

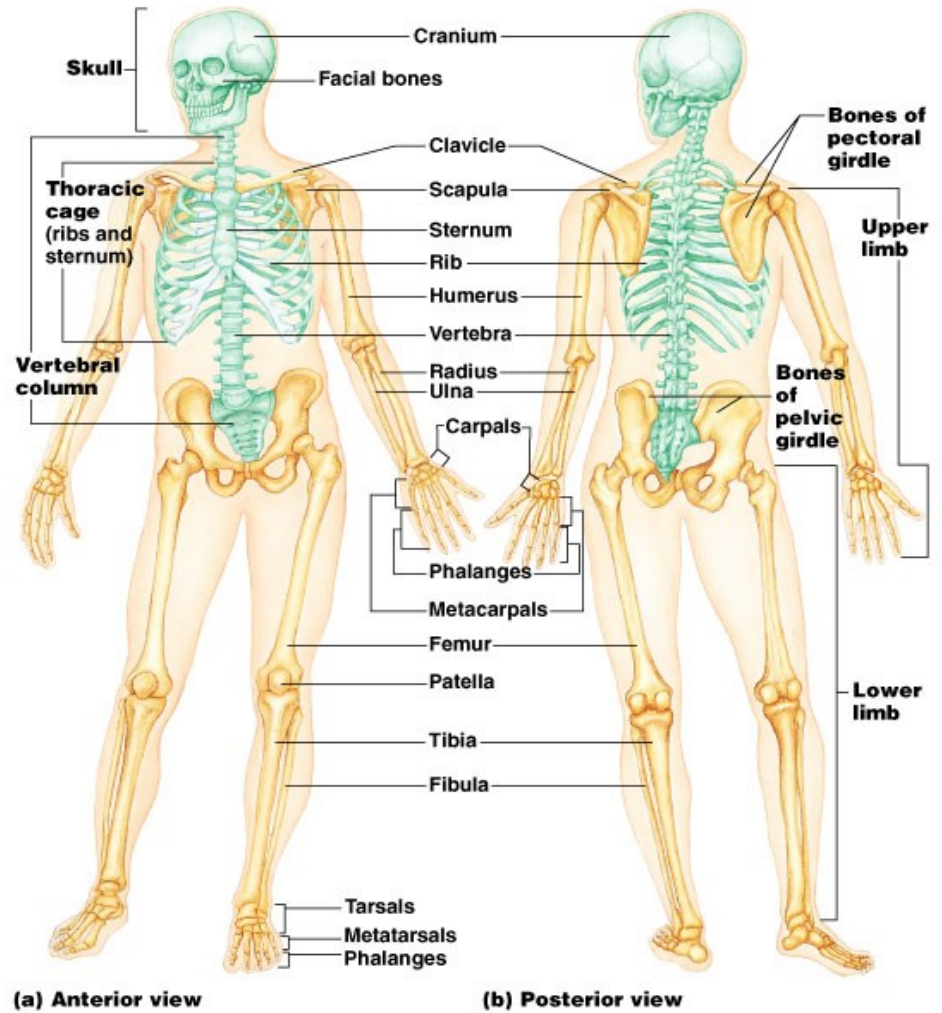
The Axial Skeleton

The Skeleton

- Consists of bones, cartilage, joints, and ligaments
- Composed of 206 named bones grouped into two divisions
 - Axial skeleton (80 bones)
 - Appendicular skeleton (126 bones)

The Axial Skeleton

- Formed from 80 named bones
- Consists of skull, vertebral column, and bony thorax

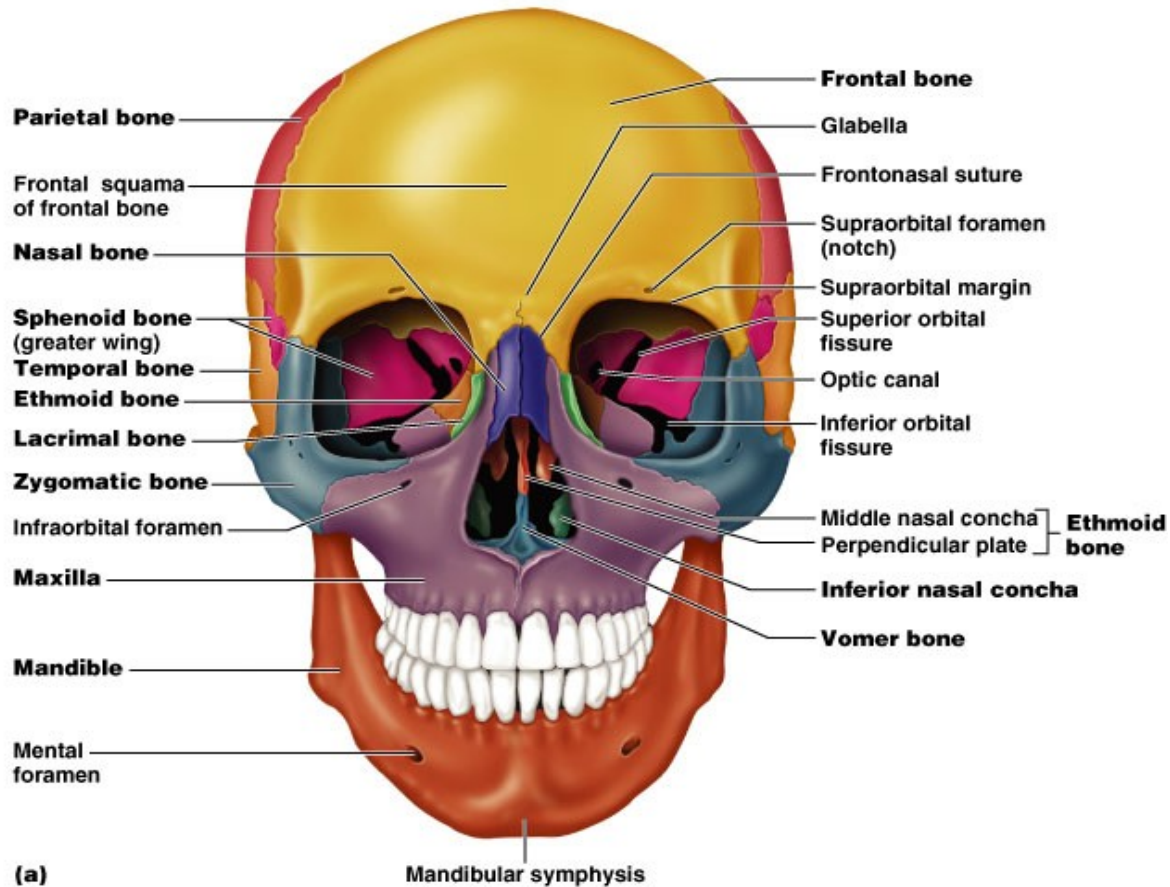


Bone Markings

- Projections that provide attachment for muscles and ligaments
- Projections that help form joints
- Depressions and openings for passage of nerves and blood vessels

The Skull

- Formed by cranial and facial bones



Overview of Skull Geography

- The skull contains smaller cavities
 - Middle and inner ear cavities – in lateral aspect of cranial base
 - Nasal cavity – lies in and posterior to the nose
 - Orbits – house the eyeballs
 - Air-filled sinuses – occur in several bones around the nasal cavity

Overview of Skull Geography

- The skull contains approximately 85 named openings
 - Foramina, canals, and fissures
 - Provide openings for important structures
 - Spinal cord
 - Blood vessels serving the brain
 - 12 pairs of cranial nerves

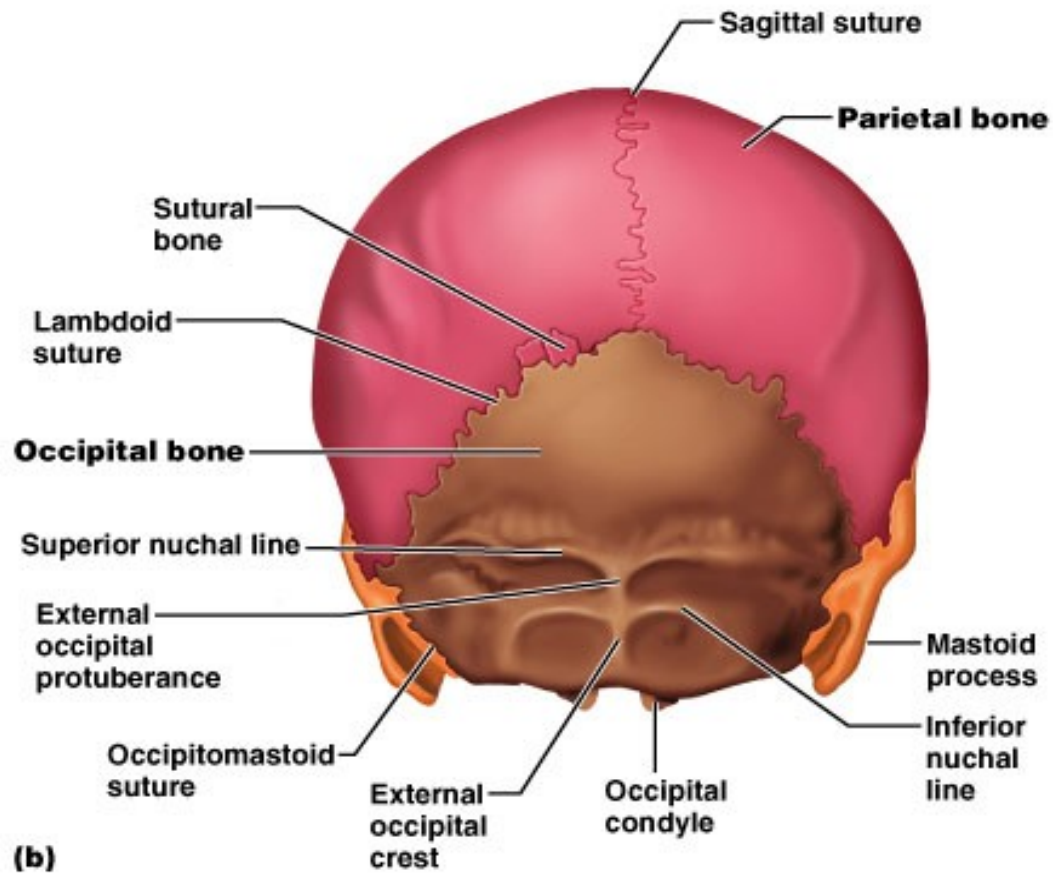
Cranial Bones

- Formed from eight large bones
 - Paired bones include
 - Temporal bones
 - Parietal bones
 - Unpaired bones include
 - Frontal bone
 - Occipital bone
 - Sphenoid bone
 - Ethmoid bone

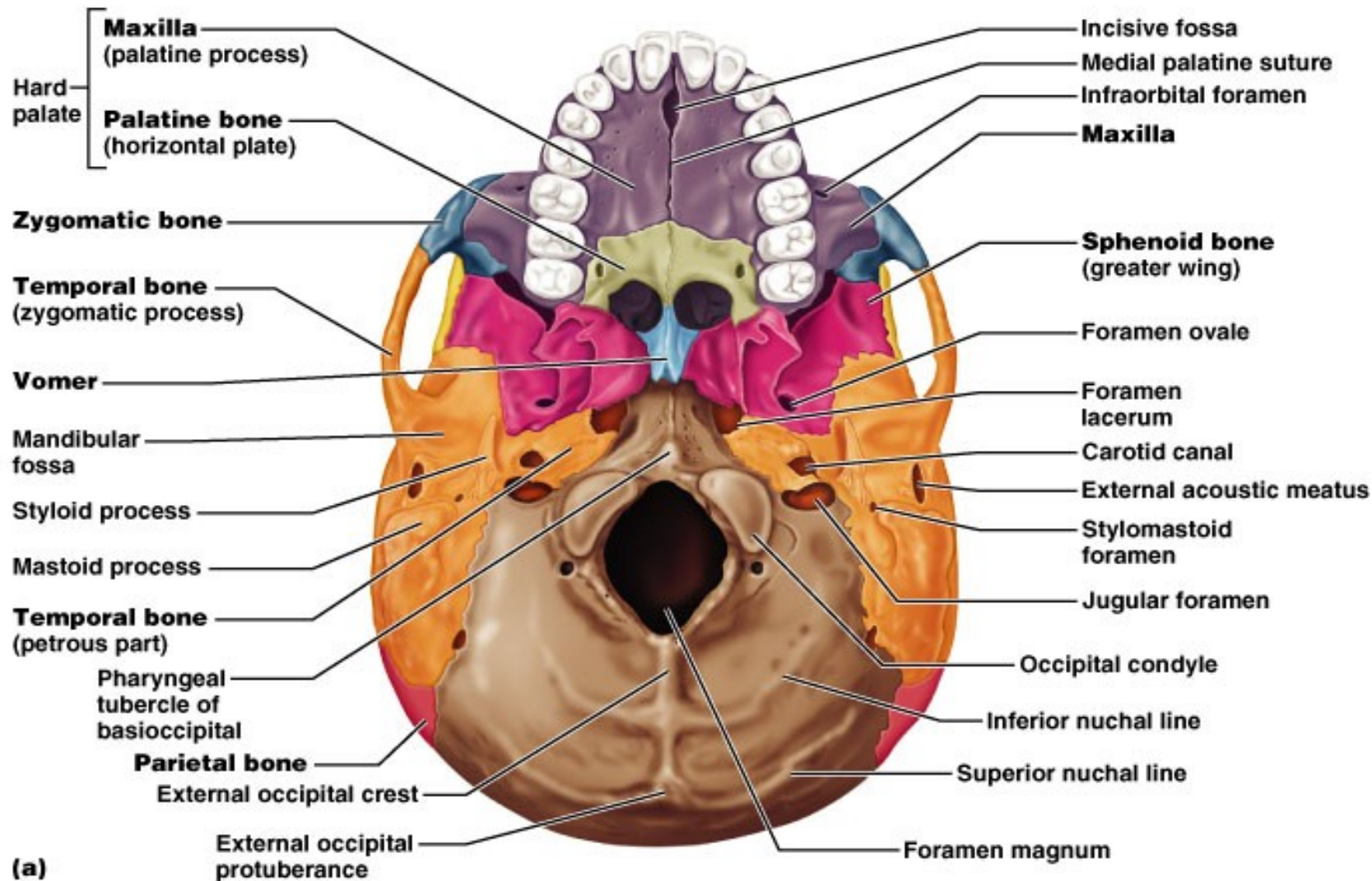
Sutural Bones

- Small bones that occur within sutures
- Irregular in shape, size, and location
- Not all people have sutural bones

