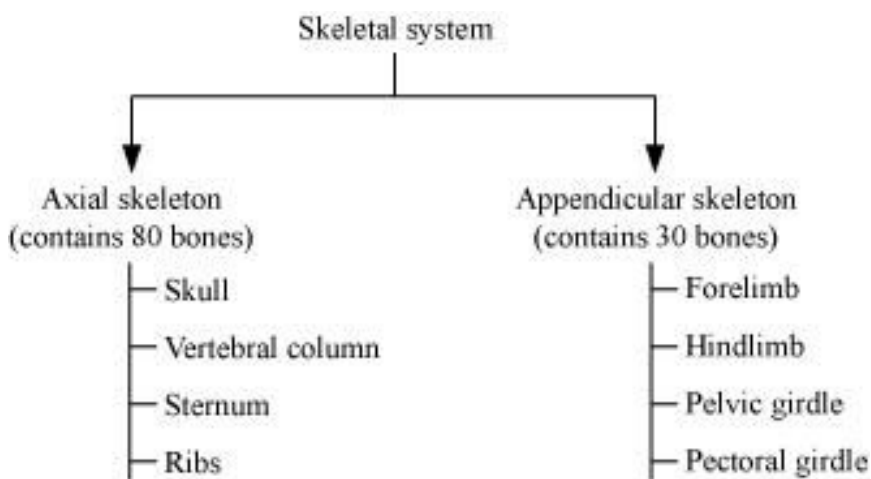


The Skeletal System

Skeletal system

- Human skeletal system is made up of 206 bones.
- A typical bone consists of osteocytes or bone cells that are embedded in a ground matrix made up of collagen fibres and calcium and phosphorus salts.



- Vertebral column forms the axis of skeleton.
- It comprises a series of 26 vertebrae.
- Vertebral formula - Bones of vertebral column starting from skull is $C_7T_{12}L_5S_1Co_1$.
- Atlas (articulate with occipital condyles) and Axis are the 1st and 2nd vertebrae respectively.

- Sternum is a flat bone on the ventral midline of thorax.
- Ribs (12 pairs) are flat bones attached dorsally to vertebral column and ventrally to sternum.
- True ribs – Upper seven pairs
- False ribs – 8th, 9th, and 10th pair; as they are not attached to the sternum directly
- Floating ribs – 11th and 12th (last two pairs); as they are not attached ventrally

Bones of forelimbs (in both for limbs)

Humerus -2
 Radius and ulna -4
 Carpals (wrist bone) - 16
 Metacarpals (palm bones) - 10
 Phalanges (Digits) - 28

Bones of hind limbs (in both for limbs)

Femur – 2
 Tibia and fibula – 4
 Tarsals (ankle bones) - 14
 Metatarsals - 10
 Phalanges - 28
 Patella (knee cap) - 2

- Pectoral and pelvic girdle helps in articulation of forelimbs and hind limbs with axial skeleton.

Bones of pelvic girdle

— Clavicle
 — Scapula

Bones of pectoral girdle

— Ilium
 — Ischium
 — Pubis

Joints

- Fibrous – Do not allow any movement

Example: between cranial bones

- Cartilaginous joints – Bones joint together with the help of cartilage

Example: joint between adjacent vertebrae

- Synovial joint – Have fluid-filled synovial cavity

It is of five types:

- Ball and socket joint – Example: between humerus and pectoral girdle, femur and acetabulum
- Hinge joint – Example: knee joint
- Pivot joint – Example: between atlas and axis
- Gliding joint – Example: between carpals
- Saddle joint – Example: between carpal and metacarpal of thumb

Disorders

- **Myasthenia gravis** – Autoimmune disease that affects the neuromuscular junction
- **Muscular dystrophy** – Genetic disorder that leads to weakening of skeletal muscles
- **Tetany** – Associated with painful and involuntary contraction due to low calcium ions in body fluids
- **Arthritis** – Degenerative joint disease that occurs due to inflammation of joints
- **Osteoporosis** – Abnormal loss of bony tissue resulting into fragile porous bone
- **Gout** – Accumulation of uric acid crystal that leads to inflammation of joints

- Muscles are one of the contractile organs of our body.
- They are the fleshy parts of our body, which help in the movement of different body parts.
- Alternate contraction and relaxation of muscles helps in the movement of bones.
- The muscles work in pairs to move a bone.
- Muscles are of three types: voluntary muscles, that can be controlled by our will, involuntary muscles, that cannot be controlled by us, and cardiac muscles, that are special kind of involuntary muscles and are found only in heart.
- Lever Mechanisms in Human Skeleton
 - First Order Lever: Fulcrum (F) is in between Power (P) and Weight (W). Example, extension of arm at the elbow by the action of triceps muscles, and resting of skull on first and second neck vertebrae.
 - Second Order Lever: Fulcrum and power are at the two ends with the weight in between. Example, gastrocnemius muscle raising weight of the body on the toes.
 - Third Order Lever: Fulcrum and weight are at the two ends with the power in between. Example, biceps muscles flexing the arms.
- When some muscles undergoes contraction, at the same time there are some muscles of the same group that relax which helps in performing various operations.
- **Biceps** are present on the front part of our upper arm while **triceps** are at the back.
- **Abdominal muscles** (abs) are pair of muscles present in the front of abdomen.