

# 3

## Body Movements



*"Bones in our body form the framework that supports the whole body."*

### Introduction

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 a fish swims? All living organisms show some type of movement. Animals, however, move more freely. It is obvious when you call your pet dog, it comes running. The same is not true for a tree.

### Movement and locomotion

The ability to move has been used as a criterion to differentiate plants and animals. Though movement is quite common in plants, it is not always apparent. Animals possess definite organs for locomotion.

The act of moving from place to place is known as locomotion. It involves the movement of the whole body as in walking, running, swimming or flying. Movement is the change in position of only a part of the body, as movement of stem towards light in plants.

Movements in animals help them to move towards safety and to places where food and water are available.

**SPOT LIGHT**

**Active****Biology****1**

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

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

**Suggested Answer**

No, you would not be able to bend your arm in this condition as the tied scale is hindering movement at the level of your elbow joint.

**Table: How do animals move from place to place?**

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



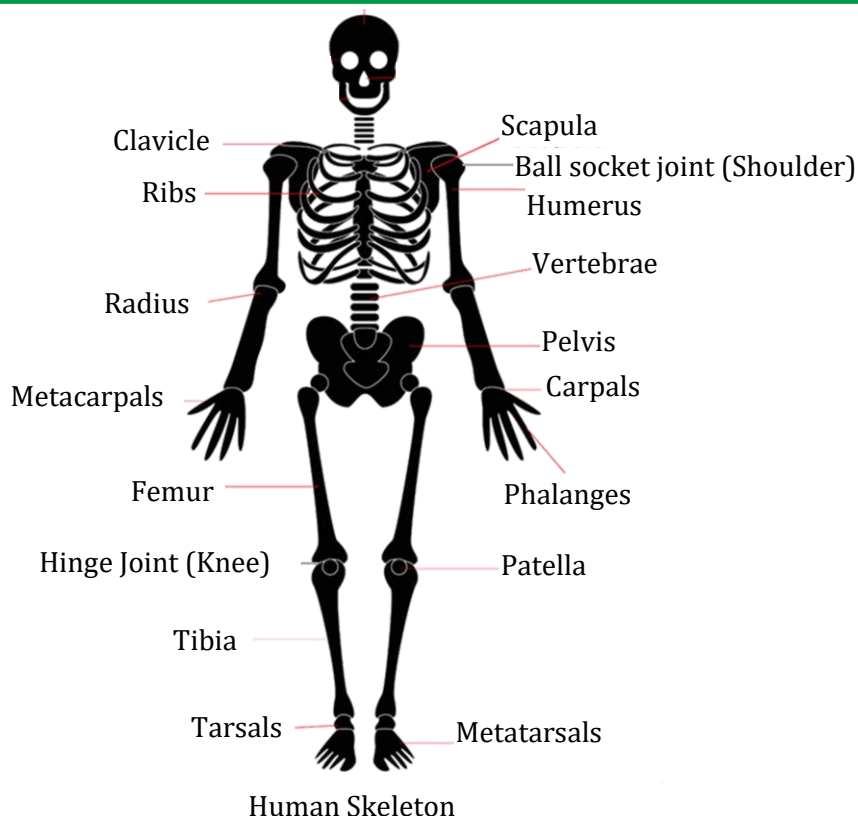
Skeleton is the term used to describe the framework of the body formed by the bones & cartilages.

**SPOT LIGHT****Ans.**

Animal	Body parts used for moving from place to place	How does the animal move?
Cow	Legs	Walk
Human	Legs	Walk
Snake	Whole body	Slither
Bird	Wings	Fly
Insect	Wings and legs	Walk and fly
Fish	Fins	Swim

**Human body and its movement****Skeletal system**

The skeleton consists of Skull, Backbone, Ribs, Breastbone, Shoulder bones, Hip bone, Arm bones and Leg bones.



### Do You Remember ?

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.



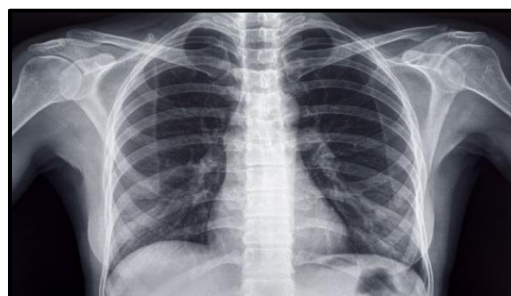
### Building Concepts

1

### What is the utility of X-ray unit in a hospital?

#### Explanation

Doctors use X-rays to examine the bones in our body particularly when you suffer a fracture. The X-ray images show the shape and number of bones in the various parts of our body. An X-ray is usually taken in a hospital to find out whether the bone of a person has been fractured (or broken) during an accident.



