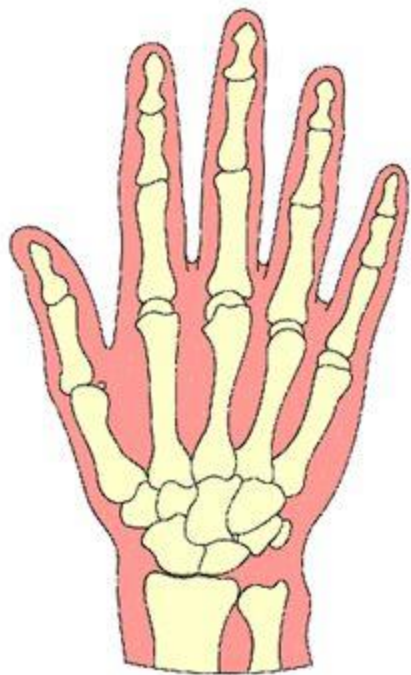
Parts of a Long Bone

1. **Diaphysis** = shaft
 - a. consists of a central medullary cavity (filled with yellow marrow)
 - b. surrounded by a thick collar of compact bone
2. **Epiphyses** = expanded ends
 - a. consist mainly of spongy bone
 - b. surrounded by a thin layer of compact bone
3. **Epiphyseal line** = remnant of epiphyseal disc
 - a. cartilage at the junction of the diaphysis and epiphyses (growth plate)



Shape: Short Bones

- Are small and thick
- Cube-shaped and contain mostly spongy bone
- Examples: Carpals, Tarsals, Calcaneus



Structure of a Flat Bone

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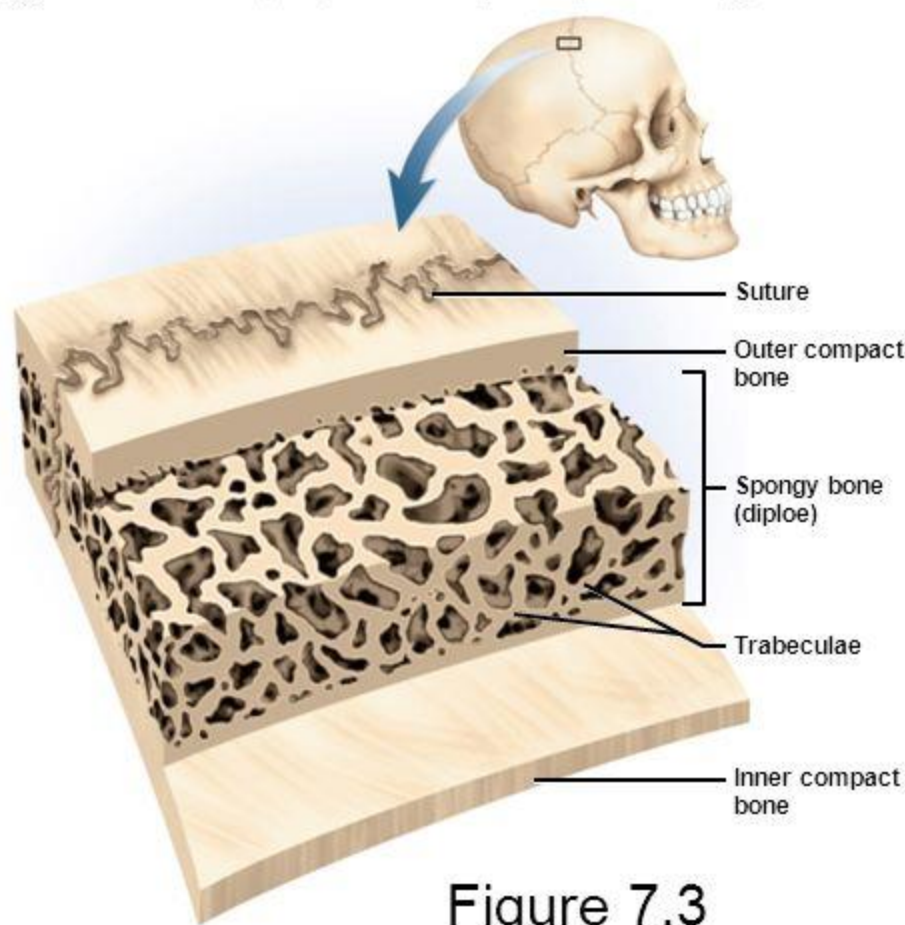