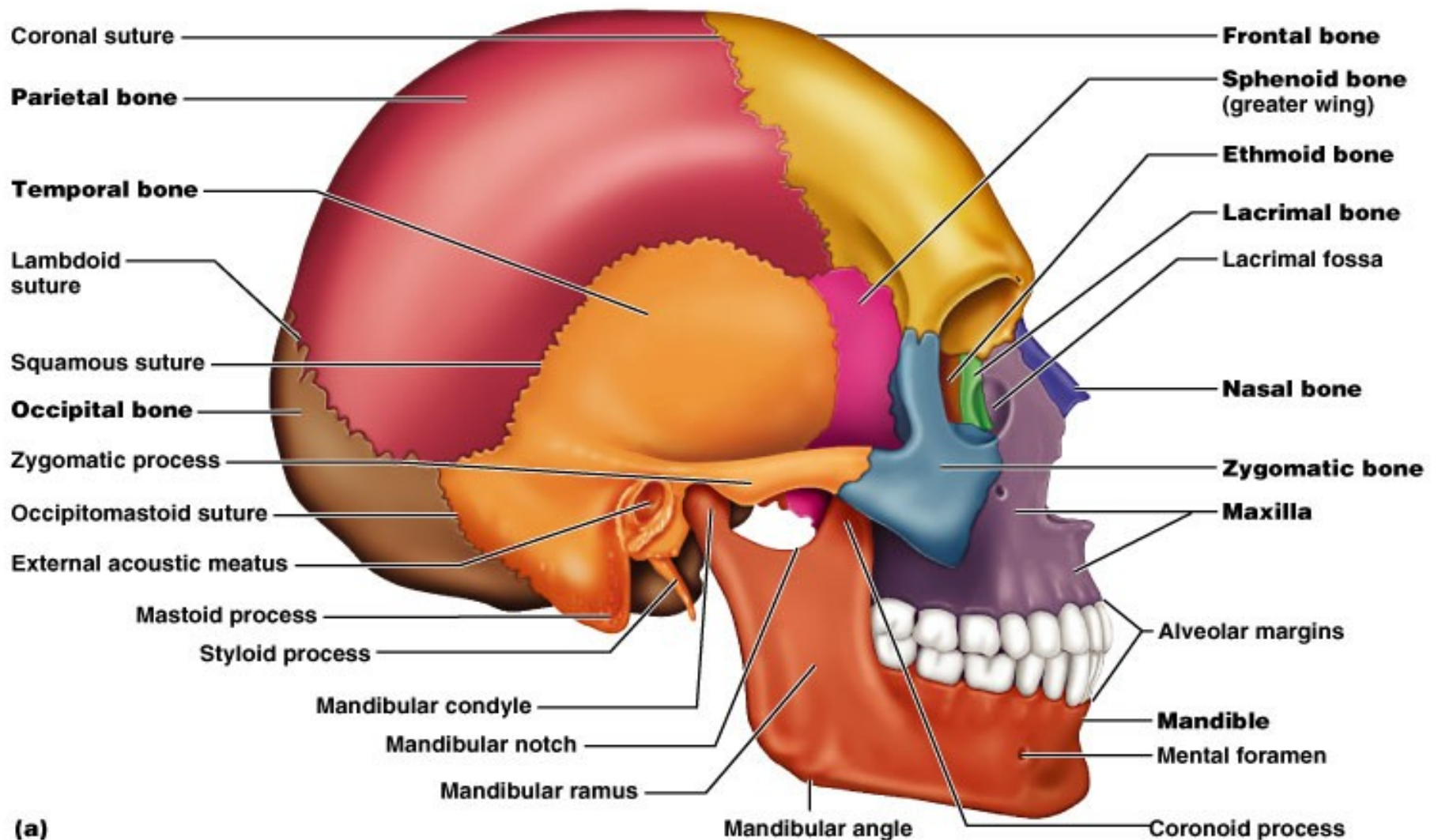
The Skull – Posterior View



Inferior Aspect of the Skull

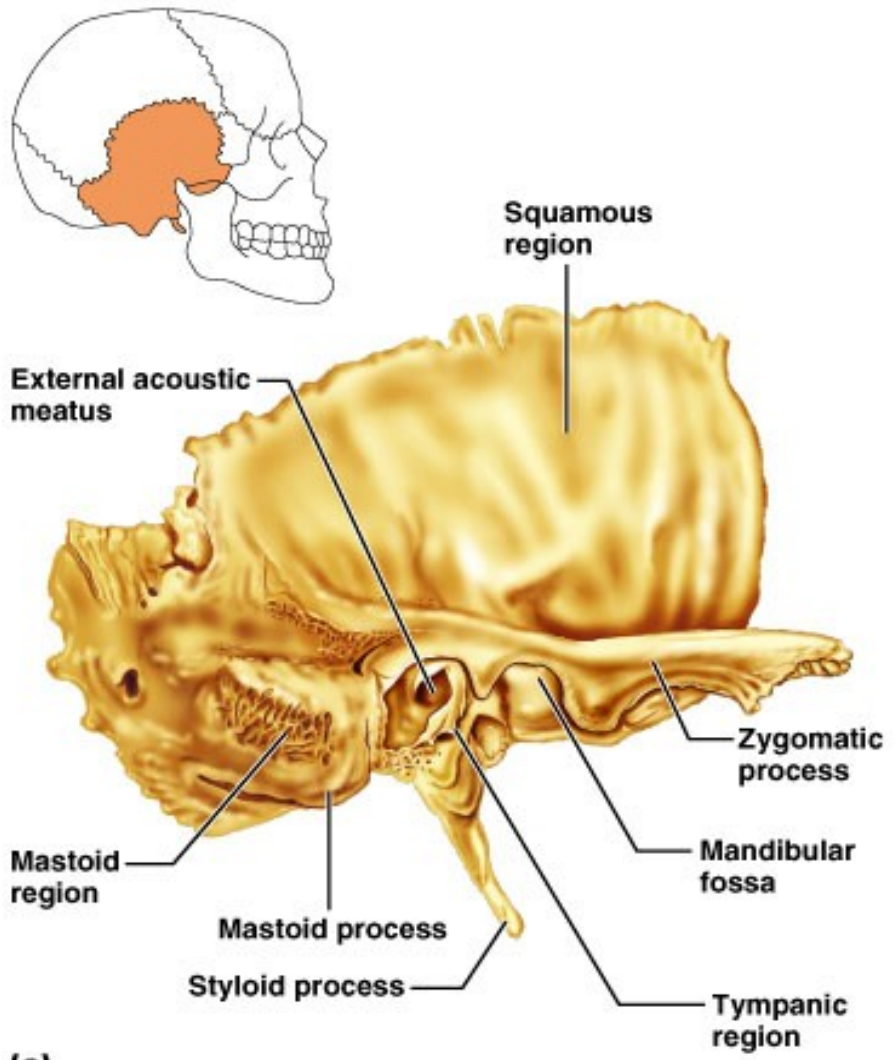


Lateral Aspect of the Skull



(a)

The Temporal Bone

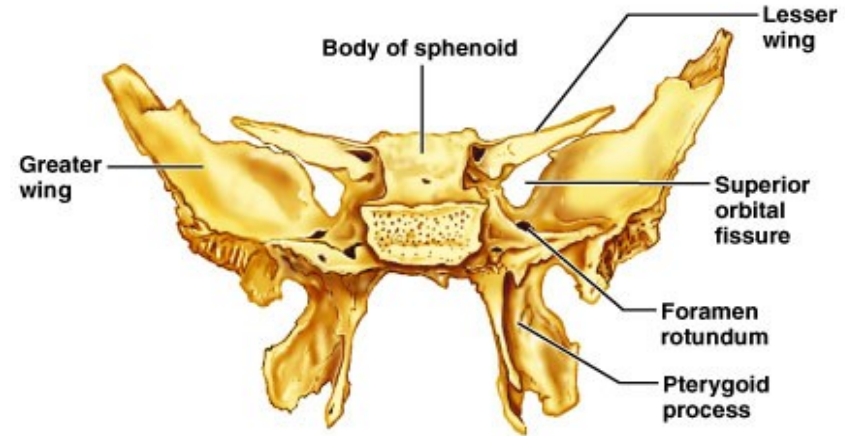
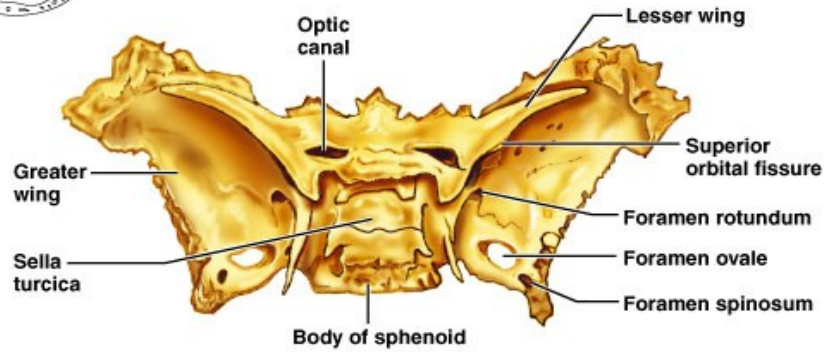


(a)



(b)

The Sphenoid Bone



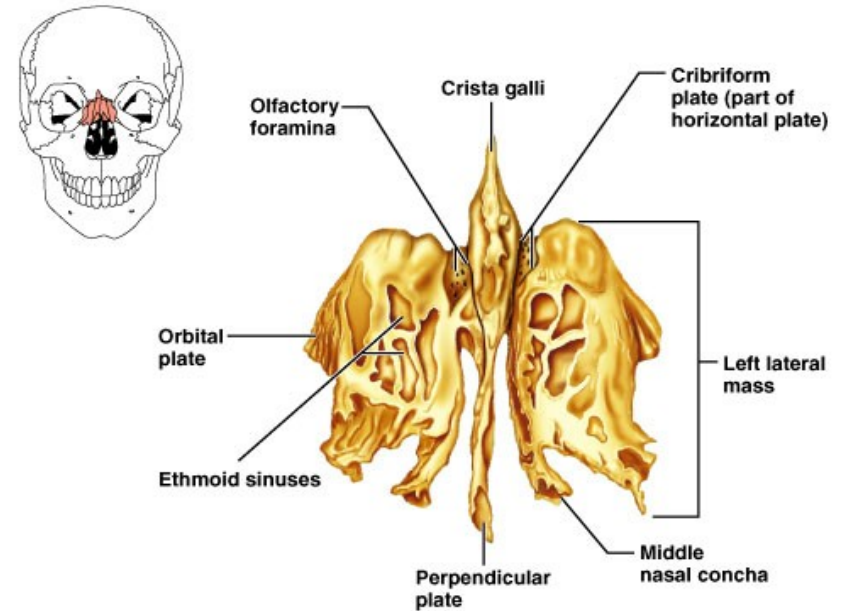
(a) Superior view, as in Figure 7.4c



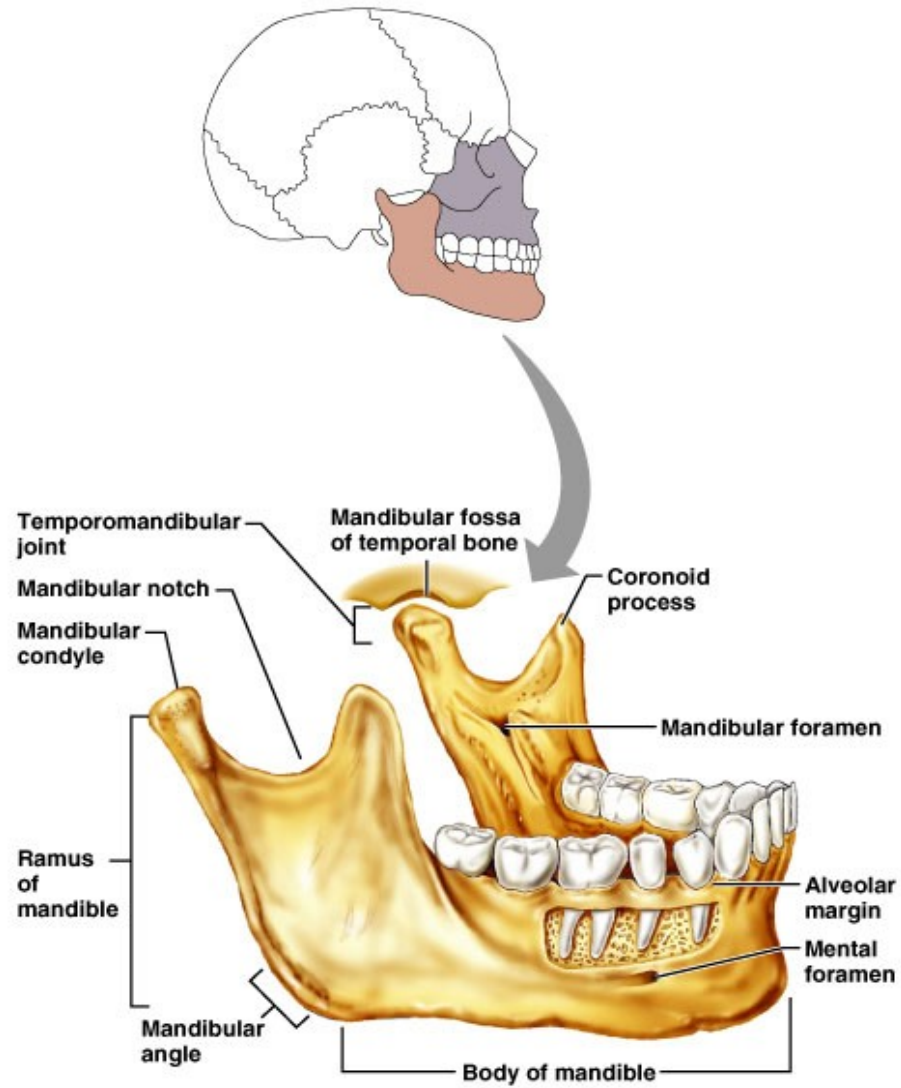
(b) Posterior view

The Ethmoid Bone

- Lies between nasal and sphenoid bones
- Forms most of the medial bony region between the nasal cavity and orbits



