BIOLOGY

Standard

X

Part - 1

1/2

Government of Kerala
Department of General Education

State Council of Educational Research and Training
(SCERT), Kerala
2019

The National Anthem

Jana-gana-mana adhinayaka, jaya he
Bharatha-bhagya-vidhata.
Punjab-Sindh-Gujarat-Maratha
Dravida-Utkala-Banga
Vindhya-Himachala-Yamuna-Ganga
Uchchala-Jaladhi-taranga
Tava subha name jage,
Tava subha asisa mage,
Gahe tava jaya gatha.
Jana-gana-mangala-dayaka jaya he
Bharatha-bhagya-vidhata.
Jaya he, jaya he, jaya he,
Jaya jaya jaya, jaya he!

Pledge

India is my country. All Indians are my brothers and sisters.

I love my country, and I am proud of its rich and varied heritage. I shall always strive to be worthy of it.

I shall give respect to my parents, teachers and all elders and treat everyone with courtesy.

I pledge my devotion to my country and my people. In their well-being and prosperity alone lies my happiness.

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Dear Students,

You will be curious to know how we sense and respond to our environment through the windows of knowledge. You will certainly be surprised to learn how the human brain, nerves and hormones act together to co-ordinate the activities of the human body and the genetic secrets behind the uniqueness of living species, the recent developments in the field of Biotechnology which leads to the progress in human life. The path of evolution related to the origin of humans on earth has also been included in the book. How the wonder machine that is, the human body prevents diseases, and the precautionary measures to be followed to keep diseases away are also mentioned here. Reminders on avoiding accidents caused by carelessness, incorporated with learning activities will be beneficial in your daily life.

The student's role is pivotal in the process of construction of knowledge. This Science textbook is only a resource in the learning process. Teachers and supplementary materials will help you in the creation of knowledge. 'Samagra', the education portal and technology enabled Q R Code printed textbooks would definitely make your learning activity in classrooms easy and joyful.

The National Skills Qualifications Framework, the current relevance of Disaster Management and the possibilities of I.C .T. have also been considered while modifying the textbook. Let all this be beneficial for you in the learning of Science by joyfully participating in life related learning experiences that impart knowledge and happiness.

Love and Regards,

Dr. J.Prasad
Director
SCERT, Kerala

CONSTITUTION OF INDIA

Part IV A

FUNDAMENTAL DUTIES OF CITIZENS

ARTICLE 51 A

Fundamental Duties- It shall be the duty of every citizen of India:

(a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;

(b) to cherish and follow the noble ideals which inspired our national struggle for freedom;

(c) to uphold and protect the sovereignty, unity and integrity of India;

(d) to defend the country and render national service when called upon to do so;

(e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;

(f) to value and preserve the rich heritage of our composite culture;

(g) to protect and improve the natural environment including forests, lakes, rivers, wild life and to have compassion for living creatures;

(h) to develop the scientific temper, humanism and the spirit of inquiry and reform;

(i) to safeguard public property and to abjure violence;

(j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievements;

(k) who is a parent or guardian to provide opportunities for education to his child or, as the case may be, ward between age of six and fourteen years.

Content

Part - I

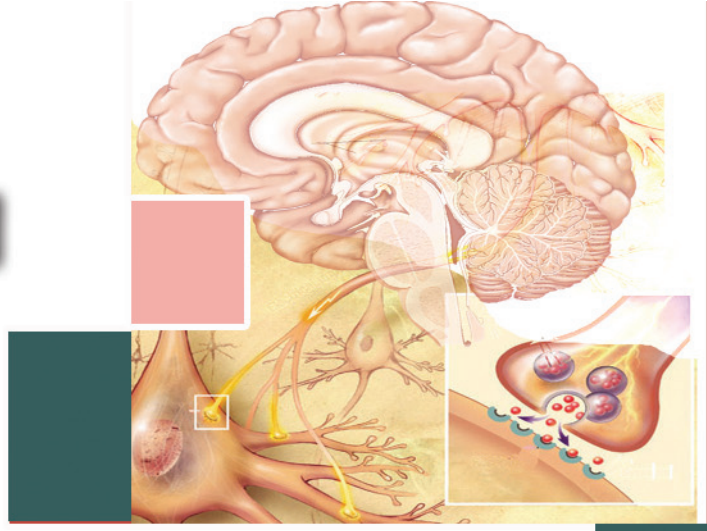
Certain icons are used in this textbook for convenience

For further reading
(Evaluation not required)

Let us Assess

Extended Activities

1 Sensations and Responses



Observe the picture. Children and other organisms have a variety of experiences. What are they?

- a child tasting a mango.
- a snail withdrawing its body into the shell when it is touched.
-

What are the factors to which children and other organisms respond here?

- taste
- touch
-
-

The senses that evoke responses in organisms are called stimuli. Do we recognise stimuli only from our immediate surroundings?

Hunger and thirst are stimuli formed inside the body, aren't they? Find out more examples for such stimuli.

How does the body receive stimuli?

Observe illustration 1.1 and form inferences.

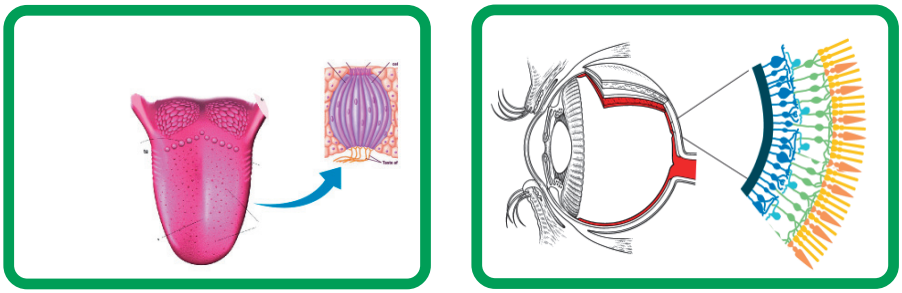


Illustration 1.1 Specialized cells that receive stimuli

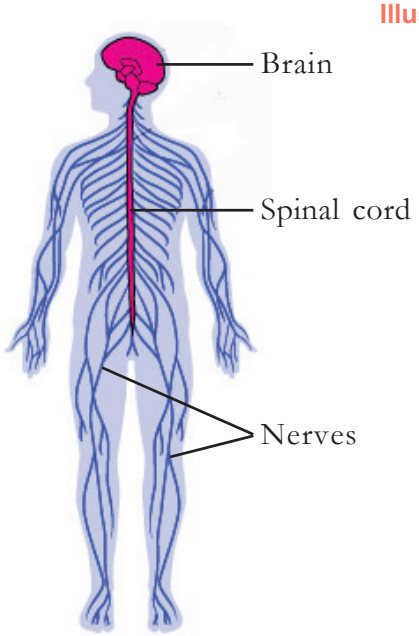


Figure 1.1 Nervous system

There are specialized cells in the sense organs and other parts of the body to receive stimuli. These cells are known as receptors. They receive stimuli and generate suitable impulses.

Normally, responses occur when the impulses generated by the receptors on receiving the stimuli reach the brain. The nervous system controls and co-ordinates these actions.

Analyse figure 1.1 and find out the major parts of the nervous system.

Neuron

Neuron or nerve cell is the basic structural unit of the nervous system. Like all other cells, the neuron has a cell membrane, cytoplasm and nucleus. Analyse illustration 1.2 and tabulate the main parts of a neuron, its characteristics and function. Write them down in the Science diary.

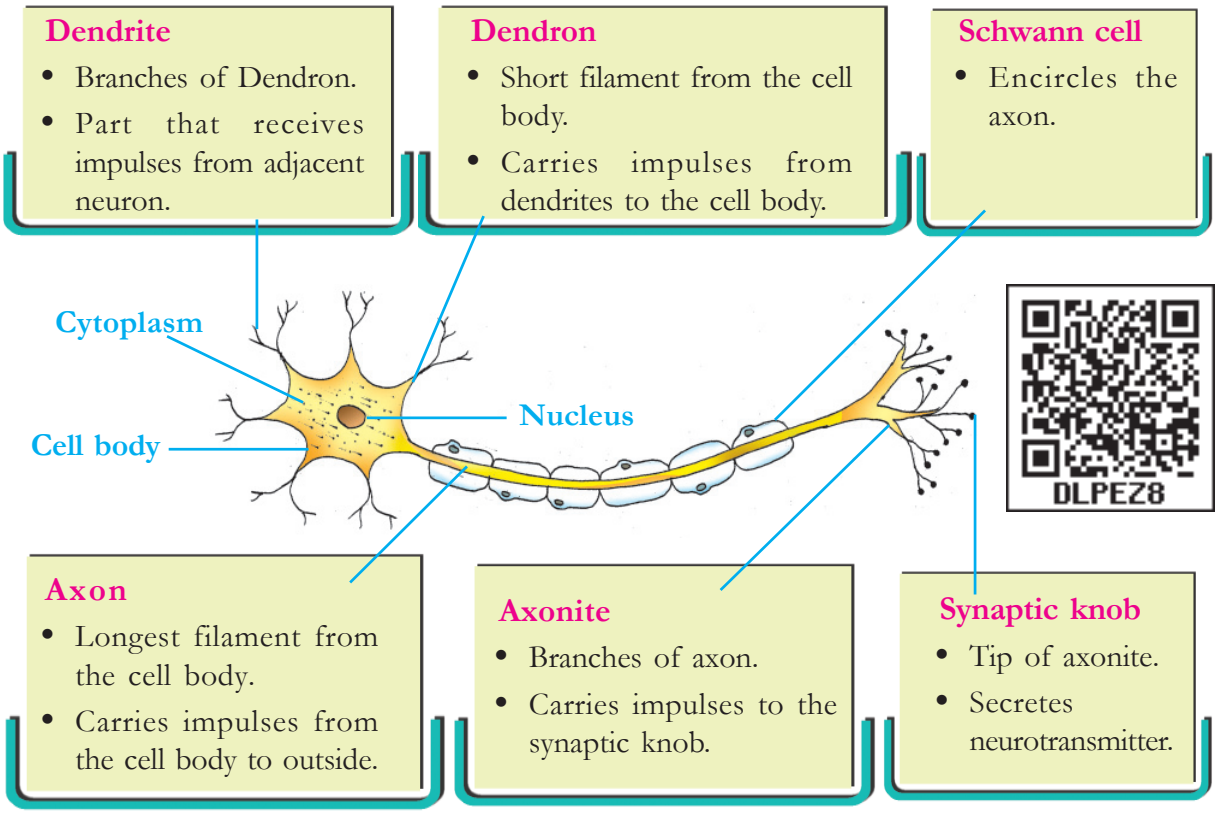


Illustration 1.2 Neuron - Structure and function

Axons of most of the neurons are repeatedly encircled by myelin, a membrane containing lipid. This is called myelin sheath. Analyse illustration 1.3 and the description. Find out the characteristics and significance of myelin sheath and prepare a note on the basis of the indicators given.

