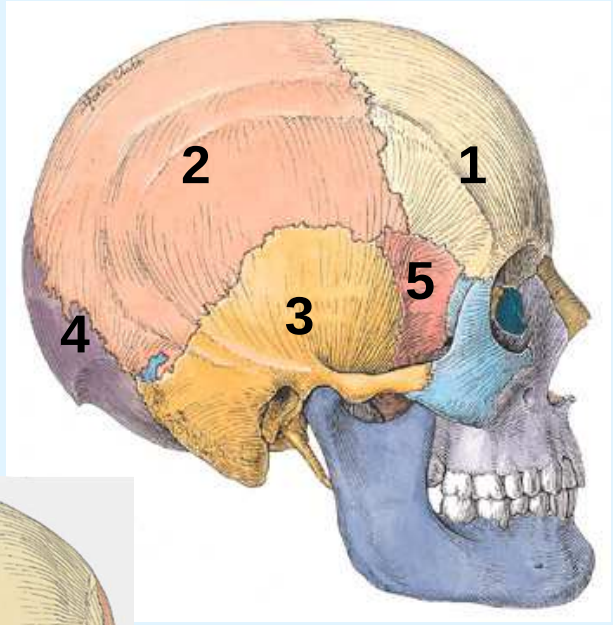
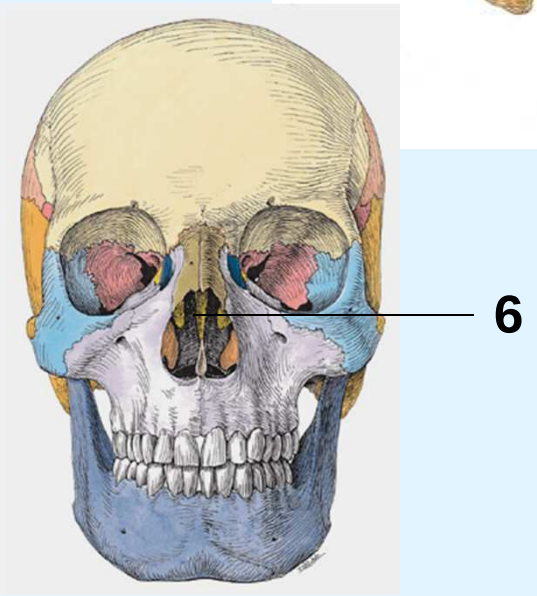
BONES OF HEAD, TRUNK, AND PELVIS

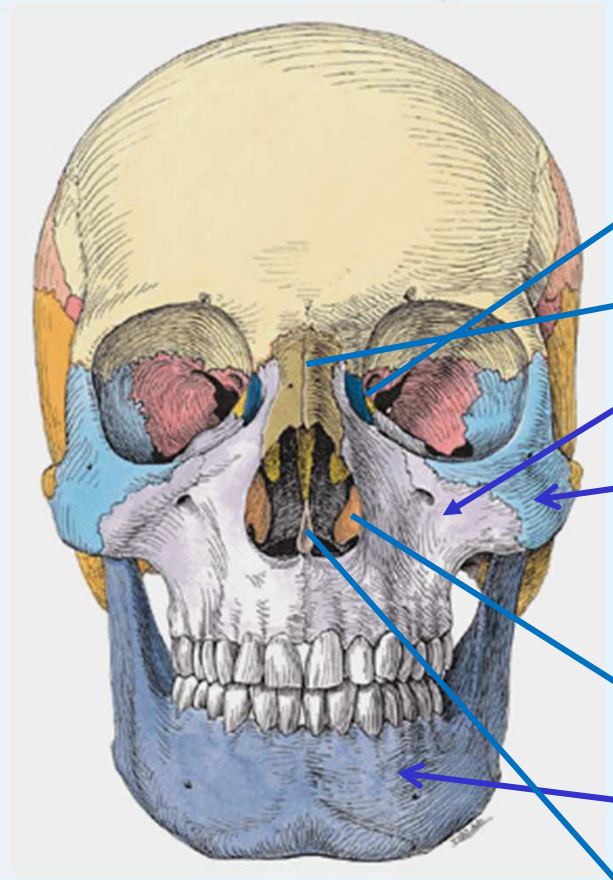
HEAD - CRANIUM (SKULL)

- a series of bones form its two parts, **neurocranium** and **facial skeleton (viserocranium)**.
  - **Neurocranium** is formed by **8** bones
    1. A frontal bone
    2. Paired parietal bones
    3. Paired temporal bones
    4. An occipital bone
    5. A sphenoid bone
    6. An ethmoid bone



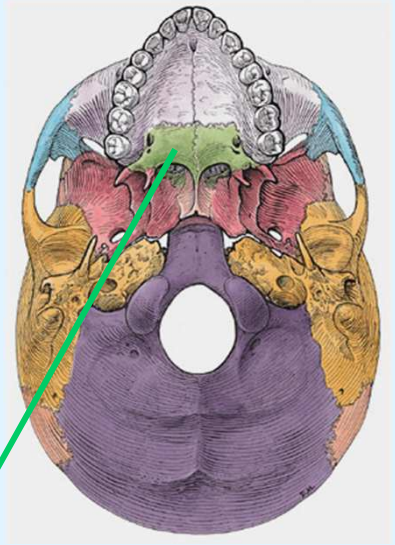


Facial skeleton



- consists of **14** irregular bones

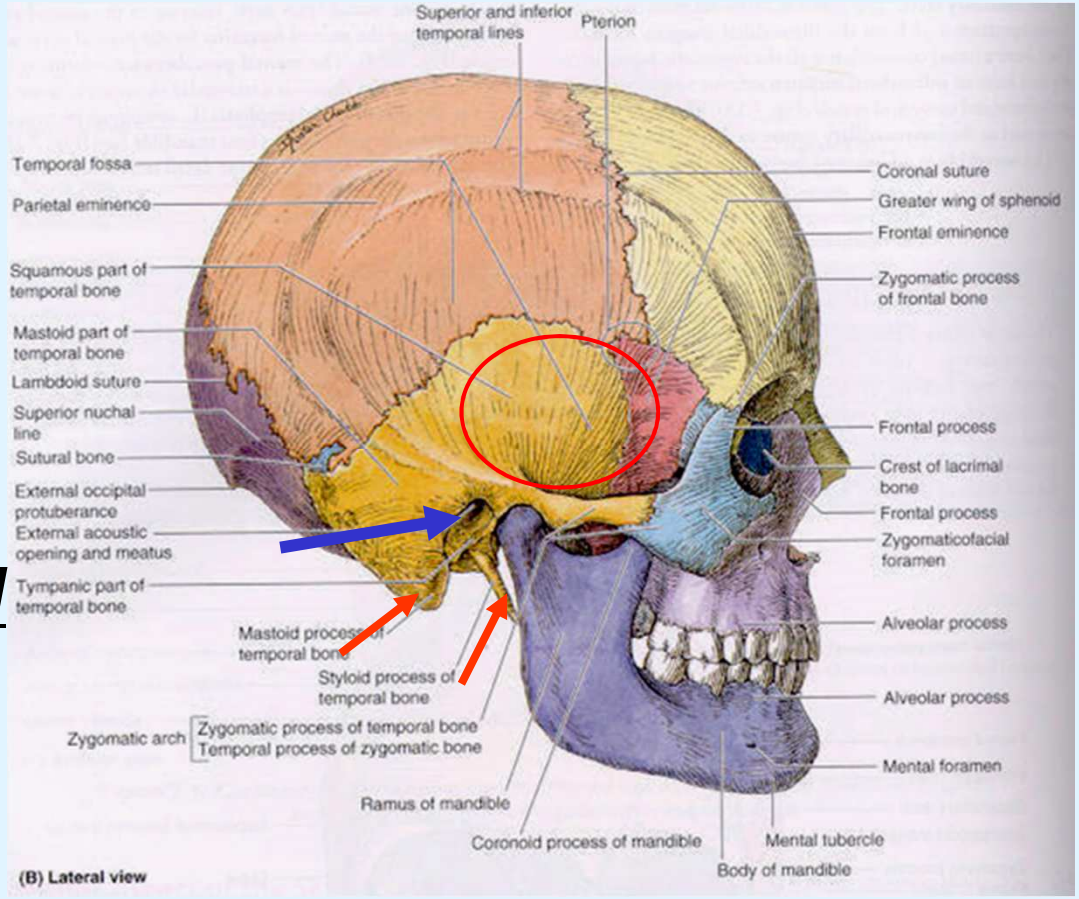
1. Lacrimal bone (2)
2. Nasal bones (2)
3. Maxillae (2)
4. Zygomatic bones (2)
5. Palatine bones (2)
6. Inferior nasal conchae (2)
7. Mandible (1)
8. Vomer (1)



Lateral aspect of the cranium

Main features

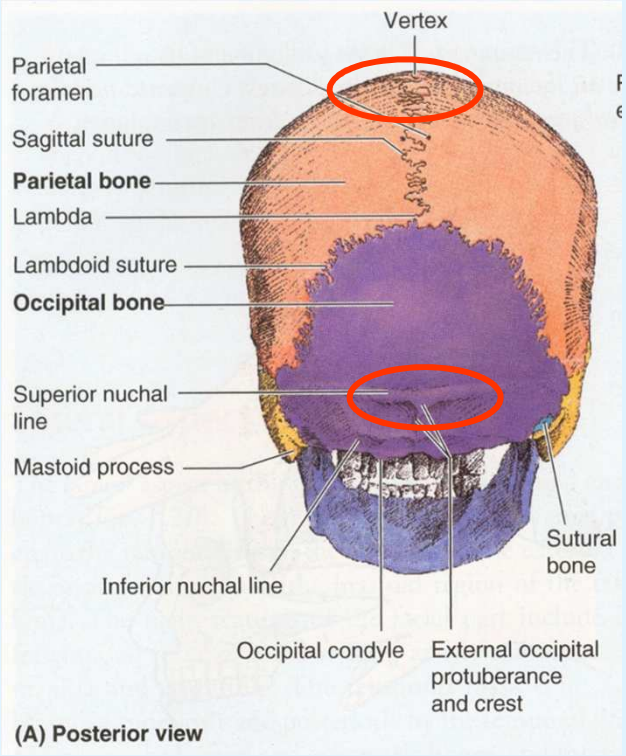
- **Temporal fossa**
- The opening of the external acoustic meatus
- **Mastoid process** of temporal bone. ***Sternocleidomastoid*** muscle attaches to it.
- **Styloid process** of temporal bone



