

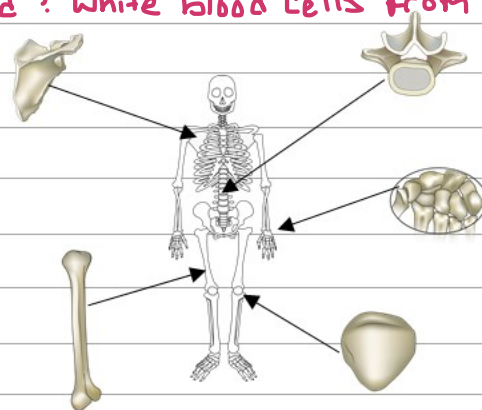
Intro to the Skeleton

What are the functions of the skeletal system?

1. Support- **Bearing the weight of the body**
2. Protection- **Encasing essential organs**
3. Movement- **Joints provide movements for bones**
4. Storage- **Storage of fats in yellow bone marrow**
5. Manufacturing- **Production of red & white blood cells from red bone marrow**

How are bones classified?

Bones are a solid matrix of living cells and fibers surrounded by calcium deposits.
Bones are classified by their Shape.



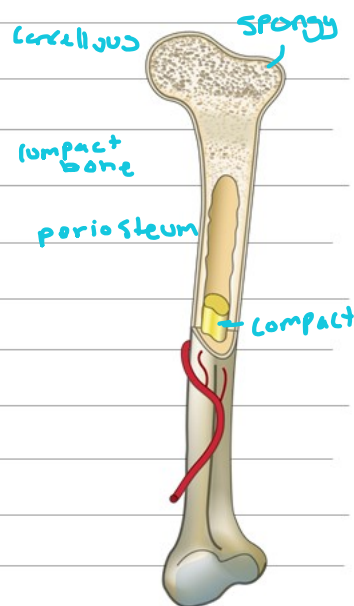
Label the bone shapes above.

What are the anatomical features of a long bone?

Long bones have 2 basic regions:
- typically longer than wide
- shaft w/ head at both ends

Between these layers is a thin layer of internal cartilage called the epiphyseal plate (growth plate).

The ends of the epiphyses are covered with an external layer of cartilage called articular cartilage which provides smooth movement of joints and cushion from shock.



In the diaphysis of the long bone, a hollow medullary cavity is found.

Red bone marrow fills the cavity in young people.

Age causes the red marrow to be replaced with fatty yellow bone marrow.

It is within the bone marrow that new blood cells are produced (called hematopoiesis).

Label the diaphysis, epiphyses, and medullary cavity.

Summary:

The skeletal system provides many functions for the body. Bones are classified by Shape and have a specific structure with bone marrow in the center of the diaphysis and articular cartilage surrounding the epiphyses.

Microscopic Anatomy of Bone

Where are spongy bone and compact bone found?

The outer layer of bone is made of tough connective tissue called periosteum. It is the location of muscle attachment and bone repair. Beneath the periosteum is a thick layer of compact bone. At the ends of long bones the spongy bone layer is beneath the compact bone.

How do spongy and compact bone differ?

Spongy bone is a lattice of trabeculae ("little beams") that are found along lines of stress for perfect resistance from compression. Between the trabeculae are spaces filled with marrow or blood vessels.



Compact bone is arranged in cylinders called osteons.

Osteons are arranged in concentric circles called lamellae.

These lamellae surround a central (or Haversian) canal that contains blood vessels and nerves.



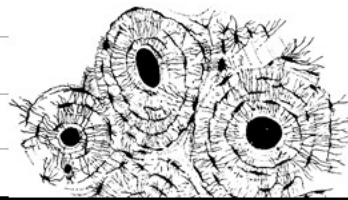
Label the trabeculae and osteons in the images above.

The central canals are connected by perforating (volkmann) canals running perpendicularly.

What are the types and functions of specialized bone cells?

	Osteocytes	Osteoclasts	Osteoblasts
Function:	mature bone cells make up the majority of the bone structure	break down bone	produce new bone

Canaliculi connect all bone cells, allowing them to receive nutrients and remove wastes.



Label the canaliculi.

Summary:

Spongy bone contains large spaces while compact bone is made of column-shaped osteons. Specialized bone cells build and destroy bone, while canaliculi keep the bone cells connected to nutrients.

Bone Formation and Remodeling

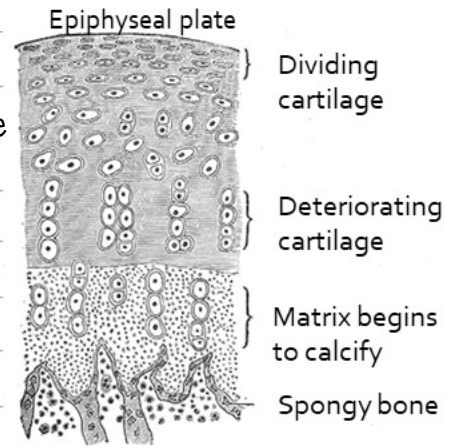
How is bone formed?

