# Movement and Locomotion

- The body of living organisms is made up of an important framework of bones called the **skeletal system** or the **skeleton**.

- The skeleton consists of bones, cartilages, ligaments, tendons and fascia.

- The **bone** is a strong, hollow and non-flexible connective tissue. It is a hard, greyish-white tissue, composed of 2/3$^{rd}$ of inorganic substances or minerals such as calcium, phosphorus, carbonates etc. and 1/3$^{rd}$ of organic substances.

- **Types of bones**
    a. Long bones
    b. Short bones
    c. Flat bones
    d. Irregular bones

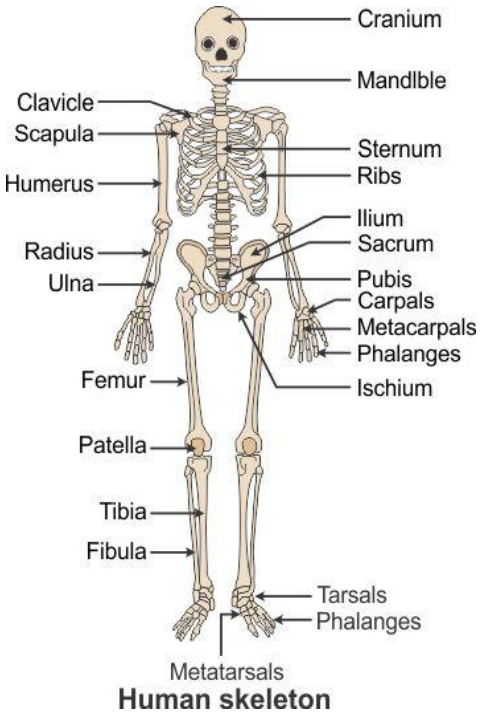
- **Cartilages** are found between two or more bones. They smoothen the bone surface, act like cushions and prevent the rubbing of bones against each other. They also function as shock-absorbing pads.

- **Ligaments** hold two or more bones together at joints. They control the motion of a joint, and in some cases, restrict the motion of a joint.

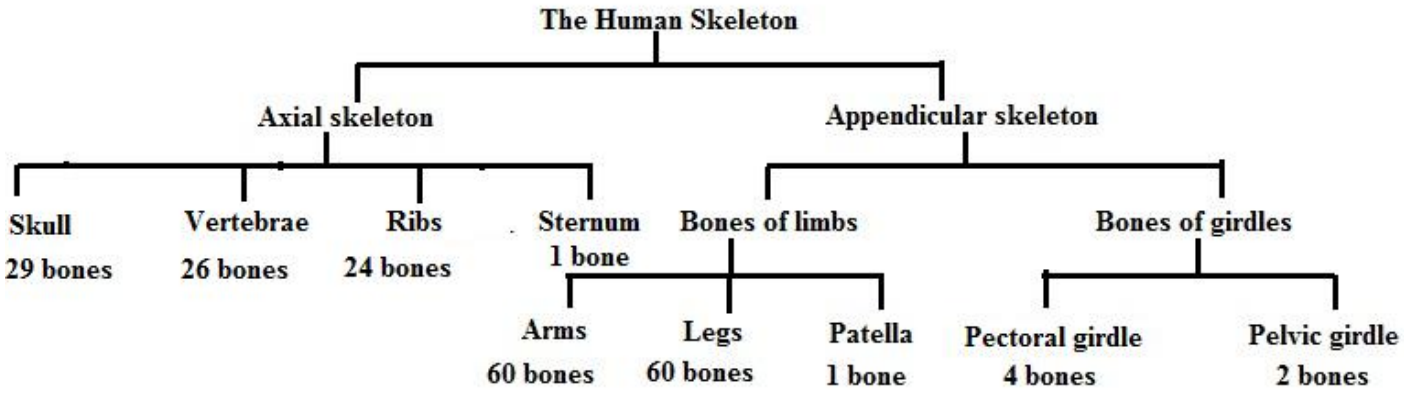
- **Tendons** are tough parallel fibres of connective tissue or cords or straps strongly attached to the bones. They play an important role in locomotion.

- The **fascia** is a strong connective tissue that surrounds the muscles, groups of muscles, blood vessels and nerves in the form of membranous sheets. Fasciae connect muscles to other muscles of the body.

- **Functions of skeleton** include providing support and shape, protection, leverage, storage of minerals and allowing movement and formation of blood cells.

