0652CH08

8 Body Movements

Sit absolutely still. Observe the movements taking place in your body. You must be blinking your eyes, time to time. Observe the movements in your body as you breathe. There are so many movements that happen in our bodies.

When you are writing in your notebook which part of the body are you moving? Or, when you turn and look at your friend? Different parts of your body move while you remain at the same place, in these examples. You also move from one place to another — you get up and go to your teacher or to the school compound, or go home after school. You walk, run, skip, jump and move from place to place.

Let us see how animals move from place to place by filling up Table 8.1, after discussing with our friends, teachers and parents.

Boojho wonders about movements in plants. He knows they do not move from place to place, but, do they show any other kind of movements?

Table 8.1 How do animals move from place to place?

Animal	Body part used for moving from place to place	How does the animal move?
Cow	Legs	Walk
Humans		
Snake	Whole body	Slither
Bird		
Insect		
Fish		

Walk, run, fly, jump, creep, crawl, slither and swim – these are only a few of the ways in which animals move from one place to another. Why are there so many differences in the way that animals move from place to place? Why is it that many animals walk while a snake slithers or crawls and a fish swims?

8.1 Human Body and its Movements

Let us look closely at some of our own movements to begin with, before looking at all these varieties of movements in animals.

Do you enjoy doing physical exercise at school? How do you move your hands and legs while doing different exercises?

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Let us try some of the many movements, our body is capable of.

Bowl an imaginary ball at an imaginary wicket. How did you move your arm? Did you rotate it at the shoulder in a circular movement? Did your shoulder also move? Lie down and rotate your leg at the hip. Bend your arm at the elbow and the leg at the knee. Stretch your arm sideways. Bend your arm to touch your shoulder with your fingers. Which part of your arm did you bend? Straighten your arm and try to bend it downwards. Are you able to do it?

Try to move the various parts of your body and record their movements in Table 8.2.

Why is it that we are able to move a few parts of our body easily in various directions and some only in one direction? Why are we unable to move some parts at all?

Activity 1

Place a scale length-wise on your arm so that your elbow is in the centre (Fig. 8.1).

Ask your friend to tie the scale and your arm together. Now, try to bend your elbow. Are you able to do it?

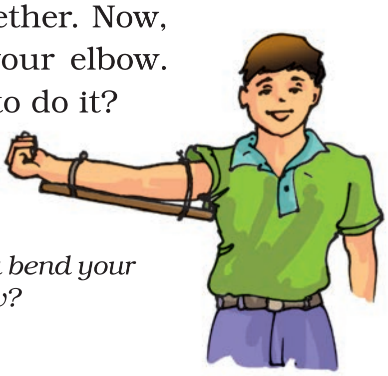

Fig. 8.1 *Can you bend your arm now?*

Table 8.2 Movements in our body

Body Part	Movement				
	Rotates completely	**Rotates partly/turns**	**Bends**	**Lifts**	**Does not move at all**
Neck		Yes			
Wrist					
Finger					
Knee					
Ankle					
Toe					
Back					
Head					
Elbow					
Arm	Yes				

Did you notice that we are able to bend or rotate our body in places where two parts of our body seem to be joined together — like elbow, shoulder or neck? These places are called **joints**. Can you name more such joints? If our body has no joints, do you think it would be possible for us to move in any way at all?

What exactly is joined together at these joints?

Press your fingers against the top of your head, face, neck, nose, ear, back of the shoulder, hands and legs including the fingers and toes.

Do you get a feel of something hard pressing against your fingers? The hard structures are the bones. Repeat this activity on other parts of your body. So many bones!

Bones cannot be bent. So, how do we bend our elbow? It is not one long bone from the upper arm to our wrist. It is different bones joined together at the elbow. Similarly, there are many bones present in each part of the body. We can bend or move our body only at those points where bones meet.

There are different types of joints in our body to help us carry out different movements and activities. Let us learn about some of them.