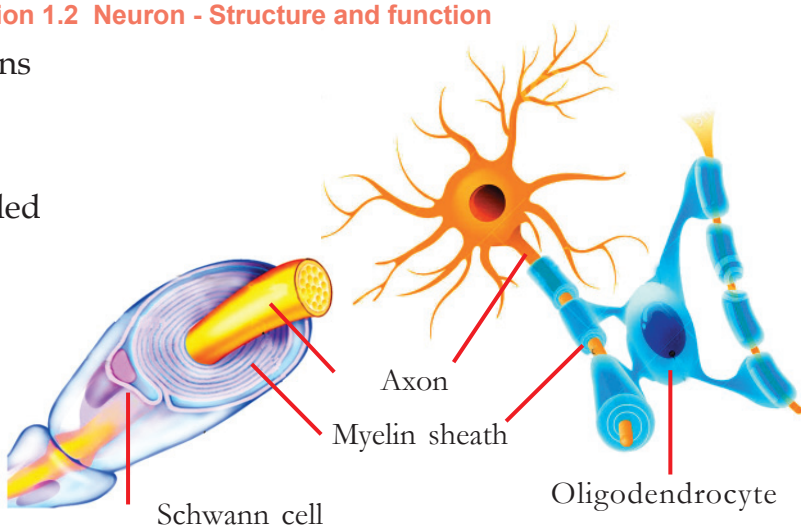


Illustration 1.3 Formation of myelin sheath

Oligodendrocytes and Schwann cells

Oligodendrocytes and Schwann cells provide protection to neurons. An oligodendrocyte constructs myelin sheath by covering the different axons simultaneously or by covering the different parts of the same axon repeatedly.

Myelin sheath made up of Schwann cells are seen in the axons in nerves. A Schwann cell encircles the axon repeatedly.

Nerve is a group of axons. Myelin sheath in the nerves is formed of Schwann cells. Myelin sheath in the brain and the spinal cord is formed of specialized cells called oligodendrocytes. The myelin sheath has a shiny white colour. The part of the brain and the spinal cord where myelinated nerve cells are present in abundance is called white matter and the part where non-myelinated nerves cells are present is called grey matter.

The major functions of the myelin sheath are to provide nutrients and oxygen to the axon, accelerate impulses, act as an electric insulator and protect the axon from external shocks.

Indicators

- Formation of myelin sheath.
- Grey matter, white matter.
- Functions of myelin sheath.

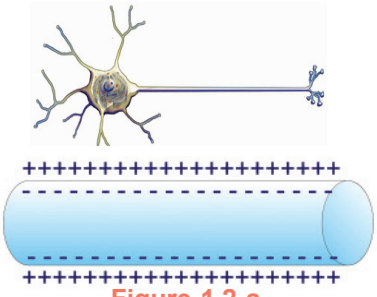


Figure 1.2 a

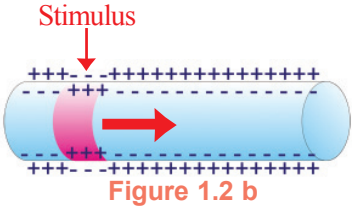


Figure 1.2 b

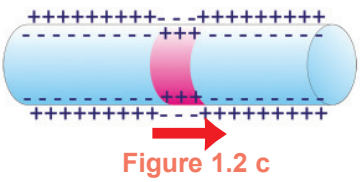


Figure 1.2 c

Generation and Transmission of Impulses

The nervous system manages control and co-ordination through impulses. How are these impulses generated and transmitted through neurons? Analyse the given figures (1.2 a, b, c) on the basis of the description and the indicators, and arrive at your own inferences.

The outer surface of the plasma membrane of the neuron is positively charged and the inner surface is negatively charged. This is due to the difference in the distribution of certain ions (Figure 1.2 a).

When stimulated, the distribution of ions in that particular part changes and hence the inner surface becomes positively charged and the outer surface becomes negatively charged (Figure 1.2 b). This momentary charge difference stimulates its adjacent parts and similar changes occur there too. As this process proceeds, (Figure 1.2 c) impulses get transmitted as electric charges. Nerve impulses are messages transmitted through the neurons.

DLYB1V

Indicators

- Charges on either side of the plasma membrane.
- Change in the charges of ions when stimulated.
- Transmission of nerve impulse.

Synapse

Impulses generated in the receptor cells reach the brain . The brain analyses it and gives direction for proper response. To make this possible, the impulses formed in a neuron are to be transmitted to other neurons and associated cells. How does this become possible? Analyse illustration 1.4 and 1.5 given below, and the description. Prepare a note, based on the indicators and your analysis.

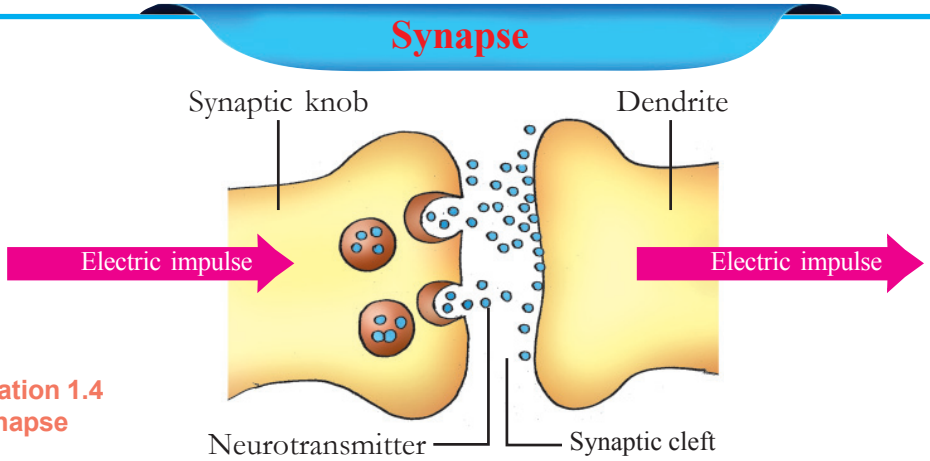


Illustration 1.4
Synapse

Synapse is the junction between two neurons or a neuron and a muscle cell or a neuron and a glandular cell. When electric impulses from the axon reach the synaptic knob, certain chemical substances are secreted from there to the synaptic cleft. These chemical substances are called neurotransmitters. They stimulate the adjacent dendrite or cell and new electric impulses are generated. Acetylcholine and dopamine are examples of neurotransmitters. Synapse helps to regulate the speed and direction of impulses.

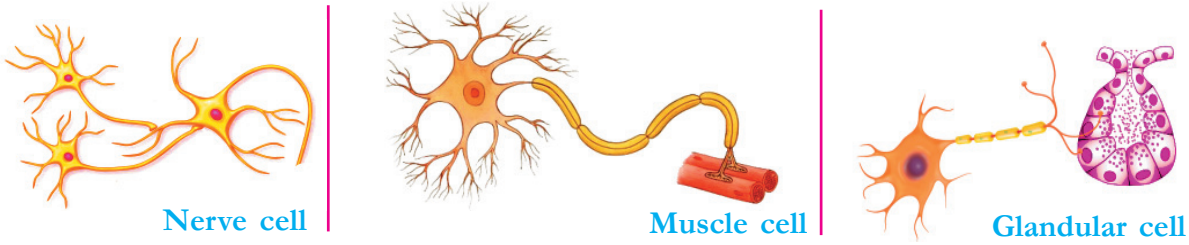


Illustration 1.5 Different types of synapses

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Indicators

- Structure of synapse.
- Transmission of impulses through synapse.
- Significance of neurotransmitter.
- Different types of synapses.

Different types of Neuron

On the basis of the direction of impulse, neurons can be classified into sensory neurons and motor neurons. Sensory neurons carry impulses to the brain and spinal cord. Motor neurons carry impulses from the brain and spinal cord to various parts of the body.

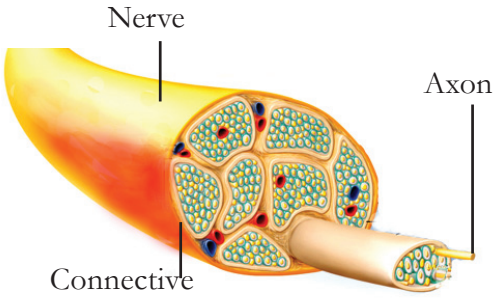


Figure 1.3
Cross section of a nerve

Nerves

You know that nerves are group of axons or nerve fibres. They are covered by connective tissue (Figure 1.3).

Nerves are classified into three on the basis of their functions. Analyse table 1.1 and prepare notes in your Science diary.

Nerves and their peculiarities	Functions
Sensory nerve (formed of sensory nerve fibres)	carries impulses from various parts of the body to the brain and the spinal cord.
Motor nerve (formed of motor nerve fibres)	carries impulses from brain and spinal cord to various parts of the body.
Mixed nerve (formed of sensory nerve fibres and motor nerve fibres)	carries impulses to and from the brain and spinal cord.

Table 1.1 Nerves and their functions

Nervous System

The nervous system consists of two parts, namely the central nervous system and the peripheral nervous system. Analyse illustration 1.6 and complete the flow chart.