X-ray of chest

## Skull

The bones of skull form a strong case around the brain. In this way, skull protects the brain. The skull also protects the main sense organs like eyes, ears and nose. The eyes are contained in two large cavities called 'eye sockets' in front of the skull.



Human Skull

## Backbone

The backbone is a long, hollow, rod-like structure running from the neck to the hips, inside our body. The scientific name of backbone is vertebral column. Backbone forms the main supporting structure of the body.

Top 7 vertebrae of backbone form our neck.

## Rib cage

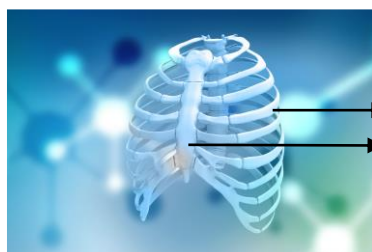
If we take a deep breath, hold it for a while and move our hand on the chest, we will find a number of bones in the chest region. These chest bones are called ribs. Ribs are the curved bones in our chest. Ribs exist in pairs. There are 12 pairs of ribs in the chest of our body.

The hollow, bony structure formed by the ribs is called 'rib cage'.

Ribs are attached in front to breast bone or sternum and at the back they are attached to backbone.



Backbone



Ribcage

Ribs  
Sternum



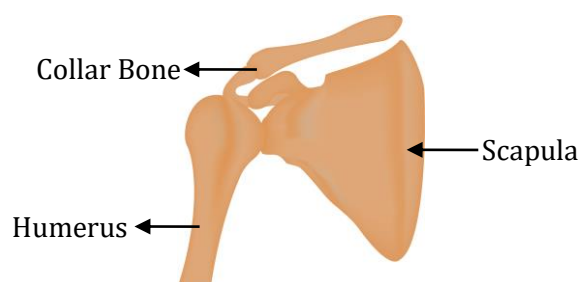
Calcium is essential for strong healthy bones. 99% of calcium in our body is in our bones and teeth.

**SPOT LIGHT**

**Shoulder bone :** Shoulders are that part of the body (or skeleton) to which our arms are attached. The human body has two shoulders, one on each side of the neck. There are two shoulder bones: collar bone and shoulder blade.



Shoulder Bones



Collar Bone

Scapula

Humerus

**Hip Bone :** The thigh bones of our legs are joined to the hip bone by the ball and socket joints. Actually, hip bone forms the link between upper part of our body (called trunk) and the legs.



Hip Bone

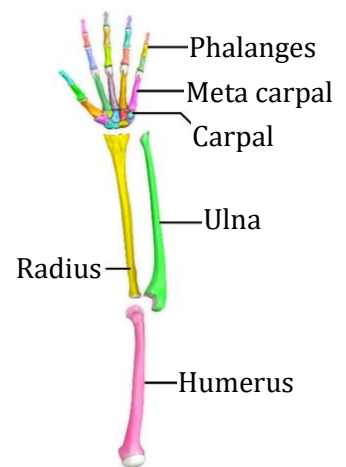
The hip bone is always known as pelvic bone (or pelvis).

SPOT LIGHT

### Bones of the hand

Each arm consists of three parts – upper arm, lower arm and hand. The hand consists of various small bones which form wrist, palm and fingers. Our hand is made up of three parts : wrist, palm and fingers.

Upper arm consists of a single bone called 'humerus'. Lower arm is made up of two bones – radius and ulna. Wrist bones are known as carpals. They are 8 in number. Bones of palm are known as metacarpals. They are 5 in number. Bones of fingers are known as phalanges. They are 14 in number.