Ball and socket joints

Activity 2

Roll a strip of paper into a cylinder. Make a small hole in an old rubber or plastic ball (under supervision) and push the paper cylinder into it as shown in Fig. 8.2. You can also stick the cylinder on the ball. Put the ball in a small bowl.

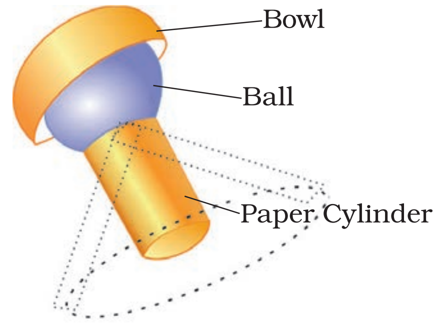

Fig. 8.2 *Making a ball and socket joint*

Does the ball rotate freely inside the bowl? Does the paper cylinder also rotate?

Now, imagine that the paper cylinder is your arm and the ball is its end. The bowl is like the part of the shoulder to which your arm is joined. The rounded end of one bone fits into the **cavity** (hollow space) of the other bone (Fig.8.3). Such a joint allows movements in all directions. Can you name another such joint you can think of, recollecting the body movements we tried at the beginning of this section?

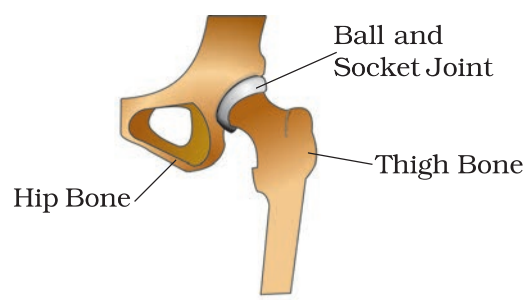

Fig. 8.3 *A ball and socket joint*

Pivotal Joint

The joint where our neck joins the head is a pivotal joint (Fig. 8.4). It allows us to bend our head forward and backward and turn the head to our right or left. Try these movements. How are these movements different from those of our arm that can rotate a complete circle in

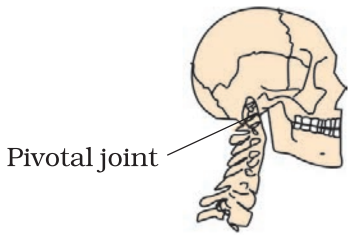

Fig. 8.4 A pivotal joint

its ball and socket joint? In a pivotal joint a cylindrical bone rotates in a ring.

Hinge joints

Open and close a door a few times. Observe the **hinges** of the door carefully. They allow the door to move back and forth.

Activity 3

Let us look at the kind of movement allowed by a hinge. Make a cylinder with cardboard or thick chart paper, as shown in Fig. 8.5. Attach a small pencil to the cylinder by piercing the cylinder at the centre, as shown. Make a hollow half cylinder from cardboard such that the rolled up cylinder can fit inside it easily. The hollow half cylinder with the rolled up cylinder sitting inside it, allows movement like a hinge. Try to move the rolled up cylinder. How does it move? How is this movement different from what we saw with our constructed ball and socket joint? We saw this kind of

Fig. 8.5 Directions of movement allowed by a hinge like joint

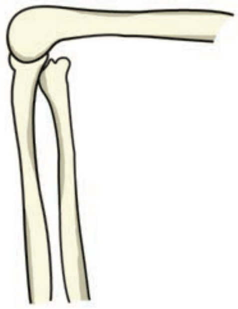

Fig. 8.6 Hinge joints of the knee

movement at the elbow in Activity 1. What we have constructed in Fig. 8.5 is different from a hinge, of course. But, it illustrates the direction in which a hinge allows movement. The elbow has a hinge joint that allows only a back and forth movement (Fig. 8.6). Can you think of more examples of such joints?

