

**BIO 4432 – Human Anatomy***Resource #1*

The concepts this resource covers are the topics typically covered during this week of the semester. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout the semester.

**We also invite you to look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester.**

If you have any questions about these study guides, group tutoring sessions, private 30 minute tutoring appointments, the Baylor Tutoring YouTube channel or any tutoring services we offer, please visit our website [www.baylor.edu/tutoring](http://www.baylor.edu/tutoring) or call our drop in center during open business hours. M-Th 9am-8pm on class days 254-710-4135.

**Keywords:** Axial Skeleton, Appendicular Skeleton, Articulations

**Week Three:** 01/31 – 02/4

***Topics of the Week: Axial Skeleton – Appendicular Skeleton and Articulations***

**Features of the upper limb bones:** \*be able to recognize these on cadaveric images and radiographs!

**Humerus**

- Greater tubercle and lesser tubercle
- Head: articulates with glenoid fossa of scapula
- Anatomical neck and surgical neck: fractures occur here; affect the axillary nerve)
- Deltoid tuberosity
- Radial groove: mid-humeral fractures; affect the radial nerve
- Trochlea
- Capitulum
- Lateral and medial epicondyles: ulnar nerve runs behind the medial epicondyle
- Olecranon fossa
- Coronoid fossa
  
- Radial tuberosity: where the biceps brachii insert
- Styloid process
  
- Olecranon: your elbow bone; articulates with olecranon fossa of humerus
- Coronoid process: articulates with coronoid fossa of humerus
- Styloid process

**Features of the lower limb bones:** \*be able to recognize these on cadaveric images and radiographs!

**Femur**

- Greater and lesser trochanters

- Head and neck: **head articulates with acetabulum of bony pelvis**
- Pectineal line
- Medial and lateral condyle

## Tibia

- Tibial tuberosity: **where tendon of quadriceps inserts**
- Medial malleolus

## Classifying joints

### By movement:

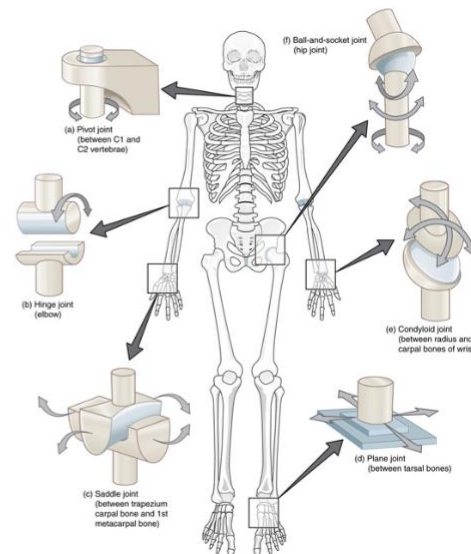
- Synarthrosis = immovable
- Amphiarthrosis = slightly movable
- Diarthrosis = freely movable

### By structure:

- Fibrous: **joint is made up of fibrous ligaments**
- Cartilaginous: **joint is made up of either hyaline cartilage or fibrocartilage**
  - o Hyaline = synchondrosis
  - o Fibrocartilage = symphysis
- Synovial: **joint has a joint cavity and surrounded by a synovial membrane; freely movable**

### Mechanical classifications:

- Hinge → elbow (humero-ulnar joint)
- Pivot → proximal radio-ulnar joint
- Ball and socket → shoulder (gleno-humeral joint)
- Condylod/ellipsoid → wrist (radio-carpal joint)
- Gliding/plane → intercarpal joints
- Saddle joint → thumb (trapeziometacarpal joint)



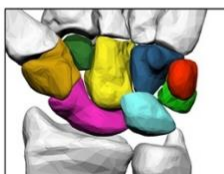
*This image was taken from lumenlearning.com.*

## Highlight #1: Bones of the Hands and Feet

*\*be able to recognize these on cadaveric images and radiographs!*

### Carpal Bones

- Scaphoid
- Lunate
- Triquetrum
- Pisiform
- Trapezium
- Trapezoid
- Capitate
- Hamate



