

CONCEPT MAP

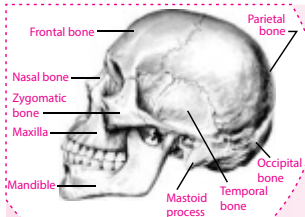
HUMAN SKELETON

Human skeleton constitutes the rigid framework of connected bones that gives shape to the body, protects and supports its soft organs and tissues and provides attachments for muscles. Human skeleton is made up of 206 bones (300 bones in newborns) which are distributed into axial and appendicular skeleton.

AXIAL SKELETON

- It lies along the longitudinal axis of the body; supports and protects the organs of the head, neck and trunk.
- It includes **skull, vertebral column, sternum** and **ribs**.

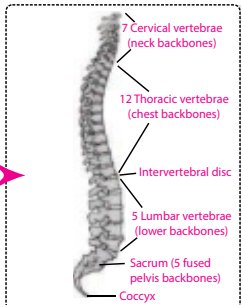
SKULL



- Skull is the bony framework of the head.
- It consists of **29 bones**, separated by sutures. These bones are **cranial bones** (8 flattened bones forming the brain box or **cranium**), **facial bones** (14 bones forming the front part of the skull), **hyoid bone** (single bone forming floor of the buccal cavity) and **bones of middle ear** (3 small bones in each ear, namely **malleus, incus** and **stapes**).
- The bones of cranium are: **1 frontal bone, 2 parietal bones, 2 temporal bones, 1 occipital bone, 1 sphenoid bone** and **1 ethmoid bone**.
- Temporal bone has a projection called **mastoid process**.
- The cranium has two small protuberances at the posterior end called **occipital condyles**, that articulate with the **first vertebra** (atlas vertebra), thus, human skull is dicondylic.

- 14 bones form the skeleton of face viz: **2 zygomatic, 2 maxilla, 2 nasal, 2 lacrimal, 1 vomer, 2 palatine, 2 inferior nasal conchae** and **1 mandible**.
- **Hyoid** is a u-shaped bone which attaches tongue with the floor of buccal cavity. It does not articulate with any other bone.
- A large hole called **foramen magnum** at the base of skull allows the brain to continue into the spinal cord located in the backbone.
- Skull protects our brain; it bears jaws which help in mastication of food, etc.

VERTEBRAL COLUMN

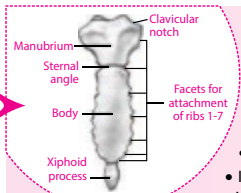


- It is also called **backbone** or **spine**. It is curved, vertical rod, about **70 cm long**, in the mid-dorsal line of the neck and trunk. It consists of **33 vertebrae**. However it consists of 26 bones, because five sacral vertebrae are fused to form one sacrum and four coccygeal vertebrae are fused to form one coccyx.
- A typical vertebra has a large, disc-like anterior, flattened portion, the **centrum** or **body** and a posterior portion, the **neural arch**. The latter encloses the spinal cord. The hole formed by the neural arch is the **vertebral foramen**. The vertebral foramina of all

twenty four vertebrae form the **vertebral canal** or **neural canal**.

- Vertebrae are categorised into five groups: **cervical (7), thoracic (12), lumbar (5), sacral (5)** and **coccygeal (4)**.
- Vertebral column displays four curves to enhance balancing powers and firmness for upright posture of the body. These curvatures are cervical, thoracic, lumbar and pelvic (=sacral).
- Between the centre of adjacent vertebrae there are elastic pads of fibrocartilage, the **intervertebral discs** which provide mobility to the vertebrae, check undue frictions and take up shocks.
- Vertebral column carries the weight of the body in motion and when the organism is standing.

STERNUM



- This is a flat bone which is present just under the skin in the middle of the front of the chest. It is about 15 cm long.
- Its shape is like a dagger and consists of three parts—the **manubrium** is the uppermost part, the **body** is the middle portion and the **xiphoid process** is the tip of the bone.
- The true ribs (7 pairs) are attached to the sternum.
- It protects the internal organs in the thoracic region and helps in the respiratory mechanism.

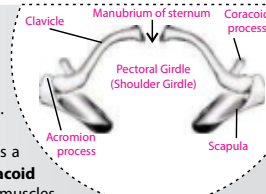
RIBS

- The **ribs** are thin, flat, curved bones that form a protective cage around the organs in the upper body.
- Ribs comprise of **24 bones arranged in 12 pairs**. Each rib remains attached to the respective thoracic vertebra.
- The **first seven pairs of ribs** are attached directly with the sternum and are called **true ribs**. The **8th, 9th and 10th** pairs of ribs do not articulate directly with sternum, but join the seventh rib by hyaline cartilage. These are called **vertebrochondral ribs** or **false ribs**. The last two (**11th** and **12th**) pairs of ribs remain free anteriorly and are not attached either to sternum or cartilage of another rib, and are called **floating ribs**.
- A typical rib consists of 2 parts: **vertebral** and **sternal**. The vertebral part is long and bony. It articulates with the thoracic vertebrae.
- The sternal part is short and cartilaginous. It articulates with the sternum or sternal part of its upper rib.

