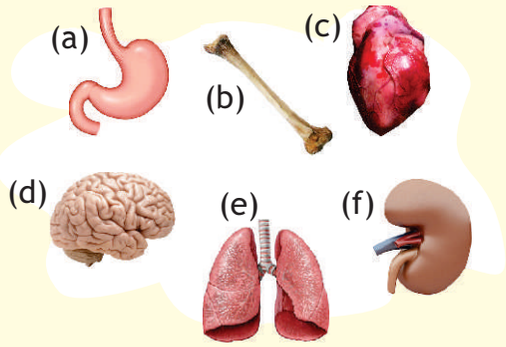
3 Our Bones and Muscles

Before We Start, Let's Check

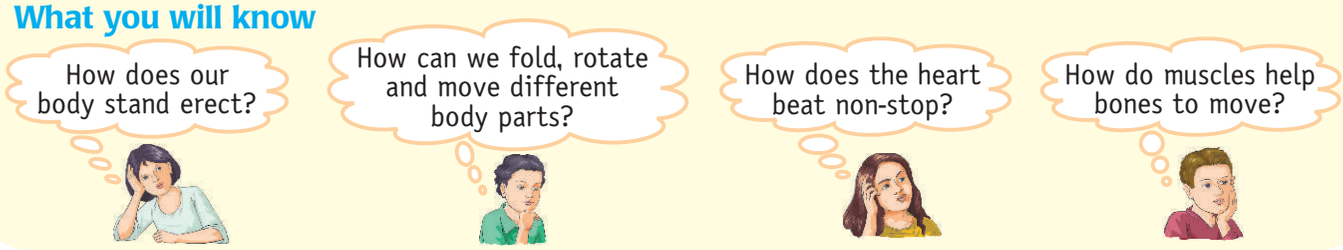
What you already know

Match the pictures of the internal parts of our body to the function each of them performs.

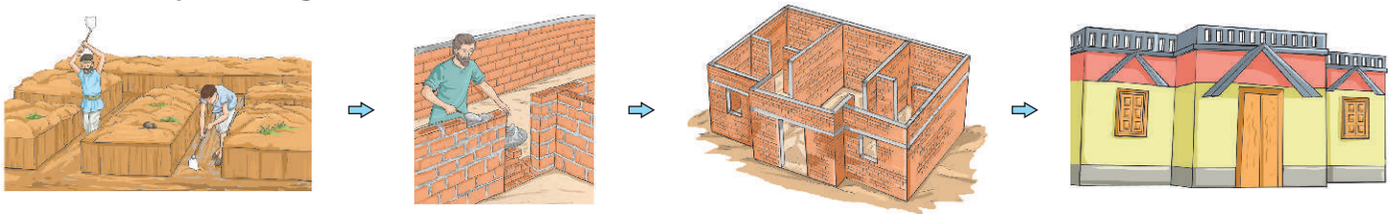
1. breathing
2. circulating blood
3. digesting food
4. supporting body
5. cleaning body
6. thinking



What you will know



Look at the pictures given below.

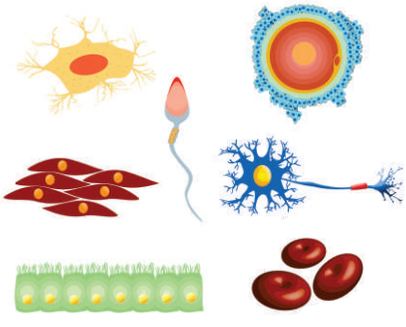


In the last picture, you can see a house. A house is made up of many rooms and the rooms are made up of walls, floors and ceilings. But what is the basic unit of a house? It is the brick. The brick is the smallest and basic unit of a house.

The basic unit of our body is the **cell**. Our body is made up of innumerable tiny cells. These cells are of different shapes and sizes.

Many similar cells join together to form a **tissue**. Many tissues combine together to form an **organ**. There are many organs inside our body as well as on the outside.