Posterior and external aspect of the cranium

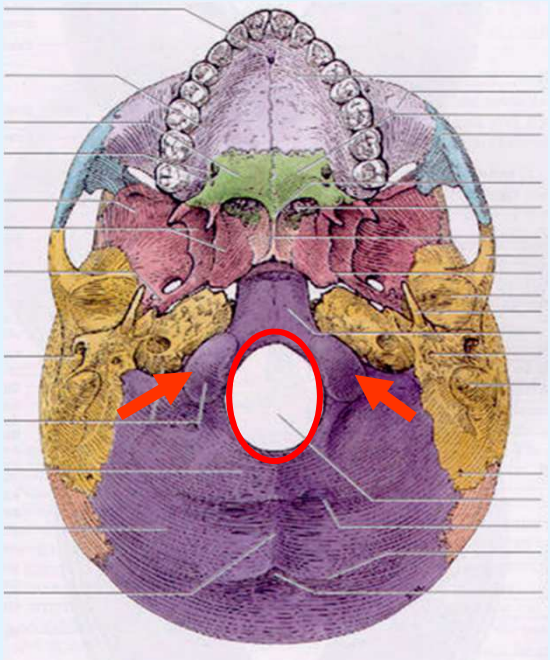
Posterior aspect

- Vertex
- **External occipital protuberance**



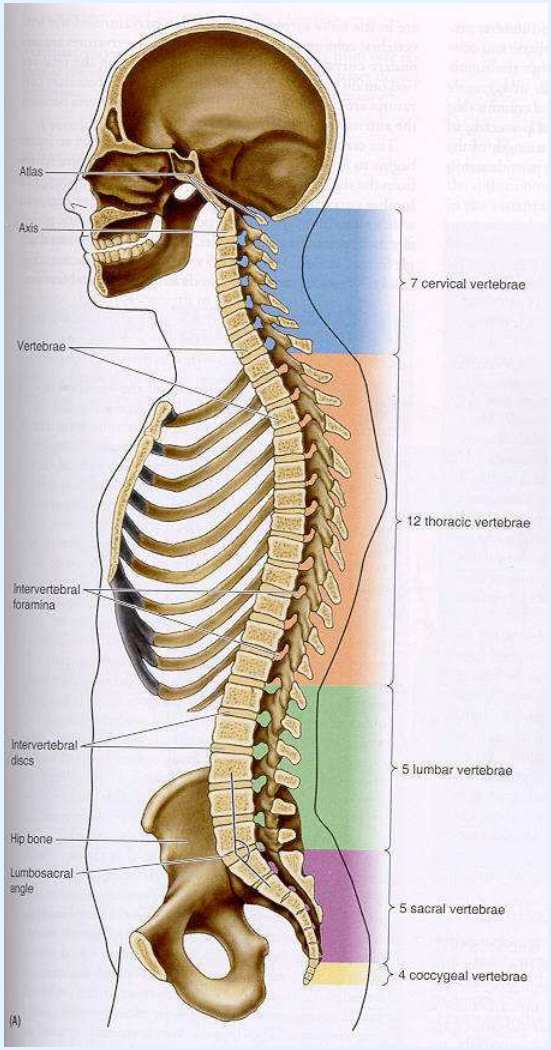
External aspect

- **Foramen magnum**
- Two **occipital condyles** are the articular surfaces for atlanto-occipital joints



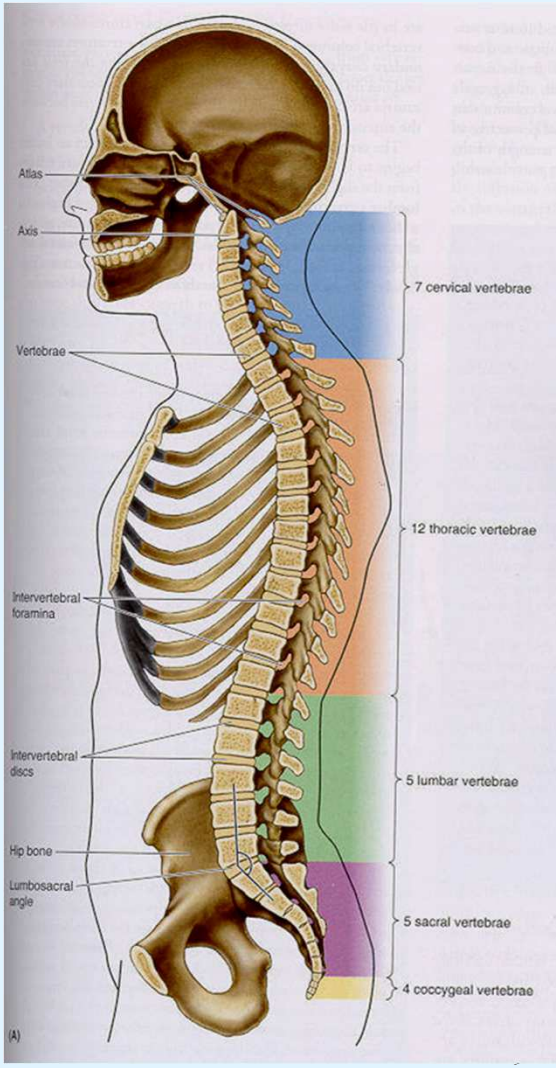
VERTERBRAL COLUMN

- Vertebral column (backbone, spine), extending from skull to apex of the coccyx
- Its function includes
  - forms the skeleton of the neck and back and is the main part of the axial skeleton
  - protests the spinal cord
  - supports the weight of the body
  - provides a partly rigid and flexible axis for the body and a pivot for the head
  - plays an important role in posture and locomotion movement from one place to another



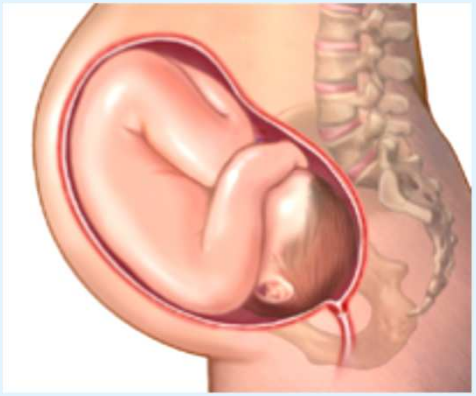
VERTERBRAL COLUMN

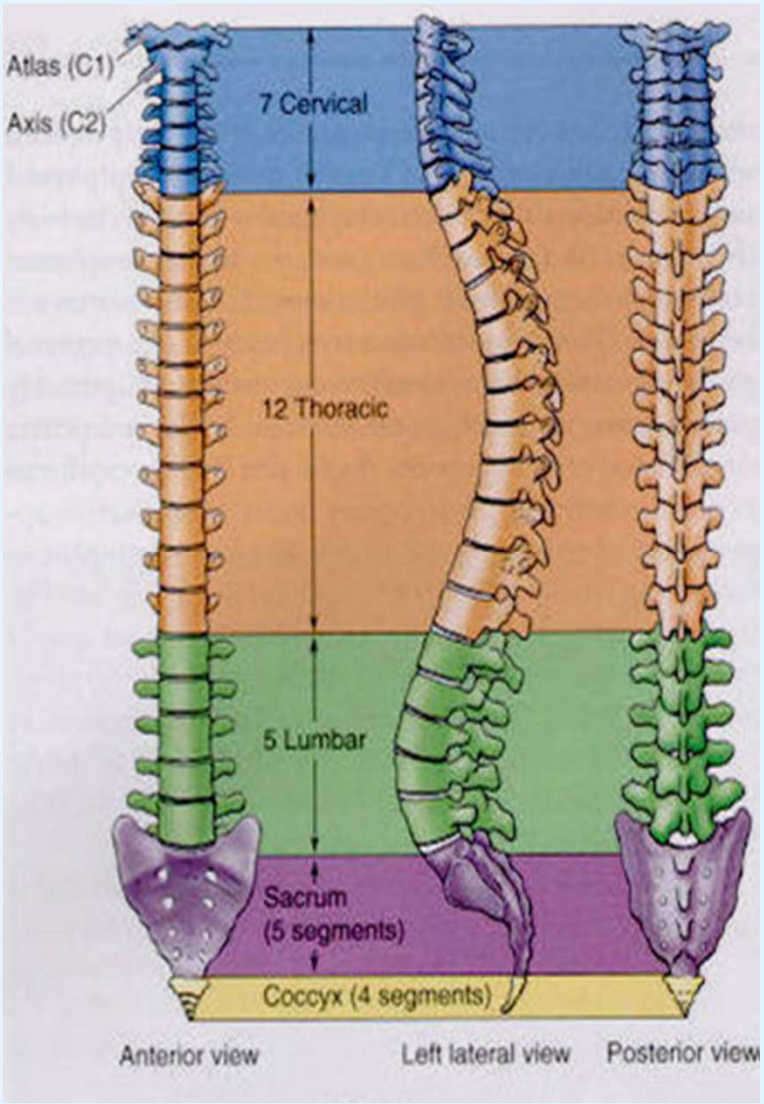
- consists of **33 vertebrae** arranged in five regions, 7 cervical (C), 12 thoracic (T), 5 lumbar (L), 5 sacral, and 4 coccygeal.
- **24 of which are movable**. 5 sacral vertebrae are fused to form **sacrum** in adults, and 4 coccygeal vertebrae are fused to form **coccyx**.
- **Intervertebral disc (IV disc)** approximately one-fourth of spine is formed by the fibrocartilaginous **IV discs**, which separate and bind the vertebrae together.



