Skeletal system of the body

❖ Axial skeleton

- Skull

The skull is composed of several separate bones united at immobile joints called sutures. The connective tissue between the bones is called a sutural ligament. The mandible is an exception to this rule, for it is united to the skull by the mobile *temporomandibular joint.*

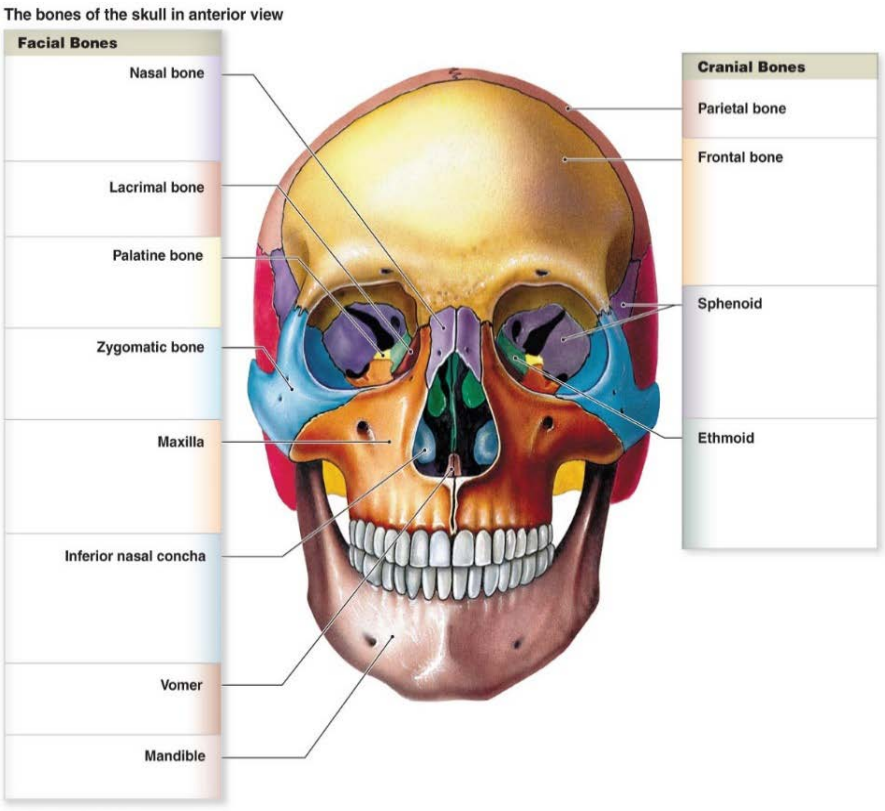
The skull is composed of 22 bones, 8 of these bones form the **cranium** (which contains the brain and meninges), and 14 of these form the **face**. The **vault** is the upper part of the cranium, and the **base of the skull** is the lowest part of the cranium.

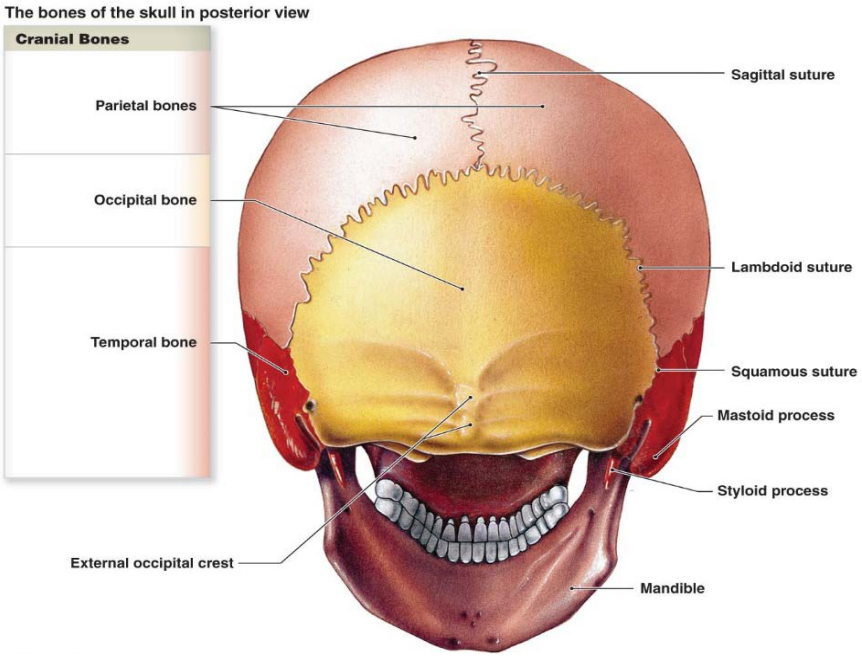
☒ **Cranium** consists of the following bones, two of which are paired :

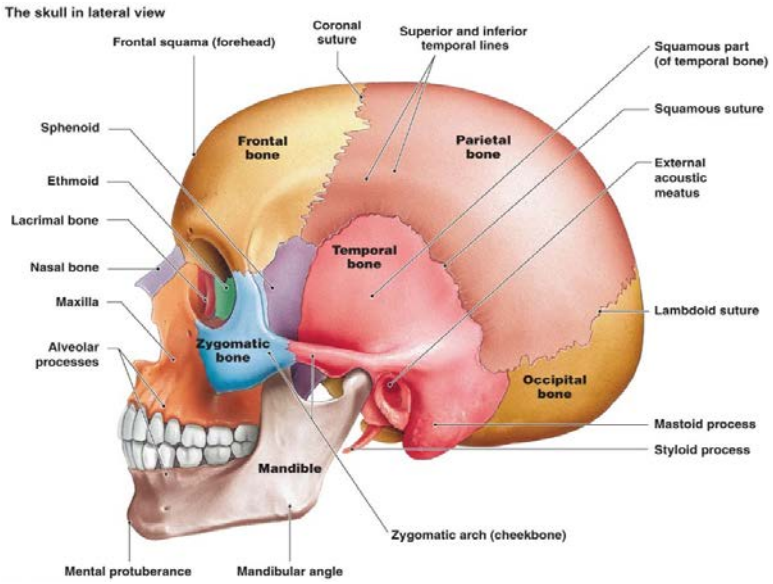
- Frontal bone: 1
- Parietal bones: 2
- Occipital bone: 1
- Temporal bones: 2
- Sphenoid bone: 1
- Ethmoid bone: 1

