



Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Axial and Appendicular Skeleton

Suman Kumar Mekap

Asst. Professor (Pharmacology)

CUTM, Bhubaneswar)



Centurion
UNIVERSITY
*Shaping Lives...
Empowering Communities...*

On The Basis of Region:

It is divided into two types, they are:

- 1. Axial Skeleton.**
- 2. Appendicular Skeleton.**



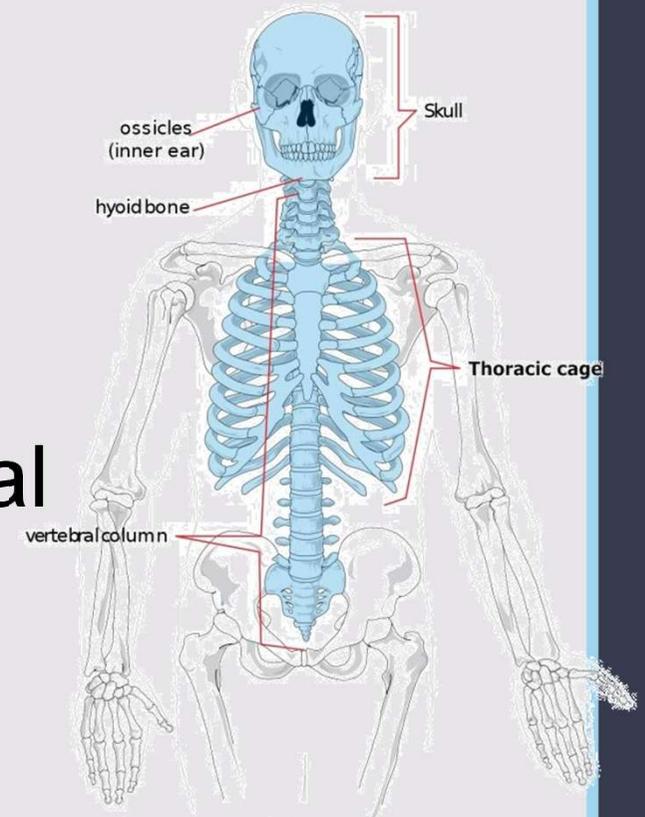
Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

1. Bones Of Axial Skeleton:

These bones forms the axial skeleton of the human body.

Examples: Bones of skull, Thoracic cage & Vertebral Column



Bones of Axial Skeleton.



**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

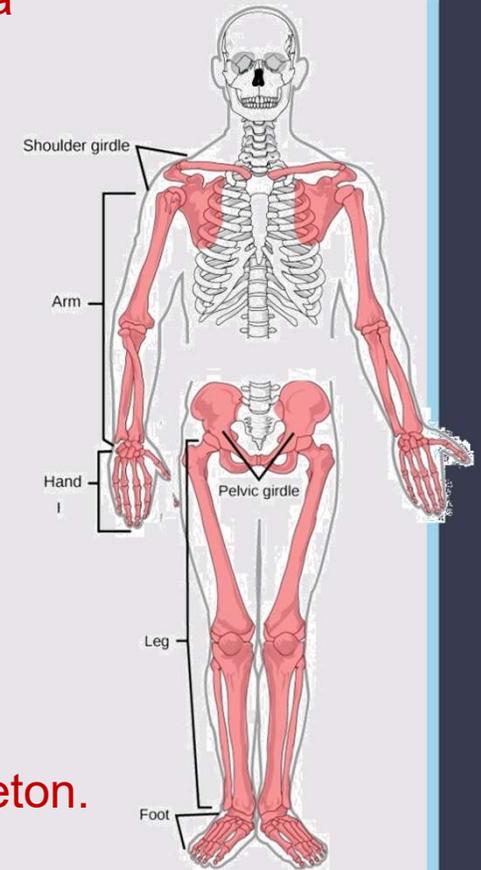
2. Bones of Appendicular Skeleton:

Upper limb, Clavicle & Scapula

These bones forms the Appendicular skeleton of the human Body.

Examples: bones of the limbs and girdles of limbs.

Lower limb, Pelvic Girdle
bones of Appendicular Skeleton.

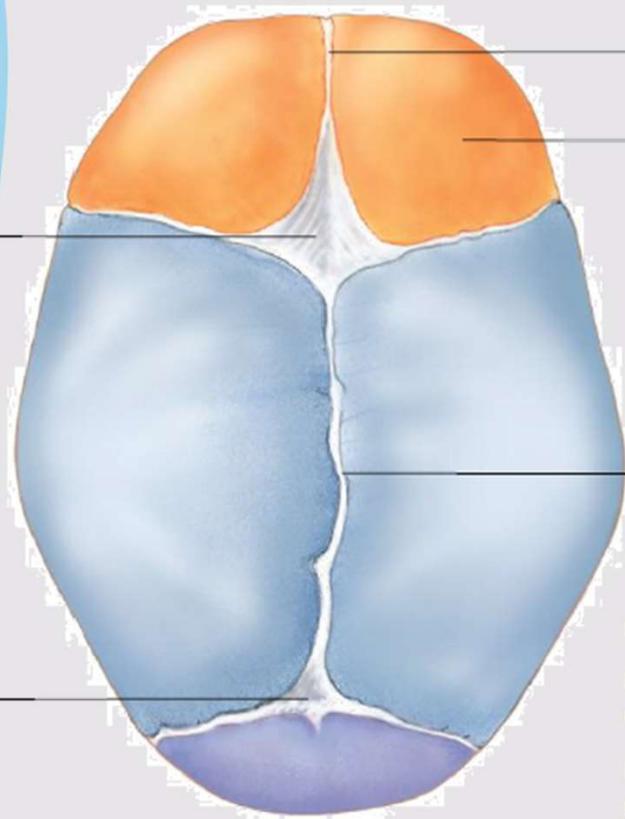




Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Fontanelles – fibrous membranes



Anterior fontanel

Posterior fontanel

Frontal suture
(metopic suture)

Frontal bone

Sagittal suture

Parietal bone

Frontal bone

Coronal suture

Lacrimal bone

Ethmoid bone

Squamous suture

Sphenoid bone

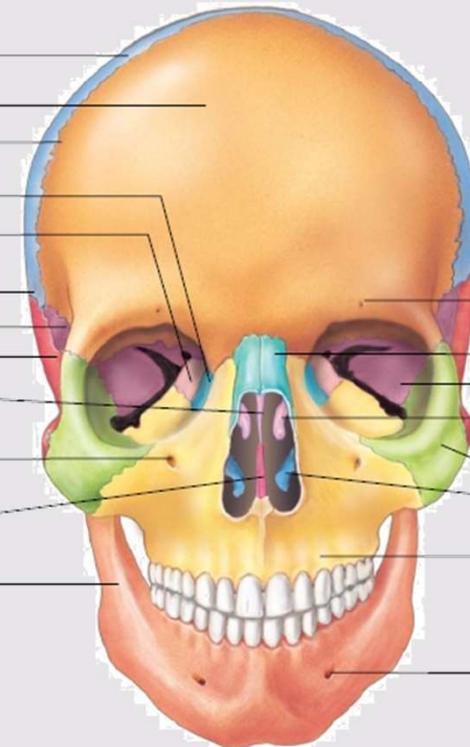
Temporal bone

Perpendicular plate
of the ethmoid bone

Infraorbital foramen

Vomer bone

Mandible



Supraorbital foramen

Nasal bone

Sphenoid bone

Middle nasal concha
of the ethmoid bone

Zygomatic bone

Inferior nasal concha

Maxilla

Mental foramen



Centurion
UNIVERSITY

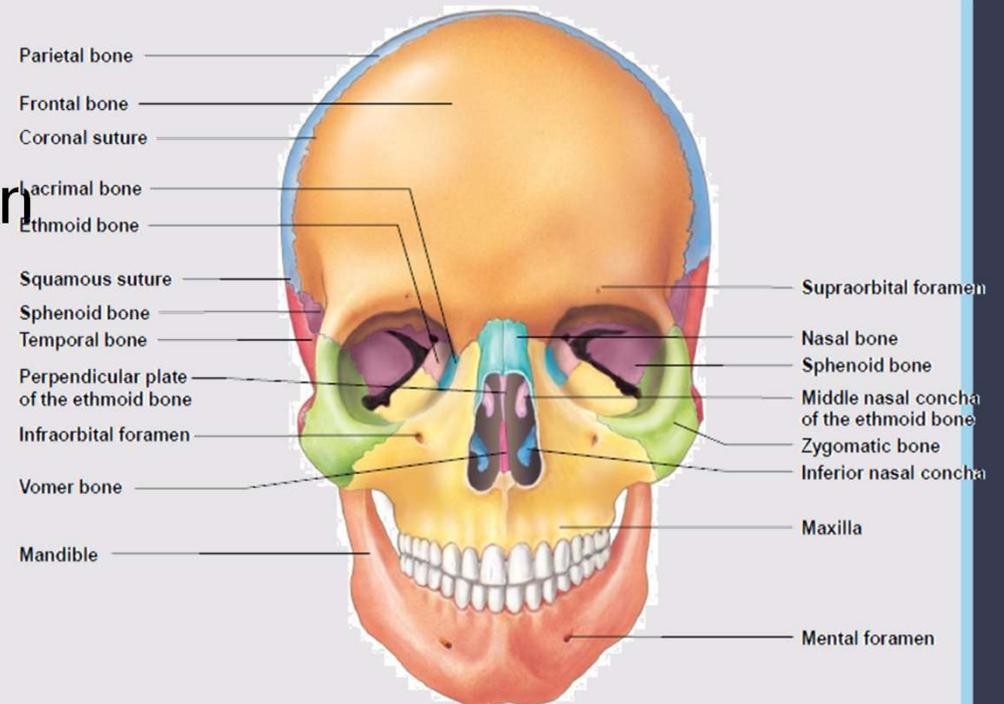
*Shaping Lives...
Empowering Communities...*

Skull

Is composed of the cranium (brain case) and the facial bones

(1) Frontal Bone

- Forehead
- Roof of nasal cavity
- Roofs of orbits
- Frontal sinuses
- Supraorbital foramen
- Coronal suture



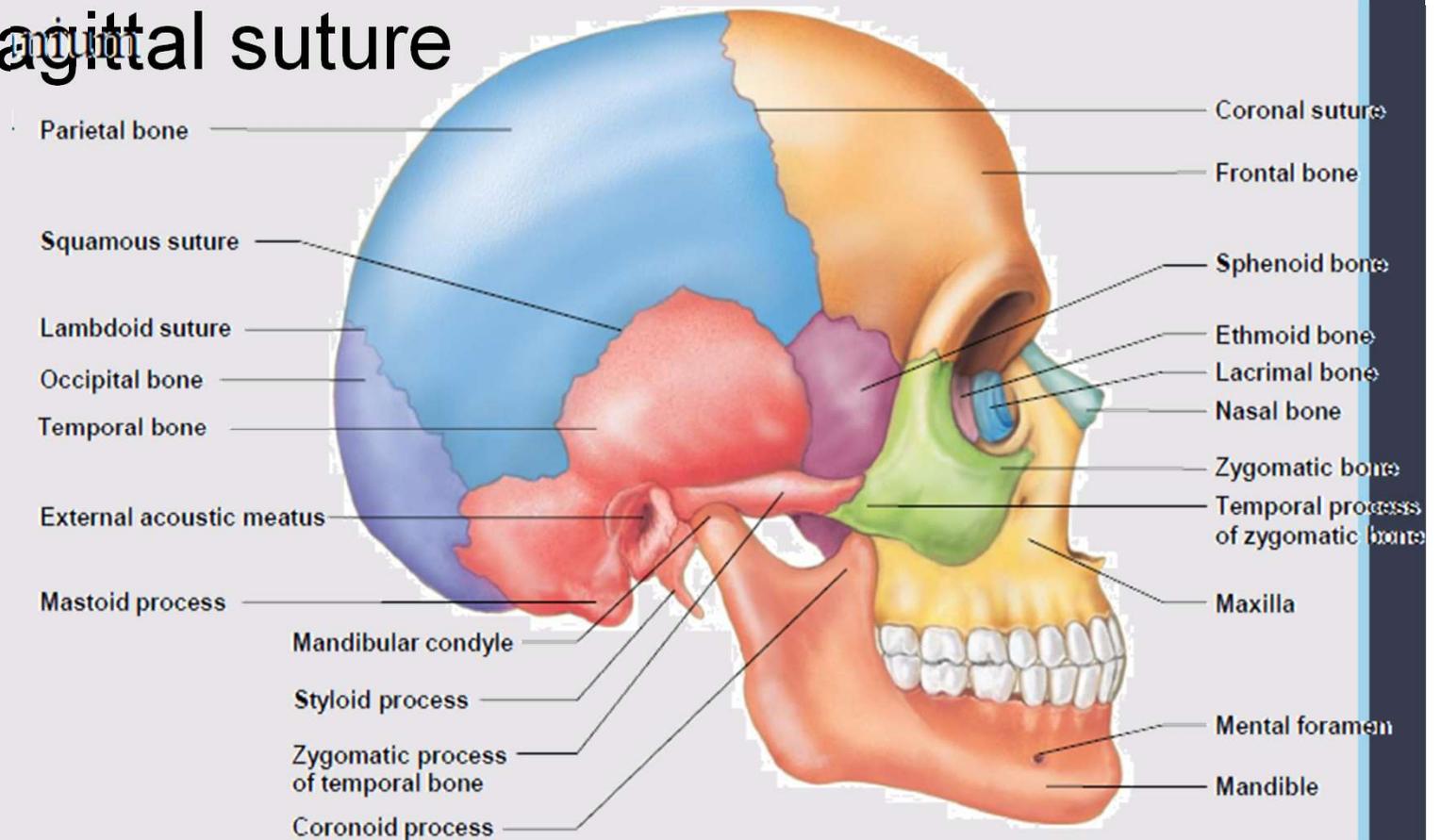


**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

(2) Parietal Bones (2)

- Side walls of cranium
- Roof of cranium
- Sagittal suture



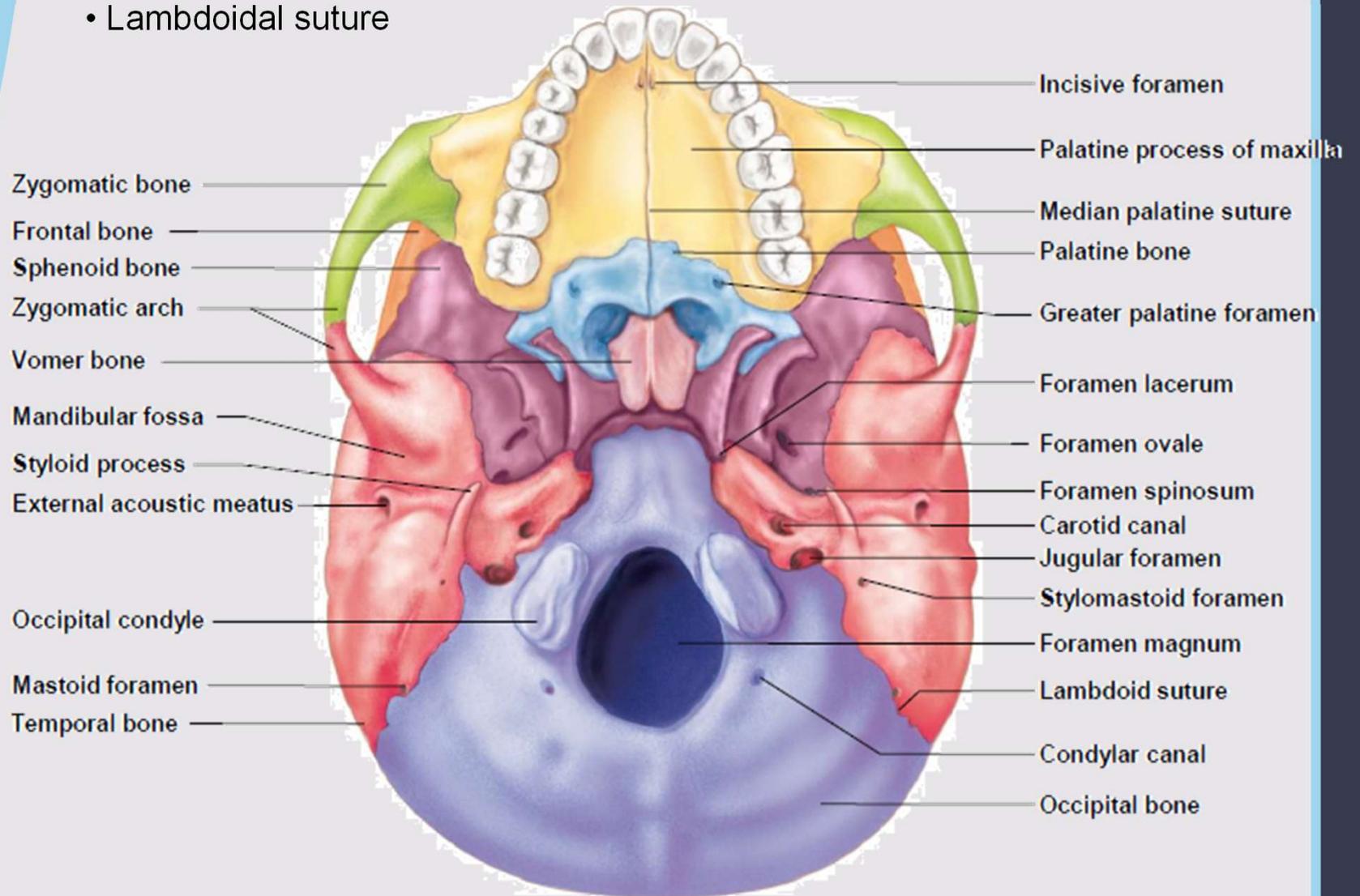


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

(3) Occipital Bone (1)

- Back of skull
- Base of cranium
- Foramen magnum
- Occipital condyles
- Lambdoidal suture