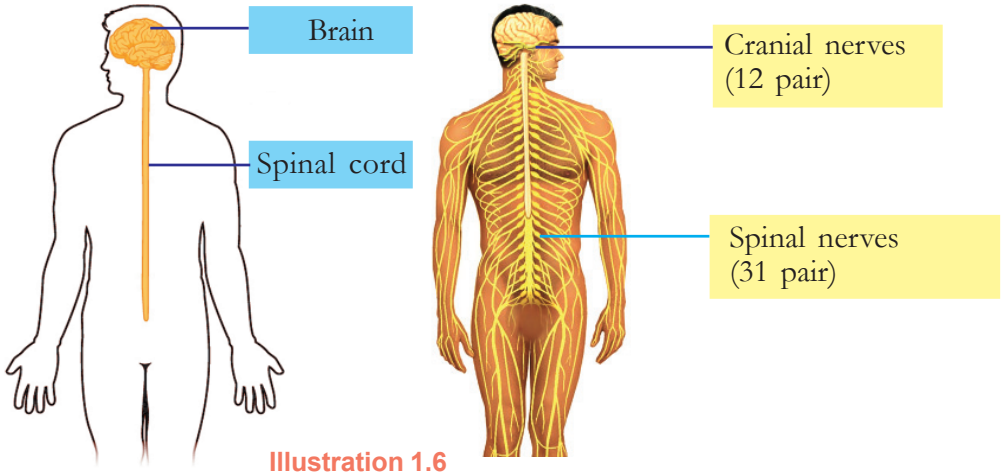
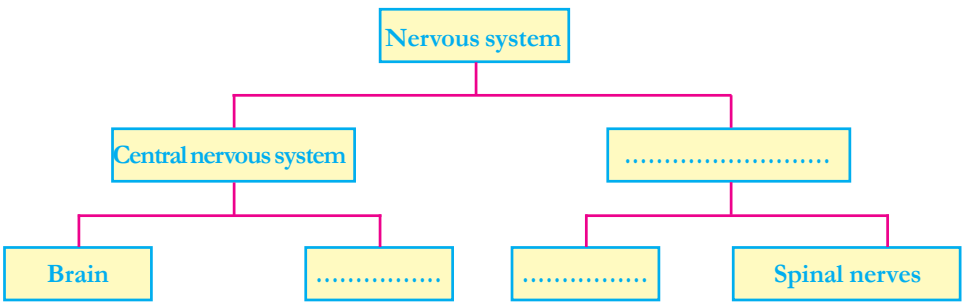


Illustration 1.6

Central nervous system Peripheral nervous system



Brain

Brain is the central part of the nervous system. Based on the indicators, analyse figure 1.4 and the description, understand how the brain gets nutrition and protection. Make notes in your Science diary.

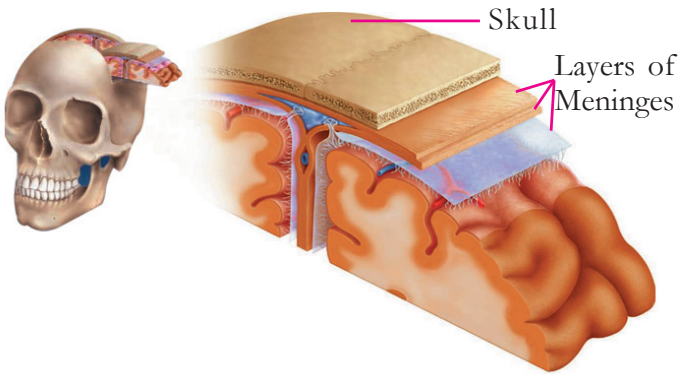


Figure 1.4
Meninges

The brain is protected inside the skull. It is covered by the meninges, a three-layered membrane. The cerebrospinal fluid is filled within the inner membranes of meninges and the ventricles of the brain.

The cerebrospinal fluid formed from the blood is reabsorbed into the blood. The functions of the cerebrospinal fluid are to provide nutrients and oxygen to the tissues of the brain, regulate the pressure inside the brain and to protect the brain from injuries.

Indicators

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- Protection of the brain.
- Nourishment of the brain.

The different parts of the brain control and coordinate all life activities. Analyse illustration 1.7 showing the structure of the brain and list the characteristics and functions of each part.

Cerebrum

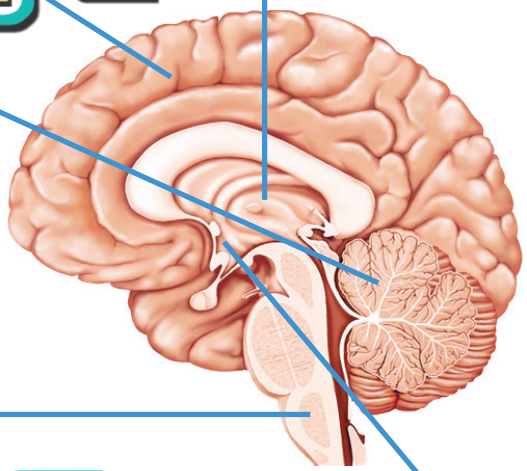
- the largest part of the brain.
- numerous fissures and folds are seen.
- The grey coloured outer part of cerebrum is called Cortex and the white coloured inner part is called Medulla.
- centre of thought, intelligence, memory and imagination.
- evokes sensations.
- controls voluntary movements.

Thalamus

- situated below the cerebrum.
- acts as relay station of impulses to and from the cerebrum.
- analyses impulses from various parts of the body and sends the important ones to the cerebrum.

Cerebellum

- the second largest part of the brain.
- seen behind the cerebrum as two flaps.
- fissures and grooves are present.
- coordinates muscular activities and maintains equilibrium of the body.



Medulla oblongata

- the rod shaped medulla oblongata is seen below the cerebrum, located near the cerebellum.
- controls involuntary actions like heart beat, breathing etc.

Hypothalamus

- situated just below the thalamus.
- plays a major role in the maintenance of homeostasis.

Illustration 1.7 Structure and function of the brain

Aren't you convinced of the importance of the brain? Discuss the necessity of wearing helmets while riding two wheelers.

Spinal Cord

The spinal cord is the continuation of the medulla oblongata. On the basis of the indicators, analyse illustration 1.8 and the description and prepare notes in your Science diary.

The spinal cord is protected inside the vertebral column. Like the brain, the spinal cord is also covered by meninges. The central canal seen in the centre of the spinal cord is also filled with cerebrospinal fluid. In the spinal cord, white matter is seen outside and grey matter is seen inside.

The Spinal Cord within the Vertebral Column

The spinal cord of a new born baby extends upto the tip of the vertebral column. But in adults, it is seen only upto the middle of the vertebral column. This is because the spinal cord does not grow in proportion to the growth of the vertebral column.

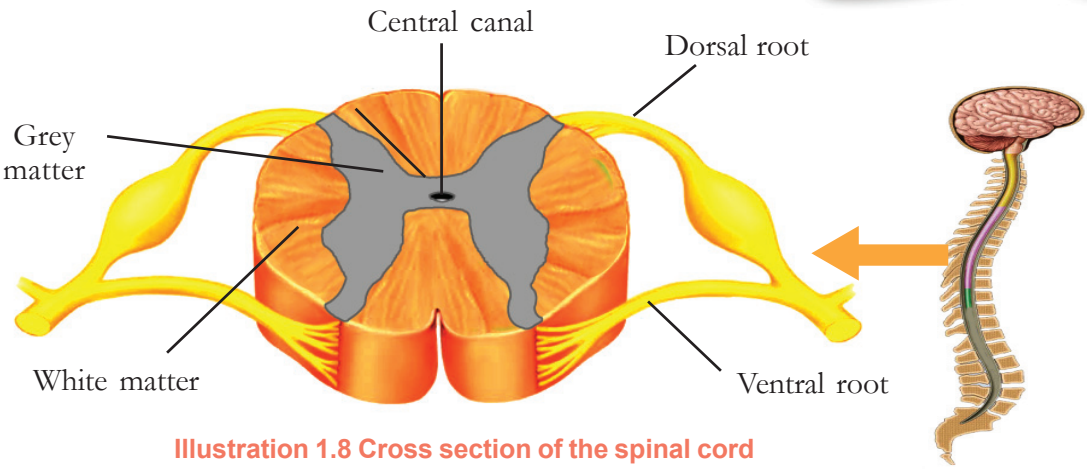


Illustration 1.8 Cross section of the spinal cord

There are 31 pairs of spinal nerves arising from the spinal cord. A dorsal root and a ventral root join to form a spinal nerve. Sensory impulses reach the spinal cord through the dorsal root. Motor impulses go out of the spinal cord through the ventral root. Impulses from different parts of the body are transmitted to and from the brain through the spinal cord. It also coordinates the repeated movements during walking, running etc.

Indicators

- Protection of the spinal cord.
- Formation of the spinal nerves.
- Functions of the spinal cord.

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Figure 1.5 Different responses

Observe figure 1.5. What is the peculiarity of such responses? Analyse the description given below and note down the peculiarities.

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The accidental and involuntary responses towards stimuli are called reflex actions. They do not happen consciously.

How does reflex action happen in our body? Analyse illustration 1.9 and the description and complete the flow chart.

