

We shall learn :

- The skeleton
- Parts of the skeleton
- The joints and ligaments
- Types of the joints
- The muscles
- Types of the muscles
- How the muscles work

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Bones and Muscles

Unit-I : Our Body



WARM UP

What is the study of bones known as ?

- Geology Philology Osteology Entomology

Can you feel something hard below the skin when you press hard on any body part? These are the bones. Have you ever wondered what your body would be like if there had been no bones in it? Your body would then be shapeless and like a lump of flesh. The bones give shape to your body. The frame of your bones is like a hanger on which the shirt of your flesh and skin is hung. The shirt gets a shape when it is hung or supported on a hanger.

The Skeleton

We have 206 bones inside our body that are connected together to form a framework called **skeleton**. The bones of the skeleton are organised into a skeletal system.

The skeleton has several important functions :

- It provides support and the basic shape to the body. Without skeleton, the body would be a shapeless heap of tissues.
- It protects the soft organs of the body. The skull protects the brain and the ribs protect the heart and lungs.
- Muscles are attached to the bones. Muscles and bones work together to move the parts of the body.
- Bones also contain bone marrow, a fatty substance which forms blood.
- Bones also contain minerals like calcium and phosphorus.



The human skeleton

Parts of the Skeleton

The skeleton has the following main parts :

The Skull : The skull is made up of 8 flat and extremely hard bones, interlocked together. They enclose the delicate brain inside it. 14 bones make up the facial region. Only the



lower jaw is movable. The skull protects the brain, eyes, tongue, nose and internal ears. It enables us to eat and talk. The upper and the lower jaw have teeth. Teeth help us in cutting and chewing food.

The Ribcage : Ribs make a cage of bones around the chest, called the **ribcage**. The ribcage protects our heart, lungs and liver.

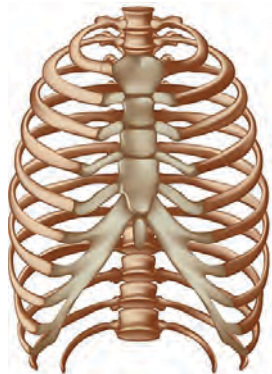
There are 12 pairs of bow-shaped ribs which form a cage and enclose the heart and the lungs. The ribs are delicate, curved bones which are joined to the backbone and the breastbone. The lowest two pairs, called **floating ribs**, are joined only to the backbone.

The Backbone or Spine : The vertebral column is made up of 33 small ring-shaped bones called **vertebrae**. It runs from the base of the skull up to hip region. A type of tissue called **cartilage** is present between most of the vertebrae. It cushions the bones and acts as a shock absorber. The vertebral column encloses and protects the spinal cord. Out of 33 vertebrae, the first seven are present in the neck region.

The backbone is also called the vertebral column. Animals like tiger, snake and frog have a backbone and are called **vertebrates**. Animals like snail, earthworm and cockroach do not have a backbone and are called **invertebrates**.



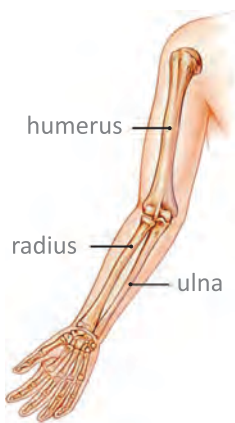
the skull



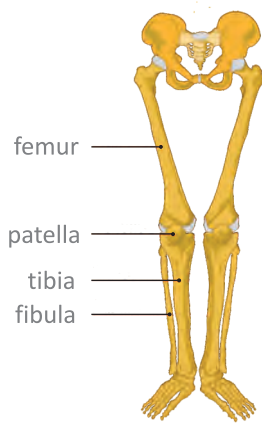
the ribcage



the backbone helps to bend your back



bones of the arm



bones of the leg

The Limbs : We have two pairs of limbs: The forelimbs (arms) and the hindlimbs (legs). The forelimbs are joined to the spine with the help of the shoulder girdles, consisting of a pair of shoulder blades and a pair of collar bones.