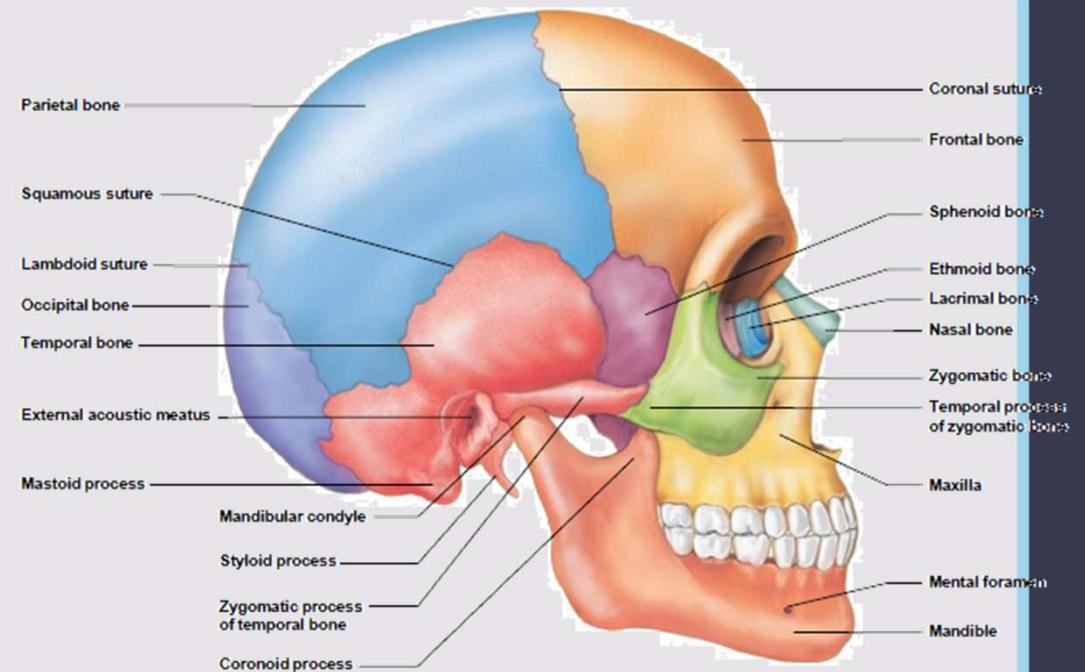


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

(4) Temporal Bones (2)

- Side walls of cranium
- Floor of cranium
- Floors and sides of orbits
- Squamous suture
- External acoustic meatus
- Mandibular fossa
- Mastoid process
- Styloid process
- Zygomatic process



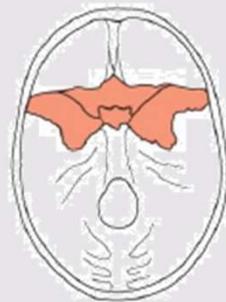


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

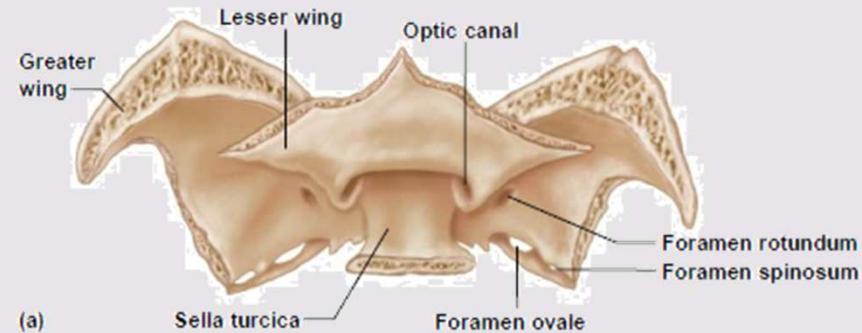
(5) Sphenoid Bone (1)

- Base of cranium
- Sides of skull
- Floors and sides of orbits
- Sella turcica
- Sphenoid sinuses

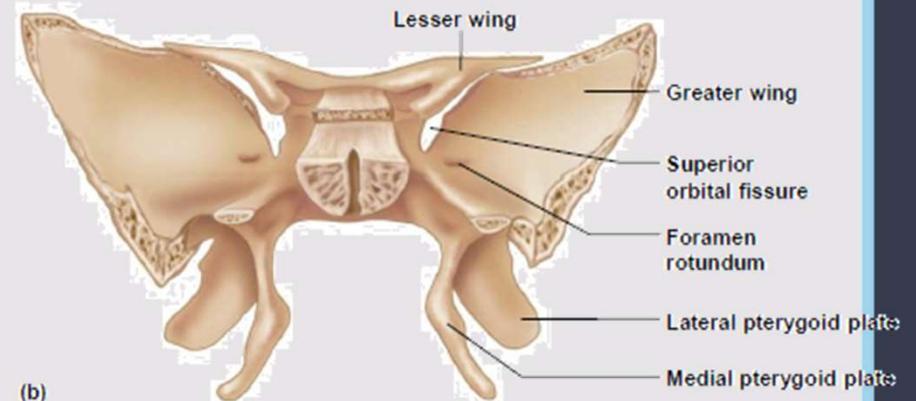


Transverse section

5



(a)



(b)



Centurion
UNIVERSITY

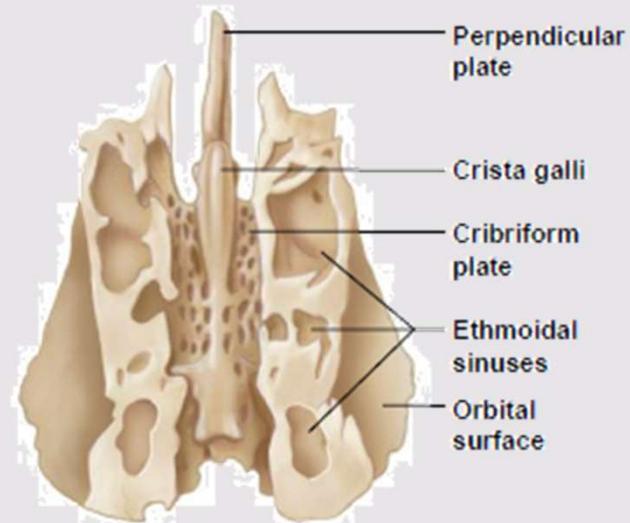
*Shaping Lives...
Empowering Communities...*

(6) Ethmoid Bone (1)

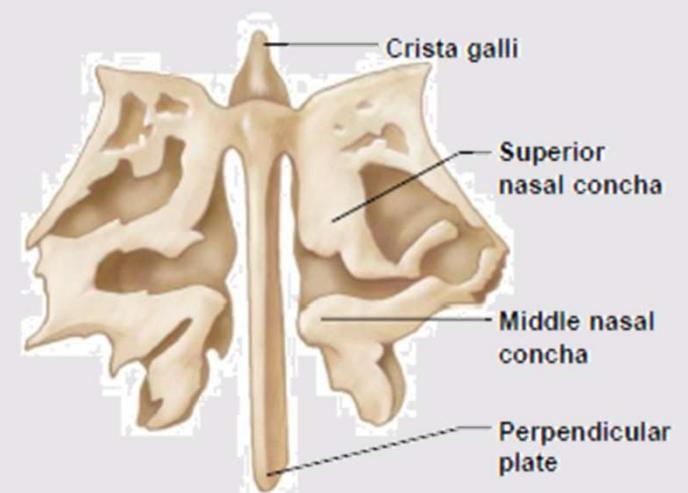
- Roof and walls of nasal cavity
- Floor of cranium
- Wall of orbits
- Cribriform plates
- Perpendicular plate
- Superior and middle nasal conchae
- Ethmoid sinuses
- Crista galli



Transverse section



(a)



(b)

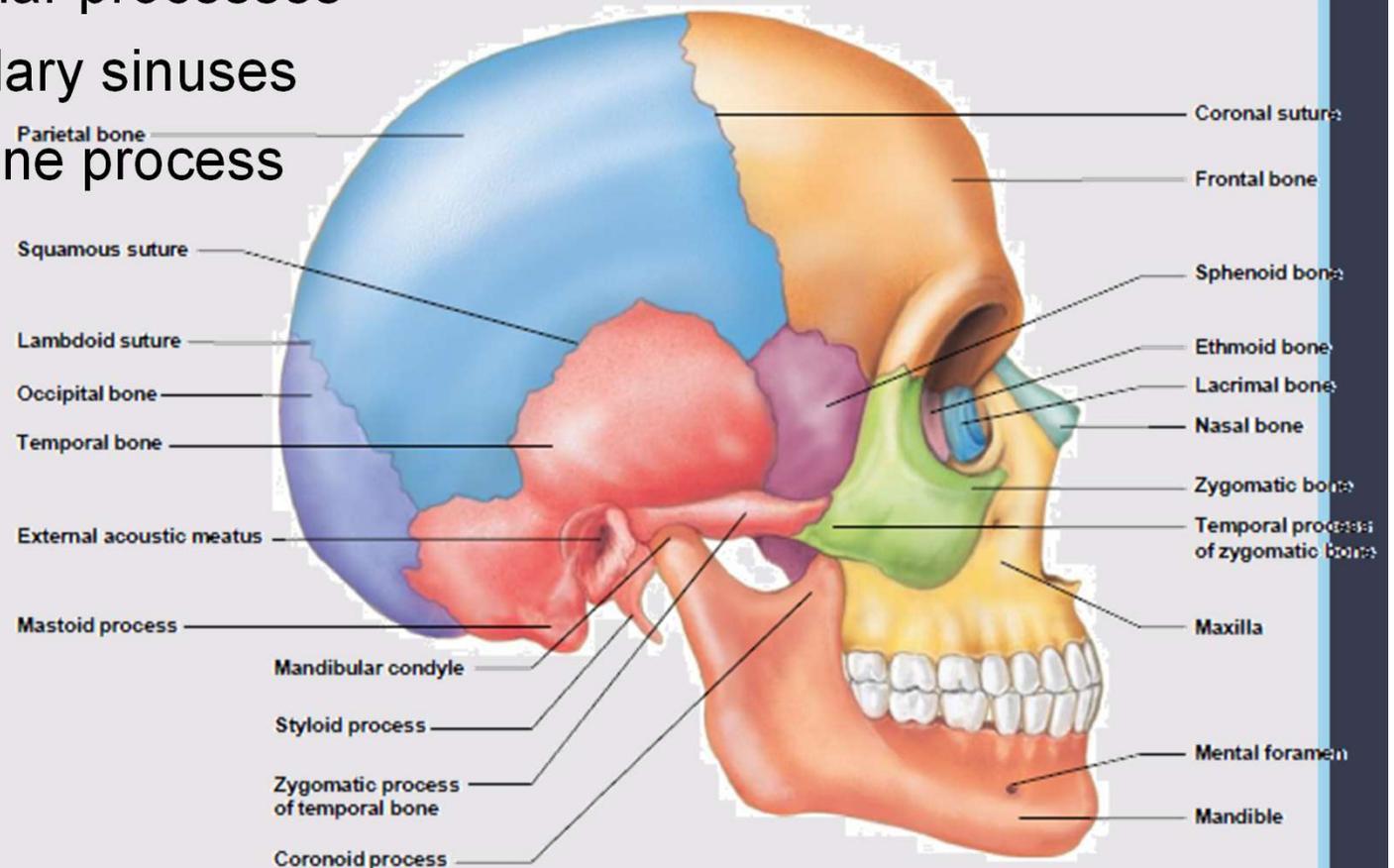


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

(7)Maxillary Bones (2)

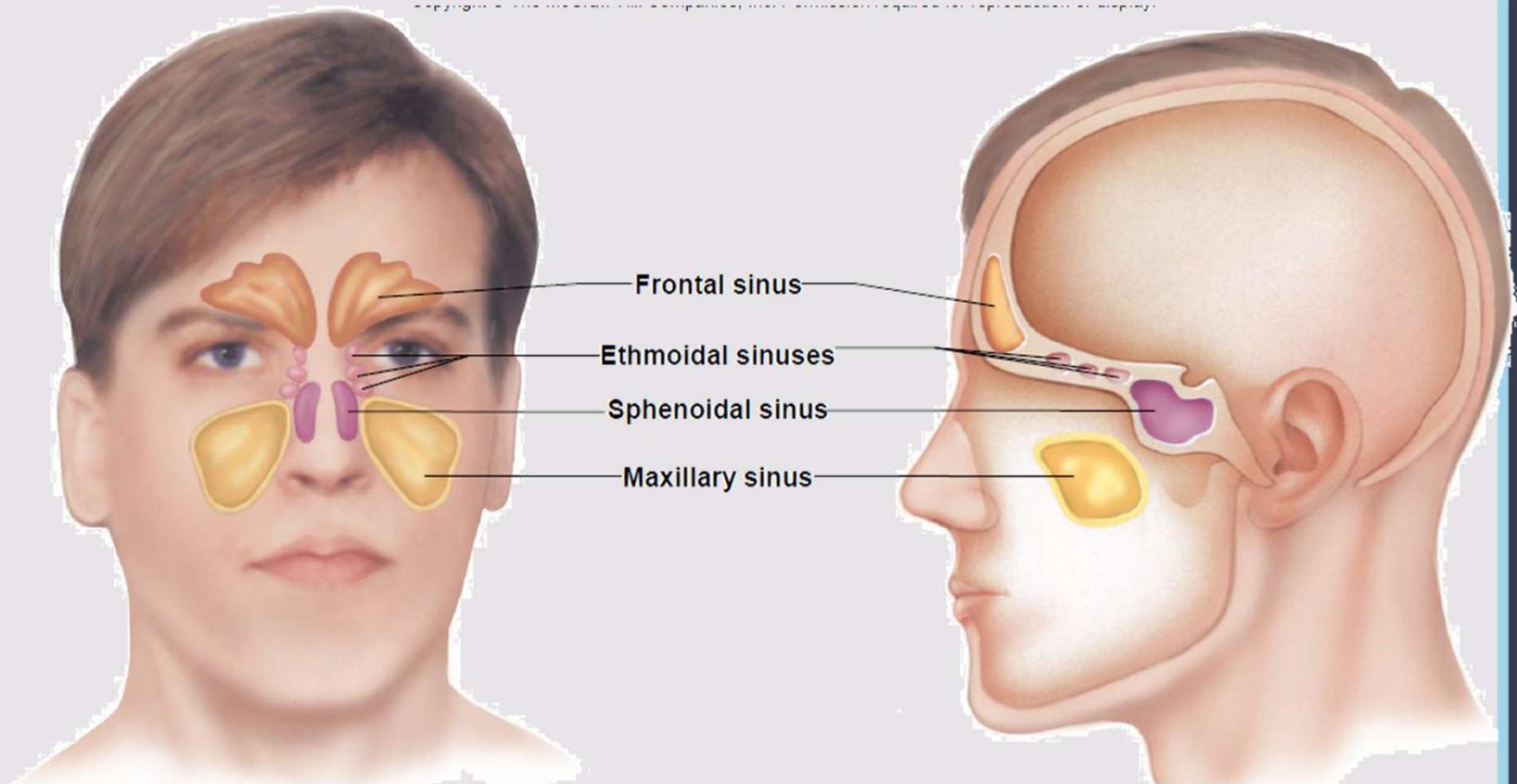
- Upper jaw
- Anterior roof of mouth
- Floors of orbits
- Sides of nasal cavity
- Floors of nasal cavity
- Alveolar processes
- Maxillary sinuses
- Palatine process





Centurion
UNIVERSITY
*Shaping Lives...
Empowering Communities...*

FACIAL SKELETON





Centurion
UNIVERSITY

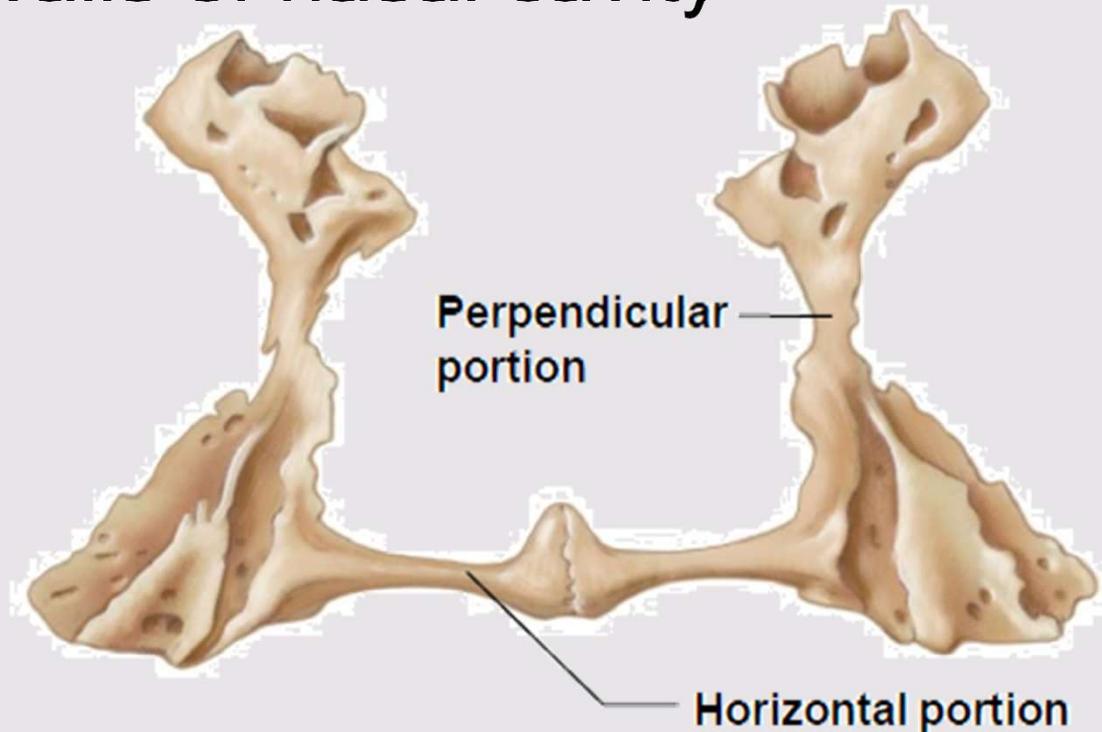
*Shaping Lives...
Empowering Communities...*

Palatine Bones (2)