Mandible

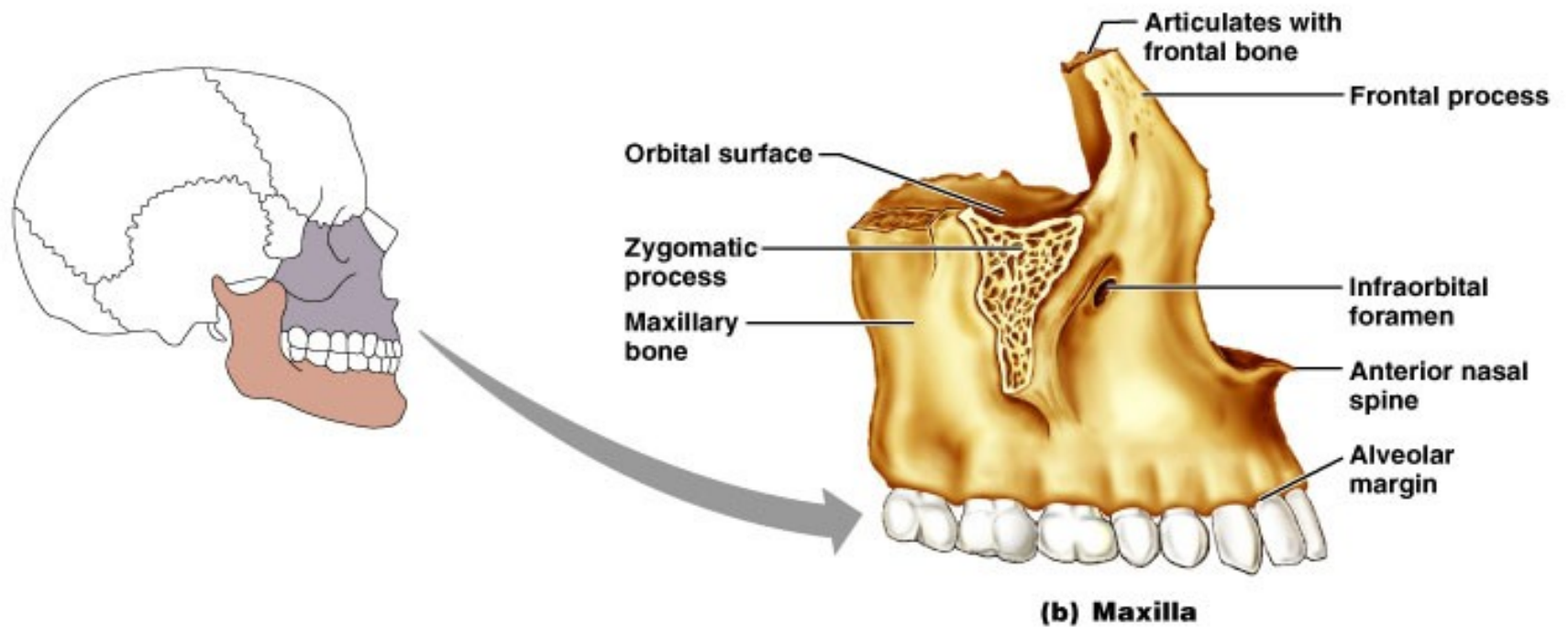


(a) Mandible

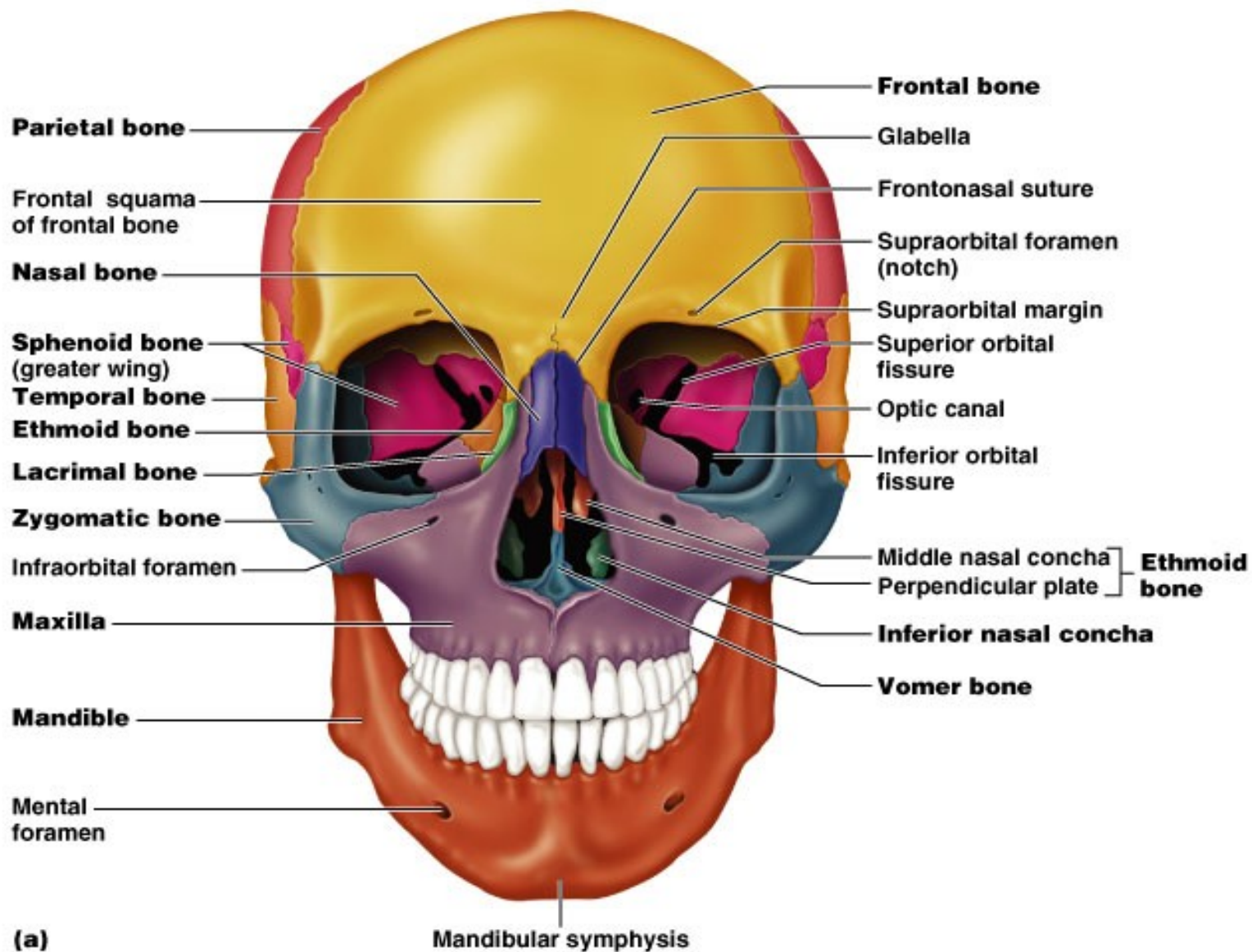
Maxillary Bones

- Articulate with all other facial bones except the mandible
- Contain maxillary sinuses – largest paranasal sinuses
- Forms part of the inferior orbital fissure

Maxillary Bones



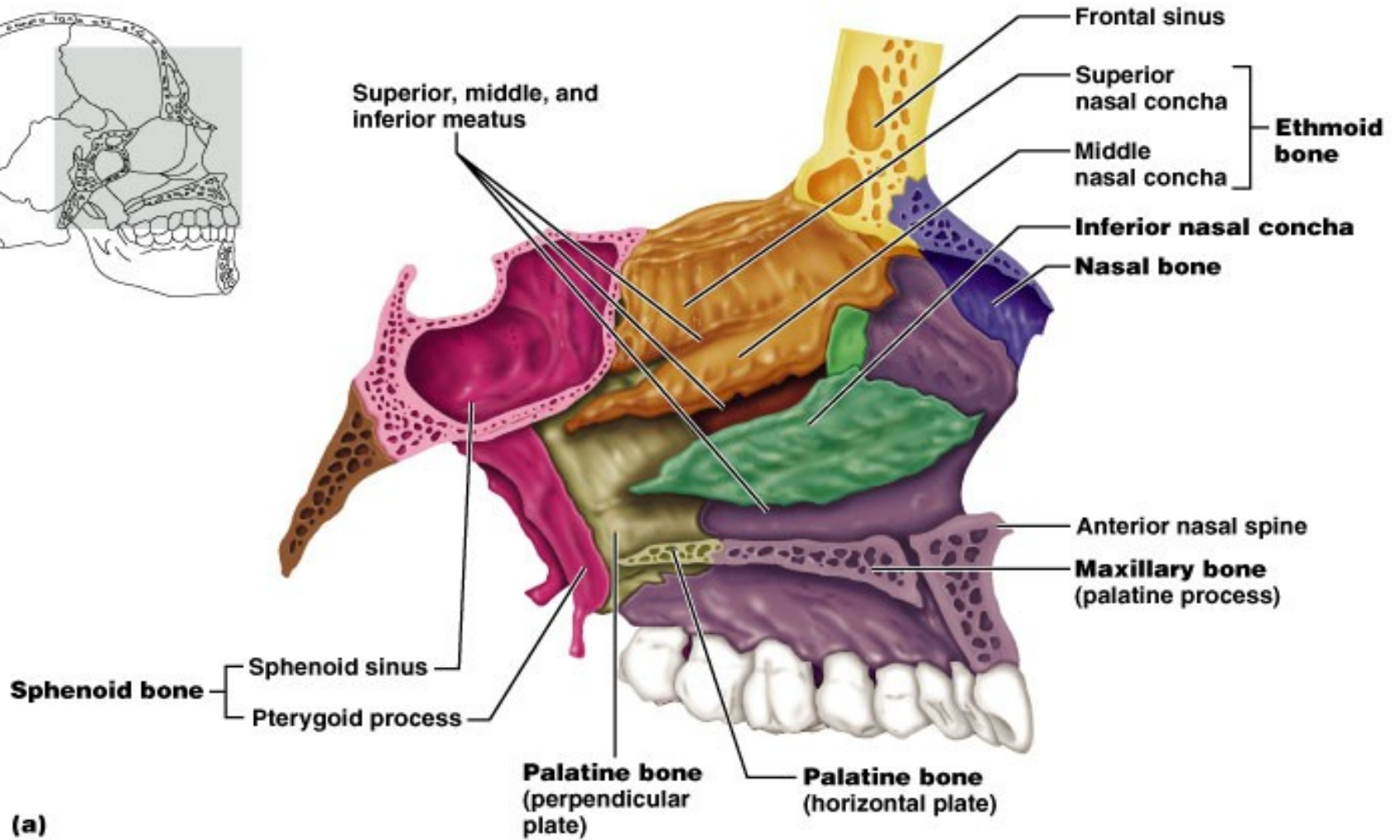
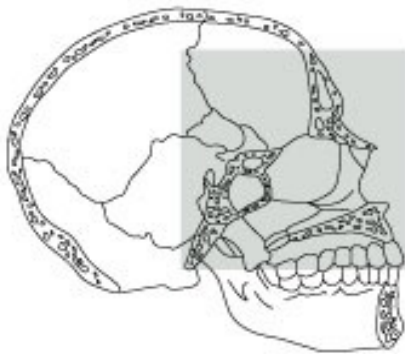
Bones of the Face



