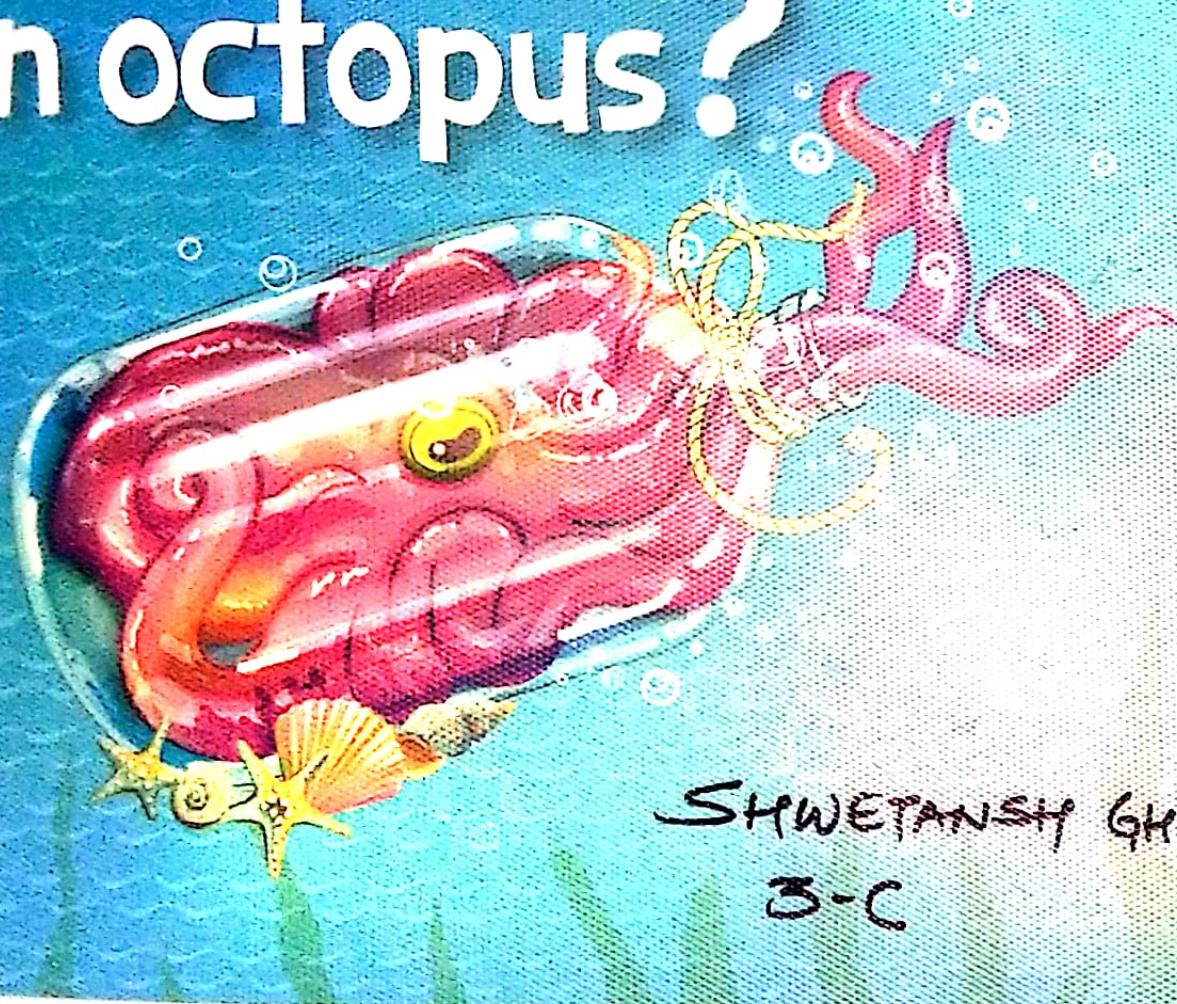


# Why does our body not move or bend like that of an octopus?



SHWETANSH GHILDAL  
3-C



Learner Book | Grade 3 | Volume 1

**SCIENCE**



## TABLE OF CONTENTS

LESSON	PAGE NO.
01. The Human Machine	10–17
• Cells	10
• Tissues, organs and organ systems	13
02. Your Fabulous Framework – The Skeletal System	18–35
• Introduction to skeletal system	18
• The human skeletal system	20
• Joints	24
• Taking care of bones and joints	26
• Vertebrates and invertebrates	28
03. The Mighty Muscles – The Muscular System	36–43
• Types of muscles	36
• Working of muscles	38
• Taking care of muscles	40
04. A Living Network – The Nervous System	44–59
• Working of the nervous system	44
• Brain	45
• Spinal cord	46
• Nerves	46
• Working of the brain	47
• Reflex action	51
• Taking care of the brain	52
05. More about our Body	62–66
• First aid	60
• Medical inventions and discoveries	61
• Careers related to body systems	62

# Body Basics-1

**Is the human body a machine?**

**How does the body know what to do?**

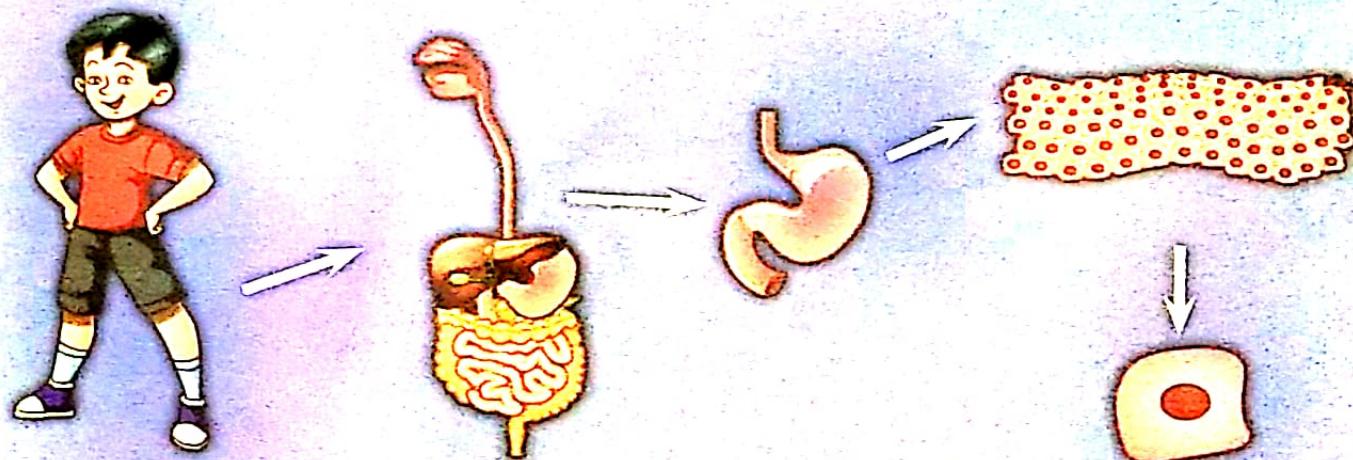
**Pinch your cheeks and then your little finger lightly. Why is one part soft to the touch while the other feels harder?**

**Have you ever wondered how an acrobat can fit into small spaces?**

**Do you know what helps us move our bodies?**

**How do humans move?**

**What helps humans to move their heads and bodies?**



# 01 | 03.04.23 The Human Machine

Look at this toy truck and lifter assembled from the parts shown alongside. A truck has both internal and external parts. Do you think a truck can work if any of its internal parts are missing?



All parts perform a specific function. A car will not function properly even if one of its parts is missing.

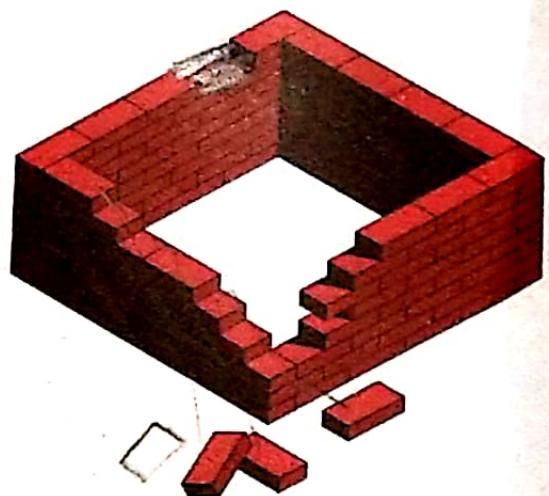
Just like a car, the human body too has different parts, both internal and external, to help it function. For example, a car has wheels to move, humans have legs; a car needs energy to move and so do humans!

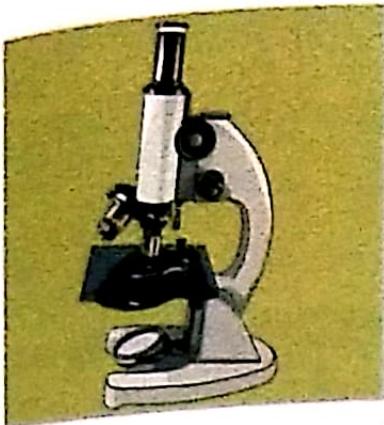
What other similarities can you think of?

## BUILDING BLOCKS

### What are cells?

The picture shows a wall built with bricks. In other words, bricks are the basic building units necessary for building the wall.





The human body and the bodies of all living things are built from building blocks known as cells. Unlike bricks, cells are tiny and most of them can be seen only under a **microscope**. Nearly a trillion cells make up our body!



**microscope**  
an instrument used for seeing tiny things

Cells are the smallest unit of life. They are made up of a soft jelly-like material. Cells make up all the different parts of the body like the heart, eyes, bones and muscles, skin, brain and other organs.

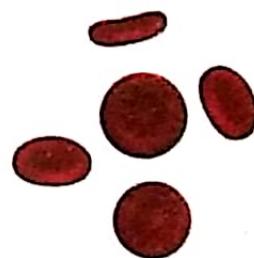
There are different types of cells that perform different functions in the body.



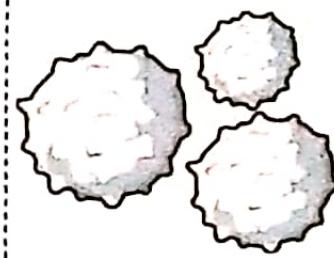
Neurons or nerve cells are long and thin and are called 'messenger cells'. They send and receive signals/messages from the brain and other cells in the body.



Muscle cells are seen in the muscles. There are different types of muscles in the human body and each muscle cell performs a function specific to the part it is in. For example, the heart muscle cells make the heart beat.



Red blood cells are round, doughnut-shaped cells that float in the blood. They begin their journey in the lungs where they pick up oxygen from the air that we breathe in. Then they travel to the heart. The blood which is pumped by the heart carries this oxygen to all the other parts of the body.



White blood cells are found in the blood and act as soldiers protecting the body. They are a part of our immune system that protects the body from infection. These cells circulate through the bloodstream and tissues to respond to injury or illness by attacking unknown organisms that enter the body.

## FASCINATING FACTS!

- The biggest cell in the world that can be seen without a microscope is the ostrich egg!
- There is about the same number of nerve cells in the human brain as there are stars in the Milky Way galaxy.
- It takes about 20 seconds for a red blood cell to circulate through the whole body.

## be a **SCIENTIST**

### JOURNAL SHEET - 1

Date \_\_\_\_\_

**INVESTIGATING QUESTION:** What do cells look like?



#### MATERIALS:

Slide with a thin piece of onion tissue, microscope



#### PROCEDURE:

1. Observe the cells under the microscope with your teacher's help.
2. Note the shape of the cells and make a sketch.



#### MY OBSERVATIONS:

##### Name of the cell

##### Sketch

## QUEST?ON BANK

1. What are cells?

2. Which of the following have cells?

- a. Grass
- b. Cow
- c. Stone
- d. Pigeon

# BUILDING BLOCKS

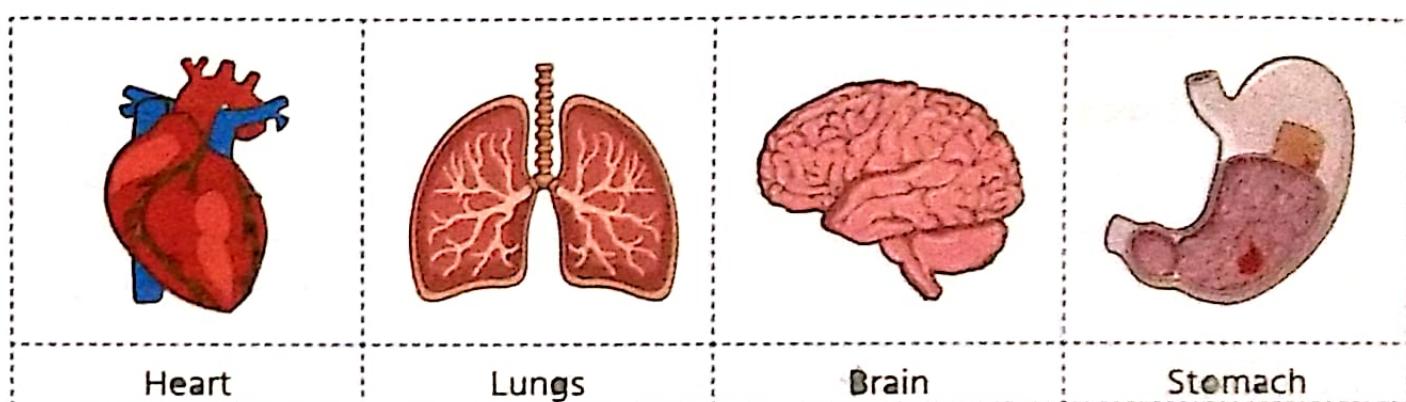
## What are tissues, organs, and organ systems?

The heart, lungs and stomach are some of the organs of the human body.

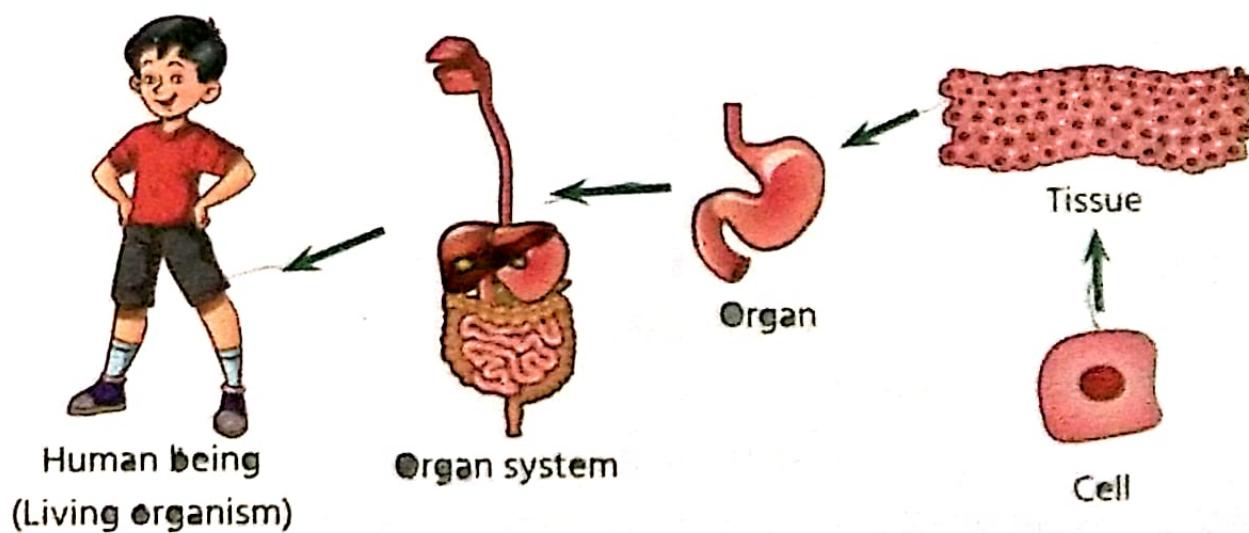
What are organs made of?