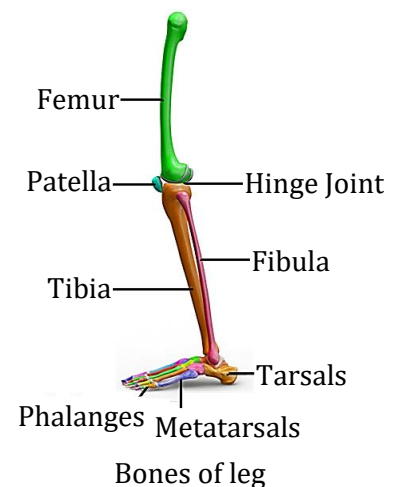
Bones of Hand



Bones of the hand

### Bones of the legs:

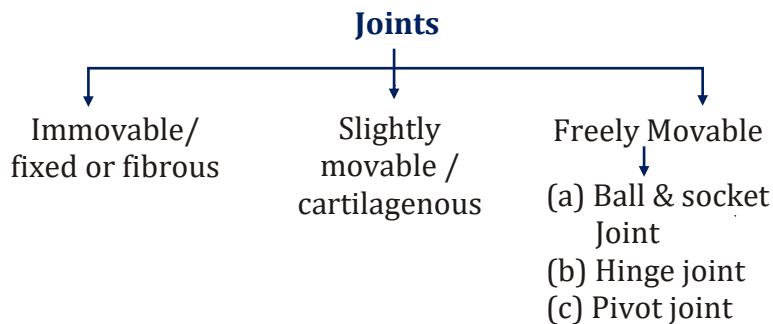
- Each leg consists of three parts – upper leg, lower leg and foot.
- Bone of upper leg - femur (Longest bone)
- Bone of knee cap - patella
- Bones of lower leg - tibia and fibula
- Bones of foot –
- Bones of ankle - tarsals (7)
- Bone of middle part of foot - metatarsals (5)
- Bone of fingers - phalanges (14)



Bones of leg

## Joints

The structural arrangements of tissues by which bones are joined together are called joints. According to the mobility, joints are classified as:-



Milk contains several important nutrients. A glass of milk will give us calcium, protein, iodine, potassium, phosphorus, vitamin B2 and B12 etc.

**SPOT LIGHT**

### Immovable joints/fixed joints

In some joints, the bones are held so tightly together that they cannot move at all. Such joints are called fixed joints. These joints allow no movement. For example, the bones of skull are interlocked with each other by their serrated margins called sutures, joints in tooth sockets, upper jaw.

### Slightly movable/cartilagenous

In these joints, a pad of flexible cartilage is present between the bones which make slight movement possible. Such joints are present between adjacent vertebrae in the backbone.

### Freely movable joints

These joints allow free movement of bones in various directions. These are also known as synovial joints.


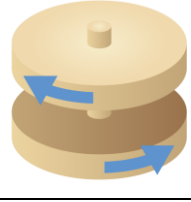
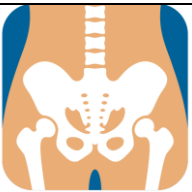

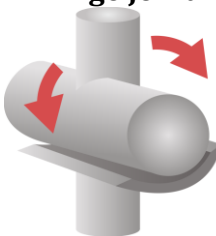
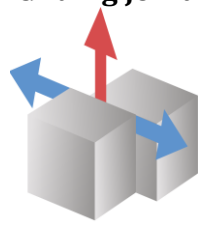


- (a) **Ball and socket joint:** In this joint, the rounded head (like a ball) of one bone fits into a cup-shaped cavity formed by the other bone. This allows movement in all directions. For example, you can move your shoulder and hip in all directions.
- (b) **Hinge joint:** The hinge joints allow the movement only in one direction (back and forth movement) like those of a door or the lid of a box. Elbow joint (joints between the upper and the lower arm), knee-joint (between thigh and lower leg) are examples of this type of joint.
- (c) **Pivot joint:** Such joints allow rotation only. Pivot joint occurs where our neck joins the head. It allows the head to move backward and forward and turn the head to our right or left. The head rotates over a cylindrical bone of the neck.

Potassium is the most abundant mineral element in muscles.

**SPOT LIGHT**



- (d) **Gliding joint:** Also known as plane joint. It allows the bones to glide past one another providing little movement. e.g. at ankle and carpals in wrist.

