



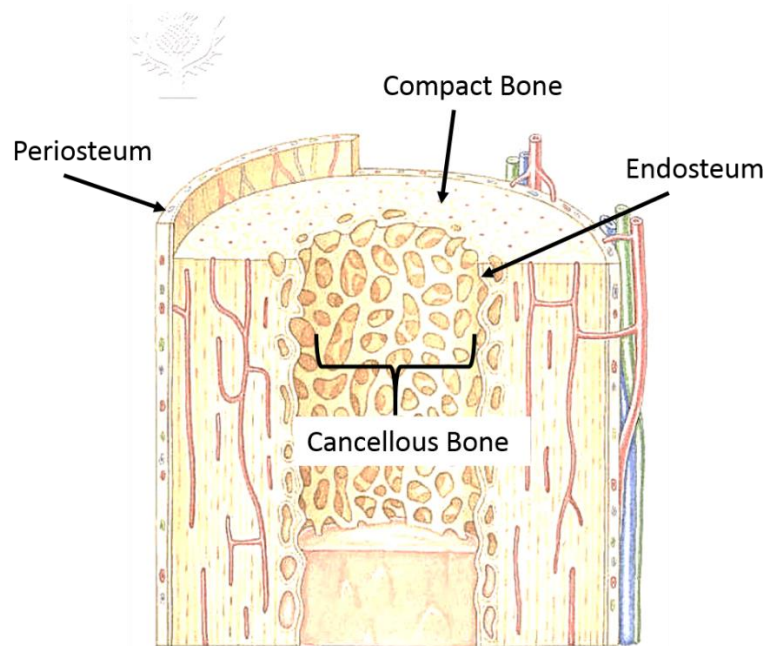
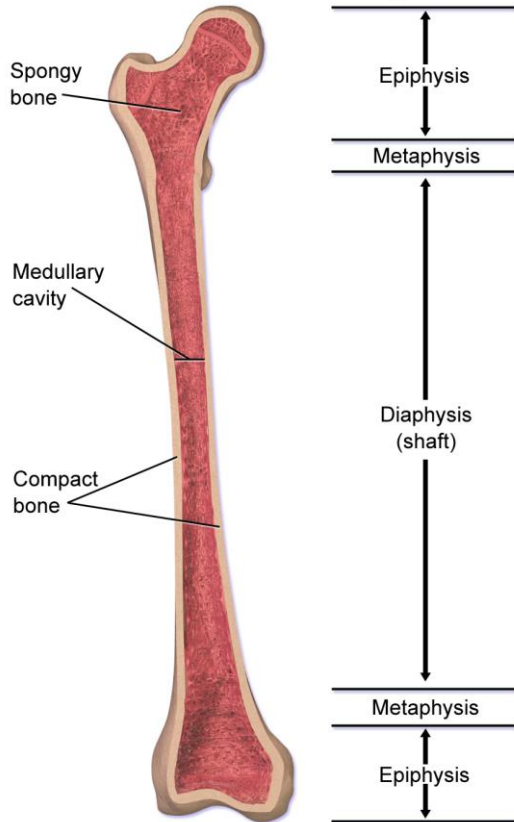
Module 4 - The Skeletal System

Bones of the Arms and Trunk

In this module we will learn the bones, bone regions and bony structures for the trunk and arms. In the arms, we will see long bones. Long bones are bones that are longer than they are wide. Long bones also grow at growth plates which are found in the Metaphysis. Long bones also contain a medullary cavity which contains marrow. In children this marrow may be red marrow (marrow that makes red blood cells), but in adults the marrow of long bones is more likely to be yellow marrow (marrow containing mostly lipid and does not make red blood cells).

We will also ask you to be prepared to identify right and left for some of the bones. Any bone that has a description in the right column of the terms table is a required bone to tell right and left.