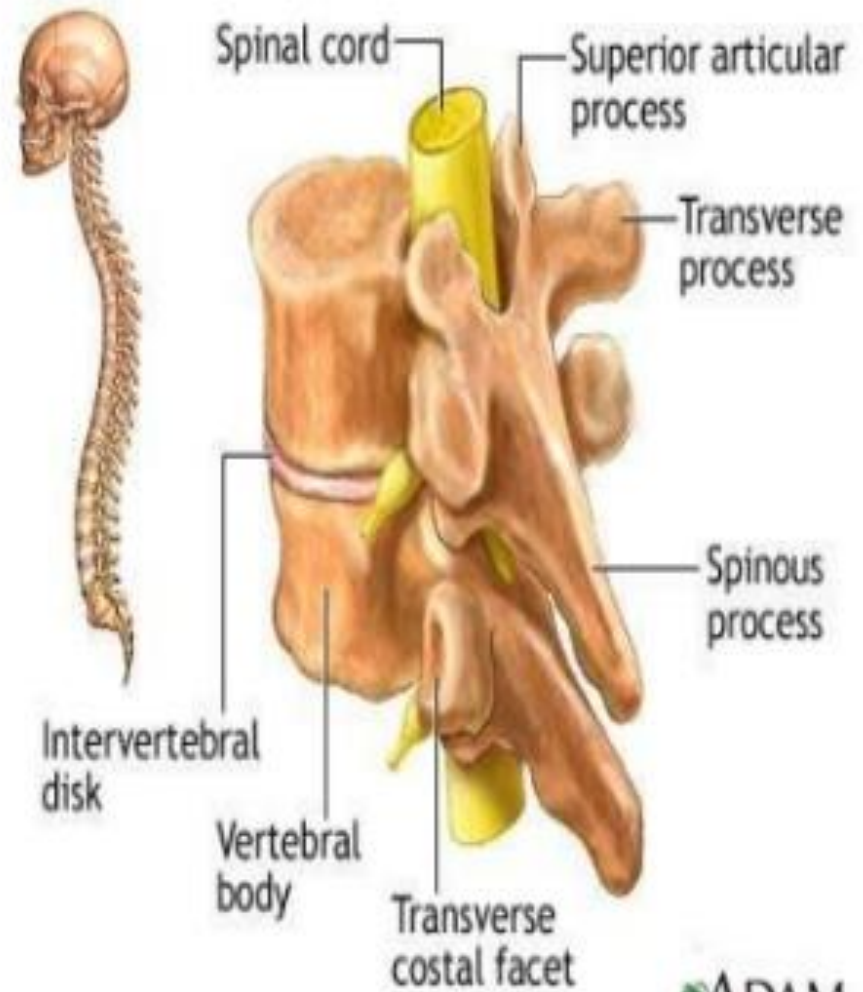
Figure 7.3

- sandwich-like construction
- two layers of compact bone enclosing a middle layer of spongy bone
 - both surfaces of flat bone covered with periosteum
- **diploe** – spongy layer in the cranium
 - absorbs shock
 - marrow spaces lined with endosteum

IRREGULAR BONE

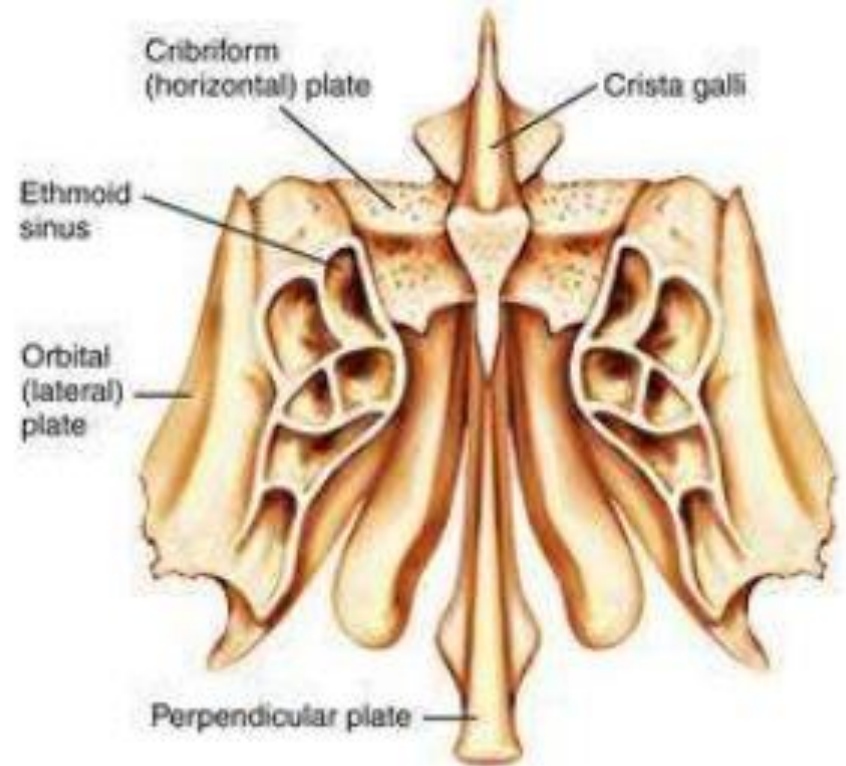
- Irregular or mixed shape
- Composed of spongy bone & marrow in compact covering bone