- 'L' shaped bones located behind the maxillae
- Posterior section of hard palate
- Floor of nasal cavity
- Lateral walls of nasal cavity



Coronal section

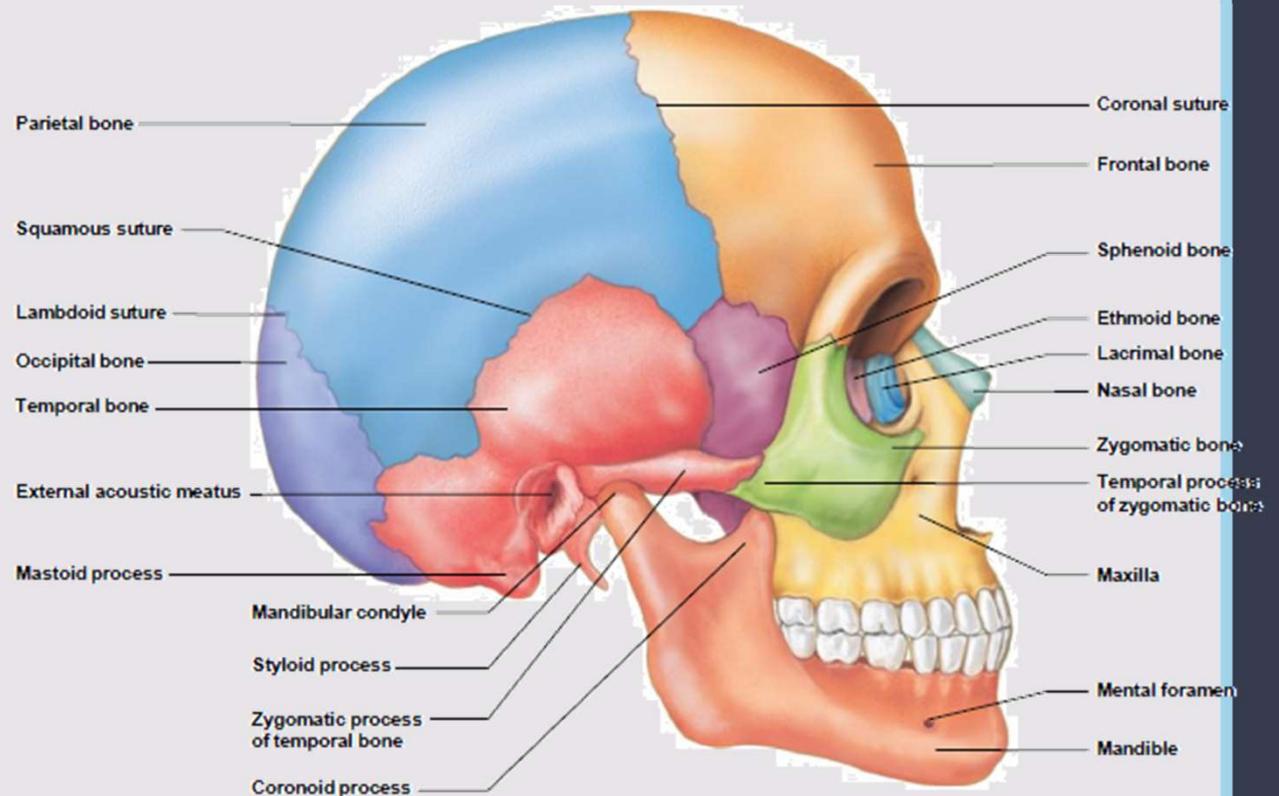




Centurion
UNIVERSITY
*Shaping Lives...
Empowering Communities...*

Zygomatic Bones (2)

- Prominences of cheeks
- Lateral walls of orbits
- Floors of orbits
- Temporal process





**Centurion
UNIVERSITY**

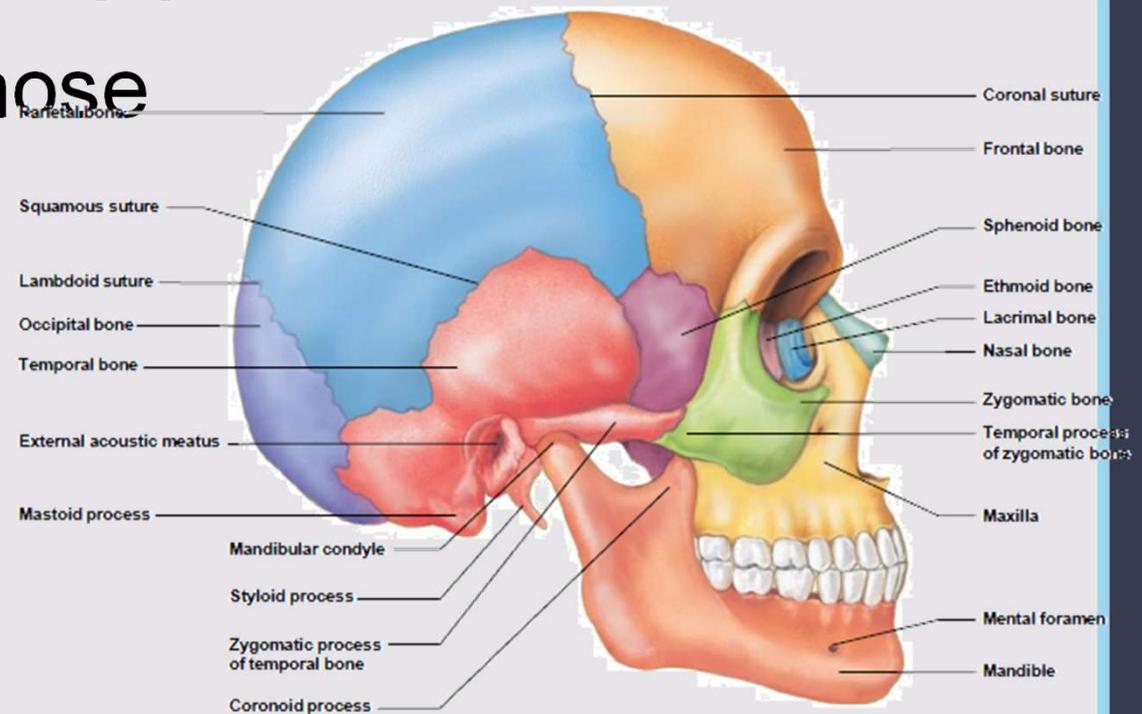
*Shaping Lives...
Empowering Communities...*

Lacrimal Bones (2)

- Medial walls of orbits
- Groove from orbit to nasal cavity

Nasal Bones (2)

- Bridge of nose





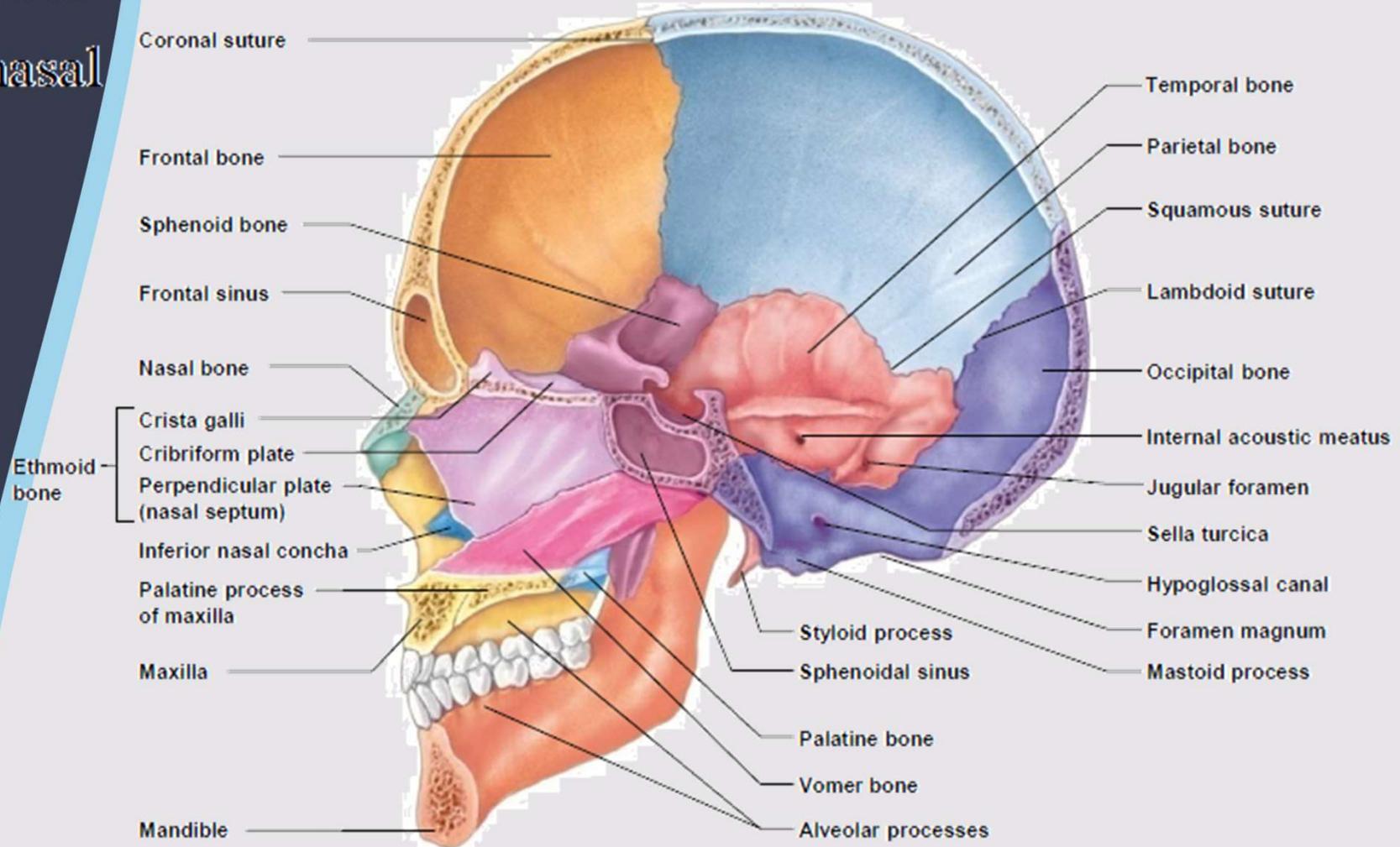
Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

of nasal

Vomer Bone (1)

- Inferior portion of nasal septum



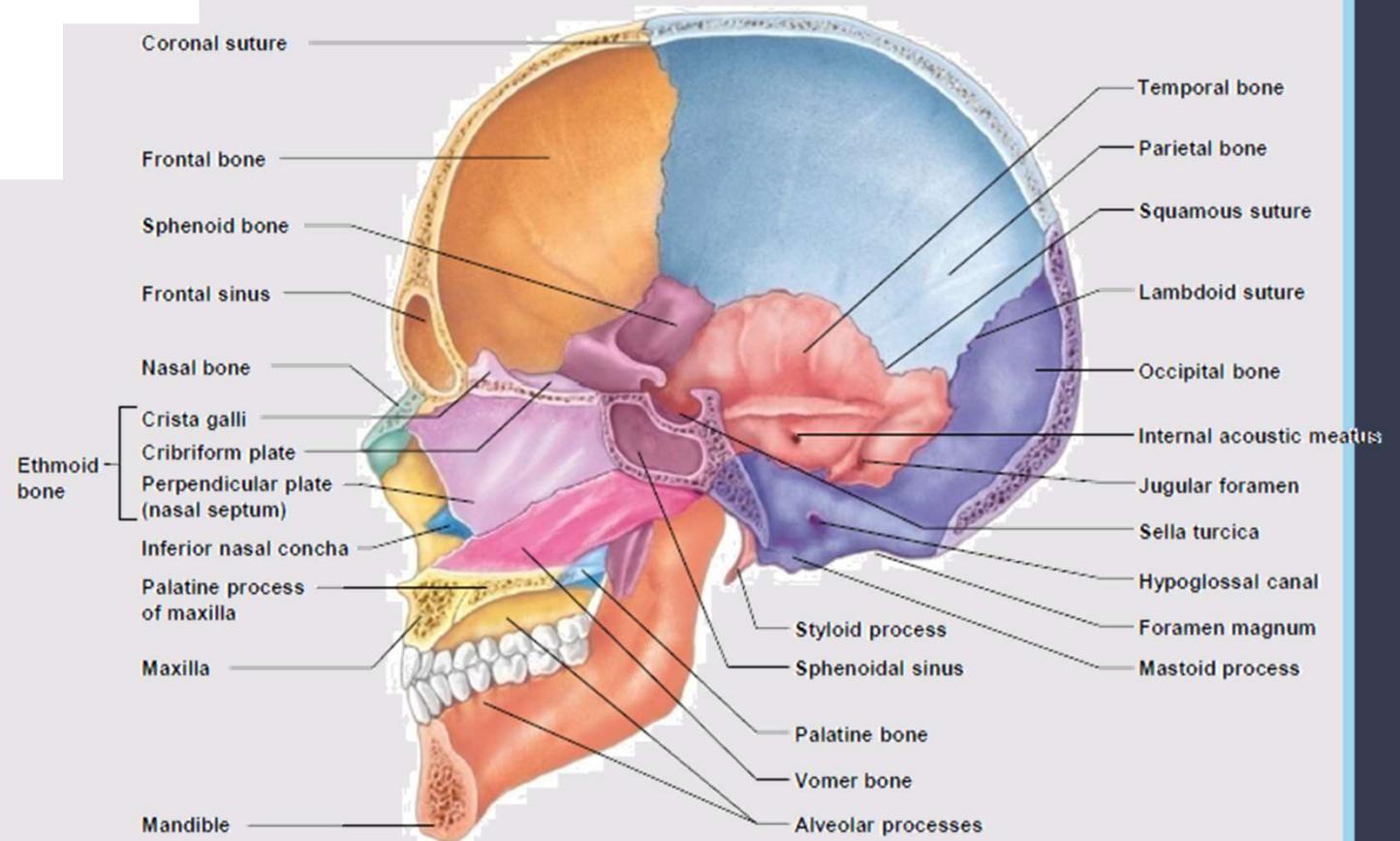


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Inferior Nasal Conchae (2)

- Extend from lateral walls of nasal cavity



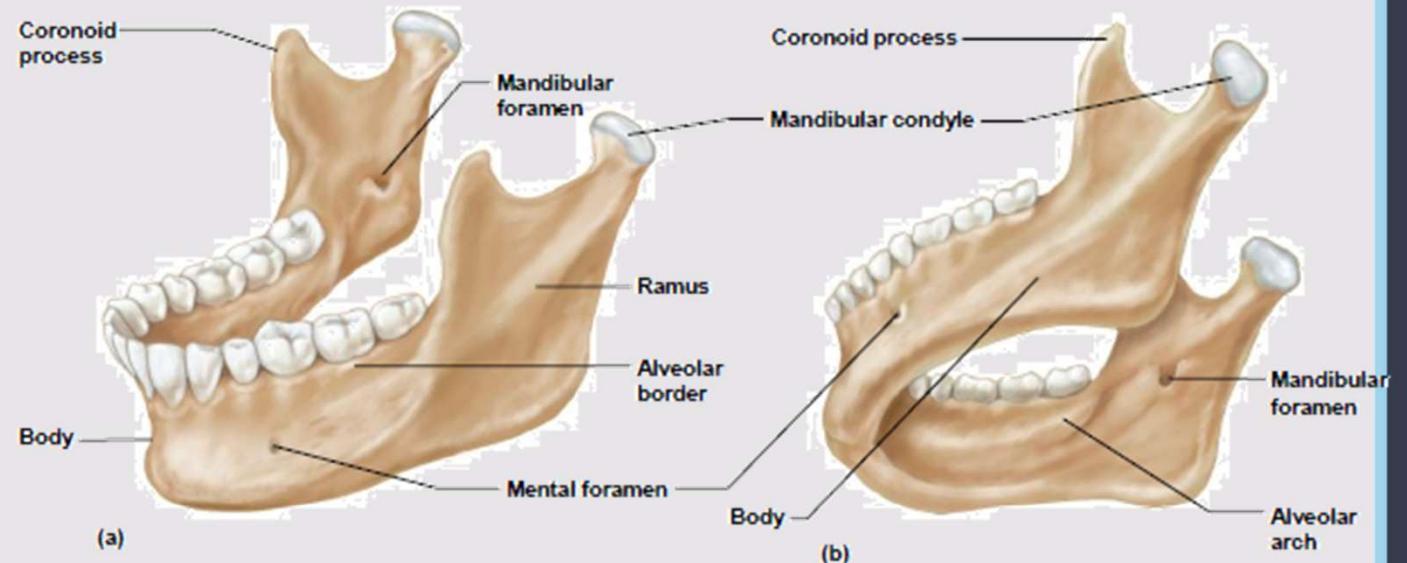


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Mandible Bone (1)

- Lower jaw
- Body
- Ramus
- Mandibular condyle
- Coronoid process
- Alveolar process
- Mandibular foramen
- Mental foramen





Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

Vertebral Column

The vertebral column, or spinal column, consists of many vertebrae separated by cartilaginous intervertebral discs.