An embryo's skeleton is made of cartilage. Near the third month of embryo development, osteoblast begin to secrete mineral deposits that replace the cartilage. The osteoblasts then mature into osteocytes.

This process of incorporating calcium & minerals into cartilage to become bone is known as ossification.

As a child grows, tall columns of chondrocytes (cartilage cells) at the epiphyseal plate divide and then deteriorate as the matrix around them calcifies. These cells are then known as osteoblast, which form spongy bone.

Osteoclasts secrete acid to enlarge the medullary cavity as the bone grows so that marrow is available for all cells.



What is the composition of bone?

Osteoid (Organic)	Mineral Salts (Inorganic)
Provides the flexibility & tensile strength required to keep bones from constantly breaking	Provides bone strength & hardness

How are bones remodeled?

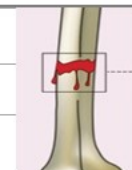

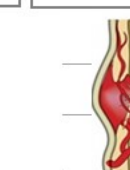

Because calcium is so important in your body, a certain level needs to be maintained in your blood at all times. To maintain that level, bone is created or dissolved.

Think of your bones as a storage tank for calcium.

There are 2 hormones that trigger these processes:

- Calcitonin - deposits extra calcium from blood into bones
- parathyroid Hormone - stimulates osteoclasts to break down bone, adding calcium to blood

How is a broken bone repaired?

Hematoma forms	Callus forms	Callus ossifies	Compact bone forms
			
Blood enters the wound. Cells begin to die. Phagocytes ingest dead bone cells and debris.	Blood vessels grow. Cartilage forms to hold the bone together.	Spongy bone forms to replace the cartilage.	Osteoclasts form a larger medullary cavity. Spongy bone is converted to compact bone.

Summary:

Bone is formed as cartilage calcifies. The osteoid portion of the bone provides flexibility while mineral salts give bones strength. Hormones direct the constant remodeling of bone. When a bone is broken, a hematoma forms, followed by a callus to repair the fracture.

The Axial Skeleton

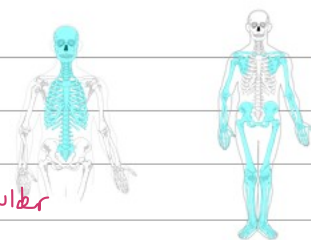
What are the 2 major sections of the skeleton?

1. Axial Skeleton

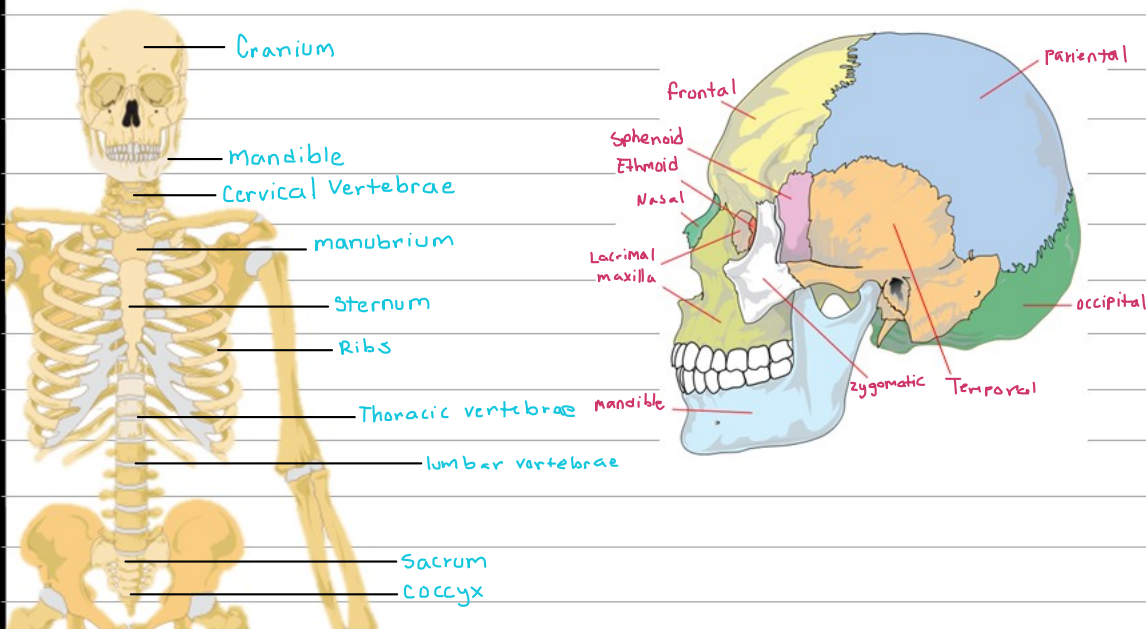
• Central axis of the body • Skull, Ribs, Sternum & Vertebrae

2. Appendicular Skeleton

• Pectoral & Pelvic girdles / Bones of the arms, legs, pelvis, and shoulder



What bones are found within the axial skeleton?



