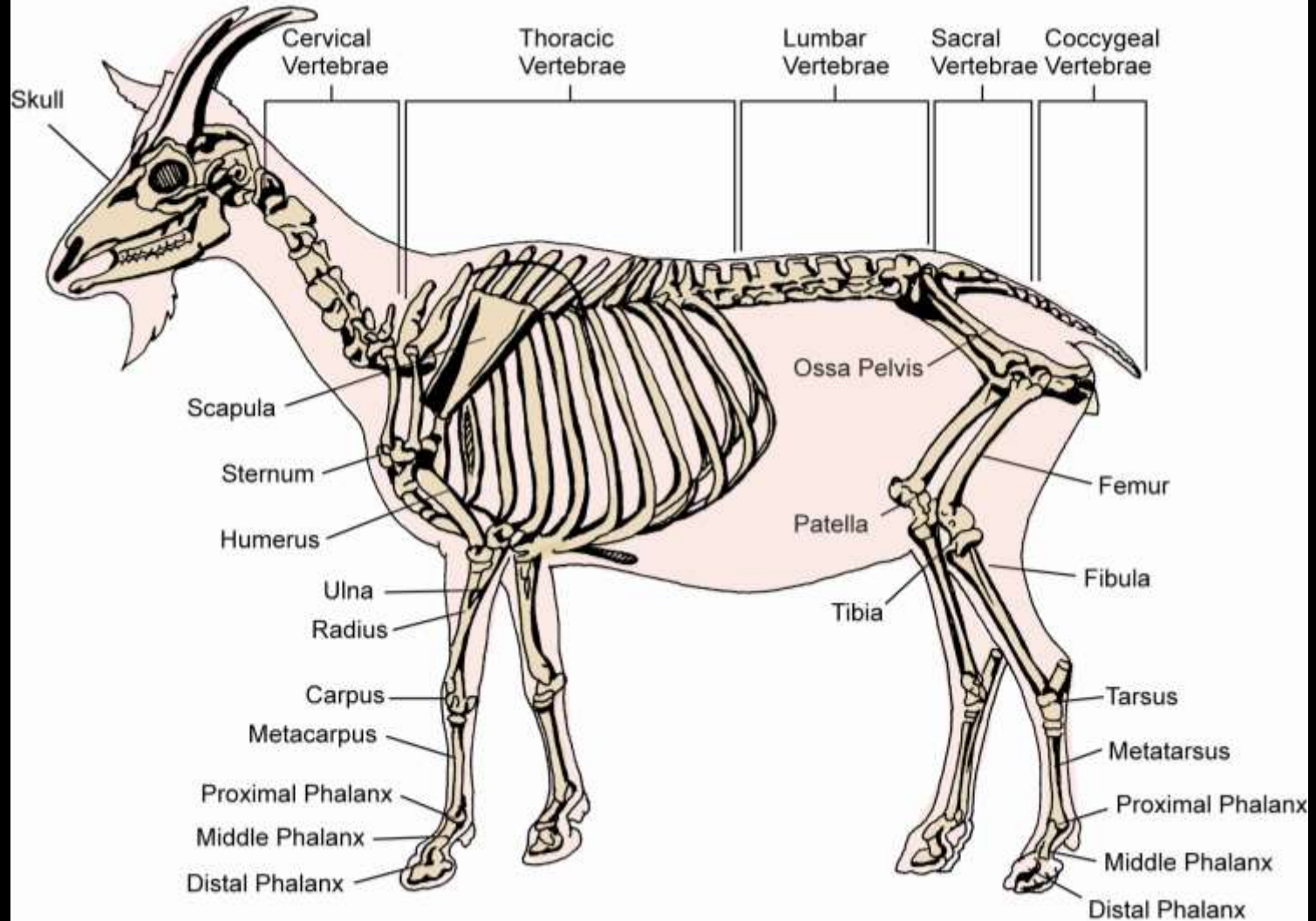


# Skeletal System

# Skeletal System

- The **skeletal system** is the framework of the body.
- The skeletal system is made up of bones and connective tissue and provides structural support for all of the other organ systems.

# Skeleton of a Goat



# Skeletal System

- The skeletal system protects the organs of the body.
- The skull protects the brain, ribs protect the lungs, and vertebrae protect the spinal cord.
- The skeleton also works in conjunction with the muscles to allow movement of the different body parts.

# Skeletal System

The skeleton is made up of the **axial skeleton** and the **appendicular skeleton**.

The **axial skeleton** consists of those bones on the midline of the body including:

- Skull
- Vertebrae
- Ribs
- Sternum

# Skeletal System

The **appendicular skeleton** is comprised of those bones coming off the midline of the body including:

- Forelegs (arms)
- Hindlegs (legs)
- Bones in the pelvic region

- Bone is made up of **organic** and **inorganic** matter.
- The organic matter is mostly collagen and gives bone flexibility and resilience.
- The inorganic matter is mostly tricalcium phosphate and gives bone rigidity and hardness.