- Sally – Scaphoid
- Left – Lunate
- The – Triquetrum
- Party – Pisiform
- To – Trapezium (think thumb = trapezium)
- Take – Trapezoid
- Cathy – Capitate
- Home – Hamate

*This image was taken from geekymedics.com.  
\*\*this is a palmar view of the left hand\*\**

### Tiger – Talus

Cubs – Calcaneus

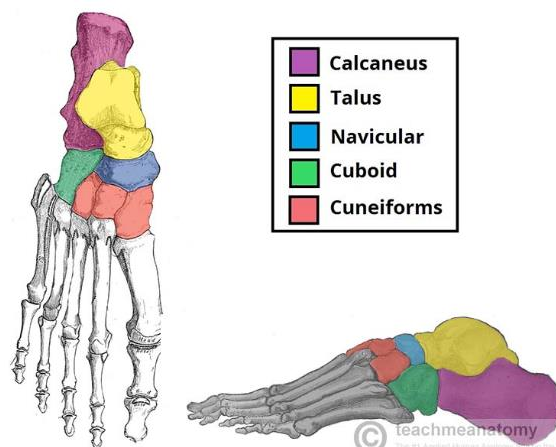
Need – Navicular

M – Medial Cuneiform

I – Intermediate Cuneiform

L – Lateral Cuneiform

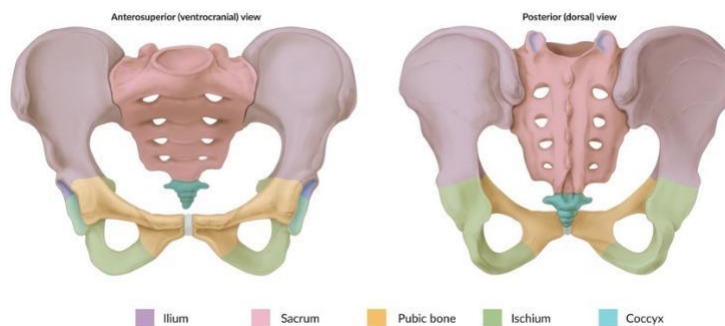
C – Cuboid



*This image was taken from teachmeanatomy.info.  
\*\*these are superior and lateral views of the right foot\*\**

## Highlight #2: The Bony Pelvis

\*be able to recognize these on cadaveric images and radiographs!



*This image was taken from amboss.com.*

The bony pelvis is the **synostosis** (fusion of bones) of the ilium, ischium, and pubis at the acetabulum.

### Some important landmarks to be familiar with:

- Iliac crest

- Anterior superior iliac spine (ASIS), anterior inferior iliac spine (AIIS), posterior superior iliac spine, and posterior inferior iliac spine
- Pubic tubercles
- Pubic crests
- Pubic symphysis
- Acetabulum
- Obturator foramen
- Ischial tuberosity (sit bone)
- Ischial spine
- Greater and lesser sciatic notches

### Ligaments of the bony pelvis:

- Inguinal ligament: **attaches from ASIS to the pubic tubercle**
- Sacrotuberous ligament: **attaches from sacrum to ischial tuberosity**
- Sacrospinous ligament: **attaches from sacrum to ischial spine**

## Highlight #3: The Pectoral Girdle

*\*be able to recognize these on cadaveric images and radiographs!*

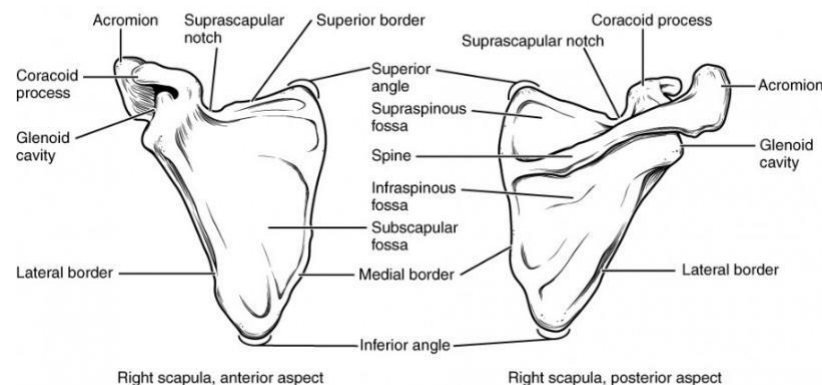
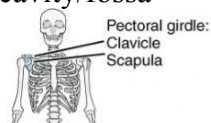
### Made up of the clavicle and scapula

