

HUMAN ANATOMY AND PHYSIOLOGY-I, BP-101(T)

UNIT-II (Integumentary system)

CLASS:5

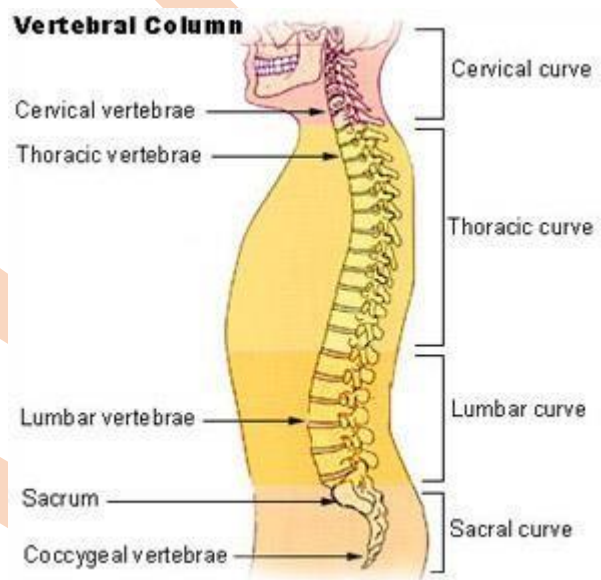
TOPIC – Salient features and functions of bones of axial and appendicular skeletal system

Functions of vertebral column:

- Supports the head
- Helps to maintain balance in upright position
- Enclose and protects spinal cord
- Permits movement
- Absorbs shock during walking
- Serves as a point of attachment for the ribs, pelvic girdle and muscles of back & upper limbs.

Vertebral Column (Trunk bones)-26

1. **Cervical vertebrae (7):** Movable
 - 7 vertebrae which are present in neck region
2. **Thoracic vertebrae (12):** Movable
 - 12 vertebrae present in posterior region of thoracic cavity area
3. **Lumbar vertebrae (5):** Movable
 - 5 vertebrae which supports the lower back
4. **Sacrum (1):** Immovable
 - 5 sacral vertebrae fuse with one another to form a single region known as sacrum
5. **Coccyx (1):**
 - 4 coccygeal vertebrae join to form a single structure



Thorax / Rib cage / Thoracic cage:

- Sternum, ribs and costal cartilages of ribs & bodies of thoracic vertebrae make a cone-shaped cage-like structure known as the thoracic cage.
- Thoracic vertebrae serve as a protective cover for organs like the heart and lungs.
- They also support bones of the shoulder girdle and upper extremities.

Sternum:

- Also known as breast bone
- Long flat bone located in the central part of the chest

- Connects to ribs via costal cartilage and forms the front of rib cage
- Helps to protect heart, lungs and major blood vessels from injury
- One of the longest and largest flat bones of our body
- It is divided into 3 regions.
 - i. Manubrium: Quadrangular shaped broader part that joins with the body of sternum, clavicles and cartilages of 1st pair of ribs
 - ii. Body/Gladiolus: Longest sternal part
 - iii. Xiphoid Process: Inferior end of sternum

Ribs:

A. True Ribs:

- 1-7 pairs in rib bones
- Also called Vertebro-Sternal ribs
- Attached to sternum & vertebrae from front & back end
- Forms upper part of rib cage
- Vertebrae are called Thoracic vertebrae

B. False Ribs:

- 8,9,10th pairs of rib-bones
- Also called Vertebra-Chondral ribs
- False ribs are connected to sternum through the 7th rib bones only
- Not joined directly to sternum like true ribs.

C. Floating ribs:

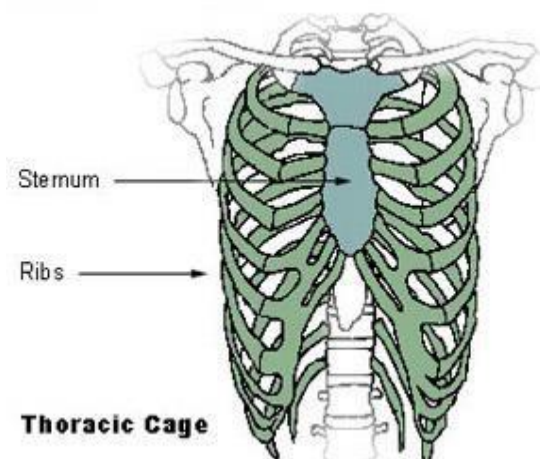
- Located in 11&12th pairs of rib bones
- Last 2 pairs of rib bones of rib cage
- Attached to one end of vertebrae of spinal cord. Other end is free.
- Weak attachment with vertebrae and zero attachment with sternum make it injury prone
- Hence floating ribs are fragile

Attached to vertebral column at one point.