Curvatures of the vertebral column

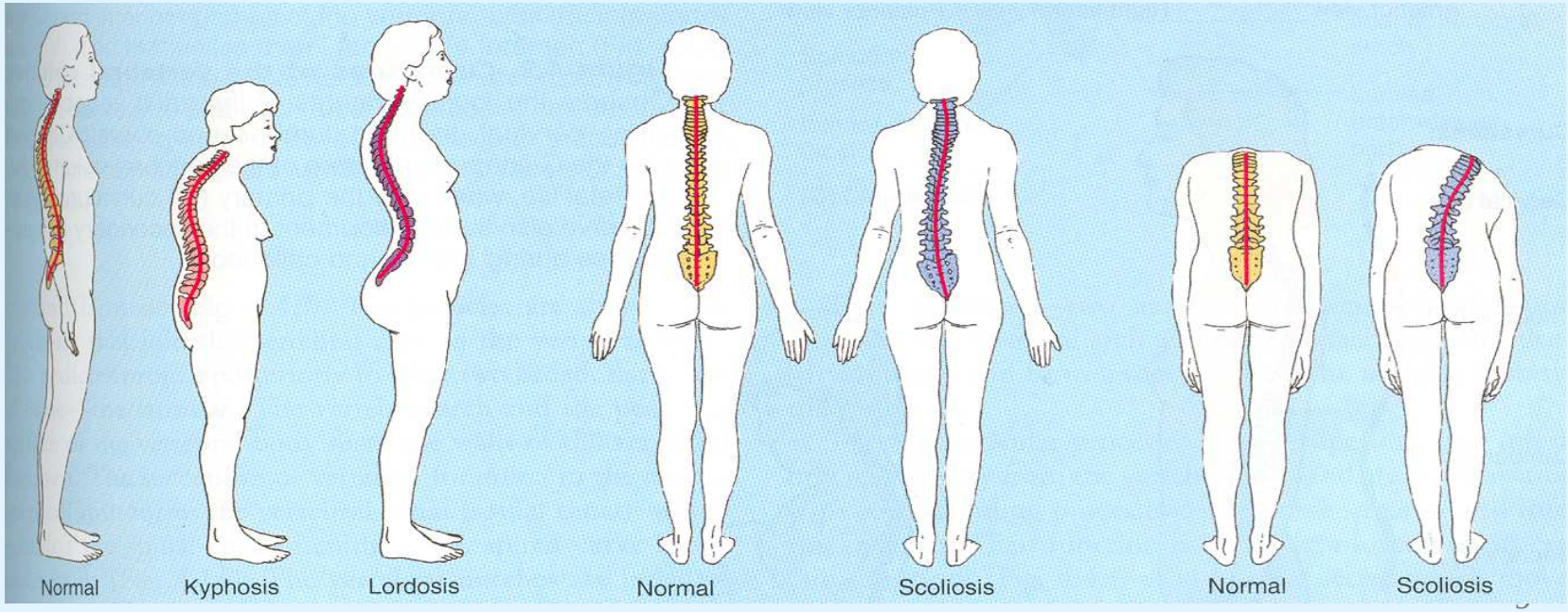
- The vertebral column in adult has four curvatures
  - Cervical (secondary)
  - Thoracic (primary curvature)
  - Lumbar (secondary)
  - Sacral (primary)
- The curvatures provide a flexible support for the body





Abnormal curvatures of the vertebral column

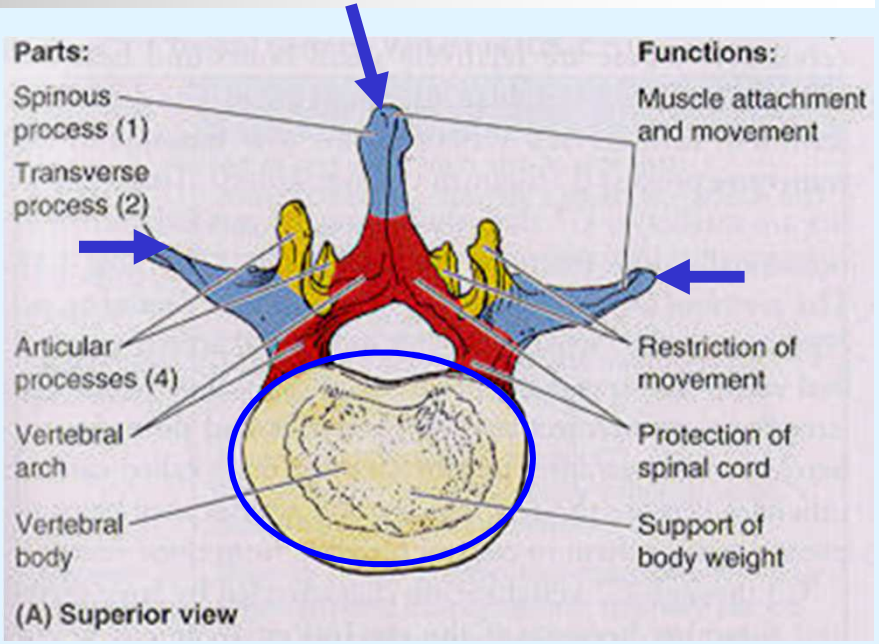
- **Kyphosis**: abnormal increase in the thoracic curvature
- **Lordosis**: an anterior rotation of the pelvis and can cause low back pain
- **Scoliosis**: an abnormal lateral curvature that is accompanied by rotation of the vertebrae



Structure and function of vertebrae

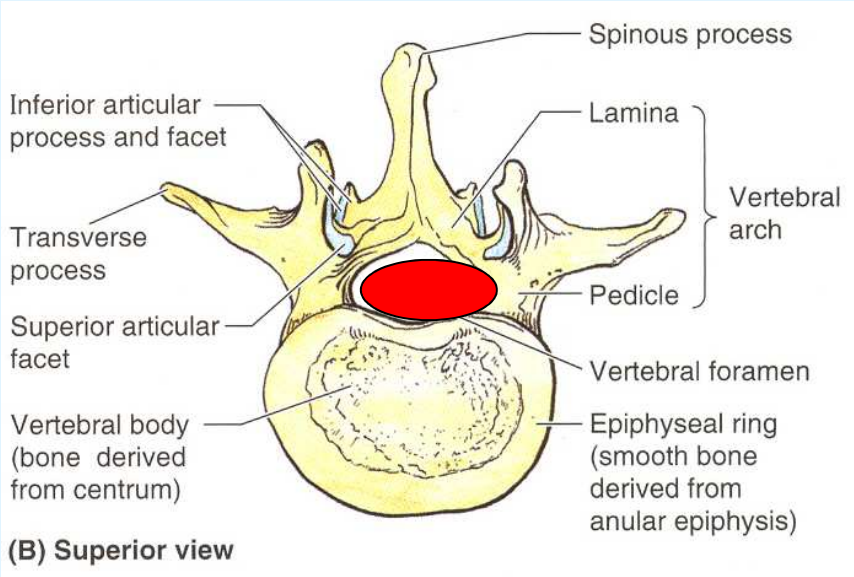
A typical vertebra consists of

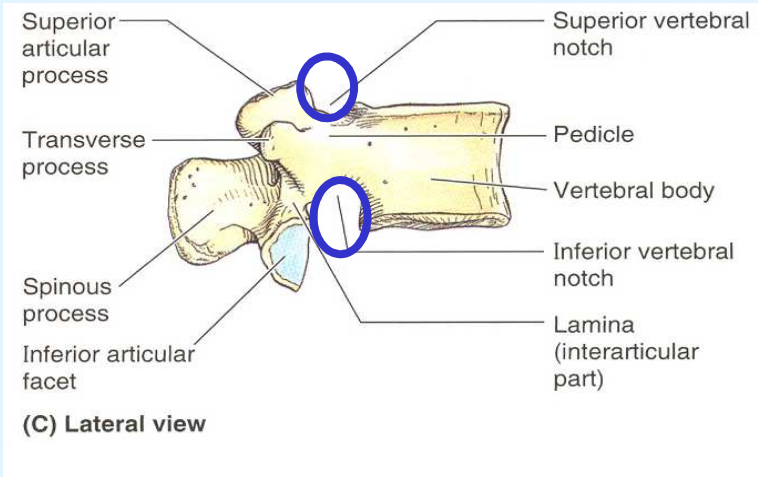
- A **vertebral body**
  - Function: gives strength to the vertebral column and supports body weight
- A **vertebral arch**
  - Function: protects spinal cord
- Seven processes
  - A **spinous process** and two **transverse processes**
    - Function: for muscle attachment and movement
  - Four **articular processes**, two superior and two inferior
    - Function: for restriction movement in certain direction



Structure and function of vertebrae

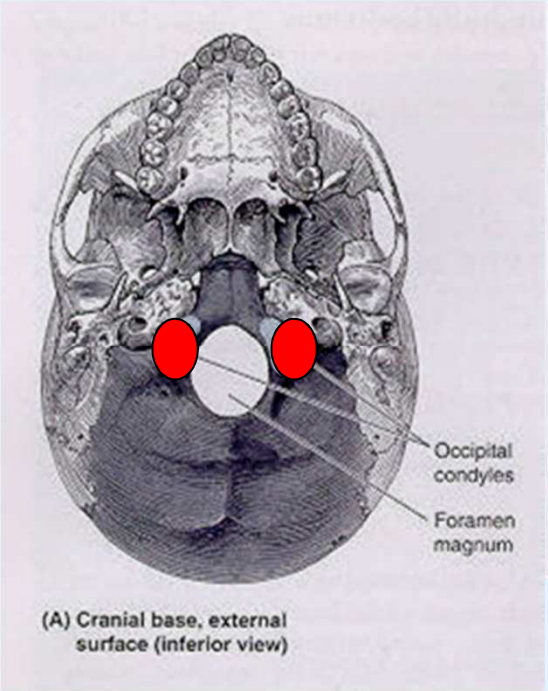
- **Vertebral foramen** is formed by the vertebral arch and the posterior surface of the vertebral body. The succession of vertebral foramen in the articulated column forms the **vertebral canal** (**spinal canal**)
- The superior and inferior vertebral notches of adjacent vertebrae contribute to the formation of **IV foramina**, which give a passage to spinal nerve roots and accompanying vessels
- **Epiphyseal ring**

