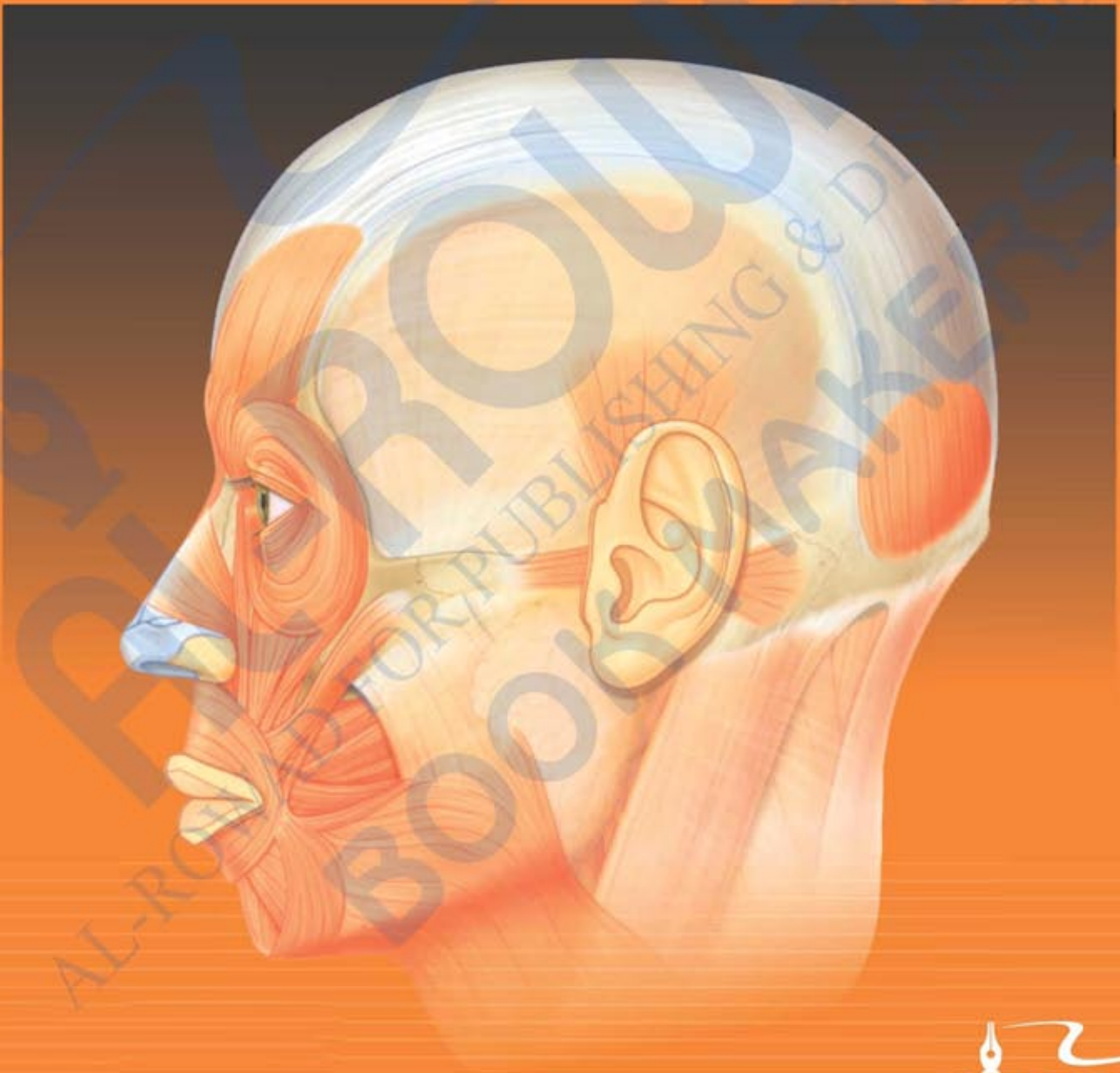


BOOK

6

SCIENCE BASICS



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Understanding living beings

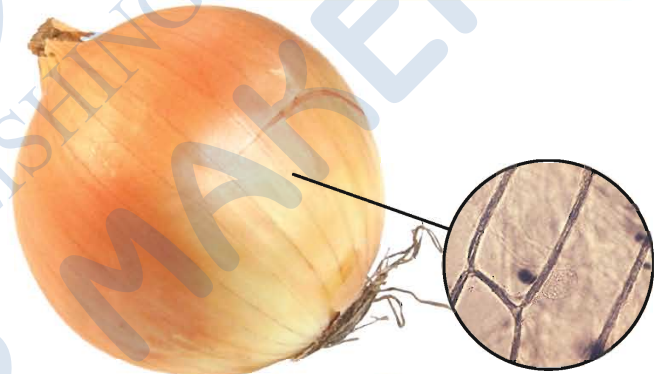
Some beings around us are living, and some are non-living. Plants and animals are living beings. Rocks, chairs and water are non-living beings.

All living beings have at least five features in common.

1. Living beings are made up of cells.
2. Living beings grow and change.
3. Living beings need energy.
4. Living beings respond to their environment.
5. Living beings reproduce.

Living beings are made up of cells

A cell is the smallest part of a living being. Most cells are so small that we can only see them with the help of microscope. Every part of the bodies of plants and animal is made up of cells. Some living beings are so small that they are made up of a single cell. Large animals have millions of cells in their bodies.



Onion cells
(100 times larger than they actually are)

Do you know?