Structure of a Long Bone



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Figure 1: The picture on the right is a long bone (the femur) that has been cut in the frontal section. The picture on the right is a zoomed in look at the long bone. The picture on the right represents a section from the shaft or diaphysis.

http://commons.wikimedia.org/wiki/File:Structure_of_a_Long_Bone.png
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LIST OF TERMS TO KNOW FOR THE STRUCTURE OF A LONG BONE

Compact Bone	Also called Cortical Bone. This is one of two types of osseous tissue that form bones. This type of bone is much denser and is generally found at the outside edge of bone. Compact bone gives bone its strength and allows it to tolerate the force loads that go through it.
Diaphysis	The main midsection or shaft of a long bone. The edges are compact bone and the center generally contains yellow marrow.
Epiphysis	Found as the rounded ends of long bones. There is an epiphysis on the proximal and distal ends. Where bones form joints, the epiphysis is covered with hyaline cartilage. The epiphysis contains spongy or cancellous bone and it is quite common for the epiphysis to contain red marrow.
Medullary Cavity	The central cavity found in a bone shaft (or diaphysis). Generally contains yellow marrow although the marrow can be red marrow in children.
Metaphysis	Between the epiphysis and the diaphysis. In a growing bone, the growth plate (a ring of hyaline cartilage) is located here. After the growth plates fuse, the metaphysis contains a ring of ossified bone where the growth plate used to be.
Cancellous Bone	Also called Spongy bone or trabecular bone. This type of bone tissue is much less dense than compact bone. Cancellous bone is typically found at the end of long bones (in the epiphysis). Cancellous bone is highly vascular (contains a lot of blood).
Periosteum and Endosteum	Connective tissue coverings of bone. The periosteum is found on the outside surface of the bone and the endosteum is found lining the walls of the medullary cavity.

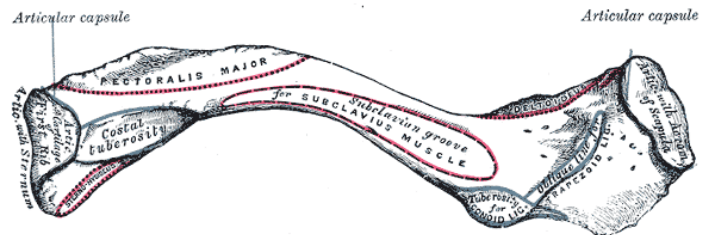
LIST OF TERMS FOR THE BONES AND BONY LANDMARKS OF THE ARMS AND TRUNK

Clavicle

- **Acromial (Lateral) End**
- **Conoid Process**
- **Sternal (Medial) End**

Sometimes this bone has been referred to as the "collar bone". But, don't use collar bone on the exam. This is the only long bone in the body that lies horizontally. This bone acts as a strut to connect the scapula to the sternum.

To identify right and left, turn the clavicle so the conoid process is both inferior and posterior. The acromial end always has to be lateral. In the picture below the conoid process is both inferior and posterior so the only way for the acromial end to be lateral is if this clavicle is on the left side of the body.

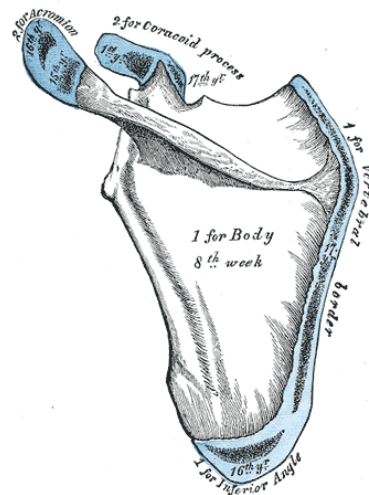


Scapula

- **Acromion Process**
- **Axillary (Lateral) Border**
- **Coracoid Process**
- **Glenoid Cavity**
- **Inferior Angle**
- **Infraspinous Fossa**
- **Scapular Notch**
- **Spine**
- **Subscapular Fossa**
- **Superior (Medial) Angle**
- **Superior Border**
- **Supraspinous Fossa**
- **Vertebral (Medial) Border**

It is thought that the word "scapula" comes from the Greek word *skaptein* which means to dig. In early times, anatomists thought the bone resembled a trowel or small shovel. This bone is a flat bone easily identified on the back of the upper trunk. This bone has several bony structures and landmarks to memorize.