#### Clavicle

- Conoid tubercle

#### Scapula

- Acromion
- Coracoid process
- Spine
- Subscapular fossa, supraspinous fossa, infraspinous fossa
- Glenoid cavity/fossa



*This image was taken from lumenlearning.com*

**Knowledge checkpoint 1:** Can you label all the features of the pectoral girdle on this radiograph?



*This image is a screenshot from the radiology section of Complete Anatomy.*

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### Highlight #4: Major Joints of the Upper Limb

**Sternoclavicular joint:** saddle (NOT synovial); synchondrosis

Important ligaments:

- Sternoclavicular ligament
- Interclavicular ligament
- Costoclavicular ligament

**Acromioclavicular joint:** synovial gliding plane

Important ligaments:

- Coracoclavicular ligament: **most effective in keeping clavicle connected to acromion**
- Acromioclavicular ligament: **injured in shoulder (AC) separation**
- Coracoacromial ligament

**Glenohumeral joint (shoulder):** synovial ball and socket; very mobile!

Important ligament: coracohumeral ligament

Actions:

- Flexion and extension
- Adduction and abduction
- Medial and lateral rotation

**Radio-ulnar joint:** synovial pivot

Important ligament: annular ligament – **keeps the head of the radius from sliding out of the joint**

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### Highlight #4: Major Joints of the Lower Limb

**Acetabulofemoral joint (hip):** synovial ball and socket

Important ligaments:

- Pubofemoral ligament: **prevents over-abduction**

- Iliofemoral ligament: prevents hyper-extension
- Ischiofemoral ligament

### Sacroiliac joint: synovial gliding/plane

#### Important ligaments:

- Anterior sacroiliac ligament
- Sacrotuberous ligament
- Sacrospinous ligament

### Knee: synovial hinge

#### Important ligaments:

- Patellar ligament: attaches patella to tibial tuberosity
- Anterior cruciate ligament: restricts anterior translation of the tibia on the femur
- Posterior cruciate ligament: restricts posterior translation of the tibia on the femur
- Medial/tibial collateral ligament
- Lateral/fibular collateral ligament

**Menisci:** remember the MCL attaches to the medial meniscus, but the LCL does not attach to the lateral meniscus.

### Talocrural Joint: ankle

#### Made up of 3 joints:

- Talocrural joint: connects distal ends of tibia and fibula with talus
- Subtalar joint: between talus and calcaneus
- Inferior talofibular joint: syndesmosis between the lateral end of tibia and medial end of fibula

#### Important ligaments:

- Deltoid ligament: medial ankle
- Lateral ligament: lateral ankle; weaker than deltoid
  - o Anterior talofibular ligament: most commonly injured ligament in ankle sprains
- Calcaneo-navicular (spring) ligament

**Knowledge checkpoint 2:** A patient presents with intense knee pain following her soccer game. The physician tests the major ligaments of the knee joint to assess for injury. He has the patient lie down on her back with her knees bent toward the ceiling and feet flat. When he pulls her leg anteriorly, it displaces much more than it is supposed to. What ligament may be injured?

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*The following section will be review of week 1 and week 2 content*

### *Week 1: Axial Skeleton – the Skull*

#### Bones of the Skull:

Bones of the Neurocranium: (remember! PEST OF 6)	Bones of the Viscerocranium: (remember! VAIN MM PLZ)
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1. Parietal bones (2)
2. Ethmoid bone (1)
3. Sphenoid bone (1)
4. Temporal bones (2)
5. Occipital bone (1)
6. Frontal bone (1)

1. Vomer (1)
2. Auditory ossicles
3. Inferior nasal concha (2)
4. Nasal bones (2)
5. Mandible (1)
6. Maxilla (2)
7. Palatine bones (2)
8. Lacrimal bones (2)
9. Zygomatic bones (2)