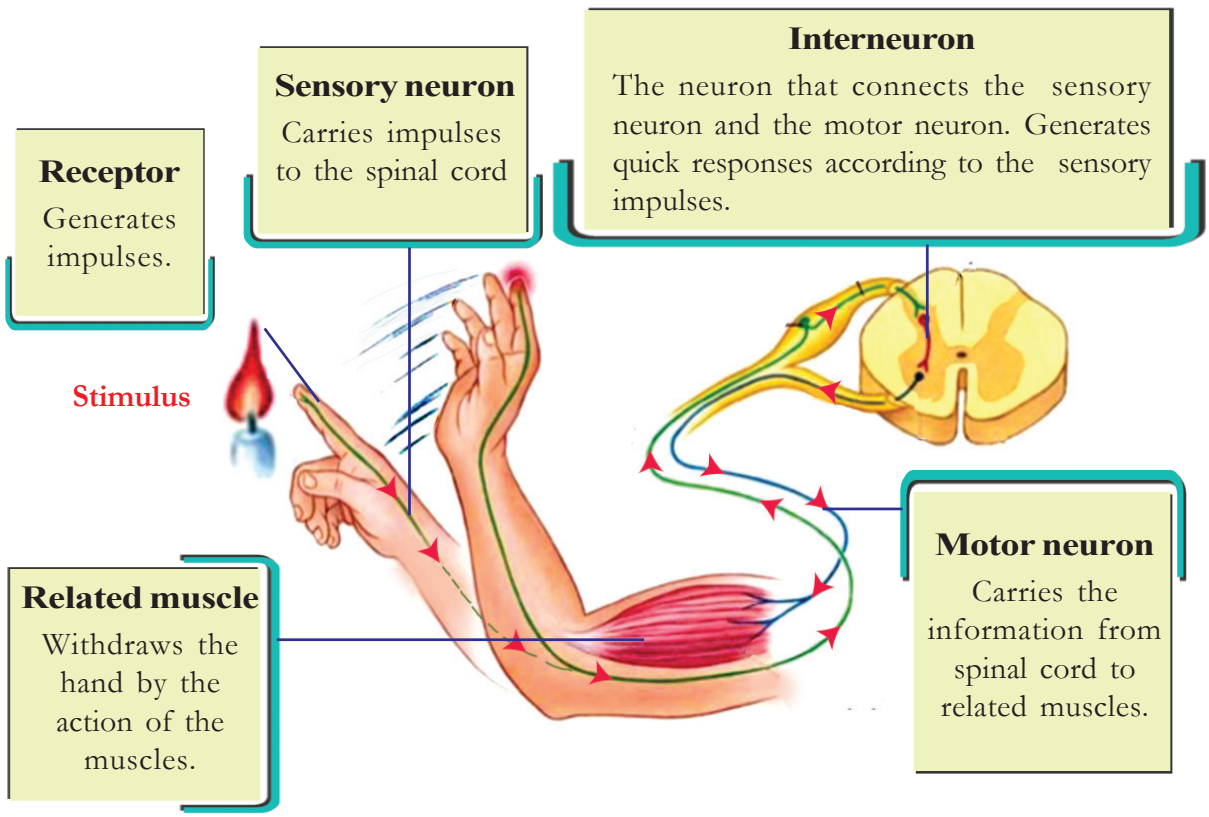

Illustration 1.9
The pathway of impulses in a reflex action

Reflex arc is the pathway of impulses in the reflex action. Mainly spinal cord acts as the centre of reflex action and such reflexes are called spinal reflexes. But all reflexes are not under the control of the spinal cord. Don't we blink our eyes when light suddenly falls on our eyes or when objects move towards them? This is also a reflex action. Such reflexes under the control of the cerebrum are called cerebral reflexes.

Alcohol and Reflex

Alcohol accelerates the action of gama amino butyric acid (GABA), a neurotransmitter in the brain. Higher doses of this neurotransmitter retard the brain action which in turn weakens the reflex action and prevents making proper decision at proper time.

Is it advisable to lift up people quickly by holding their arms or legs in an accident. What aspects related to spinal cord are to be taken care of while attending injured persons? Discuss.

Autonomous Nervous System

There may be instances in your life when you felt sudden fear or sadness. Write down some of those experiences.

- seeing a snake suddenly
-
-

What are the changes that take place in the body during such emergency situations? List them.

- Heart beat increases
-
-
-

Shouldn't these changes return to normal state? Discuss.

DN9QA4

Activities that take place beyond the conscious level are controlled by the autonomous nervous system, a part of the peripheral nervous system. The sympathetic system and the parasympathetic system together form the autonomous nervous system. Analyse illustration 1.10 to understand the actions of sympathetic and parasympathetic systems during emergency situations and complete table 1.2.

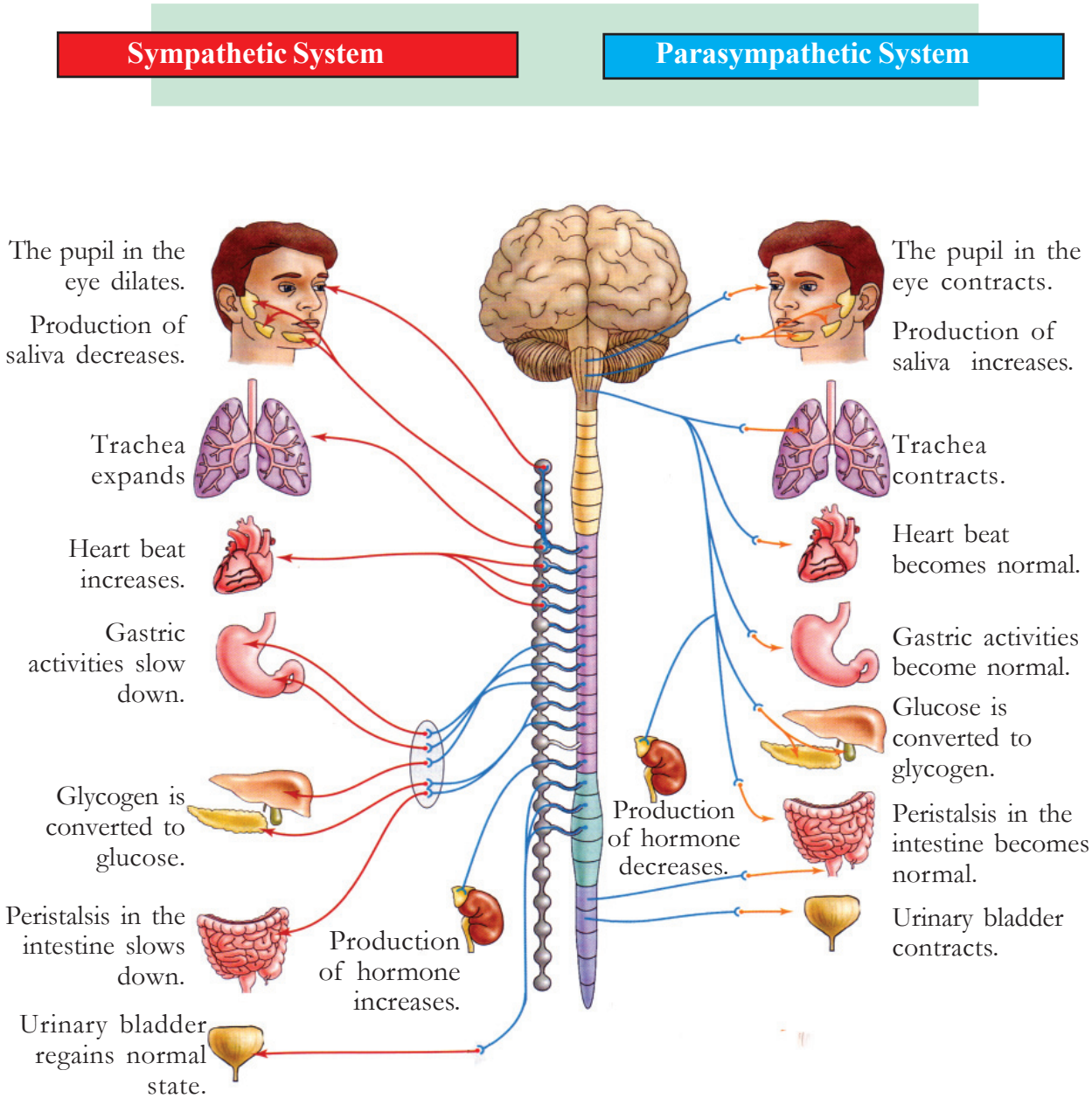

Illustration 1.10 Autonomous nervous system

Organ/part	Action of Sympathetic System	Action of Parasympathetic System
Pupil		
Salivary gland		
Trachea		
Heart		
Stomach		
Liver		
Intestine		
Urinary bladder		

Table 1.2 Action of sympathetic and parasympathetic systems

Nervous System and its Disorders

A healthy nervous system is the basis of normal body activities. Even minor defects in the nervous system may cause serious health problems. List out the familiar diseases that affect the nervous system.

- Rabies
-
-

Conduct a seminar on 'The diseases affecting the nervous system' by analysing table 1.3 and collecting more information on it.

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Disease	Causes	Symptoms
Alzheimer's	Accumulation of an insoluble protein in the neural tissues of the brain. Neurons get destroyed.	Loss of memory, inability to recognize friends and relatives, inability to do routine works.
Parkinsons	Destruction of specialised ganglions in the brain. Production of dopamine, a neurotransmitter in the brain gets reduced.	Loss of body balance, irregular movement of muscles, shivering of the body, profuse salivation.
Epilepsy	Continuous and irregular flow of electric charges in the brain.	Epilepsy due to continuous muscular contraction, frothy discharge from the mouth, clenching of the teeth following which the patient falls unconscious.

Table 1.3 Certain diseases affecting the nervous system

What should be our approach towards people affected by such diseases? Discuss.

The nervous system helps us to experience various stimuli as well as to respond towards them. Special care should be taken to maintain the health of this organ system.

Receptors that receive stimuli promote the actions of nervous system. It would be very interesting to know about these receptors and the sense organs in which they are included.

Let us Assess

1. The part of the brain which helps to maintain balance of the body.

   a) Cerebrum b) Cerebellum

   c) Medulla oblongata d) Thalamus

2. Identify the relation and fill in the blank.

   Irregular flow of charge in the brain : Epilepsy

   Decrease in the production of dopamine : ----------

3. Analyse the following situations and answer the questions.

   - a thorn pierces the foot.
   - the leg is withdrawn.
   - the thorn is taken out slowly.

   a) Write the stimuli and responses.

   b) Was the leg withdrawn after sensing the pain? Identify the reflex action. Prepare an illustration showing the parts through which the impulses were transmitted.