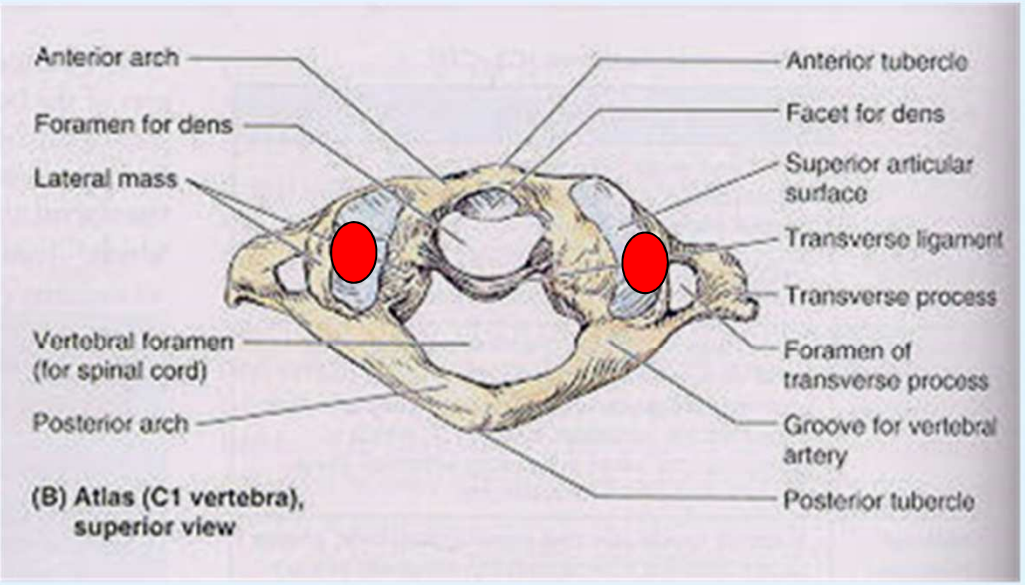




Regional characteristics of vertebrae

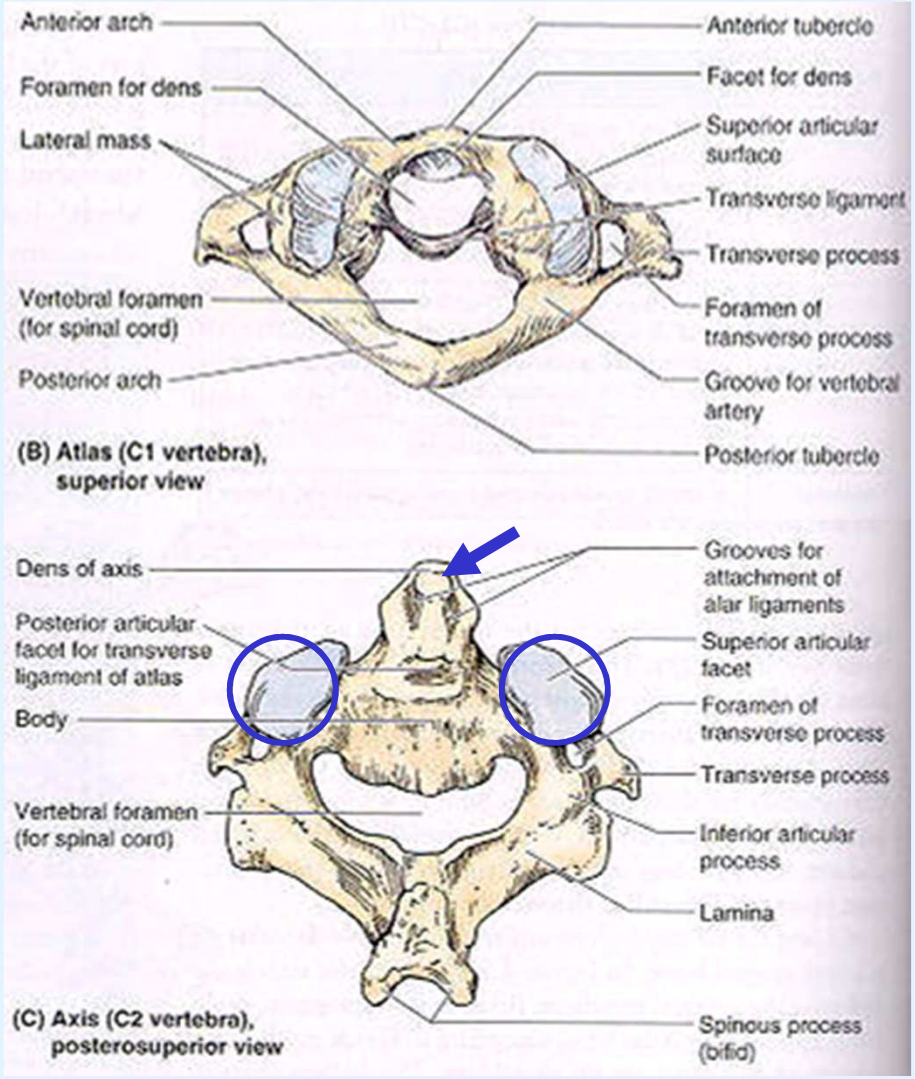
- **C1 and C2 are atypical vertebrae**
- **C1 – the atlas** - has no spinous process or body, it consists of anterior and posterior arches. The **superior articular surfaces** of C1 receive the two occipital condyles at the sides of the foramen magnum of the cranial base





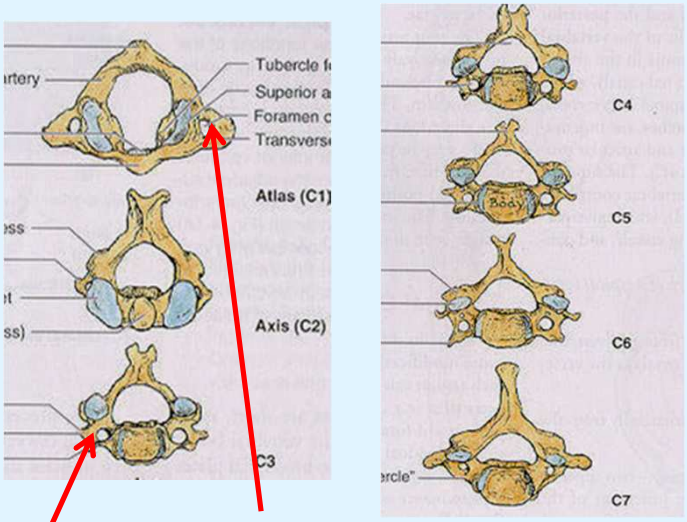
Regional characteristics of vertebrae

- **C2 – the axis** – is the strongest of the cervical vertebrae
  - Has two large, flat bearing surfaces, the superior articular facets, on which the atlas rotates
  - Has the blunt toothlike dens
- Part of the body of C1 is transferred to the body of C2.



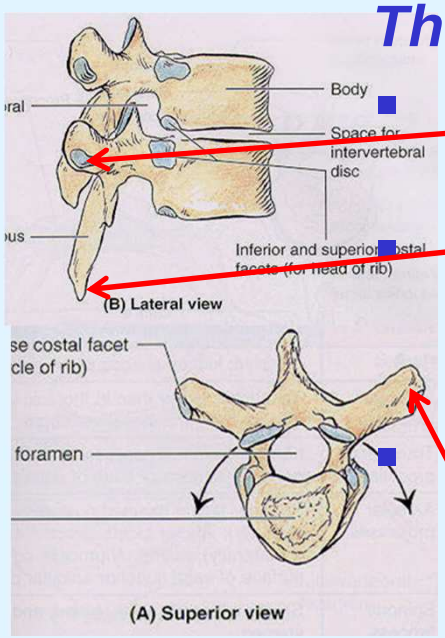
Regional characteristics of vertebrae

Cervical vertebrae



- **Transverse foramen** for passing blood vessels and nerves (small or absent in C7)
- **Body** is small and wider
- **Spinous process** is short (C3-C5) and bifid (C3-C5), C7 has a long spinous process