The powerful thigh bone or **femur**, the longest bone in our body, bears the weight of the whole body. The femur fits into the hip girdle with a ball-and-socket joint and is connected to the lower leg with the knee joint.



The long bones of the arms and legs are hollow and are filled with a soft, fatty substance called **bone marrow**. These bones are extremely strong and are designed to hold weight and tolerate pressure. That is why we are not only able to carry our own weight but also lift additional weight and walk.



Wisdom Corner

Bones are not the hardest substance in our body. The enamel coating on our teeth is harder than bones. However, bones can be repaired if broken but enamel cannot.

The Joints and Ligaments

Most bones are connected to other bones. The place where two bones join together is called a **joint**. Most joints are movable. Strong bands of tissue called **ligaments** hold the bones together at a joint.

Types of the Joints

There are two types of joints in our body :

The Immovable Joints

These joints simply connect bones. They do not allow the movement of bones. The bones at the joints of the skull do not move.

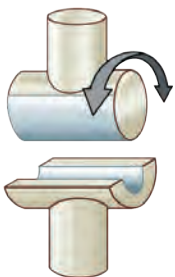


immovable joints movable joints

The Movable Joints

These joints allow full movement of bones. There are four types of movable joints :

The Hinge Joint : A hinge is like the hinges in a door. It can move the bones only in one direction. The elbows, knees, fingers and toes have hinge joints.



hinge joint



knee joint



elbow joint



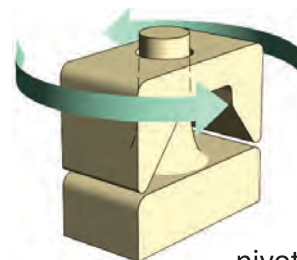
ball and socket joint



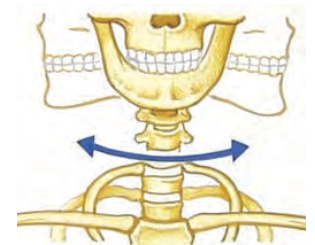
hip joint

The Ball and Socket Joint : A ball and socket joint allows the maximum movement, as displayed by ballet dancers. One bone that ends in a ball, fits into the socket of the other. It is found in the hip and shoulder joints.

The Pivot Joint : A pivot joint is found between the skull and the first two vertebrae of the spine. The uppermost vertebra in the neck is called **atlas**, named after the Greek God who is said to

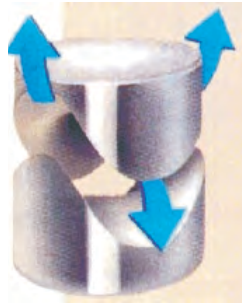


pivot joint



carry the globe on his shoulders. With the help of the pivot joint, we can move our head sideways, upward and downward.

The Gliding Joint : This kind of joint allows movement at the wrist and ankle, and also between any two vertebrae of the spine. It allows our back to bend, twist and turn at each joint.



gliding joint



ankle joint



wrist joint

The Muscles

Bones in the body cannot move on their own. They move with the help of muscles. The human body has more than 600 different muscles. Most of them are attached to bones with strong fibres called **tendons**. The tendons help the muscles in moving the bones.



Wisdom Corner

Muscles are made up of cells called muscle fibres.

Types of the Muscles

Some muscles, like the muscles attached to our skeleton are under our control, so we call them **voluntary muscles**. Muscles not under our control are called **involuntary muscles**. They control actions like the movement of food in the alimentary canal, the flow of blood and the movement of the eye muscles.

The third kind of muscles are found in the heart, which are involuntary in function, but structured like voluntary muscles. These muscles are called **cardiac muscles**.

How the Muscles Work

The muscles in the body tighten and produce movement. Muscles bend our arms and knees, push food into the digestive canal, allow us to inhale air into our lungs, chew our food and make our heart beat.