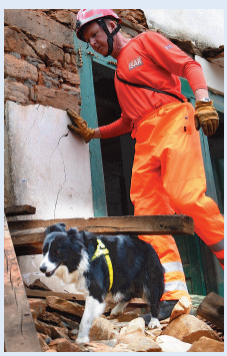
Extended Activities

- Construct a model of the human brain using suitable scrap materials and exhibit it in the class.
- Prepare the script of a short play which contains the methods of first aid to be given to people who have met with accidents and present it.

2 Windows of Knowledge

Earthquake victims rescued

Katmantu : Rescued victims who got trapped in the collapsed buildings due to earthquake in the eastern regions of Katmantu, the Capital of Nepal. The rescue operation was difficult due to heavy rain and insufficient light. Specially trained dogs helped to detect the victims and save their lives during the crisis.



Did you notice the news?

Why are dogs more capable than human beings in tracking the injured in such circumstances? Discuss.

The number of receptors in the sense organs is different in different organisms. The surface of a postage stamp is enough to arrange all the olfactory cells in the nose of a human being. But a large scarf is required to arrange the olfactory cells of a dog.

Now, you might have understood that the number of receptors influence the efficiency of sense organs. There are different types of receptors in our sense organs to receive stimuli.

Expand the given table by adding sense organs and their receptors.

Sense organs	Receptor	Stimulus
• Eye		
• Ear		
• Tongue		
• Skin		
• Nose	Olfactory receptor	Smell

Table 2.1 Sense organs and receptors

Eye

Eye is the major sense organ that helps the brain to evoke sensation. How are the eyes protected? Discuss and fill in the blanks.

- Eye socket : depressions in the skull
- External eye muscles : fix the eye balls in the orbit
- Eyebrow : .....
- Eyelashes : .....
- Eyelids : .....
- Conjunctiva : secretes mucus which protects the anterior portion of the eye ball from being dry.
- Tears : clean and lubricate the anterior part of the eye ball. Lysozyme, the enzyme present in tears, destroys germs that enter the eyes.

How far is the structure of an eye adapted to perform its function? Observe figure 2.1 and illustration 2.1. On the basis of the indicators, write your inferences in the Science diary.

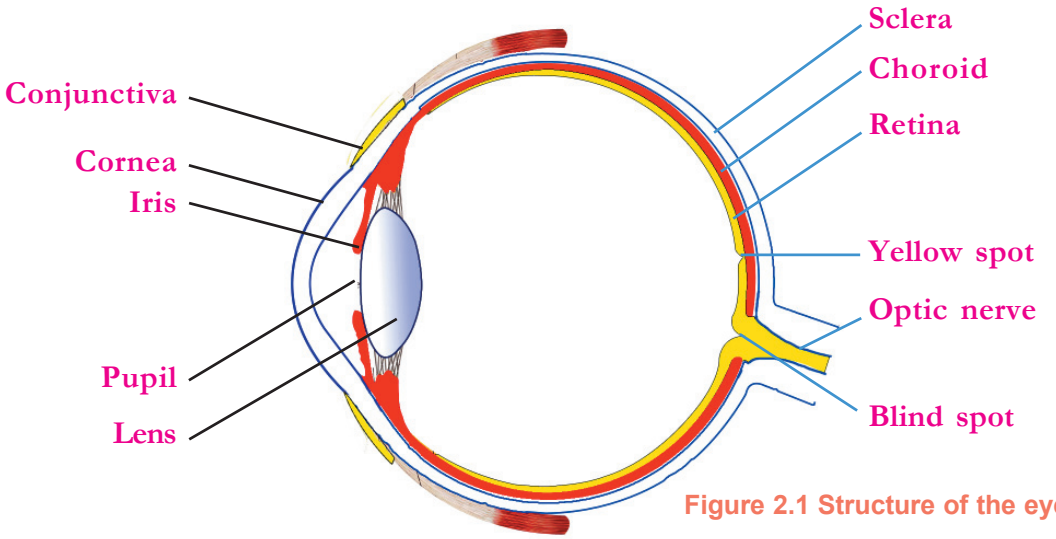


Figure 2.1 Structure of the eye

Layers of the eye

Sclera
The white outer layer which gives firmness to the eye. Made up of connective tissues.

Choroid
The middle layer which contains a large number of blood vessels.

Retina
The inner layer which has photoreceptors.

Cornea
The projected transparent anterior part of the sclera which refracts light rays to focus on the retina.

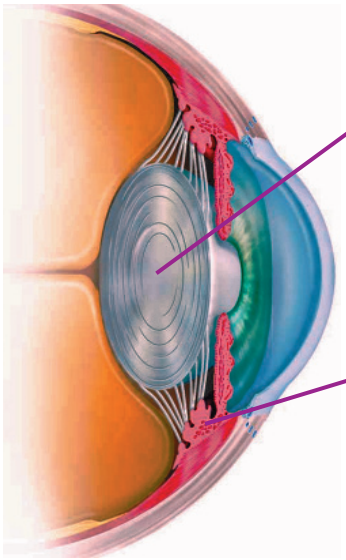
Conjunctiva
The layer which covers and protects the front part of sclera except the cornea.

Iris
The part of the choroid seen behind the cornea. Presence of the pigment melanin gives the iris a dark colour.

Pupil
The aperture seen at the centre of the iris. The size of this aperture increases and decreases depending on the intensity of light.

Yellow spot
The part of the retina where plenty of photoreceptors are present. It is the point of maximum visual clarity.

Blind spot
The part of the retina from where the optic nerve begins. Here there is no vision as photoreceptors are absent.



Lens
Elastic transparent convex lens, connected to ciliary muscles by thread like ligaments.

Ciliary muscles
Circular muscles seen around the lens. The contraction and relaxation of these muscles alter the curvature of lens.

Optic nerve
Transmits impulses from photoreceptors to the visual centre in the brain.

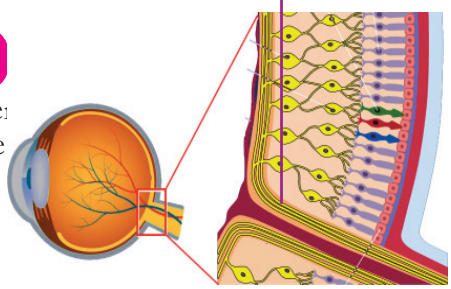


Illustration 2.1 The eye - parts and functions

The fluids in the eye	
Aqueous humor	**Vitreous humor**
The water like fluid filled in the aqueous chamber between the lens and the cornea. It is formed from blood, and is reabsorbed into blood. Provides oxygen and nourishment to the tissues of the eye.	The jelly like substance seen in the vitreous chamber between the retina and the lens. Helps in maintaining the shape of the eye.

Indicators

- Layers of the eye and their function.
- Position and significance of lens and cornea.
- Position of iris and the pupil.
- Location and function of fluids present in the eye.

Regulation of Light in the Eye

The entry of a large amount of light is harmful to the tissues of the eye. Iris and the aperture at its centre called pupil regulate the amount of light falling on the eyes. Analyse figure 2.2 and the description regarding the changes in the pupil in dim light and bright light, and form inferences.

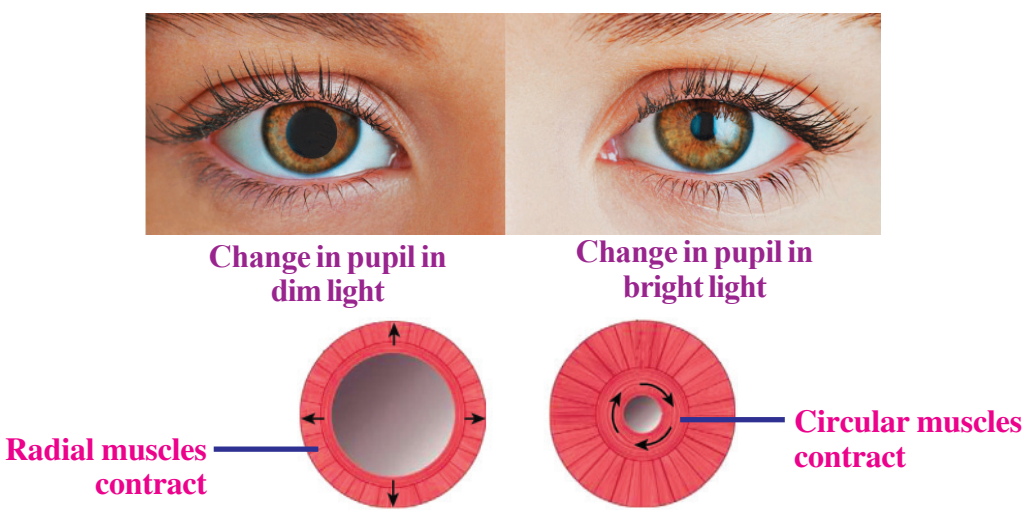


Figure 2.2 Regulation of light in the eye

The size of the pupil is regulated by the action of circular muscles and radial muscles. When the radial muscles contract in dim light, the size of the pupil increases. When the circular muscles contract in intense light, the size of the pupil decreases. Thus the amount of light falling on the lens is regulated according to the intensity of light.

Formation of Image

The curvature of the cornea and the lens help light rays which reflect from an object to get focussed on the retina. What are the peculiarities of the image formed by the lens of the eye?

Observe figure 2.3 and list the peculiarities.

Discuss and modify.

-
-
- Real

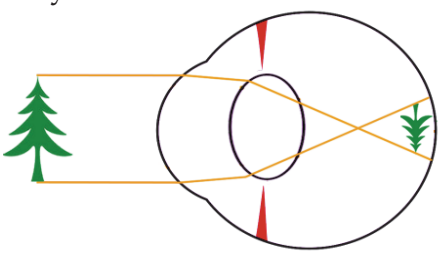


Figure 2.3 Formation of image

We can see nearby and distant objects clearly. This is because the focal length of the lens can be adjusted according to the distance of the object. Analyse illustration 2.2 which explains this and complete table 2.2. Write your inferences in the Science diary.