A group of the organs that work together and have a specific function is called an **organ system**.



different types of cells

ORGAN SYSTEMS

Our body has many organ systems that work together as one unit. The functions of eight major organ systems are listed below along with the main organs and parts associated with each system.

1. Skeletal system

The skeletal system supports and protects the body while giving it shape and form. It also helps us to move.

main organs and parts

bones, joints, ligaments, cartilage

2. Muscular system

The muscular system enables us to move different parts of our body.

main organs and parts

muscles, tendons

3. Circulatory system

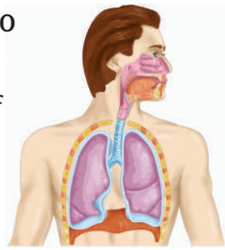
It transports nutrients to the cells throughout body which is accomplished by the circulation of blood.

main organs and parts

heart, blood, blood vessels

4. Respiratory system

It helps us to breathe. The exchange of oxygen and carbon dioxide gases takes place in it.

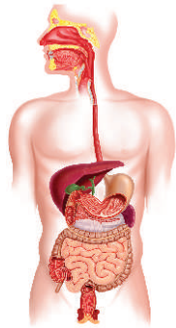


main organs

nose, trachea, lungs

5. Digestive system

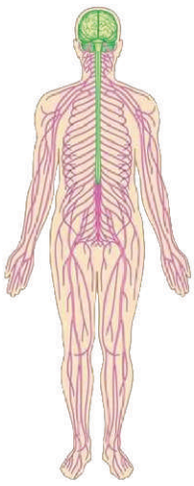
It breaks down food into smaller parts to provide energy to the body.



main organs

mouth, stomach, intestines

6. Nervous system

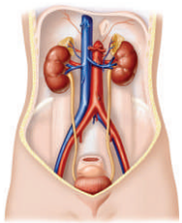


It controls the whole body. It helps us to think and learn. It also responds to changes in the environment.

main organs and parts

brain, nerves, spinal cord

7. Excretory system



It helps us in getting rid of body wastes such as sweat and urine.

main organs

kidneys, skin

8. Reproductive system

This system helps to produce babies.

main organs

Reproductive organs are different in males and females.

THE SKELETAL SYSTEM

The skeletal system is all of the bones in the body and the tissues such as ligaments and cartilage that connect them.

Inside the body, there is a framework of bones called the **skeleton**. There are 206 bones in an adult human body.

The skeletal system performs the following functions:

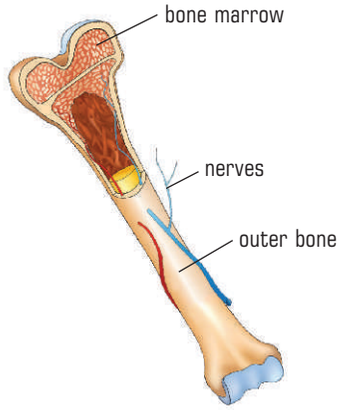
1. It gives shape and support to the body.
2. It protects the vital internal organs of the body.
3. It provides movement to the body parts with the help of the muscles attached to the bones.

skeleton

Bones

Bones are present inside the body. They are relatively light, yet five times stronger than steel.

A bone has a very hard and strong outer layer. Inside this is a layer of spongy bone. Jelly-like **bone marrow** is present in the middle of some bones. Red blood cells and some white blood cells are formed in the bone marrow.



structure of a bone

A newborn baby has around 300 bones. As the baby grows, some bones join together. Up to a certain age, the bones also grow in size. But in case of a crack or fracture of a bone, it repairs itself with time.

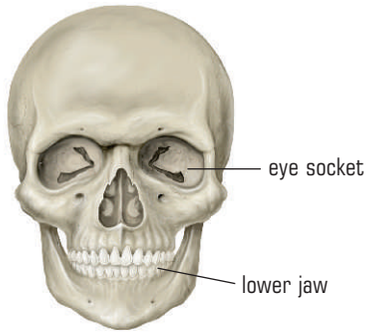
Bones are made up of calcium, sodium, phosphorous and other minerals. Calcium is needed to make bones hard and strong.