Centurion
UNIVERSITY

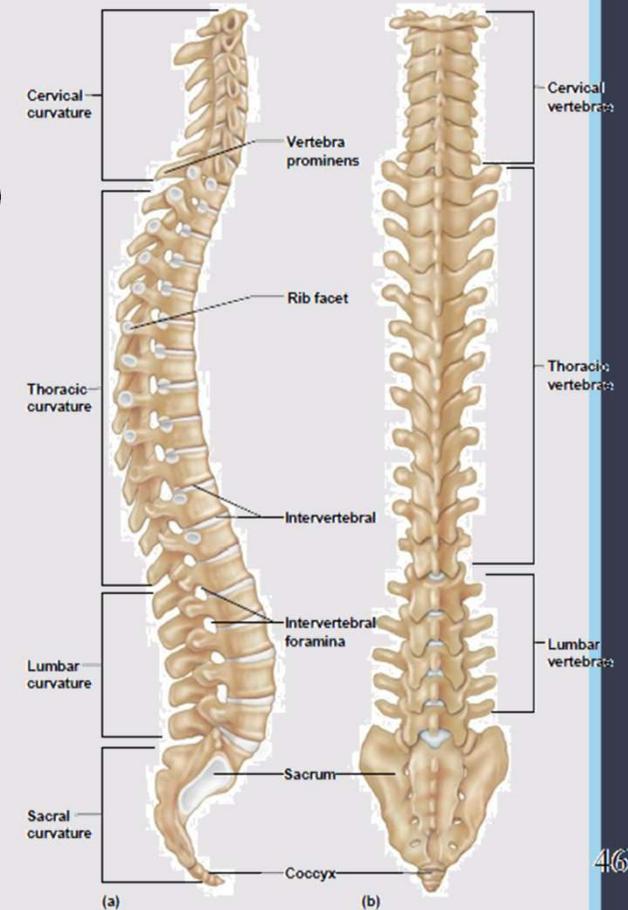
*Shaping Lives...
Empowering Communities...*

- Cervical vertebrae (7)
- Thoracic vertebrae (12)
- Lumbar vertebrae (5)
- Sacral (4-5 fused segments)

Sacrum is fused bone

- Coccygeal (3-4 fused segments)

Coccyx is fused bone

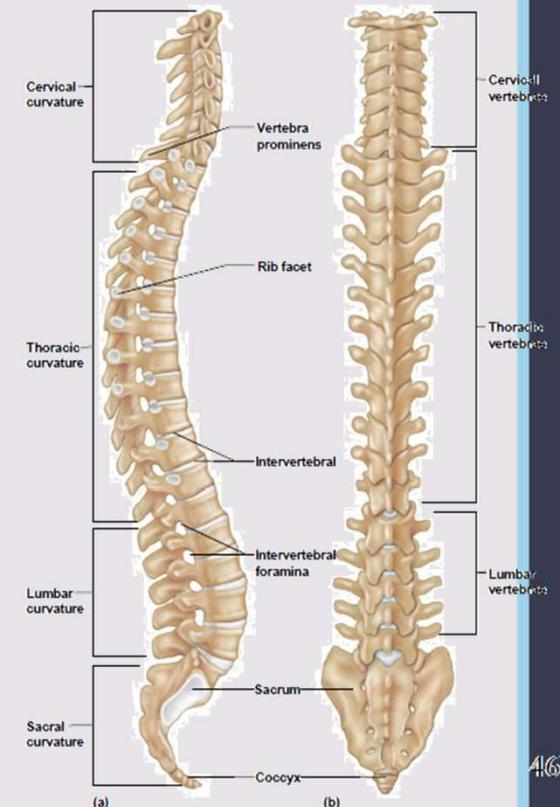




Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

- Cervical curvature
- Thoracic curvature
- Lumbar curvature
- Sacral curvature
- Rib facets
- Vertebral prominens
- Intervertebral discs (IVD)
- Intervertebral foramina (IVF)



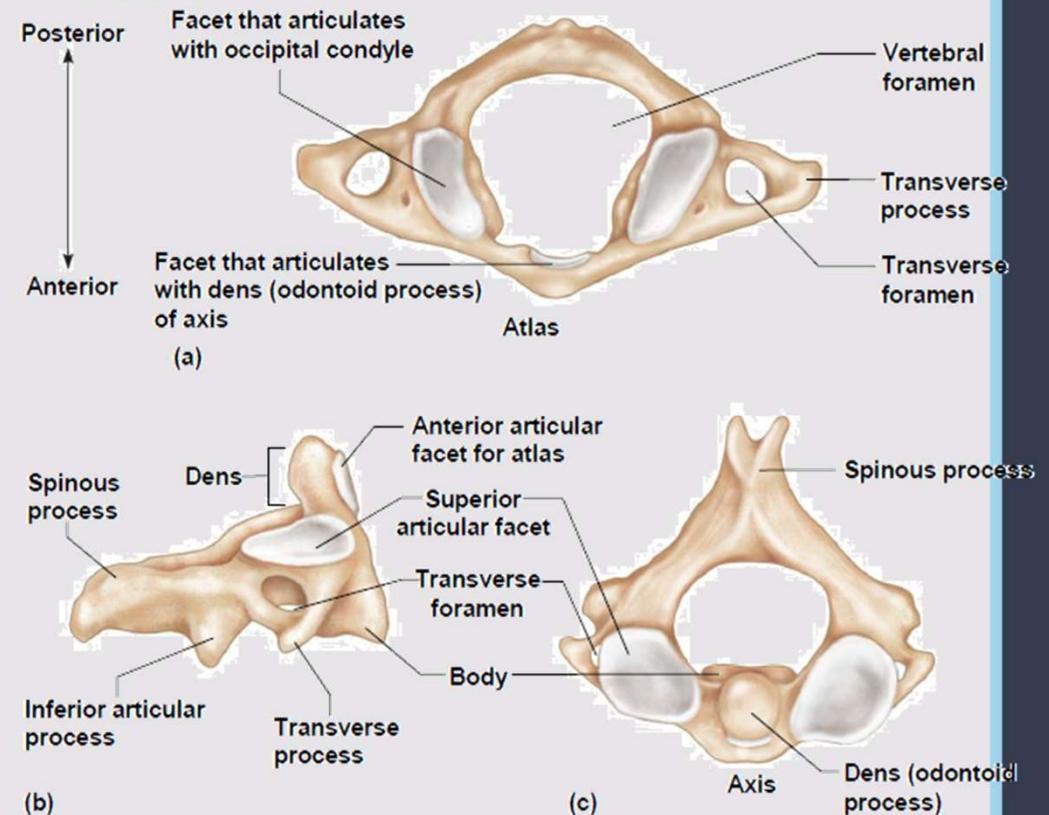


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Cervical Vertebrae

- Atlas – 1st; supports head
- Axis – 2nd; dens pivots to turn head
- Transverse foramina
- Bifid spinous processes
- Vertebral prominens – useful landmark





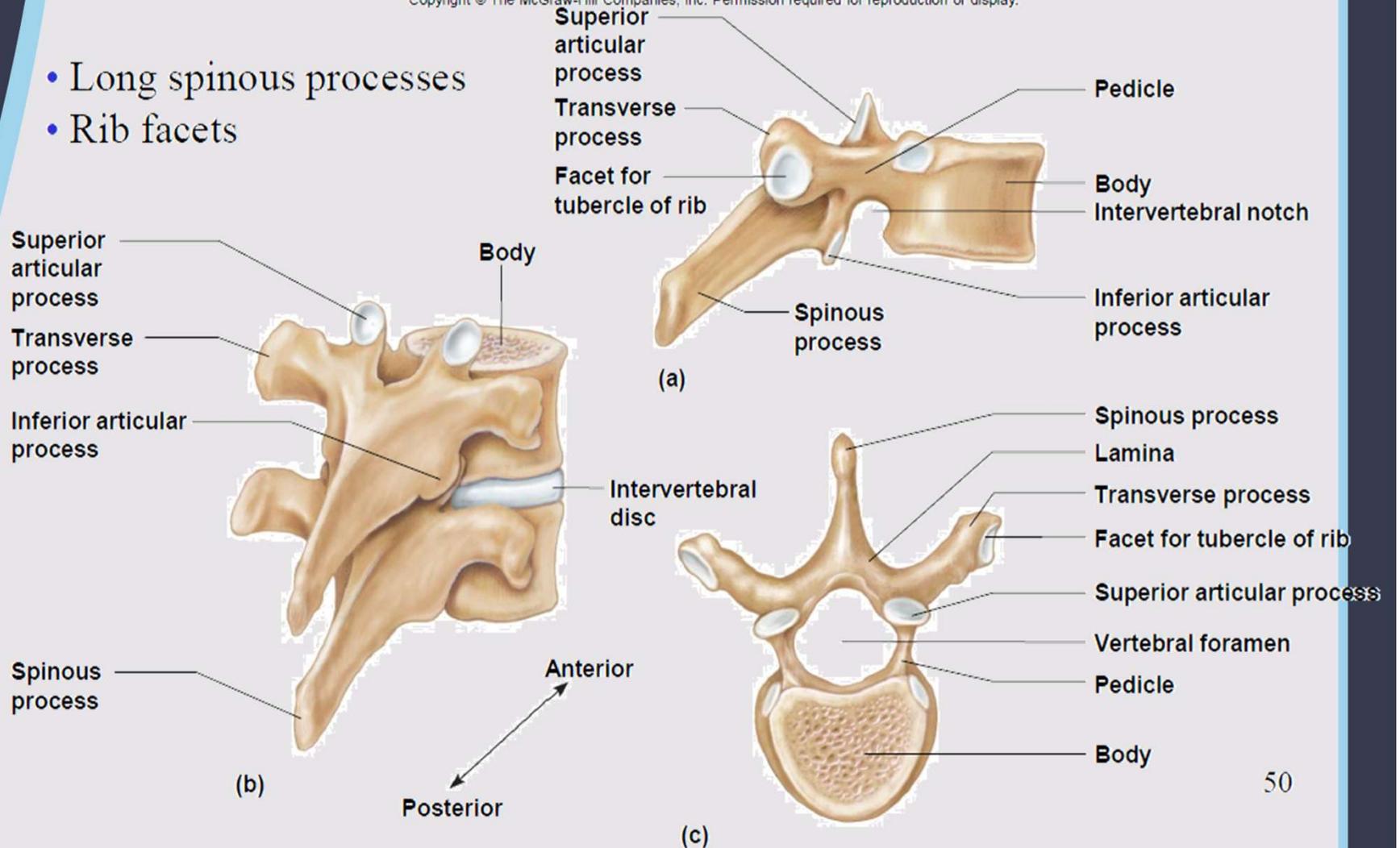
**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

Thoracic Vertebrae

- Long spinous processes
- Rib facets

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



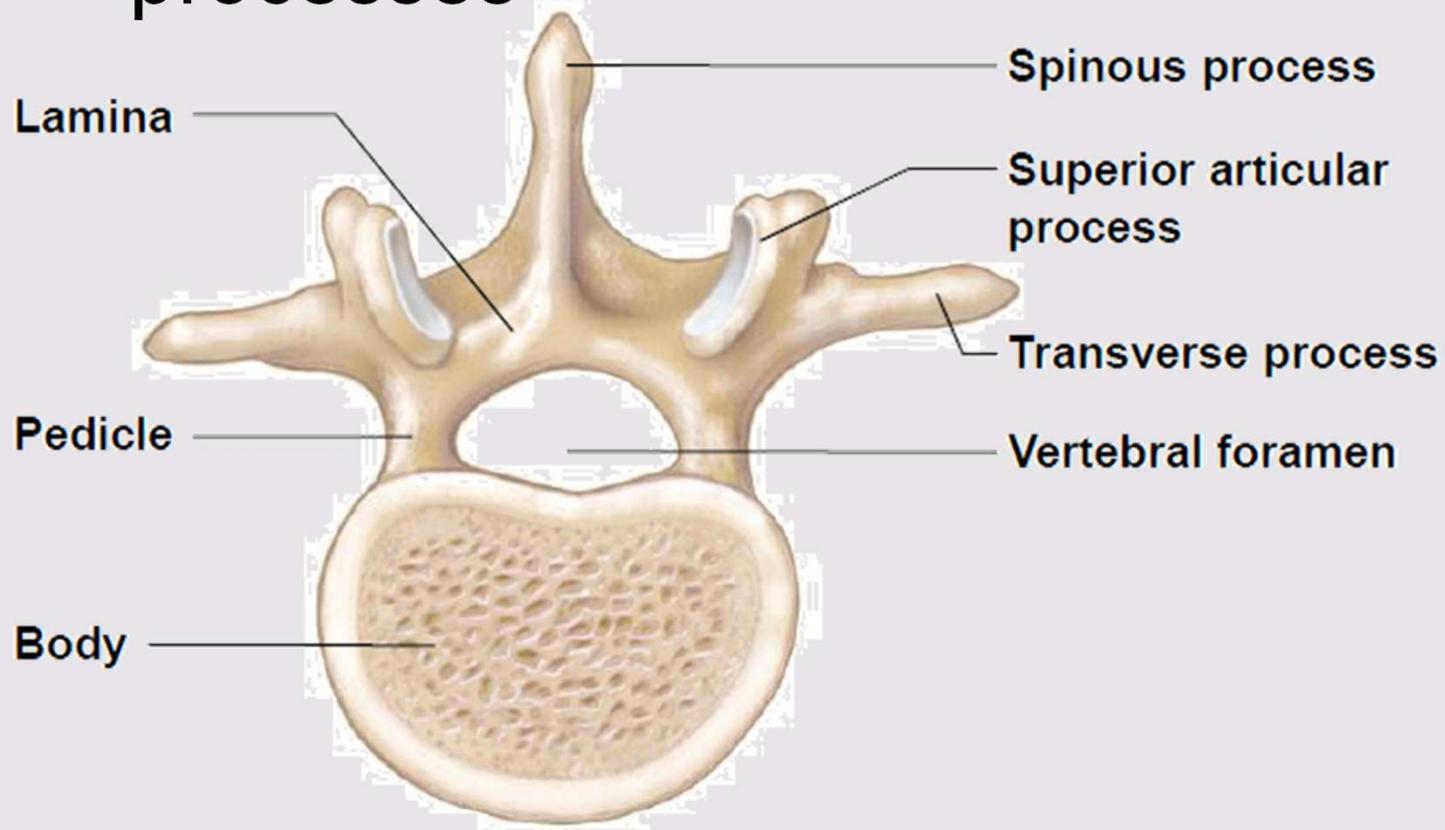


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Lumbar Vertebrae

- Large bodies
- Thick, short spinous processes



(c) Lumbar vertebra

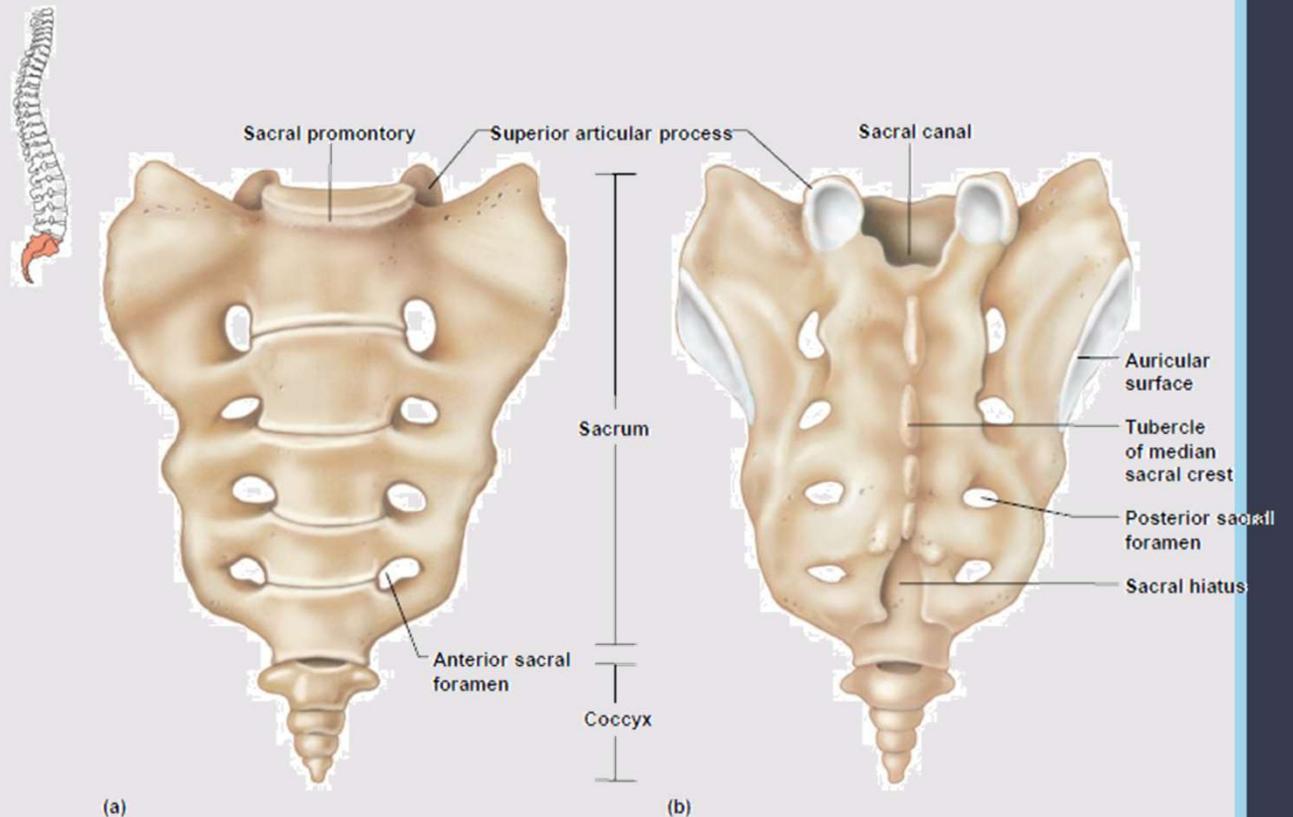


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Sacrum

- 4-5 fused segments
- Median sacral crest
- Posterior sacral foramina
- Sacral promontory aka base
- Area toward coccyx is the apex