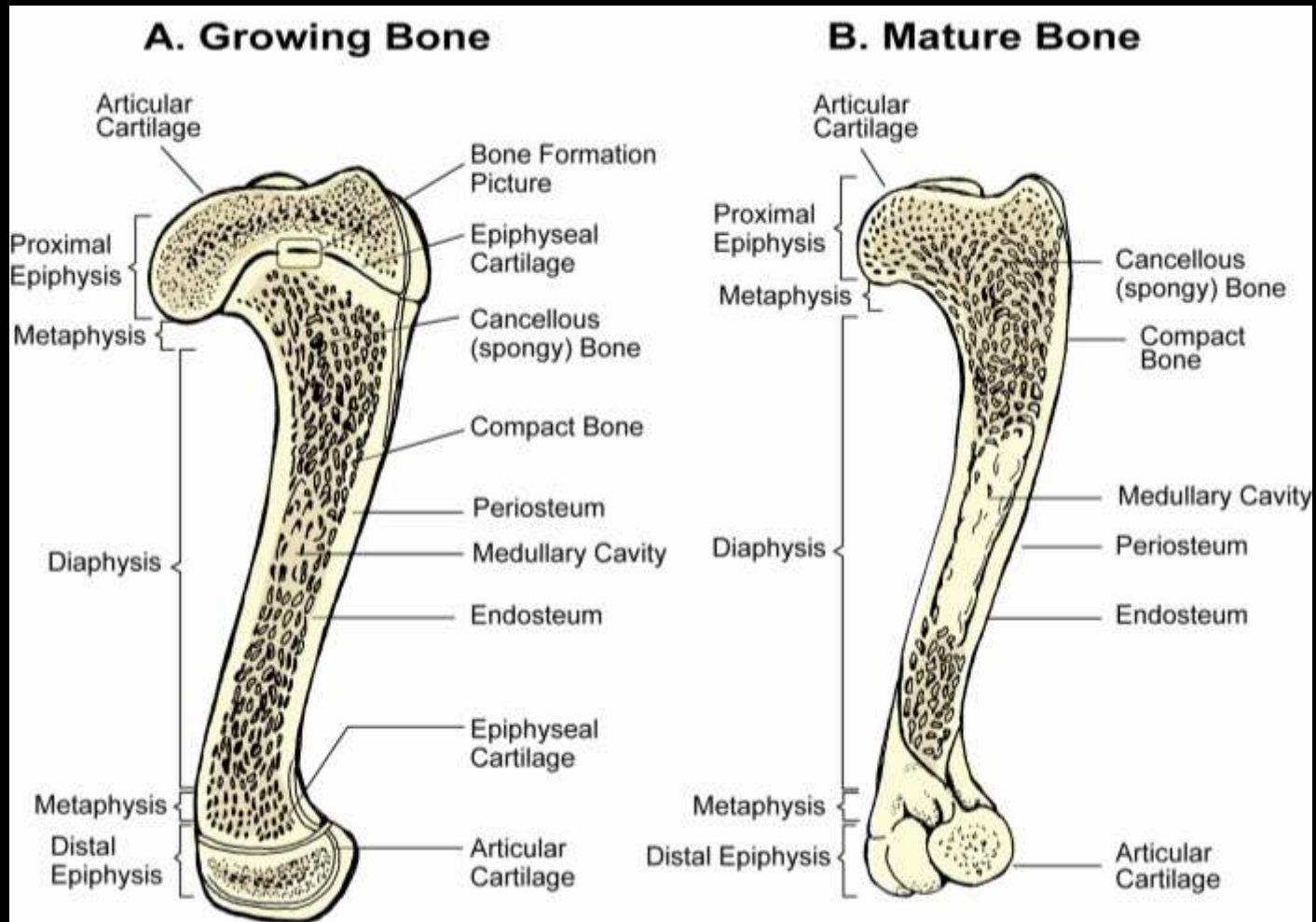
Bones are divided into four classes.

- Long bones
- Flat bones
- Short bones
- Irregular bones



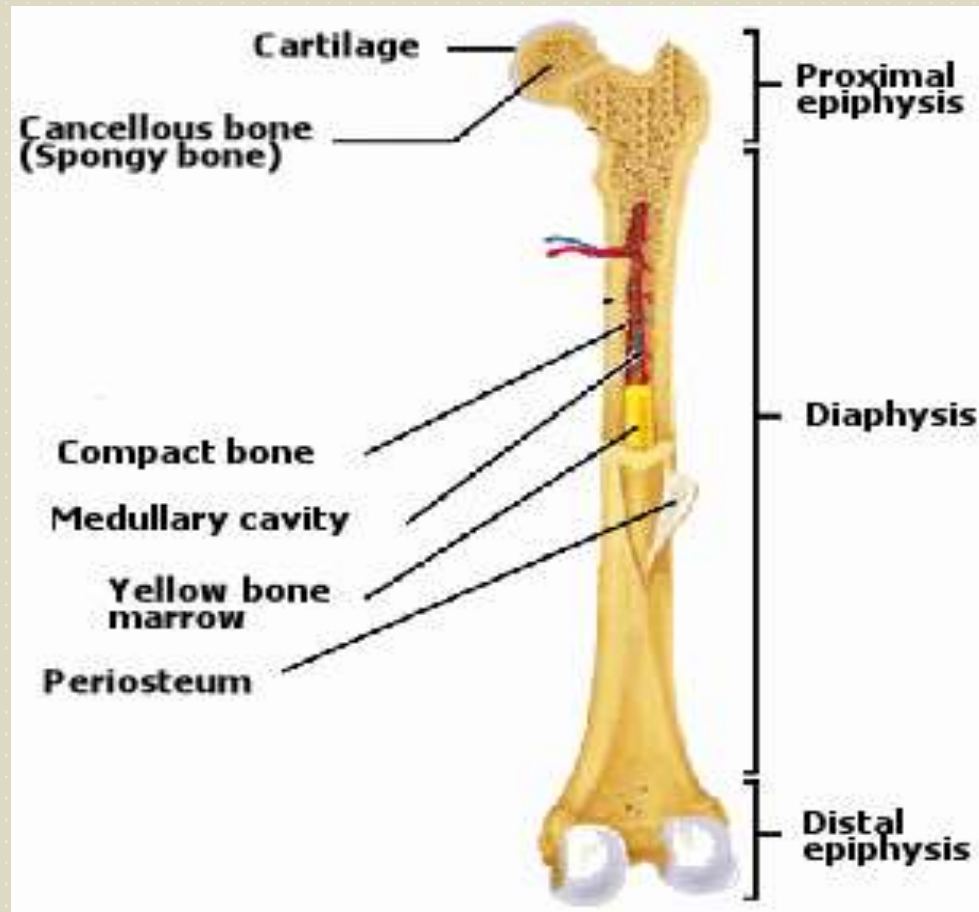
- **Long bones**, found in the limbs, are the supporting columns and levers for the skeletal system and the body.
- **Flat bones** protect the body's organs and serve as an area of muscle attachment.