Parts of the skeleton

Skull: The skull is the bony framework of the head. It protects the brain.

The skull is made up of 22 bones. Out of these, 8 flat bones protect the brain. The remaining 14 bones make up the face. The eyes fit in the eye sockets.

The lower jaw is the only joint that can be moved. This movable bone allows us to talk and eat.

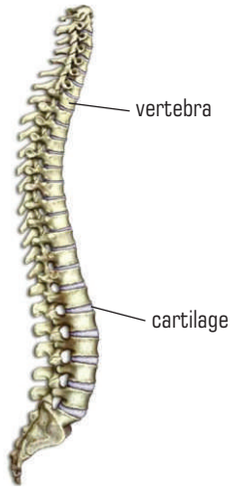


skull

The backbone: Run your hand along the central part of your back. You feel a hard long column. It is the backbone. The backbone is not a single bone; it is made up of 33 small irregular bones called vertebrae.

These bones make a strong framework which protects the spinal cord. There is a soft substance, called **cartilage**, in between every two vertebrae. It provides flexibility to the backbone.

The backbone is attached to the skull at the top. We can bend, turn and twist easily because the backbone is made in such a way.

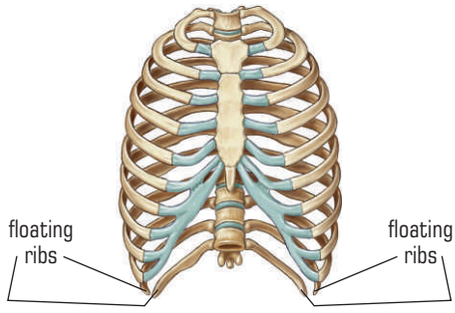


backbone

The ribcage: Twelve pairs of thin curved bones, called **ribs**, make up the ribcage. The ribcage protects the lungs and the heart.

The ribs are connected to the backbone at the back. Ten of these pairs are connected to the breastbone in the front. The last two unattached pairs are called floating ribs.

The ribcage also protects the parts of the stomach and kidneys.

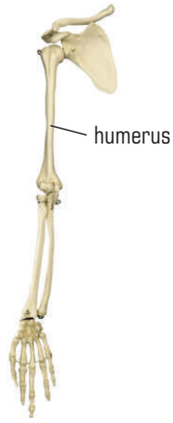


ribcage

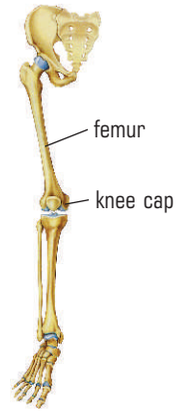
Limbs: There are two pairs of limbs in humans: the forelimbs (or arms) and the hindlimbs (or legs).

The limbs are made up of many small and big bones. The long bone of the upper arm is called the **humerus**. The longest bone in the body is the thigh bone, called the **femur**.

The wrists, palms and fingers are made up of several small bones. They help us to hold and lift things. Similarly, several small bones make up the ankle and the foot. All the bones of the hindlimbs help us to walk, stand and sit.



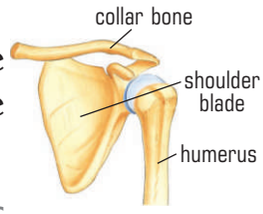
forelimb



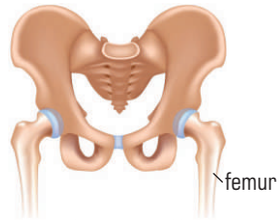
hindlimb

Girdles: There are two pairs of girdles in the body. The humerus bone of the forelimb is joined to the spine by the **shoulder girdle**.

The femur bone of the hindlimb is joined to the **pelvic girdle**. The kidneys and the urinary bladder are protected by the pelvic girdle.



shoulder girdle



pelvic girdle

Joints

Bones are hard and rigid. Then how do we move? This is possible because of the joints.