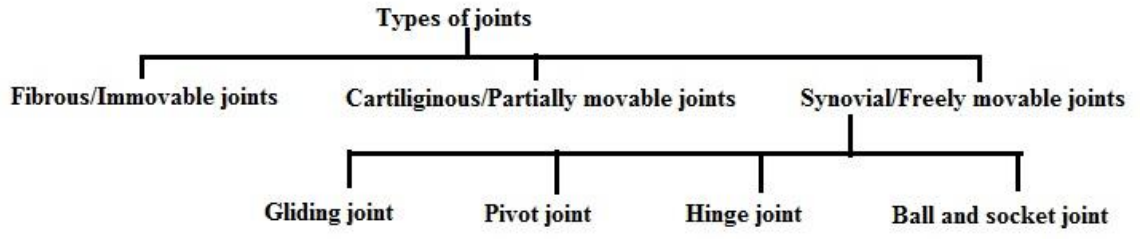


**Human skeleton**




| COMPONENT OF THE SKELETON | DESCRIPTION |
|---|---|
| **Skull** | Divided into head bones and facial bones.<br>Head bones-8, Facial bones-14 |
| **Vertebral column** | Composed of 26 ring-like bones called vertebrae.<br>Has a characteristic S-shaped curve which helps in balancing the body.<br>Cervical vertebrae-7 bones, Thoracic vertebrae-12 bones,<br>Lumbar vertebrae-5 bones, Sacrum-5 bones, Coccyx-4 bones |
| **Ribs** | Each rib articulates with a thoracic vertebra.<br>True ribs-7 pairs, False ribs-3 pairs, Floating ribs-2 pairs |
| **Sternum** | Long, flat and strong bone in the centre of the chest.<br>Holds the ribs in place. |
| **Bones of the limbs** | Upper arm bone-Humerus, Forearm bones-Radius and Ulna<br>Hand-8 carpals, 5 metacarpals, 14 phalanges<br>Leg bone-Femur, Bones of lower limb-inner Tibia and outer Fibula,<br>Knee bone-Patella<br>Foot-8 tarsals, 5 metatarsals, 14 phalanges |
| **Bones of the girdles** | Each pectoral girdle consists of a collar bone or clavicle and the shoulder blade or scapula.<br>Pelvic girdle-Ilium, Ischium and Pubis |

- The point at which two separate bones meet is called a **joint**.
- Joints permit different types of movements. They allow varying degrees of movement. Some joints permit no movement at all, while other joints allow slight movement. Certain joints afford considerable movement.




- **Immovable/Fibrous joints** do not allow any movement of the bones they connect. Fibrous joints are found in the skull as well as in the pelvic girdle. They are also found between the calf bone and tibia.

- **Partially movable** or **cartilaginous joints** permit only a limited degree of movement. Cartilaginous joints are seen in the ear lobe, at the tip of the nose and in the sternum.

- **Synovial joints** permit free movement in all directions. Examples: Joint in the knee, joint between the atlas and axis, joints in tarsal bones, hip joint, shoulder joint and wrist joint.

- **Types of synovial Joints**
  a. Ball and socket joint: Hip joint and shoulder joint.
  b. Hinge joint: Bones of fingers and toes and in the ankle and knee.
  c. Pivot joint: Atlas and axis of the backbone.
  d. Gliding joint: Wrist and the ankle.

- **Muscles** are long bundles of contractile tissues. A muscle has two ends; a fixed end where the muscle originates and a movable end which pulls some other part.

- Actions such as walking, running, playing etc. require the combined action of several muscles.

- Muscles that cause opposing movements are known as **antagonistic muscles**. Example: Biceps and triceps.

- **Functions of muscles**
  a. Muscles in the body provide the means of all movements.
  b. They cover the skeletal framework and provide shape or contour to the body.
  c. Muscles help to maintain the body posture while sitting, standing and walking.

- **Kinds of muscles**

| Skeletal muscles | Smooth muscles | Cardiac muscles |
|---|---|---|
| •They are under the control of one's will or volition.<br>•Muscles of our forelimbs, hindlimbs, fingers, neck and eyes are skeletal muscles. | •They are not under the control of one's will or volition.<br>•They are found in the walls of blood vessels and in the lining of stomach, intestine, trachea and oesophagus. | •Show rapid movements and do not get tired easily.<br>•Muscles of eyelids, heart and diaphragm are cardiac muscles. |