– **Eg..Vertebrae, Hip bone**



PNEUMATIC BONE

- Irregular bones which contain air spaces lined with mucous membrane
- Typically in skull bones
- Make the skull light
- Impart resonance to voice
- Act as conditioning chambers for inspired air
 - **Eg..Maxilla, Ethmoid**

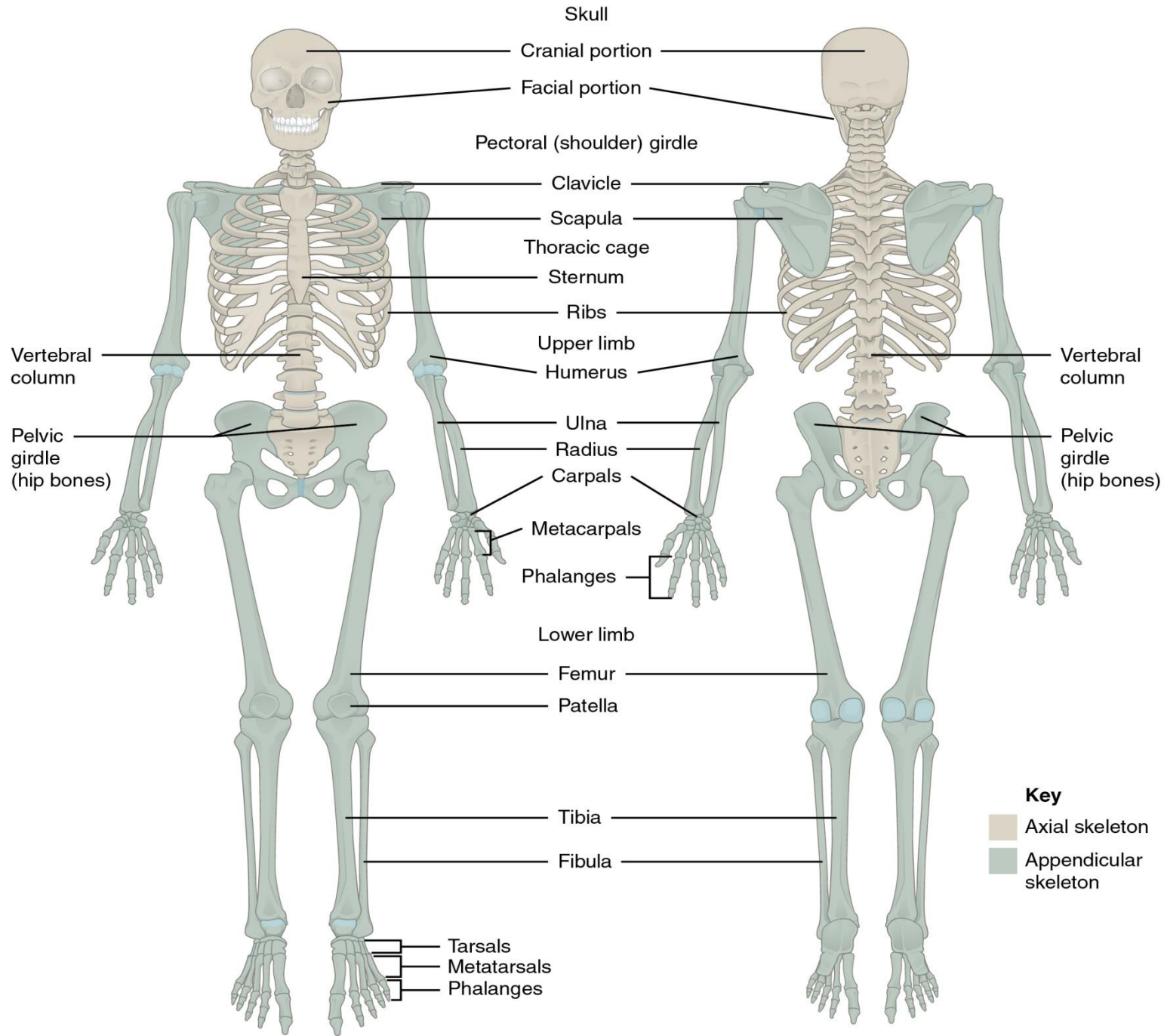


An anatomical illustration of a human knee joint. The femur (thigh bone) is at the top, and the tibia (shin bone) is at the bottom. The patella (kneecap) is positioned between them. A white line points from the text 'PATELLA' to the patella. The background is a dark blue gradient. A teal banner is at the bottom.