The muscles and bones together give shape to the body and help in moving the parts of the body. You are able to move your legs with the help of muscles and bones of the legs.



Proper food and regular exercise will keep your muscles and bones healthy. When you play, you exercise your muscles and bones and therefore, your body becomes strong and healthy. That is why, you must play outdoor games regularly.



Wisdom Corner

Bones weigh little and make up only 12% of our body weight.



Glossary

Skeleton	A framework of bones
Bone marrow	Soft fatty substance found inside long bones
Joint	A plane where two bones meet
Ligament	Strong band of tissue holding two bones together at a joint
Tendon	Tissues which join muscles to bones

Question Hour-I



A Tick (✓) the correct answer :

- Which of the following system gives shape and support to our body?
 (a) skeleton system (b) digestive system (c) excretory system
- The skull of an adult human body has :
 (a) 26 bones (b) 28 bones (c) 22 bones
- The joint between the skull and the first two vertebrae of the backbone is called as :
 (a) hinge joint (b) pivot joint (c) gliding joint
- Bones cannot move without :
 (a) muscles (b) ribs (c) bone marrow
- Voluntary muscles are :
 (a) under our control (b) not under our control (c) both

B Fill in the blanks with the correct words from the box :

- You cannot move your _____ (*upper jaw / lower jaw*).
- The floating ribs are jointed only to the _____ (*breastbone / vertebral column*).
- The upper arm joins the lower arm at the _____ (*knee / elbow*).
- Cardiac muscles are the muscles of the _____ (*lungs / heart*).
- _____ (*bone marrow / cartilage*) in the hollow of long bones makes the red blood cells of the body.



C Give one word name for each :

1. The bones that protect the brain
2. The bones that protect heart and lungs
3. The tissue that joins bones and muscles
4. The substance found inside the bones

D Which joint of the body helps us to perform the following functions?

1. Running _____
3. Jumping _____
5. Writing _____

2. Bending _____
4. Swimming _____

E Write 'T' for true and 'F' for false statement :

1. Bones in our body can move on their own.
2. All bones in the skull are movable.
3. The knee joint is a hinge joint.

F Answer the following questions :

1. What is the human skeleton made up of?
2. What are the functions of the skeletal system?
3. Differentiate between voluntary and involuntary muscles.
4. What is a joint? Explain different joints in a human body.
5. How do the muscles and bones help the body?
6. How can we keep our bones and muscles healthy?

Think Beyond HOTS

Some animals have the skeleton outside their body. What is it called? Name some animals that have this kind of skeleton.

Question Hour-II

Circle the odd one in each group. Give reasons for your answer :

- | | | | |
|-------------|---------|---------|------------|
| 1. Elbows | Fingers | Wrist | Knees |
| 2. Tongue | Arms | Chest | Legs |
| 3. Swimming | Yoga | Smoking | Gymnastics |



Fun to Drill



Find ten words in the word search that are related to the skeletal system :

H	I	P	K	S	R	I	B	R	L
M	M	N	N	K	S	P	I	N	E
Q	B	T	E	N	D	O	N	T	R
L	S	K	E	L	E	T	O	N	B
I	T	F	C	G	F	E	M	U	R
M	S	K	U	L	L	I	T	L	A
B	O	K	N	V	W	R	I	B	S
L	I	G	A	M	E	N	T	V	I
W	J	O	I	N	T	C	X	Z	U
N	A	L	A	T	L	A	S	F	S

Fun to Act



Make a model of arm :

Things you will need : Two strips of cardboard, one twice as wide as the other, the other a narrow strip rounded at one end; paper fastener, a paper hand.

Fold the wide strip in half lengthwise. Fit the rounded end of the other strip in the fold and attach the two.

Stick a paper hand onto the end of the folded strip of cardboard. Now move your model arm. Does it bend your elbow?