- Living beings that are made up of only one cell are called unicellular organisms. Amoeba is a unicellular animal.
- Living beings that are made up of several cells are called multicellular.
- All human beings are multicellular.

Living beings grow and change

Puppies grow into dogs. Buds change into flowers. Flowers wither and change into fruits. Animals stop growing after some time. You will not grow any taller after a few years, nor will your body parts increase in size. But a plant keeps on growing as long as it lives. New leaves and branches keep appearing on it. The size of the cells of a living thing does not grow very much. Living things grow by producing more cells. The more cells you have, the bigger you are.



Microscope

Living beings need energy

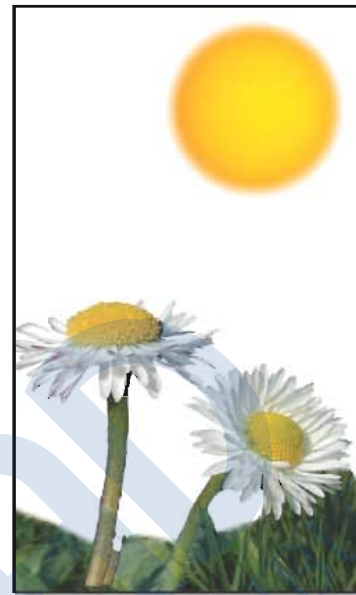
They get energy from food. Animals have to find and eat food.

Plants make their own food by a process called photosynthesis.

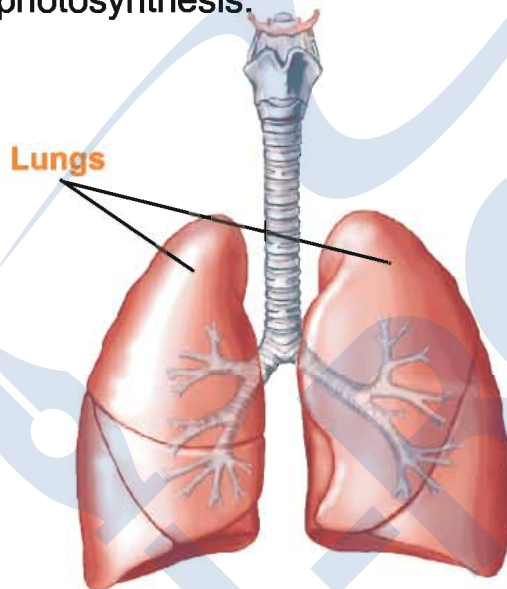
They use carbon dioxide of the air, water from the soil and sunlight to prepare their food.

