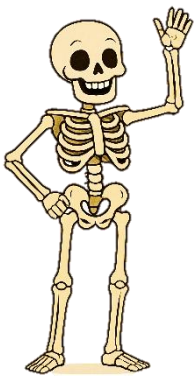




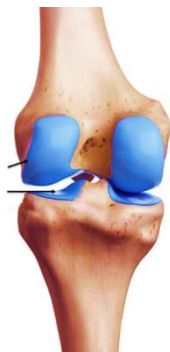
Support in Living Organism

Support in Human

- The skeletal system represents **the main part of support** in human.
- The **skeletal system** in man works on:
 - (1) **Supporting** the body.
 - (2) **Protecting** some of its organ.
 - (3) **Participating** in movement.
 - (4) **Providing** the human with a **characteristic shape**.
- It consists of:



Skeleton



Cartilages



Joints



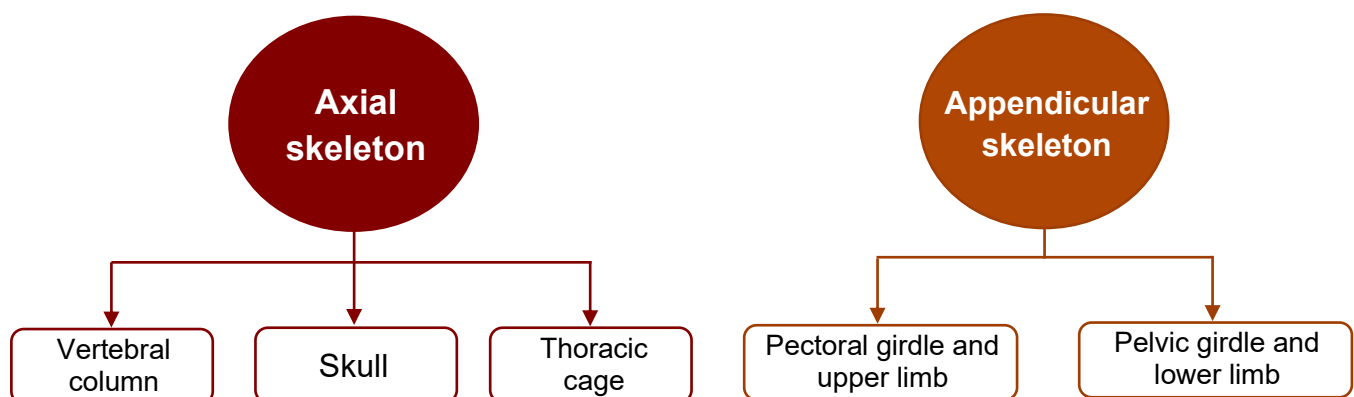
Ligaments

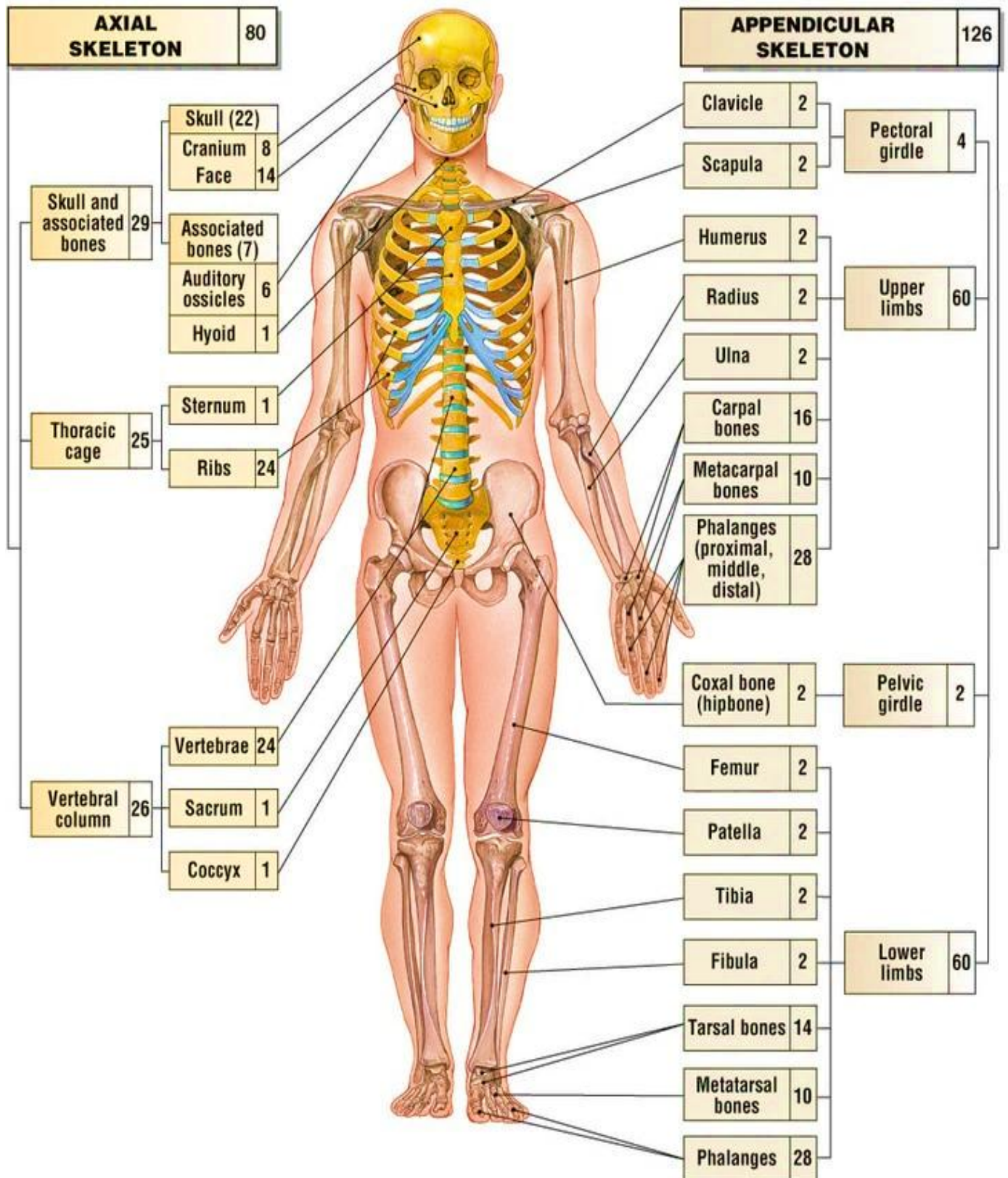


Tendons

First: Skeleton

- The human skeleton consists of **206 bones**
- Each bone has **its shape** and **size** → to suitable its **function**
- The human skeleton consists of: **Axial skeleton** and **Appendicular skeleton**







Axial skeleton

Consists of:

(1) Vertebral column

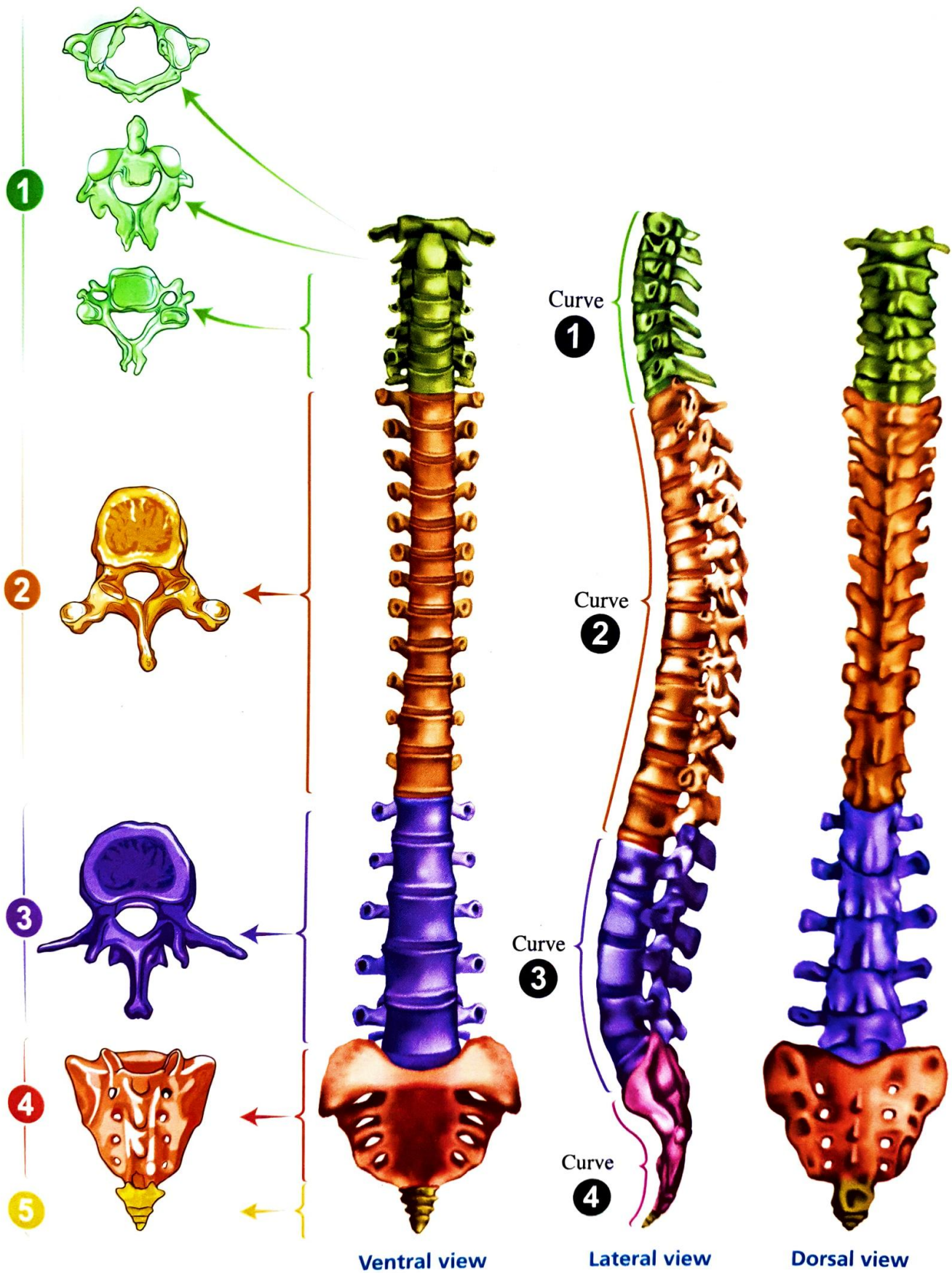
- It represents **the axis** of the human skeleton.
- Vertebral column attachments, as:
 - Its **upper part** attached with the **skull**
 - At **the thoracic region**, it is attached with **the thoracic cage** and **two upper limbs** by **the shoulder bones (pectoral girdle)**.
 - Its **lower part** is attached with the **two lower limbs** by **the pelvic girdle**.
- It consists of **33 vertebrae** that are divided into five groups and **differ in shape** according to **their sites of presence**

	Cervical vertebrae	Thoracic vertebrae	Lumbar vertebrae	Sacral vertebrae	Coccygeal vertebrae
Number	7	12	5	5	4
Arrangement	1 : 7	8 : 19	20 : 24	25 : 29	30 : 33
Site of their presence	Neck	Thorax (Thoracic region)	Abdominal region	In the pelvic region	At the end of vertebral column
Size	Moderate	Larger than the cervical	The Largest vertebrae	Broad and flat	Small in size
Articulation	Articulating	Articulating	Articulating	Fused	Fused

- **Function of vertebral column:**
 - It acts as **the main support** of the **body**.
 - It **protects** the **spinal cord**.
 - It helps in the **movement** of the **head** and **upper part of the body**.