PATELLA

SESAMOID BONES

www.visiblebody.com

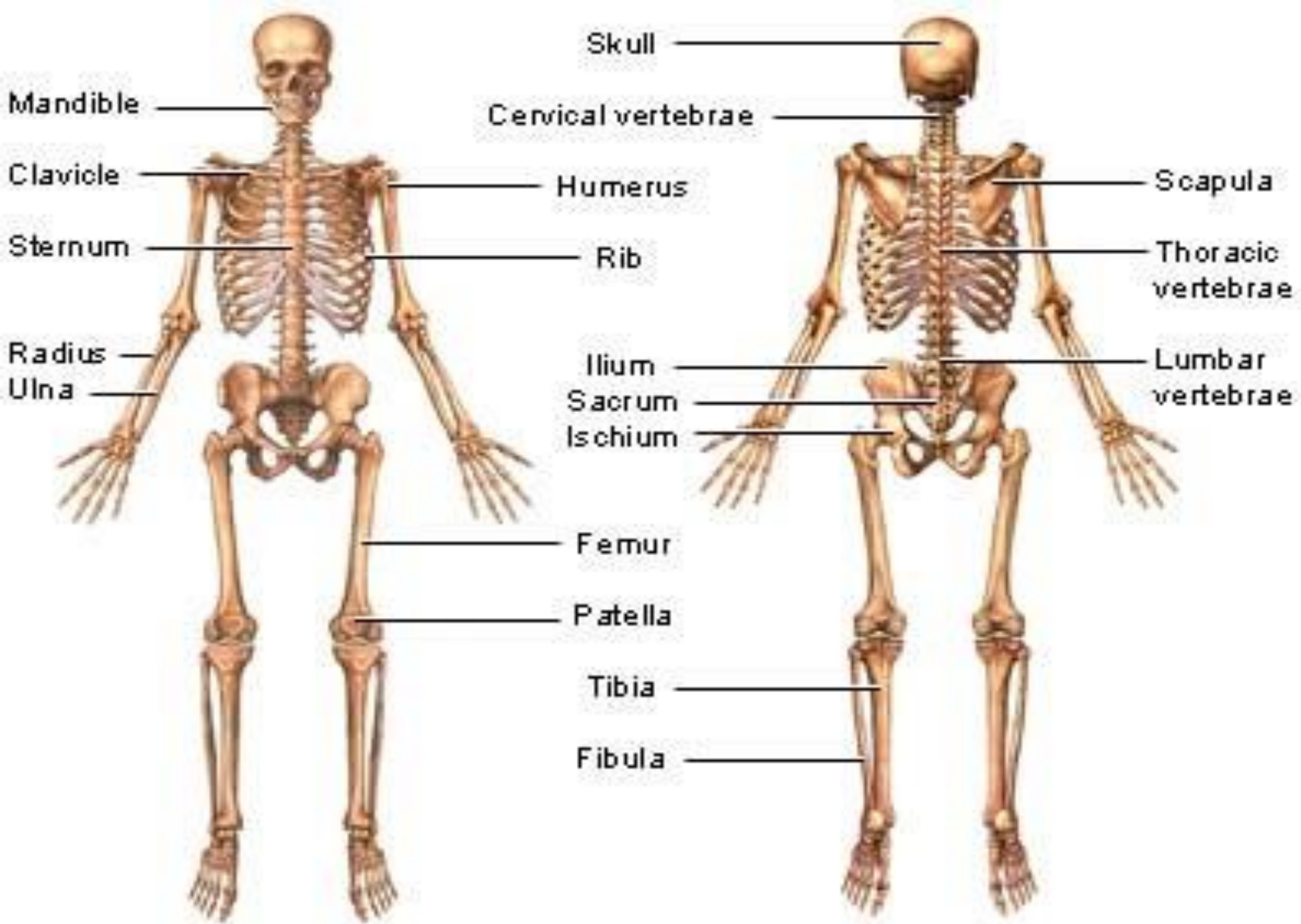


Anterior view

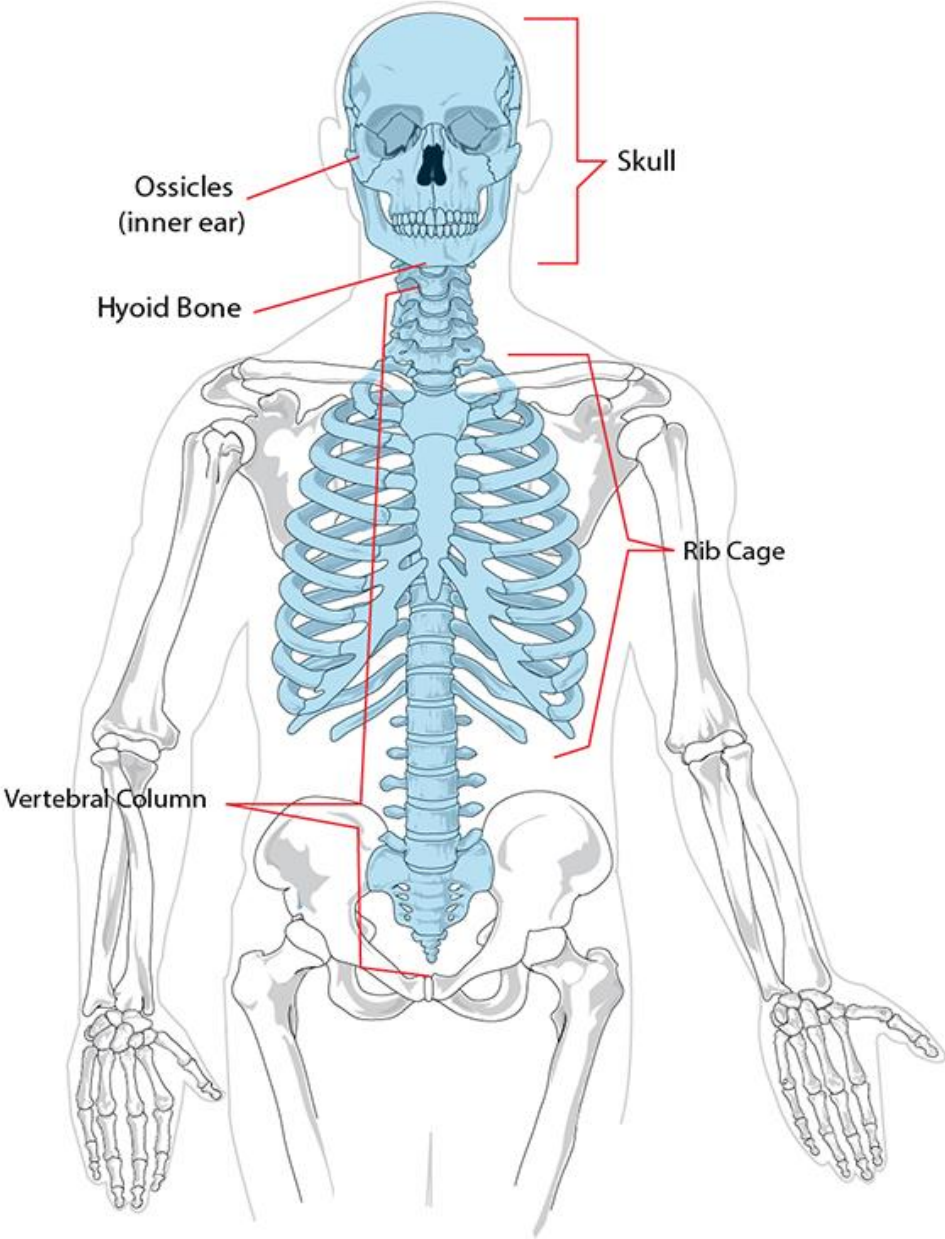