Tissues are groups of the same type of cells which perform the same function. For example, a muscle tissue (a group of muscle cells) which relaxes or contracts to bring about movement. Skin, hair and nails are other examples of tissues.

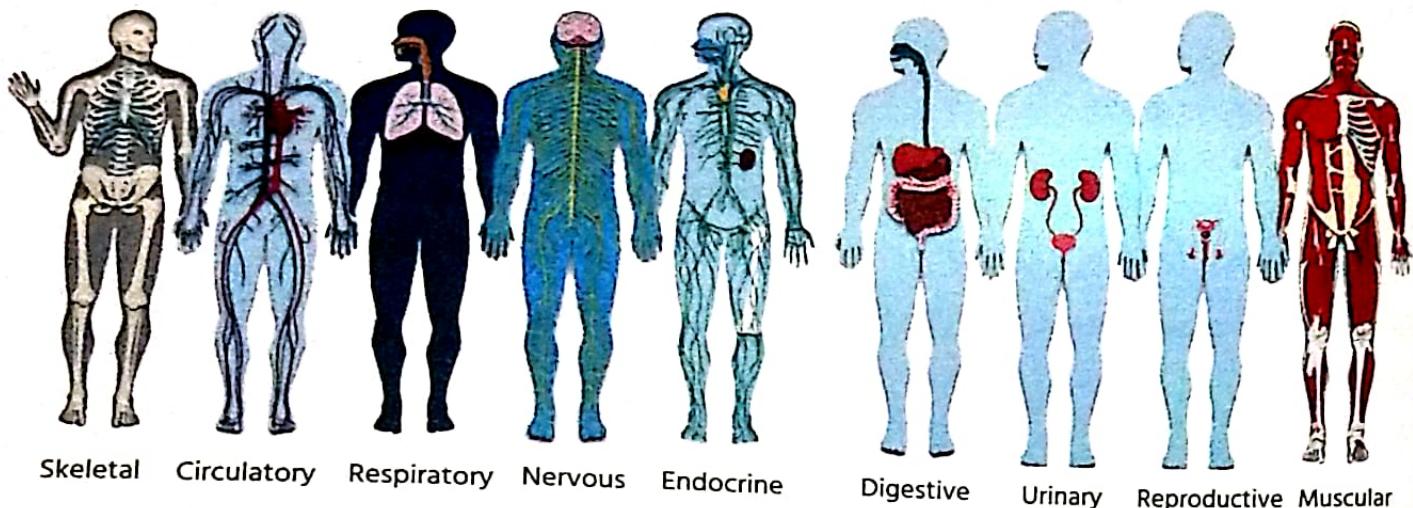
Organs are groups of tissues that perform a distinct function. The internal organs of the human body include the heart, brain, stomach and kidneys. The largest internal organ in the body is the liver, while the largest external organ is the skin.



A group of related organs form an organ system. For example, the picture shows the digestive system, an important organ system made up of different organs like the stomach and the intestines. These organs have different functions but together help in the digestion of food.



Our body has many different organ systems. All the organ systems work together to help us carry out different activities.



## QUEST?ON BANK

1. What is a tissue?
2. What is an organ?

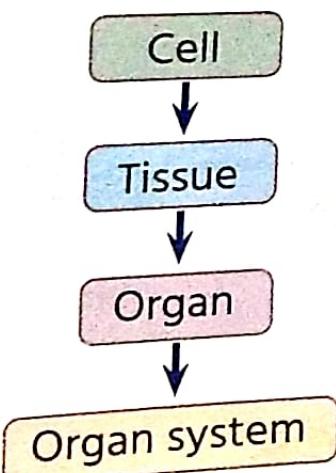
## SPOT CHECK 1

## THINK TANK



The organ systems of our body are an example of teamwork. Do you agree? Discuss in pairs and share your opinion.

## SUMMARISE



Read each statement in the **Learnt** section of the KWL chart. Think of how easy or hard you find that topic. Colour the smiley that is closest to how you feel.

 = I know the topic and I can teach it to a friend.

 = I know the topic.

 = I need help with the topic.

### Look what I LEARNT

### Colour the appropriate smiley

1. I understand that cells are the building blocks of life.



2. I know that cells form tissues, tissues form organs and organs form organ systems.



**HOME CONNECT** | Complete the Practice and Challenge Worksheets.



**Getting Cellular**

Cells are the smallest unit of life. Each cell is like a small living factory that is busy throughout the day.

1. Mr Cell Man is investigating cell specimens in his laboratory. Select the appropriate word to help him label the cell/s.

Nerve cell

Muscle cell

Red blood cell

White blood cell



1. \_\_\_\_\_



2. \_\_\_\_\_

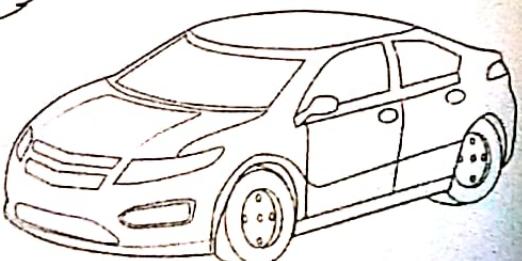
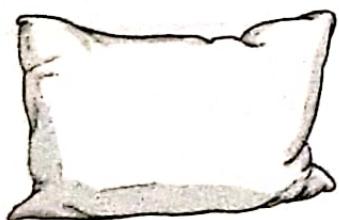
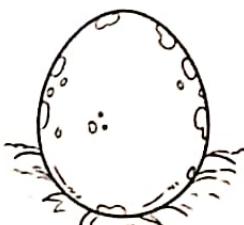
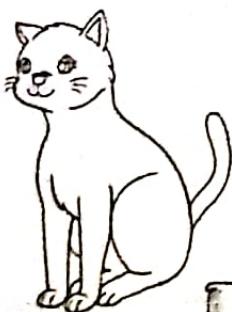


3. \_\_\_\_\_



4. \_\_\_\_\_

2. Circle and colour the things that have cells as their basic building blocks.



**3.** Ananya wants to know the difference between an organ and an organ system. How would you explain this to her?

Organ	Organ system
Example:	Example:

**4.** Circle the possible outcome in each of the following.

- a. Cells divide to form the outermost layer of the body.
  - i. Formation of skin
  - ii. Formation of lungs
  
- b. Cells are specialised to absorb nutrients from food.
  - i. Cells become a part of the nervous system
  - ii. Cells become a part of the digestive system

Facilitator's Signature

**Learning Outcome:**

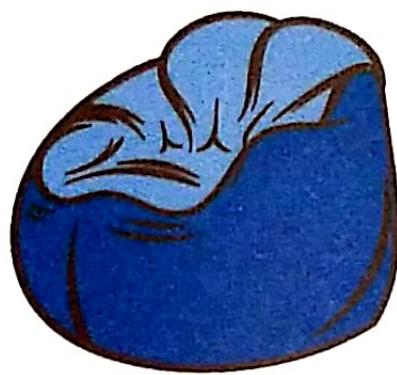
- Uses observations and tests to sort, group and classify objects

## 02 | Your Fabulous Framework - The Skeletal System

Which object will stay upright? Why?



Stool



Beanbag

The stool will stand straight without tipping over. This is because it has a strong wooden frame that bears its weight. However, the beanbag does not have the same type of support structure.

Look at yourself in the mirror. How are you able to stand straight? What do you have in your body that allows you to stand straight?

### BUILDING BLOCKS

#### What does the skeletal system do?

Like the stool, your body has a structure of hard and strong bones that make up the framework. This framework, called the skeleton, is what allows you to stand upright. It ensures that you do not slump to the ground like a blob of jelly. Bones and other tissues in the body together make up the skeletal system.

The functions of the skeletal system are:

- It provides shape and support to the body.
- It brings about movement of the body.

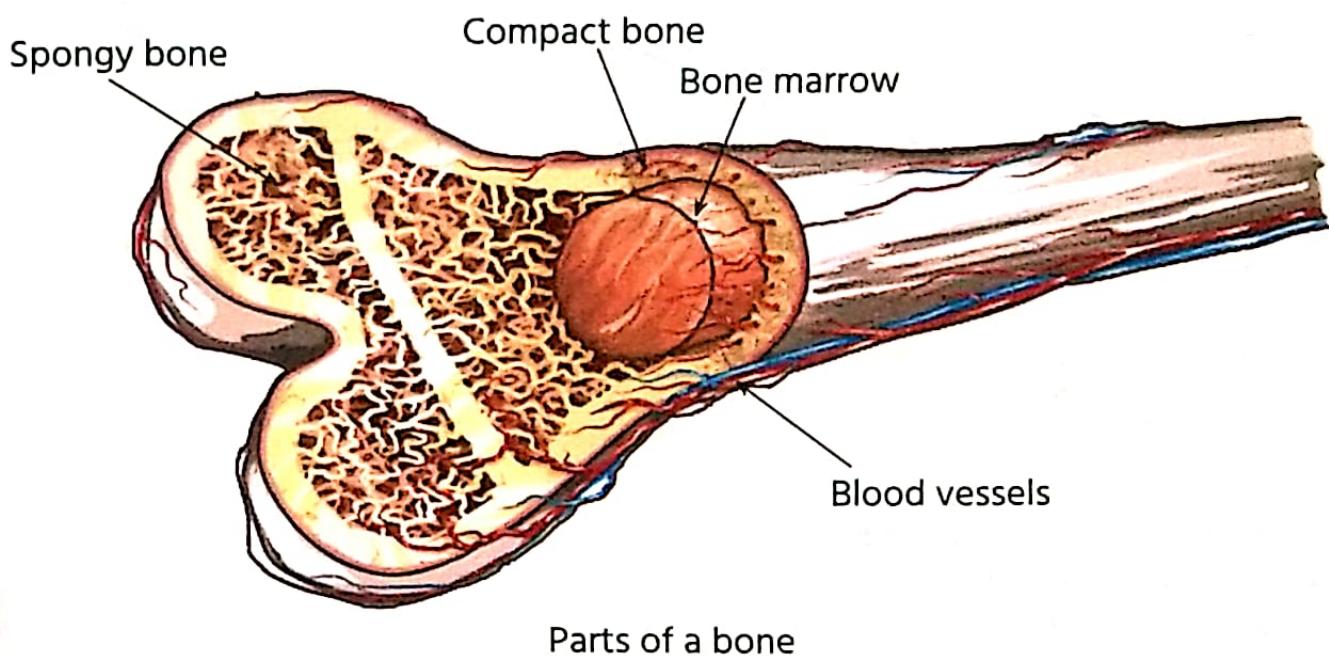
- It protects the organs of the body.
- Bones store mineral called calcium inside them.
- The bone marrow present inside the bones forms red blood cells.

The skeletal system consists not only of bones but also cartilage, ligaments, and tendons. The adult human skeleton consists of 206 bones.

When born, humans have 300 bones which **fuse** together to form 206 bones.



Your bones are hard, but they are not as hard on the inside as they are on the outside. They have three layers.

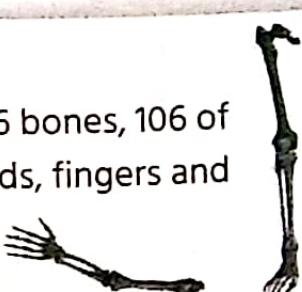


Parts of a bone

Outside is a shell of hard or compact bone which is strong and stiff. Inside this, is a layer of spongy bone in a honeycomb formation (with tiny holes). At the centre of most of the bones, is a soft jelly-like substance called marrow. This makes red and white blood cells. The whole bone is covered by a tough skin-like layer.

### FASCINATING FACT!

More than half your bones are in your hands and feet! Of the 206 bones, 106 of them are in your hands and feet. There are 54 bones in your hands, fingers and wrists. 26 bones in the human foot.



## The Human Skeletal System

**Shoulder blade:** Known as the pectoral girdle, is made up of the collar bone and shoulder bone. Your upper arm bone is attached to the pectoral girdle.

SHOULDER BLADE

**Ribcage:** Made of hollow and curved bones. Each curved bone is called a rib. The ribcage protects the lungs and the heart. The first seven pairs of ribs attach in the front to the sternum, a strong bone in the centre of the chest that holds those ribs in place.

RIBCAGE

**Backbone (Spine):** A long and curved bone which is made of smaller bones called vertebra (plural: vertebrae). The backbone supports and holds the body upright and allows it to make movements.

SPINE

**Hip bone:** An irregular shaped bone to which the leg bones are attached. It helps to move the legs freely.

HIP BONE

**Leg bones:** It consists of three big bones—the femur in your thigh and the tibia and fibula in your calf. At the knee is the knee cap. Look at the diagram and try to spot these bones. Your ankle has seven bones, your foot has five bones and each of your toes has three bones, except for the big toe which has only two bones. The leg bones are larger and stronger as they need to support the weight of the body.

LEG BONES

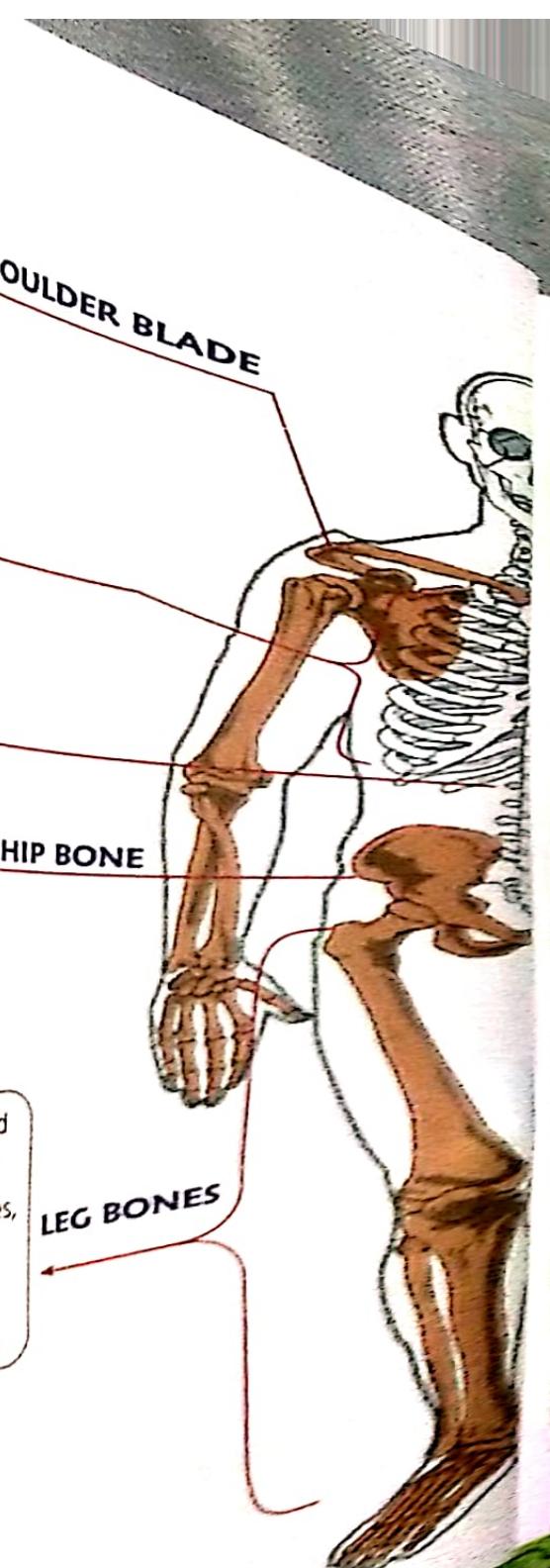
Can you count the bones in your body?