☒ **Facial** bones consist of the following, two of which are single:

- Zygomatic bones: 2
- Maxillae: 2
- Nasal bones: 2
- Lacrimal bones: 2
- Vomer: 1
- Palatine bones: 2
- Inferior conchae: 2
- Mandible: 1







☒Cranium

1. **FRONTAL BONE**

➢ **Parts:**

1. <u>Squamous portion</u>

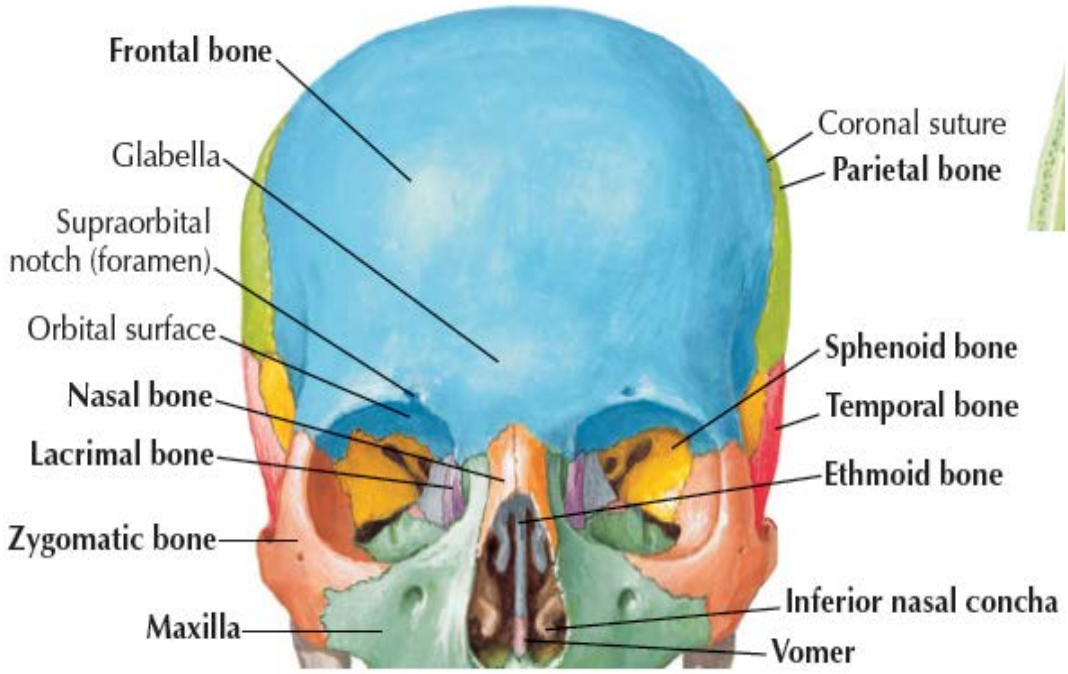
- The largest part of the frontal bone.
- Forms the majority of the forehead.
- The zygomatic process of the frontal bone extends from the posterior part of the supra orbital margin.
- Contains the frontal paranasal sinuses.
- Has supraorbital notch or foramen

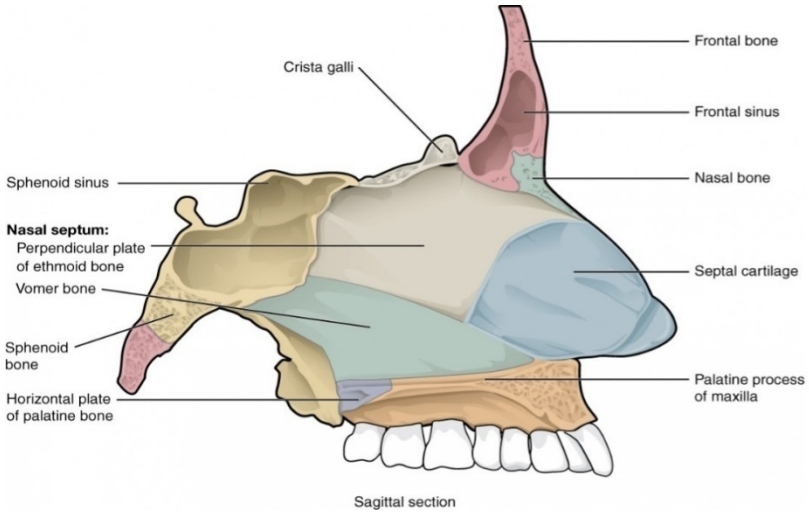
2. Orbital portion

- Forms the roof of the orbit and floor of the anterior cranial fossa.

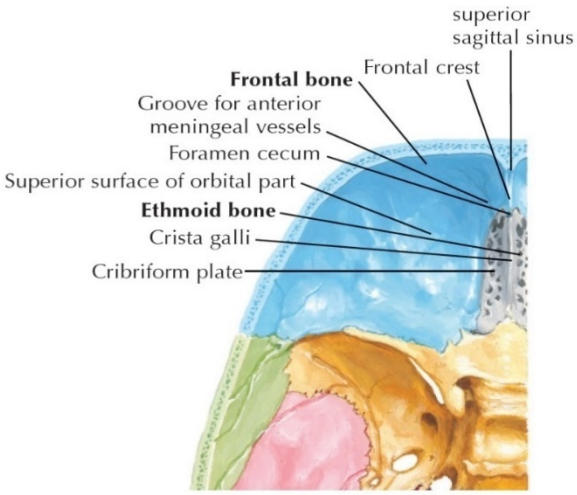
3. Nasal portion

- Articulates with the nasal bones and the frontal process of the maxilla to form the root of the nose.