This takes place in green leaves in the presence of a green substance called chlorophyll.

Chlorophyll traps the energy of the sun for photosynthesis.



Food is required by living beings to grow, to move around, and to keep their bodies healthy.



Food is converted into energy inside the cells.

Living things require oxygen from the air to get energy from food. This is why all living beings respire. During respiration, the oxygen from the air is breathed in, and reaches the cells. After food is converted into energy, carbon dioxide is given off by the cells. This is breathed out during respiration.

Animals respire in different ways. Some animals such as mammals have lungs, insects have tiny holes called spiracles, and fishes have gills which absorb oxygen dissolved in water. Plants respire through tiny holes in their leaves called stomata.



INVESTIGATE

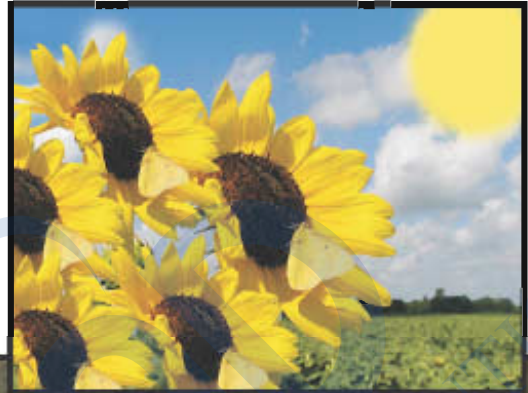
- What is a microscope?
- By what age does growth of a child take place?
- How many times do you normally breathe in a minute?
- What does the Quran say about the creation of man?

Living beings respond to their environment

an environment is every thing around a living being. Sunlight and weather are a part of the environment. Most animals sense their environment with the help of their sense organs-eyes, ears, nose, skin and tongue. They respond to it in various ways. When an animal sees food, it moves towards it to catch. When it feels cold, it tries to find shelter. When you see good food, saliva starts flowing in your mouth.

Plants do not have sense organs, but they can also feel changes around them. A plant can feel the sun and responds by growing towards it. The leaves of the plant 'touch me not' can feel something touching them and respond by closing.

Animals respond to their need for food and shelter by moving around in search of them. Plants do not need to look for food and shelter. They make their own food. They remain fixed at one place.



Living beings reproduce

All living beings can reproduce. New living beings come from adult living being. Animals reproduce by giving birth to babies, or by laying eggs from which babies come out. Most plants produce seeds from which new plants come out.



Remember

1. Living beings have at least five things in common: they are made up of cells, they grow and change, they need energy which they get by taking food and by respiring, they respond to their environment, and they reproduce.

2- These life functions are performed by living things in different ways.

Most plants produce seeds from which new plants come out.

1. Put a for true and a for false.

Can you give any reason why you said it true or false?

(a) Living beings grow because the size of their cells grow.

Reason _____

(b) Some living beings are made up of only one cell.

Reason _____

(c) Plants stop growing after some time.

Reason _____

(d) Living beings cannot get energy from food in the absence of oxygen.

Reason _____

(e) Sunlight provides energy to plants to make their food.