Thoracic vertebrae

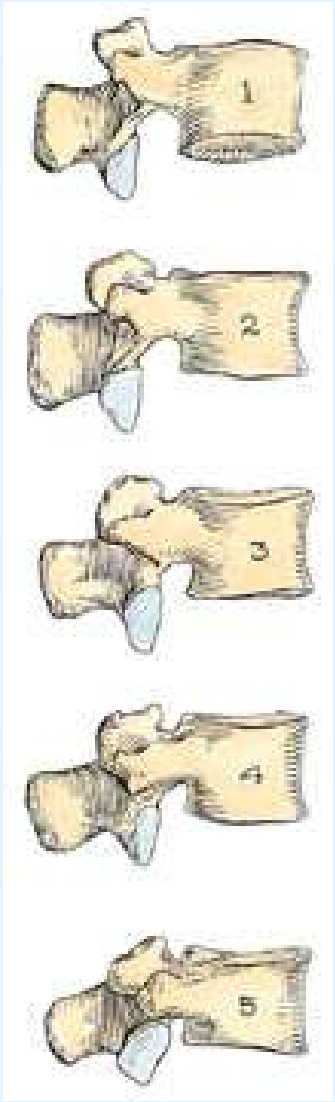


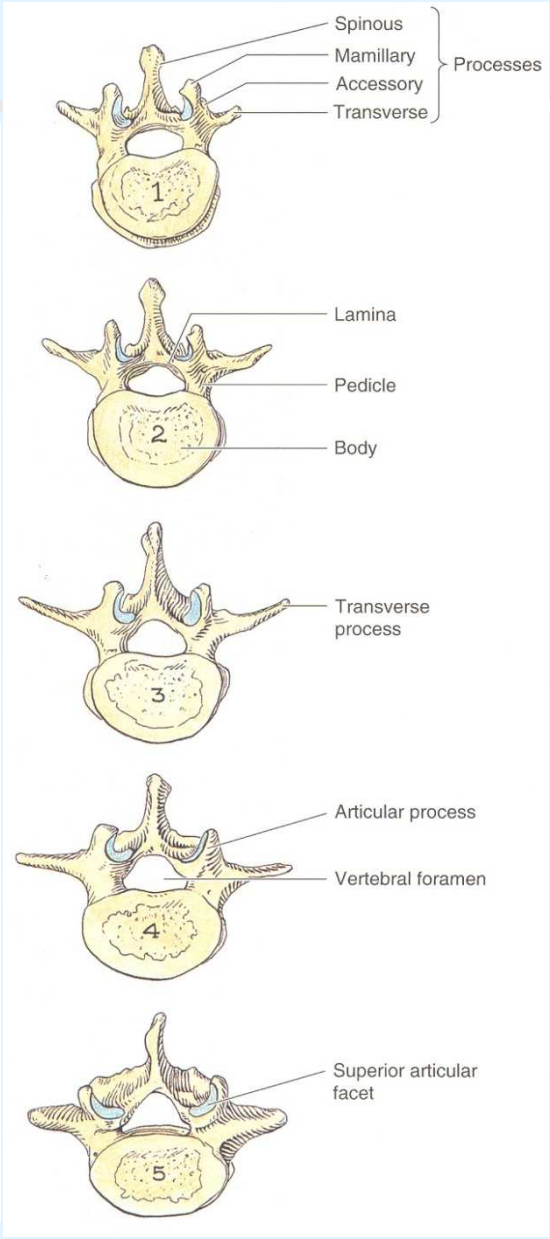
- Have the **costal facets** for articulation with ribs
- The **spinous processes** are long and slopes posteroinferiorly
- **Transverse processes** are long, strong and extend posterolaterally

- Articular processes
  - Superior facets directed posteriorly and slightly laterally
  - Inferior facets directed anteriorly and slightly medially

Lumbar vertebrae

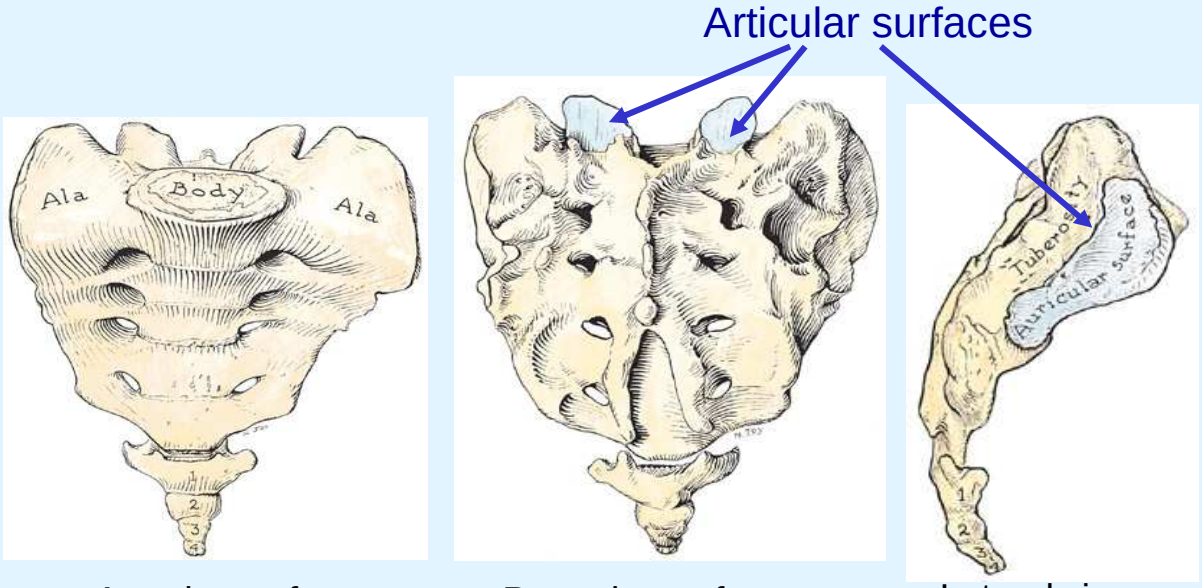
- lumbar vertebrae are distinguished by their
  - Absence of costal facets
  - Massive bodies
  - L5 is the largest of all movable vertebrae





Sacrum

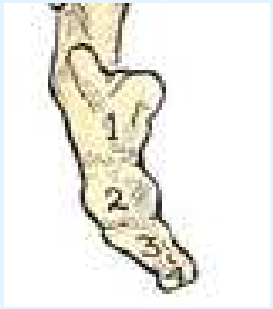
- Sacrum is usually composed of five fused sacral vertebrae in adults
- The sacrum forms the posterior part of the bony pelvis
- Articular facets for articulation with L5 and hip bone

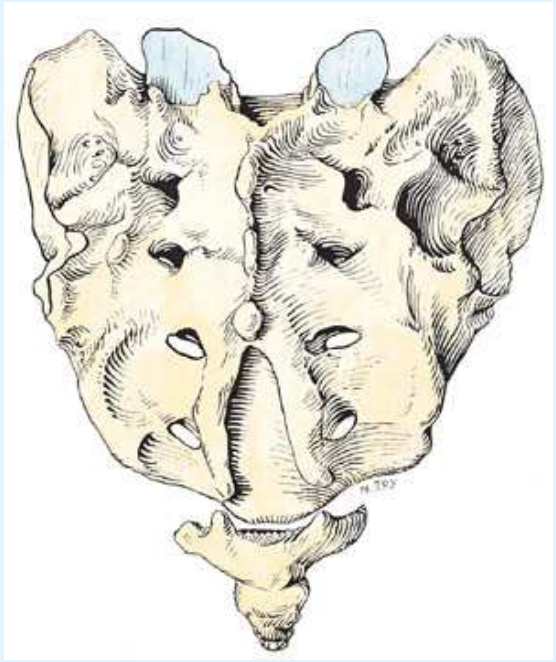


Anterior surface Posterior surface Lateral view

Coccyx

- Coccyx is usually formed by four rudimentary vertebrae, but there may be one less or one more
- The 1st coccygeal vertebra may be separate
- The last three coccygeal vertebrae often fuse during middle life





THORACIC CAGE AND WALL

- **Thoracic cage** is formed by the 12 pairs of ribs, sternum, costal cartilages, and 12 thoracic vertebrae. Along with the skin and associated fascia and muscles, the thoracic cage forms the thoracic wall
  - The role of the thoracic cage
    - lodges and protects the contents of the thoracic cavity
    - provides attachments for muscles
    - supports the pectoral girdle (shoulder girdle)
  - The thoracic wall provides mechanical function of breathing

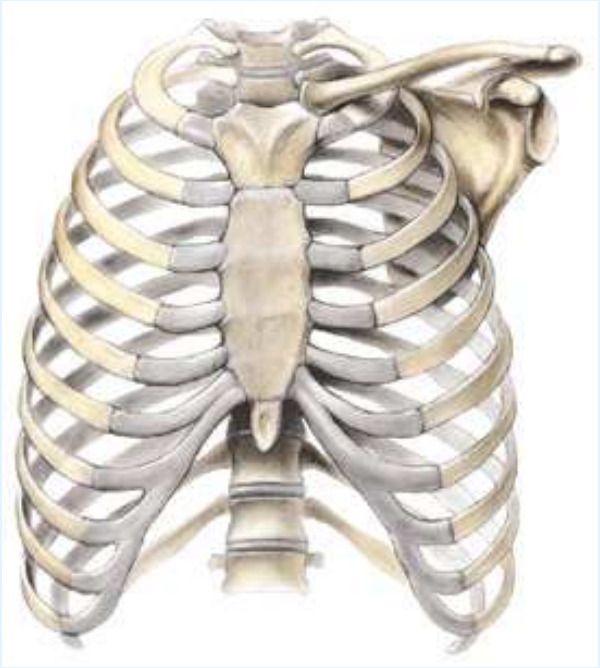
Anterior view

Posterior view

RIBS

Three types of ribs

- **True ribs** (first 7 ribs) attach directly to the sternum through their own costal cartilages
- **False ribs** (8th to 10th ribs). Their cartilages are jointed to that of the rib immediately superior to them. Their connection with sternum is indirect
- **Floating (vertebral, free) ribs** (11th and 12th ribs). They do not connect with the sternum