Sagittal section



Borders	Coronal suture separates it from the parietal bone Sphenofrontal suture separates it from the sphenoid bone Zygomaticofrontal suture separates it from the zygomatic bone Nasofrontal suture separates it from the nasal bone Frontomaxillary suture separates it from the maxilla
Articulations	Twelve bones: the sphenoid, the ethmoid, two parietals, two nasals, two maxillae, two lacrimals, two zygomatics

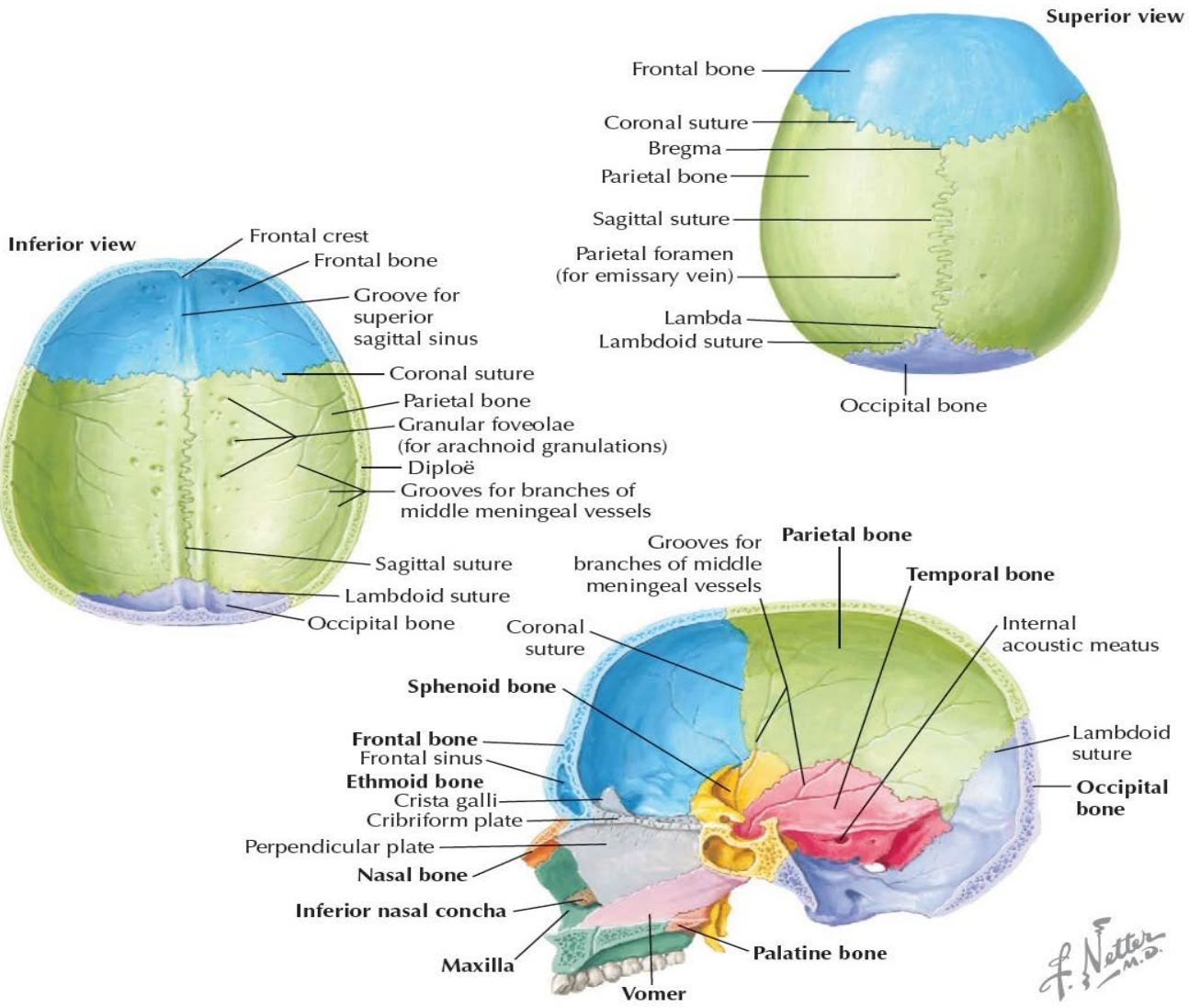
2. PARIETAL BONE

➢ Characteristics

- Forms the majority of the cranial vault
- The four corners of the parietal are not ossified at birth and give rise to the fontanelles.
- There are 2 parietal bones.
- Relatively square, forming the roof and sides of the cranial vault.
- Endocranial surface is filled with grooves made by branches of the middle meningeal artery.
- Has parietal foramen

➢ **Parts:** Has 4 angles

1. Frontal— located at <u>bregma</u>.
2. Sphenoid— located at <u>pterion</u>.
3. Occipital— located at <u>lambda</u>.
4. Mastoid— located at <u>asterion</u>.



Borders

The two parietal bones meet each other in the midline of the skull roof forming a serrated margin known as the sagittal suture. Apart from its opposite counterpart, each parietal bone is surrounded by four other bones:

- anteriorly it borders with the frontal bone (→coronal suture)
- posteriorly with the occipital bone (→ lambdoid suture)
- laterally it comes in contact with the temporal bone (→squamosal suture) and sphenoid bone (→ sphenoparietal suture)

3. OCCIPITAL BONE

➢ Characteristics

- Forms the posteriorpart of the cranial vault.
- Articulates with the atlas.
- There is 1 occipital bone.