Fixed joints

Some joints between bones in our head are different from those we have discussed so far. The bones cannot move at these joints. Such joints are called **fixed** joints. When you open your mouth wide, you can move your lower jaw away from your head, isn't it? Try to move your upper jaw, now. Are you able to move it? There is a joint between the upper jaw and the rest of the head which is a fixed joint.

We discussed only some of the joints that connect parts of our body.

What gives the different parts of the body their different shapes?

If you wanted to make a doll, what will you make first? Perhaps a framework to give the doll shape before making its outer structure, isn't it? All the bones in our body also form a framework to give a shape to our body.

The human skeleton is composed of around 305 bones at birth. The number of bones in the skeleton changes with age. It decreases to 206 bones by adulthood after some bones have fused together.

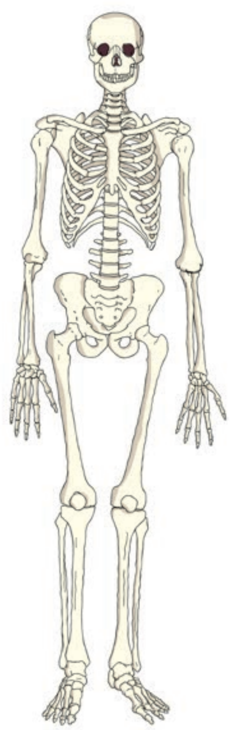
Fig. 8.7 *The Human skeleton*

This framework is called the **skeleton** (Fig. 8.7.)

How do we know that this is the shape of a human skeleton? How do we know the shapes of the different bones in our body? We can have some idea about the shape and number of bones in some parts of our body by feeling them. One way we could know this shape better would be to look at X-ray images of the human body.

Did you or anyone in your family ever have an X-ray of any part of your body taken? Sometimes when we are hurt, or have an accident, doctors use these X-ray images to find out about any possible injuries that might have happened to the bones. The X-rays show the shapes of the bones in our bodies.

Feel the bones in your forearm, upper arm, lower leg and upper leg. Try to find the number of bones in each part.

Similarly, feel the bones of your ankle and knee joints and compare these with the X-ray images (Fig. 8.8).

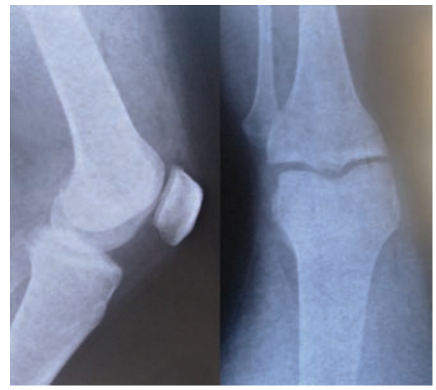
Fig 8.8 *X-ray images of ankle and knee joints*

Bend your fingers. Are you able to bend them at every joint? How many bones does your middle finger have? Feel the back of your palm. It seems to have many bones, isn't it (Fig. 8.9)? Is your wrist flexible? It is made up of several small bones called **carples**. What will happen if it has only one bone?

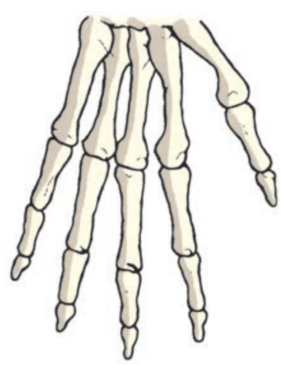
Fig. 8.9 *Bones of the hand*

Activity 4

Take a deep breath and hold it for a little while. Feel your chest bones and the back bone by gently pressing the middle of the chest and back at the same time. Count as many ribs (bones of the chest)

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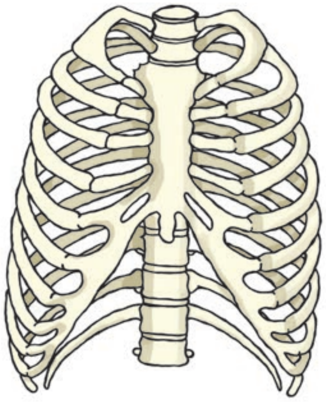
Fig. 8.10 *The rib cage*

as possible. Observe Fig. 8.10 carefully and compare with what you feel of the chest bones. We see that the ribs are curiously bent. They join the chest bone and the backbone together to form a box. This is called the **rib cage**. There are 12 ribs on each side of chest. Some important internal parts of our body lie protected inside this cage.