Reason _____

2. Name these:

(a) They are the building blocks of all living things. _____

(b) Your friend who is bigger than you has more of them. _____

(c) They absorb oxygen dissolved in air. _____

(d) It consists of everything around you. _____

3. How do plants and animals differ in:

(a) Growth _____

(b) Taking food _____

(c) Respirations _____

(d) Reproduction _____

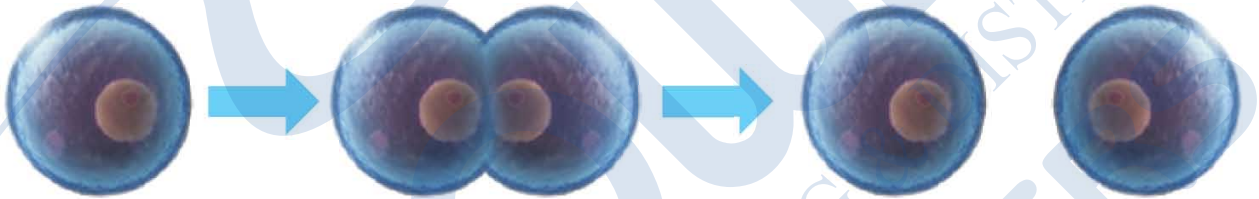
(e) Movement _____

4. Give an example of a plant responding to its environment.

AWARENESS BEYOND THE CLASSROOM

How are new cells made

All animals and plants start their life from a single cell, then more and more cells keep on forming. Their number keeps on increasing very fast. The process by which new cells form is very interesting. After a cell has grown to its full size, it begins to split in half. It forms two separate cells which are exactly alike. These cells again split into two after they have grown to their full size. This process goes on and on. Some of these new cells replace dead cells in your body. Others make you grow.



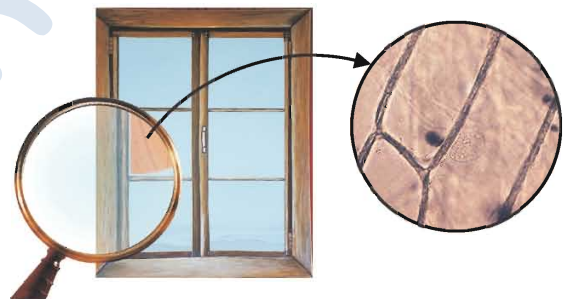
In young children, new cells are produced faster. Your body makes millions of new cells every minute. When you become an adult, your cells will split slowly. Then cells are not required for growth. They are only required to replace dead cells.

Project

You can see cells

You will need:

- ◆ An onion
- ◆ Tweezers
- ◆ Window pane



Slice a square of an onion. Peel away the thin inner surface using tweezers. You have an onion skin that is only one cell thick. It is thinner than a tissue paper. Carefully, stick the skin to a windowpane. Using a powerful hand lens, you can make out the cells. Ask your teacher to show you the onion peel under a microscope.

How we move

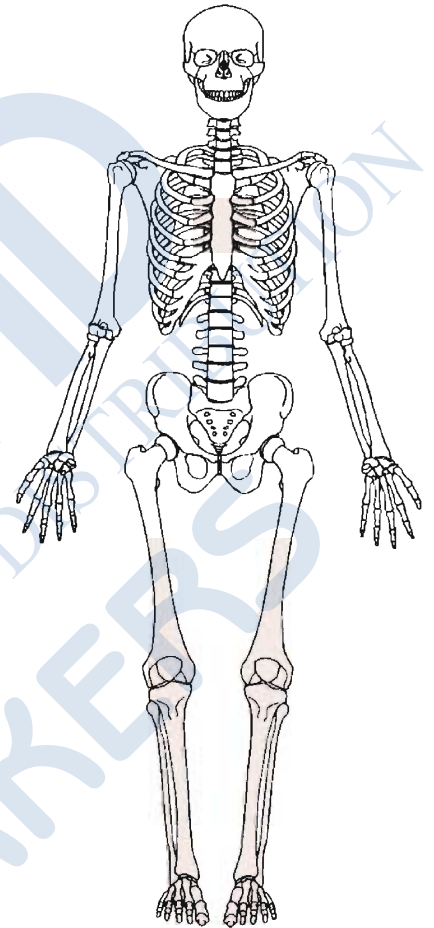
Our body is made of flesh and blood built on a frame work of bones. Without our bones, we could not stand up or move about.

We would be as floppy as suit of clothes without a hanger.