To identify right and left, imagine that you are looking at this bone from behind a person and see the spine. Also, the glenoid cavity is lateral and ready to articulate with the humerus. Ask yourself which arm (right or left) would be articulating with this scapula and you know which scapula it is.



This Scapula is a left scapula

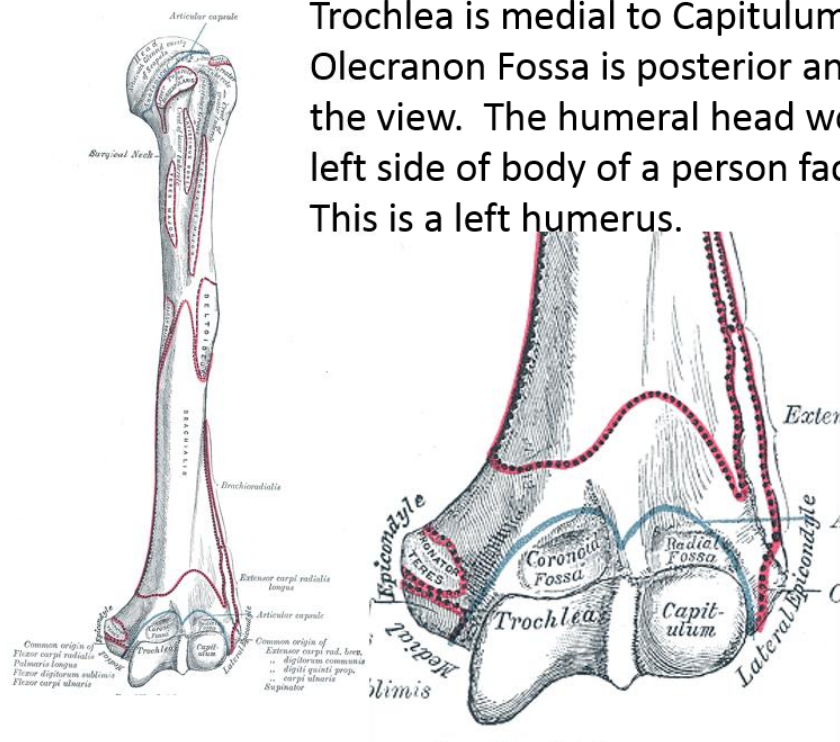
Humerus

- **Anatomical Neck**
- **Capitulum**
- **Coronoid Fossa**
- **Deltoid Tuberosity**
- **Greater Tubercle**
- **Head**
- **Intertubercular Groove**
- **Lateral Epicondyle**
- **Lesser Tubercle**
- **Medial Epicondyle**
- **Olecranon Fossa**
- **Radial Fossa**
- **Surgical Neck**
- **Trochlea**

The word humerus has nothing to do with laughter. The Latin term "umerus" means upper arm. This bone is the bone of the upper arm. It forms a joint with the scapula called a ball and pivot joint which gives this bone a lot of movement. It also has quite a few structures and landmarks to memorize.

To identify right and left, turn the humerus so that the trochlea is medial to the capitulum and the olecranon fossa is behind or posterior and out of your view. You are now looking at the anterior view of a humerus. Now, imagine in your mind what side of the body you would have to be on to connect the rounded head to a glenoid cavity.

Trochlea is medial to Capitulum,
Olecranon Fossa is posterior and out of
the view. The humeral head would fit only on
left side of body of a person facing you.
This is a left humerus.