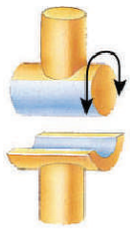
Joints are the places where two or more bones meet or join together. Bones are joined together by a thread-like band of fibrous connective tissues called **ligaments**.

Joints are of two types: immovable joints and movable joints.

Immovable joints do not allow movement of bones, for example joints in the bones of the skull and the pelvis.

Movable joints allow free movement of bones. They have cartilage between them so that the bones do not rub against each other.

Movable joints are of four major types.

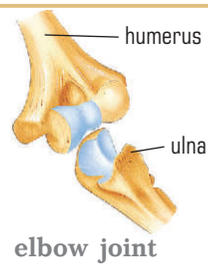


1. Hinge joint

This joint works like the hinge of a door. It allows movement in one direction only, that is, back and forth.

Examples

bones of the knees, elbows, fingers and toes



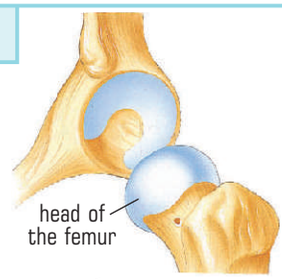
elbow joint

2. Ball and socket joint

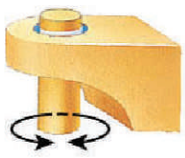
In it, the ball-like end of one bone fits into a cup-like socket of the other bone. The round bone easily rotates in the socket. It allows movement in almost all directions.

Examples

shoulder joint and hip joint



hip joint

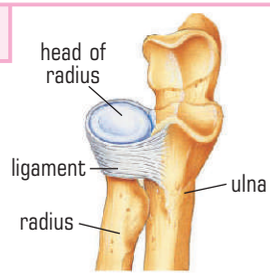


3. Pivot joint

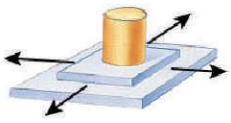
In it, the rounded surface of one bone fits into a ring formed by the other bone. It allows the rotating movement from side to side and up and down.

Examples

in the neck at the base of the skull, and in the elbows



elbow joint

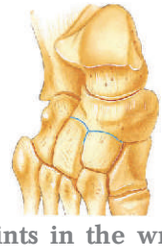


4. Gliding joint

In it, two flat bones slide over one another. It allows simple back-and-forth sliding and sideways sliding.

Examples

bones of the wrists and the ankles


joints in the wrist

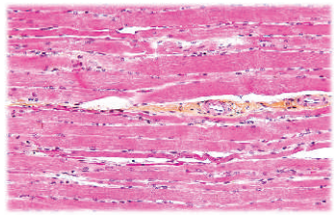
MUSCLES

Press the palm of your left hand with your right hand. You will feel something soft beneath the skin. They are muscles.

Muscles are bunches of tissues inside the body. Most of them are attached to the bones by strong tissue fibres called **tendons**.

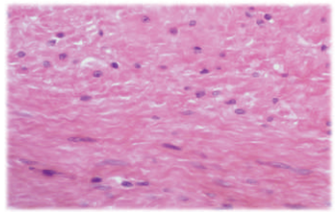
Kinds of muscles

There are three kinds of muscles in the body.



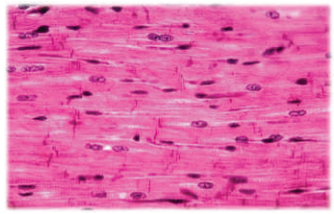
1. Voluntary muscles: These muscles are attached to the bones. So, they are also called **skeletal muscles**. These muscles are under our control, that is, we can move them according to our wish.

The arms, legs, hands, etc. have voluntary muscles. These muscles have stripes on them and are called **striped muscles**.



2. Involuntary muscles: These muscles are not under our control. They work on their own.

These muscles are found in and around our internal organs like the windpipe, stomach, blood vessels, etc. These muscles do not have stripes on them. They are spindle-shaped, short and work smoothly. So, they are also called **smooth muscles**.