# Longitudinal Section of a Long Bone In a Young Animal



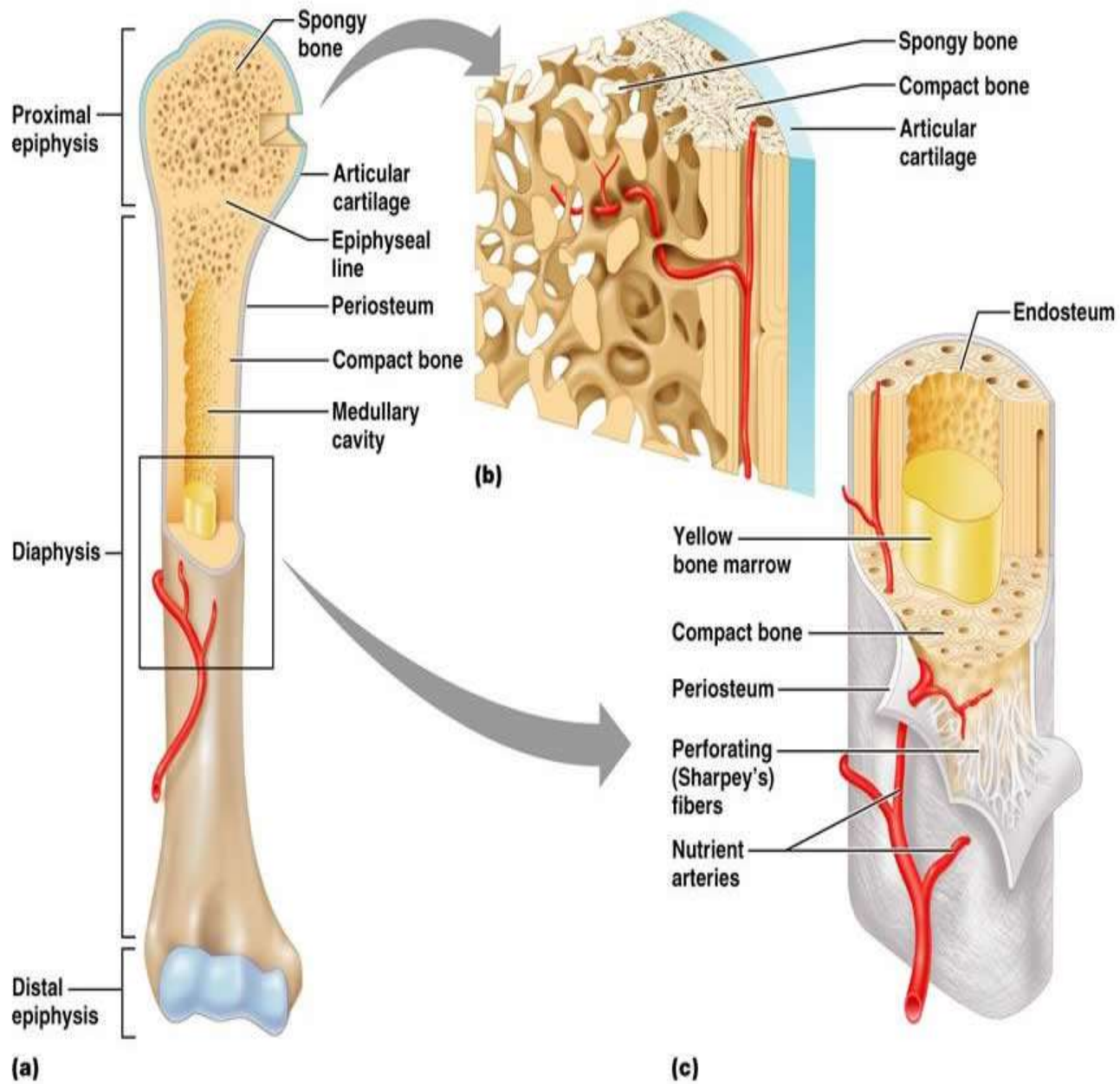
- **Short bones**, such as the bones in the knee hock joint, diffuse concussion, diminish friction, and change the direction of tendons.
- **Irregular bones** are those found in the vertebral column.

# Parts of the Long Bones



## B) Diaphysis

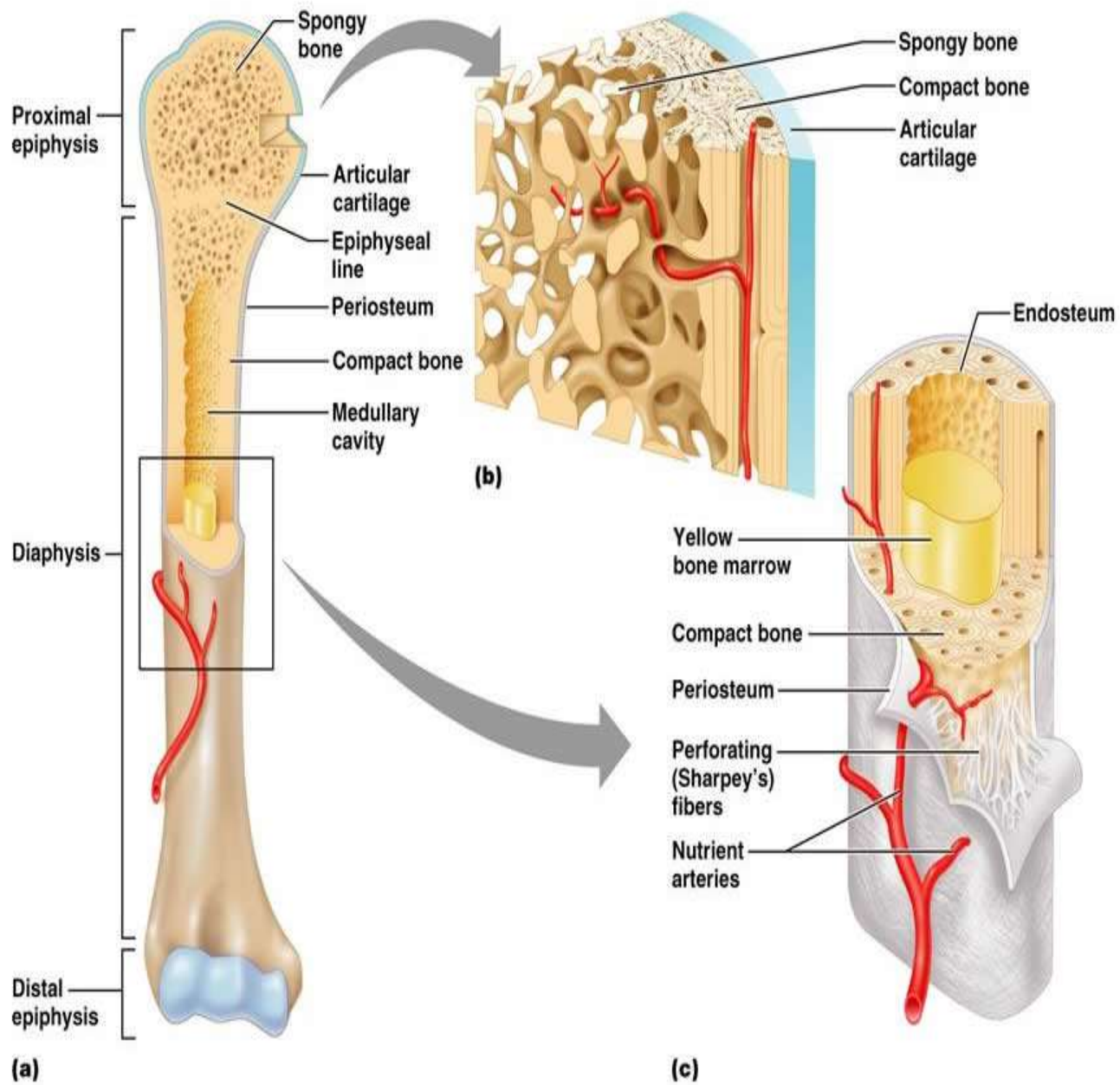
- Shaft or body of a long bone
- Main part of the bone
- Houses the marrow,
- Composed of compact bone
- Provides the strength and support functions for the bone



