Skeletal System and Nervous System

Learning Checklist

- Skeletal system
- Nervous system
- Sense organs

Let’s Get Started

Look at the pictures given below and fill in the blanks with the help of the words in the box.

brain  muscles  bones

I am able to run and stretch using the ___________ and ___________ in my body.

I am able to think and solve sums using my ___________.

All the bones in our body are part of the skeletal system. We use our brain to think, read, write, etc. The brain is part of our nervous system. In this chapter, we will learn more about the skeletal system and the nervous system.

SKELETAL SYSTEM

The skeletal system consists of bones and cartilage. There are 206 bones in an adult human body. The framework of bones is called the skeleton, which gives support and shape to the body.
Following are some of the functions of the human skeletal system:

- It protects the soft internal organs of our body.
- It gives strength, support and shape to the body, and also helps in movement.
- It contains important minerals needed by our body.
- Many bones are hollow and filled with a substance called bone marrow. Bone marrow produces the blood cells.

The main parts of the skeletal system are the skull, the backbone, the ribcage and the limbs.

**The Skull:** The hard structure that you feel when you touch and press your head is called the skull. It protects the brain. The skull has 22 bones. It also has holes where the eyes, nose and ears are positioned. Of all the bones in the skull, only the lower jawbone can move; all others are fixed. The upper and lower jaws have teeth.

**The Backbone (Spine):** The long bone that you feel when you run your hand through the centre of your back is called the backbone, spine or the vertebral column. The backbone is made up of 33 small bones called the vertebrae. These bones help us in bending, twisting and turning. It also helps in keeping the body upright. The backbone protects the spinal cord inside it, which is connected to the brain in the skull.

**The Ribcage:** The frame of bones that forms a cage-like structure in the chest area is called the ribcage. It protects the heart and the lungs. It is made up of 12 pairs of long curved bones called the ribs. These ribs join the backbone at the back. Ten pairs of ribs are joined to the front bone called the breastbone or sternum. The remaining two pairs of ribs that are not attached to the breastbone are called the floating ribs.
The Limbs (Arms and Legs): A pair of arms (also called forelimbs) and a pair of legs (also called hindlimbs) make up the limbs in our body. The long bone in the arm is called the humerus and the thigh bone in the leg is called the femur. The femur is the longest bone in the human body. The feet and the hands are made up of many smaller bones.

Joints

The place where two bones meet is called a joint. The substance or the tissue that joins two bones or holds together two bones in place is called a ligament.

All the joints in our body are movable except the joints in the skull.

Joints are of different types and show different kinds of movements:

Ball and Socket Joint: This type of joint is found in the shoulder and hip regions, and allows movement of these parts in all directions.

This joint helps in movements such as bending, stretching and rotating.

Hinge Joint: This type of joint is found in the elbows, fingers, knees and toes, and helps us to move these parts in only one direction.

For example, you can bend your lower leg backwards. You can bend your elbows and touch your shoulder with your hand.

Pivot Joint: This type of joint is found between the skull and the backbone, and helps us to move our head upwards, downwards and sideways.
Gliding Joint: This type of joint is present in the ankles and the wrists, and helps the bones of these parts to slide easily.

Cartilage

Cartilage is a tough, elastic tissue that is found in various parts of the body such as the joints in the ankle, knee and elbow and also between the vertebrae in the backbone. Cartilage prevents the bones from rubbing against each other and wearing out.

Cartilage is also found in the ears and the nose. Touch the top part of your ear or the tip of your nose. These parts are soft to touch. They are the cartilages.

Bones and cartilage alone cannot bring about movement. Movement happens when bones and cartilage work together with muscles.

Let us learn how bones and muscles work together.

Muscles

There are more than 600 muscles in our body. The bones in our body cannot move without the help of muscles. Muscles are attached to the bones with the help of tough cords called tendons. To move a bone, two muscles come into play. When you want to move your arm or leg, one muscle has to contract and another muscle has to relax to allow movement of the arm or leg.

Muscles are of two types: voluntary and involuntary.

Voluntary Muscles: The muscles that are under our control are called voluntary muscles.

All the muscles attached to the skeleton (called skeletal muscles) of the body are voluntary muscles, for example, muscles in the arms and legs.

When looked through a microscope, these muscles seem to have bands or stripes on them. Therefore, they are also called striped or striated muscles.

Involuntary Muscles: The muscles that are not under our control are called involuntary muscles.
Muscles of the organ systems like the digestive system are called **smooth muscles** or **unstriated muscles** because they are not striped. Muscles of the heart are called **cardiac muscles**.

Both smooth muscles and cardiac muscles are examples of involuntary muscles.

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**Revise and recall**

**Fill in the blanks using the words from the help box.**

<table>
<thead>
<tr>
<th>shoulder</th>
<th>600</th>
<th>ten</th>
<th>206</th>
<th>33</th>
<th>tendon</th>
<th>skeleton</th>
</tr>
</thead>
</table>

1. The skeletal system is made up of _________ bones.
2. There are about _________ muscles in our body.
3. _____________ pairs of ribs are joined to the breastbone.
4. The backbone is made up of _________ small bones.
5. _________ is a tough cord that connects the muscle to the bone.
6. The joint in the _________ allows movement in all directions.
7. Voluntary muscles are attached to the _________ in the body.