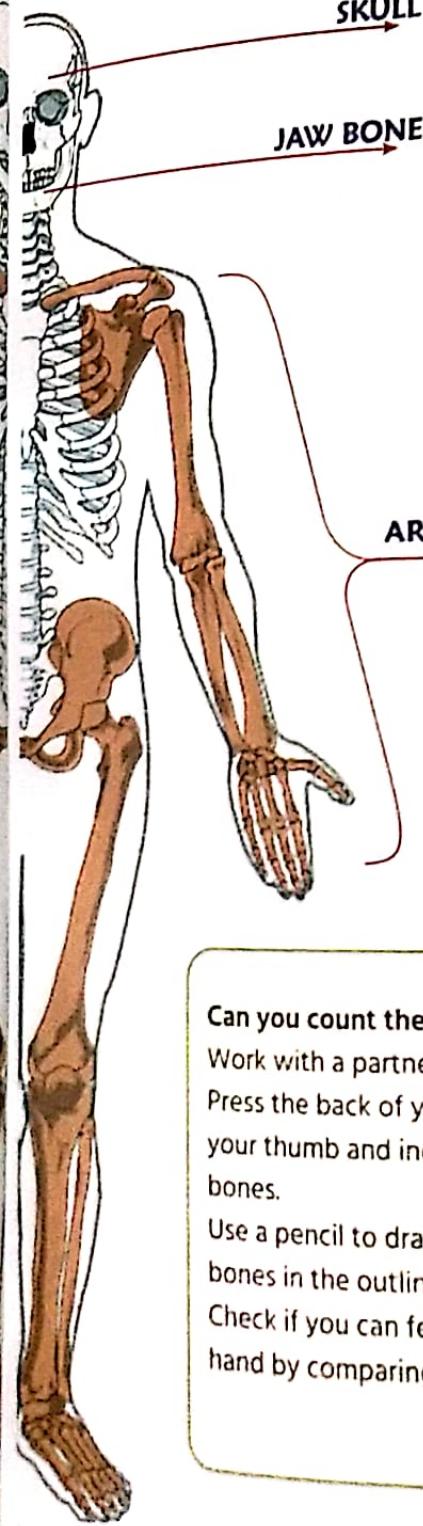
Move your hand over your chest, press lightly as you inspect your chest to feel the bones under your skin. Which structure of the skeletal system do you feel?  
I can feel the \_\_\_\_\_

Try to count the number of bones in this region.

How many bones can you feel?

I can feel \_\_\_\_\_ bones





**Skull:** It is a **hollow** and hard bone. It protects the brain and gives a shape to the head.

**Hollow**

having a hole or empty space inside

**Jaw bone:** It enables you to open and close your mouth and helps you eat. Your teeth are attached to the jaw bone.



**ARM BONES**

**Arm bones:** Each arm is made of three bones—the humerus, radius and ulna. Look at the figure and try to spot these bones. Your wrist has eight bones, your palm has five bones while each of your fingers has three bones, except the thumb which has two bones.

**Can you count the bones in your body?**

Work with a partner.

Press the back of your hand and palm with your thumb and index finger to feel your bones.

Use a pencil to draw where you feel your bones in the outline of the hand.

Check if you can feel all the bones in your hand by comparing it with the diagram.

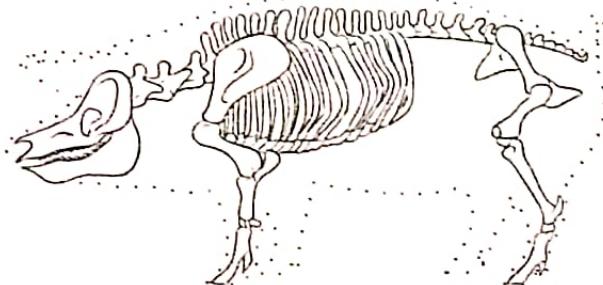
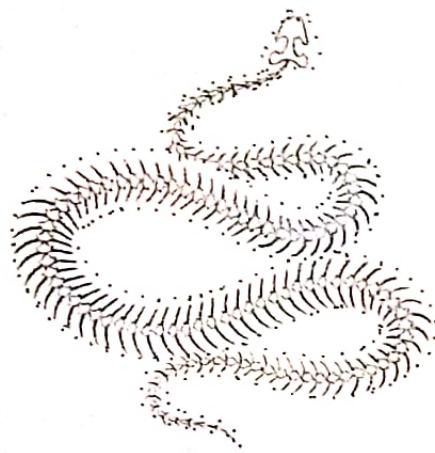
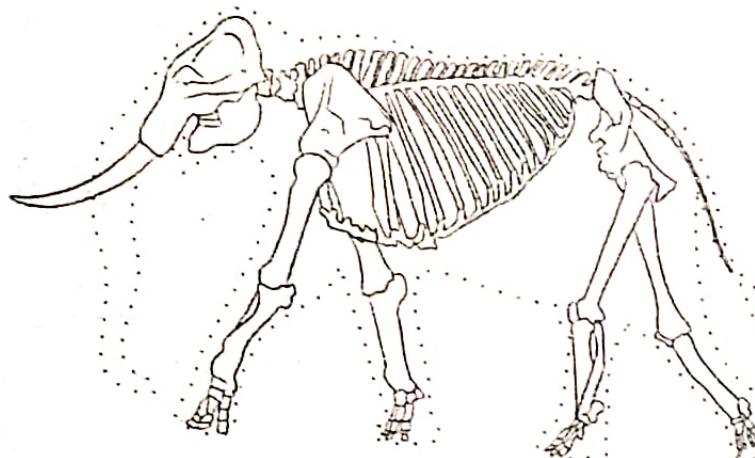
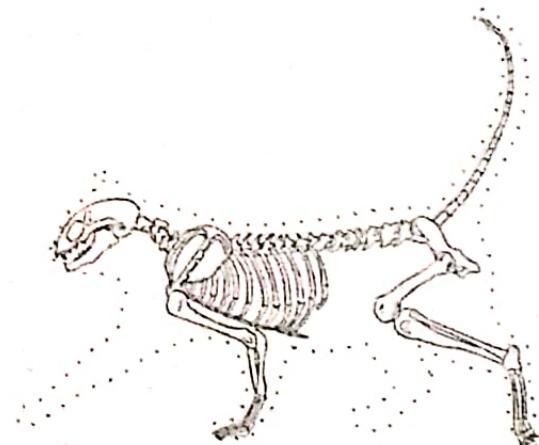


**SPOT CHECK**

1

**Let's  
EXPLORE**

Identify these animals from their skeletons. Now, connect the dots to check if you have identified them correctly.

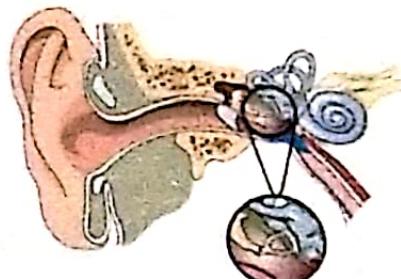


## FASCINATING FACT!



The femur is the longest and heaviest bone in our body. It is in the thigh and it supports the weight of the body.

The smallest bone of the body is stapes or stirrup bone and it is inside the ear. It measures approximately 2–3 mm.



## GREAT MINDS

Marie Curie was born in Poland in 1867. She was deeply interested in science. However, the place she lived in did not allow women students, so she moved to France and studied physics at a university there. Together with her husband, she discovered two new substances, polonium and radium. These substances are radioactive, that is, they emit invisible rays that can pass through solid matter. This is the basis of the x-rays that is used as a diagnostic tool even today. Her research in physics and chemistry got her two Nobel Prizes.



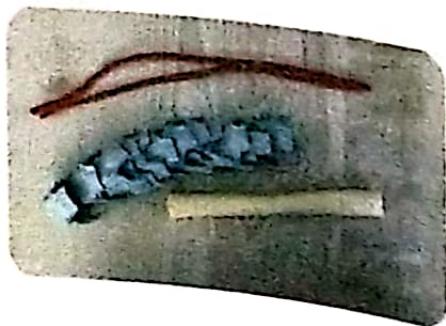
## CREATIVE CORNER

### Model of the vertebral column

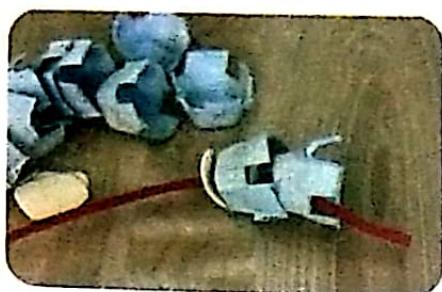
**Materials:** Egg cartons, foam sheets, pipe cleaners, a pair of scissors

#### Procedure:

1. Cut out the egg cups from an empty egg carton.
2. Cut the foam sheets into small pieces in a way that they fit into the bottom of the egg carton cups.
3. Make a hole in the centre of the egg carton cups and foam circles using scissors. Take the help of an adult to do this.



4. Thread the egg carton cup into the pipe cleaner. Follow with a foam circle.
5. Repeat step 4 until you have threaded all the egg carton cups and foam circles.
6. Your model of the vertebral column is ready! Use it to see how flexible the human vertebral column is.



## QUEST?ON BANK

1. Name the bone that protects your brain.
2. List the functions of the skeletal system.

## THINK TANK

Look at the skull closely. Do you see the nose and ears on it?

Feel your nose and ears to check if they have bones in them.

Why do you think you cannot see them on the skull?



## BUILDING BLOCKS

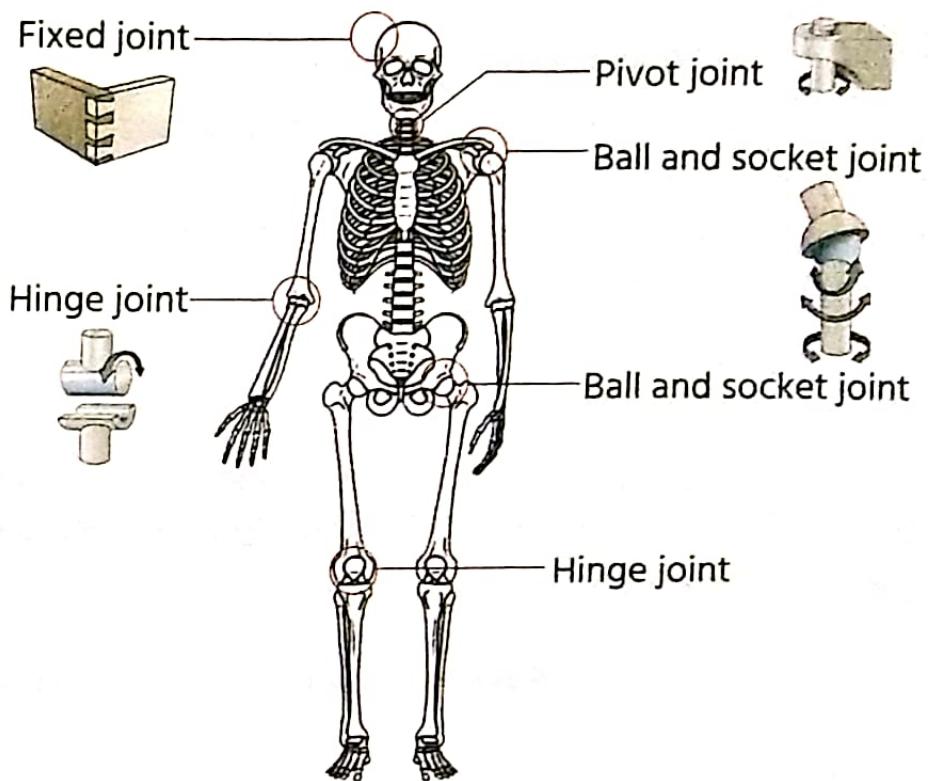
### What are joints?

A single bone is **rigid**, tough and does not bend. However, the whole skeleton can move because its bones are linked together at places called joints. A joint is the region where two bones meet. Movement of bones happens only at the joints. The place where the bones meet in a joint is covered with a smooth, shiny, slippery and slightly springy substance called the cartilage. It is covered with a thick liquid that allows the joints to move smoothly, very similar to the oil in a car. The bones in our joints are linked together by strips of strong tissue called the ligaments. Ligaments let the bone move and stop them from coming apart or moving too far.

**rigid**  
not flexible



The following joints are classified by their range of movement.



### Fixed joints

Some joints like the joints of the skull do not move at all. These are called fixed joints. They are also called immovable joints.

### Moveable joints

Other joints move, but the extent of movement differs.

Swing your arm around. You are able to make this movement possible due to the ball and socket joint present in your shoulder. The round ball-like end of one bone fits into the cup-like area or socket of the other bone. The hip also has a ball and socket joint. Bend and straighten your arm at the elbow. You can make this movement due to the hinge joint in your elbow. Like the hinges of a door, these joints permit movement in one direction only.

Another important joint is the pivot joint. Turn your neck from side to side. You are able to do this due to the pivot joint.

### FASCINATING FACT!

The number of bones in your neck is the same as those in a giraffe!