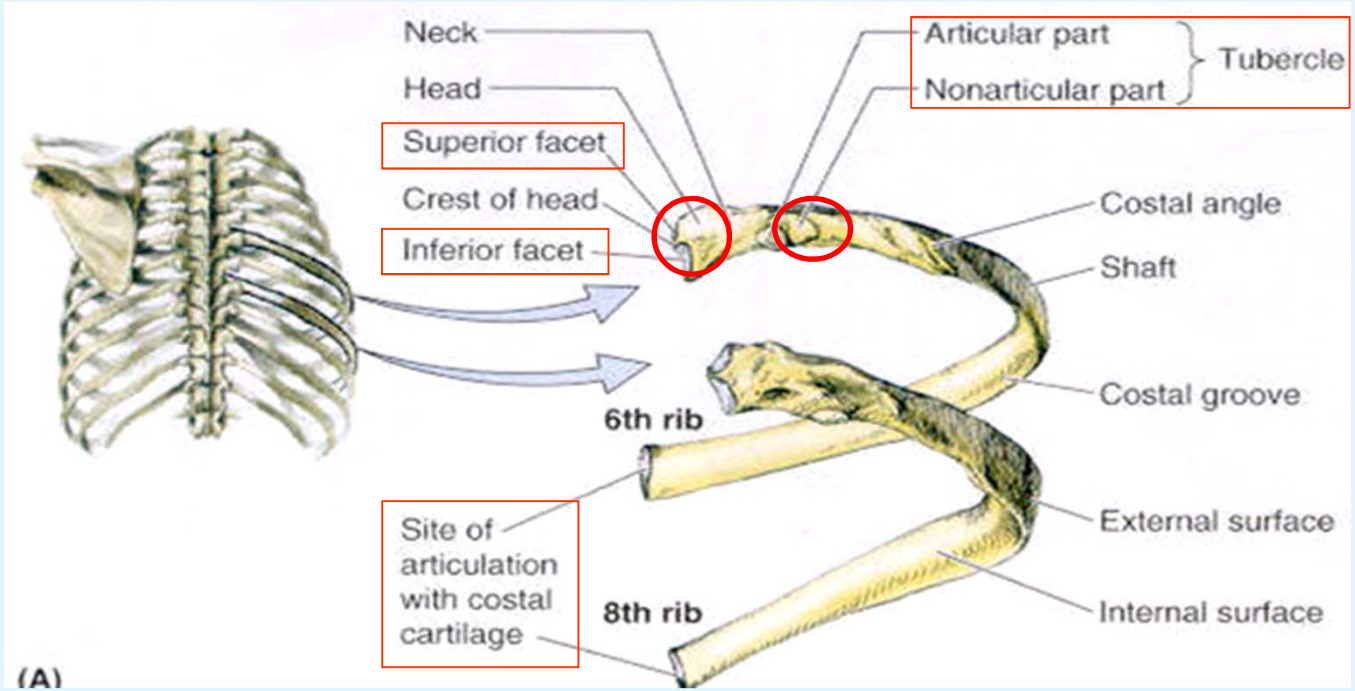


SKELETON OF THORACIC WALL

RIBS

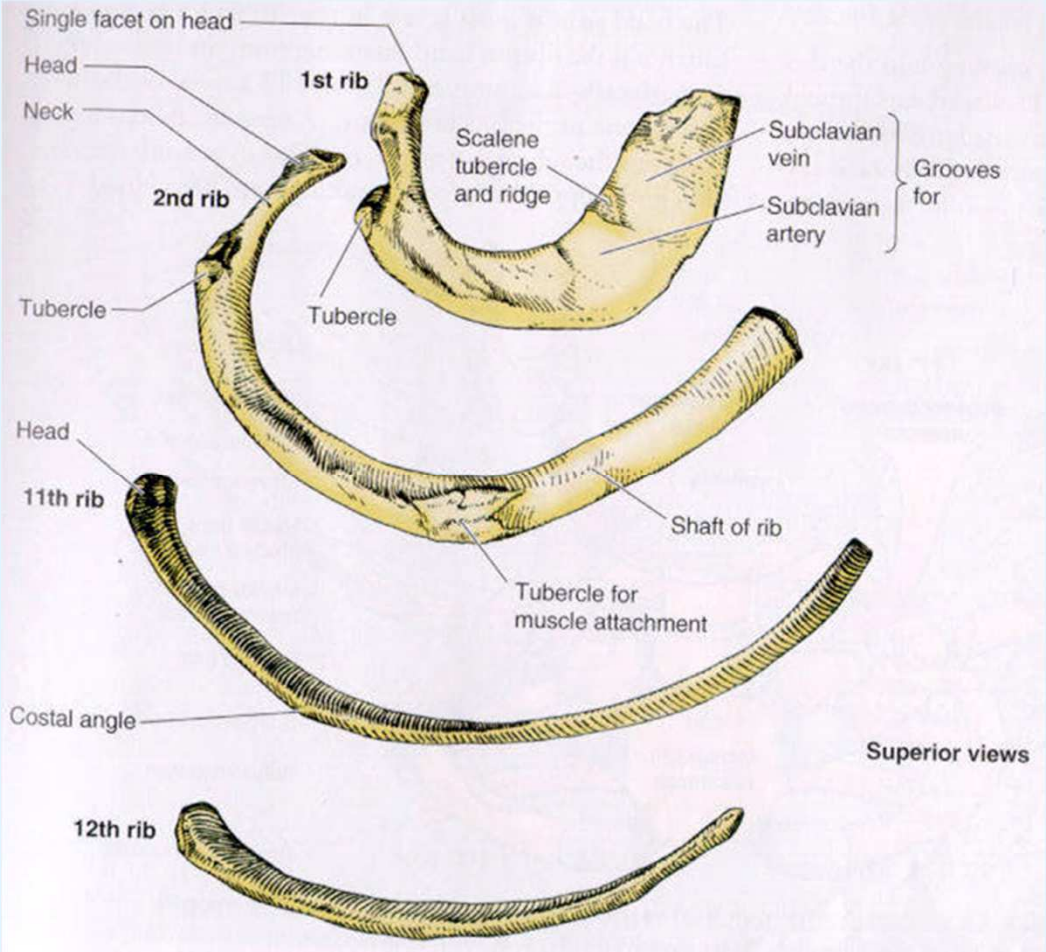
Typical ribs have a

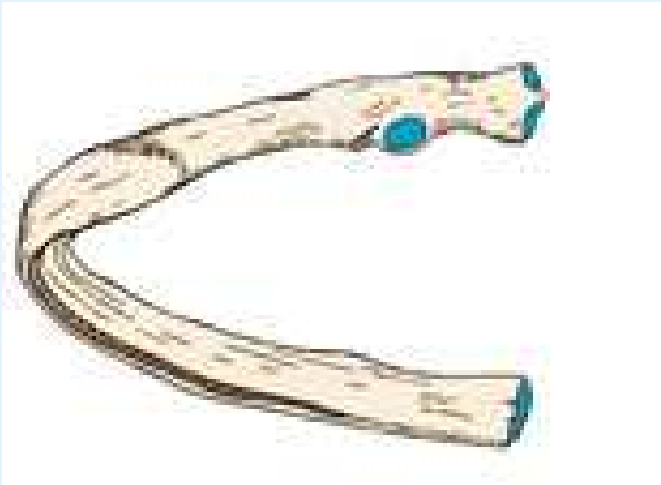
- **Head** that has two facets for articulation with vertebrae
- **Neck**
- **Tubercle** that has one articular area for articulation with vertebra
- **shaft**



RIBS

Atypical ribs (1st, 2nd, and 11th to 12th) are dissimilar

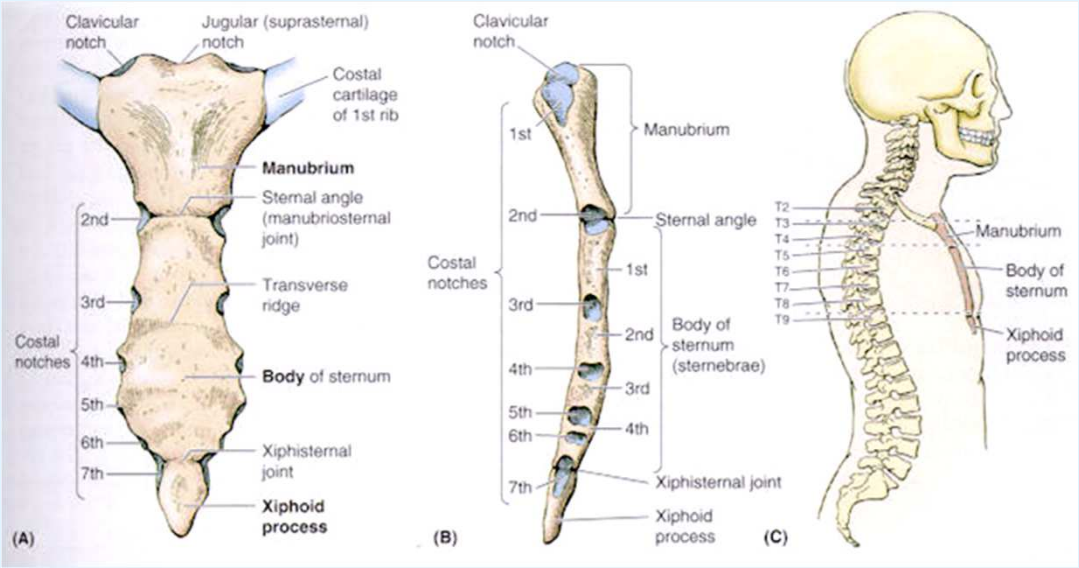




A typical rib

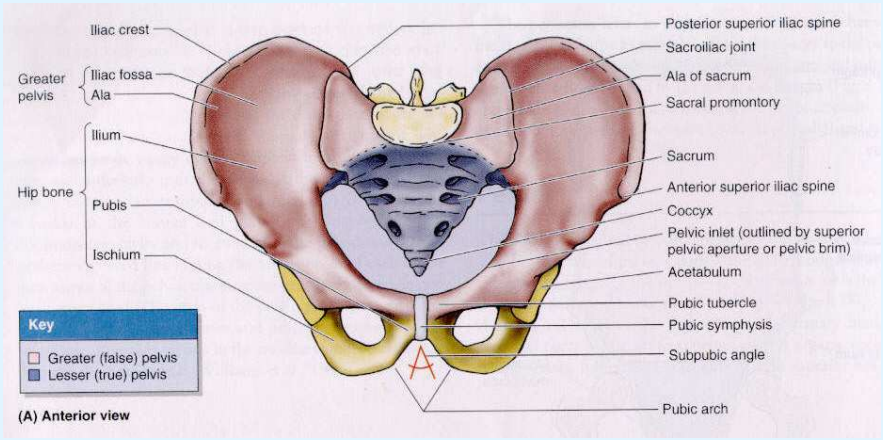
STERNUM

- Consists of three parts, **manubrium**, **body**, and **xiphoid process**
- Lies at the level of the bodies of T3 to T10 vertebrae
- Articulates with clavicles and pairs of costal cartilages of 1st to 7th ribs
- The **jugular notch**, **sternal angle**, and **xiphoid process** are palpable and are the important landmarks



