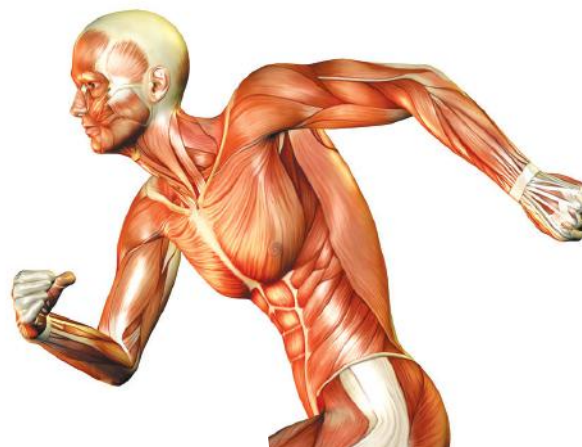


# Bones And Muscles

## 4

The human body is an amazing machine. Just as a machine is made of many parts, our body is made up of many organs. Each organ has a specific function to perform.

A group of organs working together to perform a particular job for the body, forms an organ system. The human body is made up of many organ systems. All these systems work close to make coordination with one another.



### THE SKELETON

The framework of bones in our body is known as the skeleton. It is covered with flesh and skin. The skeleton gives shape and support to the body. It protects our internal organs. An adult human has 206 bones of different shapes and sizes in the body.

The bones are hard from outside but spongy from inside. This makes the bones both lightweight and strong. Some bones which are hollow have a soft, fatty substance inside them called marrow. The marrow produces new blood cells. The red blood cells (RBCs) carry oxygen to all the parts of the body and the white blood cells (WBCs) fight infections. The skeletal system comprises of the skull, backbone, ribcage and limbs.



*The Skeleton*

### SKULL

Skull is the hardest part of the body that protects the brain. In adult human beings, skull is normally made up of 22 bones, joined together to cover the brain and to give shape to the head. All the bones in the skull are fixed except the lower jaw. The movable lower jaw helps us to talk and eat.



*The skull*



*Jaws*



## BACKBONE

There are 33 small bones called vertebrae in the back, which are joined together to form the backbone. The backbone is also called the spine or the vertebral column. The joints allow slight movement of the vertebrae. That is why you can bend and twist your back. Each vertebrae has a hole in it. The delicate spinal cord passes through these holes. The vertebral column thus protects the spinal cord.



*Straight*



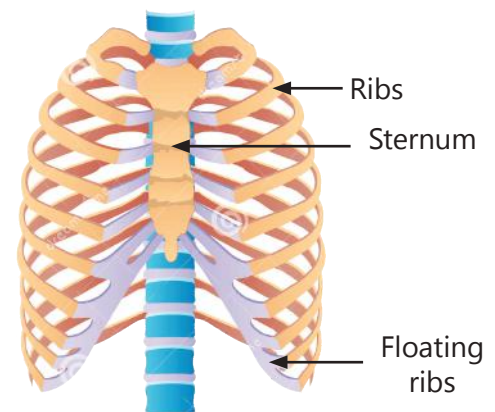
*Forward bent*



*Backward*

## RIBCAGE

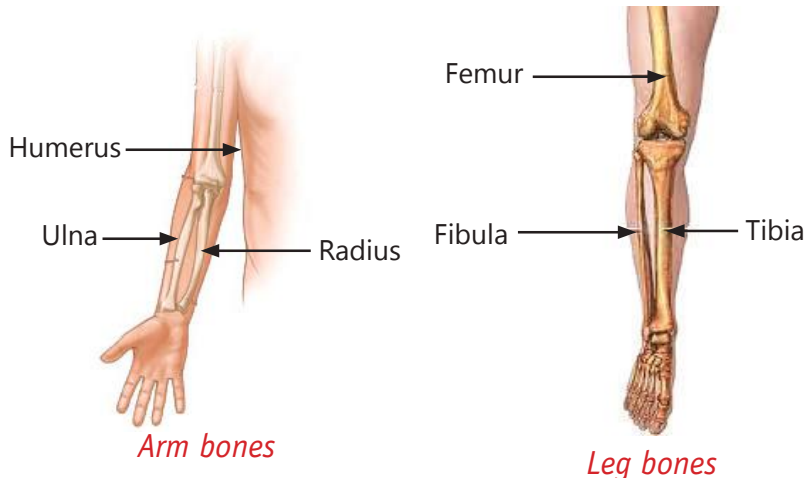
Ribs make a cage of bones around the chest called the rib cage. The rib cage is made of 12 pairs of ribs joined at the back to the backbone but only the first 10 pairs are joined in front of the breastbone. The bone in the middle of the rib cage is called the breastbone or sternum. The long curved bones attached to it are called the ribs. The last two pairs of ribs are only joined to the backbone.