➢ Parts:

1. Squamous portion

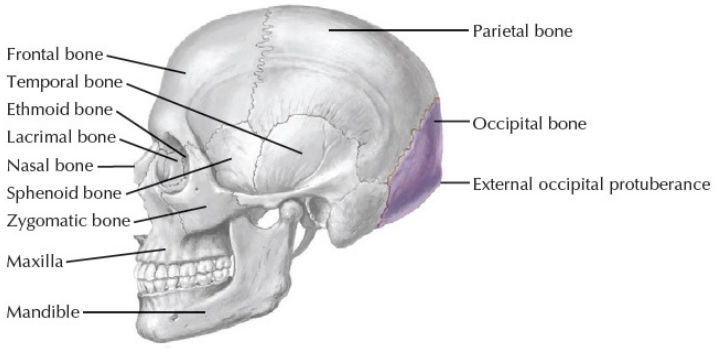
- Articulates with the temporal and parietal bones by occipitomastiod and lambdoid sutures
- The largest portion of the occipital bone.
- Located posterior and superior to the foramen magnum.
- Has the external occipital protuberance (more pronounced in males).
- Has the superior and the inferior nuchal lines.
- Has grooves on the internal surface for 3 of the sinuses forming the confluence of the sinuses (the superior sagittal and the right and left transverse sinuses)
- The depression superior to the transverse sinus is for the occipital lobes of the brain.
- The depression inferior to the transverse sinus is for the cerebellum.

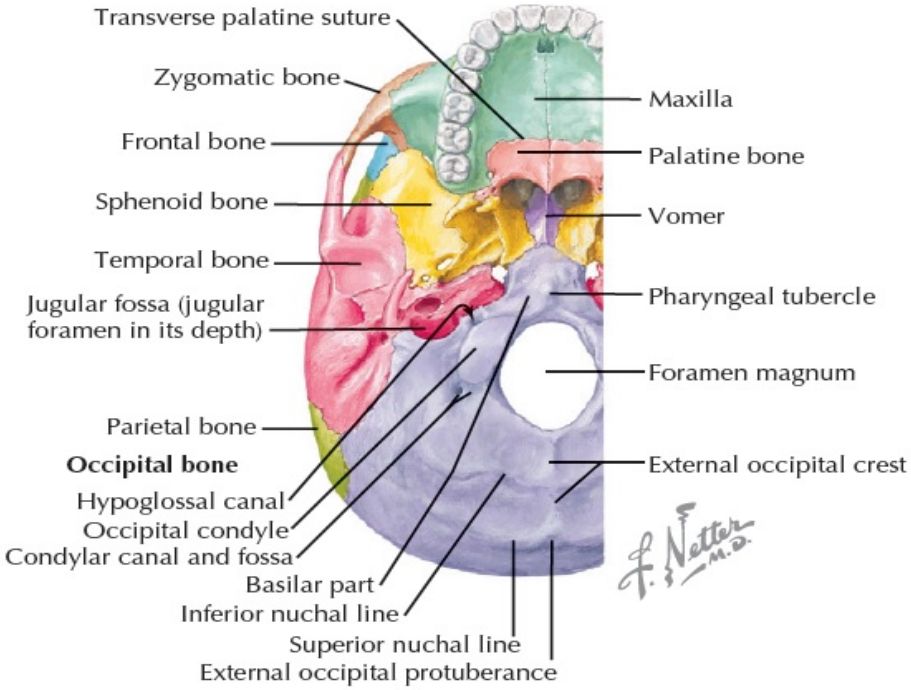
2. Lateral portion

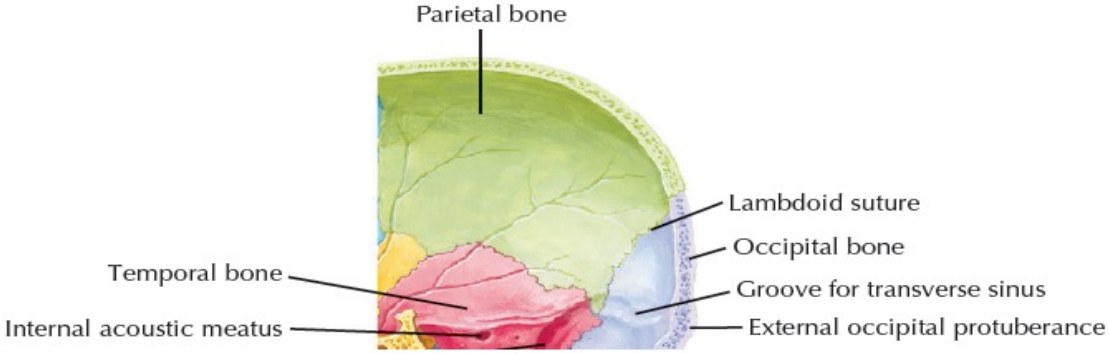
- Articulates with the temporal bone.
- It is the portion lateral to the foramen magnum.
- Has the occipital condyles that articulate with the atlas.
- Contains the hypoglossal canal.
- Forms a portion of the jugular foramen.

3. Basilar portion

- Articulates with the petrous partof the temporal and the sphenoid bones.
- It is the portion immediately anterior to the foramen magnum.
- Pharyngeal tubercle is part of the basilar portion that provides attachment for the superior constrictor muscle.
- Internal surface of the basilar portion is called the **clivus**, and part of the brainstem lies against it.







4. TEMPORAL BONE

- **Characteristics**
  - Help form the base and the lateral walls of the skull.
  - House the auditory and vestibular apparatuses.
  - Contain mastoid air cells.
  - There are 2 temporal bones.
- **Parts:**

1. <u>Squamous part:</u>

- The largest portion of the bone.
- Three portions to the squamous part:

☒ Temporal

- Temporal portion is the thin large area on the squamous part of the temporal.
- On the internal surface of the temporal portion lies a groove for the middle meningeal artery.

☒ Zygomatic process

- The zygomatic process extends laterally and anteriorly from the squamous portion; it articulates with the temporal process of the zygomatic bone to make the <u>zygomatic arch.</u>

☒ Glenoid fossa

- Glenoid fossa is inferior and medial to the zygomatic process; it articulates with the mandibular condyle, forming the temporomandibular joint

2. <u>Petrous part:</u>

- Forms the solid portion of bone.
- The auditory and vestibular apparatuses are located within the petrous part.
- Helps separate the temporal and the occipital lobes of the brain.
- It extends anteriorly and medially.
- The medial part articulates with the sphenoid bone to form the foramen lacerum.
- Internal acoustic meatus is observed on the medial side of the petrous part.
- Carotid canal lies on the inferior part of the petrous part.
- Petrotympanic fissure lies between the petrous part of the temporal bone and the tympanic part of the temporal bone.
- On the posterior inferior surfaceof the petrous part lies the jugular fossa.