## D) Periosteum

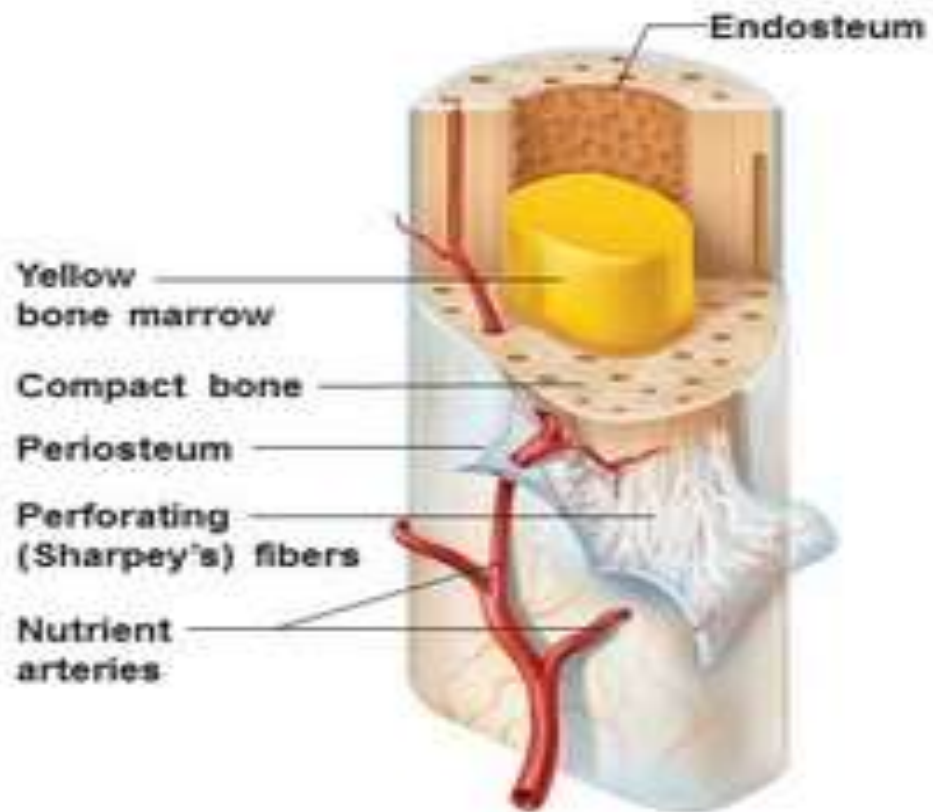
- Tough connective tissue covering that surrounds the shaft of the bone
- Contains bone forming cells
- Bone grows out (thickness) from this tissue
- Protects the surface of the bone, provides nourishment for the developing bone cells, and is the attachment site for ligaments





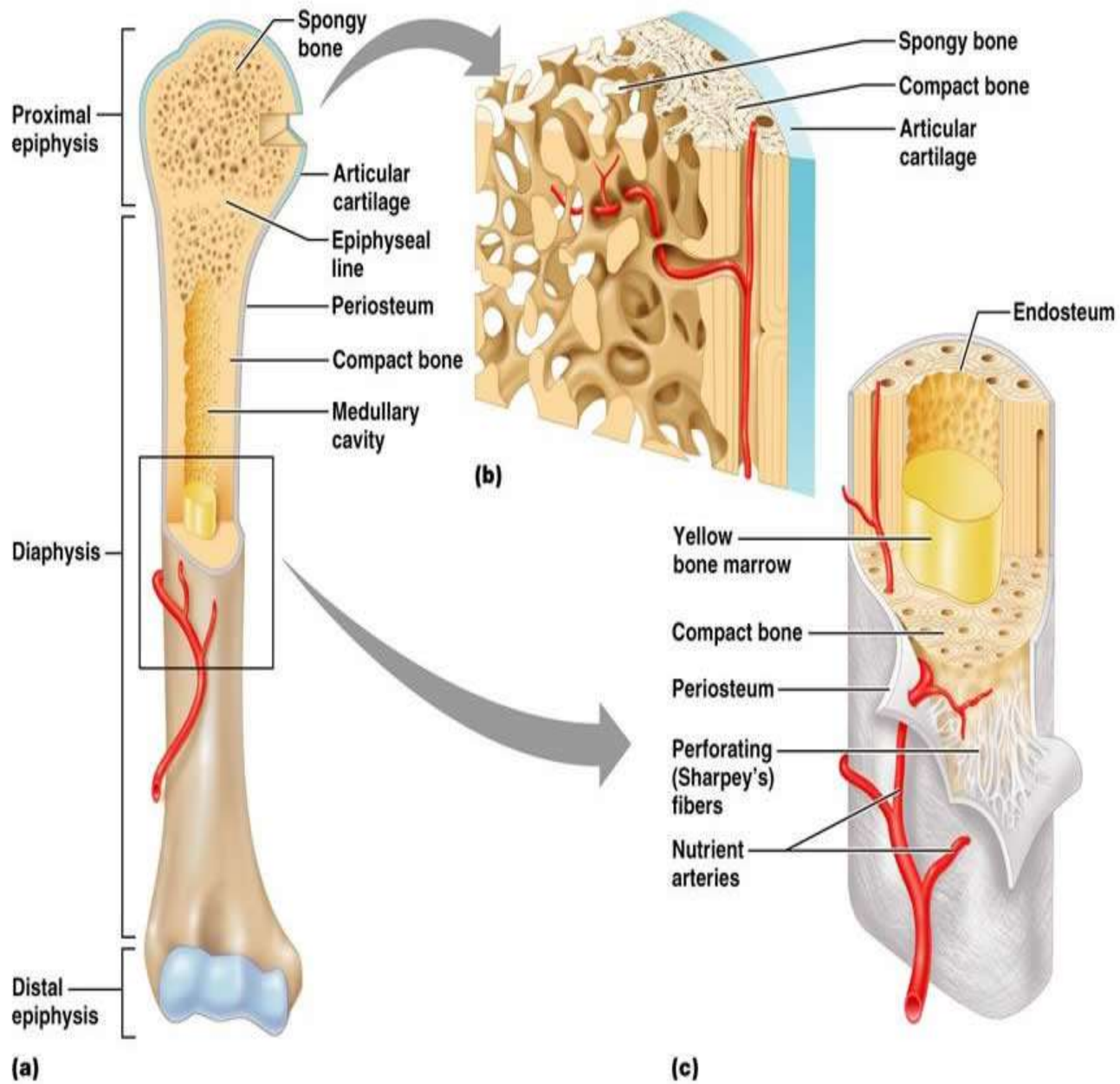
## F) Perforating Fibers/Sharpey's Fibers

- Collagen fibers that are incorporated into bone tissue from tendons
- Site of attachment for tendons to bone from muscle
- Cemented to the bone-----strong bond
- Allows for muscle to pull and push off of bone for movement