### QUEST?ON BANK

1. Give an example of a fixed joint.
2. Why is a hinge joint compared to the hinge of a door?

## BUILDING BLOCKS

### How can you take care of your bones and joints?

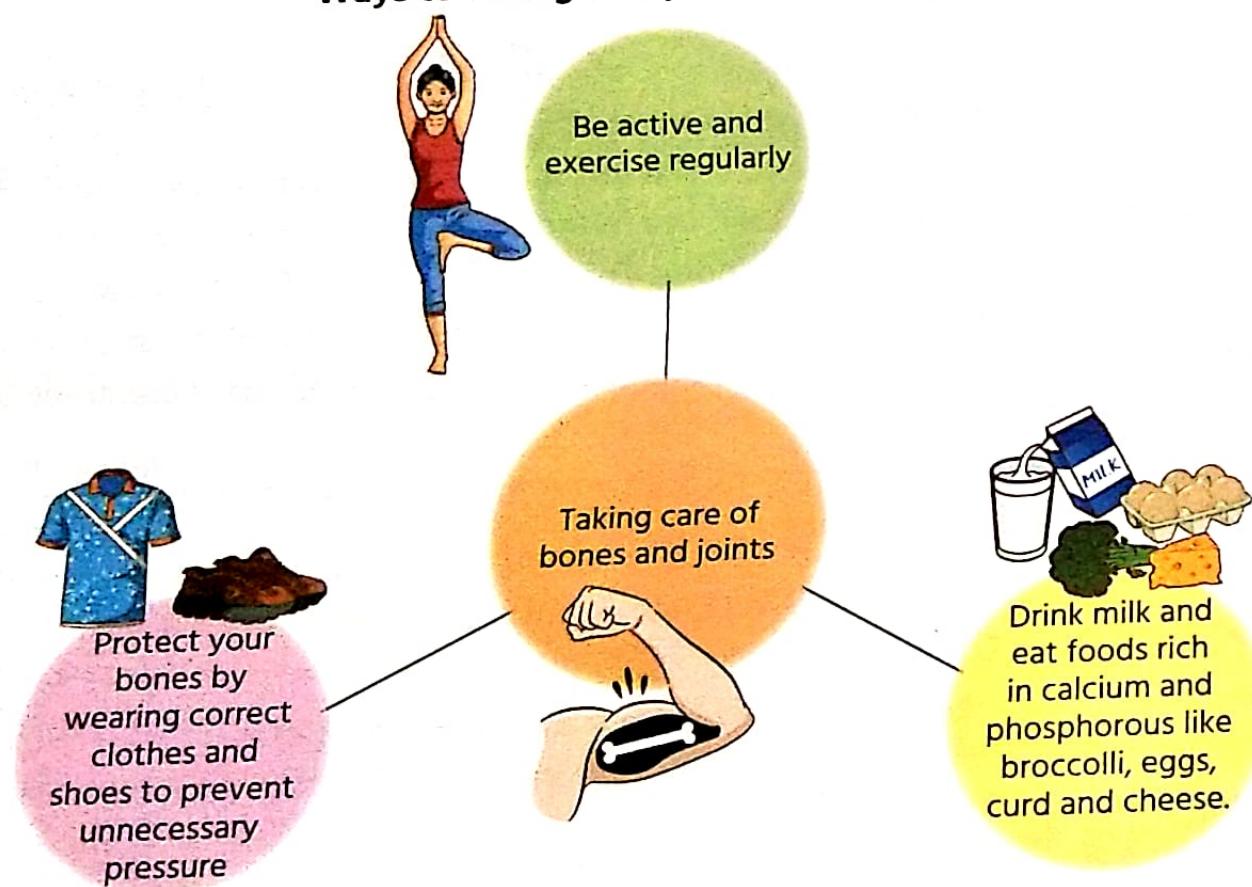
Even though your bones are strong, they can break. A fracture is a break or crack in the bone. It needs to heal before you can use it again. If you have a fracture, the doctor will take an x-ray of the broken bone and fasten it with plaster so that it does not move.

A few days after the fracture, cartilage is formed over the damaged area and this heals the bones by repairing the cells.

A fracture can take anywhere between three to six weeks to heal. Once the bone heals, you may need to do some special exercises to get back your muscle strength.



### Ways to strengthen your bones and joints



### SPOT CHECK 2

## let's **EXPLORE**



Your bones protect the important organs of your body and help you to move about freely. Besides bones, however, there are other things that can be used to cushion and protect your body.

### Materials:

Old newspaper, cardboard, straw, glue, ice cream sticks, twine, cloth, an egg

### Problem Statement

The egg represents any part of the human body. Even though it has an outer shell, it is still **fragile**. Design a protective covering to prevent the egg from breaking even if it is thrown from a height.

- Work in groups.
- Brainstorm ideas.
- Sketch what your protective covering (packaging) would look like. Try and make it attractive and compact.
- Make the packaging using the given resources.
- Test your protective covering by placing the egg in it and throwing it down from a height of 5 feet.



**fragile**  
easily broken or damaged

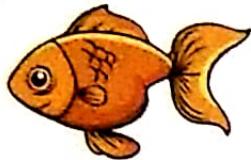


### QUEST?ON BANK

1. How are ball and socket joints different from the hinge joints?
2. Why should we have a diet rich in calcium?
3. Why is it important to wear helmet, knee pads and elbow pads while skating or cycling?

## BUILDING BLOCKS

Many other animals like dogs, cats, monkeys, birds, snakes and lizards have bones too. Most animals with bones have a backbone or a vertebral column. These animals are known as vertebrates.



Fish



Penguin



Frog



Cow

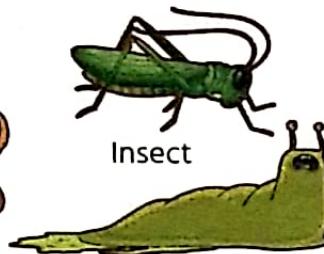
However, there are many animals that do not have bones. Insects, worms, jellyfish, octopi, snails, starfish and slugs are some animals that do not have bones. Animals without bones are often referred to as invertebrates. Animals that do not have a skeleton are very flexible.



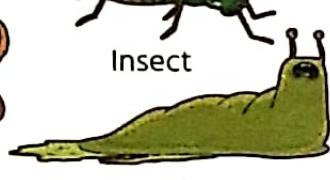
Jellyfish



Octopus



Insect



Slug



Starfish



Worm

Invertebrates do not have a backbone and may or may not have an exoskeleton. An exoskeleton is a hard covering that supports and protects the bodies of some types of animals. The word exoskeleton means "outside skeleton".

Invertebrates that have an exoskeleton are less flexible due to their rigid outer covering. The function of the exoskeleton is to protect and hold the body together. Some examples include grasshoppers, cockroaches, crabs, lobsters, snails and clams.



Cockroach



Crabs



Lobsters



Snail



Clam

SPOT CHECK 3

## THINK TANK

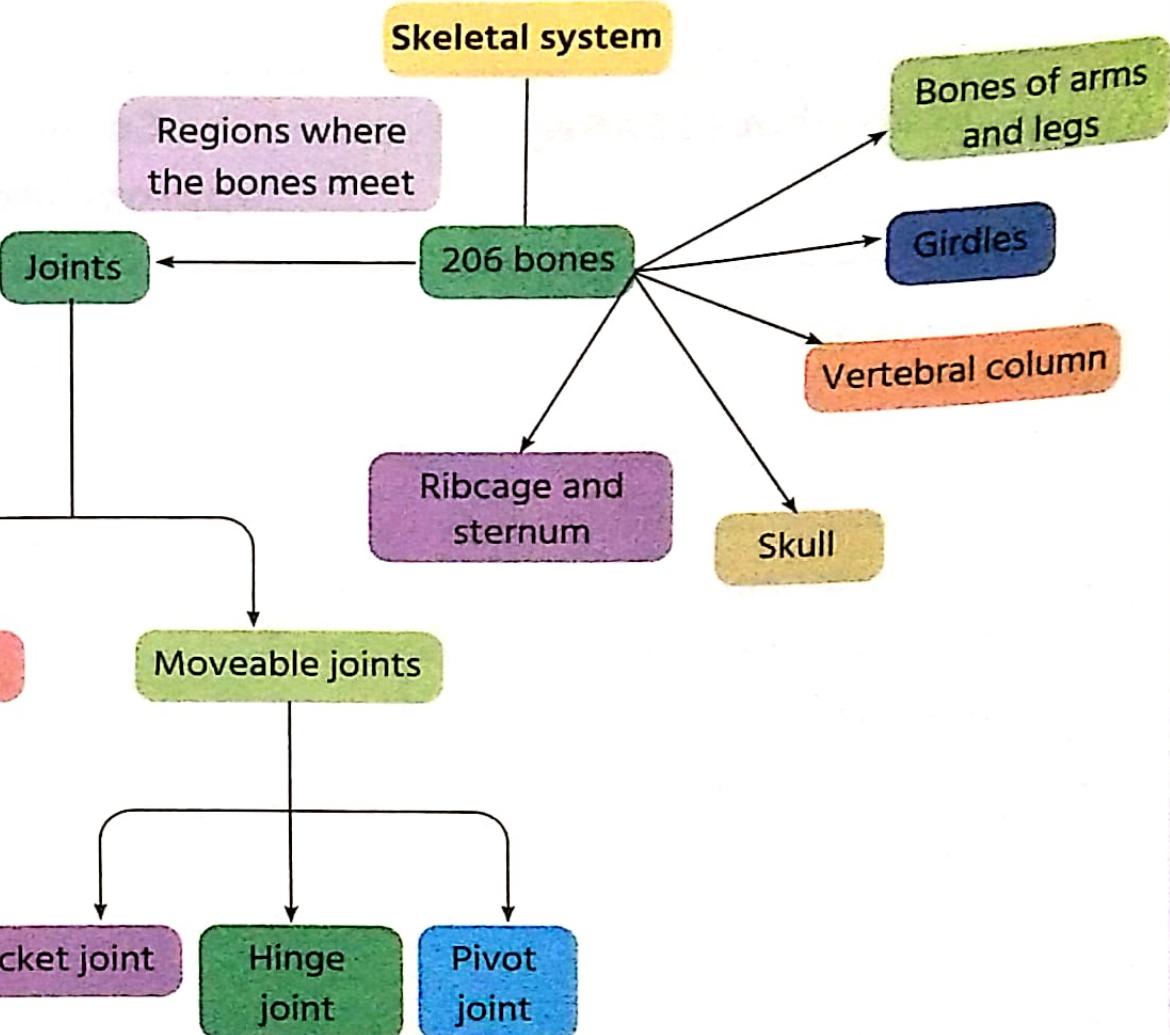
The body of a snail is bigger than its shell. It can fit its entire body inside its *coiled* shell. When a snail senses danger, it *retreats* into its shell.

How do you think the snail can do this?



*coiled*  
twisted or wound  
around  
*retreats*  
moves back or  
withdraws

## SUMMARISE



## HOME CONNECT

Complete the Practice and Challenge Worksheets.



Read each statement in the **Learnt** section of the KWL chart. Think of how easy or hard you find that topic. Colour the smiley that is closest to how you feel.



= I know the topic and I can teach it to a friend



= I know the topic



= I need help with the topic

### **Look what I LEARNT**

1. I can identify the major bones of the skeletal system.
2. I can differentiate between moveable and fixed joints.
3. I know how to take care of my bones and joints.
4. I know that some animals have bones while others do not.

### **Colour the**

### **appropriate smiley**



# SPOT CHECK 1

Your Fabulous Framework

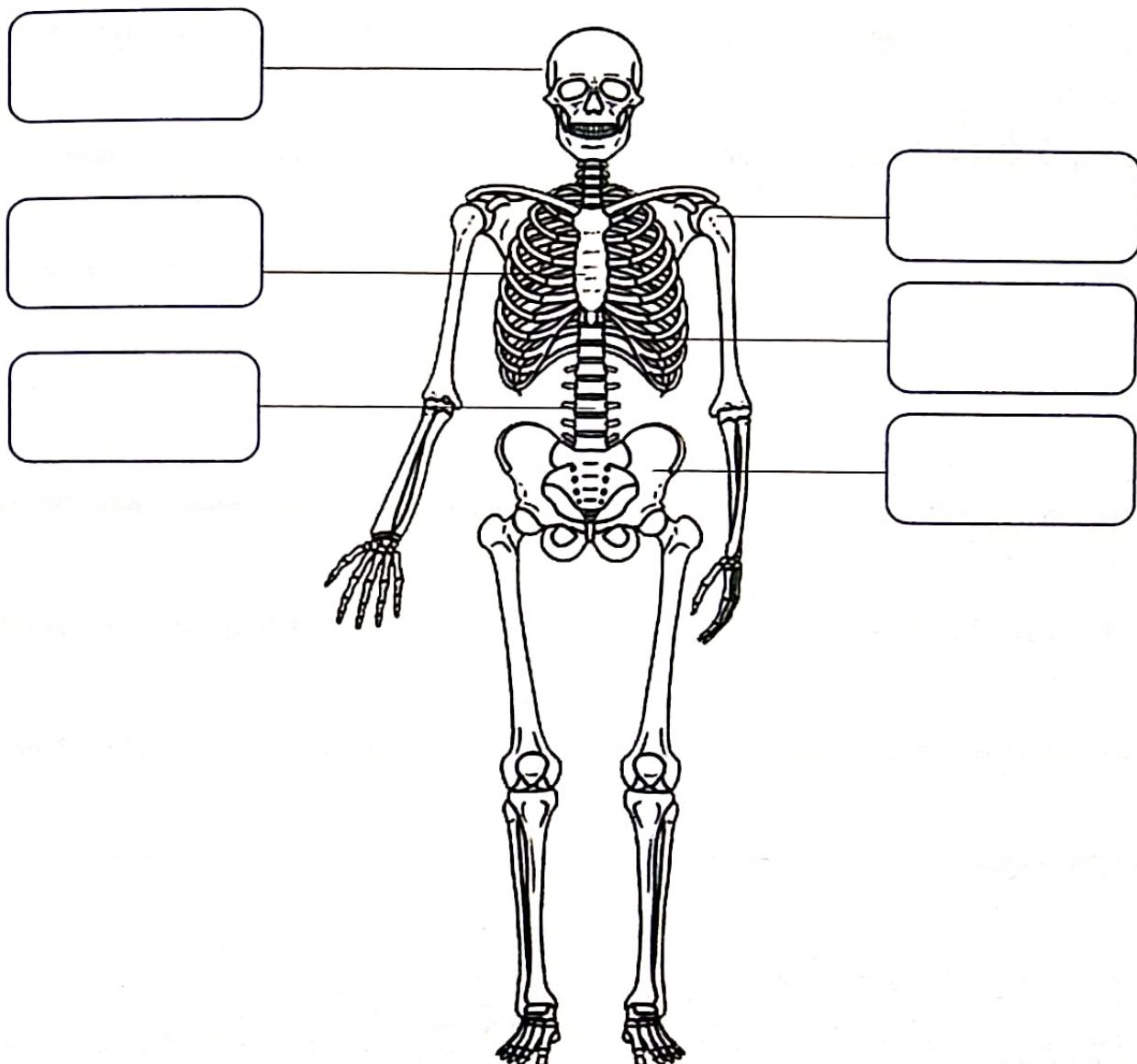
Date: \_\_\_\_\_

## Make No Bones About It!

Did you know that animals such as jellyfish, octopus, spiders and worms have no bones! They are invertebrates. Get thinking about the bones in your body.

1. Label the bones in the human body using words from the box.

Ribcage   Vertebral Column   Skull   Hip Bone   Sternum   Pectoral Girdle



2. Read the passage. Select the appropriate part of speech (noun, pronoun, verb and adjective) to fill in the blanks.



Internal Bodies Hard Perform Our Make Us Store Firm Move

Bones are a \_\_\_\_\_ substance that form a framework of the  
(adjective)

\_\_\_\_\_ of humans and many animals. Together, they form  
(noun)

the skeleton. Bones \_\_\_\_\_ many functions. They give the  
(verb)

body shape and protect our \_\_\_\_\_ organs. They work with  
(adjective)

\_\_\_\_\_ muscles and allow \_\_\_\_\_ to move.  
(pronoun) (pronoun)

Bones also \_\_\_\_\_ minerals that our bodies need and contain  
(verb)

marrow which \_\_\_\_\_ the red and white blood cells. On its  
(verb)

own, each bone is hard and \_\_\_\_\_ but together, the skeleton  
(adjective)

is flexible and helps you \_\_\_\_\_! Additionally, bones also  
(verb)

make blood.