3. <u>mastoid part</u> :

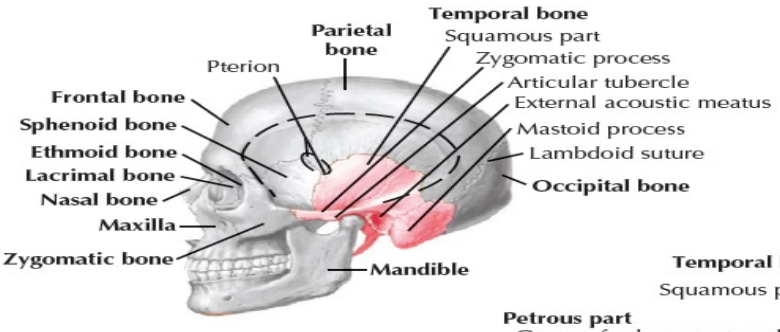
- extends posteriorly and has large mastoid air cells.
- superior serrated edge for the articulation with the mastoid angle of the parietal bone, posterior also serrated for articulation with the inferior border of the occipital bone, anterior fused with the squamous part.

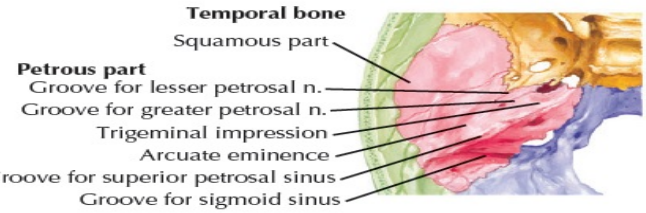
4. <u>Tympanic part:</u>

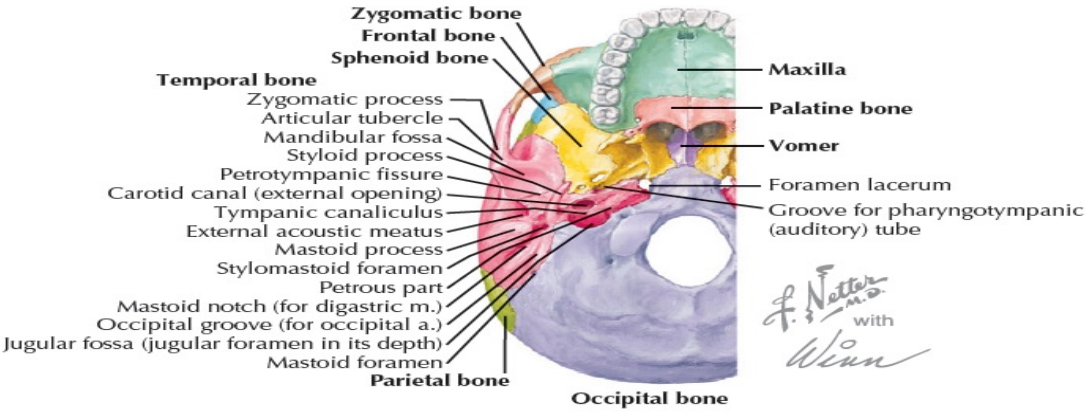
- A plate of bone forming the anterior,posterior, and inferior portions of the external acoustic meatus.
- Anterior part forms the posterior portion of the glenoid fossa

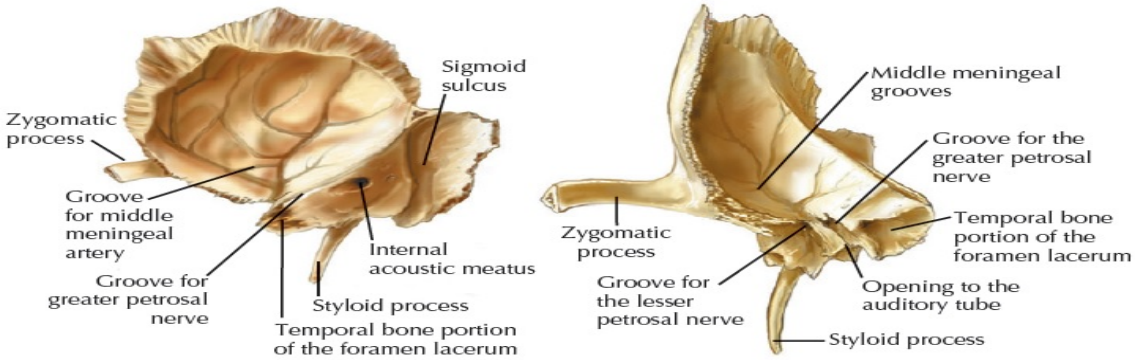
5. <u>Styloid process</u>:

- A projection from the temporal bone.
- The stylomastoid foramen lies posterior to this process.









5. SPHENOID BONE

➢ **Characteristics**

- Forms the majority of the middle portion of the cranial base.
- Forms the majority of the middle cranial fossa.
- Contains the sphenoid paranasal sinus.
- There is 1 sphenoid bone.

➢ **Parts**

1. Body:

- The center of the sphenoid
- Superior part of the body, known as the sella turcica, is saddle-shaped and possesses the anterior and posterior clinoid processes.
- Hypophyseal fossa, the deepest part of the sella turcica, houses the pituitary gland.
- Dorsum sellae is a square-shaped part of the bone that lies posterior to the sella turcica.
- Clivus is the portion that slopes posterior to the body.
- Body contains the sphenoid paranasal sinuses.
- Optic canal is found in the body of the sphenoid.

2. Greater wing:

- Extends laterally and anteriorly from the posterior portion of the body of the sphenoid.
- Helps form a large part of the middle cranial fossa.
- Anterior portion lies in the orbit.
- Contains 3 foramina:

✓ Foramen spinosum.
✓ Foramen rotundum.
✓ Foramen ovale.

3. Lesser wing:

- Extends laterally and anteriorly from the superior portion of the sphenoid body.
- Separated from the greater wing by the superior orbital fissure.