Ask some friends to touch their toes without bending their knees. Starting from the neck, move your fingers downwards on the back of your friend. What you feel is the **backbone**. It is made up of many small bones called vertebrae. The backbone consists of 33 vertebrae (Fig. 8.11). The rib cage is joined to these bones.


Fig. 8.11
The backbone

If backbone was made up of only one long bone, will your friend be able to bend?

Make your friend stand with both hands pressed to the wall and ask her to push the wall. Do you notice two bones on the back are prominent where the shoulders are? They are called **shoulder bones** (Fig. 8.12).


Fig. 8.12 *Shoulder bones*

Observe Fig. 8.13 carefully. This structure is made of **pelvic bones**. They enclose the portion of your body below the stomach. This is the part you sit on.

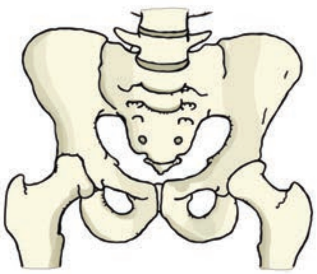
Fig. 8.13 *Pelvic bones*

The skull is made up of many bones joined together (Fig. 8.14). It encloses and protects a very important part of the body, the brain.

We discussed many bones and the joints of our skeleton. There are

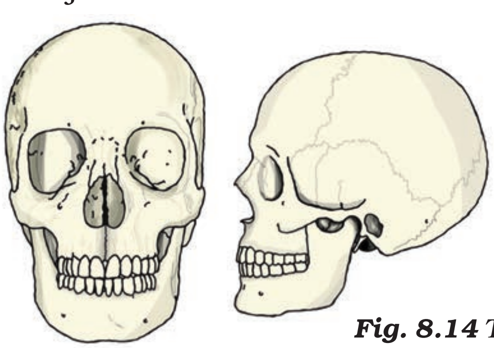
Fig. 8.14 *The skull*

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some additional parts of the skeleton that are not as hard as the bones and which can be bent. These are called **cartilage**.

Feel your ear. Do you find any hard bony parts that can be bent (Fig. 8.15)? There do not seem to be any bones here, isn't it? Do you notice anything different between the ear lobe and the portions above it (Fig. 8.16), as you press them between your fingers?

Fig. 8.15 *Upper part of ear has cartilage*

Fig. 8.16 *The ear lobe*

You do feel something in the upper parts of the ear that is not as soft as the ear lobe but, not as hard as a bone, isn't it? This is cartilage. Cartilage is also found in the joints of the body.

We have seen that our skeleton is made up of many bones, joints and cartilage. You could feel, bend and move many of them. Draw a neat figure of the skeleton in your notebook.

We have learnt about the bones in our body and about joints that help us move in different ways. What makes the bones move the way they do? Let us find out.

Make a fist with one hand, bend your arm at the elbow and touch your shoulder with the thumb (Fig. 8.17). Do you see any change in your upper arm? Touch it with the other hand. Do you observe a swollen region is the upper arm? This is a **muscle**. The muscle bulged due to **contraction** (it became smaller in length). Now bring your arm back to its normal position. What happened to the muscle? Is it still contracted? You can observe similar contraction of muscles in your leg when you walk or run.