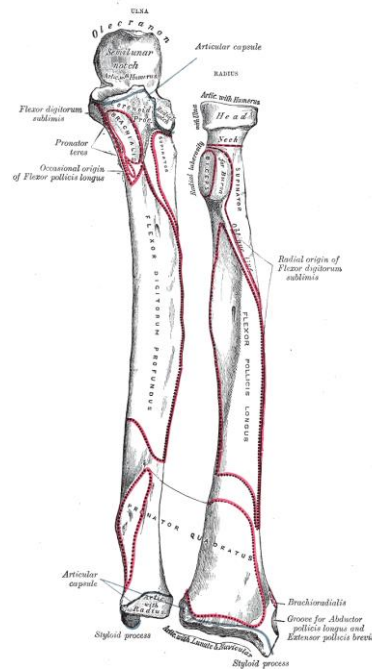


Radius

- **Head**
- **Neck**
- **Radial Tuberosity**
- **Styloid Process**
- **Ulnar Notch**

This is one of two large bones that make up the forearm. The other is the Ulna. The radius rotates around the ulna when you twist your forearm. This is how it got its name.

To identify right or left, view the radius and ulna together. Test questions about identification of right and left of these two bones will include them together. Be sure trochlear notch is facing you. You are now looking at an anterior view. On the human body, the radius is always lateral and the ulna is always medial when a person is standing in anatomical position. With this knowledge, you should be able to examine the picture below and realize that this is an anterior view and because the radius is always lateral this would have to be a left forearm.



Ulna

- **Coronoid Process**
- **Head**
- **Olecranon Process**
- **Radial Notch**
- **Styloid Process**
- **Trochlear (Semilunar) Notch**
- **Ulnar Tuberosity**

Generally, this is the bone we refer to when we speak of our elbow bone. In fact, the olecranon process would be the point of the elbow. This is the other large long bone of the forearm.

To identify right or left? We will always ask right and left questions of this bone when it is together with the radius. Use the same technique as the radius to tell right and left on this bone.

Carpals

- **Scaphoid**
- **Lunate**
- **Triquetrum**
- **Pisiform**

Carpal comes from the Latin root "carpus" which means wrist. The eight small carpal bones form two transverse rows. It is often easier to memorize the eight carpal bones by coming up with a Mnemonic Device (a sentence that helps us memorize a string

- **Trapezium**
- **Trapezoid**
- **Capitate**
- **Hamate**

of words). For example, start with the proximal row of carpals on the thumb side. Take the first letter of each carpal bone from thumb side to pinky finger side and then start over on the distal row from thumb to pinky side. This gives you a string of letters

S-L-T-P-T-T-C-H

Then come up with a sentence like...

"Some Lunatics Try Pilates That They Can't Handle"

This is the same order that the bones are listed in this list and the same order that the bones are shown in the online atlas.

Mnemonic devices like this have helped students for many years as they try to keep track of the location of a string of anatomical structures. You might try coming up with others on your own when you think it might be helpful.

Metacarpals

- **Metacarpal 1**
- **Metacarpal 2**
- **Metacarpal 3**
- **Metacarpal 4**
- **Metacarpal 5**

"Meta-" means "between" or in the middle. Metacarpals are bones found in the intermediate hand or between the carpal bones and the Digits. The area called your "palm" would be the anterior surface of the metacarpals. There are 5 metacarpals, one for each digit of the hand. The first metacarpal is the one that underlies the digit called the thumb and the 5th is proximal to the "pinky" finger.

Digits (Phalanges)

- **Distal Phalanx**
- **Middle Phalanx**
- **Proximal Phalanx**

Also referred to as the fingers. Fingers are actually made up of three bones. Starting at the tips of the fingers, the bones that make up a finger include the distal, middle and proximal phalanx. Phalanx is the singular form for these bones. All together we call them phalanges. The thumb has only two phalanges, the proximal and distal phalanx. There is no middle phalanx in the thumb. There are 4 fingers and 1 thumb, but we say there are 5 digits. Digit one is the thumb and digit 5 is the pinky finger. Be sure to refer to the metacarpal and phalange bones by number. Resist the temptation to use names like thumb, index, middle, ring or pinky finger on the test.