Special Parts of the Skull

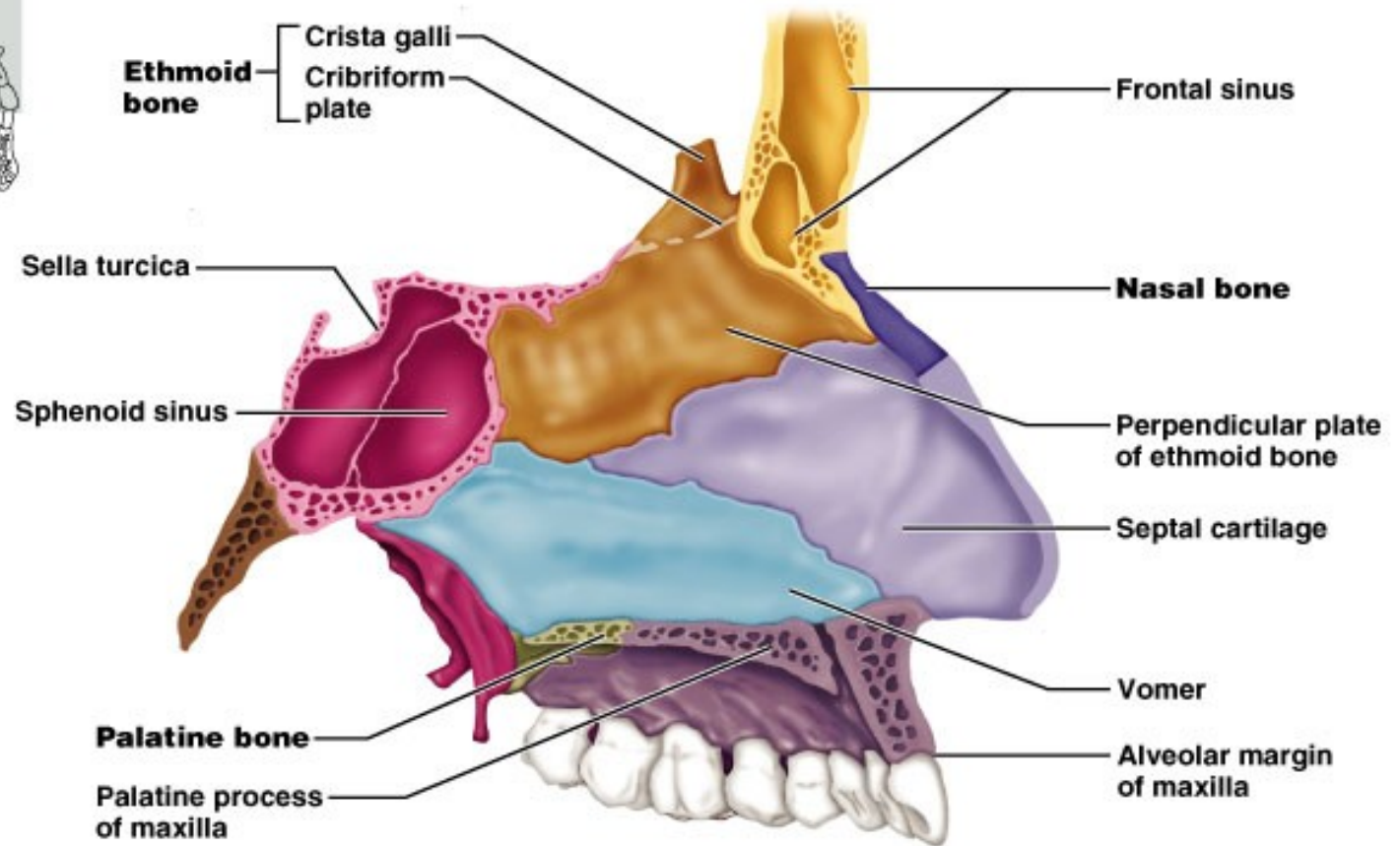
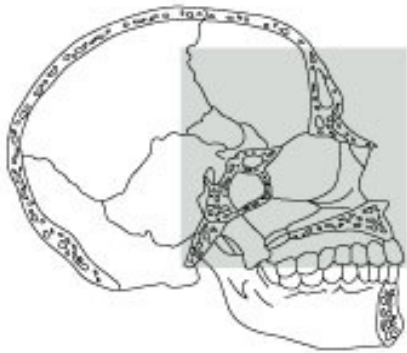
- Orbits
- Nasal cavity
- Paranasal sinuses
- Hyoid bone

Nasal Cavity



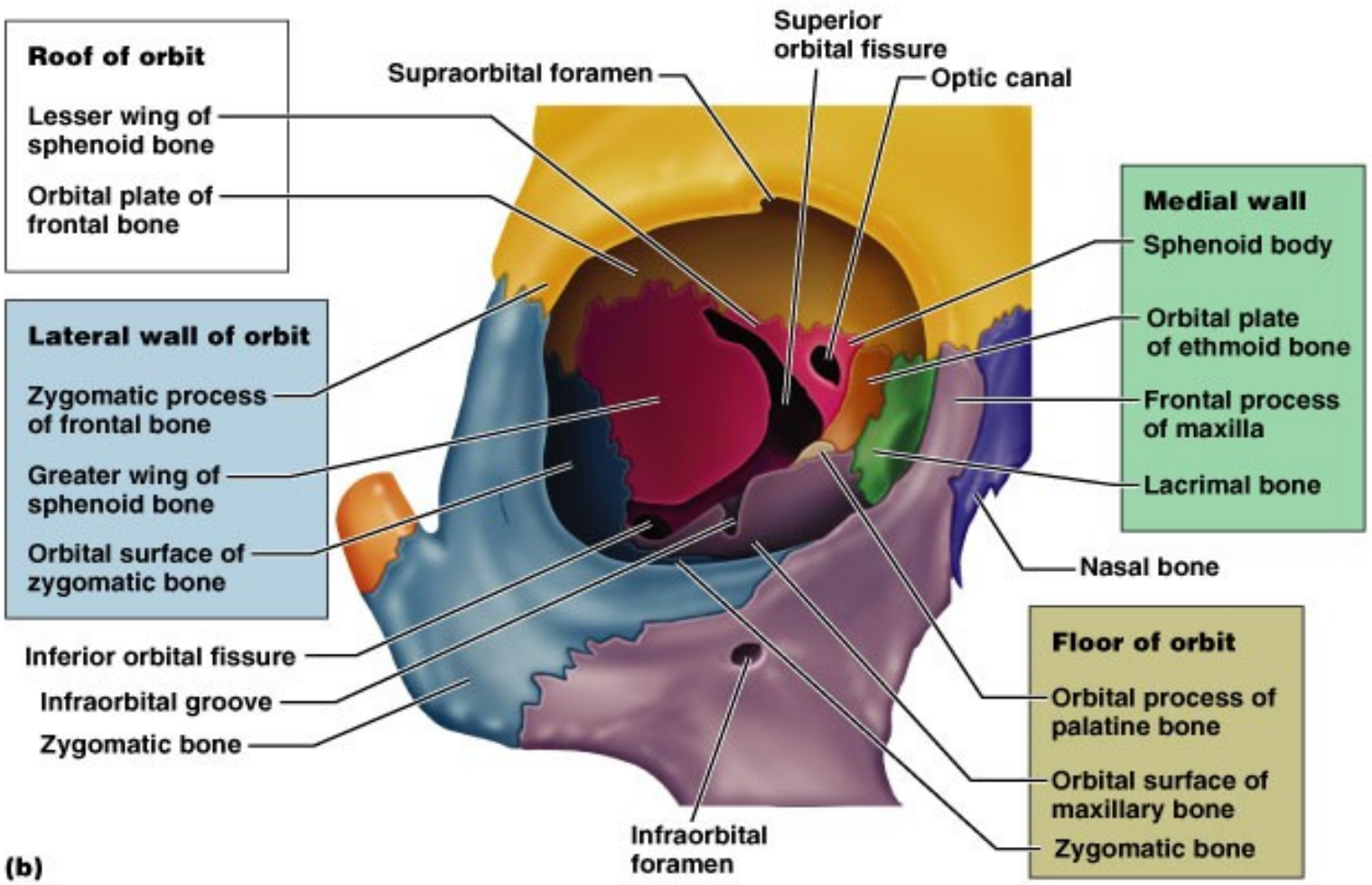
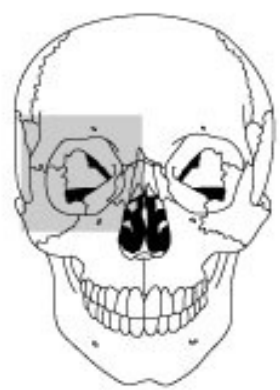
(a)

Nasal Septum



(b)

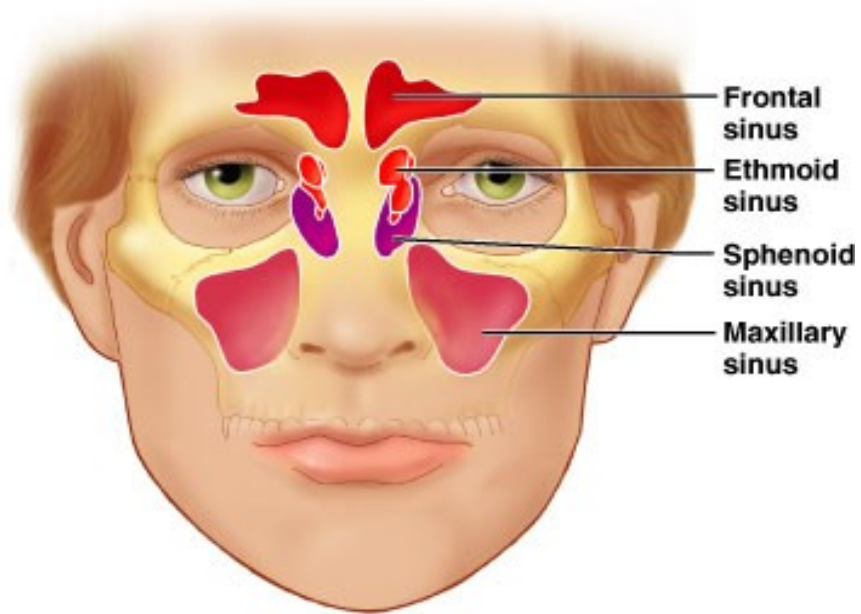
Orbits



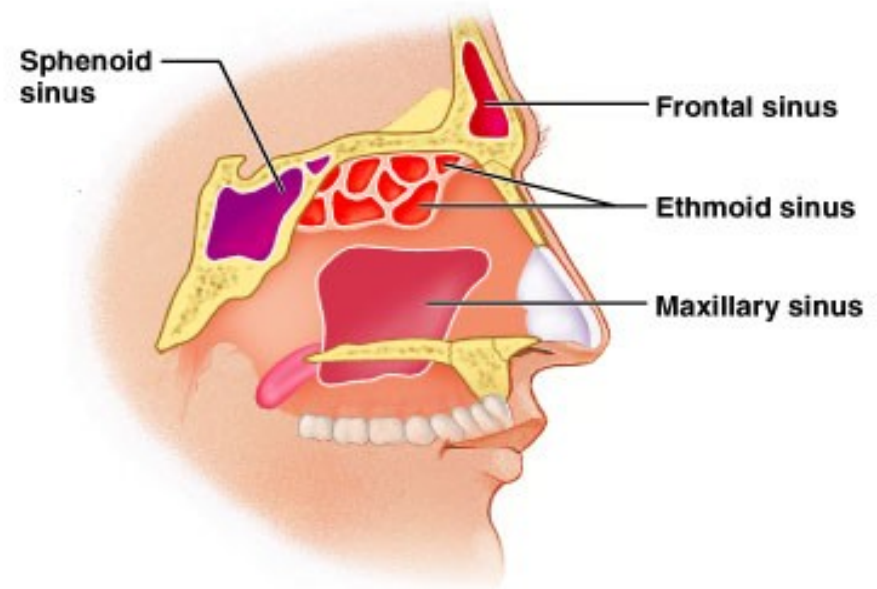
Paranasal Sinuses

- Air-filled sinuses are located within
 - Frontal bone
 - Ethmoid bone
 - Sphenoid bone
 - Maxillary bones
- Lined with mucous membrane
- Serve to lighten the skull

Paranasal Sinuses



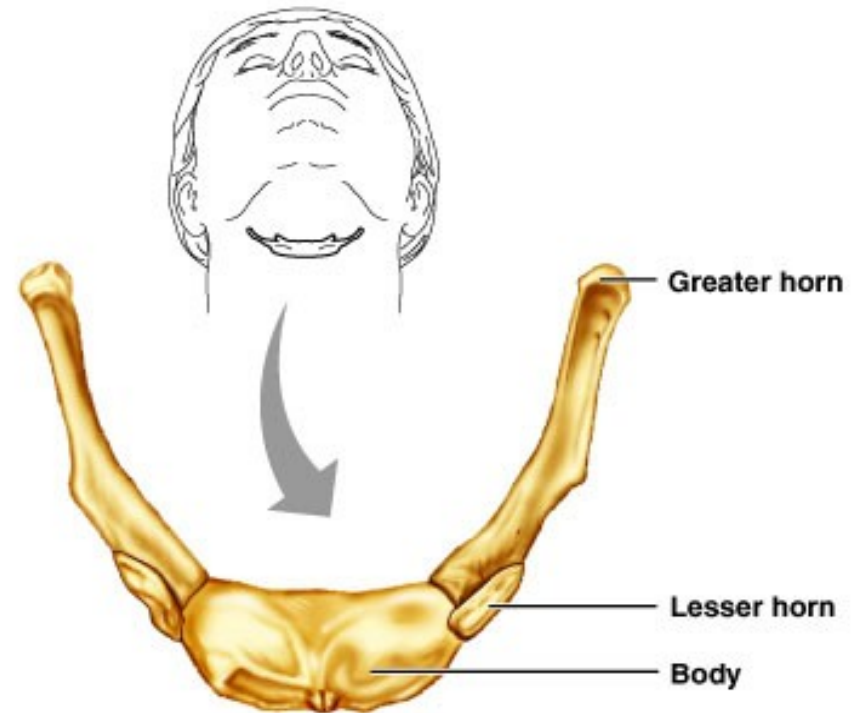
(a)