We can walk, jump and run because our bodies are made up of a great many separate bones, all joined together by bands of muscles. Some of the bones are actually joined together so that they cannot be moved alone. This gives them extra strength. Our skull, for example is made of 30 flattened bones which are linked like a jigsaw. Others meet at moveable joints which are like hinges and makes us flexible and bendy.

As well as allowing us to move, our bones and muscles protect very important organs inside our body. A cage of ribs encloses the heart and lungs. A box like skull protects the brain. A cord of nerves runs safely through the center of the spine bones.

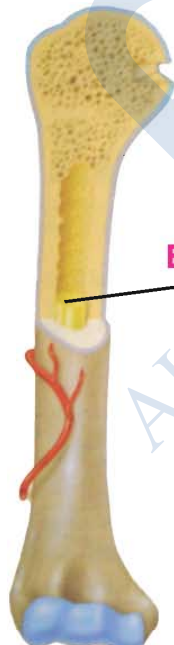
The hip bones and spine shield the liver, intestines and stomach.



The human skeleton

The skeletal system

As our body has a number of soft parts, it is necessary to have a hard framework supporting these parts. Otherwise the body will collapse. This framework is provided by the bones and is called the skeleton. It gives shape and strength to the body. It also protects the soft, inner organs of our body such as the heart or lungs.



Bone marrow

As child we have more than 350 bones. But as we grow, some of them join together. An adult normally has 206 bones. From outside, bones feel smooth and hard. However, they are softer and spongy on the inside. The inner substance of a bone is called the bone marrow.

Do you know?

- Each of us has about 206 bones of all shapes and sizes and over 600 muscles.
- The lower jaw is the only bone in the skull that can move. It enables us to eat and talk.
- We can use 15 muscles when we smile.

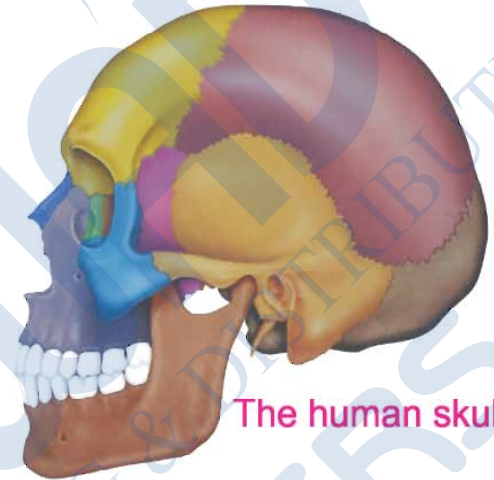
The main parts of human skeleton

Although the individual bones are hard, several of them can move at the places where they are joined to other bones. That is why we can move several parts of our body. The human skeleton consists of the following main parts.

The skull

The skull is the bony structure that surrounds and protects our brain.

The upper portion is made up of 8 flat bones joined together. The face and jaw contain 13 bones. Our skull bones are just under our skin. There are holes in the bones of our face for our eyes, nostrils, mouth and ears. Our teeth are fixed to the jaw bones.



The human skull

The backbone or spine

The spine or vertebral column is attached to the skull. It is made up of 33 small bones. These are called vertebrae. The spine forms the center supporting rod for the skeleton. It also protects the delicate spinal cord which contains nerves and blood vessels. The vertebrae can move over each other. This allows you to bend and twist your back.



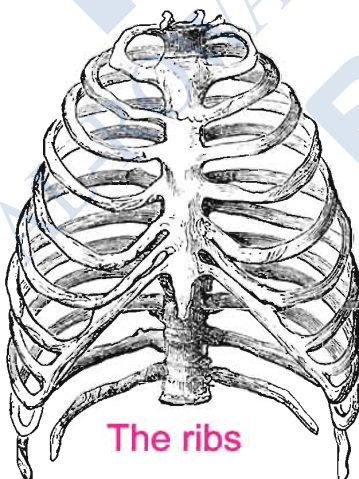
The limbs

Nearly half of all our bones are in our hands, wrists, feet and ankles. The biggest bone of the body is the thigh bone or the femur. The upper bone of the arm is attached to the spine by the collar bone and the shoulder girdle. The femur is attached to the hip girdle.