<p><b>Ball and socket joint</b></p> 	<p><b>Pivot joint</b></p> 
<p>In this type of joint, the ball-like surface of one bone fits into a cup-like hollow in the other. A ball-and-socket joint allows maximum movement in all directions. <b>Examples:</b> Joints at the hip and the shoulder.</p>	<p>In this joint, the rounded surface of one bone fits into a ring formed by the other, such that one bone is able to rotate over the other. <b>Example:</b> Joint where the neck joins the head.</p>
	
<p><b>Hinge joint</b></p> 	<p><b>Gliding joint</b></p> 
<p>This kind of joint provides back and forth movement similar to the hinges of a door. <b>Examples:</b> Joints at the knee and the elbow.</p>	<p>This kind of joint allows bones to glide over each other, providing little movement in all directions. <b>Examples:</b> Joints at the ankle and the carpals in wrist.</p>
	

Various joints

Ligament – attach bone to bone, Tendon – attach bone to muscles

### Cartilage

Some additional parts of the skeleton that are not as hard as the bones and which can be bent. These are cartilage. Cartilage is soft, smooth and elastic tissue. 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. It is also found in the joints of the body. We have seen that our skeleton is made up of many bones, joints and cartilages.



Upper part of ear has cartilage



The ear lobe

## Muscular system

Muscular system consists of muscles which helps in locomotion and movement.

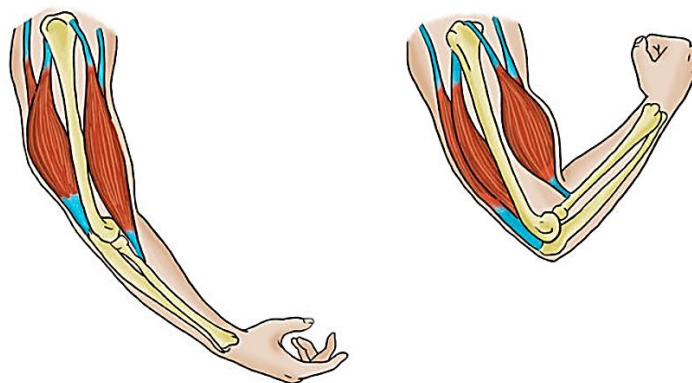
Locomotion is the result of co-ordinated action of muscles of the limb bones. The contraction and relaxation of muscles move the bones.

## Muscles

Muscles are the fibrous tissue which possess the property of contraction and relaxation. It is the property of muscles which is responsible for the movement of bones and joints.

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 muscles of the pair relax. To move the bone in the opposite direction, the relaxed muscle 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 move together to move a bone.



Two muscles work together to move a bone

## How do our arms move?

To understand the movement, let us perform the following acts:

You can observe similar contraction of muscles in your leg when you walk or run.



## Aim

To understand the action of muscles.



## Experiment

Make a fist with one hand. Bend your arm at the elbow and touch your shoulder with the thumb.

With your other hand, see if there is any change in your upper arm.

## Observation & conclusion

You will feel a swollen region inside your upper arm. This swollen region is due to a swollen muscle. This is due to contraction of the muscle.

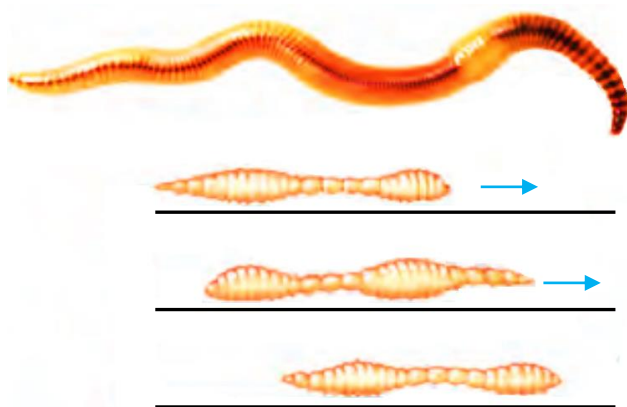
Now bring your arm back to its normal position and note what happens. You will feel that the swollen muscle is no longer present. It has returned to its earlier normal position. This is due to relaxation of muscles.

## Gait in animals

### Earthworm

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



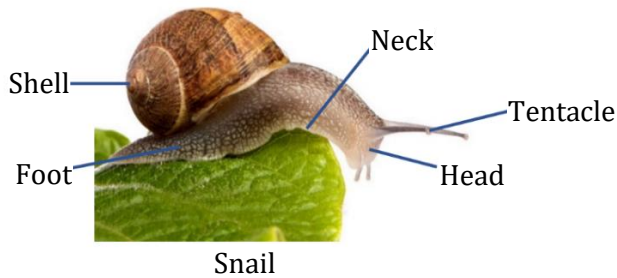
Movement of earthworm



Earthworm

## Snail

The snail moves with the help of a large, disc shaped muscular foot. It deposits a little fluid, at its front end and walks smoothly over this fluid. The shell is dragged along with the foot, as the shell cannot move by itself.