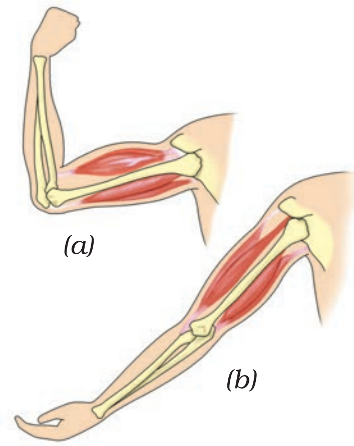


Fig. 8.17 *Two muscles work together to move a bone*

When contracted, the muscle becomes shorter, stiffer and thicker. It pulls the bone.

Muscles work in pairs. When one of them contracts, the bone is pulled in that direction. The other muscle of the pair relaxes. To move the bone in the opposite direction, the relaxed musle contracts to pull the bone towards its original position, while the first relaxes. A muscle can only pull. It cannot push. Thus, two muscles have to work together to move a bone. (Fig. 8.17)

Are muscles and bones always required for movement? How do other animals move? Do all animals have bones? What about an earthworm or a snail? Let us study the manner of movement, that is, the gait of some animals.

8.2 "Gait of Animals"

Earthworm

Activity 5

Observe an earthworm moving on soil in a garden. Gently lift it and place it on a piece of blotting or filter paper. Observe its movement (Fig. 8.18). Then place it on a smooth glass plate or any slippery surface. Observe its movement now. Is it different from that on paper? In which of the above two surfaces do you find that the earthworm is able to move easily?

The body of an earthworm is made up of many rings joined end to end. An

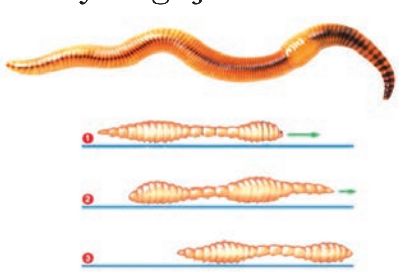


Fig. 8.18 *Movement of earthworm*

earthworm does not have bones. It has muscles which help to extend and shorten the body. During movement, the earthworm first extends the front part of the body, keeping the rear portion fixed to the ground. Then it fixes the front end and releases the rear end. It then shortens the body and pulls the rear end forward. This makes it move forward by a small distance. Repeating such muscle expansions and contractions, the earthworm can move through soil. Its body secretes a slimy substance to help the movement.

How does it fix parts of its body to the ground? Under its body, it has a large number of tiny bristles (hair like structures) projecting out. The bristles are connected with muscles. The bristles help to get a good grip on the ground.

The earthworm, actually, eats its way through the soil! Its body then throws away the undigested part of the material that it eats. This activity of an earthworm makes the soil more useful for plants.

Snail

Activity 6

Observe a snail in your garden or in field. Have you seen the rounded structure it carries on its back (Fig. 8.19)?

Fig. 8.19 *A snail*

This is called the shell and it is the outer skeleton of the snail, but is not made of bones. The shell is a single unit and does not help in moving from place to place. It has to be dragged along.

Place the snail on a glass plate and watch it. When it starts moving, carefully lift the glass plate along with the snail over your head. Observe its movements from beneath.

A thick structure and the head of the snail may come out of an opening in the shell. The thick structure is its foot, made of strong muscles. Now, carefully tilt the glass plate. The wavy motion of the foot can be seen. Is the movement of a snail slow or fast as compared to an earthworm?

Cockroach

Activity 7

Observe a cockroach (Fig. 8.20).

Cockroaches walk and climb as well as fly in the air. They have three pairs of legs. These help in walking. The body is covered with a hard outer skeleton. This outer skeleton is made of number of plates joined together and that permits movement.

Fig. 8.20 *A cockroach*

There are two pairs of wings attached to the body behind head. The cockroaches have distinct muscles — those near the legs move the legs for walking. The body muscles move the wings when the cockroach flies.