## C) Articular Cartilage

- Hyaline Cartilage
- Covers the ends of the long bone
- Forms the pads of our joints
- Avascular
- Difficult to repair once damaged



## A) Epiphysis

- Area that is at the end of the long bone
- Mixture of spongy and compact bone tissue
- Forms the lower/upper portion of a joint
- Zone is covered with hyaline cartilage
- Long bones have a proximal and distal epiphysis

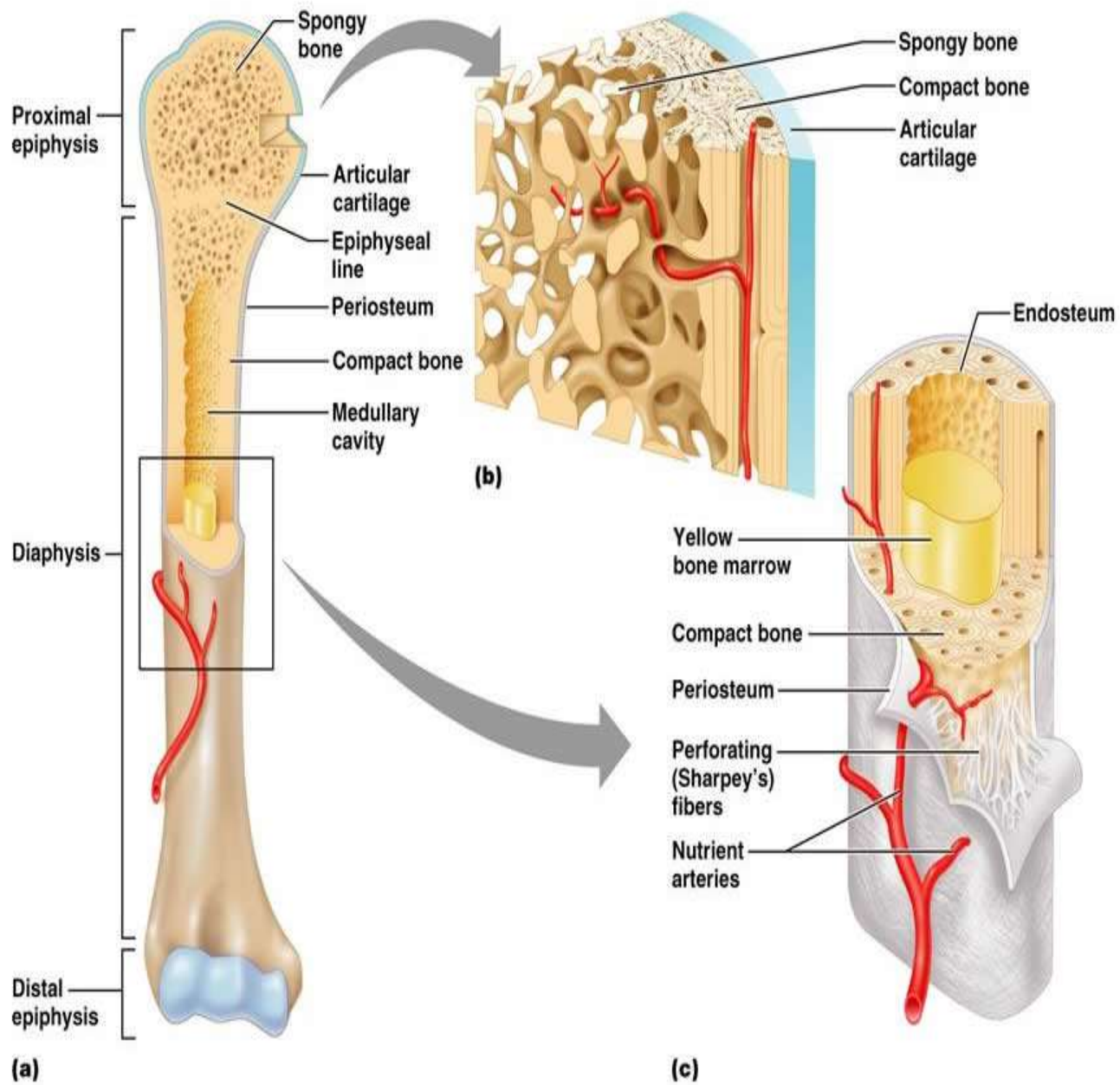
## A) Epiphyseal Line

- Scar left behind when our long bones stop growing in a lengthwise direction
- Hyaline cartilage fills it in, and eventually bone grows in this place
- Line is noticeable on X-Ray's and other bone scans

## A) Epiphyseal Plate

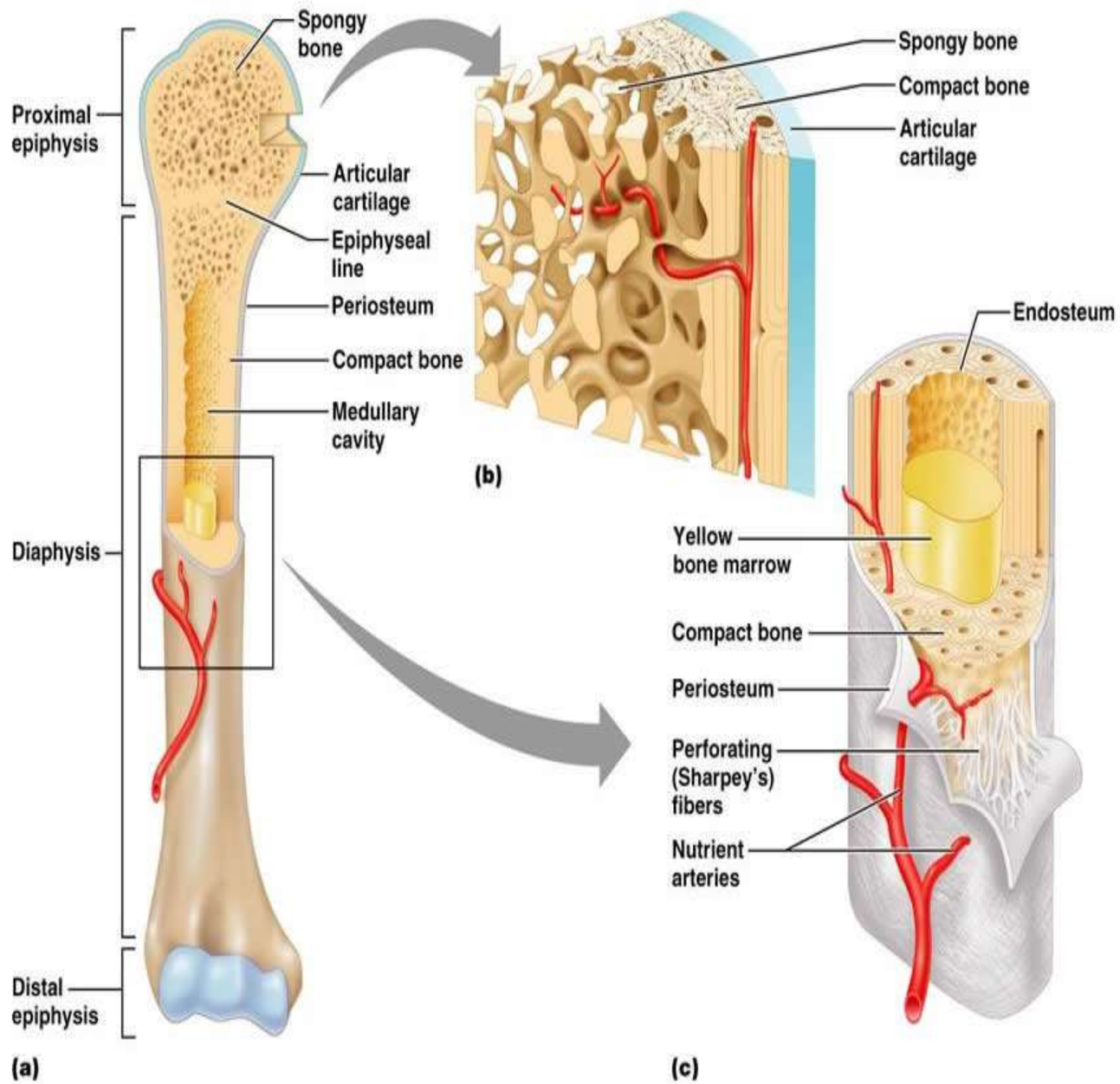
- If the bone is still growing, this is the active site where hyaline cartilage is first put down
- Bone cells will grow over the hyaline cartilage and eventually replace it
- Bone grows lengthwise from this point