Posterior view

Key

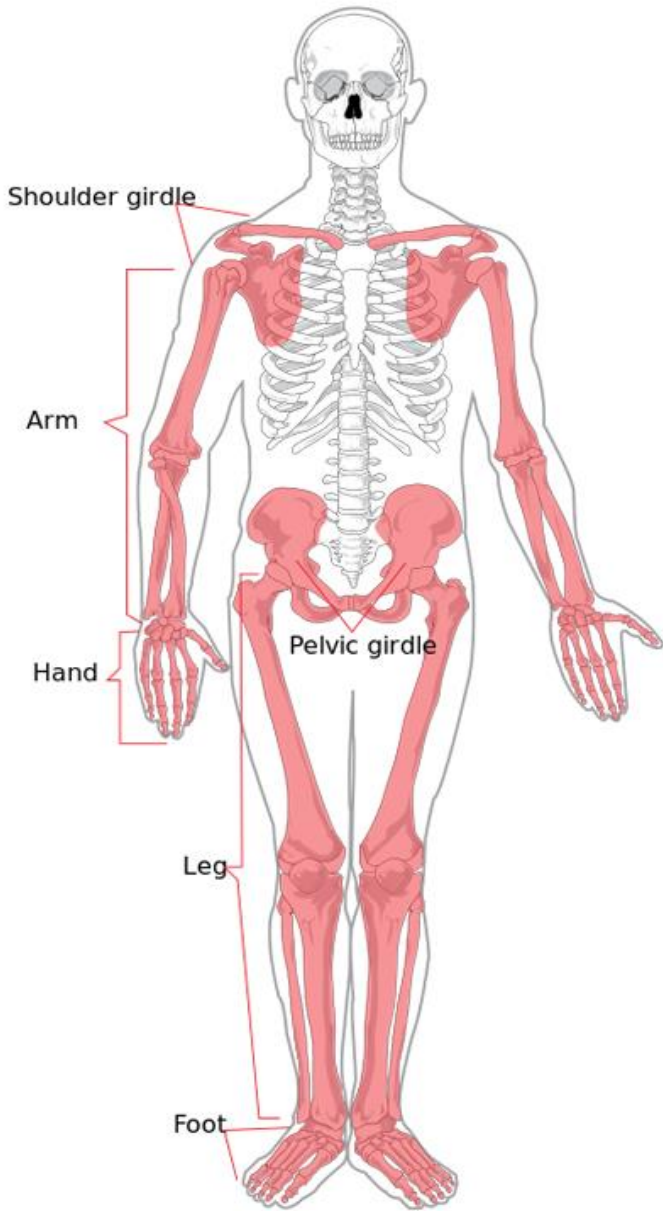
- Axial skeleton
- Appendicular skeleton