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**NERVOUS SYSTEM**

What helps you to remember the topics that you have read in your previous chapters or classes?

How do you blink your eyes without even knowing about it?

We are able to do these tasks with the help of the nervous system.

The nervous system is made up of the brain, the spinal cord and a network of nerves that run throughout our body.

The nervous system controls all the other organ systems of our body.
**Brain**

The brain controls everything in the human body. The skull protects the brain. The part of the skull that protects the brain is called the **cranium**.

The brain is made up of three parts that carry out different tasks. They are the cerebrum, the cerebellum and the brain stem.

**Cerebrum**: This is the largest part of the brain. It controls our intelligence, memory, logic and sense organs. It also controls our body movements.

**Cerebellum**: This is the second largest part of the brain and is present behind the cerebrum. It controls balance and posture of our body, and also actions of the muscles in the body.

**Brain Stem**: It is also called the **medulla**. The brain stem connects the brain to the spinal cord. The nerves in the brain stem control our heartbeat, breathing and the blood pressure.

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**Science in Context**

The average adult human brain weighs about 1.3 to 1.4 kg and is made up of about 10 billion nerves.

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**Spinal Cord**

The spinal cord is a bunch of nerves that begins from the base of the brain and connects it to other parts of the body.

It is protected inside the backbone. Its main function is to pass on information between the brain and the other body parts.

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**Reflex Actions**

A reflex action is an involuntary or automatic action of our body in response to something.

Most reflex actions take place when the messages are sent to and from the spinal cord, without involving the brain. Hence, such responses are very fast.
For example, if you touch a hot object by mistake, a reflex causes you to remove your hand immediately. You blink when something flies in front of your eyes; you step back when someone tries to fall on you. Even coughing and sneezing are reflexes.

Nerves

Nerves are bundles of long, thin, thread-like structures that carry messages between the brain or spinal cord and other parts of the body. Depending on their function, there are three main types of nerves in our body.

Sensory Nerves: These nerves carry messages from the sense organs to the brain or spinal cord.

Motor Nerves: These nerves carry messages from the brain or spinal cord to the muscles or organs.

Mixed Nerves: These nerves carry out both the functions, that is, carry messages to the brain or spinal cord and bring back messages from the brain or spinal cord.

Sense organs are the organs that give messages about our surroundings to our nervous system. The sense organs include the eyes, the ears, the nose, the tongue and the skin.

The Eyes: We have two eyes to help us see. The coloured part of our eye is called the iris. The black circle in the centre of the eye is called the pupil, which allows light to enter through it.
A transparent, dome-shaped part called the **cornea** covers the front portion of the eye and protects the pupil and the iris. The lens is present behind the iris.

The inner part of our eye has a very thin layer of tissues called the **retina** which captures the light that enters the eye and sends it to the brain through the **optic nerve**.

**The Nose:** The nose helps us to smell and breathe. The nose has two holes called **nostrils**.

At the back of the nose, there is a space called the **nasal cavity**. It is separated from the mouth by a bony structure called the **palate**.

**The Ears:** The ears help us to hear sounds. The outer part of the ear that we can see is called the **pinna**. It collects sound and sends it to the **eardrum**. The eardrum sends vibrations to the **inner ear** through the **middle ear**.

The inner ear converts these vibrations to a signal which is sent to the brain.

**The Tongue:** The tongue is a fleshy sense organ found on the floor of the mouth. It helps us to speak, chew and taste.

The taste buds on the tongue help us to identify different tastes by sending signals to the brain.

The primary tastes that the tongue can sense are sweet, salty, sour and bitter.

**The Skin:** The skin, which is the largest organ and the outer covering of the body, can sense touch and helps us to feel heat, cold, pain, etc.

The skin carries out many functions needed for our survival which include wound healing, protection, maintaining the body temperature and preventing infections.

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**Science in Context**

Butterflies can taste with their feet as they have taste buds situated in their feet.
Let's Say Together

<table>
<thead>
<tr>
<th>Skeleton</th>
<th>Cartilage</th>
<th>Cerebrum</th>
<th>Cerebellum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflex action</td>
<td>Cornea</td>
<td>Retina</td>
<td>Pinna</td>
</tr>
</tbody>
</table>

Keywords

**Ligament**: Tissue that holds together two bones in place

**Tendons**: Tissues that help the muscles to attach to the bones

**Vertebrae**: Small bones that make up the backbone

**Voluntary muscles**: The muscles that are under our control such as muscles in the arms and legs

**Involuntary muscles**: The muscles that are not under our control such as the heart muscles

**Cerebrum**: The largest part of the brain that controls our intelligence, memory, logic and sense organs

**Cerebellum**: The second largest part of the brain that controls balance and posture of our body, and also actions of the muscles