Follow this link to practice labeling the skull: [https://ltsa.sheridancollege.ca/apps/human-anatomy/quiz\\_labeling\\_skull.html?bgImage=](https://ltsa.sheridancollege.ca/apps/human-anatomy/quiz_labeling_skull.html?bgImage=)

### The 12 Cranial Nerves and their Foramina: (S = sensory, M = motor, B = both)

CN I: Olfactory (S) – cribriform foramina

CN II: Optic (S) – optic canal

CN III: Oculomotor (M) – superior orbital fissure

CN IV: Trochlear (M) – superior orbital fissure

CN V<sub>1</sub>: Ophthalmic (S) – superior orbital fissure

CN V<sub>2</sub>: Maxillary (S) – foramen rotundum

CN V<sub>3</sub>: Mandibular (B) – foramen ovale

CN VI: Abducens (M) – superior orbital fissure

CN VII: Facial (B) – internal acoustic meatus

CN VIII: Vestibulocochlear (S) – internal acoustic meatus

CN IX: Glossopharyngeal (B) – jugular foramen

CN X: Vagus (B) – jugular foramen

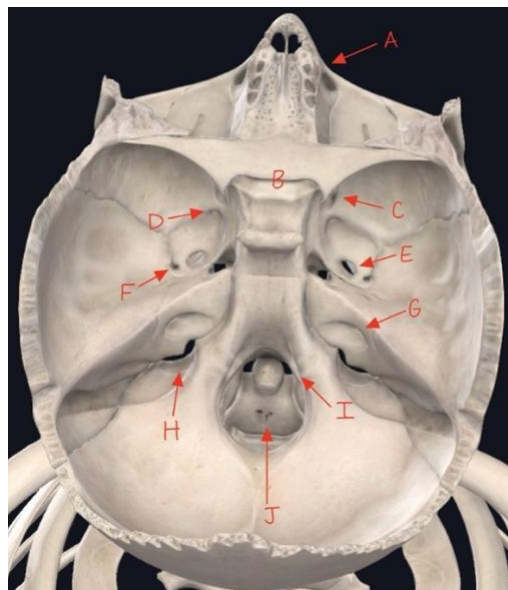
CN XI: Accessory (M) – jugular foramen

CN XII: Hypoglossal (M) – hypoglossal canal

The 3 major branches of **Trigeminal nerve (CN V)** are Ophthalmic (V<sub>1</sub>), Maxillary (V<sub>2</sub>), and Mandibular (V<sub>3</sub>)!

**Knowledge checkpoint 3:** In this superior view of the skull, can you label all the foramina along with the nerve(s) each transmits?

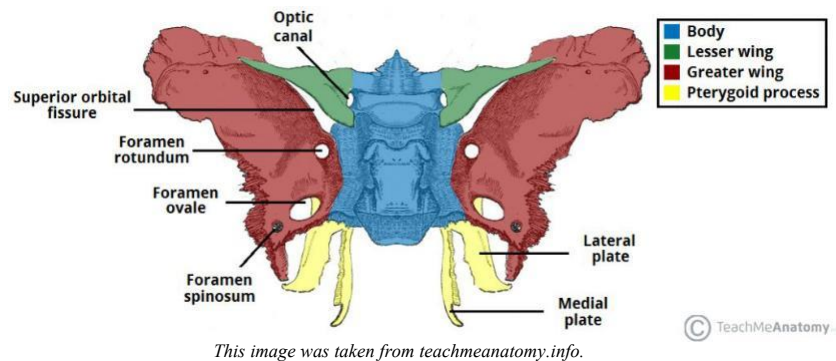
*This image is a screenshot from Complete Anatomy.*



## Highlight #1: Sphenoid Bone

5 openings of the sphenoid bone: optic canal, superior orbital fissure, foramen rotundum, foramen ovale, and foramen spinosum

The **pituitary gland** sits in the **sella turcica** of the pituitary gland.