\_\_\_\_\_  
Facilitator's Signature

**Learning Outcomes:**

- Uses observations and tests to sort, group and classify objects
- Identifies some of the important bones in the human body

**Bones Together**

Movement of bones happens only at the joints.

1. The diagram shows a human skull.

- Colour in blue the only bone that moves.
- Name the part that is protected by the skull.

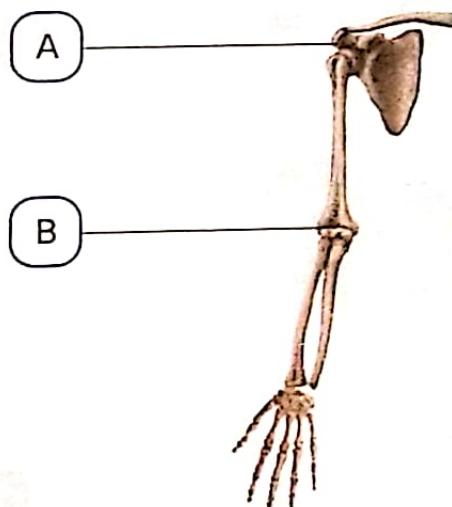
---

- Identify the joints indicated by the jagged lines.

---



2. Identify the joints marked A and B. How do the movements of these joints differ?



A. \_\_\_\_\_

B. \_\_\_\_\_

---

Facilitator's Signature

**Learning Outcomes:**

- Uses observations and tests to sort, group and classify objects
- Identifies some of the important bones in the human body
- Describes some of the important functions of skeletons

**Bones or No Bones**

Animals may or may not have bones.

1. Kartik loves roller-skating. How is Kartik taking care of his bones?

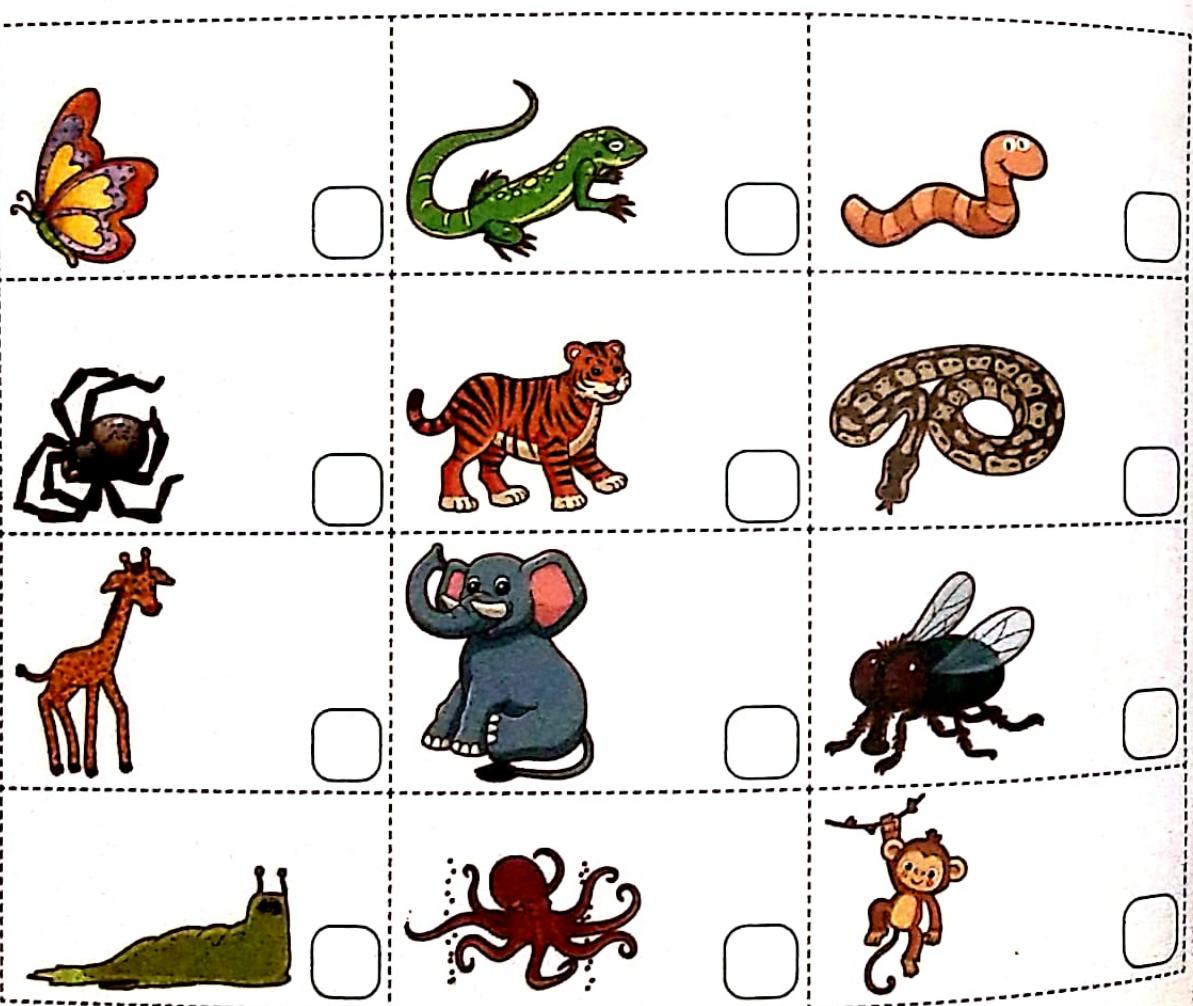
---

---

---



2. Write V for vertebrates and I for invertebrates.



**3.** List foods that are good for strong and healthy bones.

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

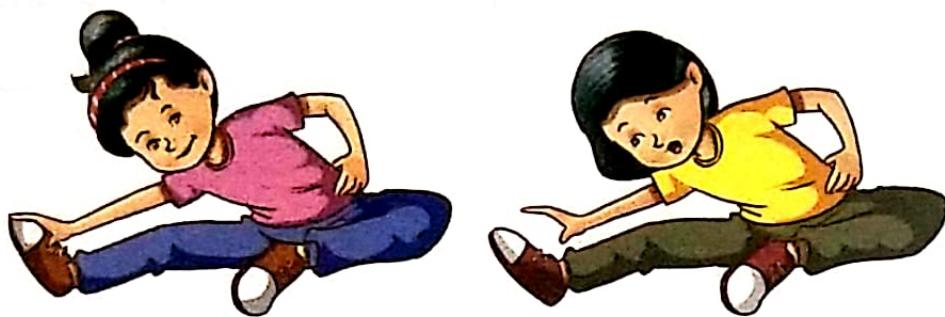
**4.** Taking care of your bones is important. State two do's and two don'ts to keep your bones healthy.

Do's	Don'ts

**Learning Outcomes:**

- Uses observations and tests to sort, group and classify objects
- Identifies vertebrates as animals with a backbone and invertebrates as animals without a backbone
- Uses secondary information sources to research an answer to a question

## 03 | The Mighty Muscles – The Muscular System



Look at the girls exercising. One of them can touch her toes, while the other cannot. Why do you think the second girl cannot touch her toes?

You can hop, skip, blink, jump, bend, stretch and breathe because of your muscles. The human body has more than 600 types of muscles. These are attached to the bones in the body and help you do various activities. For example, the leg muscles help you to run, walk and skip; the arm muscles help you to lift and carry things; the neck muscles hold your head upright while the muscles in your face help you to smile, wink and make funny faces!

Why some people cannot perform simple actions like touching their toes is because their muscles are not flexible enough.

### BUILDING BLOCKS

#### What are the types of muscles?

Almost half your body weight is the weight of your muscles. Muscles are made up of elastic fibres similar to the material of a rubber band. Thousands of these small fibres are bundled together to form muscles.

Let us read about the different types of muscles in the human body.



You see a ball on the ground. You kick it. You can move your leg as a result of the action of the muscles attached to your bones.

These muscles are under your control and are called voluntary muscles. Since they are attached to the bones, they are also known as skeletal muscles.

You are hungry. Your stomach starts rumbling. This is due to the working of your stomach muscles.

These muscles are not under your control and are thus called involuntary muscles. You cannot control your involuntary muscles.



The muscles of the heart or cardiac muscles are special muscles. They keep working all through the life of an individual. They ensure that the heart pumps blood to the different parts of the body.

### THINK & TALK

The muscular system works with the help of the nervous system. Explain. Discuss in pairs and share.



## FASCINATING FACTS!

- Did you know that some of our muscles help us blink? The muscles that make your eye blink is the fastest one in the body.
- You have over 30 facial muscles that help express surprise, happiness, sadness and anger. Did you know that it is easier to smile than frown? You use all your facial muscles to frown, but only half to grin broadly.

## BUILDING BLOCKS

### How do muscles work?

Muscles help you perform different activities, such as running, walking, writing, dancing and jumping. They move body parts by contracting or becoming shorter and relaxing or going back to their original length.

Voluntary muscles are attached to the bones. These muscles work in pairs and as they contract, they pull or tug the bones.

Look at the biceps and triceps in the diagram. They work as a pair and are attached to the arm bones. Can you name the bones?



When the biceps contracts, the lower arm bends towards the shoulder. The triceps then relax.



When the triceps contract, the arm goes back to its original position. What happens to the biceps when the triceps contract?



**INVESTIGATING QUESTION:** How do our muscles work?



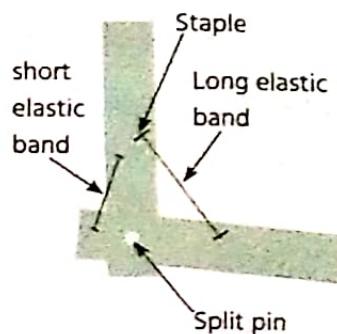
**MATERIALS:** Two pieces of cardboard, marker, pencil, two rubber bands, sticky tape, stapler, drawing board pin/two-way pin

Cord lengths



**PROCEDURE:** 1. Draw an outline of the upper arm on one piece of cardboard and the outline of the lower arm on the other. First, draw it with a pencil and when you are satisfied, trace it using a marker.

2. Place the cardboard of the lower arm over the cardboard of the upper arm.
3. Using a drawing board pin/two-way pin, join the two pieces of cardboard together. Fasten the pin using sticky tape so that the pin does not fall off or prick your fingers.
4. With your teacher's help, staple the rubber bands to the cardboard as shown in the diagram.
5. Secure the stapler pins and the rubber band with sticky tape so that it does not snap off and hurt you while working.



**MY OBSERVATIONS:**

1. Straighten the arm so that it is completely straight just as your arms are in an attention position. In this position, I observe that:
  - The upper rubber band is contracted/relaxed
  - The lower rubber band is contracted/relaxed
2. Now, bend the forearm so that the arm forms a 'V'. In this position, I observe that:
  - The upper rubber band is contracted/relaxed
  - The lower rubber band is contracted/relaxed

## THINK TANK



How do your bones and muscles change as you grow? Discuss in pairs and share.

## QUEST?ON BANK

1. What are the two types of muscles that you see in your body?
2. How do muscles work?

## BUILDING BLOCKS

### How can you keep your muscles healthy?

When muscles are overstretched or there is a tear in the ligament, it is called a strain. This usually happens when you take part in a physical activity before 'warming up' the muscles or the muscle is not used to doing the activity. For example, playing a new sport or a familiar sport after a long break.

Sprains are usually the result of an injury, such as twisting an ankle or a knee. Both strains and sprains are common in children and teenagers because they are active and still growing.



Try to do 25 jumping jacks. Did you get tired? How do you feel?

When you exercise a lot, your muscles get tired from all the contracting and relaxing. They may hurt and can feel sore too! Activities such as running, jumping, skipping, swimming or playing sports all make your muscles stronger. Any physical activity you engage in will make you strong. This is because you are using different muscles in your body. To make your muscles strong and healthy, exercise regularly using different sets of muscles and eat a healthy balanced diet!

## FASCINATING FACT!

Muscle memory is a memory that is created by repeating an action over and over again. Our muscles adjust themselves, becoming more precise and exact in what they do. This is why it is important to practise when learning to write or play a sport!

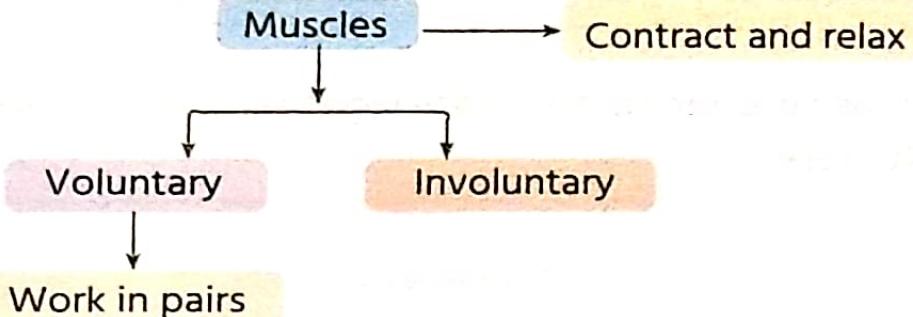
## HOME CONNECT

Complete the Practice and Challenge Worksheets.



## SUMMARISE

### Muscular system



Read each statement in the **Learnt** section of the KWL chart. Think of how easy or hard you find that topic. Colour the smiley that is closest to how you feel.

-  = I know the topic and I can teach it to a friend  
 = I know the topic  
 = I need help with the topic

### Look what I LEARNT

1. I understand how muscles work.
2. I understand the different types of muscles.
3. I know how to keep my muscles healthy.

### Colour the appropriate smiley



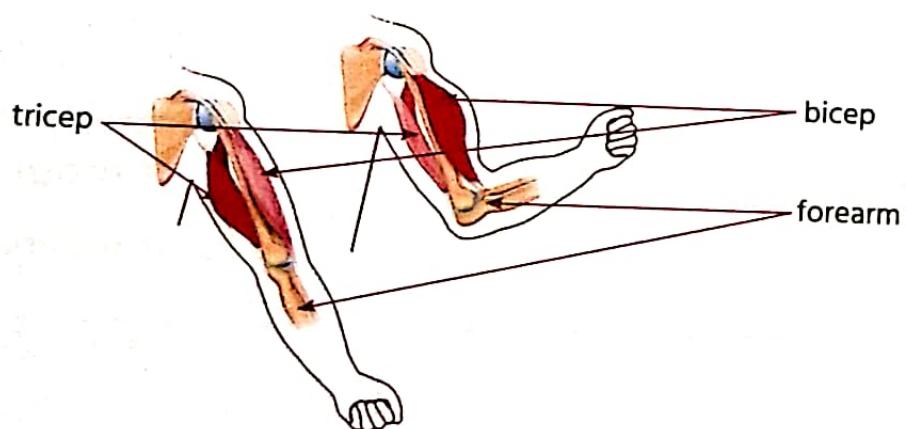
**Muscle Power**

Thousands of small fibres are bundled together to form muscles.