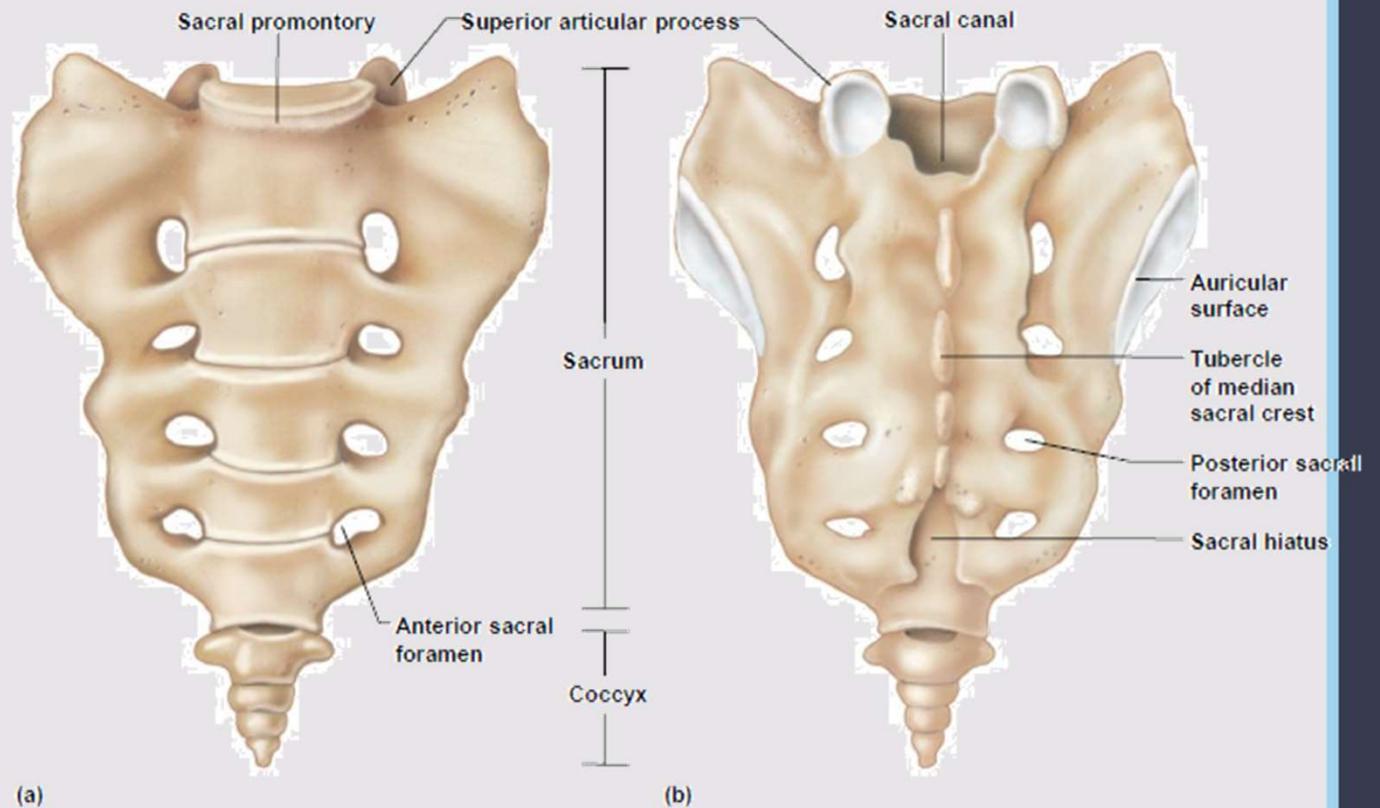


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Coccyx

- Aka tailbone
- 3-4 fused segments





Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

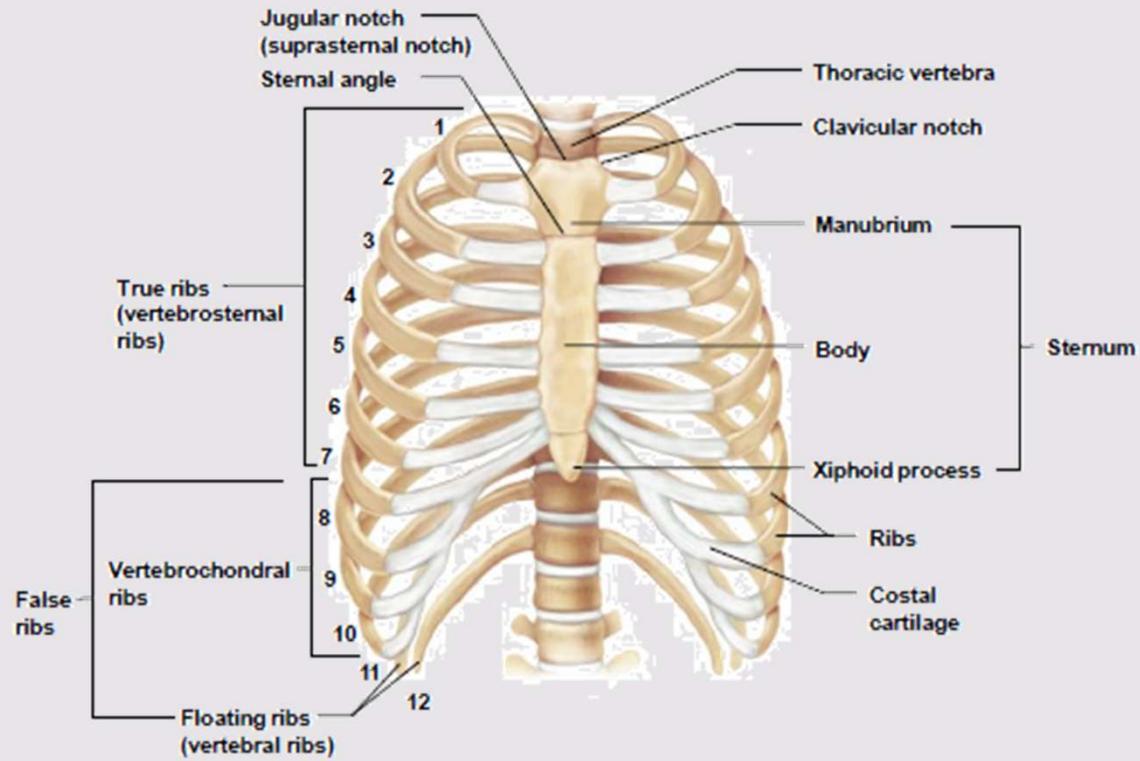
Thoracic Cage

- The thoracic cage includes the ribs, the thoracic vertebrae, the sternum, and the costal cartilages that attach the ribs to the sternum.
- Ribs (12)
- Sternum
- Thoracic vertebrae (12)
- Costal cartilages
- Supports shoulder girdle and upper limbs
- Protects viscera
- Role in breathing

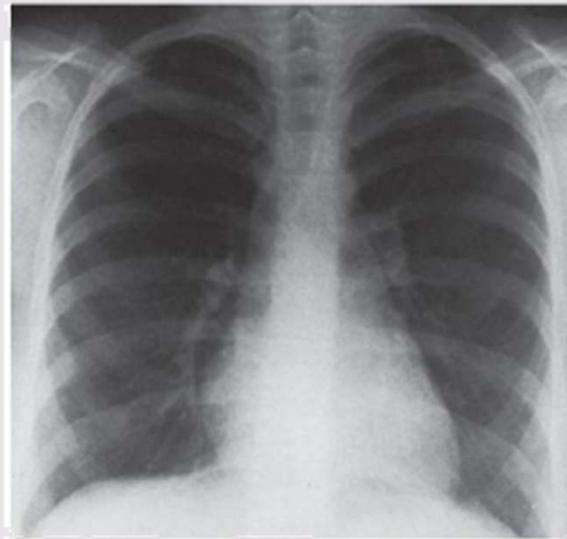


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*



(a)



(b)

© Victor B. Eichler, PhD

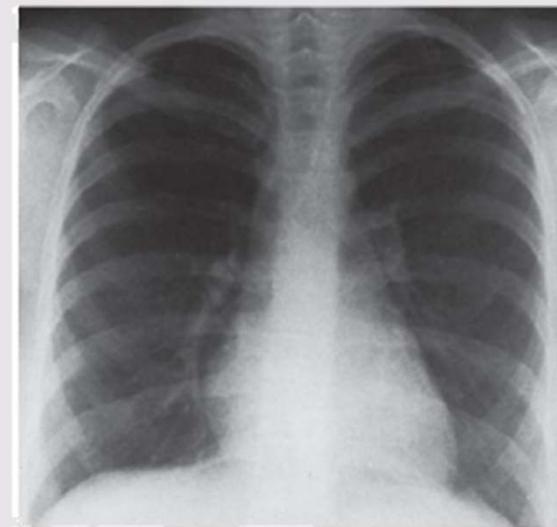
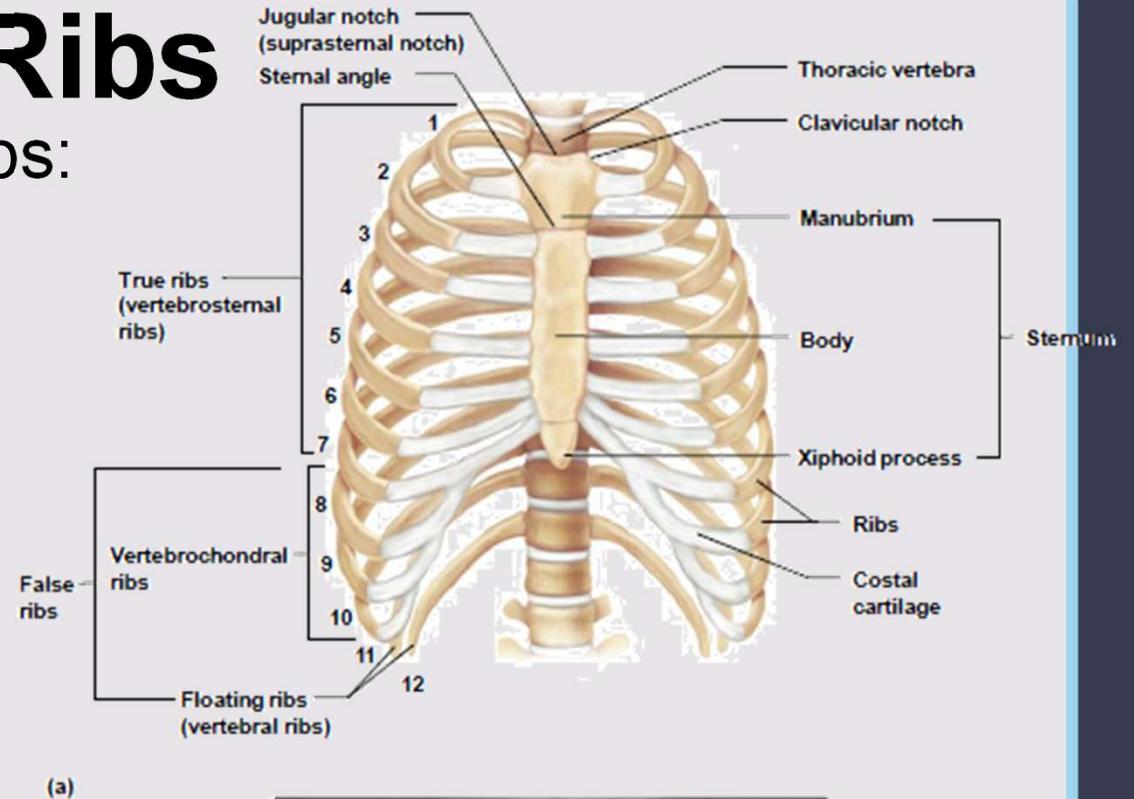


Centurion UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Ribs

- Humans have 12 pairs of ribs:
- True ribs (7)
- False ribs (5), of which:
- Floating (2)
- There are some anomalies:
- Cervical ribs
- Lumbar ribs



(b)

b: © Victor B. Eichler, PhD

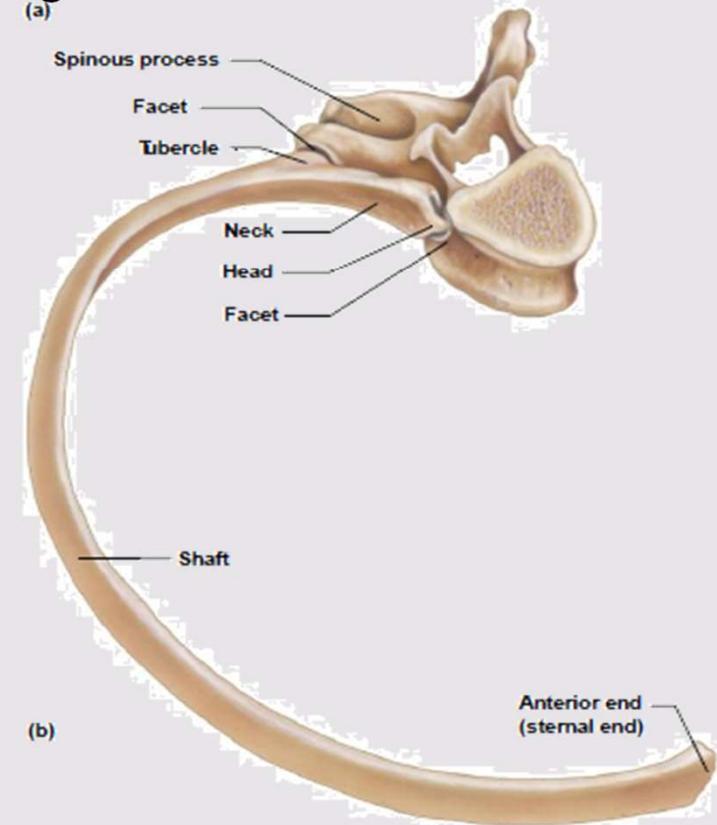


**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

Rib Structure

- Shaft
- Head – posterior end; articulates with vertebrae
- Tubercle – articulates with vertebrae
- Costal cartilage – hyaline cartilage



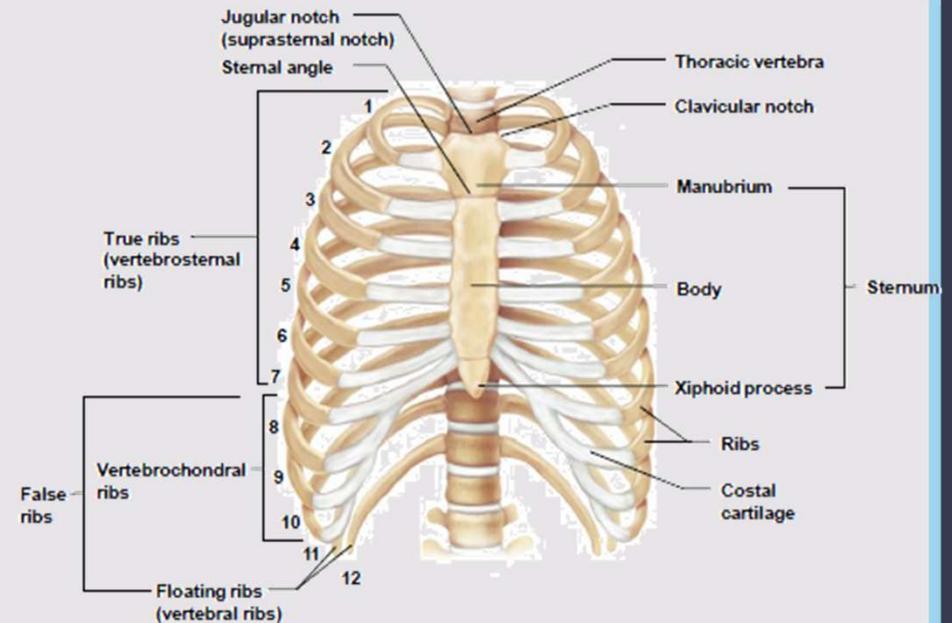


**Centurion
UNIVERSITY**

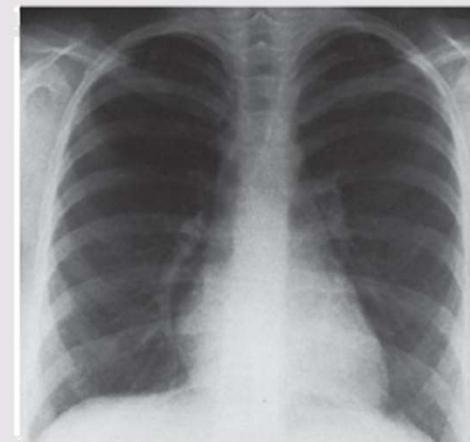
*Shaping Lives...
Empowering Communities...*

Sternum

- Three (3) parts of the sternum:
- Manubrium
- Body
- Xiphoid process



(a)



(b)

b: © Victor B. Eichler, PhD

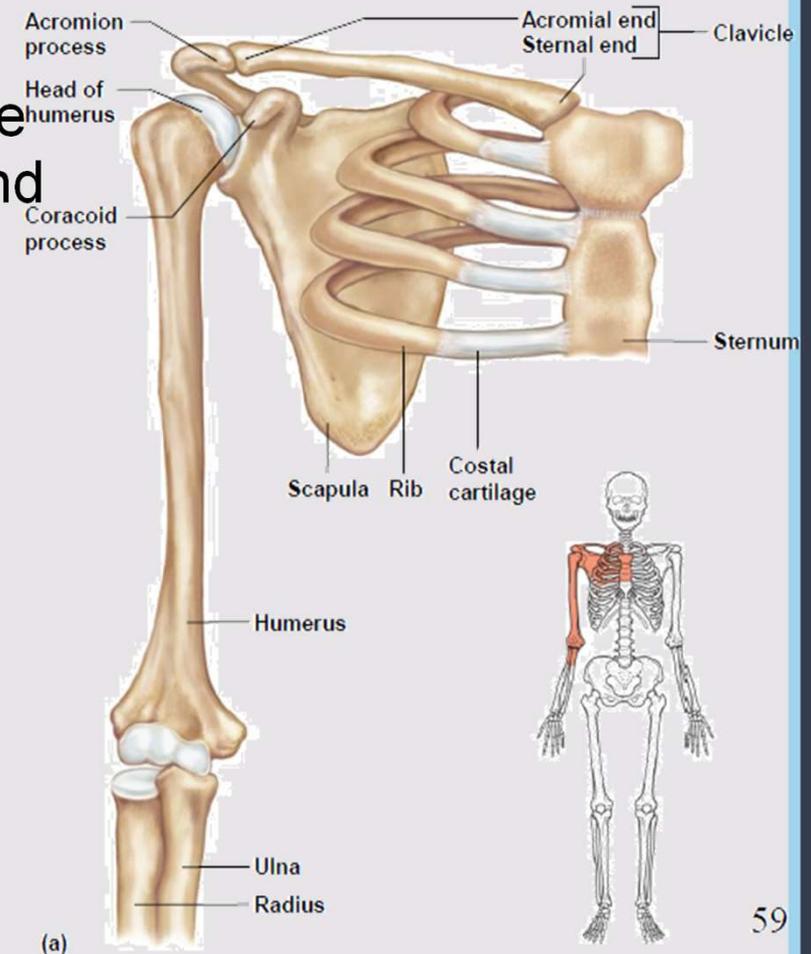


**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

Pectoral Girdle

- Also known as the shoulder girdle
- Clavicles
- Scapulae
- Supports upper limbs
- True shoulder joint is simply the articulation of the humerus and scapula