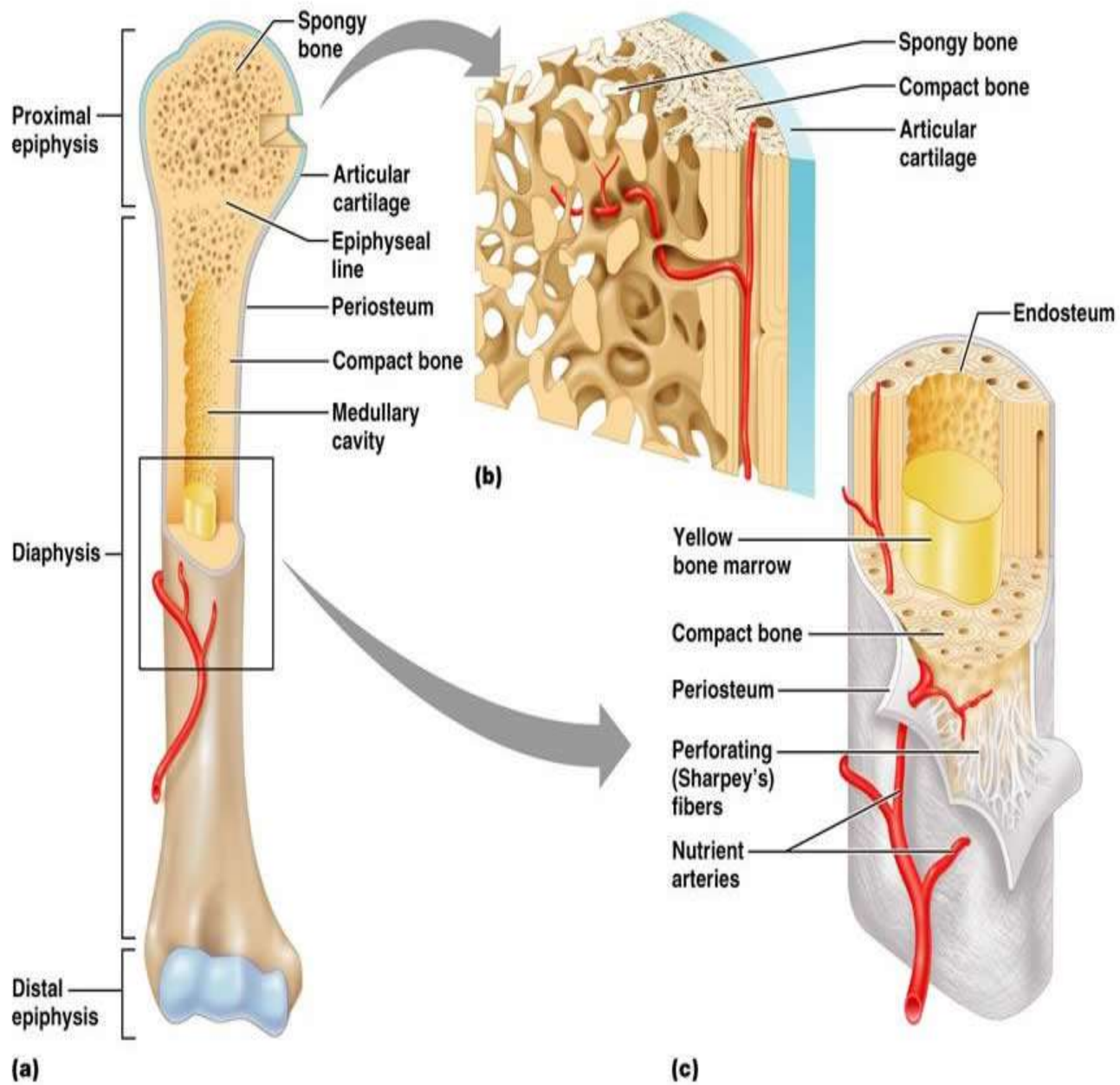




## G) Medullary Cavity

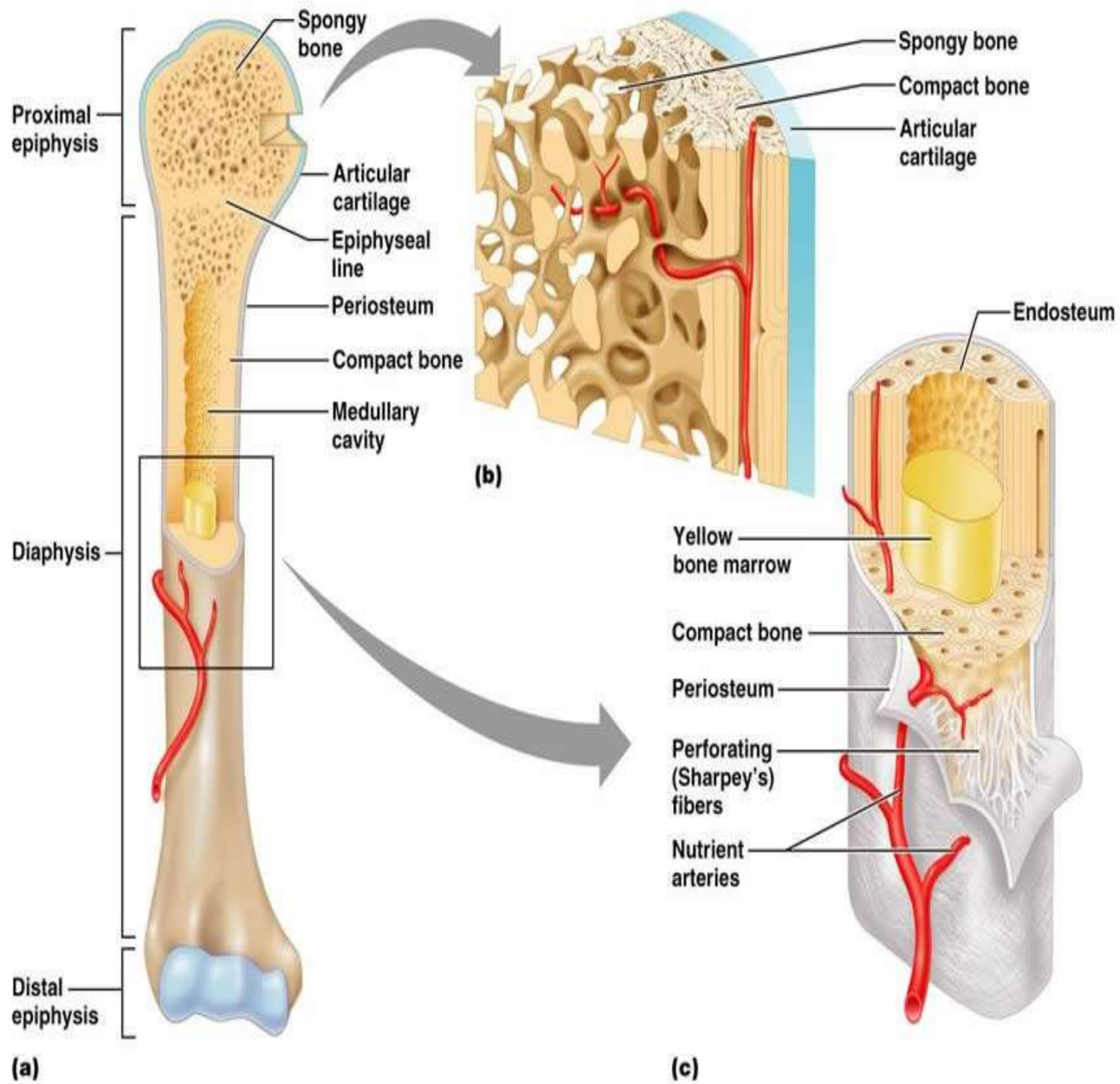
- Houses Bone marrow
- Middle of the shaft of a long bone, and the interior portions of all flat bones
- Red bone marrow signifies young long bones
- Yellow bone marrow signifies adult bone marrow
- As we age fat (yellow bone marrow) replaces red bone marrow and the flat bones become the only sites of bone cell production





# Metaphysis

- Where compact bone from the shaft, transitions into spongy bone towards the end of the long bone