1. Read the statements and state whether the muscles used are voluntary or involuntary.

Statement	Voluntary or involuntary?
You bend your leg to kick the football.	
You smile at a friend.	
The food you ate is travelling down your food pipe.	
You swing your hands round and round.	

2. Look at the picture and fill in the blanks.



- When you bend your lower arm, the biceps \_\_\_\_\_ and pull up the bones of the forearm. During this time the triceps \_\_\_\_\_
- When you straighten your hand, the triceps \_\_\_\_\_ while the biceps \_\_\_\_\_
- This shows that both the muscles work in \_\_\_\_\_

**3.** Explain the following terms.

Voluntary muscles	Involuntary muscles

**4.** Suggest two ways to keep your muscles healthy.

Facilitator's Signature

**Learning Outcomes:**

- Uses observations and tests to sort, group and classify objects
- Knows that bones move because pairs of muscles that are attached to them contract and relax

# 04 | A Living Network – The Nervous System

Which of the following can you use to send a message?



Mobile phone



Email



Letter

You can use all these to send messages. They all help us to communicate.

Do the different parts of the body communicate with each other? How do your muscles know when to move, walk or run? How do you know that something is too hot or cold to touch?

The systems in our body send messages to each other through the brain and a large network of nerves. For example, when you want to run, your brain sends a message through the nerves to the muscles, bones and joints in your legs to bend and move forward. The nerves and brain together form the nervous system.

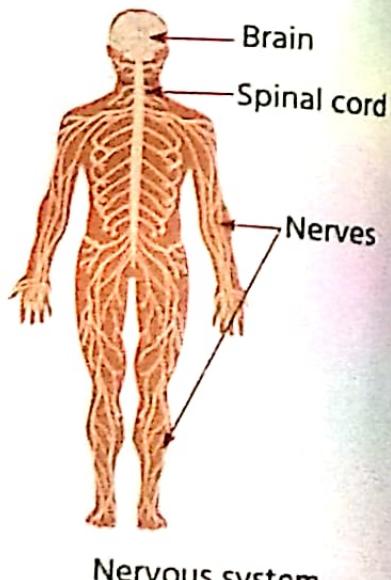
## BUILDING BLOCKS

### How does the nervous system work?

What happens when you come across a stone on the road? The nerves from the eyes send a message to your brain that reads, "There is a stone in front of you!" Your brain quickly processes the information and sends a message to your feet, "Avoid the stone, you may fall." You step away from the stone and move on. All this happens in a matter of a few seconds. This entire communication is done through the nervous system.

To understand how the nervous system functions, you need to know the different parts that make up the nervous system.

The nervous system consists of the brain, spinal cord and nerves.



The brain, the spinal cord and a large network of nerves present in your body together form the nervous system. The brain and the spinal cord together form the Central Nervous System. The brain controls all the body functions by sending and receiving messages through the nerves. The dense network of nerves forms the Peripheral Nervous System. The peripheral nervous system carries messages to and from the central nervous system. They help the different organ systems in the body to communicate with each other.

## BRAIN

The brain looks like a walnut in many ways. It is made up of two halves or hemispheres and has bumps and grooves on its surface. When you touch your head, the skull is hard, exactly like the walnut shell. It protects the soft and delicate brain inside.



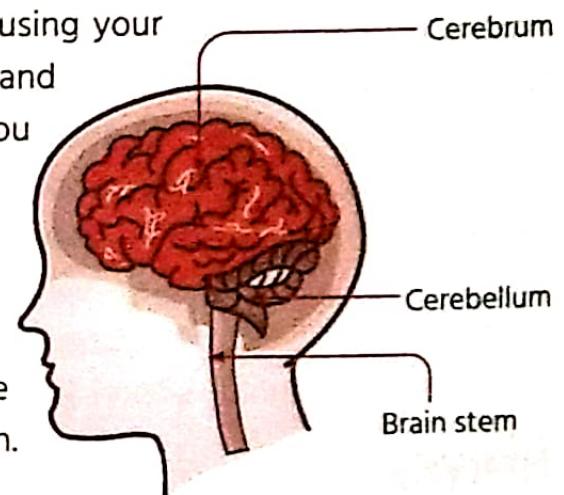
Brain

The brain controls everything you do. It can be called the 'boss' of the body. It is the control centre. Different parts of the brain are in charge of different tasks, such as speaking, moving, thinking, solving problems, memory, etc.

**Cerebrum:** When you are thinking hard, you are using your cerebrum. It is the thinking part of the brain and controls voluntary movements (functions that you can control), such as speech, memory, emotion and **sensory processing**. It is split into two

 **sensory processing**  
using information received through our senses

halves or hemispheres (left and right) which together make up the largest part of the brain.



According to neuroscience, the right side of the brain controls the left side of your body and vice-versa. The right side performs tasks that involve creativity (imagination, ideas, inspiration, appreciating art and music, etc.) and the left side deals with language and logic. So we can say that listening and composing a piece of music impacts the brain as a whole. It **stimulates** and combines

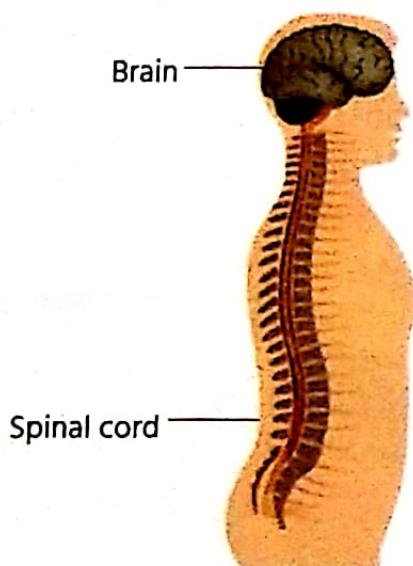
 **stimulates**  
activates

both halves—the left part (rhythm and pattern) and the right part (**lyrics**), which affects overall **cognitive** development.



**Cerebellum:** This is a small rounded part at the back of the brain. It is responsible for balance, coordination and movement. It also helps in learning new things.

**Brain stem:** This is the lower part of the brain where it meets the spinal cord. It controls involuntary actions like digestion. The lowest part of the brain stem is the medulla oblongata. Without this, we will not be able to live because it controls the heart's functioning (heartbeat and blood pressure) and breathing. Another important part of the brain stem is the hypothalamus which controls body temperature.



## SPINAL CORD

The spinal cord is a delicate and **intricate** structure that resembles a rope. It stretches from the brain stem all the way down to the lower back. It is protected by the bony structure called the vertebra in your backbone (spinal column). The nerves branch off to different parts of the body in pairs from either side. Just like a communication (telephone/computer) network, the nerves send tiny electrical signals with information to and from one part of the body to another. These electrical impulses (signals) are called 'nerve/neural messages' and control reflexes (involuntary actions).

**intricate**  
having a lot of small parts or pieces arranged in a complicated way



## NERVES

The nerves form a vast network of information that reaches every part of the body almost like the body's own Internet. Even though the brain is the boss of the body, it cannot work alone. It needs a network of nerves and the spinal cord to allow the flow of messages back and forth.

Nerves are made up of cells called **neurons**. They are long and thin and send instant messages just like emails or text messages. Many neurons together make up a nerve. Each human being is born with many neurons, but most of

**SPOT CHECK** 1

**neurons**  
nerve cells



these are not connected to each other. As we grow older and learn new things, the brain sends messages to the neurons causing them to form connections (called 'synapse'). This is one of the reasons it gets easier for you to do certain actions if you keep repeating them because the connection gets stronger. For example, cycling, writing, swimming, etc.

### How are messages passed between neurons?

Neurons pass messages using a blend of electrical and chemical actions. Each neuron resembles a flat star with tiny branches on one end and a long tail with smaller branches at the other end.

When the brain sends a message to a neuron, it passes

**impulse**

a signal that carries information or instructions between the parts of a system



that message along by generating a small electrical **impulse**. This impulse travels along its tail to the next neuron with the help of the chemicals released. This process continues till the message reaches the receiver which then

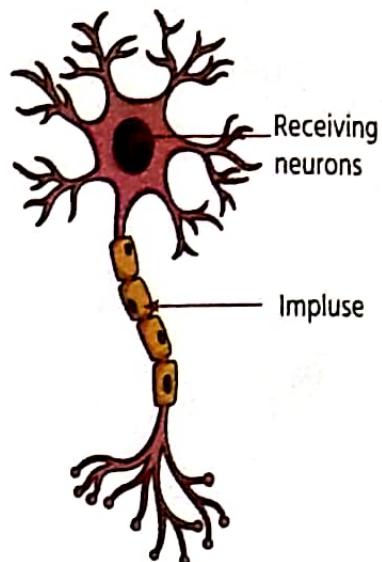
performs the action. For example, if you see a glass falling off the table, your nerves and brain communicate so that you can stretch your hands out to catch it before it hits the floor. If your reflexes are good, you will be able to catch it just in time. Reflex actions are those that your body performs before the message reaches the brain. This happens because the neuron sends the message through the spinal cord directly to your hand instead of sending it via the brain.

### How does the brain work?

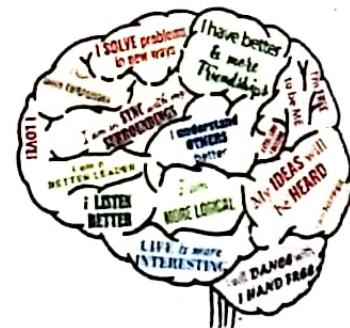
The brain helps us think, remember, solve problems and control our bodies.

But how does it do this?

Our sense organs help us to get information about what's happening around us. These messages are carried to the different regions of the brain where they are processed and **interpreted**. The brain then sends messages to the organs and muscles that help us to respond.



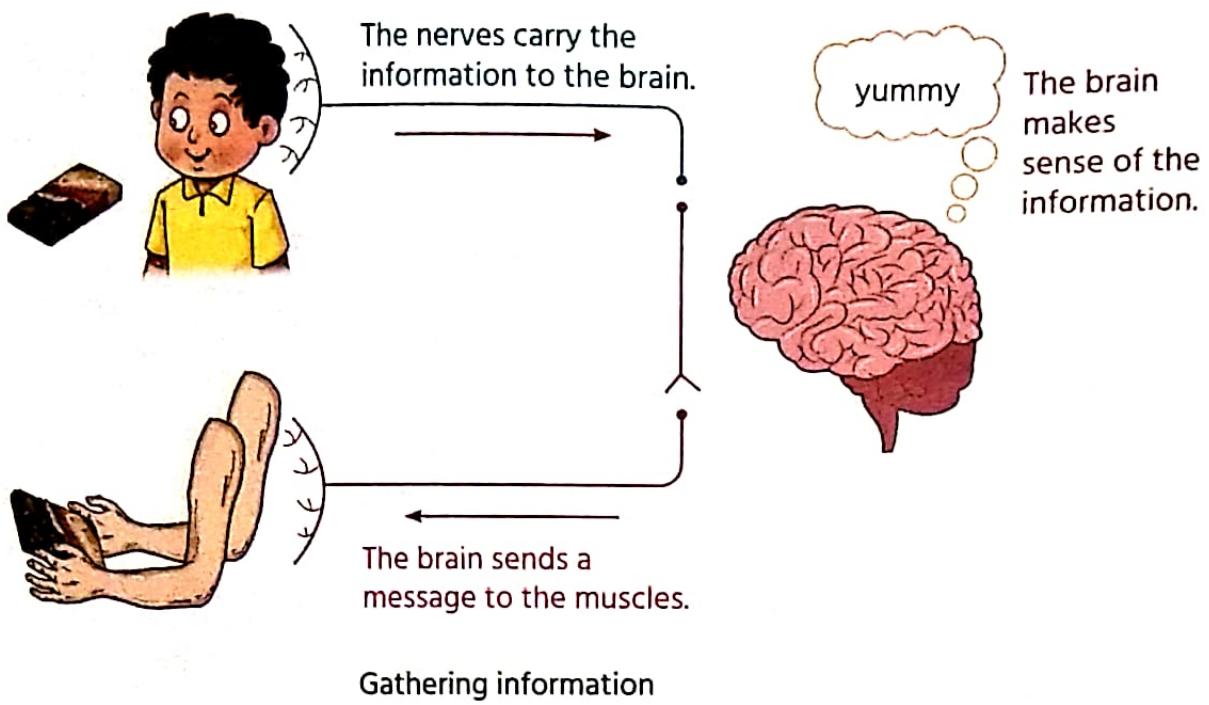
Structure of a Neuron



Our brain helps us to do many things!



**interpreted**  
understood



## How do you remember?

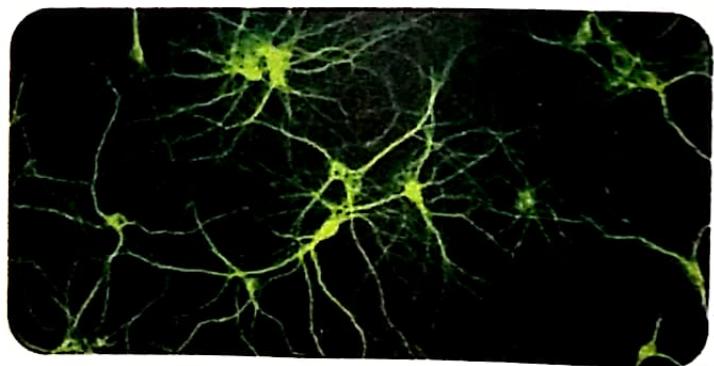
Remember a fun outing you had a year ago? When you look back, you may see flashes of the day but not the exact sequence. The way your brain stores these images is your memory.

Memory is the ability of the brain to take, store and recall information.

## How are memories created?

The brain is made of cells known as neurons. The neurons connect with each other to form pathways through which messages travel. When you learn something new, more connections are made between the neurons. The more a pathway is used, the stronger it gets. That is why when you practise something over and over, you get better and better at doing it.

Everyone forgets things at times. But sometimes an injury to the head may cause a person to lose his or her memory. A loss of memory is called amnesia. A person with amnesia cannot remember what happened recently or long ago.



A network of neurons in the brain

## FASCINATING FACTS!

- Did you know that the brain keeps working even when you are asleep?
- What are dreams? Dreams are stories and ideas that our brain tells us when we are asleep. Most people dream around five times each night but do not always remember them. Scary dreams are called nightmares which may wake you up. Some people even talk in their sleep – this usually happens when they are dreaming.

## THINK TANK

What do you think would happen if you injured your arm and the nerve connection was lost?

Circle the things you would be unable to do:

- Swim



- Run



- Catch a ball



- Kick a ball



- Hold an ice cream cone



- Play a video game



If a nerve connection is lost, that part of the body will not be able to communicate with the brain. However, this is temporary. Once new nerve cells are formed, you recover and are able to engage in all the activities that you could not do!



## PROCEDURE:

1. Select an activity from the list.
  - Learn to juggle a ball
  - Learn to dribble a basketball
  - Learn the 19 times table
  - Memorise the name of the states of India
  - Memorise the names of the countries of Africa
  - Learn to hem
2. Do the activity. Rate yourself.
3. Ask an adult to take a short video of you doing the task on the first day.
4. Practise every day for 10 minutes for 10 days.
5. Ask an adult to take a video of you doing the task at the end of 10 days.