APPENDICULAR SKELETON

- It is situated at the lateral sides which actually extend outwards from the principal axis.
- It consists of two girdles, the **pectoral** and **pelvic girdles** and the **bones of arms** and **legs**.

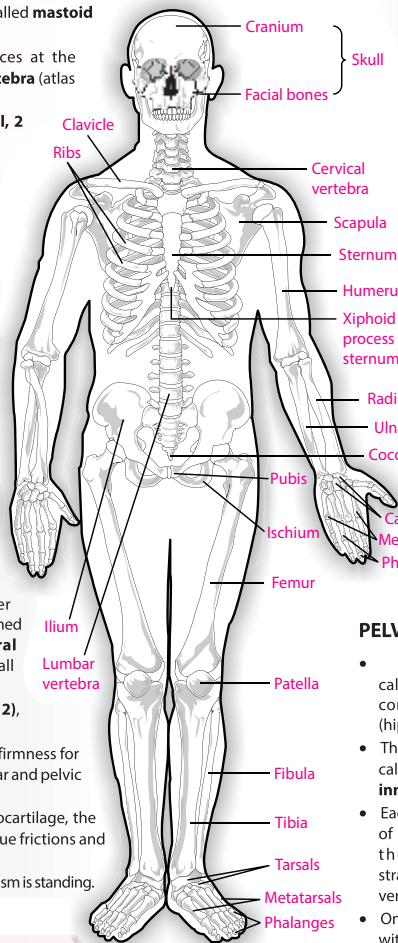
PECTORAL GIRDLE



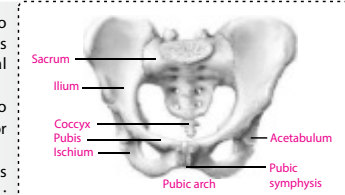
- Each pectoral girdle consists of two bones: **1 clavicle** and **1 scapula**. The scapula (shoulder blade) consists of a sharp ridge, the **spine** and a triangular **body**. The end of the spine projects as a flattened and expanded process called **acromion**. This process articulates with the clavicle.
- At the lateral end of the superior of the scapula is a projection of the anterior surface called the **coracoid process**, to which the tendons of the muscles attach. At the point where the superior and lateral borders of the scapula meet there is the lateral angle which presents a shallow articular surface termed as **glenoid cavity** into which the head of the humerus is articulated.
- The primary function of the pectoral girdle is to provide an attachment point for the numerous muscles that allow the shoulder and elbow joints to move.

FORELIMBS

- Each arm has **30 bones**, which constitute **1 humerus** (upper arm), **1 radius** and **1 ulna** (lower arm), **8 carpals** (wrist), **5 metacarpals** (palm) and **14 phalanges** (digits).
- The **humerus** is the **longest bone in the upper extremity**.
- At the bottom of the humerus, are two depressions where it connects to the ulna and radius of the forearm.
- Together, the humerus and the ulna make up the elbow, ulna is longer than the radius. Radius, ulna, however, contributes more to the movement of the wrist and hand than the ulna.
- Each wrist is composed of **eight carpals** which are arranged in two rows: **scaphoid, lunate, triquetrum** and **pisiform** in proximal row and **trapezium, trapezoid, capitate** and **hamate** in distal row.
- The forelimbs give support to the shoulders by articulating the head of the humerus with the glenoid cavity of the pectoral girdle.



PELVIC GIRDLE



- **pelvic girdle**, also called the **hip girdle**, is composed of two coxal (hip) bones.
- The **coxal bones** are also called the **ossa coxae** or **innominate bones**.
- Each coxal bone consists of three separate parts: the **ilium** (short and straight bone), the **ischium** (lower elongated bone, running parallel to vertebral column) and the **pubis** (inner, smaller bone).
- On its outer surface it has a deep depression called the **acetabulum** which, with almost spherical head of the femur, forms the hip joint.
- It supports the weight of the body from the vertebral column. It also protects and supports the lower organs, including the urinary bladder, the reproductive organs, and the developing foetus in case of a pregnant woman.

HINDLIMBS

- Each leg has **30 bones** which constitute **1 femur, 1 patella, 1 tibia, 1 fibula, 7 tarsals, 5 metatarsals** and **14 phalanges**.
- **Femur, tibia** and **fibula** bones together support the shank of the leg. The **tarsals** form the ankle, **metatarsals** form the sole and **phalanges** form the digits of the foot.
- The **femur** is the **longest, largest, and strongest bone** in the body whose head fits into the acetabulum of hip girdle.
- The **tibia** connects to the femur to form the knee joint and with the talus, a foot bone, to allow the ankle to flex and extend.
- The **tibia** is **larger than the fibula** because it bears most of the weight, while the fibula serves as an area for muscle attachment.
- **Fibula** is shorter, thinner and slender.
- Each ankle is composed of seven **tarsals** which are **calcaneum, talus, cuboid, navicular** and **first, second, third cuneiforms**.
- The leg bones carry the weight of the body and are involved in propulsion and support.