A snail can slide over a razor blade without getting hurt! The slimy mucous enables it to slide over sharp objects without being injured!

**SPOT LIGHT**

There are two sets of muscles in the foot of snail which contracts and expand alternately, producing a kind of wave effect. A series of waves in the muscles of foot make the snail move forward.

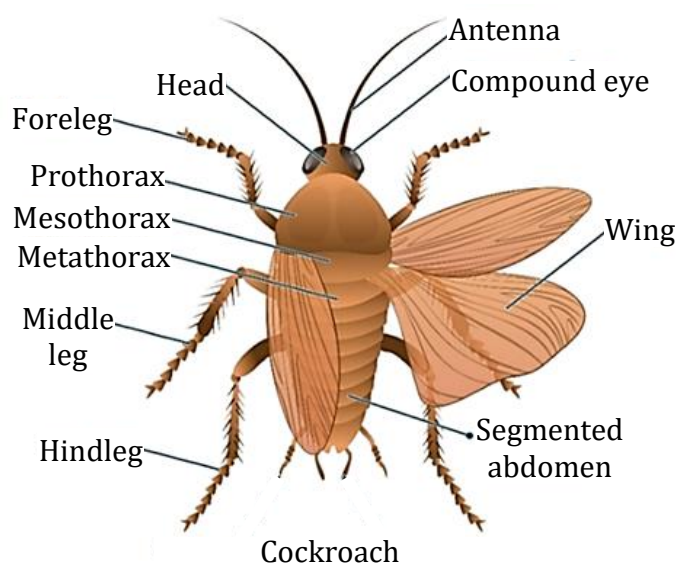
## Cockroach

Cockroaches are insects which come out at night to feed. They can walk, climb as well as fly in the air. Two pairs of wings are present. Three pairs of legs are also present which help in walking. Bones are not present. The body is covered with a hard outer skeleton. This outer skeleton is made of different units joined together and this permits movement.

Muscles present near the legs help in walking while the breast muscles attached to the wings help in flying.

The skeleton of a cockroach is covered with hard and tough outer covering called exoskeleton because it is present outside the body.

**SPOT LIGHT**



## Fish:

Various adaptations are found in fish which help in movement.

### (i) The fish has flexible backbone.

Due to flexible backbone, the fish can bend its body easily from side to side to move through water.

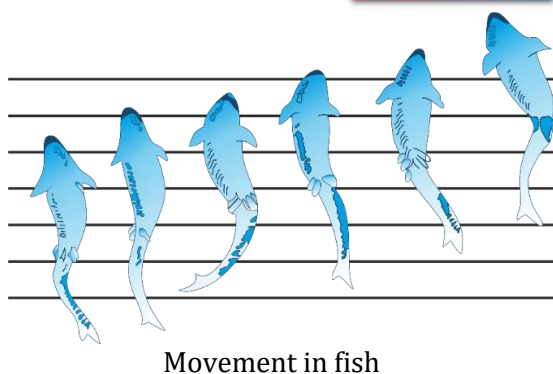
### (ii) The fish has fins.

The thin and flat projections on the body of fish are called fins that help in steering, balancing and stopping in water. The tail fin also helps in moving the fish forward in water.



### (iii) The fish has powerful body muscles.

The powerful body muscles of fish on both sides help in moving its tail on both sides. 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. 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. Fish also have other fins on their body which mainly help to keep the balance of the body and to keep direction, while swimming.



## Snakes:

Snakes have a long backbone and a large number of thin muscles. The muscles are connected to each other. Backbone, ribs and skin are also connected to the muscles. Movement takes place by crawling. A snake contracts and relaxes the muscles on the two sides of its body alternately to form many loops in which different parts of the snake's body are moving to the left side and right side at the same time. Each sideways moving loop of snake pushes back against the ground and gives the snake a forward push. The resultant push of all the loops of snake's body make it move forward very fast.