**Reflex action**: The involuntary or automatic action of our body in response to something

**Sensory nerves**: The nerves that carry messages from the sense organs to the brain or spinal cord

**Motor nerves**: The nerves that carry messages to the brain or spinal cord and also bring back messages from the brain or spinal cord

Summary

1. The skeletal system consists of the skull, the backbone, the ribcage and the limbs.
2. Our body has four different types of movable joints: ball and socket joint found in the hip and shoulder regions; hinge joint found in the elbow, fingers, knee and toes; pivot joint found behind the head just below the skull; and gliding joint found in the wrist and ankle.
3. Cartilage is a tough, elastic tissue found in various parts of the body such as the joints, the ears and the nose.
4. Muscles help to move the bones in our body and are attached to the bones by tough cords called tendons.
5. The nervous system controls all the other organ systems of our body using the brain, the spinal cord and a bundle of nerves.
6. The spinal cord controls the automatic actions of the body which are called reflex actions.
7. Sense organs carry messages about our surroundings to our nervous system. The sense organs include the eyes, the ears, the nose, the tongue and the skin.
EXERCISE

A  Choose the correct option for each of the following.
1. The function of the skeletal system is to give ___________ to the body.
   (a) support  (b) shape  (c) strength  (d) All of these
2. The joint between the skull and the backbone is ___________.
   (a) ball and socket  (b) pivot  (c) hinge  (d) gliding
3. Ten pairs of ribs are connected in the front to the ___________.
   (a) backbone  (b) sternum  (c) brain  (d) nerves
4. Which of these structures protects the brain?
   (a) Backbone  (b) Ribcage  (c) Skull  (d) Forelimb
5. Most reflex actions that take place in our body are controlled by the ___________.
   (a) brain  (b) spinal cord  (c) ribs  (d) joints

B  Fill in the blanks using the correct words.
1. ___________ protects the soft internal organs of our body. (Nerves/Skeleton)
2. The ___________ controls everything that the body does. (brain/bones)
3. ___________ muscles are attached to the skeleton. (Voluntary/Involuntary)
4. Most of the joints in the skull are ___________. (movable/immovable)
5. The nasal cavity is separated from the mouth by a bony structure called ___________. (cranium/palate)

C  Match the following.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Humerus</td>
<td>(1) Hinge joint</td>
</tr>
<tr>
<td>(b) Ankle</td>
<td>(2) Tissue that joins two bones</td>
</tr>
<tr>
<td>(c) Hips</td>
<td>(3) Gliding joint</td>
</tr>
<tr>
<td>(d) Knees</td>
<td>(4) Ball and socket joint</td>
</tr>
<tr>
<td>(e) Ligament</td>
<td>(5) Long bone in the arm</td>
</tr>
</tbody>
</table>
D State whether the following statements are true (T) or false (F).
1. Bones and muscles work together to bring about movement. [ ]
2. Gliding joints are found between the small bones in the vertebral column. [ ]
3. The nervous system is made up of the brain, the heart and the nerves. [ ]
4. The medulla controls our intelligence, memory, logic and sense organs. [ ]
5. The skin is the largest organ in our body. [ ]

E Name the following.
1. The longest bone in the human body
2. A place where two bones meet
3. The type of joint in the shoulder
4. The system that controls everything you do
5. The part of the brain that helps us to maintain balance of our body

F Answer the following questions briefly.
1. How many pairs of ribs are there in a human body? What are floating ribs?
2. What are joints? Name the different types of joints found in a human body.
3. What is cartilage? Where is it found in the body?
4. Name the three parts of the brain. Which is the largest part of the brain?
5. What is a reflex action?
6. Name the different types of nerves.

G Answer the following questions.
1. What are the functions of the human skeletal system?
2. Name the main parts of the skeletal system. Explain the structure of the ribcage and the spinal cord.
3. Describe the two types of muscles in our body. Give examples for each.
4. What are the functions of the different parts of the brain?
5. Explain how a reflex action takes place when you touch a hot pan.
6. What are sense organs? Explain briefly the functions of each sense organ.
HOTS (Higher Order Thinking Skills)

1. What would happen if we do not have any bones in our body? (Hint: Think about the functions of the skeletal system.)

2. Why do people find it difficult to move their body as they get older? (Hint: Bones grow weaker with age.)

I Label the different parts of the brain in the following diagram.

J Project

Prepare a chart on the different types of joints present in our body and display the chart in your class. Also, write the kind of movement shown by each joint.

K Life Skills

A diet that has food grains, vegetables, fruits, protein and small amounts of milk and fats helps to keep our skeletal and nervous systems healthy.

Exercise and good sleep keep the brain active and the body fit. Exercises such as brisk walking, swimming, running, playing and dancing help to maintain a healthy body weight and make the bones stronger.

Write five healthy habits in your notebook that you will follow to keep your skeletal and nervous systems healthy.

L Cross-curricular Learning Link

Write a story in 100 words about a dish you made in the kitchen. Use the terms related to different tastes that the tongue can sense in your story.
Label the parts of the skeletal system and the types of joints that you have studied in this chapter.