Birds

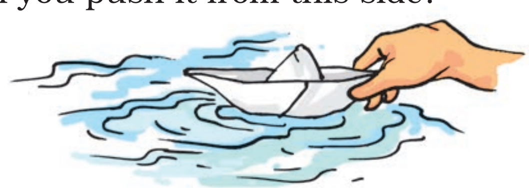
Birds fly in the air and walk on the ground. Some birds like ducks and swans also swim in water. The birds can fly because their bodies are well suited for flying. Their bones are hollow and light. The bones of the hind limbs are typical for walking and perching. The bony parts of the forelimbs are modified as wings. The shoulder bones are strong. The breastbones are modified to hold muscles of flight which are used to move the wings up and down (Fig. 8.21).

Fig. 8.21 *Skeleton of a bird*

Fish

Activity 8

Make a paper boat. Put it in water and push it with one narrow end pointing forward [Fig. 8.22 (a)]. Did it go into the water easily? Now hold the boat sideways and push it into the water from the broad side [Fig. 8.22 (b)]. Are you able to make the boat move in water when you push it from this side?



(a)

(b)

Fig. 8.22 *Playing with boats*

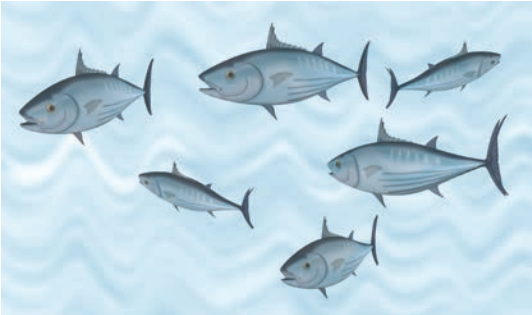


Fig. 8.23 *Fish*

Have you noticed that the shape of a boat is somewhat like a fish (Fig 8.23)? The head and tail of the fish are smaller than the middle portion of the body – the body tapers at both ends. This body shape is called **streamlined**.

The shape is such that water can flow around it easily and allow the fish to move in water.The skeleton of the fish is covered with strong muscles. During swimming, muscles make the front part of the body curve to one side and the tail part swings towards the opposite side. The fish forms a curve as shown in Fig. 8.24. Then, quickly, the body and tail curve to the other side. This makes a jerk and pushes the body forward. A series of such jerks make the fish swim ahead. This is helped by the fins of the tail.

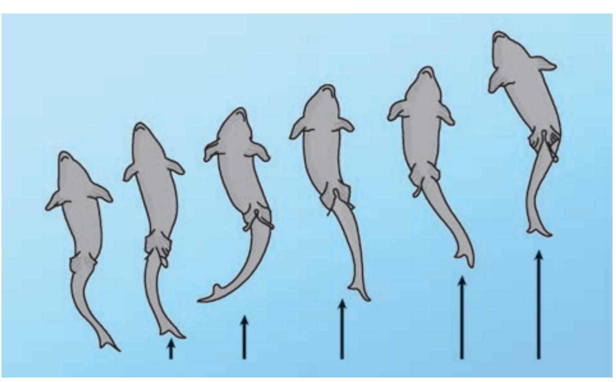


Fig. 8.24 *Movement in Fish*

Fish also have other fins on their body which mainly help to keep the balance of the body and to keep direction, while swimming. Did you ever notice that under water divers wear fin like flippers on their feet, to help them move easily in water?

How do snakes move?

Have you seen a snake slither? Does it move straight(Fig. 8.25)?

Snakes have a long backbone. They have many thin muscles. They are connected to each other even though they are far from one another. Muscles also interconnect the backbone, ribs and skin.

The snake's body curves into many loops. Each loop of the snake gives it a forward push by pressing against the ground. Since its long body makes many loops and each loop gives it this push, the snake moves forward very fast and not in a straightline.