Pelvic Skeleton

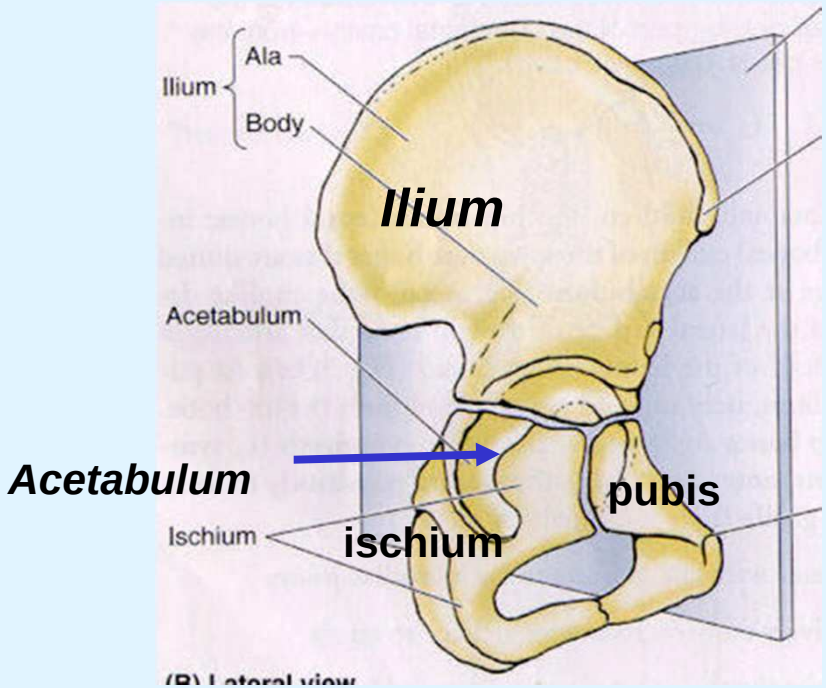
- In the mature adult the **pelvic skeleton (bony pelvis) is formed by four bones**
  - **Hip bones**, two large, irregular shaped bones, each of which develops from the fusion of three bones, **ilium, ischium, and pubis**
  - **Sacrum**, formed by the fusion of five originally separate sacral vertebrae
  - **Coccyx**, formed by the fusion of four coccygeal vertebrae



BONES OF THE PELVIS

Hip bone (lateral aspect)

- The flattened, fan-shaped part of the hip bone
- In children, each hip bone consists of three separate bones, ilium, ischium and pubis, which are united by cartilage at the **acetabulum**

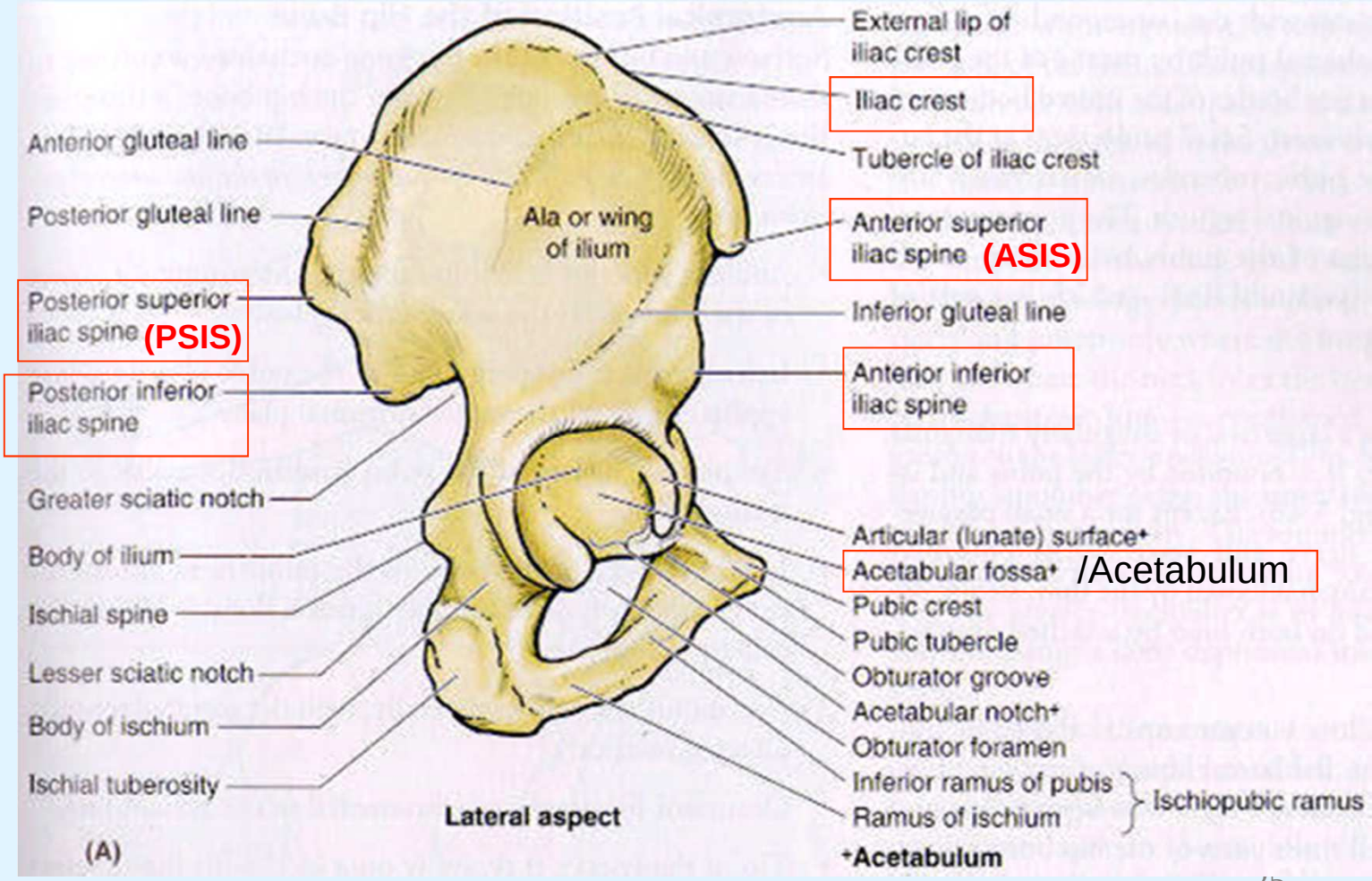


Lateral view of a child's hip bone

BONES OF THE PELVIS

Ilium (lateral aspect)

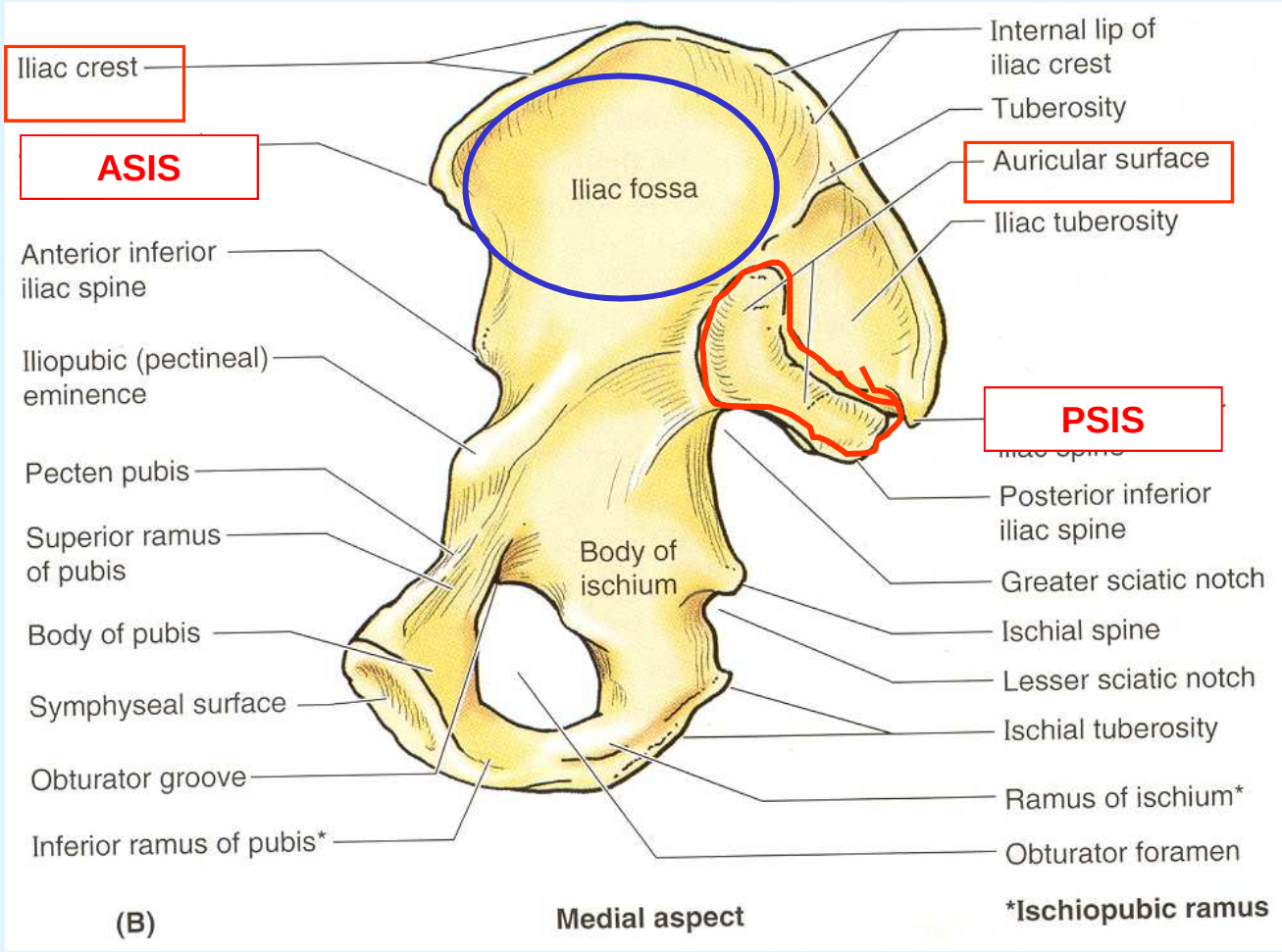
- The flattened, fan-shaped part of the hip bone