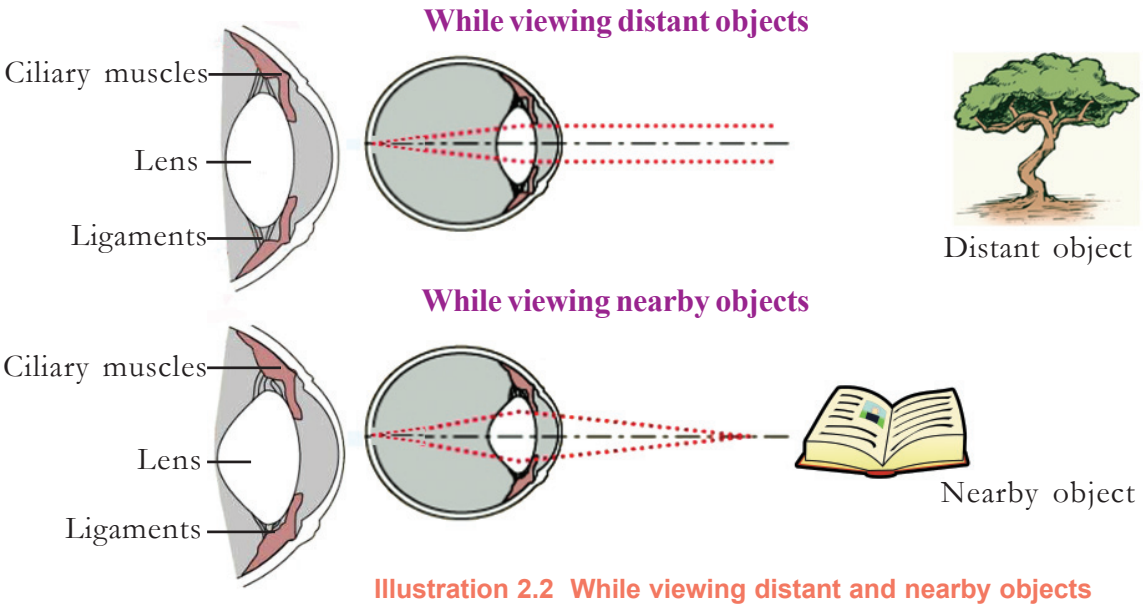


Illustration 2.2 While viewing distant and nearby objects

While viewing nearby objects	While viewing distant objects
Ciliary muscles contract	Ciliary muscles relax
Ligaments relax	Ligaments stretch
Curvature of lens	Curvature of lens .....
Focal length	Focal length .....

DP2DF2

Table 2.2

The ability of the eye to adjust the focal length of the lens by changing its curvature in accordance to the distance of the object from the eye and form the image on the retina is called the power of accommodation of the eye.

Retina and the Photoreceptors

You might have understood that photoreceptors are present in the retina. Rod cells and cone cells are the photoreceptors in the retina. Rod cells are more in number than cone cells.

Observe figure 2.4 and relate the shape of photoreceptors with their names. Analyse the description and compare the photoreceptors and complete table 2.3.

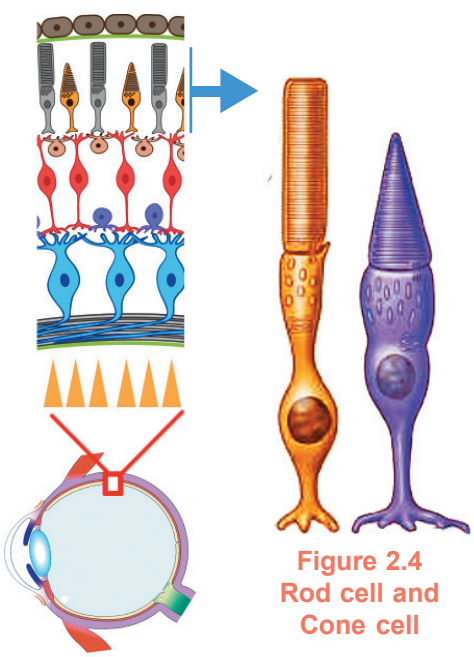


Figure 2.4
Rod cell and
Cone cell

Rod cells contain the visual pigment called rhodopsin. This pigment is formed from a protein named opsin and retinal which is a derivative of Vitamin A. Since they are activated even in dim light, we are able to see objects in dim light. These cells cannot detect colour.

Cone cells contain a pigment called photopsin. This is also called iodopsin.This pigment is also composed of opsin and retinal. There are three types of cone cells in our eyes, which help us to detect three primary colours of light – red, green and blue. This diversity is due to the difference in amino acids in the opsin molecule. So, cone cells provide us with colour vision.

	Rod cell	Cone cell
Pigment		
Shape		
Function		

Table 2.3

The Chemistry of Vision

How are impulses formed in photoreceptors to make vision possible? Analyse illustration 2.3, figure 2.5 and the description and write your inferences in the Science diary.

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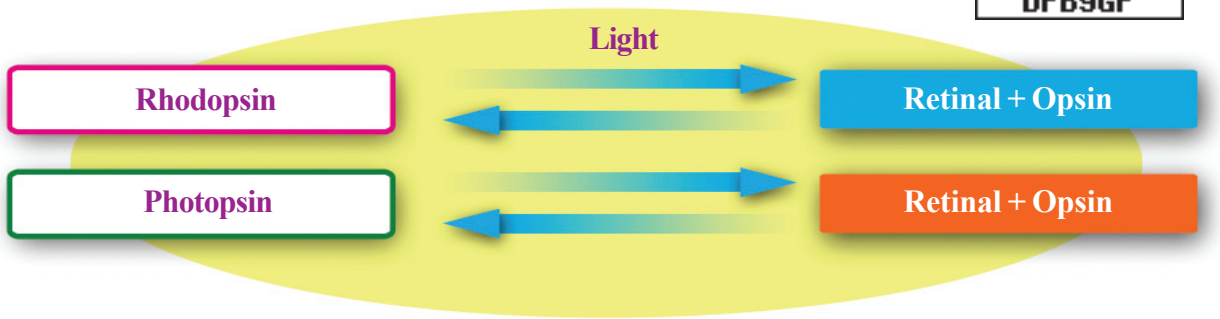


Illustration 2.3 Formation of impulses in photoreceptors

In the presence of light, the pigments present in photoreceptors, dissociate. This chemical change leads to the formation of impulses. These impulses are transmitted to the cerebrum through optic nerves and this enables vision.

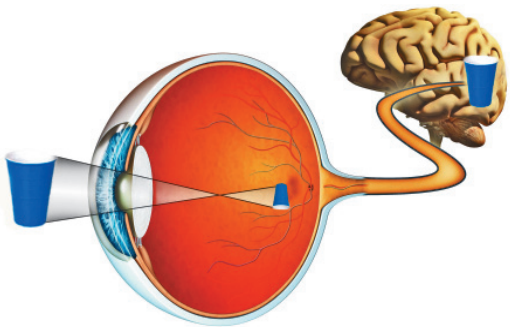
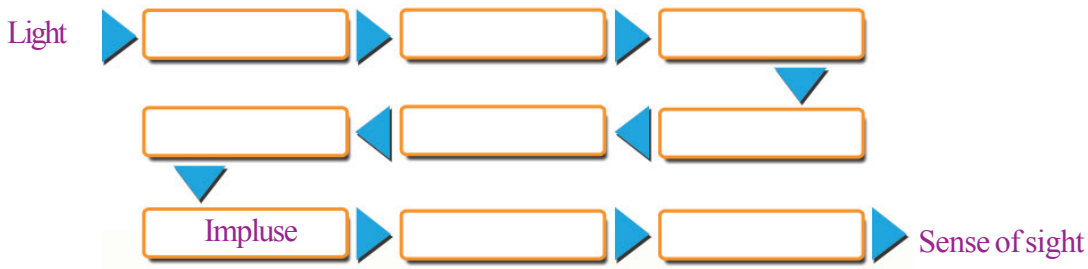


Figure 2.5 Sense of sight

Indicators

- Factors present in the visual pigments.
- Formation of impulses in photoreceptors.
- Sense of sight.

Complete the flowchart related to the sense of sight given below.



Binocular Vision

Aren't two images of the same object formed in our two eyes? But we see only one image of the object. How does this happen?

Try the activity given below.

Stretch your left hand forward. Close your right eye and focus on the forefinger of your left hand. Now close your left eye and without changing the direction of your head, focus on the same finger. Do you notice any change in the position of the finger?

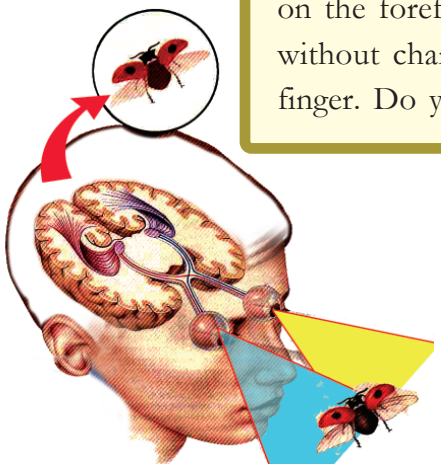


Figure 2.6 Binocular vision

Observe figure 2.6.

The images from two sides of the same object are formed in the left and right eye. When these two images combine as a result of the activities of the brain, a three dimensional image of the object is formed. This is called binocular vision.

Eye – Defects and Diseases

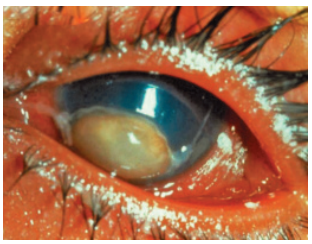
You are now aware of some of the eye defects. Prepare a note on eye defects and their remedies.

- Myopia
-
-

Let us familiarise ourselves with a few more eye defects and diseases.

Night blindness

You have studied that the retinal, a part of the visual pigment, is derived from Vitamin A. The deficiency of Vitamin A results in the low production of retinal. This in turn prevents the resynthesis of rhodopsin. In this condition, objects cannot be seen clearly in dim light and this disease is called night blindness.



Xerophthalmia

Xerophthalmia

If there is a prolonged deficiency of Vitamin A, the conjunctiva and cornea become dry and opaque. This causes xerophthalmia and leads ultimately to blindness.

Colour Blindness

Observe figure 2.7.