(b)

The Hyoid Bone

- Lies inferior to the mandible
- The only bone with no direct articulation with any other bone
- Acts as a movable base for the tongue

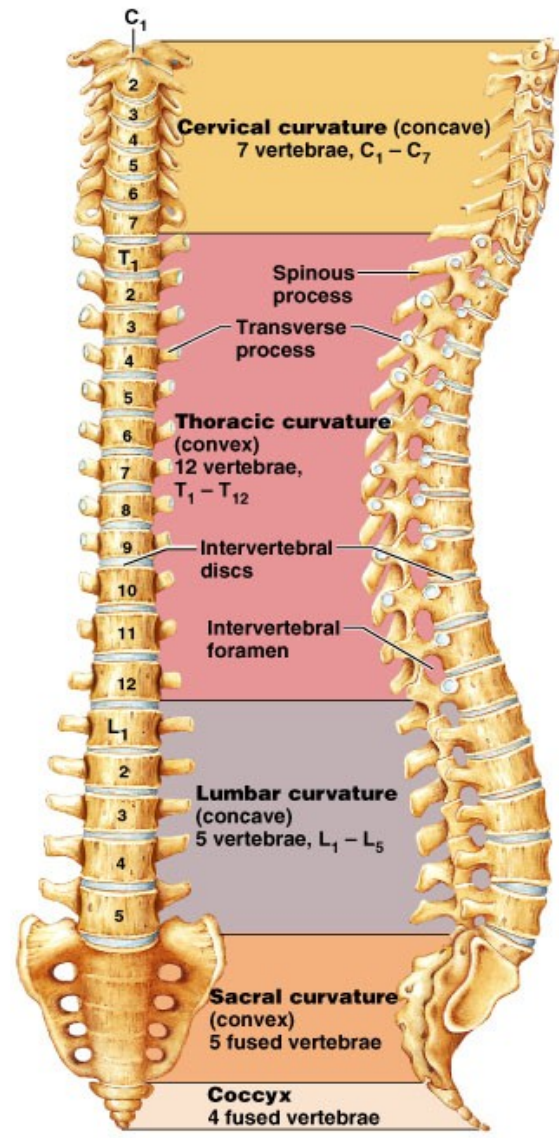


- Lab time

The Vertebral Column

- Formed from 26 bones in the adult
- Transmits weight of trunk to the lower limbs
- Surrounds and protects the spinal cord
- Serves as attachment sites for muscles of the neck and back
- Held in place by ligaments
 - Anterior and posterior longitudinal ligaments
 - Ligamentum flavum

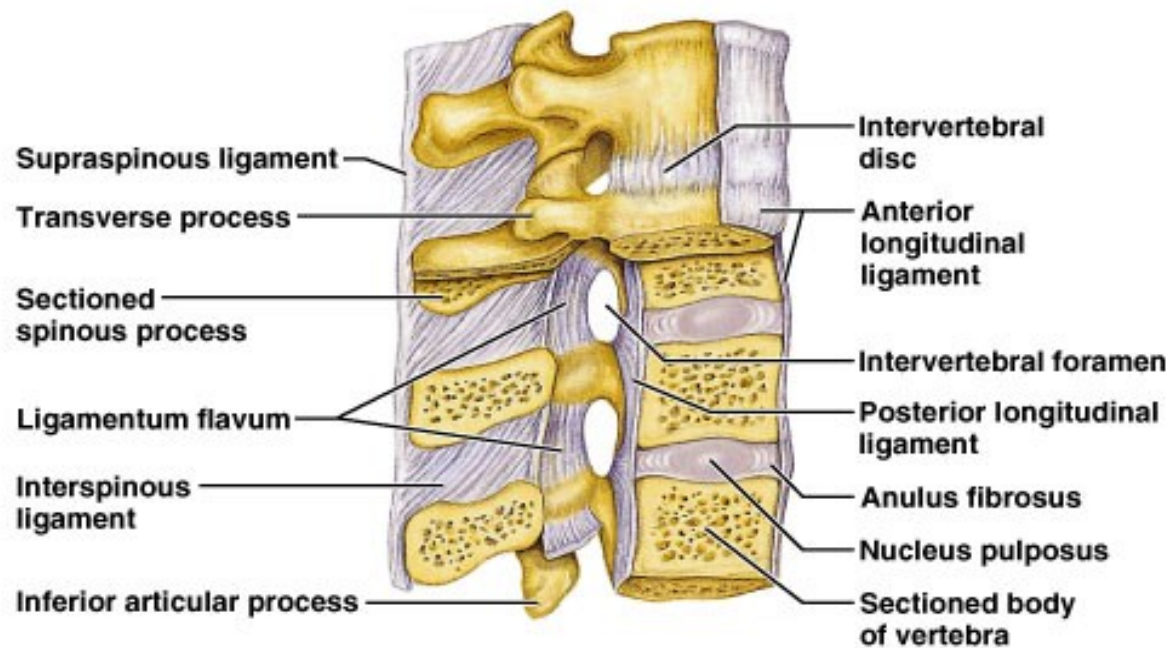
The Vertebral Column



Anterior view

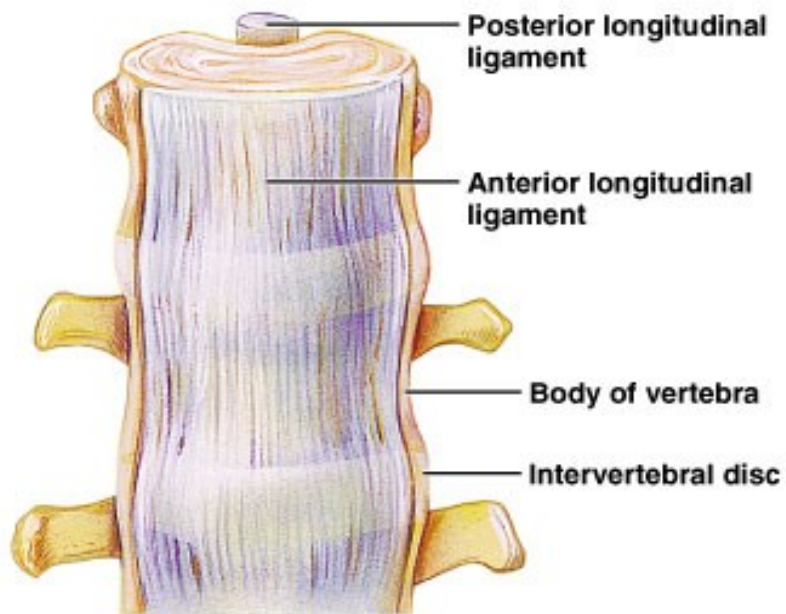
Right lateral view

Ligaments and Intervertebral Discs

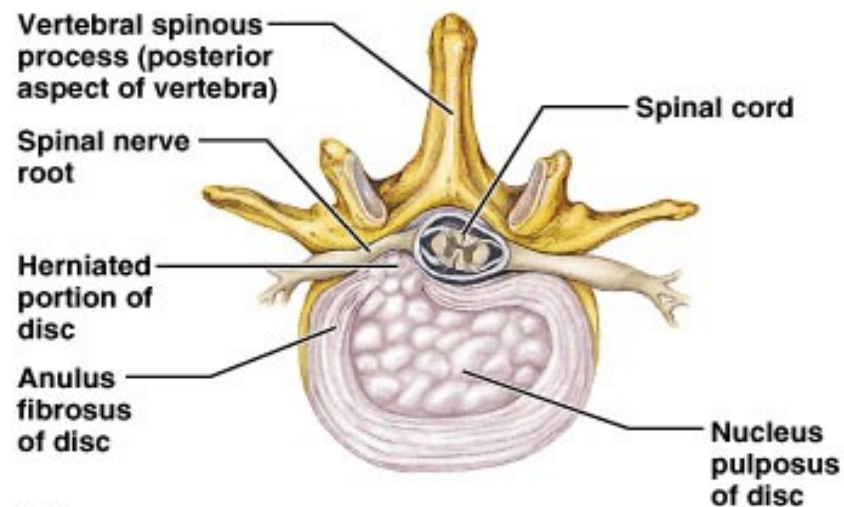


(a)

Ligaments and Intervertebral Discs

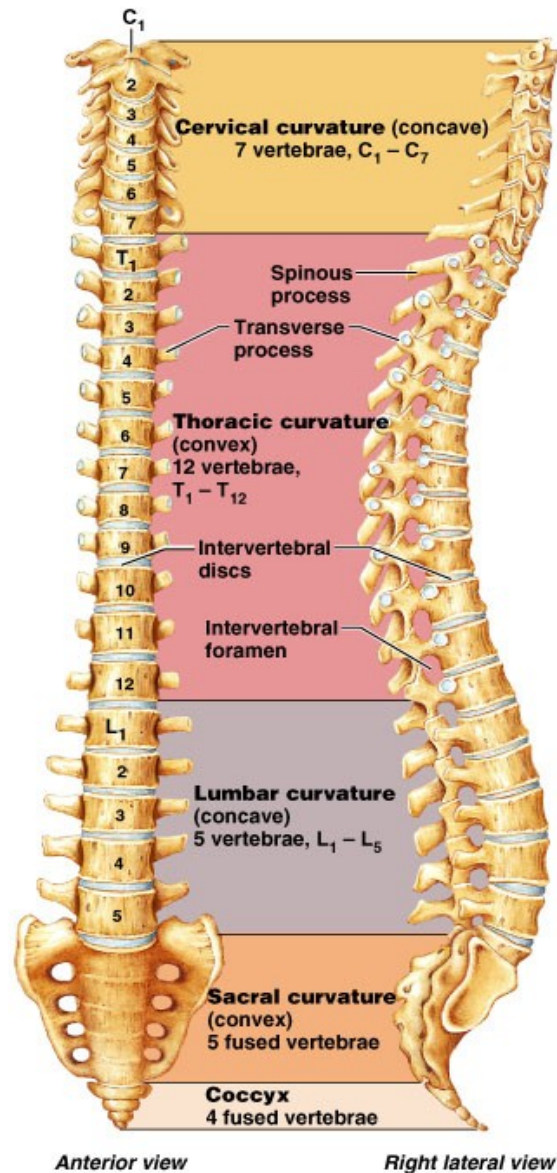


(b) Anterior view

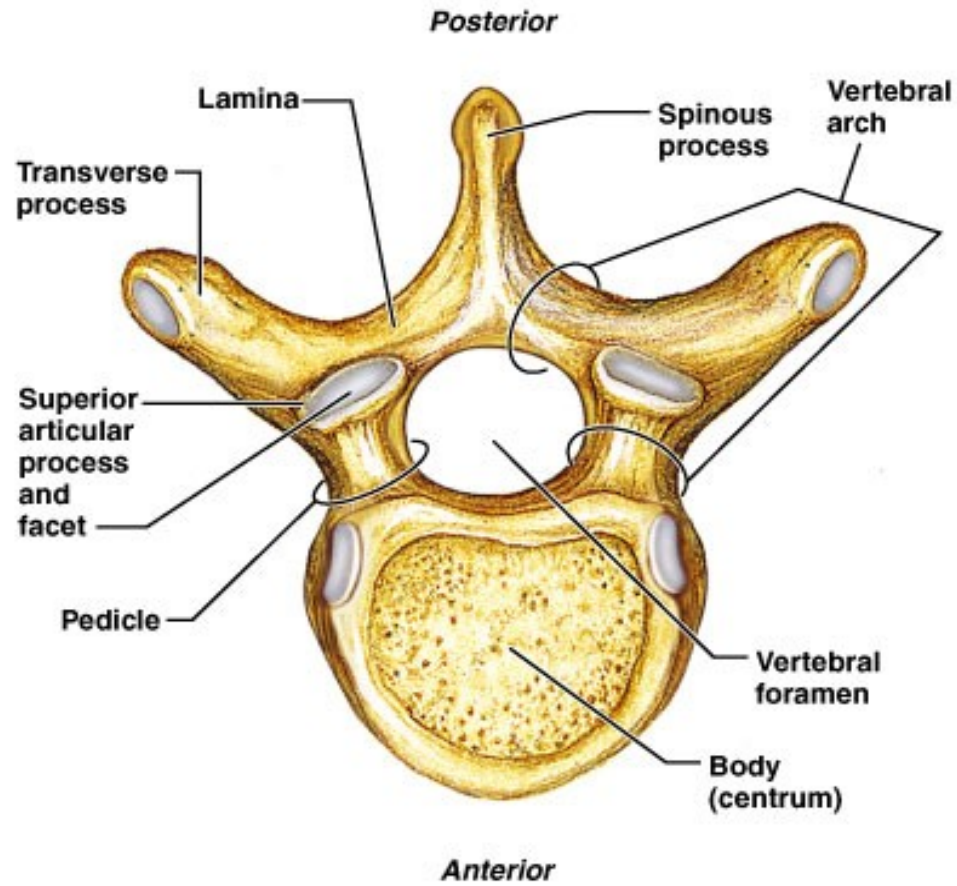


(c)