Key points

- The number of bones of the vertebral column in human is about **26 bones** (due to the fusion of the five sacral vertebrae together as one bone, and the four coccygeal vertebrae together as one bone).
- Number of the **articulated vertebrae** are **24**, and the **fused vertebrae** are **9**.
- The vertebral column in human contains **four curves**.





• The structure of bony Vertebra:

The vertebrae consist of:

1) Centrum (vertebrae body):

It is an **anterior thick part** attaches to the two transverse processes

2) Two transverse processes

3) Spinal ring (neural ring):

it is a bony ring that attaches posteriorly to the centrum and the spinal cord extends inside it to be protected

4) Processes that attach to spinal ring:

- Two anterior articulating process
- Two posterior articulating process
- Neural spine (spinal process): a dorsal spine incline downward

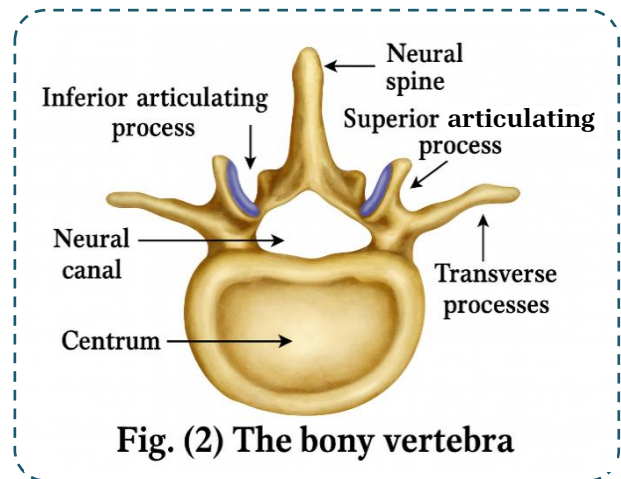


Fig. (2) The bony vertebra

• Functional adaptation of the vertebrae:

(1) **Vertebrae** are **strong** and **hard** structure to protect the spinal cord and support the upper part of the body and head

(2) **Vertebrae** have **neural canal** to allow the passage of spinal cord.