AXIAL SKELETON DIAGRAM



APPENDICULAR SKELETON DIAGRAM



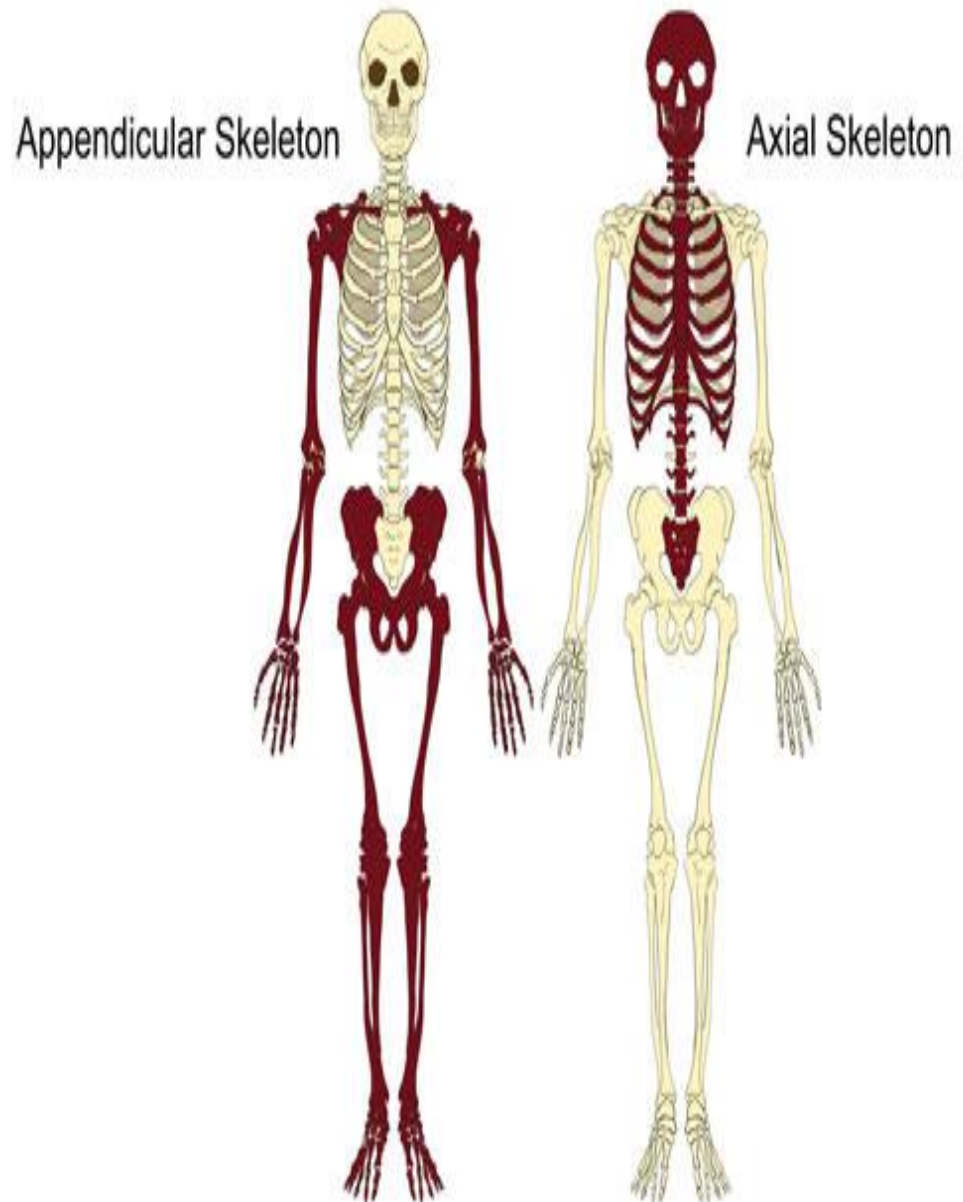
REGIONAL CLASSIFICATION

Axial skeleton (80)

- Skull & facial bones
- Vertebral column
- Thoracic cage

Appendicular skeleton (126)

- Upper limb: Girdle & free bones
 - Lower limb: Girdle & free bones
-
- 206 number is not exact; varies



Distribution of Bones in Human Adult

- there are total of **206 bones** in an adult human.
distributed as follows:

skull (cranium + face)	= 22 (8 + 14)
Ears	= 6
hyoid	= 1
vertebral column	= 26
sternum	= 1
ribs	= 24
pectoral girdle and forelimbs	= 64
pelvic girdle and hindlimbs	= 62

FUNCTIONS OF BONE

1. **Support:** provides framework that supports and anchors all soft organs.