The backbone or spine

The ribs

The ribs are narrow curved bones that form a cage to protect the heart and lungs, there are twelve pairs of ribs. They are joined to the backbone at the back and the breast bone in front. Two pairs of ribs, however, are joined only to the backbone, they are called floating ribs.



The ribs

INVESTIGATE

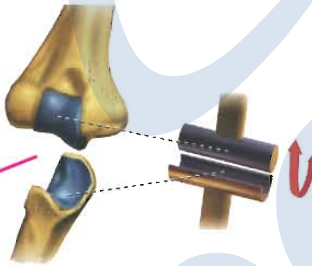
- Which is the strongest bone of your body?
- Which is the biggest muscle of your body?
- What do athletes do to keep their body fit?
- Look at one of your hands. How many bones can you find in it?

Joints: joints occur wherever two bones meet.

They are strong enough to withstand jerks. There are several joints in the body. Different joints do not allow different types of movement. Only the skull joints do not allow any movement. We can move our lower leg only in one direction because our knee joints does not allow movement in other directions. However, we can even twist our ankle because the ankle joint is different from the knee joint. Let us see how.

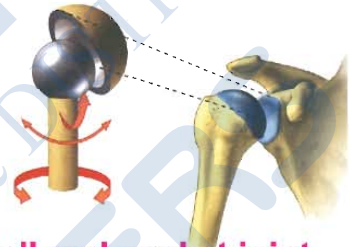
1. Knees and elbows are hinge joints. They can only move up and down, or backwards and forwards, like door hinges.

Hinge joint

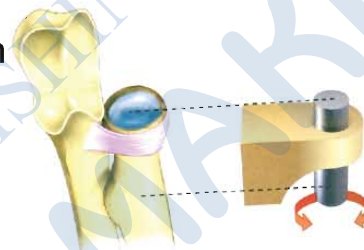


2. Shoulder and hip are ball and socket joints. One of the bones ends in a ball that fits into the hole (or socket) in the other bone. The bone that ends in a ball (femur and upper arm bone) can move in any direction.

Ball and socket joint



3. The skull is connected to the top vertebra in the spin with a pivot joint. It allows to rotate head and also to move upwards and downwards.



Vertebrae joint

4. Wrists and ankles have sliding joints where bones can slide over each other. This allow you to move hand and foot from side to side as well as backwards and forwards.