Snake

**Birds:**

Birds are adapted to fly in the air and walk on the ground. Birds like duck and swans swim in water. Birds walk on the ground by using their hind limbs. Those birds which swim in water do so by pushing against water with their hind limbs which have webbed feet that helps in swimming.



Sparrow



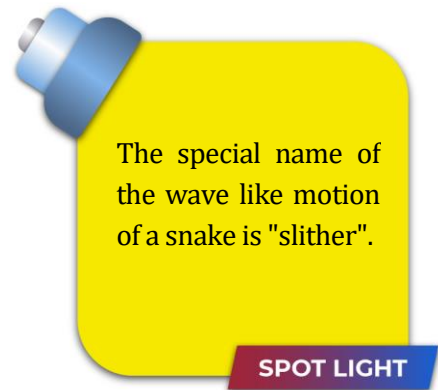
Skeleton of a Bird

Birds have following adaptations which enable them to fly:

- (i) Their forelimbs are modified to form wings for flying.
- (ii) Their flight feathers provide a large flat surface which is light but strong.
- (iii) Their bones are hollow and light.
- (iv) Their bodies are streamlined and extremely light.
- (v) They have powerful flight muscles.
- (vi) Their breastbone is extended for the attachment of large flight muscles.

**Yoga – For Better Health**

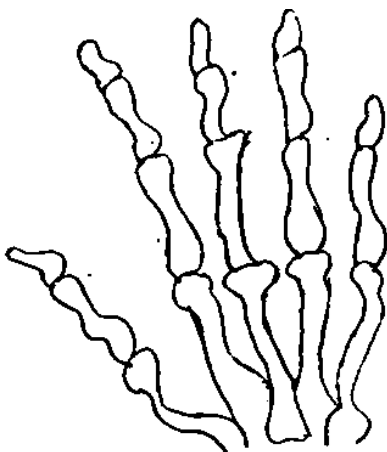
21<sup>st</sup> June celebrated as International Day of Yoga by United Nation. Yoga keeps the backbone erect enable us to sit straight. During yoga lifting our own weight helps in making the bones strong and get rid of osteoporosis. It also helps in relieving joint pain which mainly observed in elder age group. It activates all the muscles in the body. It also keeps the heart healthy and it works efficiently. Certain yoga postures should be performed under the supervision of a trained person.



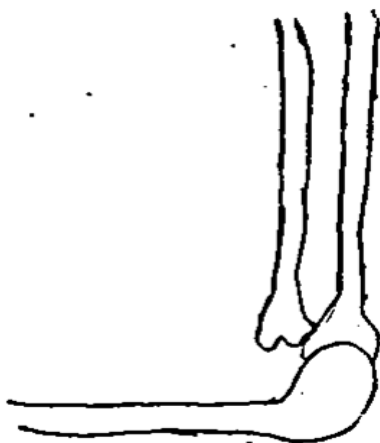
The special name of the wave like motion of a snake is "slither".