We have learned about the use of bones and muscles for the movements of different animals. Paheli and Boojho have many questions in their sacks about the different movements in animals. So must you be having many unanswered questions buzzing in your

Fig. 8.25 *Movement in a snake*

minds? The ancient Greek philosopher Aristotle, in his book *Gait of Animals*, asked himself these questions. Why do different animals have the body parts that they do have and how do these body parts help animals to move the way they do? What are the similarities and differences in these body parts between different animals? How many body parts are needed by different animals for moving from place to place? Why two legs for humans and four for cows and buffaloes? Many animals seem to be having an even number of legs, why? Why is the bending of our legs different from that of our arms?

So many questions and perhaps we have looked for some answers through our activities in this chapter and we need to look for many more answers.

Yoga — For Better Health

Yoga is an invaluable gift of the ancient Indian tradition. The United Nations declared 21 June as International Day of Yoga. Yoga keeps a person healthy. It helps in keeping the backbone erect, enabling you to sit straight and not slouch. Many postures in yoga require you to lift your own weight, which help in making the bones strong and help ward off osteoporosis. It also helps in relieving joint pain, which is mostly observed in elderly people. It tunes all muscles in the body and keeps them active. It keeps the heart healthy and makes it work more efficiently. Certain yoga postures should be performed under the supervision of a trained person.

Key words

Backbone	Muscle
Ball and socket joint	Outer skeleton
Bristles	Pelvic bones
Cartilage	Pivotal joint
Cavity	Rib cage
Fixed joint	Shoulder bones
Gait of animals	Skeleton
Hinge joint	Streamlined

Summary

- Bones and cartilage form the skeleton of the human body. It gives the frame and shape to the body and helps in movement. It protects the inner organs.
- The human skeleton comprises the skull, the back bone, ribs and the breast bone, shoulder and hipbones, and the bones of hands and legs.
- The bones are moved by alternate contractions and relaxations of two sets of muscles.
- The bone joints are of various kinds depending on the nature of joints and direction of movement they allow.
- Strong muscles and light bones work together to help the birds fly. They fly by flapping their wings.
- Fish swim by forming loops alternately on two sides of the body.
- Snakes slither on the ground by looping sideways. A large number of bones and associated muscles push the body forward.
- The body and legs of cockroaches have hard coverings forming an outer skeleton. The muscles of the breast connected with three pairs of legs and two pairs of wings help the cockroach to walk and fly.
- Earthworms move by alternate extension and contraction of the body using muscles. Tiny bristles on the underside of the body help in gripping the ground.
- Snails move with the help of a muscular foot.

Exercises

1. Fill in the blanks:
   (a) Joints of the bones help in the ____________ of the body.
   (b) A combination of bones and cartilages forms the ______ of the body.
   (c) The bones at the elbow are joined by a ___________________ joint.
   (d) The contraction of the ___________ pulls the bones during movement.
2. Indicate true (T) and false (F) among the following sentences.
   (a) The movement and locomotion of all animals is exactly the same. ( )
   (b) The cartilages are harder than bones. ( )
   (c) The finger bones do not have joints. ( )
   (d) The fore arm has two bones. ( )
   (e) Cockroaches have an outer skeleton. ( )
3. Match the items in Column I with one or more items of Column II.

Column I	Column II
Upper jaw	have fins on the body
Fish	has an outer skeleton
Ribs	can fly in the air
Snail	is an immovable joint
Cockroach	protect the heart
	shows very slow movement
	have a streamlined body

4. Answer the following:
   (a) What is a ball and socket joint?
   (b) Which of the skull bones are movable?
   (c) Why can our elbow not move backwards?

THINGS TO THINK ABOUT

We discussed the many movements our bodies are capable of. Healthy bones, muscles, joints and cartilages are needed by the body for all these movements. Some of us suffer from conditions that could make these movements not so easy. In a whole class activity, try to find ways that one would manage everyday activities, if any one of our body movements was not possible. In Activity 1, for instance, you tied a scale on your arm and disabled the elbow movement. Think of other ways of restricting normal body movements and find ways that everyday activities could then be managed.