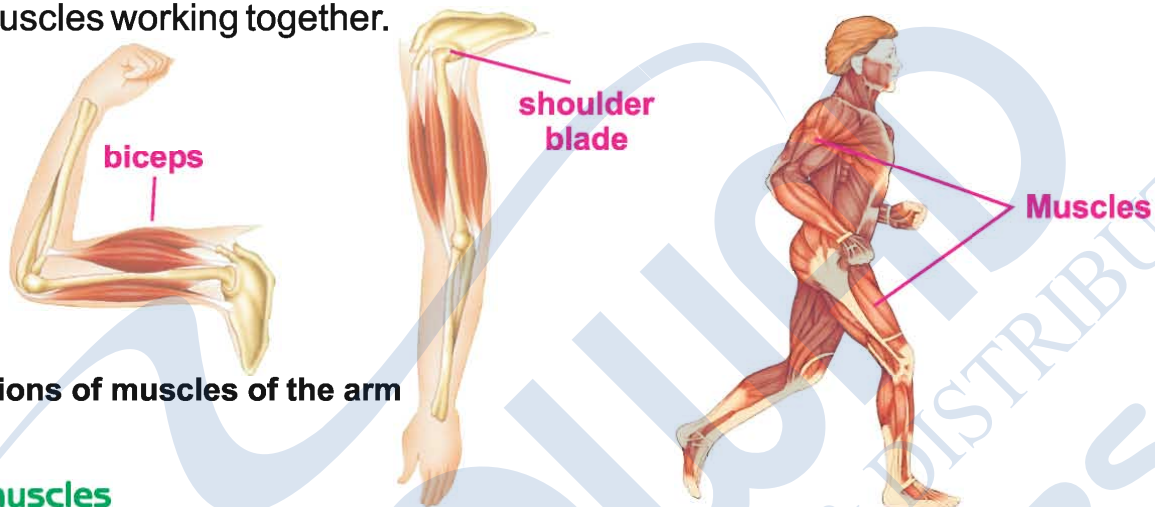
The muscular system

About half the weight of our body is that muscles. They are made up of bundles of fibers. They make our body move. We have about 650 muscles and each one produces a particular movement. The muscles that move our body parts are attached to our bones by strong fibers called tendons. Muscles work by pulling on a bone – they cannot push. Therefore at least two separate muscles are needed to move a joint. For example our arm movements are controlled by two muscles- biceps and triceps.



The muscular system

When we want to pull up our arm, the biceps which are joined to the arm in front, become shorter and pull up lower arm bone. When we want to lower our arm, our triceps, which are at the back, become shorter and pull our lower arm bone. Several movements of the Body require many muscles working together.



Actions of muscles of the arm

Types of muscles

All movements of our body are controlled by our muscles. There are three kinds of muscles in the body. Some muscles are under our control. We can move them when we want. These are called voluntary muscles. When we move our hands or legs, we use voluntary muscles.

The involuntary muscles work on their own. We have no control over them. They cause movements of inner parts of our body such as the stomach or intestines. They keep the body systems working properly.

The third type of muscles are cardiac muscles. They cause the heart to pump blood over the body. They work throughout our life without stopping, and without getting tired.

Remember

1. The skeletal system consists of bones and gives our body its shape. It also protects all the soft organs inside.
2. The main parts of skeleton are, the skull, the backbone, the ribs and the limbs.
3. Joint occur where two bones meet. Different types of joints, and sliding joints.
4. The muscular system consists of muscles. It controls movement of all parts of our body.
5. There are three types of muscles. Voluntary muscles, involuntary muscles and cardiac muscles.

Making muscles stronger

The more we use a muscle, the bigger and stronger it gets. So if you want strong muscles, exercise them regularly.

1. Put a for true and a for false.

Can you give any reason why you said it true or false?

(a) Bones are hard on the outside but soft inside.

Reason _____

(b) A new born child has 206 bones.

Reason _____

(c) Blood cells are made inside the bones.

Reason _____

(d) The skull contains several moveable bones.

Reason _____

(e) Floating ribs are not joined to the breast bone.

Reason _____

(f) The knee has a hinge joint.

Reason _____

(g) The ball and socket joint allows movement in an up and down direction only.

Reason _____

(h) Muscles can pull or push a bone to make it move.

Reason _____

2. Name these:

(a) This system gives the body its shape. _____

(b) The small bones that make up the spine. _____

(c) The biggest bone of the body. _____

(d) The type of joint by which the skull is connected to the top vertebrae. _____

(e) The strong fibres that attach muscles to the bones. _____

(f) The muscles that shorten if you want to lower your arm. _____

(g) Muscles which work on their own, over which you have no control. _____

(h) The tireless muscles that work throughout our life without stopping. _____

3. What functions does the skeleton perform?

4. What functions do the following bones perform?**(a)** The spine

(b) The ribs

5. What is a joint?

6. Why at least two muscles needed to move any joint in the body?

7. (a) Explain the structure of the ball and socket joint.

(b) What kind of movement does such a joint allow?