3. Cardiac muscles: The muscles found in the heart are called **cardiac muscles**. These muscles are also involuntary muscles, but they have stripes like voluntary muscles.

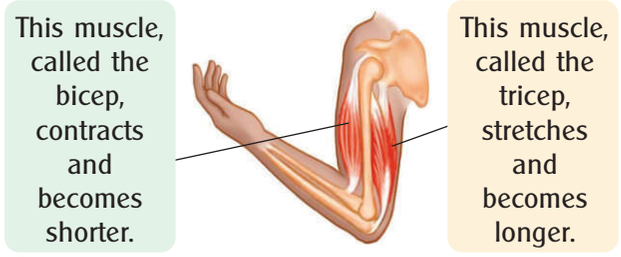
These are strong muscles. They work continuously, pumping blood throughout the body whole life.

Working of muscles

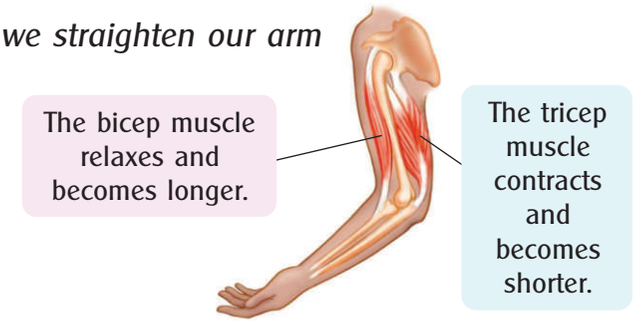
Muscles, along with bones, help the body in movement. Muscles work in pairs only. The movement is caused by contracting and stretching collectively. When one muscle contracts, the other stretches and vice versa.

Let us understand it with the example of the movement in our elbows.

When we bend our elbow



When we straighten our arm



Words to Remember

cell	–	the basic unit of the human body
tissue	–	a combination of cells
organ	–	a combination of tissues
ligament	–	a thread-like band of fibrous connective tissues that joins bones
cartilage	–	a soft substance present inside the vertebrae and some joints
skeleton	–	the framework of bones inside the body
bone marrow	–	a jelly-like substance inside the bone where blood cells are formed
skull	–	the bony framework of the head
joint	–	the place where two or more bones connect
vertebra	–	one of 33 small bones that form the backbone
ribs	–	thin, curved long bones inside the chest
tendon	–	strong tissue fibres that join muscles to bones

Points to Recall

- The human body is like a machine and the cell is its smallest unit.
- A group of organs that carry out a specific work together is called an organ system.
- Our body has eight major organ systems.
- We have a framework of bones inside our body that gives support and shape to it.
- Some bones have bone marrow inside them where the red and the white blood cells are formed.
- Bones have a self-repairing mechanism.
- Calcium makes bones hard and strong.
- The skull, the backbone, the ribcage, limbs and girdles are main parts of the skeleton.
- Joints, where two or more bones connect, allow the bones to move in various directions.
- There are four major types of joints: hinge joint, ball-and-socket joint, pivot joint and gliding joint.
- Muscles are bunches of tissues that help bones to move.
- There are three kinds of muscles: voluntary muscles, involuntary muscles and cardiac muscles.
- Muscles work in pairs only.

Exercises

A. Tick (✓) the correct option.

1. Which of the following is not a part of the nervous system?
   (a) brain (b) heart (c) nerves (d) spinal cord
2. How many bones are there in the skull?
   (a) 206 (b) 600 (c) 14 (d) 22
3. Where are ball-and-socket joints located?
   (a) ankles (b) elbows (c) hips (d) wrists
4. Muscles are attached to bones by
   (a) tendons (b) ligaments (c) cartilage (d) none of these
5. _____ muscles are found in and around internal organs.
   (a) Cardiac (b) Smooth (c) Striped (d) none of these