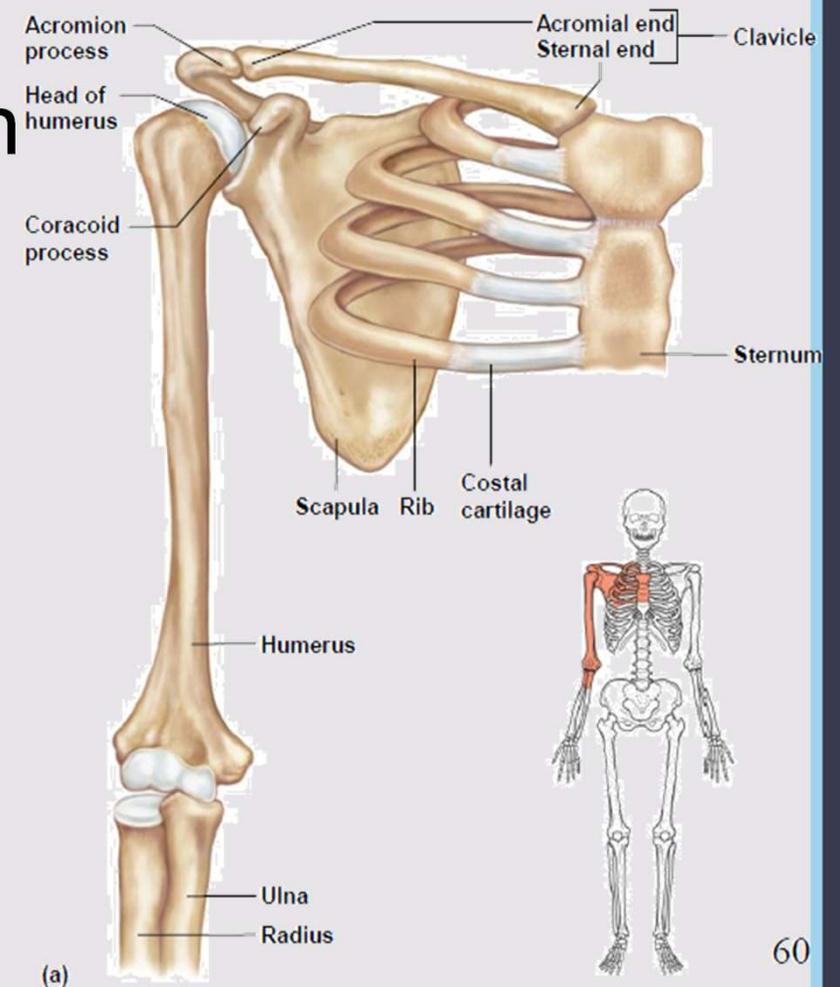




Centurion
UNIVERSITY
*Shaping Lives...
Empowering Communities...*

Clavicles

- Articulate with manubrium
- Articulate with scapulae (acromion process)
- A-C joint



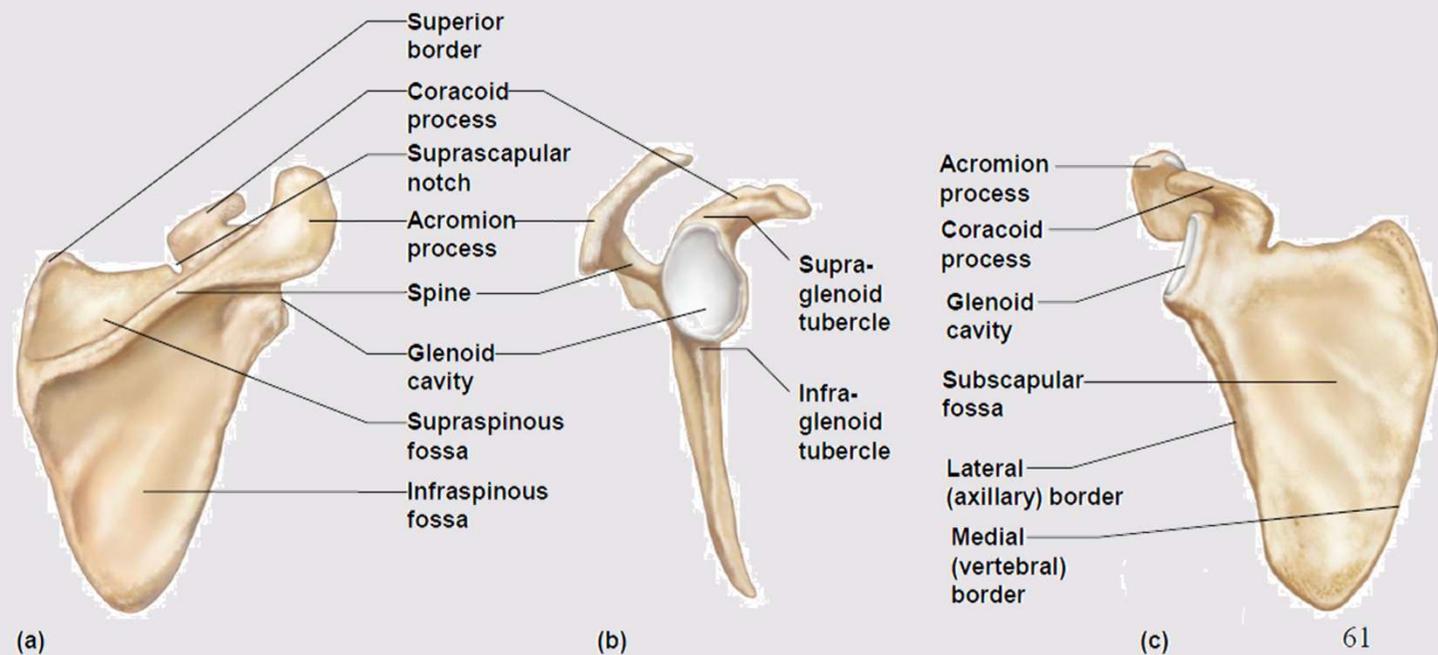


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Scapulae

- Spine
- Suprascapular fossa
- Infraspinous fossa
- Acromion process
- Coracoid process
- Glenoid fossa or cavity

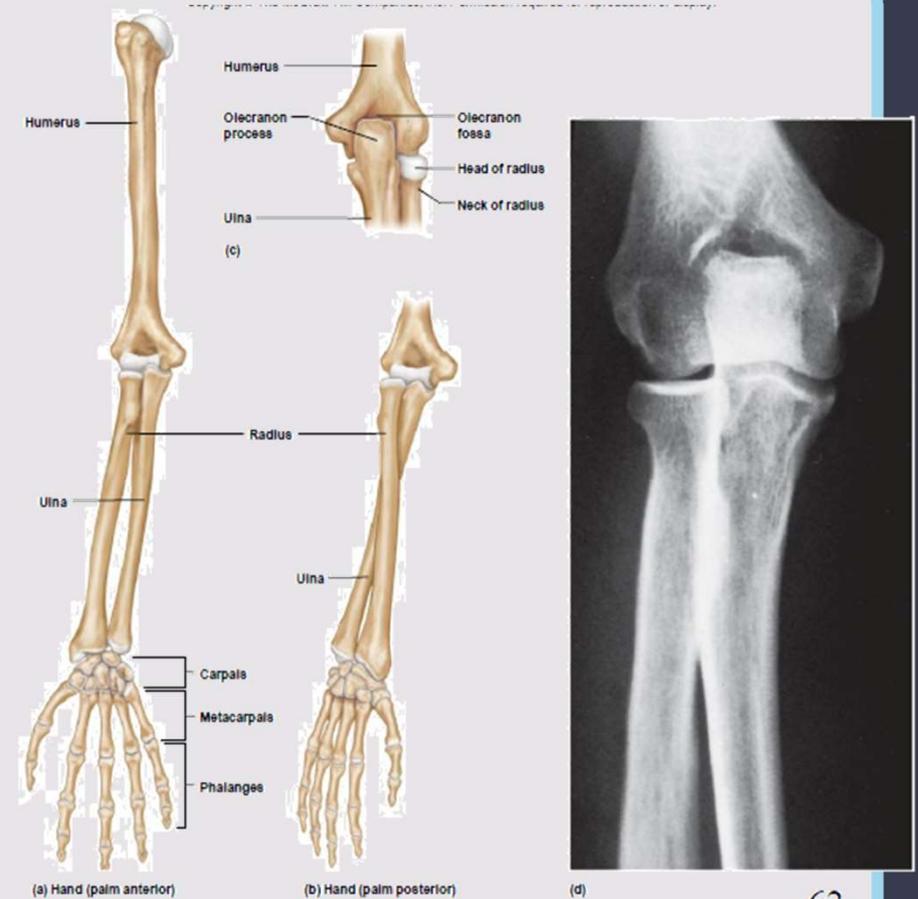




Centurion
UNIVERSITY
*Shaping Lives...
Empowering Communities...*

Upper Limb

- Humerus
- Radius
- Ulna (Interosseous membrane)
- Carpals
- Metacarpals
- Phalanges



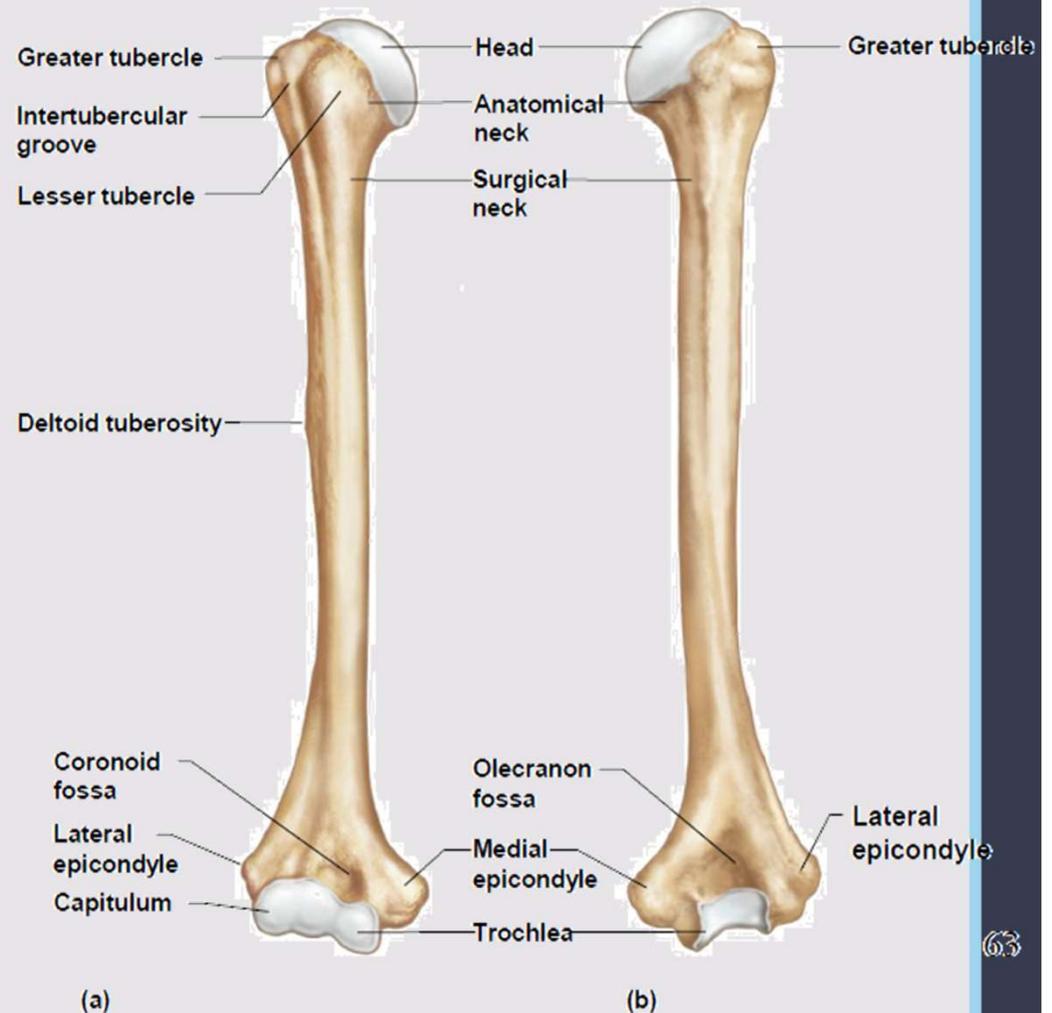


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Humerus

- Head
- Greater tubercle
- Lesser tubercle
- Anatomical neck
- Surgical neck
- Deltoid tuberosity
- Capitulum
- Trochlea
- Coronoid fossa
- Olecranon fossa



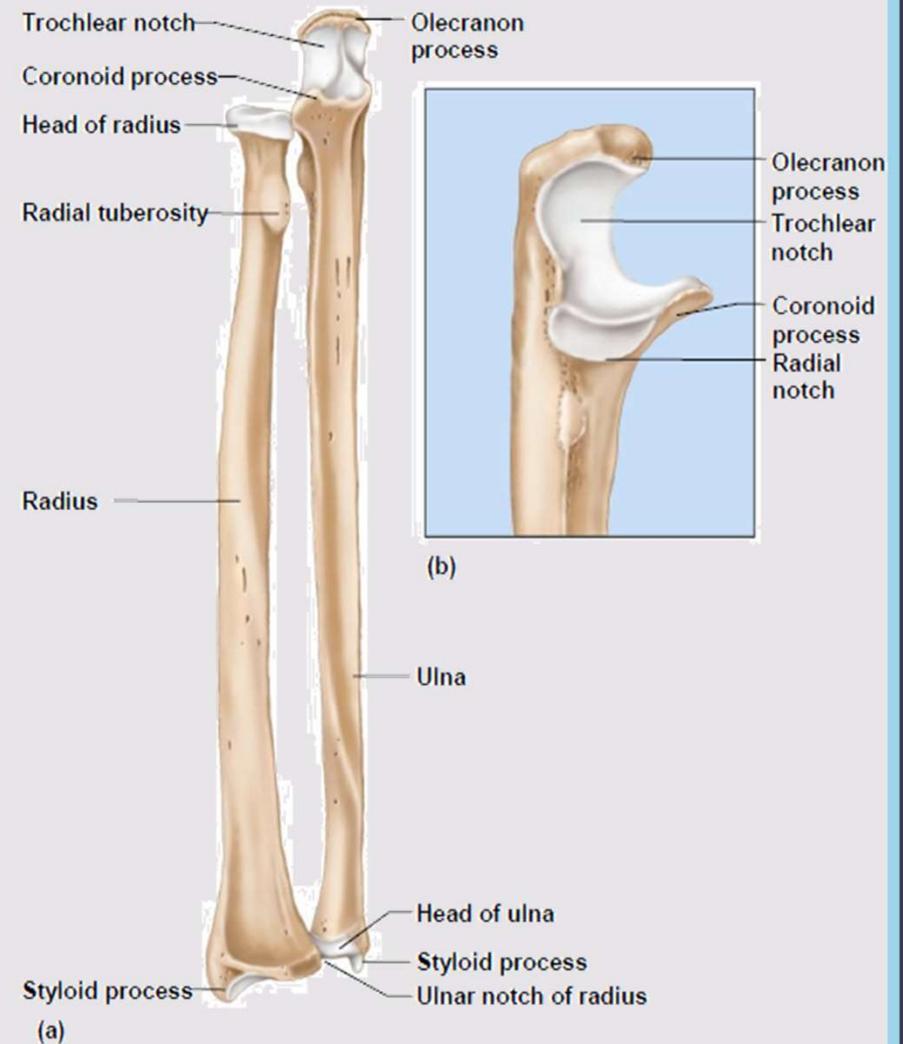


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Radius

- Lateral forearm bone
- Head
- Radial tuberosity
- Styloid process



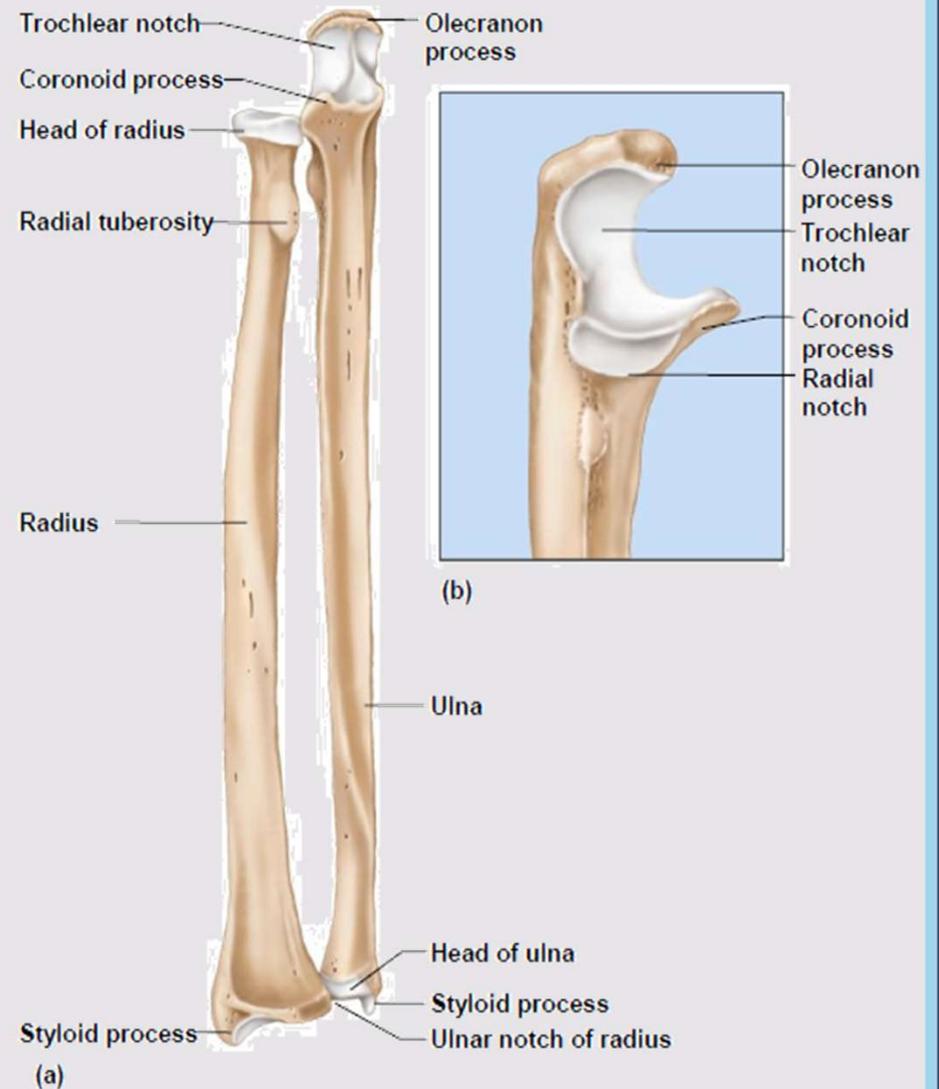


Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

Ulna

- Medial forearm bone
- Trochlear notch
- Olecranon process
- Coronoid process
- Styloid process