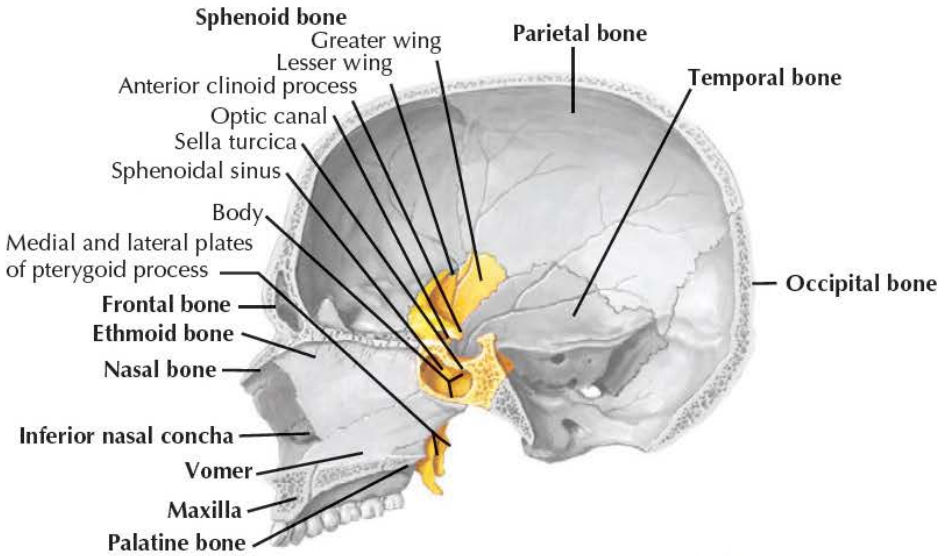
4. Pterygoid process:

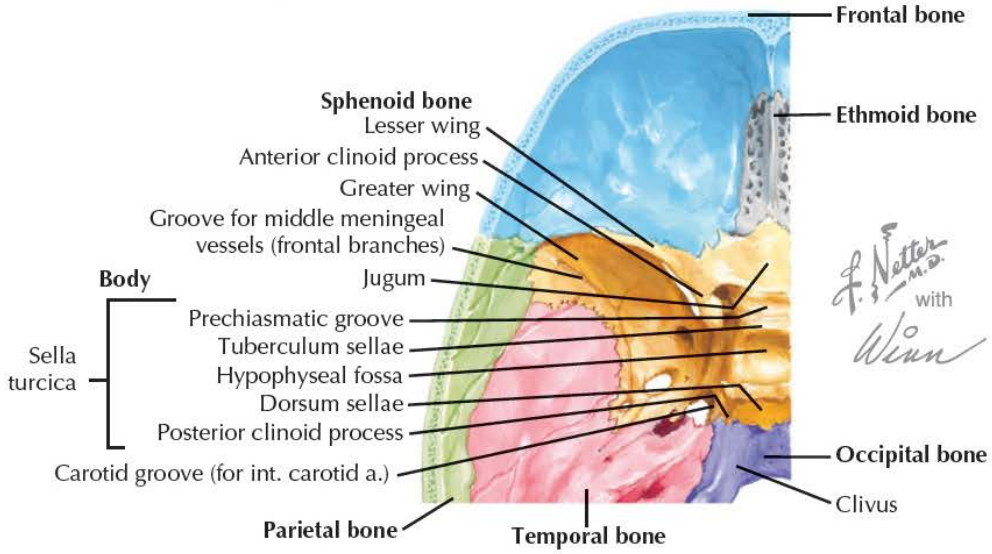
- Arises from the inferior surface of the body.
- There are 2 pterygoid processes each has a:

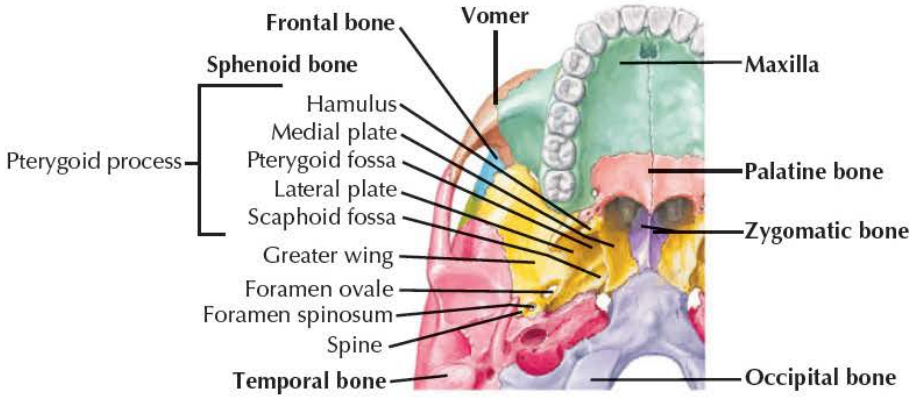
✓ Lateral pterygoid plate.
✓ Medial pterygoid plate.

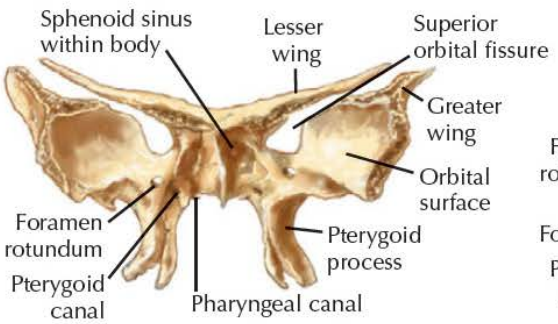
- Pterygoid hamulus extends from the medial pterygoid plate.
- Two canals are associated with the pterygoid process:

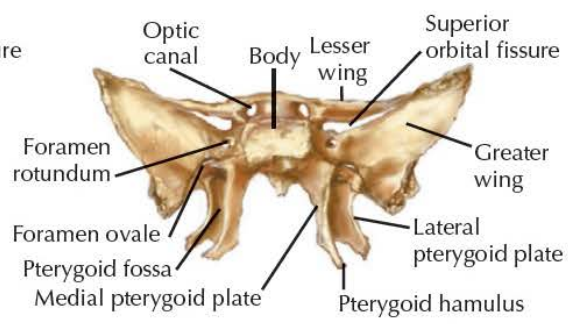
✓ Pterygoid canal.
✓ Pharyngeal canal.