Thoracic Cage

Sternum (1)

Ribs (24)



Hyoid bone:

- It is a horse-shoe shaped / u-shaped bone between larynx and mandible.
- It is a unique component of axial skeleton that do not join with any other bone.
- Through temporal bone, hyoid bone is suspended by means of ligament.
- Hyoid bone serves as point of attachment for tongue, neck and pharynx muscles.
- It also assists in keeping larynx open.

Appendicular Skeleton (126 bones):

- Consists of Upper limbs, Shoulder girdle, lower limbs & pelvic girdle.

A. Upper Limbs (Bones of Arm):

- Includes Arms, fore arms, wrists and hands

I. Humerus:

- Bone of Upper arm
- The Head site is within the Glenoid cavity of the scapula forming the shoulder joint
- Distally, at the elbow with 2 bones- Ulna & Radius.

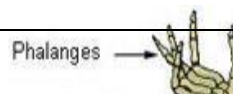
II. Ulna & Radius:

- The Ulna is located on the medial aspect of fore arm, (the little finger side)
- Longer than radius
- The radius is smaller bone of arm located on lateral aspect of fore arm (the thumb side)
- Radius is narrow at proximal end and wider at distal end
- Ulna & Radius articulate with humerus at elbow joint
- Distal end of radius articulates with three bones of wrist – Lunate, Scaphoid & Triquetrum

III. Carpals, Metacarpals & Phalanges:

- The Carpus (wrist) is the proximal region of the hand
- Consists of 8 small bones (carpals) joined to each other by ligaments
- Scaphoid, Lunate, Triquetrum, Pisiform, Trapezium, Trapezoid, Capitate and Hamate
- Metacarpals or palmis intermediateregion of hand, having 5 bones called Metacarpals
- Each metacarpal bone consists of a proximal base, an intermediate shaft and a distal head(1 to 5 starting from thumb)
- Phalanges or bones of fingers or bones of digits make up distal part of hand
- There are 14 phalanges in the 5 digits of each hand, Digits are numbered 1 to 5 beginning with thumb.
- A single bone of digit is called Phalanx.
- Starting from thumb, other four digits are called Index finger, Middle finger, Ring finger and little finger.
- First row phalanges- Proximal row
- Second row phalanges- Middle row (excludes thumb)
- Third row- Distal row

Upper Extremity



- Humerus (2)
- Radius (2)
- Ulna (2)
- Carpals (16)
- Metacarpals (10)
- Phalanges (28)

B. Pectoral (Shoulder) Girdle:

- The Human body has 2 pectoral or shoulder girdles attached to bones of upper limbs to axial skeleton
- Each pectoral girdle consists of Clavicle and Scapula

IV. Clavicle or Collar Bone:

- S-shaped
- It is rougher and more curved in males
- The medial end is rounded and articulates with manubrium of sternum to form Sternoclavicular Joint.
- The broad, flat and lateral end articulates with the Acromion of Scapula to form Acromio-clavicular joint.
- Conoid ligaments attach the Clavicle & Scapula

V. Scapula (Shoulder Bone):

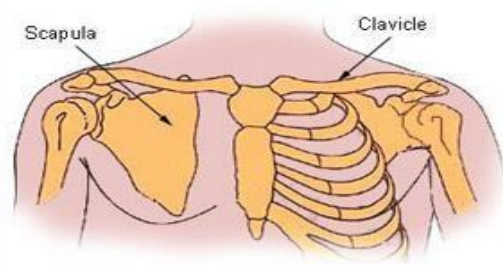
- It is a large, triangular, flat bone situated in superior part of posterior thorax between level of 2nd and 7th ribs.
- A prominent ridge called spine runs diagonally across posterior surface of scapula.
- Lateral end of spine projects a flattened expanded process called Acromion
- Thin edge of scapula closer to vertebral column is called medial (Vertebral) border.
- Thick edge closer to arm is called lateral (Axillary) border.