B. Answer these questions in 'Yes' or 'No'.

1. Are bones stronger than steel? _____
2. Does a newborn baby have more bones than an adult? _____
3. Is the backbone the longest bone in the body? _____
4. Does the ball-and-socket joint allows maximum movement of bones? _____
5. Can we control cardiac muscles? _____

C. Answer in one or two words only.

1. Which organ system helps to produce babies? _____
2. How many bones are there in an adult human body? _____
3. How many floating ribs are there in the ribcage? _____
4. Name the long bone attached to the shoulder girdle. _____
5. Where is the humerus located? _____

D. Answer in one sentence only.

1. What is an organ system?
2. What is the role of the excretory system in the body?
3. What part of the skull allows us to talk and eat?
4. How does the pivot joint work?
5. What are tendons?

E. Answer in a few sentences.

1. Name the major organ systems and explain any two.
2. What are the functions of the skeletal system?
3. Explain the structure of the backbone.
4. How do voluntary muscles work?
5. What do you understand by involuntary muscles? Explain with examples.

Creative Skills

BRAINSTORM

1. You know the backbone is made up of 33 small disc-shaped bones called vertebrae. What would happen if the backbone were a single straight bone?
2. Why can you move your lower jaw only and not the upper jaw?
3. Why can't we bend our elbows backwards?
4. Imagine that your legs have involuntary muscles. What would the result be?

Tell Your Teacher

Bones are very important part of our body. Strong and well-shaped bones give us strength and make our body beautiful. It is our duty to protect and take care of our bones. Read the following and tell your teacher what right or wrong thing each child does.

- Radhika drinks a glass of milk daily. She also loves to eat curd and cheese.
- Naman goes to his school on his bicycle. Sometimes, he rides the bicycle without wearing a helmet and knee caps.
- Irfan always lies on his back while watching TV. He also spends several hours a day hunching over his computer.

FIND OUT

Why does this child have bent legs? What diseases is he suffering from?

_____

Does a cockroach also have bones inside its body. If yes, how many? If no, what makes its legs strong enough to run?

_____

Project

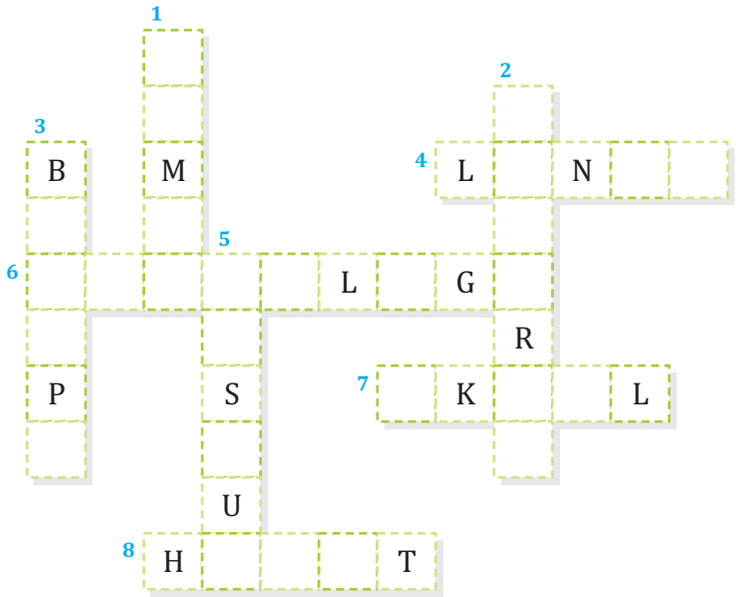
Take a sheet of chart paper. Paste a picture of the human skeleton on it. Using coloured pens, label all the bones and joints that you have studied in this chapter.

Crossword

Solve the crossword using the clues given.

Down (↓)

1. the longest bone in the body
2. the long bone of the upper arm
3. the muscles attached to the front side of the upper arm
5. a combination of cells



Across (→)

4. internal organs; part of the respiratory system
6. a soft jelly-like substance found between vertebrae
7. the bony case of head
8. the internal organ having cardiac muscles