8. What is the difference between voluntary and involuntary muscles?

9. Discuss in class and answer.**What would happen if the spine consists of one long bone?**

AWARENESS BEYOND THE CLASSROOM

1. Our skeleton is inside our body. It is known as endoskeleton. But insects, spiders, lobsters, snails and some other animals have skeletons outside their body. They are hard cases that support and protect their body from outside. They are known as exoskeleton. The shell of a snail is its exoskeleton. But exoskeleton can be heavy. Aren't you glad that you do not have an exoskeleton to carry around with you? It would have been several times heavier than your school bag!

2. An earthworm does not have any bone in its body. It does not have an exoskeleton either. How then does its body get support? It has a liquid filled very tightly in its body. The liquid presses against its skin like air inside a tyre. This gives strength to the body and enables the earthworm to burrow through the earth.

Project

Make models of your bones:

You will need:

- ◆ pipe-cleaners
- ◆ straws
- ◆ a plain paper sheet
- ◆ a pencil
- ◆ thread



Look at one of your hands. Can you see and feel the different bones in it.

Place your hand on a plain piece of paper and draw around it. Try and draw in the different bones that you can feel.



Model your finger bones and the way they move using pipe-cleaners and straws. Cut the straws to match the length of the individual finger bones.

Thread the straw pieces on the pipe-cleaners and join them all together.

You can try feeling and modeling other bones in your body too.

How our brain works

Our brain is the control center of the whole body. It receives messages from all parts of our body and issues necessary commands to control the body's action. The brain is made up of special type of cells called nerves cells. The delicate brain is protected on the outside by strong skull bones.

Main parts of the brain

The brain is divided into three main regions-the cerebrum, the cerebellum and the medulla. Each part has its own functions to perform.

The cerebrum is the main part of the brain. It has many folds and grooves. It does all our thinking.

The cerebellum is a small egg-shaped part under the cerebrum at the back of the head. The cerebellum works with the cerebrum to control the movements of our muscles. It also help our body to keep its balance.

The medulla is shaped like a stem. It comes out from the base of the brain and joins spinal cord. It controls involuntary actions such as breathing and heart beat.

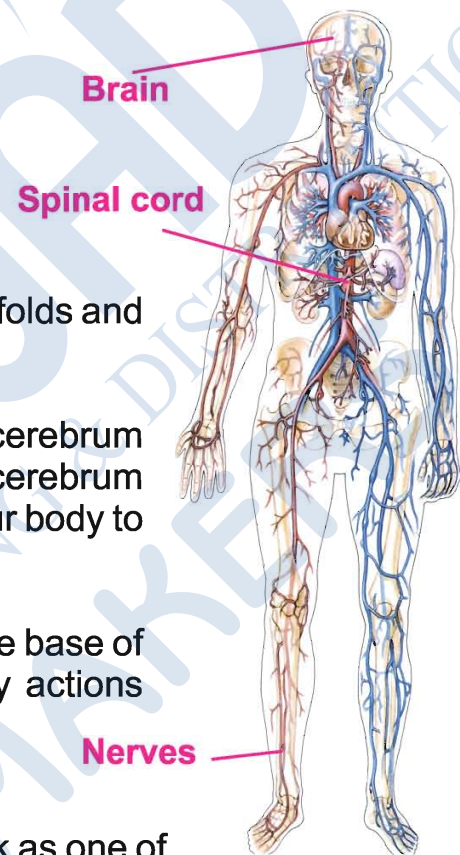
The spinal cord

The spinal cord is shaped like a tube. It is about as thick as one of our fingers. It starts from the medulla and goes down the middle of our back. It is protected by the vertebrae of our spin. Messages travel from our brain, down the spinal cord to all parts of our body. Incoming messages enter the spinal cord from all parts of our body and then travel up to our brain.

Nerves

nerves are made up of nerve cells. They link every part of our body to the brain through spinal cord. The body has three different kinds of nerve cells.

Sensory nerve cells carry signals from the sense organs to the spinal cord and brain. These messages are information about things such as temperature, smell, colour or pressure.



Do you know?

- There are about 10,000 million nerve cells in our brain.
- Our brain, spinal cord and millions of nerves make up our nervous system.