Can you read the figure clearly?

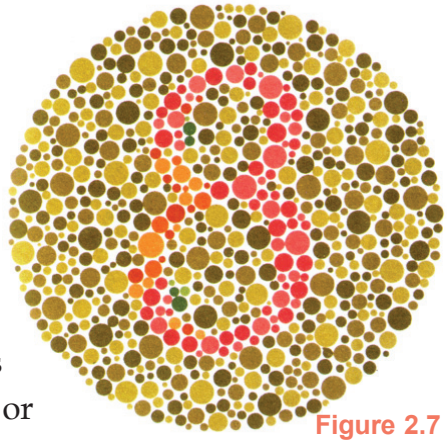


Figure 2.7

You are aware that the retina contains cone cells which can detect red, green and blue colours. Some persons cannot distinguish green and red colours due to the defect of cone cells. This condition is called colour blindness. Can you guess why persons with colour blindness are not selected for military or for jobs like that of a driver, pilot etc? Discuss.

Glaucoma

Aqueous humor is the fluid which nourishes the tissues in the eyes. If the reabsorption of aqueous humor does not occur, it causes an increase in the pressure inside the eyes. This causes damage to the retina and the photoreceptor cells and ultimately leads to blindness. This defect is called glaucoma. It can be rectified by laser surgery.

Cataract

It is a condition in which the lens of the eyes become opaque resulting in blindness. This can be rectified by replacing the lens with an artificial one, through surgery.

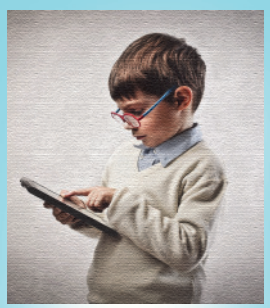
Conjunctivitis

This is an infection of the conjunctiva. The causative organisms may be bacteria, virus etc. This disease is transmitted through contact and can be prevented by maintaining personal hygiene.

Protection of Eyes

What are the things to be taken care of to ensure the health of the eyes?

Computer Vision Syndrome



The problems of the eyes caused by the excessive use of cell phones, computer, tablet etc is called computer vision syndrome. The continuous use of such devices affects the ability of the eye to focus. Headache is its major symptom. Drying of the eye, high pressure in the eye etc are other symptoms.

Discuss on the basis of the indicators given below.

Indicators

- Food materials rich in Vitamin A and Health of the eye.
- Excessive use of mobile, computer etc and Health of the eye.

Observe the poster.

Prepare a presentation on the procedure of 'Eye donation' by collecting data and present it in the class.

Ear

You have studied that auditory receptors are present in the ear. The ear not only helps us in hearing, but also in maintaining the balance of the body.

Observe figure 2.8 and list the main parts of the ear.

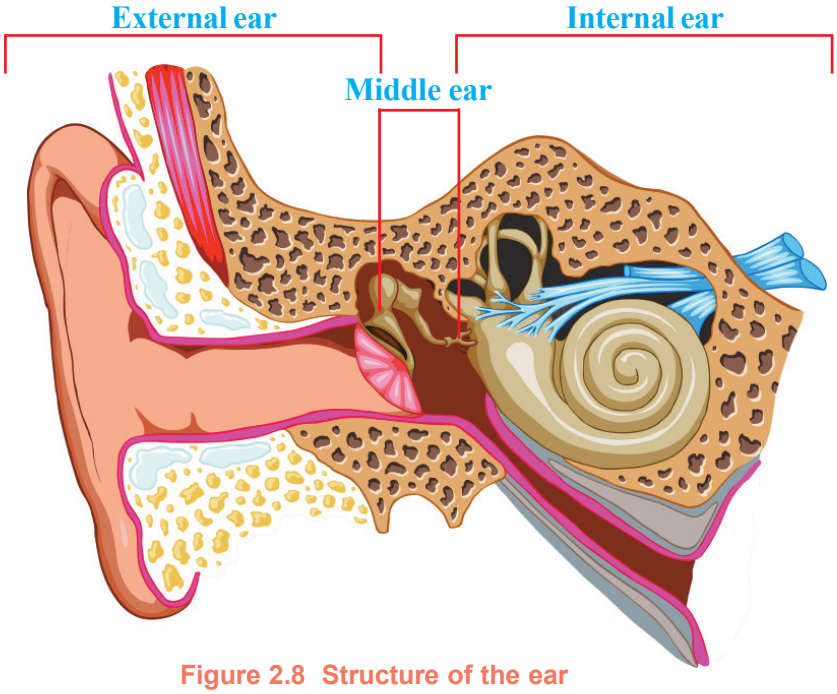


Figure 2.8 Structure of the ear

Let us examine the main parts of the ear in detail.

External Ear

Observe figure 2.9 and prepare a note on the basis of the indicators.

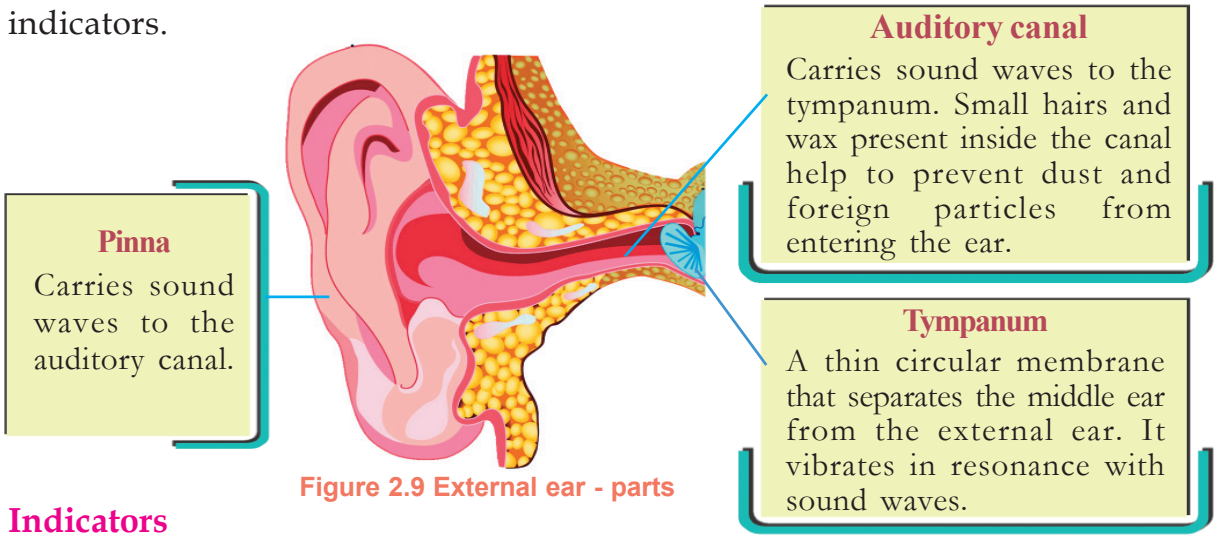


Figure 2.9 External ear - parts

Indicators

- Function of pinna.
- Importance of the auditory canal.

Middle Ear

Analyse figure 2.10 and prepare a table by including the parts of the middle ear and their functions.

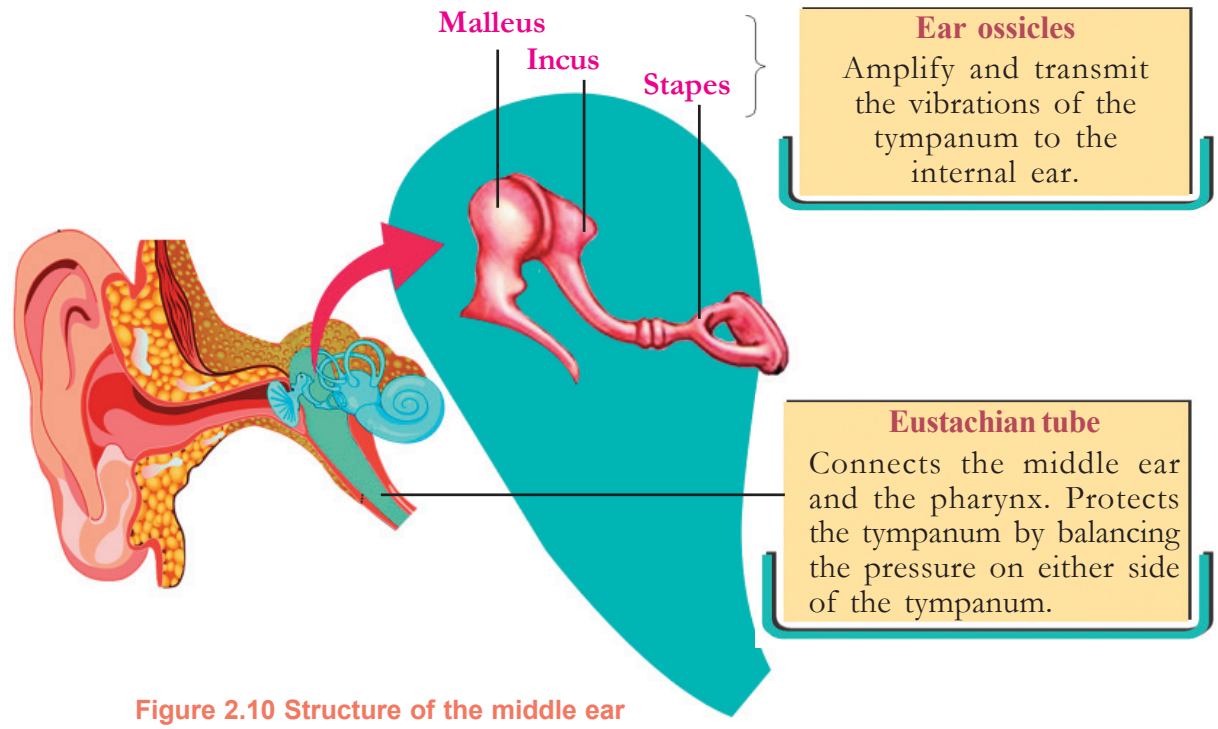


Figure 2.10 Structure of the middle ear

Internal Ear

Observe figure 2.11 and understand the parts of the internal ear.