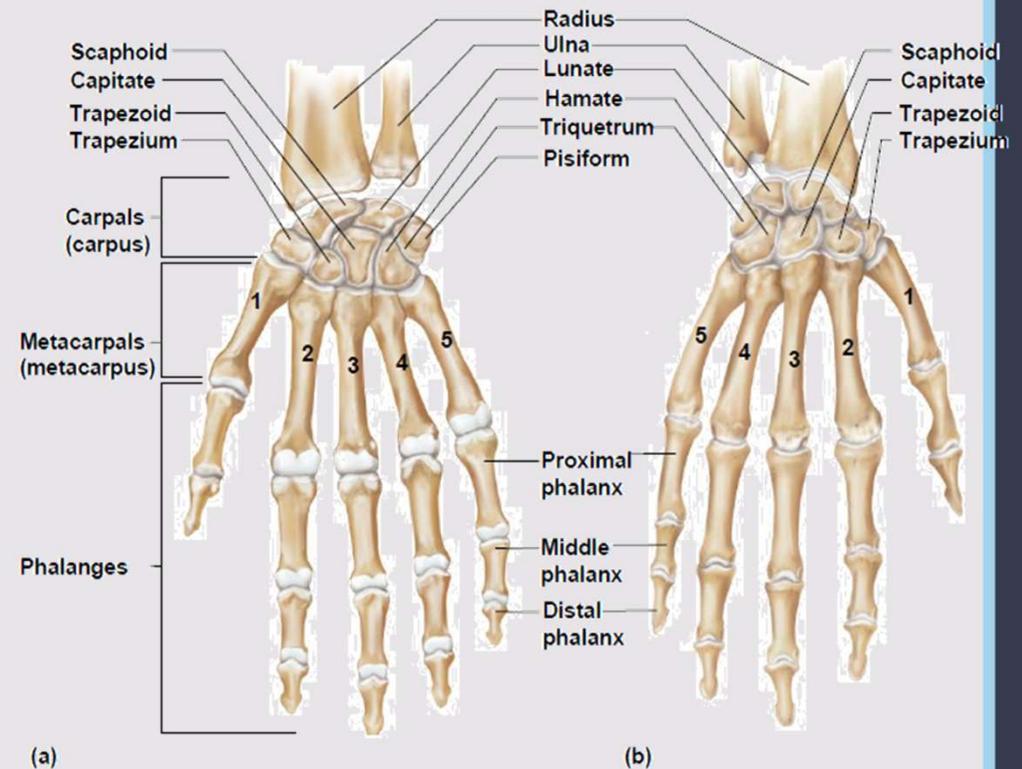


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Wrist and Hand

- Carpal Bones (16 total bones)
 - Scaphoid
 - Lunate
 - Triquetrum
 - Pisiform
 - Hamate
 - Capitate
 - Trapezoid
 - Trapezium
- Metacarpal Bones (10)
 - Phalangeal Bones (28)
 - Proximal phalanx
 - Middle phalanx
 - Distal phalanx



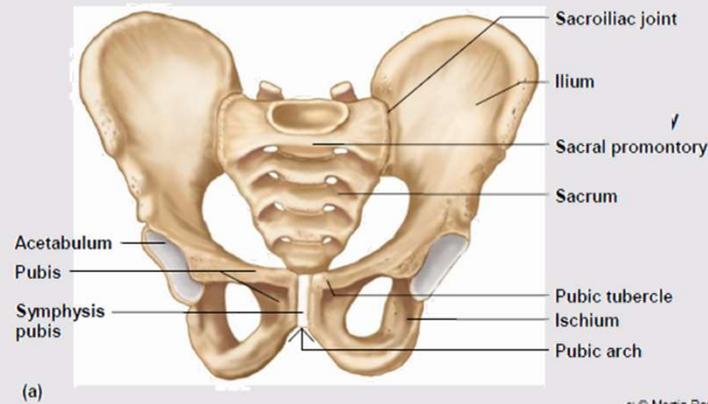
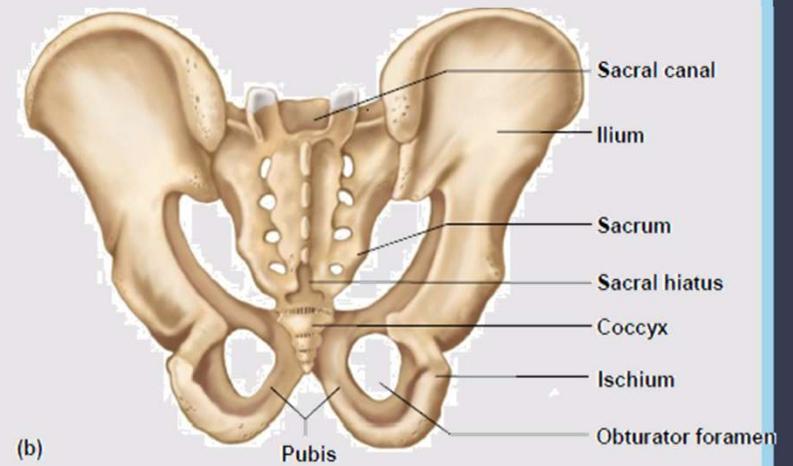


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Pelvic Girdle

- Coxal Bones (2)
- Supports trunk of body
- Protects viscera
- Forms pelvic cavity





Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Hip Bones

- Also known as the coxae:

- Acetabulum

- There are three (3) bones:

1. Ilium

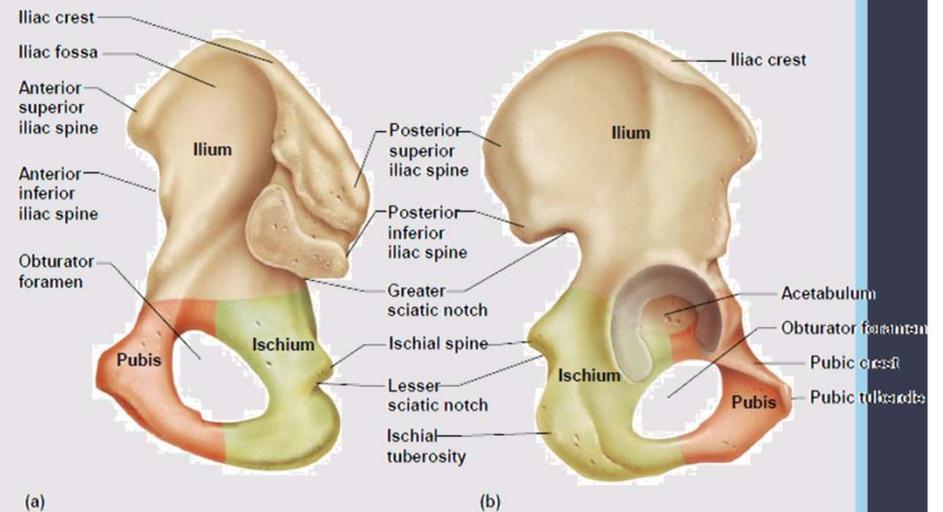
- Iliac crest
- Iliac spines
- Greater sciatic notch

2. Ischium

- Ischial spines
- Lesser sciatic notch
- Ischial tuberosity

3. Pubis

- Obturator foramen



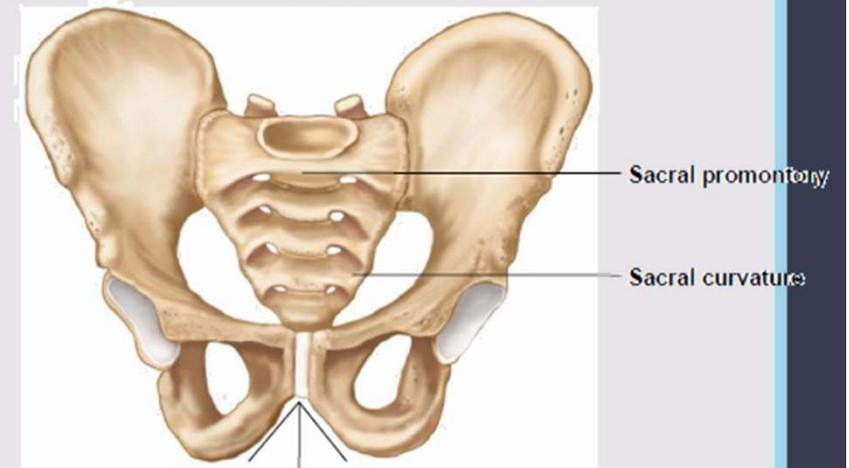
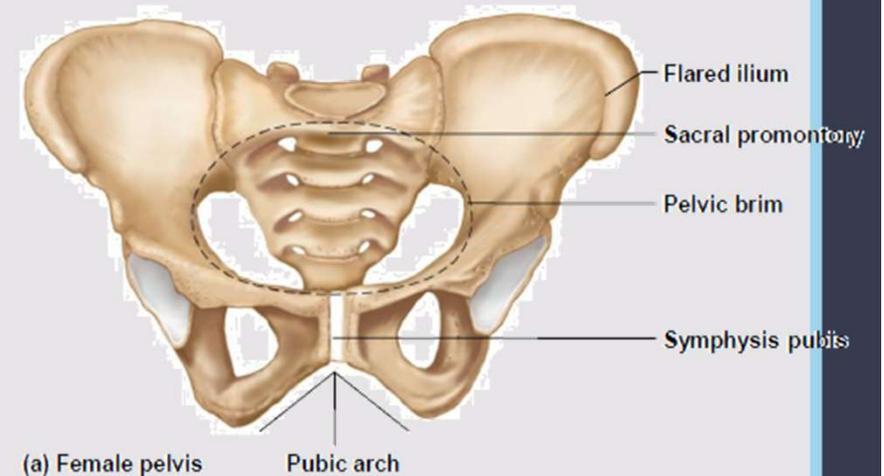


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Greater and Lesser Pelvis

- Greater Pelvis
 - Lumbar vertebrae posteriorly
 - Iliac bones laterally
 - Abdominal wall anteriorly
- Lesser Pelvis
 - Sacrum and coccyx posteriorly
 - Lower ilium, ischium, and pubic bones laterally and anteriorly



1

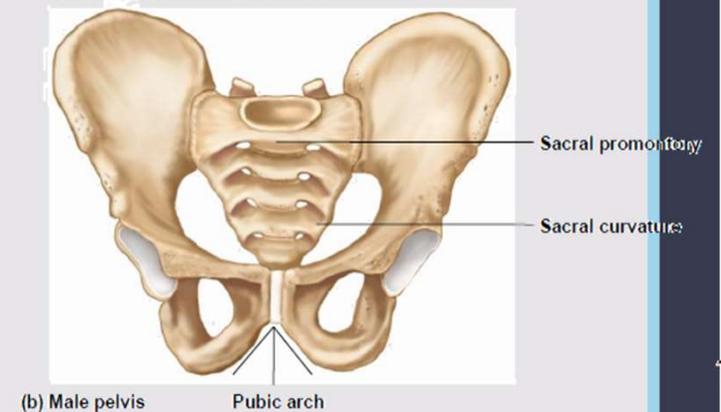
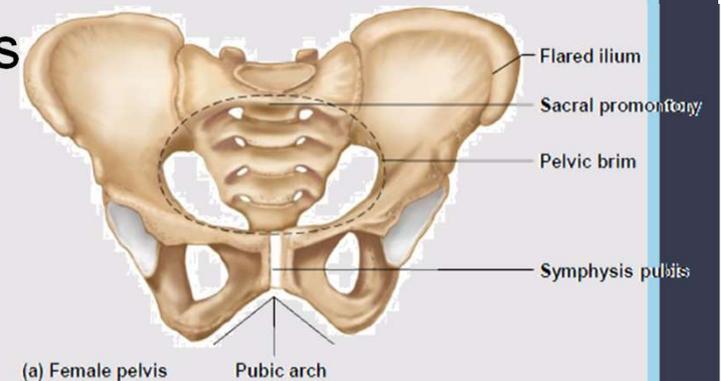


Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

Differences Between Male Female Pelvis

- Female pelvis
- Iliac bones more flared
- Broader hips
- Pubic arch angle greater
- More distance between ischial spines and ischial tuberosities
- Sacral curvature shorter and flatter
- Lighter bones
- Why?



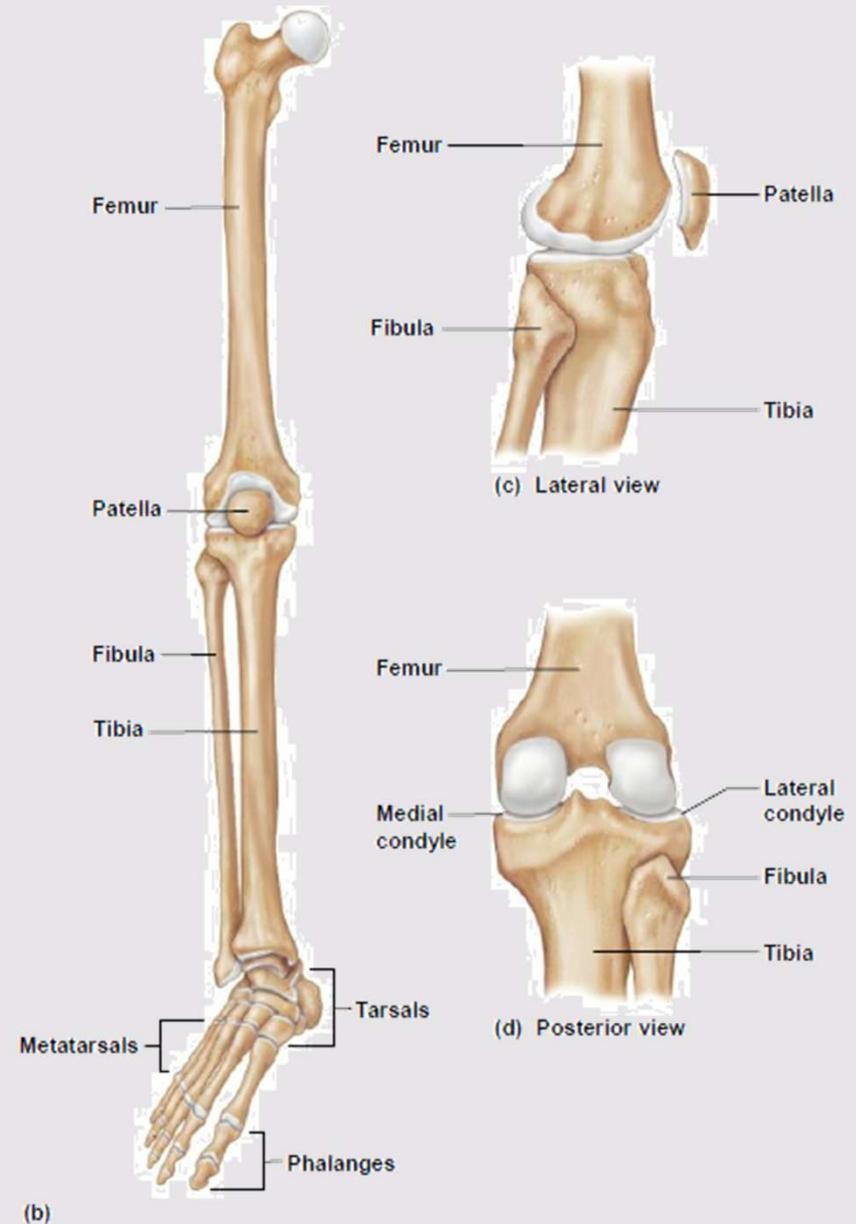


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Lower Limb

- Femur
- Patella
- Tibia
- Fibula
- Tarsals
- Metatarsals
- Phalanges





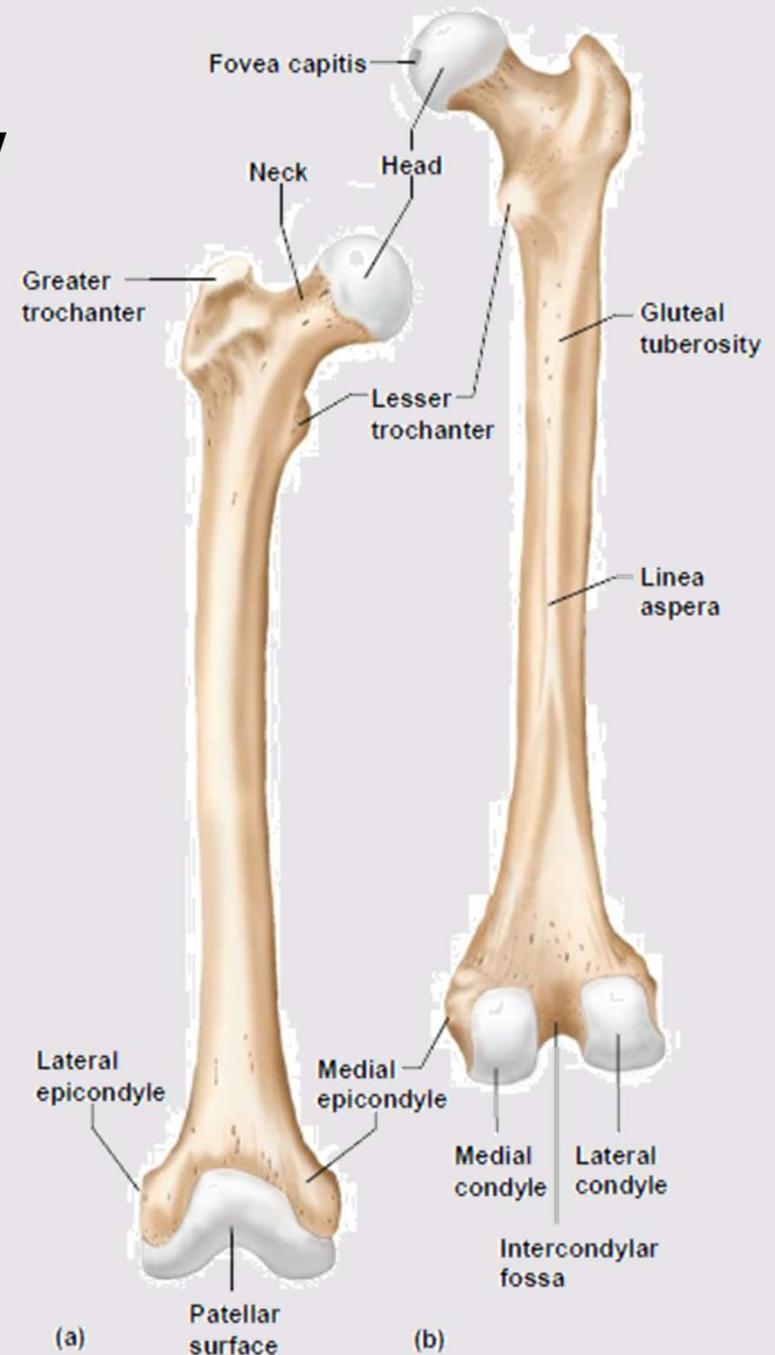
Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Femur