Sphenoid bone
Greater wing
Lesser wing
Anterior clinoid process
Optic canal
Sella turcica
Sphenoidal sinus
Body
Medial and lateral plates of pterygoid process
Frontal bone
Ethmoid bone
Nasal bone
Inferior nasal concha
Vomer
Maxilla
Palatine bone
Parietal bone
Temporal bone
Occipital bone


Frontal bone
Sphenoid bone
Lesser wing
Anterior clinoid process
Greater wing
Groove for middle meningeal vessels (frontal branches)
Body
Jugum
Sella turcica
Prechiasmatic groove
Tuberculum sellae
Hypophyseal fossa
Dorsum sellae
Posterior clinoid process
Carotid groove (for int. carotid a.)
Parietal bone
Temporal bone
Ethmoid bone
Occipital bone
Clivus
F. Netter M.D. with Winn


Frontal bone
Vomer
Sphenoid bone
Maxilla
Hamulus
Medial plate
Pterygoid process
Pterygoid fossa
Lateral plate
Palatine bone
Scaphoid fossa
Zygomatic bone
Greater wing
Foramen ovale
Foramen spinosum
Spine
Temporal bone
Occipital bone


Sphenoid sinus within body
Lesser wing
Superior orbital fissure
Greater wing
Orbital surface
Foramen rotundum
Pterygoid process
Pterygoid canal
Pharyngeal canal


Optic canal
Body
Lesser wing
Superior orbital fissure
Foramen rotundum
Greater wing
Foramen ovale
Lateral pterygoid plate
Pterygoid fossa
Medial pterygoid plate
Pterygoid hamulus

6. ETHMOID BONE

➢ **Characteristics**

- A porous bone that forms the major portion of the middle part of the face **between the orbits.**
- Helps form the orbit, nasal cavity, nasal septum, and anterior cranial fossa.
- There is 1 ethmoid bone

➢ **Parts:**

1. Perpendicular plate

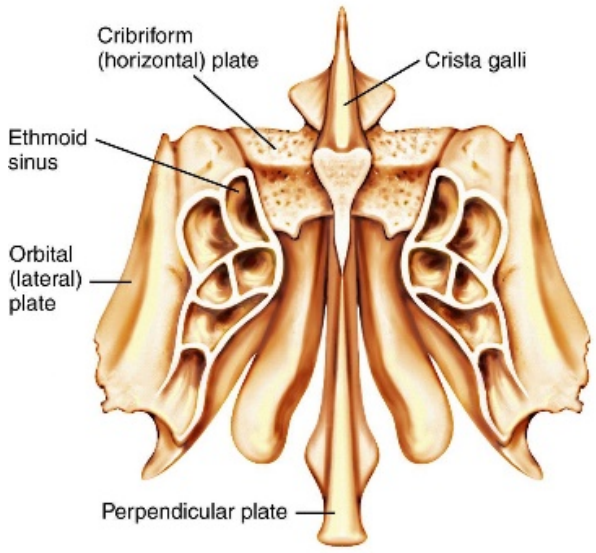
- A flat plate that descends from the cribriform plate to form part of the nasal septum.
- Articulates with the vomer inferiorly.