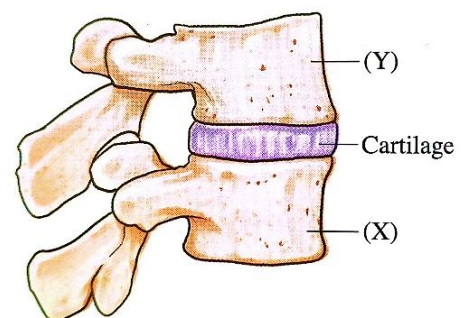
(3) **Vertebrae** have **transverse processes** and **centrum** to join with ribs to form the thoracic cage.

(4) **Vertebrae** contain **bone marrow** which produces **all types of blood cells**.

(5) **Not all** vertebrae are **fused** which **facilitate neck and back movement**.

Key points

- The number of **processes** in the typical (lumbar) vertebra is **7 processes**.
- The number of **paired processes** in the typical vertebra = **3 pairs**.
- The vertebrae articulate with each other through the **articulating processes**.
- The vertebra that **bisects** the neck is the **vertebra no. (4)**
- The vertebra that **numerically bisects** vertebral column is the **vertebra no. (17) [the 10th thoracic vertebra]**
- The lower vertebra (X) articulates through its **two superior articulating processes** with the **two inferior articulating processes** of its upper vertebra (Y).

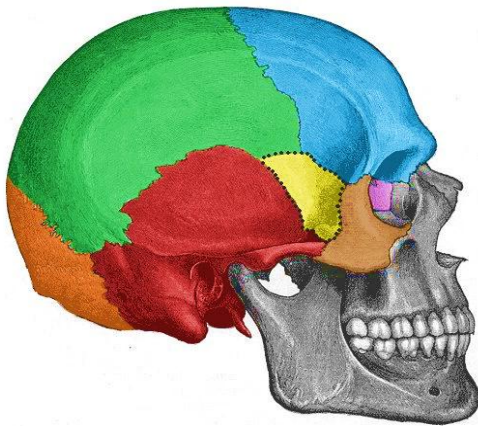




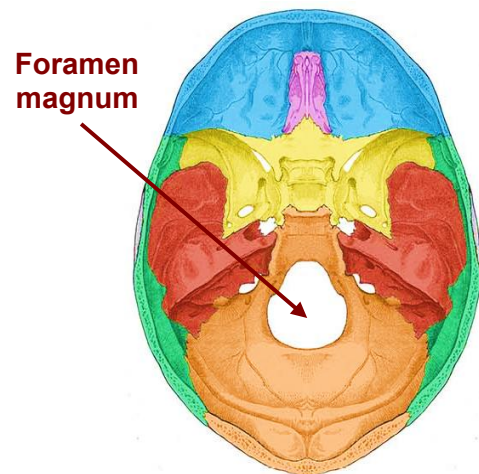
(2) Skull (Cranium)

- It is a **bony case** consists of two parts, **which are**:

Facial (anterior) part	Cerebral (posterior) part
- It consists of 14 bones. - It includes: Face bones Two jaws Position of sense organs such as: ears, eyes and nose.	- It consists of 8 serrated bones attach firmly to each other at their end and form cavity to protect the brain. - At its base, there is a foramen magnum through which the spinal cord connected to the brain.



Lateral view of skull



Inferior view of skull

Key points

- The skull and its accessories consist of **29 bones**.
(**22 bones** + **6 auditory ossicles** + **1 hyoid**)
- The **brain** and **spinal cord** expressed as **the Central nervous system**.
- The skull bones connect with each other through **fibrous tissue** by growing older changes into **bony tissue** to **facilitate the delivery** and **allow the completion of brain growth after birth**.
- All joint that connects skull bones with each other are **fibrous joint** that doesn't allow any movement, **except the joints in lower jaw** is **synovial joint** that allow movement to facilitate talking and chewing the food.