# Endosteum

- Lines the medullary cavity
- Inner layer of stem cells
- Allows for the production of more bone cells on the inside of the marrow cavity

- The inner core of the bone is soft tissue called **bone marrow**.
- Some of bone marrow consists of yellow fat, called **yellow marrow**.



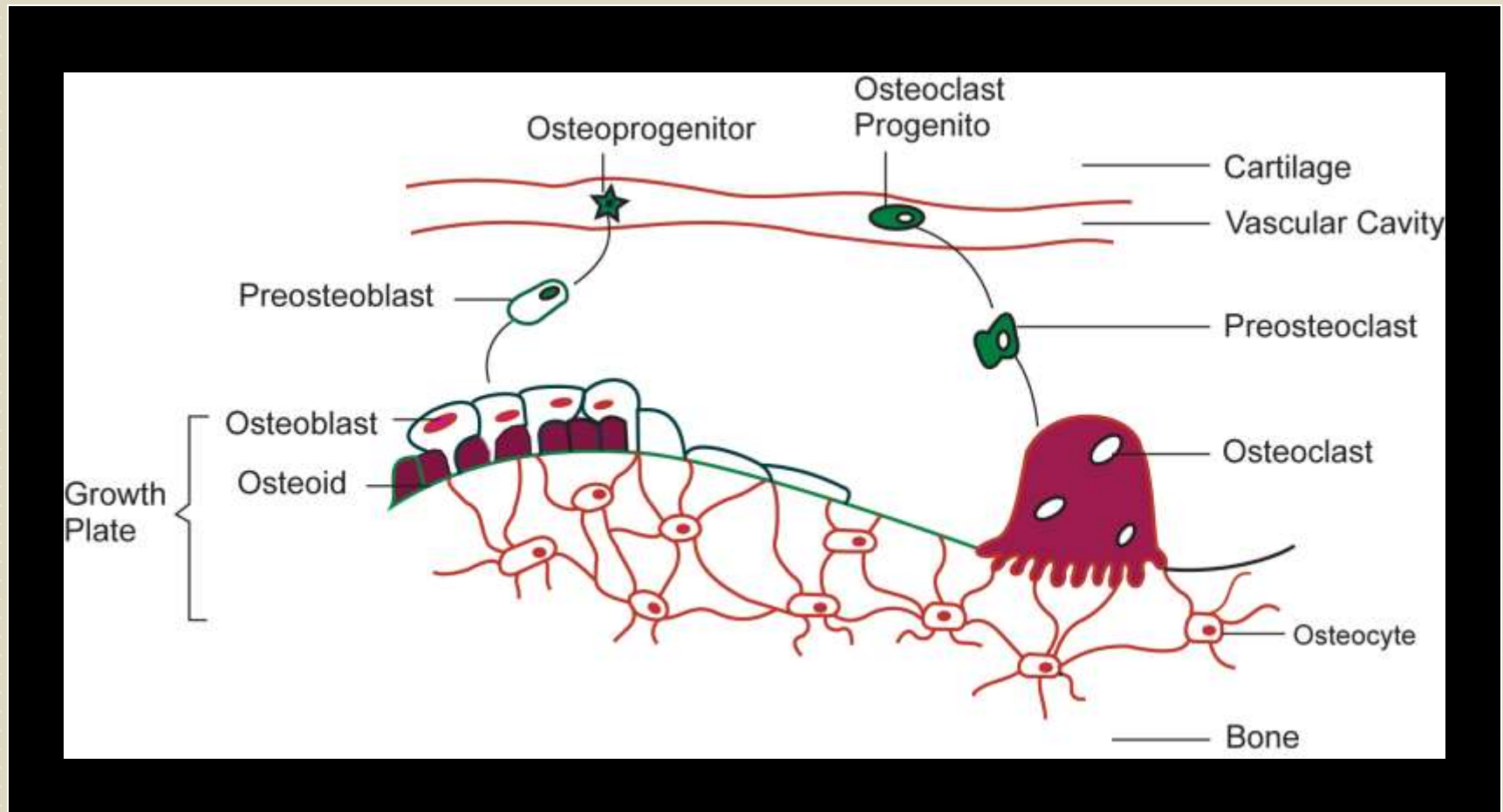
- The outer portion of bone marrow is comprised of red tissue, called **red marrow**.
- The red marrow is responsible for blood cell and platelet formation.