*Ribcage*

## LIMBS

The arms are called **forelimbs**. Each forelimb has three bones. The upper arm above elbow has one bone, called **humerus**. The lower arm below the elbow has two bones called **radius** and **ulna**. The wrist, the hands and the fingers are made up of many small bones. The **hind limbs** or the legs also have three bones each. Femur is the thigh bone, the longest bone in the body. The lower leg below the knee has two bones, called **tibia** and **fibula**.



# JOINTS

Joints are the meeting points of two bones. Bones are held together by strong bands of fibre-like structures called ligaments. They control the amount of movement of bones. At the joints, where the bones rub against each other, they are supported by a stiff but flexible substance called cartilage. The cartilage protect the bones from wear and tear due to friction.

There are two kinds of joints - immovable joints and movable joints.

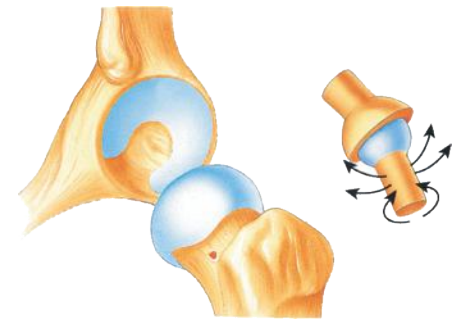
**Immovable joints :** In an immovable joint, bones are held tightly together. There is no cartilage between the joints. Bones of the skull are immovable joints.

**Movable joints :** Movable joints help in the movement of the body by allowing the bones to move. These joints are covered with cartilage which prevents the bones from rubbing against each other.

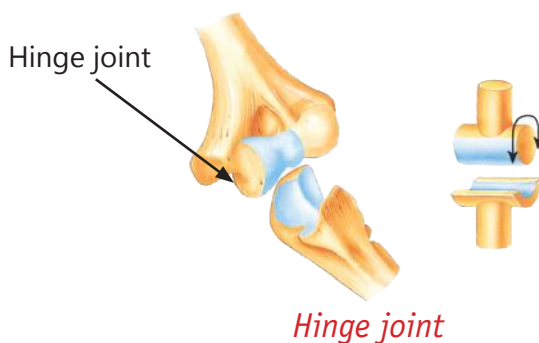
Our body has four types of movable joints :

- (i) Ball and socket joint
- (ii) Hinge joint
- (iii) Pivot joint
- (iv) Gliding joint

**Ball and socket joint :** It allows the bones to move easily in all directions. In such joints, one end of the bone is like a ball that fits into a hole or a socket of the other bone. The shoulder joints and hip joints are examples of ball and socket joints.



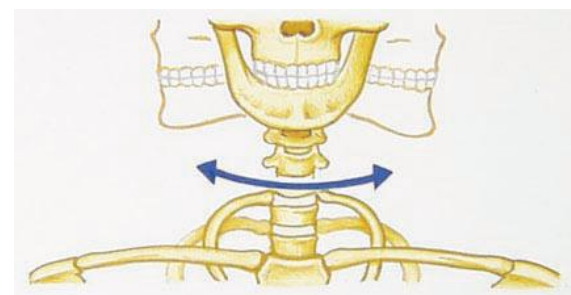
*Ball and socket joint*



*Hinge joint*

**Hinge joint :** A hinge joint allows movement in a certain spot to take place. This joint is similar to the opening and closing of a door. Some examples of hinge joints are the elbow, knee, ankle and joints between the fingers. Hinge joints allow the body parts to bend and straighten.

**Pivot joint :** It is found between the first two vertebrae of the backbone. The skull is connected to the top vertebra, with a pivot joint. It allows the head to move upwards, downwards and sideways.



*Pivot joint*



*Gliding Joint*

**Gliding joint** : The gliding joints allow small sliding movements at the wrist, ankle and between the vertebrae of the backbone. It allows the back to bend, twist and turn. Such a joint is also called a gliding joint.