## MY OBSERVATIONS:

Day	How easy or difficult was it to do the task? Put a (✓) in the correct column.				
	Very difficult	Difficult	Average	Easy	Very easy
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					



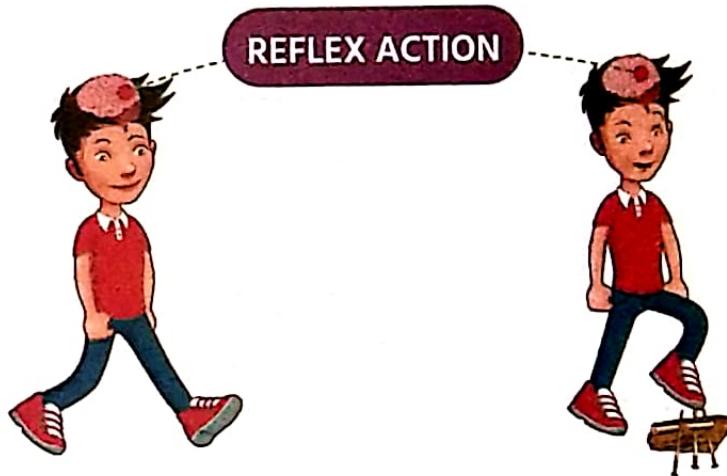
I noticed that the more I practised, the \_\_\_\_\_

## FASCINATING FACT!

Your brain is more powerful and faster than the world's fastest computer. Messages are transmitted to and from the brain at an amazing speed of 240 km per hour. Also, as the nerve cells in the brain work by forming new connections, the structure of your brain keeps changing as and when you learn new things.

## LEARN BEYOND

At times, your body must respond quickly to a signal. During this time, the message is sent to the spinal cord rather than the brain for a faster response. For example, when you step on a nail, your immediate response is to lift your foot – this message comes from the spinal cord. It is only later that you look down and see what pricked your foot. This automatic and spontaneous response is known as a reflex action.



## CREATIVE CORNER



### Materials:

Clay or play dough, string, twine, wool, ice cream sticks, glue, beads, etc.

### Procedure:

Create a model to show how messages travel from a sense organ to the brain and from the brain to the muscles and organs of the body. Use different colours to indicate the direction of the flow of messages. You can select materials of your choice.

## BUILDING BLOCKS

Just like you need to look after your body, you need to look after your brain too! Here are some ways to keep your brain healthy.



Wear seatbelts in cars and helmets while riding two-wheelers to keep your head safe.



Play outdoors with your friends.



Exercise regularly. Take up a sport like badminton or swimming or skating.



Get the right amount of sleep. At your age you need approximately 10 hours of uninterrupted sleep.

## Keeping the brain healthy

Drinks enough water.



Make an effort to stay happy.



Do puzzles or learn something new to exercise your brain.



Avoid sugary drinks and fried food.



Eat right. Make sure you eat a balanced diet.





## SEL

One of the ways to keep your brain healthy is by managing your emotions. Emotions like anger, fear and worry tend to put pressure on your brain. All of us experience these emotions, however, it is important to learn to manage our response to them. Imagine a situation where you are very angry with someone.

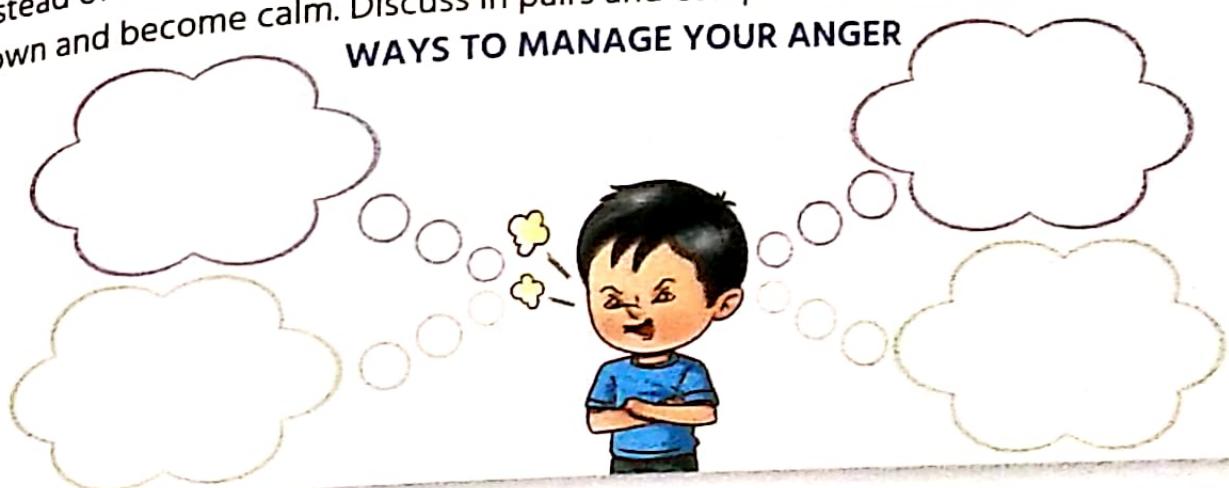
How do you feel? Circle the emotions that apply to you.

When I am angry:

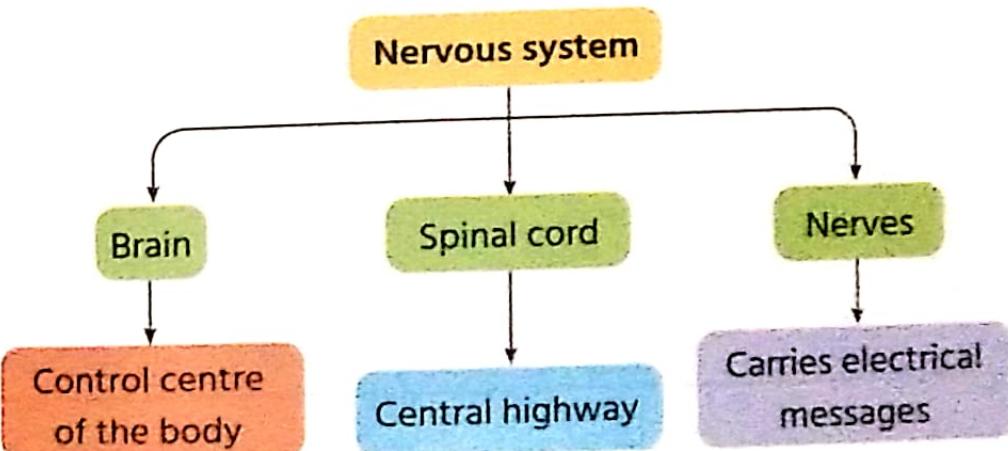
- I feel tense and nervous.
- I feel like I am going to burst.
- I feel like shouting.
- I feel like crying.
- I feel like I want to hit someone.

Instead of doing something that will make you feel bad later, think of ways to cool down and become calm. Discuss in pairs and complete the word web.

### WAYS TO MANAGE YOUR ANGER



## SUMMARISE



Read each statement in the Learnt section of the KWL chart. Think of how easy or hard you find that topic. Colour the smiley that is closest to how you feel.



= I know the topic and I can teach it to a friend



= I know the topic



= I need help with the topic

### Look what I LEARNT

1. I know the parts of the nervous system.
2. I realise that learning new things strengthens my brain.
3. I know some ways to keep my brain healthy.

### Colour the

### appropriate smiley



**Brainy Business**

Your brain is a powerful and complex organ that deals with hundreds of messages around you. It receives messages from many nerve cells all through your body. These messages are sparked when you see, hear, smell, touch, taste and move in your world.

**1. Decode the message to find the answer.**

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

- a. Which part of the brain controls speech, thoughts and memories? It is the largest part of the brain.

3	5	18	5	2	18	21	13

- b. What part of the brain controls balance, movement and coordination?

3	5	18	5	2	5	12	12	21	13

- c. What part sits at the base of the brain and connects to the spinal cord? It sends and receives messages between the brain and the nerves throughout the body.

2	18	1	9	14	19	20	5	13

- d. What part of the brain controls breathing, heartbeat and other body functions?

13	5	4	21	12	12	1

15	2	12	15	14	7	1	20	1

2. State whether the statements are true or false.

- a. The brain stem is the largest part of the brain. \_\_\_\_\_
- b. The cerebrum controls voluntary movements such as speech, memory and emotions. \_\_\_\_\_
- c. The brain stem controls involuntary actions such as digestion. \_\_\_\_\_
- d. The spinal cord is protected by bony structures called ribs. \_\_\_\_\_
- e. The brain and the spinal cord form the peripheral nervous system. \_\_\_\_\_
- f. The cerebellum helps you balance, move and takes care of coordination. \_\_\_\_\_
- g. The medulla oblongata controls breathing, heartbeat and blood pressure. \_\_\_\_\_
- h. The ribcage protects the brain. \_\_\_\_\_
- i. Nerves carry messages throughout the body. \_\_\_\_\_
- j. The brain is your body's control centre. \_\_\_\_\_
- k. The neurons controls emotions. \_\_\_\_\_
- l. The hypothalamus controls body temperature. \_\_\_\_\_

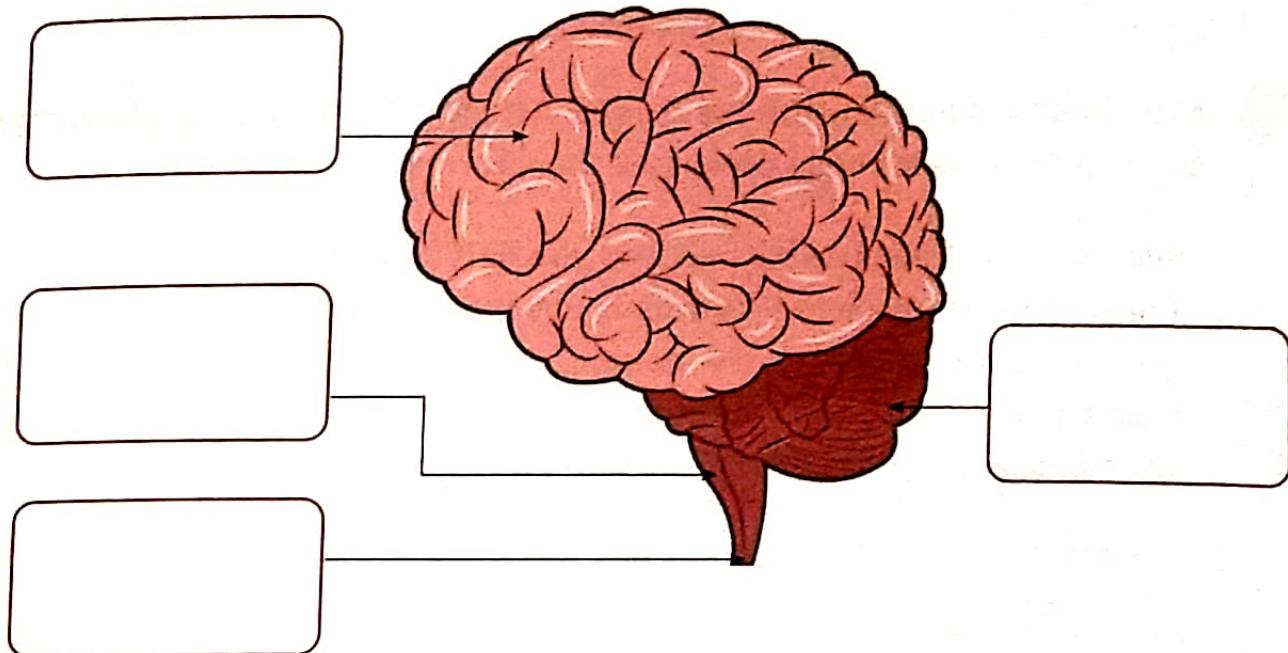
**3. Label parts of the brain using words given in the box.**

**Brain stem**

**Cerebrum**

**Spinal cord**

**Cerebellum**



**4. Fill in the blanks using words from the word bank.**

**Brain stem**

**Cerebrum**

**Cerebellum**

- The \_\_\_\_\_ connects the brain to the spinal cord and controls breathing, swallowing and heart beat.
- The \_\_\_\_\_ is at the back of the brain. It controls balance and coordination.
- The \_\_\_\_\_ is the largest part of the brain. It controls movement, speech and thinking.

Facilitator's Signature

**Learning Outcomes:**

- Uses observations and tests to sort, group and classify objects
- Describes the human nervous system, including the functions of the organs involved

**What-a-Nerve**

Nerves are made up of cells called neurons. Many neurons together make up a nerve.

1. Matt spots a banana peel on the ground. Arrange the steps in the flowchart to show how Matt's brain processes the information.

**Matt bends and picks up the peel and throws it in the bin.**

**The nerves carry the messages from Matt's brain to his muscles.**

**Matt sees a banana peel on the ground.**

**Matt's brain interprets the information.**

**The message is sent from Matt's eyes to the brain through the nerves.**

a.



b.



c.



d.



**2.** Tia is in Grade 4. Shade in green Tia's activities that will keep her brain healthy.

On school days, Tia often stays up late to play video games or to study.

Tia makes sure that she eats a lot of fruits and nuts, and drinks milk every day.

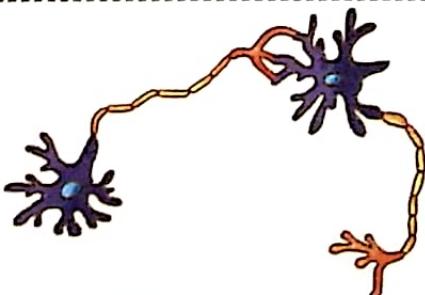
In the evening, Tia practises the violin for 30 minutes.

Tia is nervous and worried about her exams.

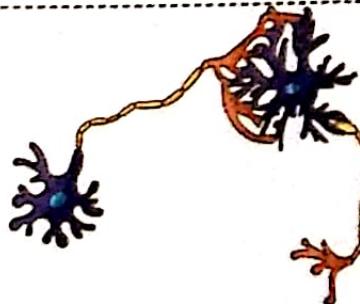
After school, Tia says that she is too tired to go out and play. She lies down on the sofa and watches TV instead.

Tia likes meeting her friends and playing games with them.

**3.** Noora is learning a new language. The images show the changes in two of her neurons before starting learning the language and after some time. Answer the questions based on your understanding.



Before



After

- a. What could have caused these changes?

---

---

- b. Noora's maths teacher tells her that practice will help her get better at solving sums quickly. Keeping in mind what you have learnt about the brain, how would you explain this to Noora?

---

---

Facilitator's Signature

**Learning Outcomes:**

- Uses observations and tests to sort, group and classify objects
- Describes the human nervous system, including the functions of the organs involved

# 05 | More about our Body

## FIRST AID

First aid is the assistance given to a person suffering a sudden illness or injury until full medical treatment is available.

In case of an accident, you should follow these steps.

- Do not panic. Stay calm and call an adult for help. Call a doctor, if necessary.
- Provide first aid to the injured person only if you have learnt about it. Otherwise, seek help from someone who has experience in providing first aid.
- Try to calm the injured person. Make the person sit or lie down. Do not crowd near the injured person.