## Week 2: Axial Skeleton – Vertebrae and Associated Ligaments

The **Vertebral column** consists of:

- 7 cervical vertebrae
- 12 thoracic vertebrae
- 5 lumbar vertebrae
- 5 sacral vertebrae (fused)
- 4 coccygeal vertebrae (fused)

**Important features of vertebrae:** \*be able to recognize these on cadaveric images and radiographs!

**Lamina:** connects the transverse and spinous processes

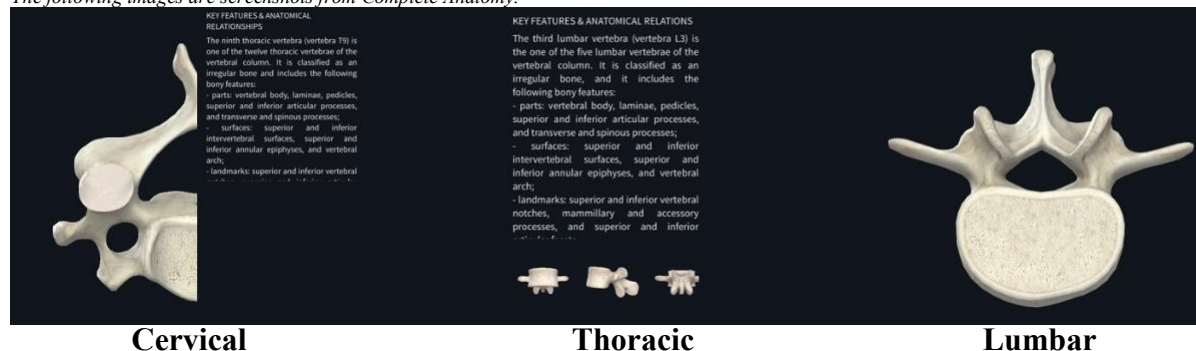
**Pedicle:** connects the vertebral arch and body

**Superior and inferior articular facets:** form facet joints that allow for flexion and extension between vertebrae

- Cervical: superior facets point up and inferior point down
- Thoracic: superior facets point posteriorly and inferior point anteriorly
- Lumbar: superior facets point medially and inferior point laterally

**Intervertebral foramen:** where spinal nerves exit the vertebral column

The following images are screenshots from *Complete Anatomy*.





**Important ligaments of the axial skeleton:**

**Supraspinous ligament:** connects tips of spinous processes

**Interspinous ligament:** connects spinous processes superiorly and inferiorly

**Ligamentum flavum:** connects lamina of consecutive vertebrae

**Anterior longitudinal ligament:** found on the anterior side of the vertebral column along the vertebral bodies; prevents over-extension of the spine

**Posterior longitudinal ligament:** found on the posterior side of the vertebral column along the vertebral bodies; limits over-flexion of the spine

**Nuchal ligament:** attaches at external occipital protuberance of skull and T1; limits forward flexion of the cervical spine

**The Sternum**

**Manubrium, body, and xiphoid process**

**Sternal angle:**

- At the level between T4 and T5
- Where the arch of aorta begins and ends
- Where the trachea bifurcates into primary bronchi

**Highlight #1: Cervical Vertebrae****Key features of cervical vertebrae:**

**Bifid spinous process**

- C7 has the longest spinous process (vertebra prominens)

The vertebral artery travels through the transverse foramen of cervical vertebrae

**The atlas (C1):**

- Does not have a body or spinous process
- Superior articular facets articulate with the occipital condyles of the skull
- Flexion and extension of the neck → saying “yes”!

**The axis (C2):**

- Has a body and a spinous process
- The dens/odontoid process allows for rotational movement → saying “no”!