- Bone is a living tissue that changes constantly.
- Bone undergoes continuous deposition (creation of new bone material) and resorption (removal of old bone material).

- Bone is formed from cartilage when the animal is an embryo. This process is known as **endochondral ossification** or **endochondral bone formation**.

- The bone forming cells are known as **osteoblasts**.
- Osteoblasts develop into **osteocytes**, or mature bone cells.

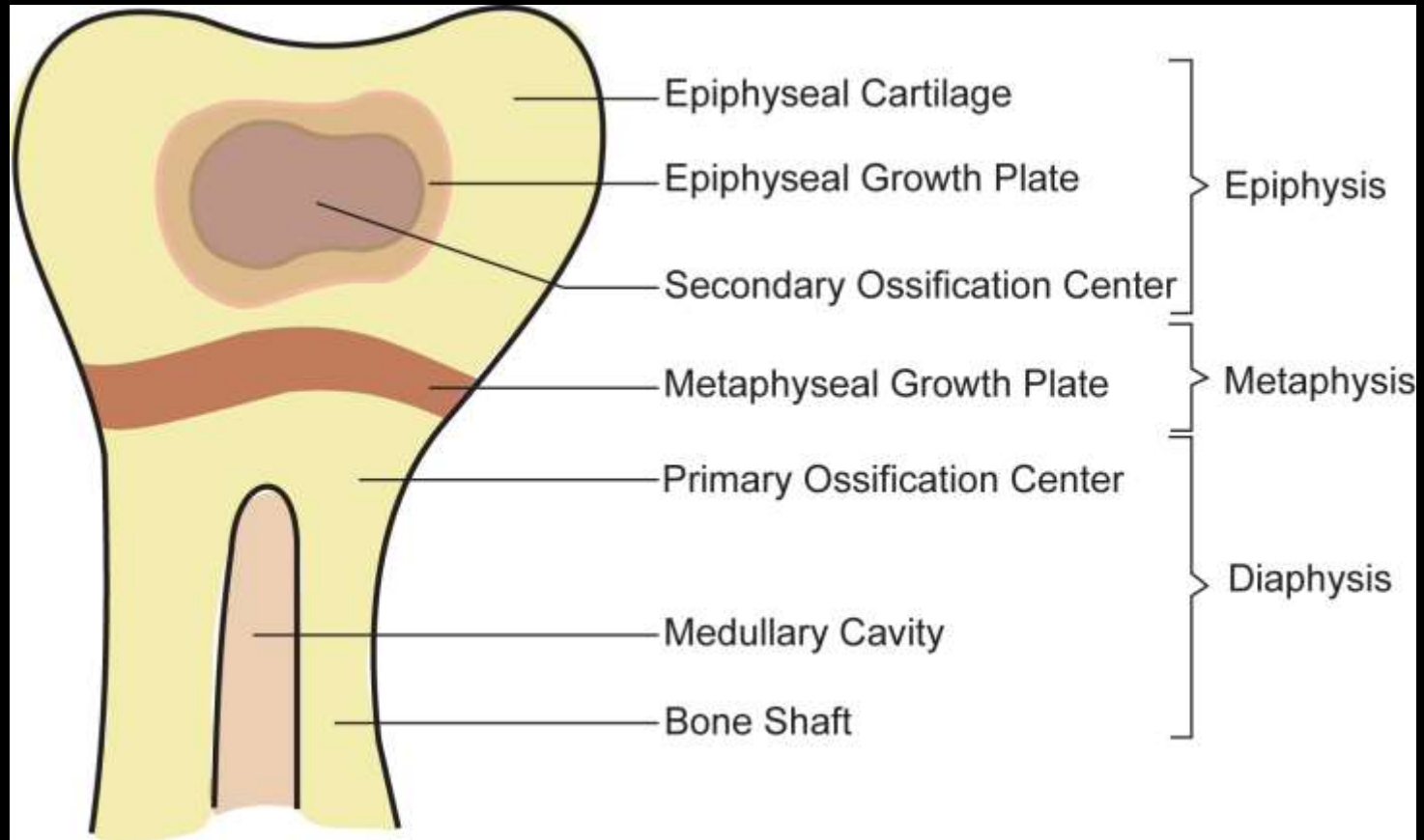
# Formation of Bone Cells at a Growth Plate



Bone formation occurs at a growth plate:

- Primary ossification occurs at the **metaphyseal growth plate**.
- Secondary ossification occurs at the **epiphyseal growth plate**. The secondary ossification site is in the center of the **epiphysis**.

# Bone Formation in a Long Bone



# Connective Tissue

Connective tissue binds tissues together to give form and strength to organs and provide protection and leverage.



# Connective Tissue

Four types of **connective tissues** exist within the skeletal system:

- Ligaments
- Tendons
- Cartilage
- Fascia

# Ligaments / Tendons

- **Ligaments** connect bone to bone
- **Tendons** attach muscle to bone

# Cartilage

Three types of **cartilage** found in the body:

- **Hyaline cartilage** is found on the ends of bones and acts as cushioning in joints.
- **Elastic cartilage** makes up body parts such as the ears.
- **Fibrocartilage** provides cushioning between the inter vertebral discs.

- **Fascia** is located between the skin and the underlying muscle or bone. It is comprised of two layers. The top layer, **superficial fascia**, is attached to the skin while the bottom layer, **deep fascia**, covers the muscle or bone.

**Joints** are articulations (unions) between bones. Three types of joints are found in the body:

- Fibrous
- Cartilaginous
- Synovial

- Joints can be highly movable – for example, the shoulder
- Partially movable – for example, the ribs
- Immovable – for example, suture joints between the plates of the skull.

# Synovial Joints

Allow the greatest range of movement such as:

- Gliding
- Flexion
- Extension
- Hyperextension
- Rotation
- Adduction
- Abduction
- Circumduction

# Synovial Joint