2. **Protection:** skull and vertebrae surround soft tissue of the nervous system, and the rib cage protects vital thoracic organs.
3. **Movement:** skeletal muscles use the bones as levers to move the body.
4. **Storage:** fat stored in the interior of the bones. Bone matrix serves as a storehouse for various minerals.
5. **Blood Cell Formation:** hematopoiesis occurs within the marrow cavities of the bones.

Functions of the Skeleton

1. Protection

The cranium protects the soft tissue of the brain.

2. Shape

Without the skeleton, the body would be flabby and shapeless.

3. Blood Production

Red blood cells are made in the ribs and limb bones.

4. Calcium Storage

Bone is the largest supply of calcium

5. Support

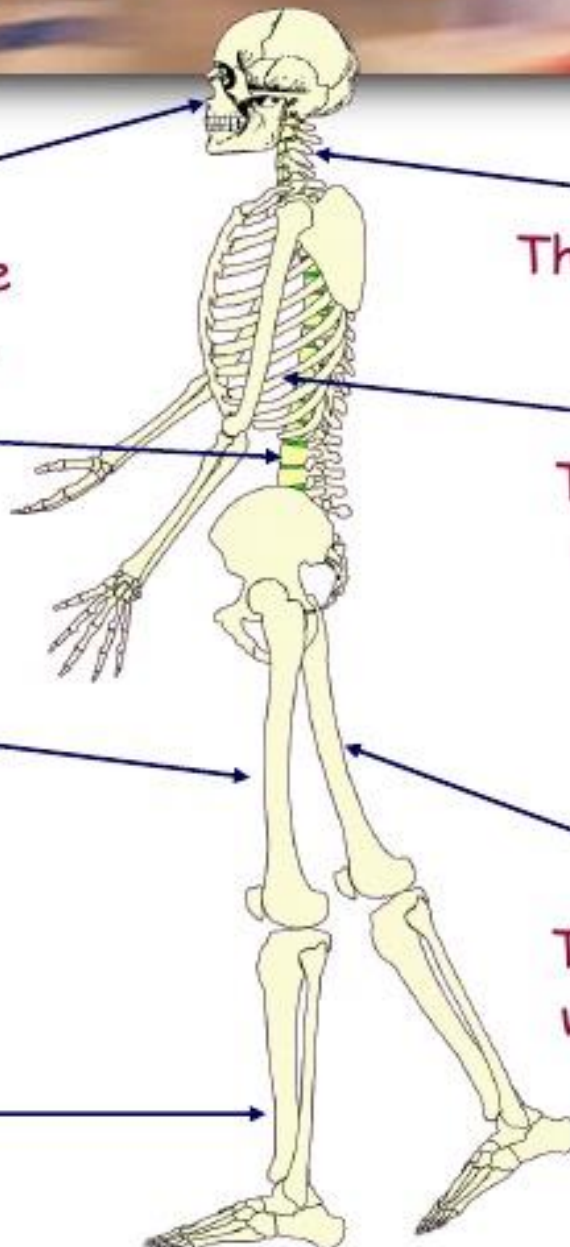
The vertebrae support the head.