In case of cuts and wounds follow these steps.

- Stay calm and assess the situation.
- If there is too much bleeding, immediately call for help and apply pressure to the area to stop the bleeding.
- If the injury is not major, apply pressure (usually just a few minutes) to stop bleeding and allow the body to form a clot.
- Clean the area with soap and water if available, if not wipe with a cotton or alcohol swab and let dry.
- Apply an antibiotic ointment.
- Apply a clean bandage or piece of gauze, as needed.

## LET'S MAKE A FIRST AID KIT

First aid kits may be kept in cloth bags, and plastic or metal boxes. Label the kit clearly as First Aid Box. You can also add the symbol of the medical emblem or a cross on the box. Create a checklist of items that are in your kit.

A first aid kit may contain many items, but basic items that can help with first aid include:

- Plastic gloves (2 pairs)
- Bandages of different sizes
- Gauze pads and rolled gauze

- Adhesive tape
- Instant cold pack (disposable)
- Safety pins
- Triangular bandage (to wrap injury or make an arm sling)
- Cotton swabs and balls
- Bottle of water
- Soap and hand sanitiser
- Antiseptic wipes/liquid
- Thermometer
- Flashlight with extra batteries
- Tweezers to remove stingers, splinters and thorns
- Scissors with rounded tips
- Zip-close plastic bags (to dispose of medical waste)
- Common medicines for fever, pain killer, antacids, cough drops and cough syrup, and so on



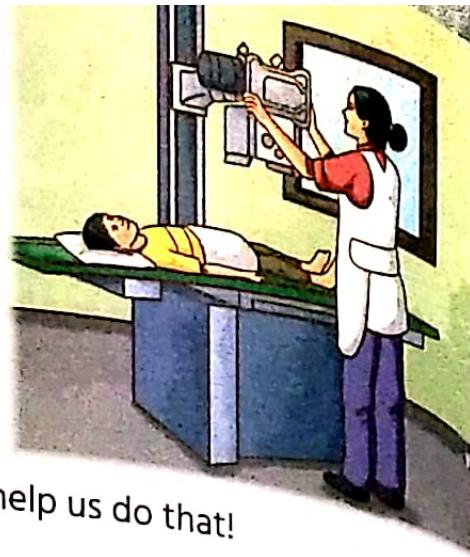
Once your kit is ready, designate a spot that is clearly defined, visible, and consistent so that locating the kit becomes routine. In case you need to use the kit, notify your parent or another adult, especially if you or your friend is injured. If an adult is available, ask for help while using the kit. Most importantly, learn how to use your first aid kit. Practice a few times with an adult.

## MEDICAL INVENTIONS AND DISCOVERIES

- Antiseptics prevent germs from growing in and around a wound and help the body heal quickly. The first antiseptic was invented by Joseph Lister, a British surgeon. He experimented by applying chemicals (phenol) to wounds to keep them clean and prevent infection. He is known as the 'Founder of Antiseptic Surgery'. Today, several types of antiseptics are available to treat wounds.
- Antibiotics are used to kill harmful bacteria and prevent any infections or infectious diseases caused by them. Penicillin, the first antibiotic, was discovered accidentally by Alexander Fleming while conducting an experiment. Different antibiotics are used to treat different types of viruses and infections.



X-rays are like light rays but can pass through most objects. That is why they are used to produce images of things inside the body. They can help to detect problems with bones, teeth and other organs. They are also used at airports to check luggage. Another use of x-rays is to detect cracks in metals.



## CAREERS RELATED TO THE BODY SYSTEMS

Looking after ourselves is very important and various people help us do that! Let us look at some careers related to human body systems.

### Nervous System

- A neurologist is a doctor who treats disorders that affect the brain, spinal cord and nerves.
- A psychologist studies human behaviour, for example, the way people think, feel, learn and behave.



### Skeletal and Muscular Systems

- An orthopaedic surgeon is a doctor who detects, prevents and treats injuries related to bones, joints, ligaments, muscles, nerves and tendons.
- A chiropractor treats problems related to the spinal cord, muscles and nerves through proper nutrition, adequate rest and daily exercise.
- A physical therapist is a person who treats injury through exercise.
- A radiologist is a person who examines bones and internal organs using techniques like x-ray and ultrasound.
- A general physician does not specialise in any one area of medicine; he/she treats many different conditions including illnesses and injuries.



**1.** Read each sentence and state whether True or False.

- a. Tissues are the basic building blocks of life. \_\_\_\_\_
- b. All animals with bones have a vertebral column. \_\_\_\_\_
- c. Skeletal muscles are involuntary muscles. \_\_\_\_\_
- d. Your hip joint is an example of a ball and socket joint. \_\_\_\_\_
- e. When a muscle contracts it increases in length. \_\_\_\_\_
- f. The elbow joint is an example of a pivot joint. \_\_\_\_\_
- g. A lobster has an external skeleton called the exoskeleton. \_\_\_\_\_

**2.** Sandra has to write six facts about the skeletal system. This is what she has written. Check her statements and (✓) if it is correct or put a (✗) if it is incorrect. Write the incorrect statement correctly.

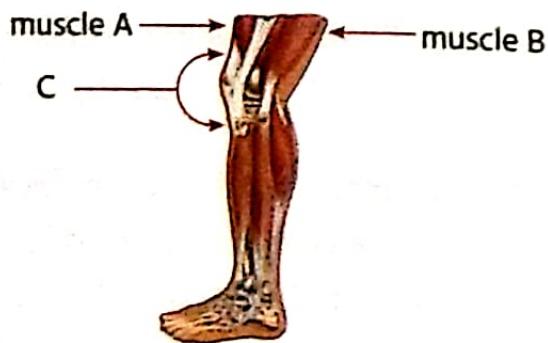
Statement	✓ or ✗
The backbone has fixed joints.	
The sternum lies in the centre of the chest.	
The ribcage protects the heart and lungs.	
The skull is made up of one single bone.	
The hip joint is a ball and socket joint.	
Each leg has 30 bones.	

**3.** Unscramble the words in the brackets to complete the sentences related to the skeletal system.

- a. Bones connect at the \_\_\_\_\_ (sjnoit)
- b. The mineral that keeps our bones strong is \_\_\_\_\_ (ciuaclm)
- c. \_\_\_\_\_ (boen armrwo) is at the centre of the bone.
- d. The part of the skeleton that protects the heart is the \_\_\_\_\_ (brcieag)
- e. \_\_\_\_\_ (r-ysxa) are used by the doctors to see bones inside the body.

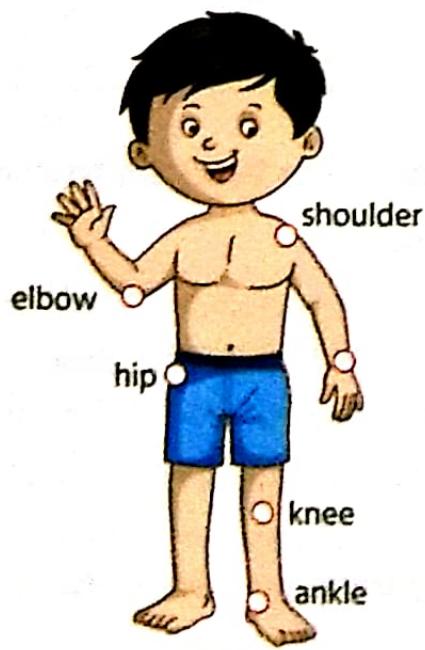
Correct the statements here.

4. Tina is getting ready to kick the ball. Look at the picture and fill in the blanks.



- C is a \_\_\_\_\_ joint as the movement of the lower leg can happen only in one direction.
- When muscle B \_\_\_\_\_, it pulls the leg up.
- If Tina straightens her leg, her muscle \_\_\_\_\_ will contract.

5. Circle the ball and socket joints in the picture.



**6. Answer the questions.**

a. What is an organ system?

---

---

b. What do the nerves do?

---

---

c. What are the functions of the skeletal system?

---

---

d. Name two types of joints in your legs.

---

---

e. Differentiate between voluntary and involuntary muscles giving one example of each.

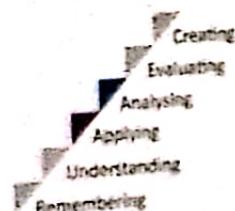
Voluntary	Involuntary
<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>

Facilitator's Signature

Parent's Signature

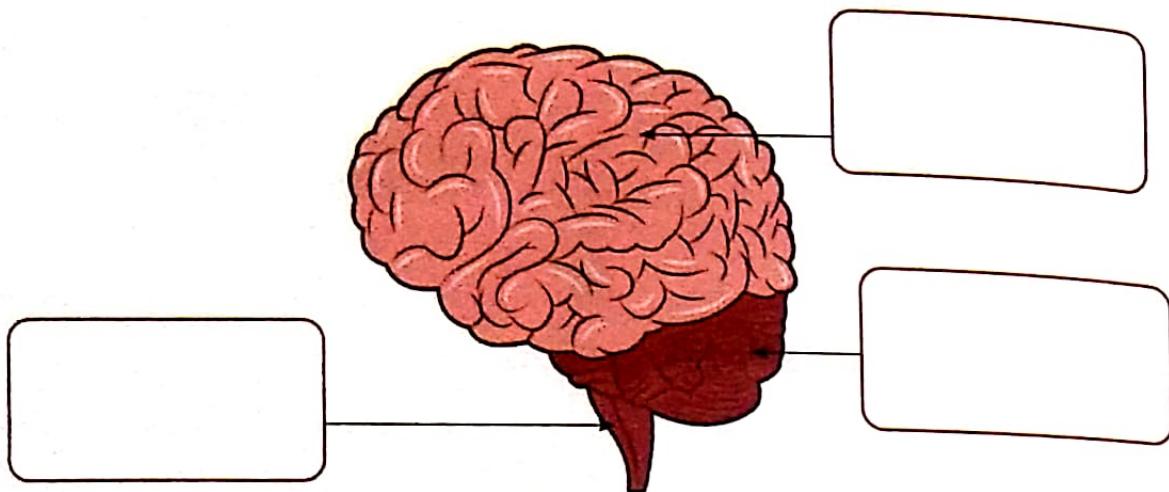
**Learning Outcomes:**

- Uses observations and tests to sort, group and classify objects
- Identifies some of the important organs in humans and describe their functions
- Identifies some of the important bones in the human body
- Knows that bones move because pairs of muscles that are attached to them contract and relax
- Describes some of the important functions of skeletons
- Knows that some animals have an exoskeleton



**1. Look at the picture and answer the questions.**

- a. Identify the organ and label its parts.



- b. Answer the questions based on the picture above.

- i. Name the organ and state its function.

---

---

---

- ii. Name the bone that protects this organ.

---

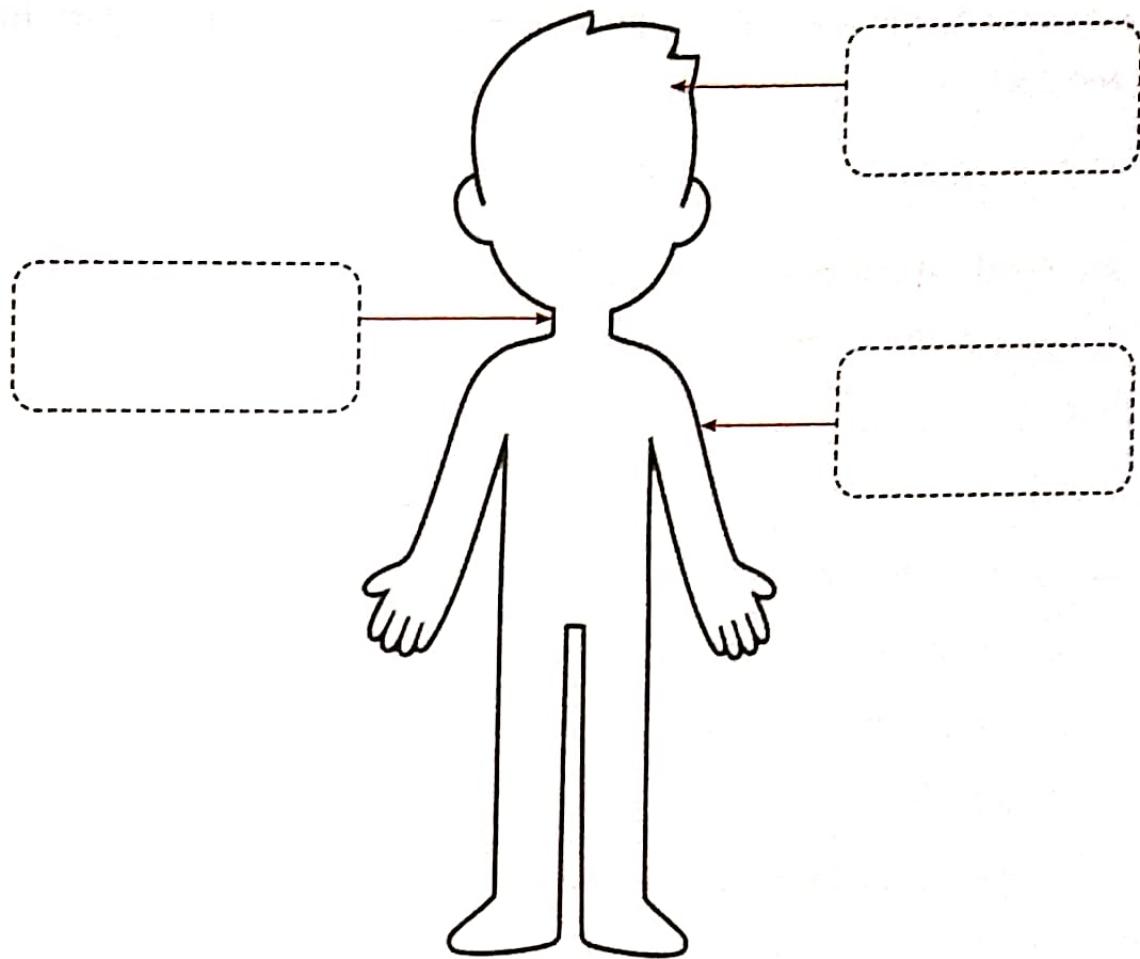
---

- iii. Which is the biggest part of this organ. State its functions.

---

---

2. Draw the nervous system inside the boy's body. Label its parts.



3. Zia is packing for her trekking trip with her friends. She has been given the responsibility of preparing the First Aid box. Make a list of things Zia should carry in her box.

---

---

---

---

---

**4.** Shiv has always been fascinated by the power of the human nervous system. He recently learned the importance of the spinal cord in empowering the brain. Which medical expert can help him learn better about it?

**5. Answer the questions.**

a. What do the nerves do?

---

---

b. Write one function of each

i. Cerebrum: \_\_\_\_\_

ii. Cerebellum: \_\_\_\_\_

iii. Brain stem: \_\_\_\_\_

c. State two ways you can keep your brain healthy.

---

---

---

---

Facilitator's Signature

**Learning Outcomes:**

- Uses observations and tests to sort, group and classify objects
- Identifies some of the important organs in humans and describe their functions
- Describes the human nervous system, including the functions of the organs involved

Parent's Signature