Regions and Normal Curvatures



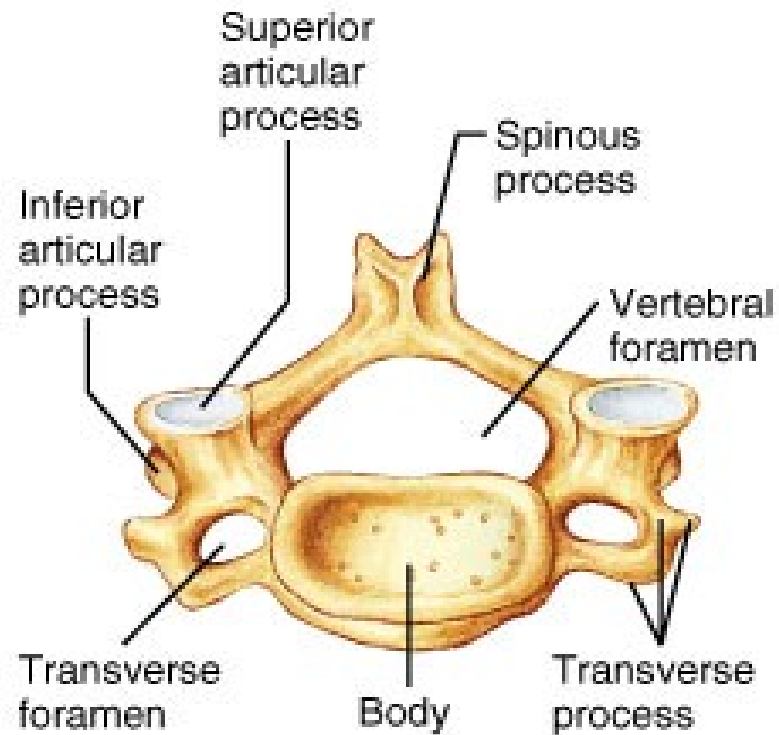
General Structure of Vertebrae



Cervical Vertebrae

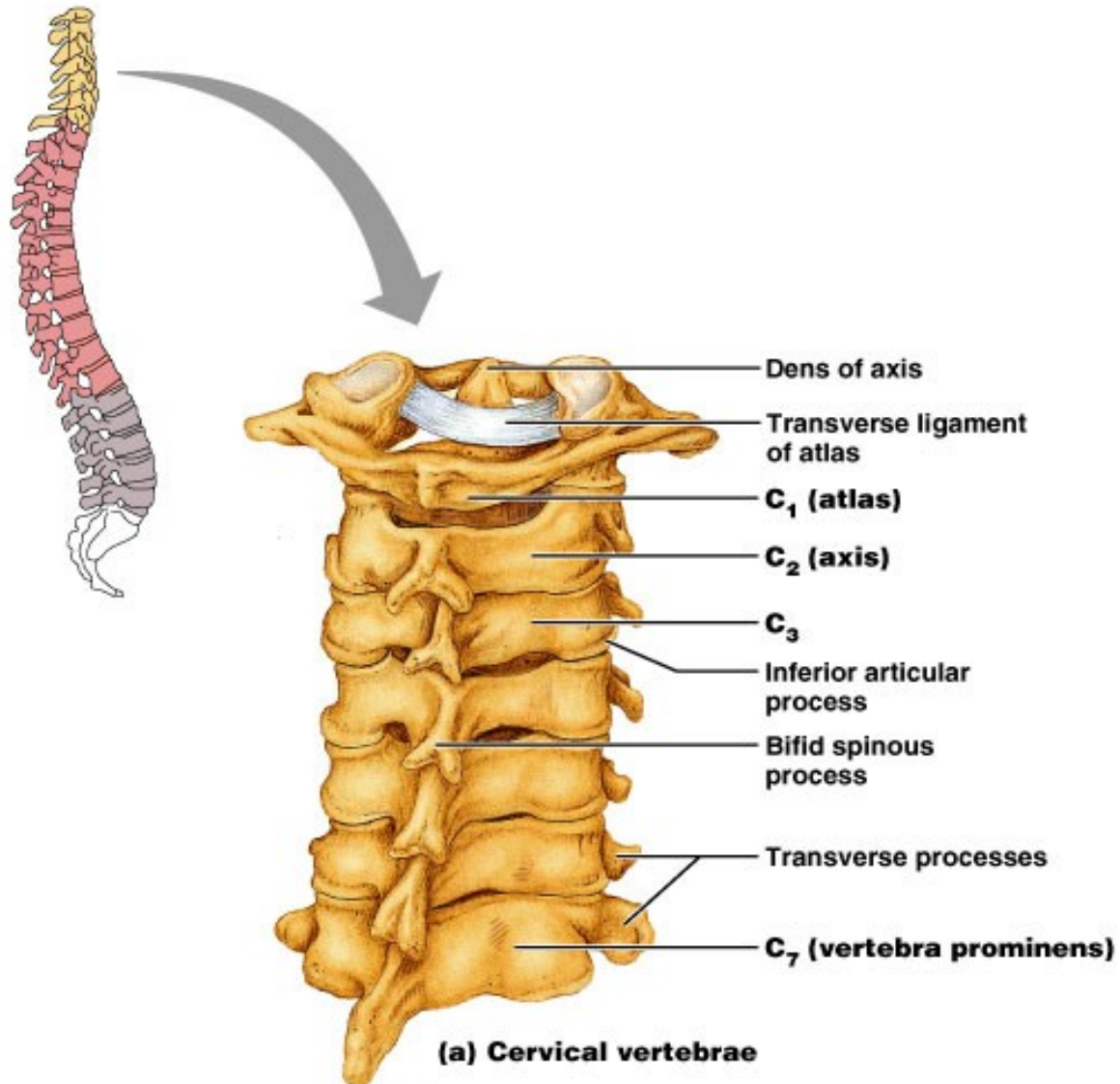
- Seven cervical vertebrae ($C_1 - C_7$) – smallest and lightest vertebrae
- $C_3 - C_7$ are typical cervical vertebrae
 - Body is wider laterally
 - Spinous processes are short and bifid (except C_7)
 - Vertebral foramen are large and triangular
 - Transverse processes contain transverse foramina
 - Superior articular facets face superoposteriorly

Cervical Vertebrae

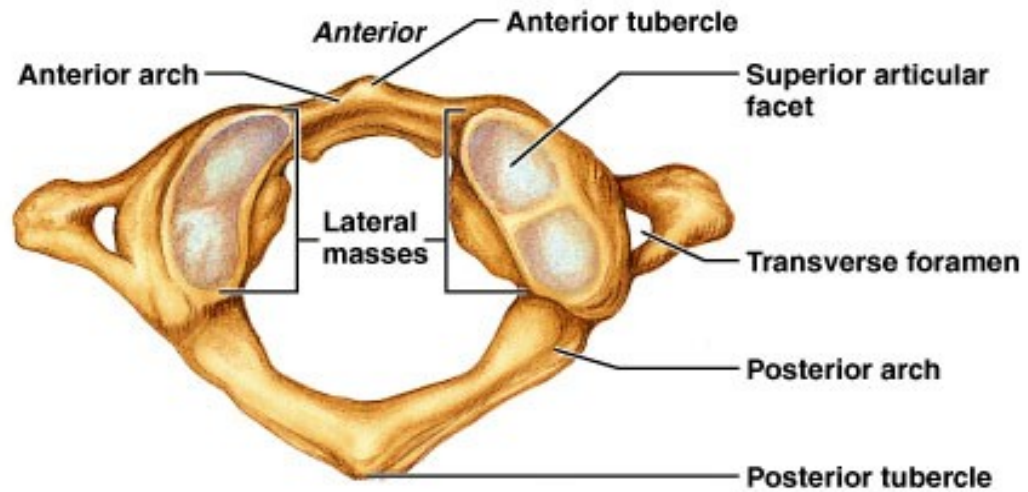


(a) Cervical

Cervical Vertebrae

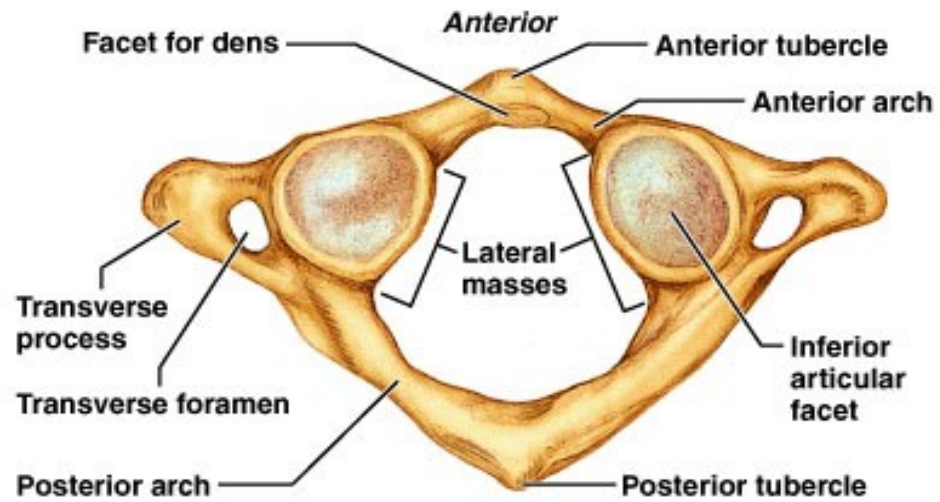


The Atlas



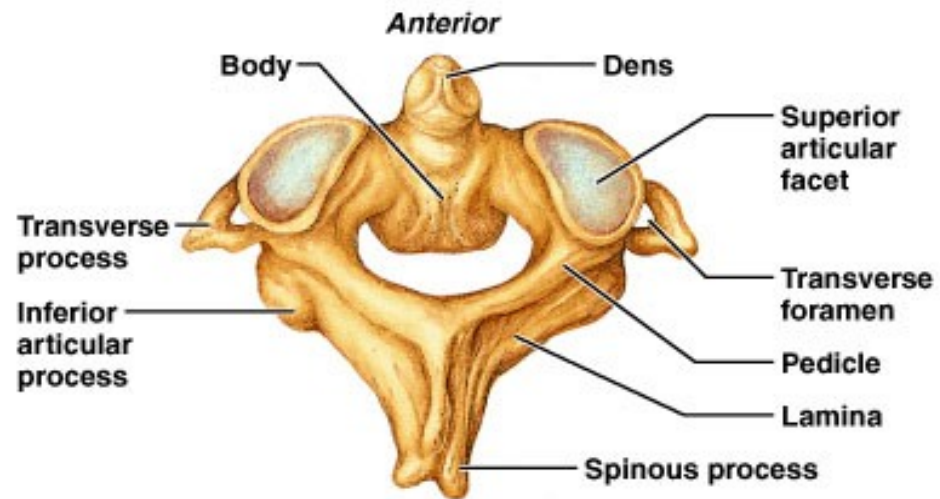
(a) Superior view of atlas (C₁)

The Atlas



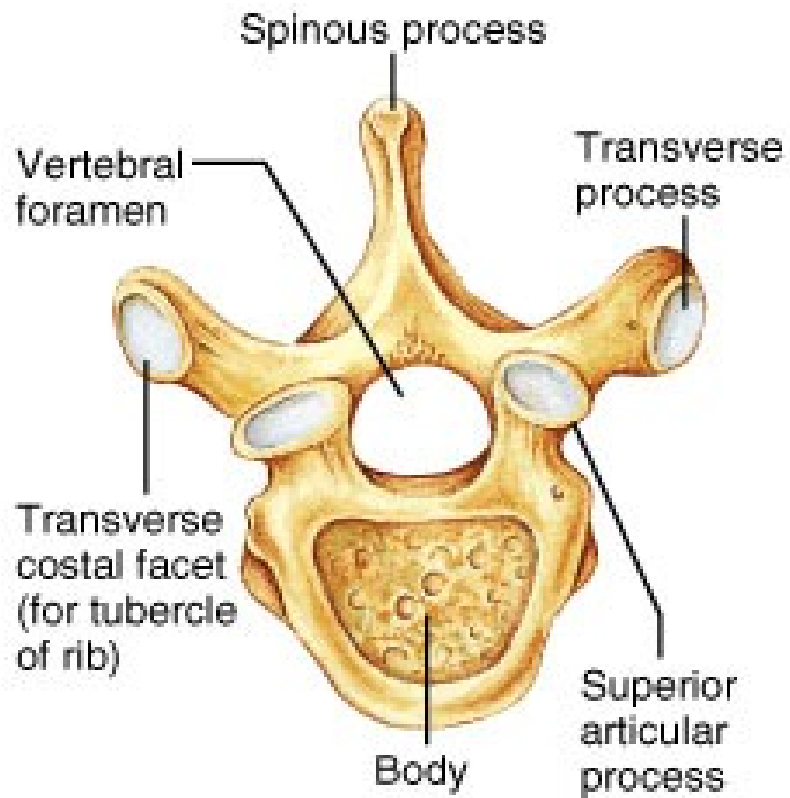
(b) Inferior view of atlas (C₁)