1. Protection

The rib cage protects the delicate heart and lungs.

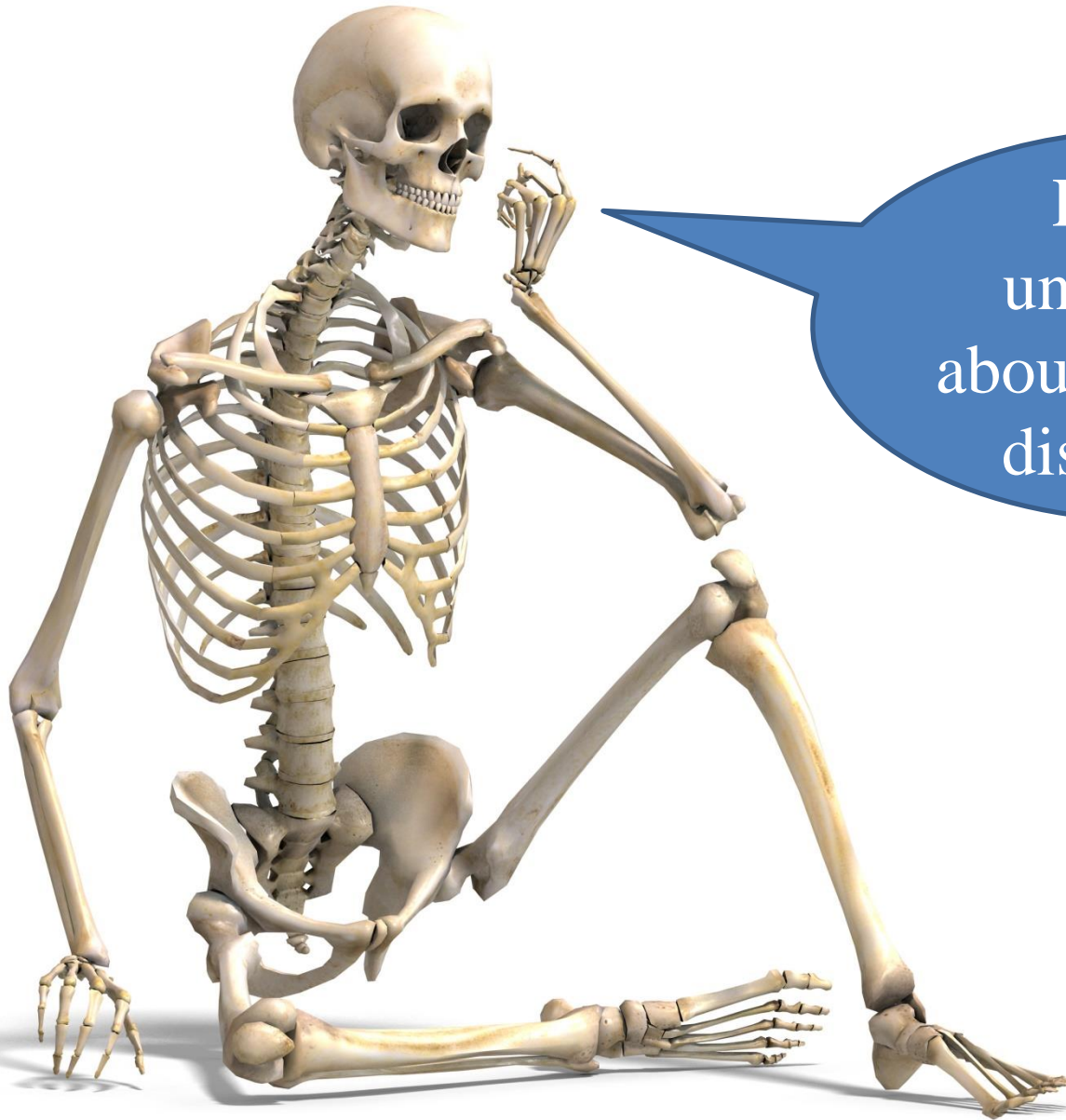
6. Movement

The bones and joints work with muscles to enable us to walk, run and sprint.



The Skeletal System





Do you understand about the above discussion.

THANK
YOU