**Ligaments of the Atlas and Axis:** keep the dens intact

- Transverse ligament of the atlas – part of the cruciform ligament (transverse ligament + superior and inferior bands)
- Alar ligaments – attached from dens to the occipital condyles of the skull

**Highlight #2: Articulation of Ribs with Thoracic Spine****The Costovertebral Joint**

The head of the rib has **2 facets**: one for the vertebra of the same number and one for the vertebra above

- Example: rib 7 articulates with vertebrae T6 and T7

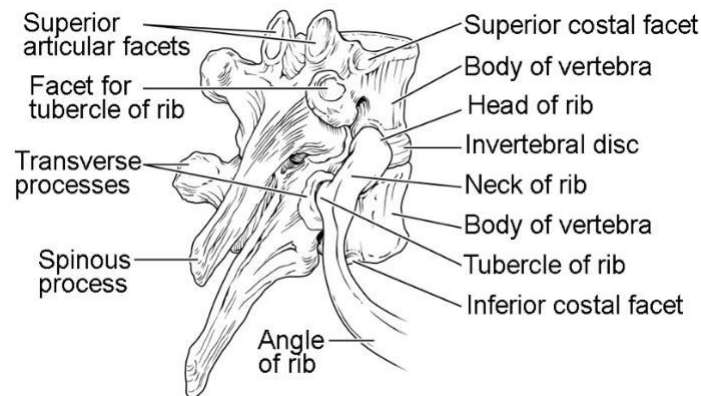
Vertebrae have **2 demi-facets**: one for the rib of the same number and one for the rib below

- Example: T7 articulates with ribs 7 and 8

## The Costovertebral Joint

The tubercle of the rib articulates with the transverse costal facet of the transverse process

- The transverse costal facet always articulates with the same number rib as vertebra



*This image was taken from lumenlearning.com.*

## We have 12 total ribs

True/vertebrosternal ribs: the first 7 ribs articulate anteriorly with the sternum

False ribs: the remaining 5 either attach directly to the sternum or do not connect to it at all

- Ribs 8-10 are vertebrochondral ribs meaning they attach to the sternum by joining the costal cartilage above
- Ribs 11 and 12 are floating/vertebral ribs and do not attach to the sternum at all

**Knowledge checkpoint 4:** Rib 4 articulates with which two vertebrae?

- T4 and T5
- T3 and T4
- C5 and C5
- T4 only

## THINGS YOU MAY STRUGGLE WITH!

1. ***The cranial nerves and their associated foramina:*** give yourself as much exposure to images of the skull as possible. Look at it from the superior and inferior views and label both. Color coordinate it if that's your thing. Use mnemonics if that's your thing. It will click after practicing I promise!
2. ***RADIOLOGY!!!:*** Like Dr. Parizi says, get your radiology eyes early! The Noted Anatomist has a great radiology playlist on YouTube to help you with this.  
<https://www.youtube.com/playlist?list=PLF2PbpJOR9t03TzSHHCATSBfyORPrV4oE>
3. ***Volume of material:*** This course covers A LOT of material quickly. It's super-duper important for you to stay on top of the material because once you get behind it is very hard to catch up. Cramming does not work before these exams. Spend time with the material in different ways and using the resources that work best for you. YOU CAN DO THIS!!

**CONGRATS:** You made it to the end of the resource! Thanks for checking out these weekly resources! Don't forget to check out our website for group tutoring times, video tutorials and lots of other resources: [www.baylor.edu/tutoring!](http://www.baylor.edu/tutoring!)

### Answers

1. 1 = acromion  
2 = clavicle  
3 = greater tubercle  
4 = coracoid process  
5 = intertubercular groove  
6 = body of scapula  
7 = deltoid tuberosity  
8 = rib  
9 = body of humerus  
10 = lateral epicondyle  
11 = olecranon process  
12 = medial epicondyle  
13 = head of radius
2. Anterior cruciate ligament
3. A = cribriform foramina; CN I – olfactory  
B = optic canal; CN II – optic  
C = superior orbital fissure; CN III – oculomotor, CN IV – trochlear, CN V<sub>1</sub> – ophthalmic, CN VI – abducens  
D = foramen rotundum; CN V<sub>2</sub> – maxillary  
E = foramen ovale; CN V<sub>3</sub> – mandibular  
F = foramen spinosum; middle meningeal artery  
G = internal acoustic meatus; CN VII – facial, CN VIII – vestibulocochlear  
H = jugular foramen; CN IX – glossopharyngeal, CN X – vagus, CN XI – accessory  
I = hypoglossal canal; CN XII – hypoglossal  
J = foramen magnum; spinal cord
4. b