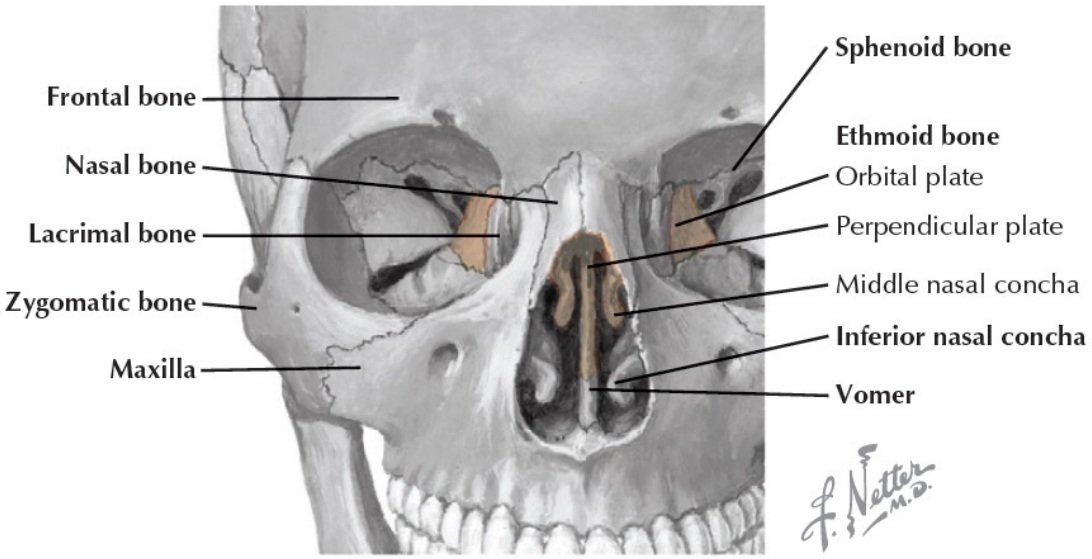
2. Cribriform plate

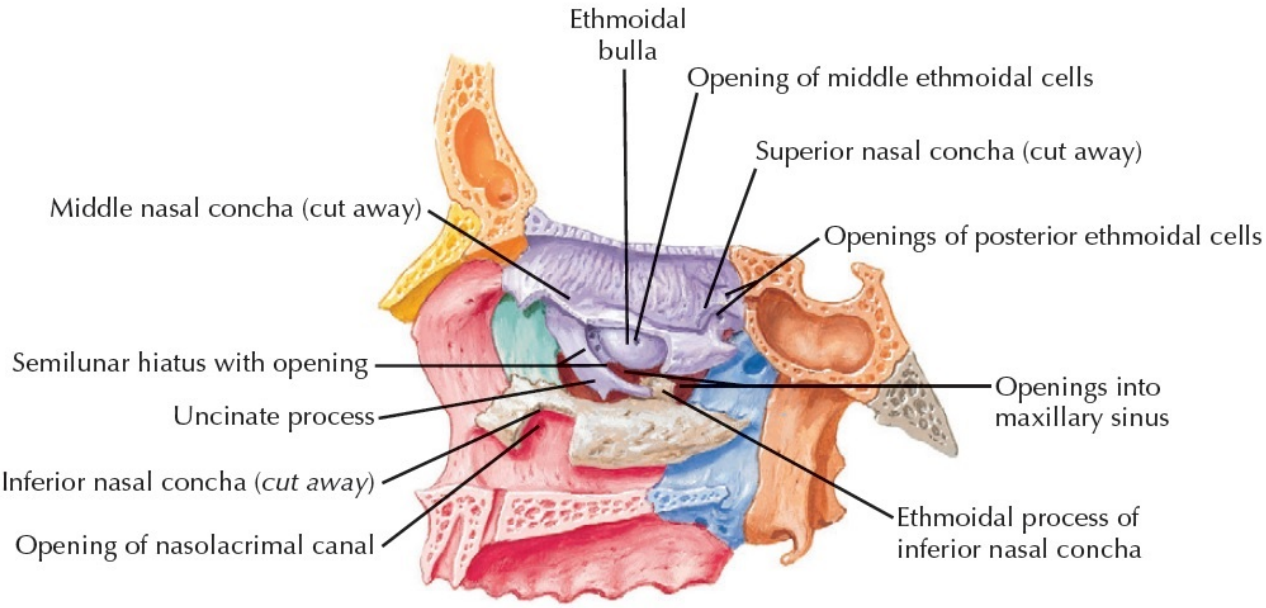
- A horizontal bone that forms the superior surface of the ethmoid and it contains numerous foramina for the olfactory nerve.
- Crista galli is a vertical plate that extends superiorly from the cribriform plate
- Associated with a small foramen cecum, anterior and posterior ethmoidal foramina .

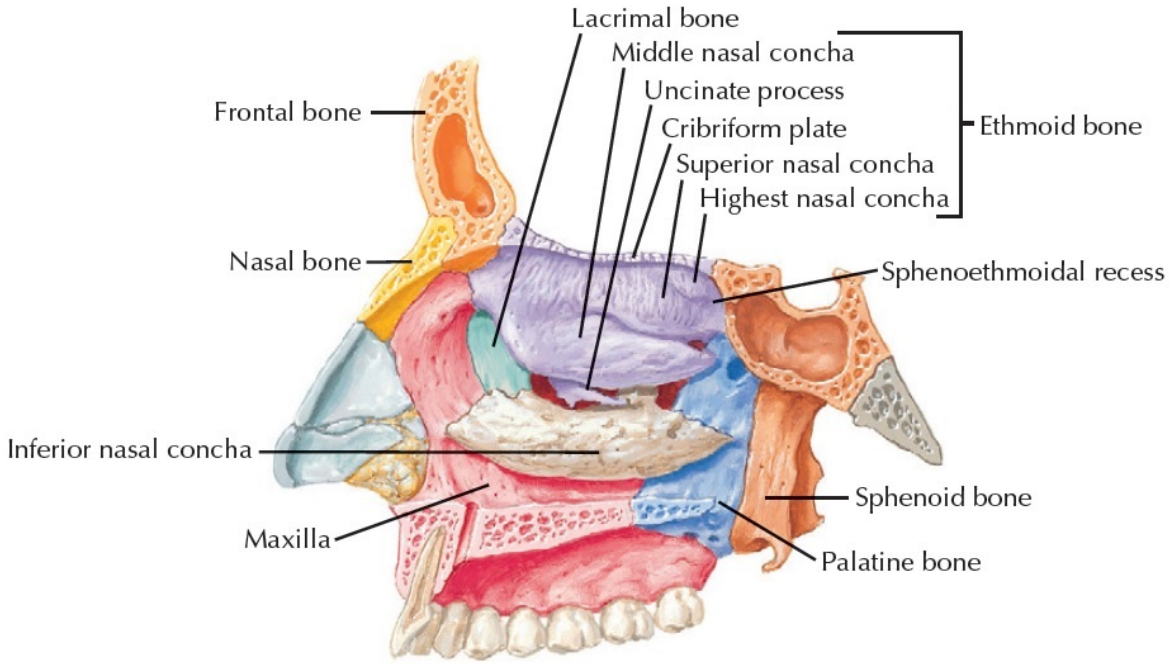
3. Ethmoid labyrinth

- The largest part of the ethmoid bone.
- Descends inferiorly from the cribriform plate.
- Ethmoid paranasal sinuses are located within the ethmoid labyrinth.
- Ethmoid labyrinth forms 2 major structures within the nasal cavity:
  - ✓ Superior nasal concha.
  - ✓ Middle nasal concha.
- Ethmoid bulla is the large elevation of bone located by the middle ethmoid paranasal sinuses.
- Uncinate process is a curved piece of bone.
- Between the uncinate process and the ethmoid bulla is the hiatus semilunaris.




Frontal bone
Nasal bone
Lacrimal bone
Zygomatic bone
Maxilla
Sphenoid bone
Ethmoid bone
Orbital plate
Perpendicular plate
Middle nasal concha
Inferior nasal concha
Vomer
F. Netter M.D.


Ethmoidal bulla
Opening of middle ethmoidal cells
Superior nasal concha (cut away)
Middle nasal concha (cut away)
Openings of posterior ethmoidal cells
Semilunar hiatus with opening
Openings into maxillary sinus
Uncinate process
Inferior nasal concha (cut away)
Ethmoidal process of inferior nasal concha
Opening of nasolacrimal canal


Lacrimal bone
Middle nasal concha
Uncinate process
Cribriform plate
Superior nasal concha
Highest nasal concha
Ethmoid bone
Frontal bone
Nasal bone
Sphenoethmoidal recess
Inferior nasal concha
Sphenoid bone
Maxilla
Palatine bone