The Axis



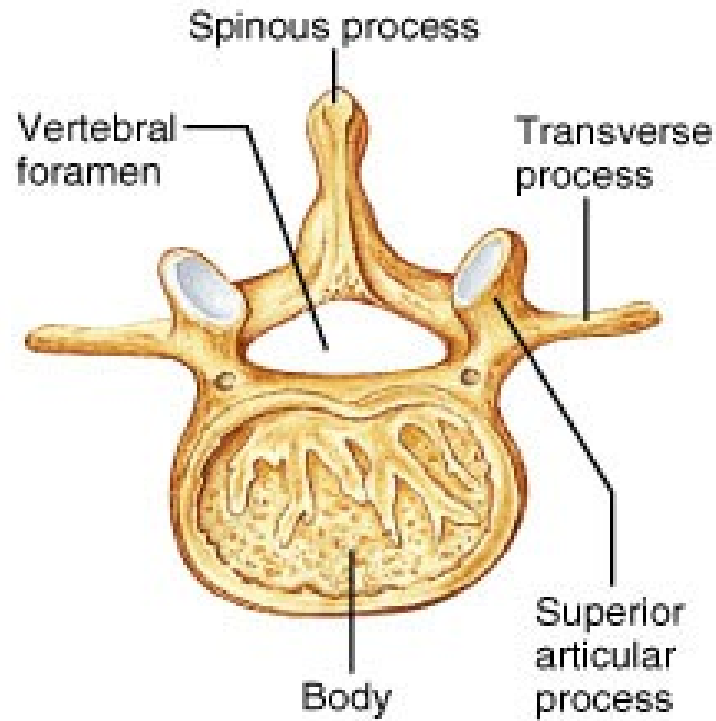
(c) Superior view of axis (C₂)

Thoracic Vertebrae



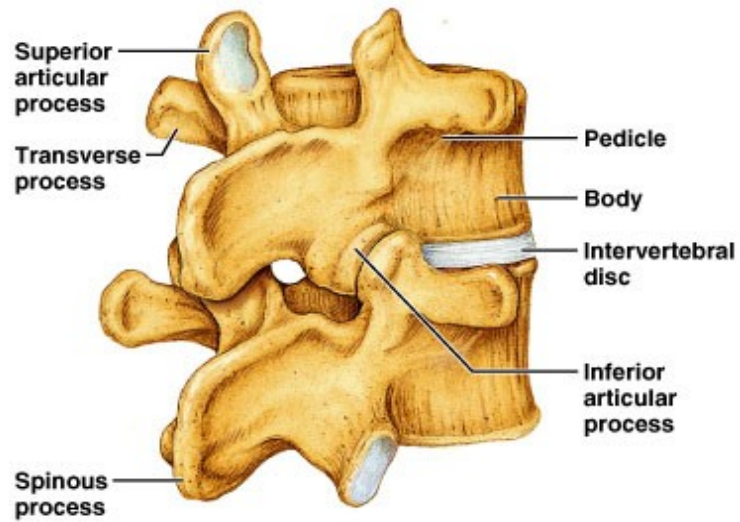
(b) Thoracic

Lumbar Vertebrae



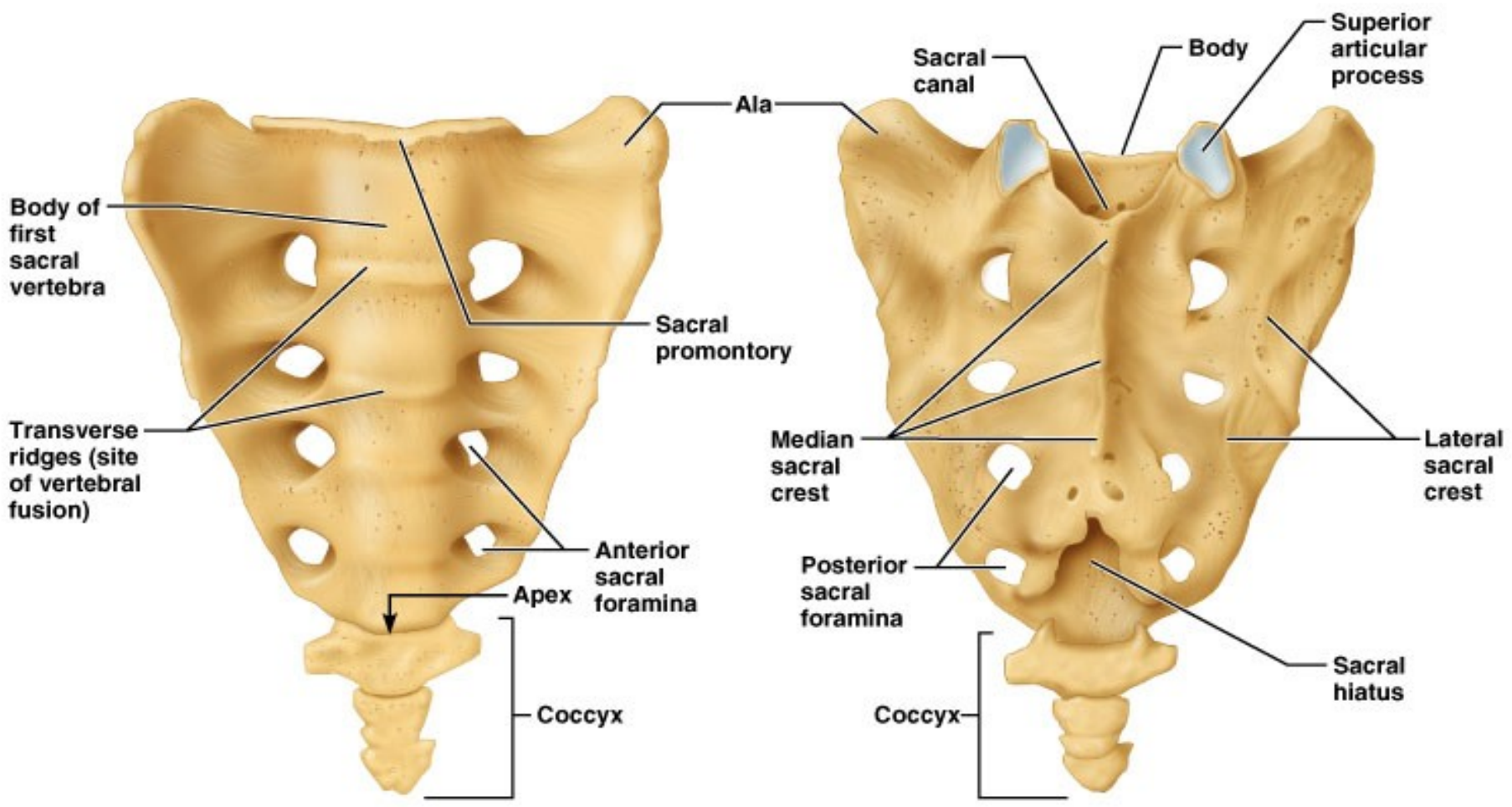
(c) Lumbar

Lumbar Vertebrae



(c) Lumbar vertebrae

Sacrum



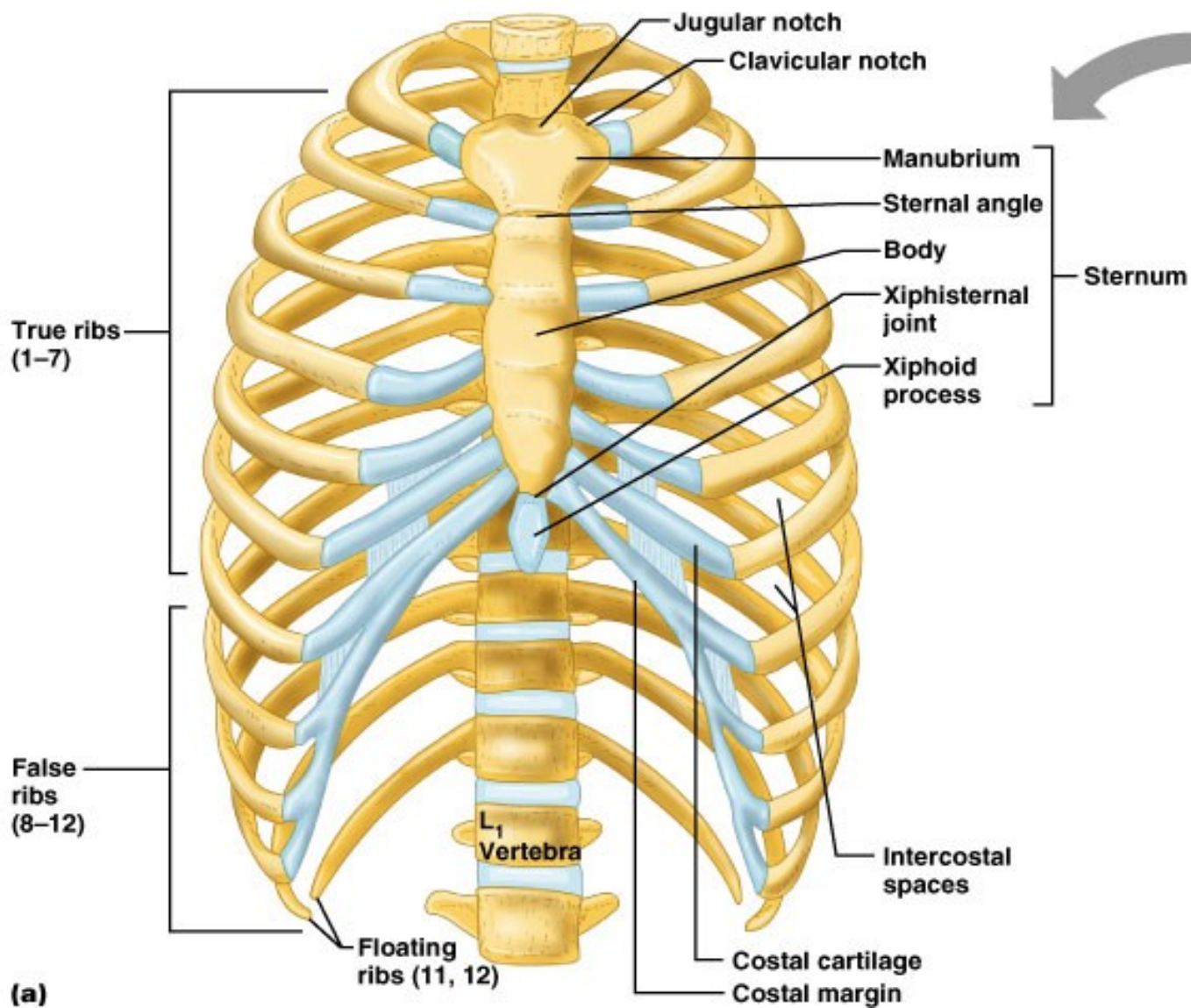
(a) Anterior view

(b) Posterior view

Bony Thorax

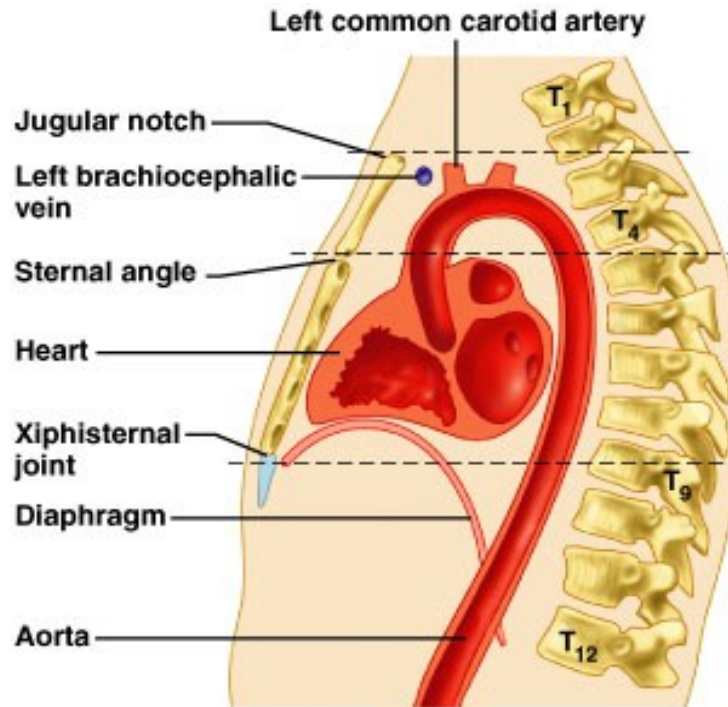
- Forms the framework of the chest
- Components of the bony thorax
 - Thoracic vertebrae – posteriorly
 - Ribs – laterally
 - Sternum and costal cartilage – anteriorly
- Protects thoracic organs
- Supports shoulder girdle and upper limbs
- Provides attachment sites for muscles

The Bony Thorax



(a)

The Bony Thorax

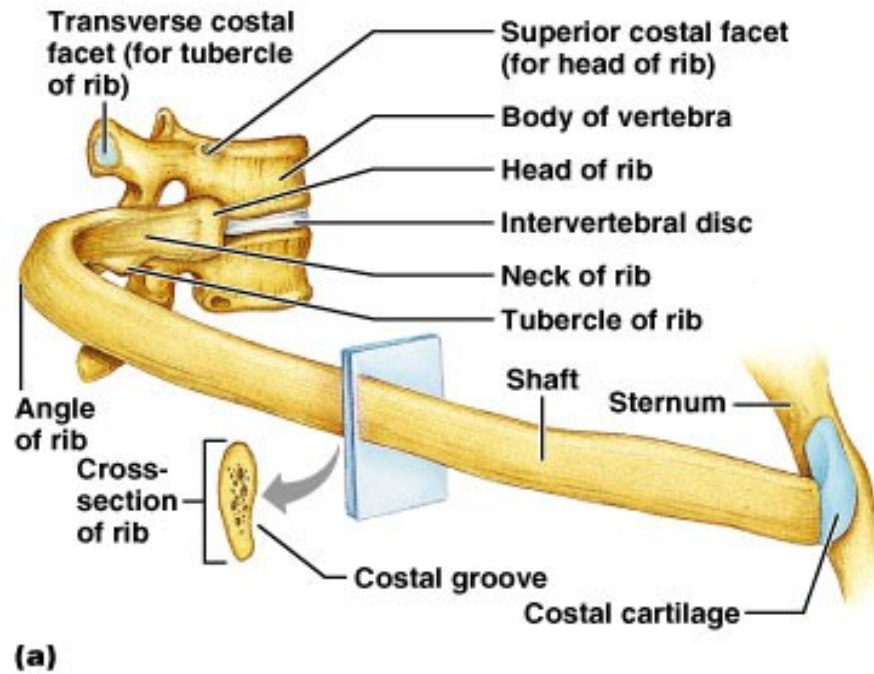


(b)