Pectoral girdles

- Clavicle (2)
- Scapula (2)

C. Pelvic Girdle (HIP):

- The pelvic(hip) girdle consists of 2 hip bones called Coxal bones
- The hip bones unite anteriorly at a joint called pubic Symphysis.
- They unite posteriorly with sacrum at sacroiliac joints.
- Functionally the bone at pelvis provides a strong and stable support for the vertebral column, pelvic and lower abdominal organs.
- The pelvic girdle, also connects bones of lower limbs to axial skeleton
- The structure of pectoral (shoulder) girdle offers more mobility than strength
- Pelvic girdle offers more strength than mobility
- Although the hip bones function as single bones but anatomists commonly discuss each hip bone as 3 separate bones



Pectoral Girdles

i. Ilium:

- It is the largest bone of hipbone composed of superior and inferior body
- The body helps forming Acetabulum socket for the head of femur

ii. Ischium:

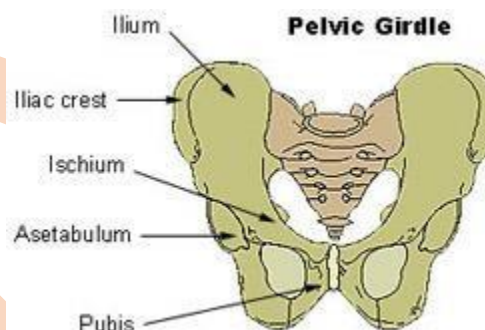
- Inferior and posterior portion of hip bone
- Comprised of superior body and inferior ramus.

iii. Pubis:

- Anterior and inferior part of hip bone
- A superior ramus, inferior ramus and a body between rami comprise the pubis.

Pelvic Girdle:

- Coxal, innominate, or hip bones (2)

**D. Lower Limbs:**

- Each lower limb has 30 bones
- Femur in thigh, patella in knee cap, tibia and fibula in leg, 7 tarsals (ankle), 5 metatarsals and 14 phalanges in foot (bones of digits)

i. Femur (Thigh bone):

- Longest, heaviest, strongest bone in the body
- Its proximal articulates with acetabulum of the hip bone (proximal end has rounded head)
- Distal end articulates with the tibia and patella
- Body (shaft) of femur angles medially, so that the knee joints are closer to midline. Angle is greater in female because female pelvis is broader.
- Extended distal end of femur includes medial condyle and lateral condyle.

ii. Patella:

- Small triangular bone located to Anterior joint
- The broad proximal end of the sesamoid bone is called Base
- The pointed distal end is called Apex.
- The posterior surface contains 2 articular facets (one for medial condyle and one for lateral condyle of femur)

iii. Tibia and Fibula:

- Larger, medial, weight bearing bone of the leg
- Tibia articulates at its proximal end with femur and fibula; and its distal end with fibula and talus bone of ankle.
- Tibia & Fibula as ulna and radius connected by an Interosseous membrane.
- The proximal end of tibia is expanded into : a. lateral condyle b. medial condyle
- The fibula is parallel and lateral to tibia
- The head of fibula, the proximal end articulates with inferior surface of lateral condyle of tibia form tibiofibular joint.

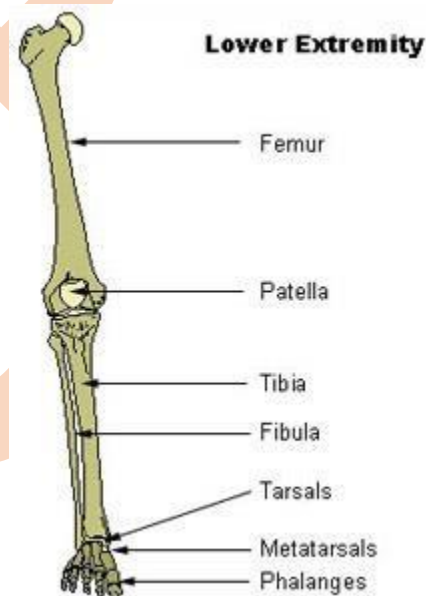
- The distal end articulates with talus of the ankle.

iv. Tarsals, Metatarsals and Phalanges:

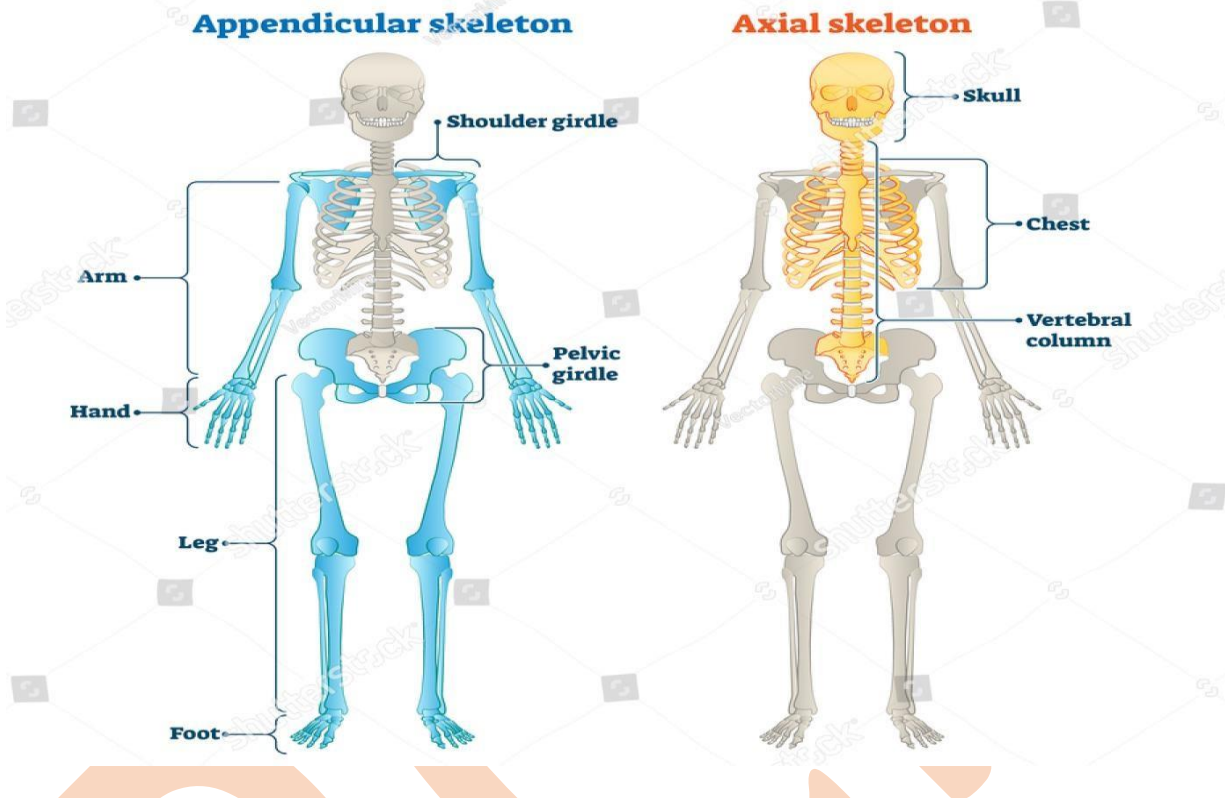
- The tarsus (Ankle) is proximal region of foot and consists of 7 tarsal bones
- Talus and Calcaneus (largest and strong tarsal bones), Navicular, Cuboid, 3 Cuneiform bones
- Joints between tarsal bones are called Intertarsal joints
- The talus bone is the only bone of foot That articulates with fibula and tibia
- The metatarsus intermediate region of the foot consists of Metatarsal bones (from medial to lateral)
- Each metatarsal consists of: a. a proximal base, b. an intermediate shaft, c. A distal head
- Metatarsals articulate proximally with 1st, 2nd and 3rd cuneiform and cuboid bones (forms tarso-metatarsal joints)
- Distally they articulate with proximal row of phalanges to form Metatarso-phalangeal Joints.
- The phalanges comprise distal component of foot same as hand in both number (14) and arrangement.
- Joints between phalanges of foot are called Inter-phalangeal Joints.

Lower Extremity:

- Femur (2)
- Tibia (2)
- Fibula (2)
- Patella (2)
- Tarsals (14)
- Metatarsals (10)
- Phalanges (28)



DIVISIONS OF THE SKELETAL SYSTEM



IMPORTANT QUESTIONS:

2M QUESTIONS:

1. Define skin and its functions.
2. Enlist the layers of skin.
3. Define muscle tone
4. Differentiate osteoclast and osteoblast.
5. Define skeletal system and its functions.
6. Differentiate tendon and ligament.
7. Define muscle contraction.
8. Define neuromuscular junction
9. Explain largest and shortest bones of human body
10. Name the largest nerve of human body.
11. Define: 1. Joint
2. Synovial joint with examples.

5M QUESTIONS:

- 1) Explain the physiology of muscle contraction.
- 2) Write in details about structure and functions of skin.

- 3) Write a note on different types of joints.
- 4) Write features and functions of bones of axial and appendicular skeletal system.
- 5) Write in details about synovial joints and their function with the help of diagram.

10M QUESTIONS:

- 1) Write a note on different types of joints.
- 2) Write features and functions of bones of axial and appendicular skeletal system.
- 3) Write in details about synovial joints and their function with the help of diagram.

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