**SPOT LIGHT**

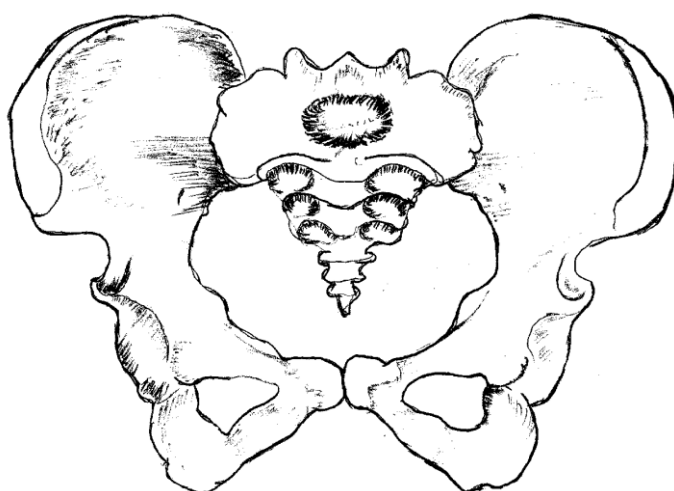
## Biology Diagrams made Easy



Bones of Hand

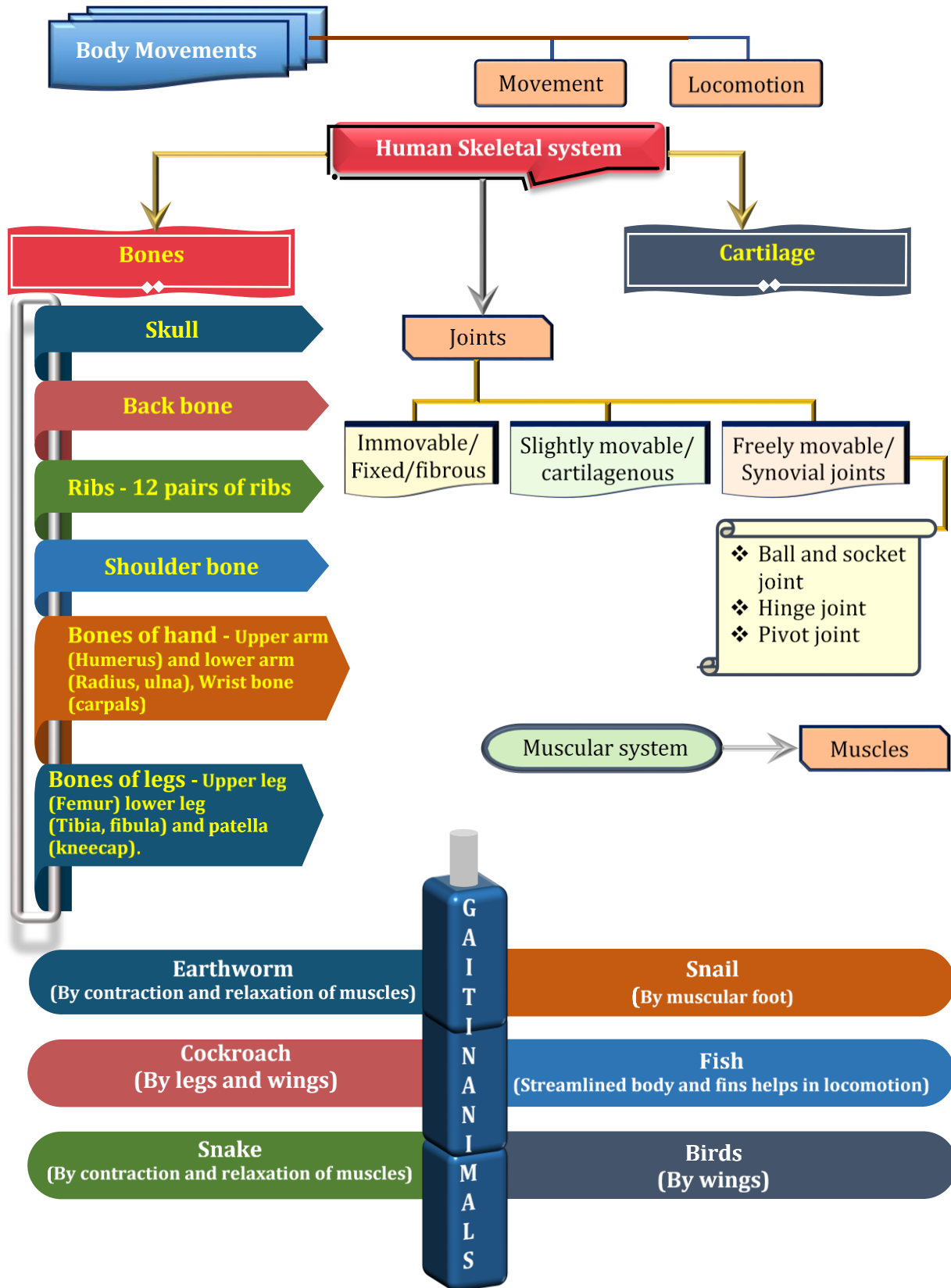


Hinge joints of the knee



Pelvic bone

## Chapter At a Glance





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### SOME BASIC TERMS

1. **Backbone** : The back that provide support for the body.
2. **Muscle** : A soft tissue that has ability to contract.
3. **Bristles** : A short stiff hairs.
4. **Streamlined** : Tapers at ends and bulge at middle.
5. **Skeleton** : Framework of bone.
6. **Pelvic Bone** : Bones located in abdominal cavity.
7. **Cavity** : A hollow region inside the bones.
8. **Outer skeleton** : Outer hard covering.
9. **Osteoporosis** : Bone become weak and brittle.
10. **Patella** : Knee cap