Sternum

- **Body**
- **Calvicular Notch**
- **Costal Notches**
- **Jugular Notch**
- **Manubrium**
- **Sternal Angle**
- **Xiphoid Process**

Sometimes called the breastbone. However, be sure to avoid using the term "breastbone" on the exam, We won't give credit for common names when a more formal anatomical name is the term bolded to the left on these tables. The sternum is where most of the ribs attach on the anterior trunk. The sternum helps protect the heart and lungs. The sternum is made can be divided into 3 regions (the Manubrium, The Body and the Xyphoid).

Ribs

- **Head**
- **Tubercle**
- **Neck**
- **Angle**
- **Body**
- **Costal Groove**
- **Costal Cartilage**
- **False Ribs (5 pair)**
- **Floating Ribs (2 pair)**
- **True Ribs (7 pair)**

The ribs are long curve bones which form a cage on the human thorax. The ribs attach to the vertebrae through the head of the rib. On the anterior trunk, the ribs blend in with cartilage, called costal cartilage which attaches to the sternum. For the most part humans have 24 ribs (12 pairs). There can be a little variation as some people can be missing or have an extra pair of floating ribs. Males and females have the same number. When Adam donated a rib for Eve, his male children must have gotten it back☺.

Vertebrae

- **Vertebrae - General Features**
 - **Body**
 - **Inferior Articular Facet**
 - **Inferior Articular Process**
 - **Inferior Intervertebral Notch**
 - **Intervertebral Foramen**
 - **Lamina**
 - **Pedicle**
 - **Spinous Process**
 - **Superior Articular Facet**
 - **Superior Articular Process**
 - **Superior Intervertebral Notch**
 - **Transverse Process**
 - **Vertebral Arch**
 - **Vertebral Foramen**
- **Cervical Vertebrae (7)**
 - **Atlas (C1)**
 - **Axis (C2)**
 - **Bifid Spinous Process**
 - **Odontoid Process (Dens)**
 - **Transverse Foramen**
- **Thoracic Vertebrae (12)**
 - **Costal Facet**
- **Lumbar Vertebrae (5)**

The human spine generally contains 7 cervical vertebrae, 12 thoracic vertebrae, 5 lumbar vertebrae, 5 fused sacral vertebrae and 4 fused coccyx vertebrae. Rarely a person can have 1 or 2 less or 1 or 2 more. The most common area for an extra vertebrae is in the lumbar, sacral or coccyx region. Vertebrae have many structure names in common. Even though the structures can look quite different in different regions of the spine, we tend to use the same names. The online atlas will show an example of a cervical, thoracic and lumbar vertebrae for most of the common structures between them. The cervical vertebrae have a few special structures that are not found on any other vertebrae. The thoracic vertebrae has the costal facet where the ribs connect to the spine, and the other vertebrae do not have this structure.



Sacrum

- **Anterior (Ventral) Sacral Foramen**
- **Auricular Surface**
- **Median Sacral Crest**
- **Posterior (Dorsal) Sacral Foramen**
- **Sacral Canal**

The sacrum is a large triangular shaped bone at the base of the spine. It is formed by the fusion of 5 vertebrae that are inferior to the lumbar spine. The sacrum connects to the spine and to the pelvis. This is why the sacrum is a kind of link that transfers forces from from the legs to the spine and from the spine to the legs. Its thick strong shape is well adapted for this job.

Coccyx

Commonly referred to as the "tail bone". Again, you would not want to use "tail bone" on the exam. The coccyx make up the final segment of the vertebral column. These bones sit just inferior to the sacrum. Some people say that the coccyx are not necessary and just make up a remnant of a tail. In reality the coccyx is a very important attachment point for several muscles.