The lateral aspect of right hip bone of an adult in the anatomical position

BONES OF THE PELVIS

Ilium (medial aspect)



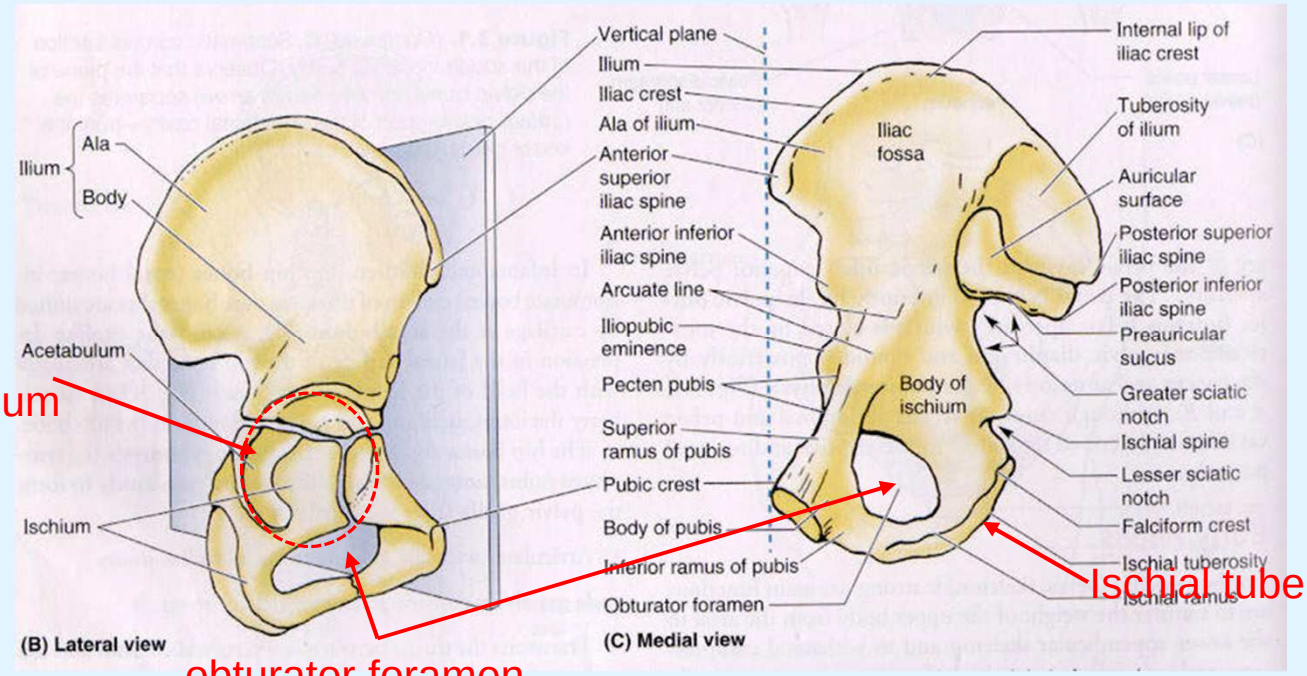
For articulation with sacrum

The medial aspect of right hip bone of an adult in the anatomical position

BONES OF THE PELVIS
Ischium

- The ischium composes the posteroinferior part of the hip bone. It has a **body** and **ramus**. The body of ischium helps to form the **acetabulum**. The ramus of the ischium helps to form the **obturator foramen**

- **Ischial tuberosity** is the place where Semitendinosus, Semimembranosus and Biceps femoris (long head) attach to



acetabulum

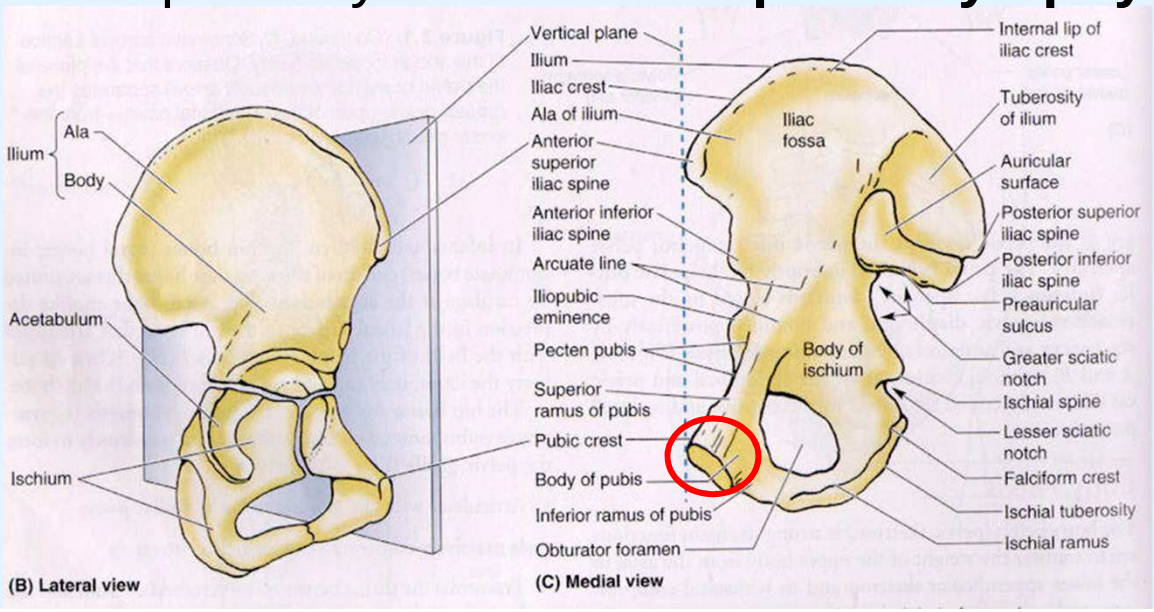
obturator foramen

Ischial tuberosity

BONES OF THE PELVIS

Pubis

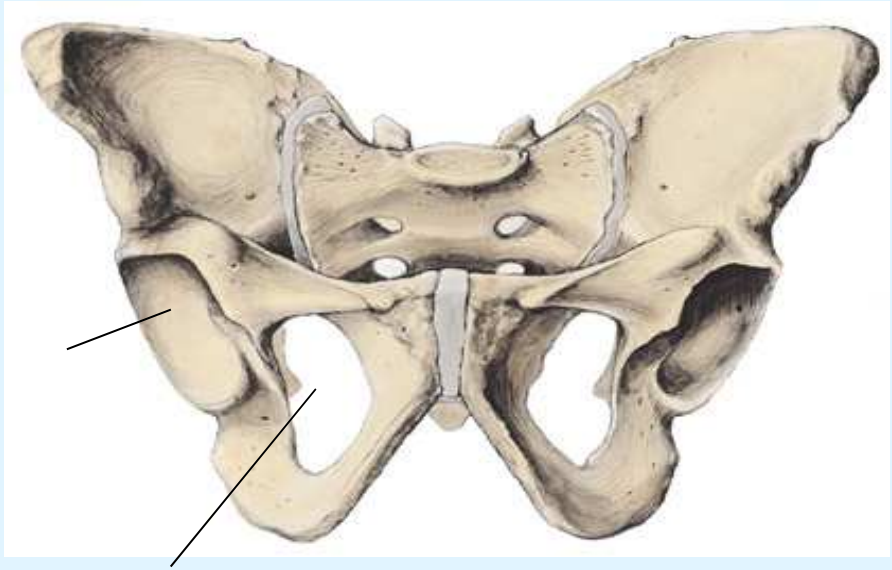
- The pubis is an angulated bone and composes the anteromedial part of the hip bone.
- The superior ramus of the pubis helps to form the acetabulum, and the inferior ramus helps to form the obturator foramen
- Medially, the **symphyseal surface** of the body of the pubis articulates with the corresponding surface of the body of the contralateral pubis by means of the **pubic symphysis**



BONES OF THE PELVIS

Obturator foramen & acetabulum

- **Obturator foramen** is bounded by the pubis and ischium and their rami, which is a small passageway for the obturator nerve and vessels
- All three parts (ilium, ischium, pubis) of the hip bone join to form the **acetabulum**, which articulates with the head of the femur to form the hip joint



Bones of the pelvis

Reading material

- Moore & Agur, (5th edition)
  - Head bone: p.486-490
  - Back bone: p.266-274
  - Thoracic bone: p.44-49
  - Pelvis bone: p.196-199
- Moore & Agur, (4th edition)
  - Head bone: p.496-501
  - Back bone: p.275-283
  - Thoracic bone: p.48-51
  - Pelvis bone: p.204-208

Questions

1. Identify the bones of the axial skeleton; their functions, and their locations.
2. Name and locate the main cranial and facial bones of the skull.
3. Locate foramen magnum, and occipital condyles in the base of the cranium.
4. What are the five regions of the vertebral column? How many vertebrae do each region contain? Name and describe the curvatures of the spine.
5. Describe the anatomy of a typical vertebra and its bone markings and formations, describe the function of the bone markings and formations.
6. Compare and contrast the structures and functions of vertebrae from different regions of the vertebral column.
7. Describe the anatomy of a typical rib and sternum.
8. Which ribs articulate with the sternum and which do not or only indirectly meet it?
9. Describe the anatomy of pelvic skeleton and its bone markings and describe the function of the bone markings and formations.