What is the structure of the vertebral column?

The vertebral column extends from the skull to the pelvis. It provides support and protects the spinal cord running through it.

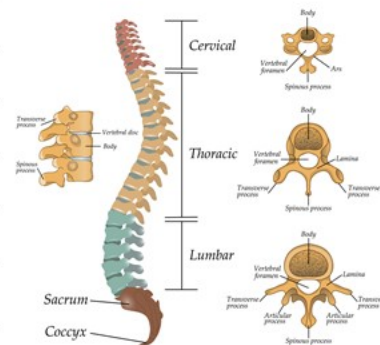
It consists of 33 vertebrae at birth, but the 5 sacral vertebrae and 4 vertebrae of the coccyx fuse in adolescence.

The remaining vertebrae are separated by intervertebral discs that provide cushioning and absorb shock.

The spine is convexly curved at birth, but two portions (in the cervical and lumbar vertebrae) develop concave curves later in life.

The primary (convex) and secondary (concave) curvatures of the spine allow for better balance and distribution of weight throughout the body.

The structure of the segments of the spine

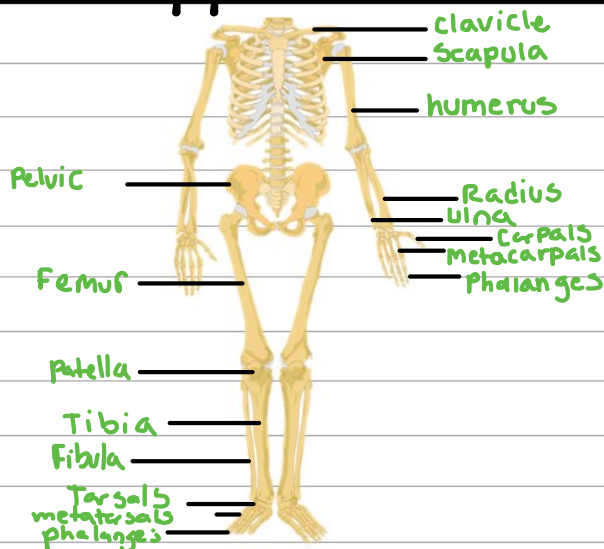


Summary:

The skeleton is divided into axial and appendicular portions. Within the axial skeleton are the skull, vertebral column and ribs. The vertebral column has 5 sections. The sections that aren't fused together have intervertebral discs for cushioning.

Movement of the Appendicular Skeleton

What bones are found within the appendicular skeleton?



How do joints differ structurally?

There are 3 structural types of joints:

	Fibrous	Cartilaginous	Synovial
Description:	<ul style="list-style-type: none"> immovable or slightly held together by Cartilage 	<ul style="list-style-type: none"> immovable or slight movable held together by cartilage 	<ul style="list-style-type: none"> Highly movable Contain synovial fluid
Example:	SKULL	Ribs	Joints

What is the structure of synovial joints?

A joint capsule filled with Synovial Fluid surrounds the end of the bones.

A synovial membrane and articular Cartilage line the joint cavity.

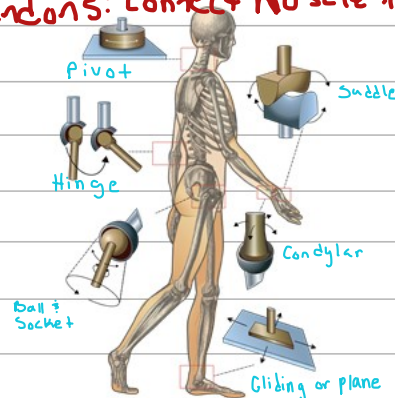
How do ligaments and tendons differ?

Ligament = Connect bone to bone Tendons: Connect muscle to bone

What are the types of synovial joints?

Label the following types of joints on the image:

pivot joint, ball & socket joint, saddle joint, gliding/plane joint, hinge joint, condylar joint



Summary:

The appendicular skeleton consists of the pelvis, legs, and arms. The bones of the skeleton are connected by Joints, which vary in structure and function. Synovial joints are the most moveable and can provide a range of movements based on the shape of the bones involved.