Longest bone of body

- Head
- Fovea capitis
- Neck
- Greater trochanter
- Lesser trochanter
- Linea aspera
- Condyles
- Epicondyles





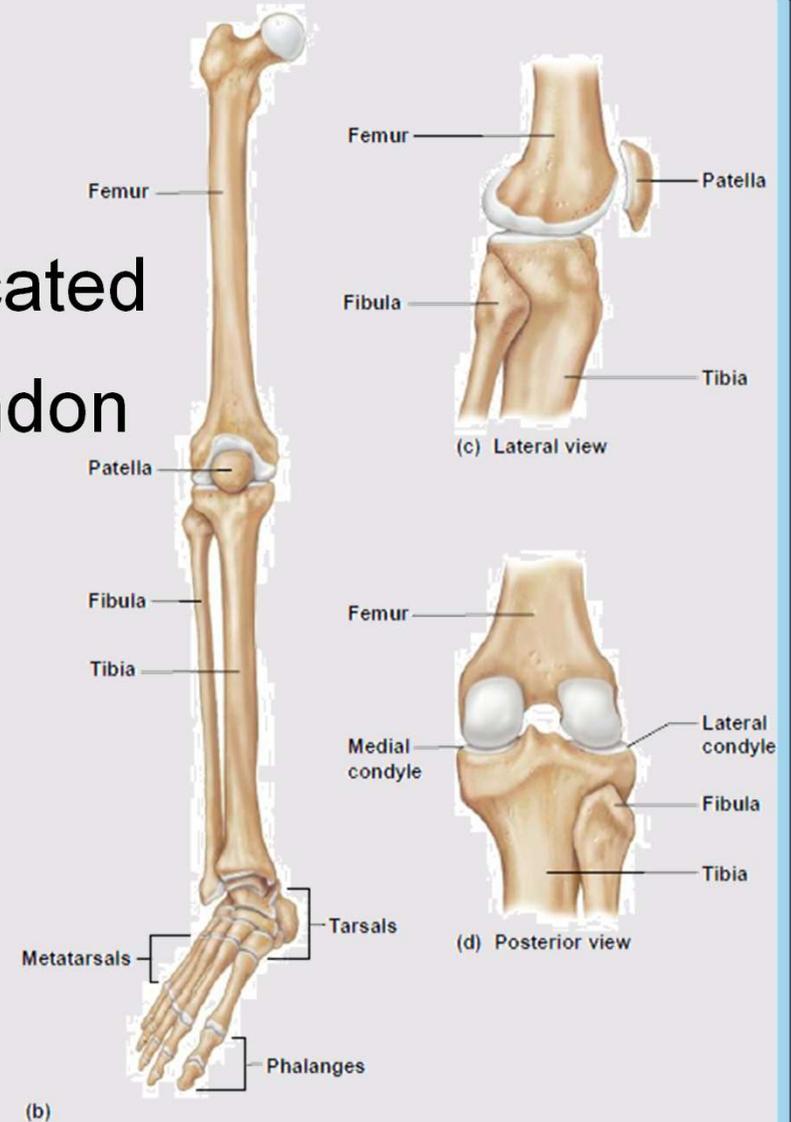
Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Patella

Known as kneecap

- Anterior surface of the knee joint
- Flat sesamoid bone located in the quadriceps tendon

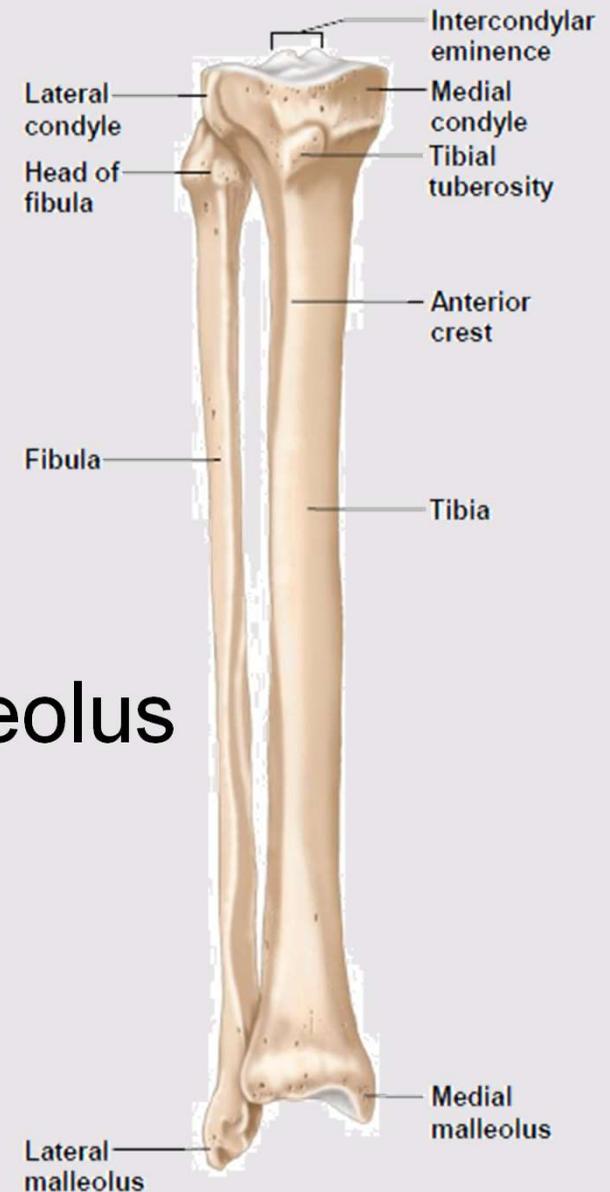




Centurion
UNIVERSITY
*Shaping Lives...
Empowering Communities...*

Tibia

- Known as shin bone
- Medial to fibula
- Condyles
- Tibial tuberosity
- Anterior crest
- Makes the medial malleolus



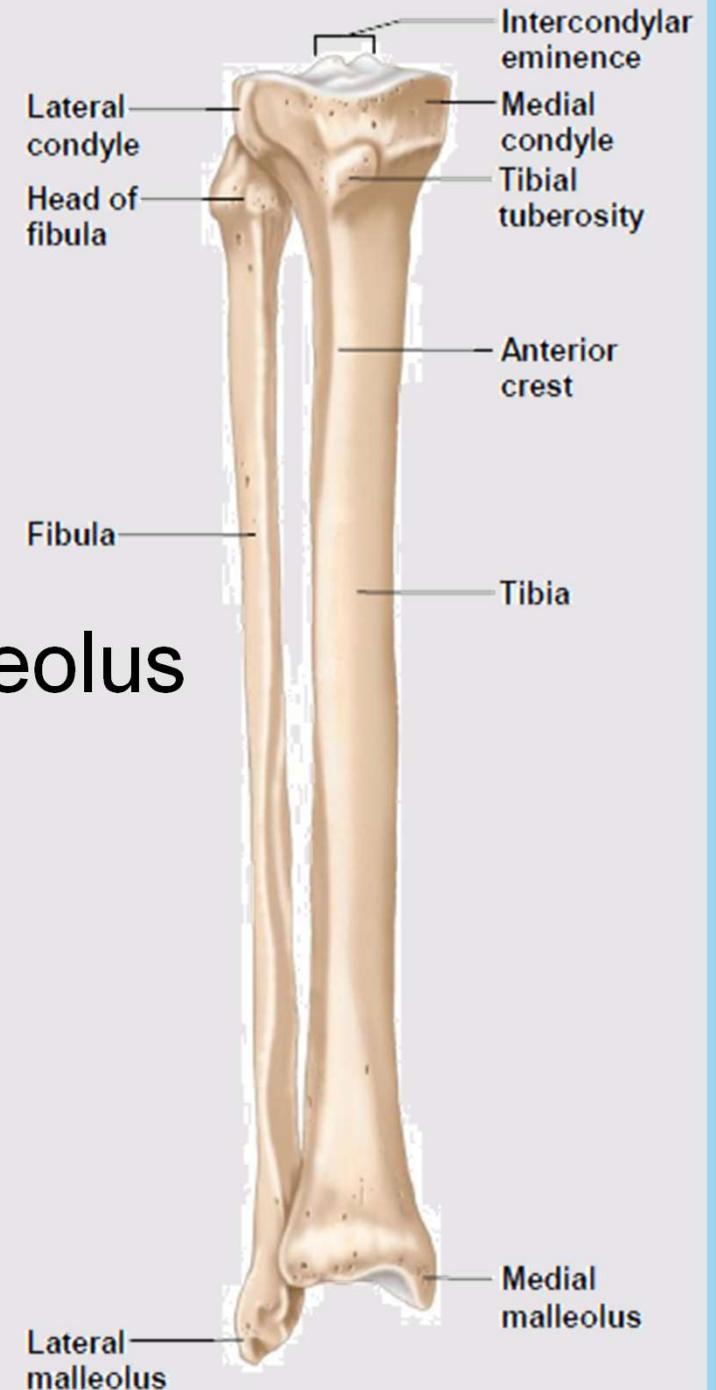


Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Fibula

- Lateral to tibia
- Long, slender
- Head
- Makes the lateral malleolus
- Non-weight bearing





Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Foot

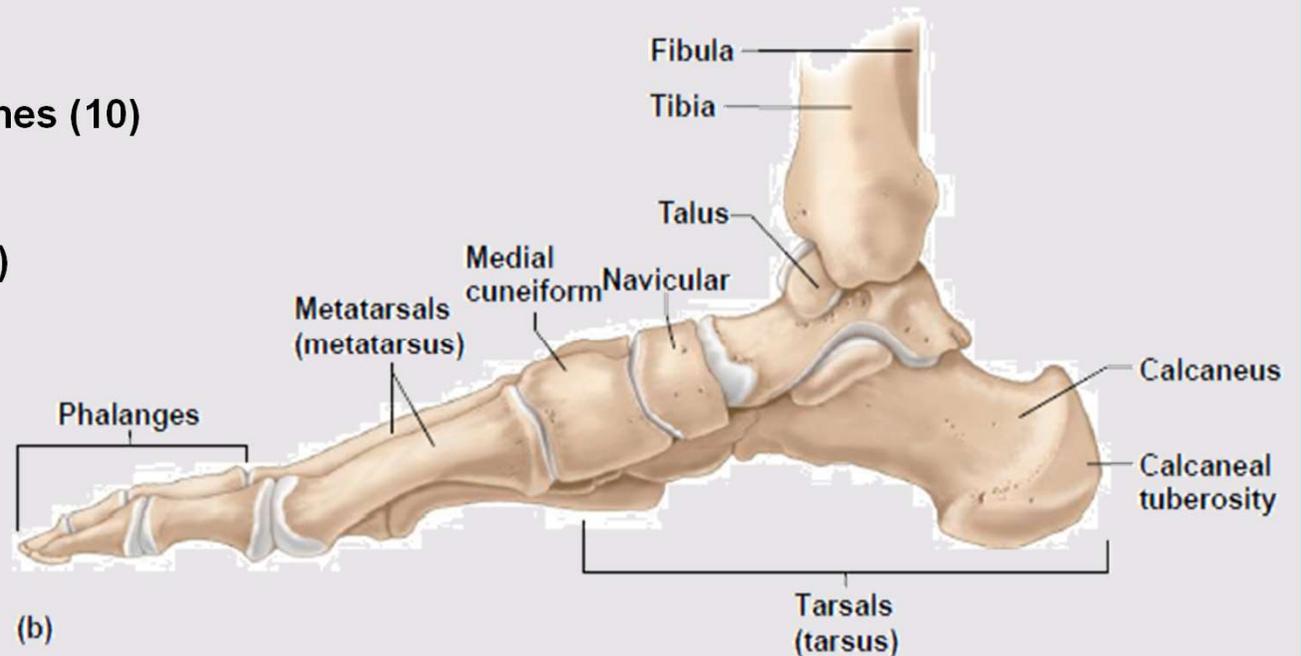
Tarsal Bones (14)

- Calcaneus
- Talus
- Navicular
- Cuboid
- Lateral (3rd) cuneiform
- Intermediate (2nd) cuneiform
- Medial (1st) cuneiform

Metatarsal Bones (10)

Phalanges (28)

- Proximal
- Middle
- Distal

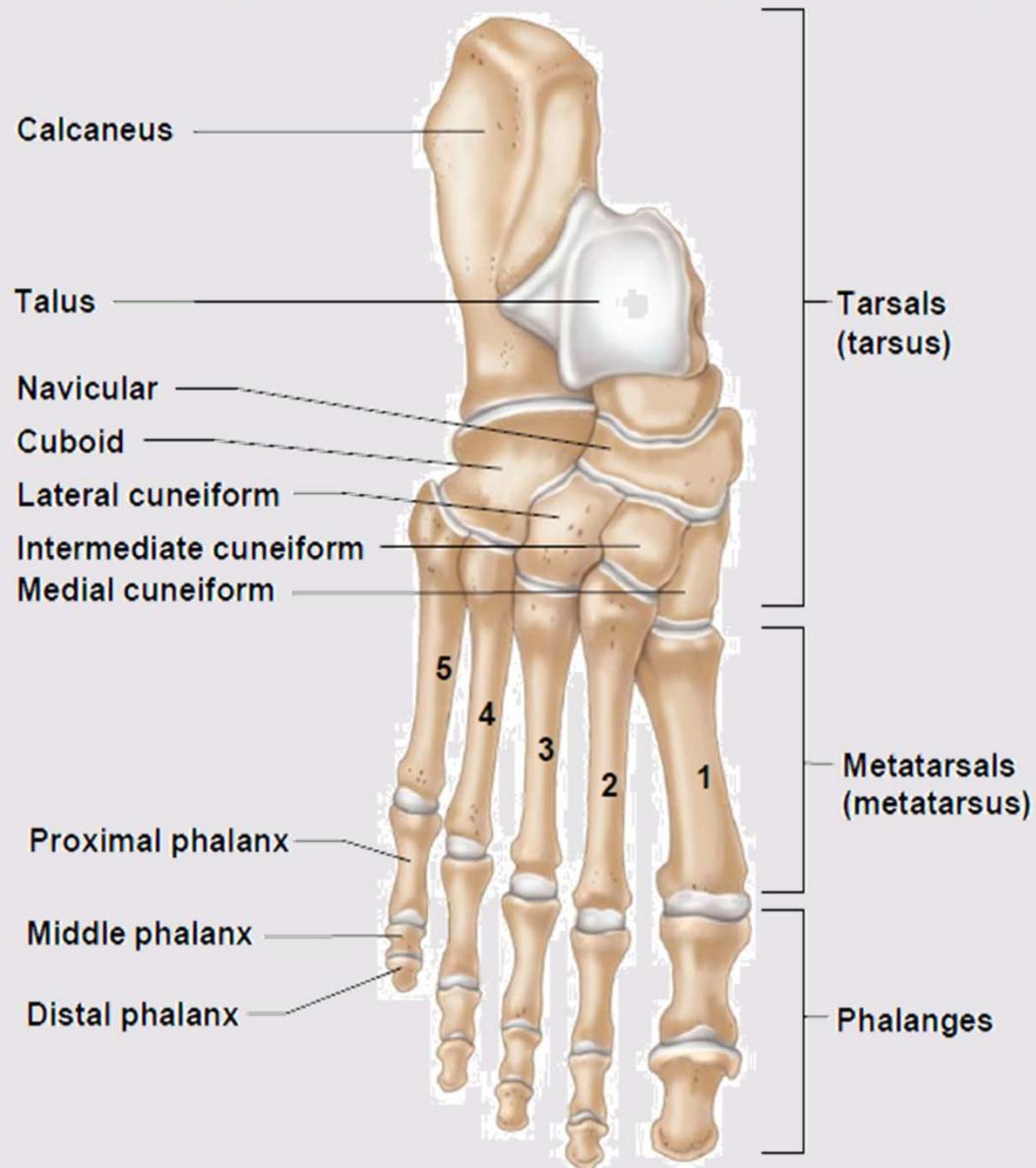




Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Foot



(a)