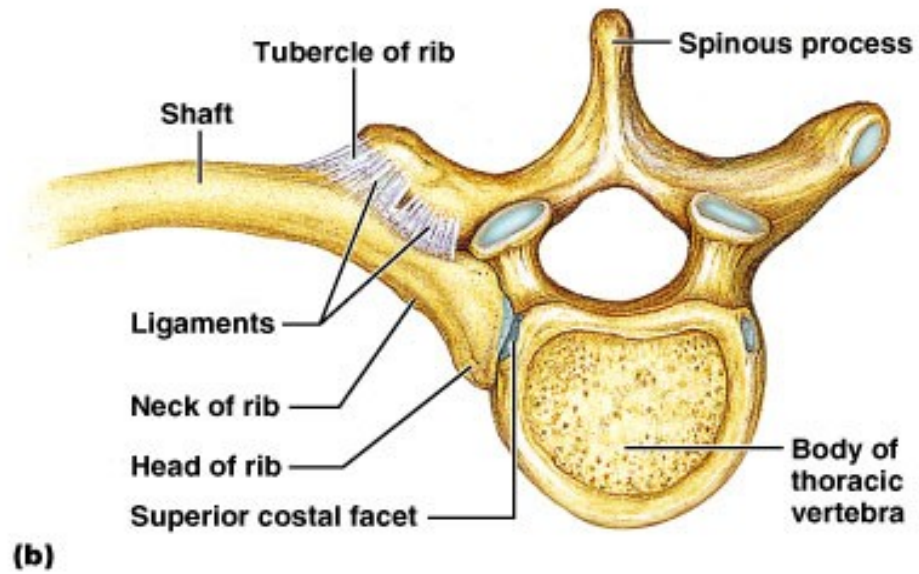
Ribs

- All ribs attach to vertebral column posteriorly
- True ribs - superior seven pairs of ribs
 - Attach to sternum by costal cartilage
- False ribs – inferior five pairs of ribs
- Ribs 11-12 are known as floating ribs

Ribs



Ribs



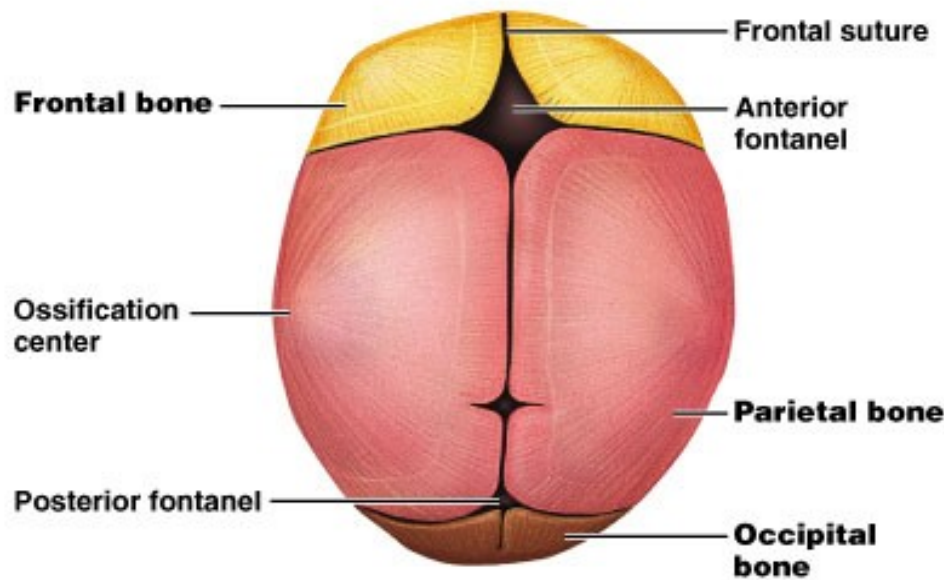
The Axial Skeleton Throughout Life

- Many bones of the face and skull form by intramembranous ossification
- Endochondral bones of the skull
 - Occipital bone, sphenoid and ethmoid bones, and parts of the temporal bone

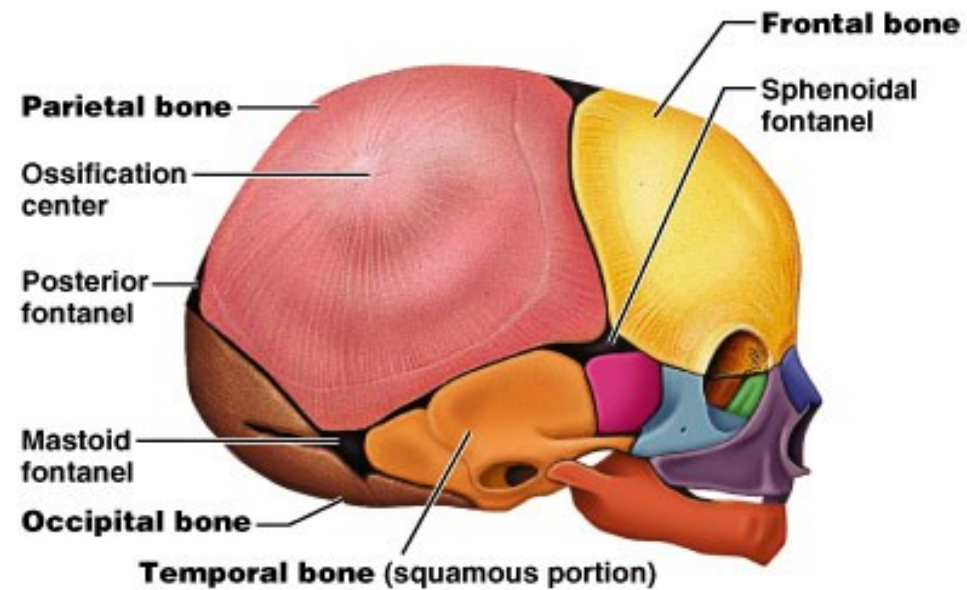
The Axial Skeleton Throughout Life

- Membrane bones begin to ossify in second month of development
- Bone tissue grows outward from ossification centers
- Fontanelles – unossified remnants of membranes

Fontanelles



(a) Superior view



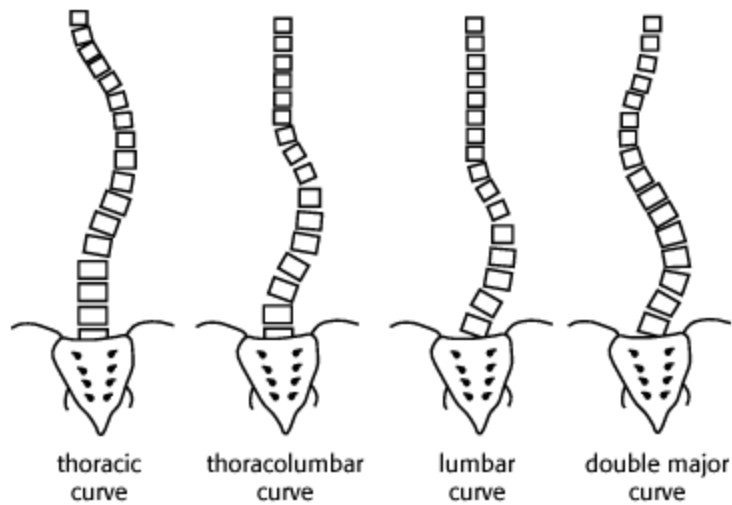
(b) Lateral view

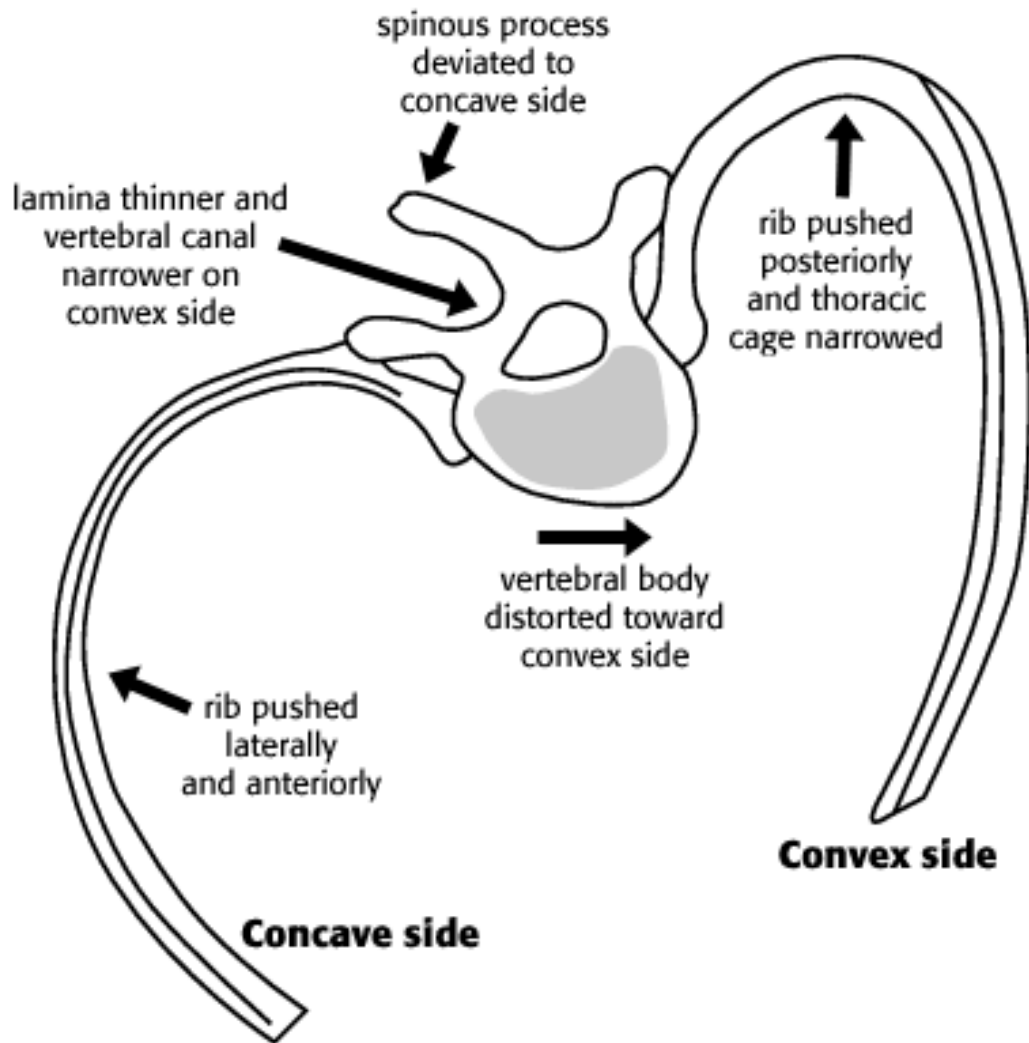
The Axial Skeleton Throughout Life

- Aging of the axial skeleton
 - Water content of the intervertebral discs decreases
 - By age 55, loss of a few centimeters in height is common
 - Thorax becomes more rigid
 - Bones lose mass with age

Disorders of the Axial Skeleton

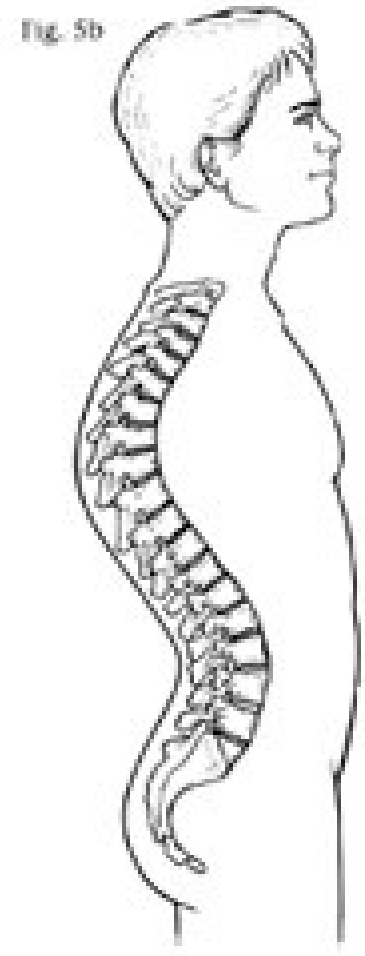
- Abnormal spinal curvatures
 - Scoliosis – an abnormal lateral curvature





Disorders of the Axial Skeleton

- Abnormal spinal curvatures
 - Kyphosis – an exaggerated thoracic curvature



Disorders of the Axial Skeleton

- Abnormal spinal curvatures
 - Lordosis – an accentuated lumbar curvature – "swayback"