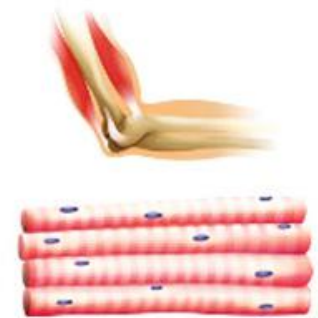
## **MUSCLES**

Bones alone are not capable of moving various body parts. They move with the help of muscles. The body of an adult has more than 600 muscles. The muscles tighten and relax to produce movement.

Muscles are fleshy tissues which are connected to the bones by strong fibres called tendons. Muscles help to bend our arms and knees, allow us to inhale air, chew our food and even make our heart beat. Thus, muscles account for all types of body movements.

There are three kinds of muscles:

- 1. Voluntary or Skeletal muscles** : These are attached to the skeletal system. These are called voluntary because they are under our control. We can move or stop them at will. For example, you can throw something with your hand and kick anything with legs whenever you want to. The muscles of arms and legs are in your control. Their cells have bands or stripes on them. That is why they are also called striped muscles.



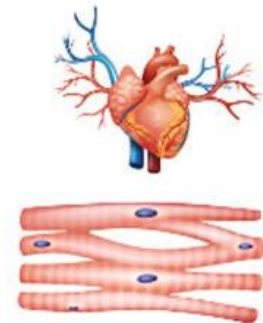
*Skeletal muscles*



*Smooth muscles*

- 2. Involuntary or Smooth muscles** : These are the muscles over which we have no control. The cells of these muscles do not have stripes on them and so they are called smooth and unstriated muscles. Muscles of stomach, trachea and blood vessels are some of the involuntary muscles.

- 3. Cardiac muscles** : These are the muscles of the heart. As a matter of fact, the heart is almost entirely made up of muscles. These muscles work throughout your lifetime. They do not stop even for a moment. They have bands like striped muscles and they work continuously without getting tired like involuntary muscles.



*Cardiac muscles*

## How Muscles work?

Our body moves because of the action of the muscles. The muscles are made of muscle cells. The muscle cells are the cells that can contract (shorten) and relax (lengthen) when needed. When muscle cells contract, they cause the bones to come close to each other at a joint. When the muscle cells relax, they allow bones to straighten again at the joint. The muscles work in pairs to allow movement.

### Know the Keywords :

Skeleton	: A framework of bones
Joint	: A place where two bones meet
Bone marrow	: Soft fatty substance found inside long bones
Tendon	: Tissue which joins muscles to bones

### Point to Remember

- The combination of bones and muscles makes human body to work incredibly.
- The skeleton is the framework of the bones which give shape to our body and protect the soft, delicate inner organs such as the heart and the lungs.
- Skull is the hardest part of the body that protects the brain.
- Ribs form a protective cage around the heart and the lungs called the ribcage.
- The thigh bone or femur is the longest bone in our body.
- Ball and socket joint allows the bones to move easily in all directions.
- Knees, elbows, fingers and toes have hinge joints.
- Muscles are fleshy tissues which are connected to the bones by strong fibres called tendons.

## EXERCISE TIME

### A. Multiple choice questions (MCQs).

Tick (✓) the correct option :

1. The part of the human skeleton that protects our brain is \_\_\_\_\_.

a. spine  b. skull  c. ribcage

2. Which of these is the longest bone of the body?

a. Femur  b. Ulna  c. None of these

3. The lungs and heart are protected by \_\_\_\_\_.

a. skull

b. spine

c. ribcage

4. Muscles of stomach, trachea and blood vessels are \_\_\_\_\_.

a. Voluntary

c. Involuntary

c. Cardiac

**B. Fill in the blanks :**

1. Muscles are attached to the bones by strong bands called \_\_\_\_\_.

(tendons/nerves)

2. The \_\_\_\_\_ muscles are also called cardiac muscles.

(lungs/heart)

3. The \_\_\_\_\_ gives shape and support to the body.

(muscles/skeleton)

4. Voluntary muscles are also called \_\_\_\_\_ muscles.

(striped/unstriped)

**C. Write 'T' for true and 'F' for false :**

1. The skull has many movable joints.

2. Tibia and fibula are the two bones present in lower leg.

3. The ball and socket joint allows movement in one direction only.

4. The pivot joint helps us to move hips and shoulders.

**D. Answer the following questions :**

1. What is the role of backbone in our body?

2. What are joints?

3. Explain the following :

(a) Ball and socket joint

(b) Hinge joint

(c) Pivot joint

4. Explain the three kinds of muscles.

5. How do muscles work?



## Creative Work

- Label the human skeletal system.