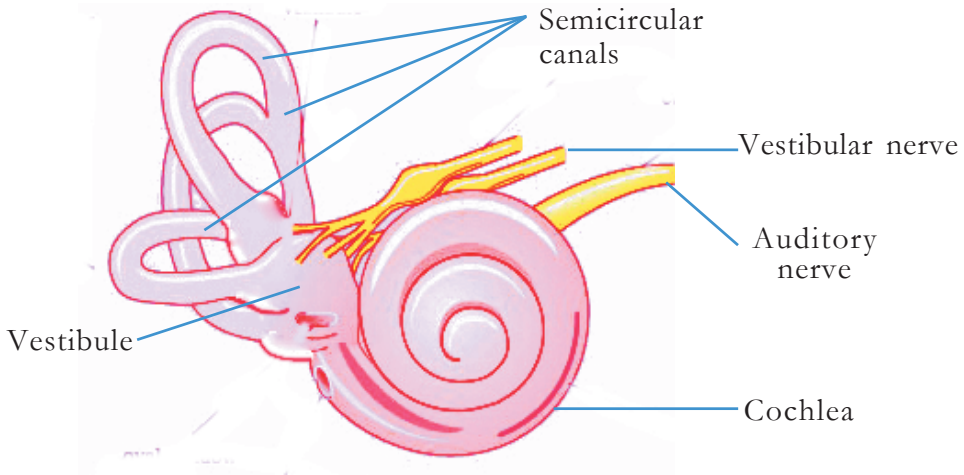


Figure 2.11 Structure of the internal ear

The internal ear is situated inside a bony case in the skull called the bony labyrinth. In this bony case there are membraneous labyrinths as well. The space inside the membraneous labyrinth is filled with a fluid named endolymph. The space between the membraneous and bony labyrinth is filled with a fluid called perilymph. Semicircular canals, vestibule and cochlea are the main parts of the internal ear. Semicircular canals and vestibule help in balancing the body whereas cochlea helps in hearing.

How is hearing possible?

Observe illustration 2.4 of uncoiled cochlea.

Oval window
Membrane seen attached to the stapes. Spreads the vibration of ear ossicles to the inner ear.

Round window
Helps in the movement of fluid inside the cochlea.

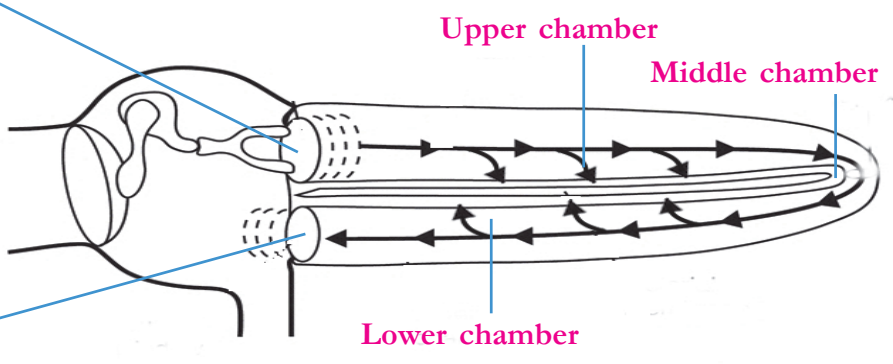


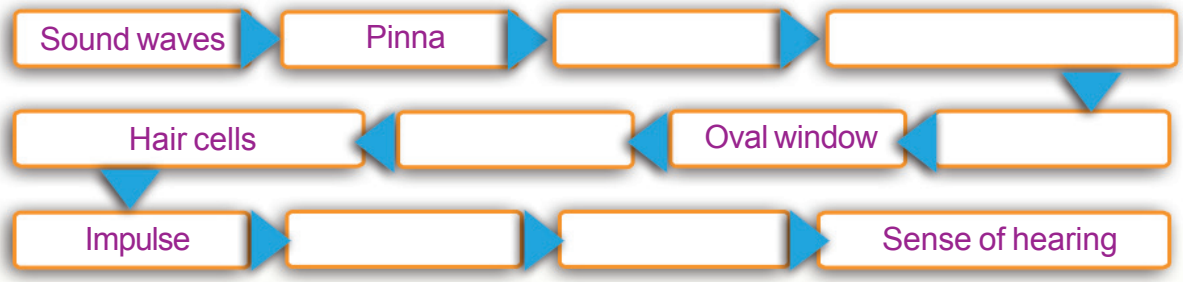
Illustration 2.4 Cochlea and fluid movements

Cochlea is a coiled tube like a snail shell. It consists of three chambers. Specialized sensory hair cells which are present in the basilar membrane that separates the middle and lower chambers, function as auditory receptors. The basilar membrane and sensory hair cells together constitute the Organ of Corti.

DPU1JZ

The sound waves which pass through the external ear vibrate the tympanum.This vibration of the tympanum is transmitted to the ear ossicles which causes the vibration of the membrane in the oval window. This vibration further causes the movement of the fluid inside the cochlea. As a result, the sensory hair cells of the Organ of Corti of the cochlea are stimulated and impulses are generated. These impulses reach the cerebrum through the auditory nerve and hearing is effected.

Analyse illustration 2.4 and the description and complete the flow chart given below by including the parts of the ear that bring about the sense of hearing. Also prepare a note in your Science diary.



Ear and Body balancing

Doesn't the ear help in maintaining the balance of the body? How is it possible? Analyse figure 2.12 and the description based on the indicators and prepare a flow chart on body balance maintaining.

Body balance is maintained in accordance with the movement of the head. Movements of the head bring about the movement of the endolymph present inside the vestibule and the semicircular canals. This causes movement of the sensory hair cells and generates impulses. These impulses are transmitted by the vestibular nerves to the cerebellum, and the equilibrium of the body is maintained.

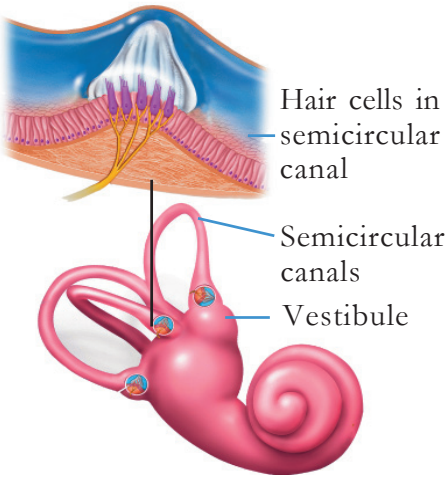


Figure 2.12
Vestibule, semicircular canals

Hearing Aid

Deafness is caused by structural deformities or diseases of the ears. Hearing aids are also included in the various methods of treatment of deafness. Hearing aid is a small electronic equipment that can be fitted internally or behind the ear. Hearing aids are a boon for the hearing impaired to work in the main stream of society.

Indicators

- Parts of the internal ear which help in body balance.
- Generation of impulses.

To detect taste

Isn't taste, one of the reasons for enjoying the food we eat? What are the different types of tastes we can detect?

Analyse the description and figure 2.13 given below, and understand the mechanisms about detecting taste. Based on the indicators, prepare a flowchart on the method of detecting taste.

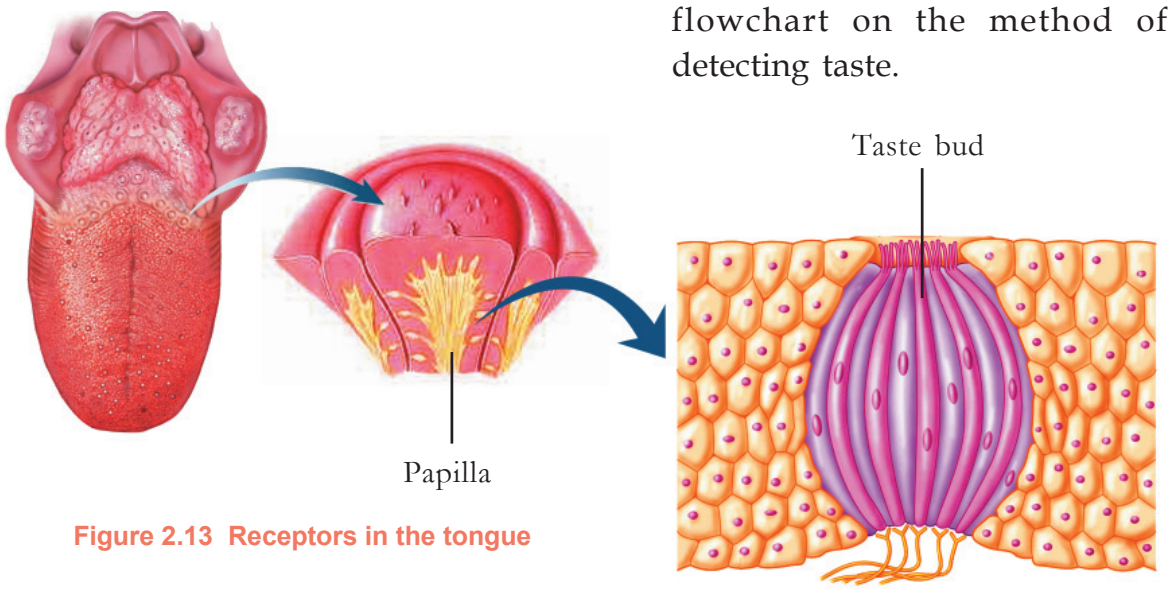


Figure 2.13 Receptors in the tongue

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Chemoreceptors seen inside the mouth and tongue help us to detect taste. These are seen mainly on the surface of the tongue. The projected structures seen on the surface of the tongue are called papillae. The parts seen on the papillae that detect taste are the taste buds. We have taste buds that are stimulated by tastes like sweet, salt, sour, bitter, umami etc.

Each taste bud has chemoreceptors that help to detect different tastes. Substances responsible for taste dissolve in saliva, stimulate the chemoreceptors and generate impulses. These impulses reach the brain through the respective nerves and we experience taste.

Diversity of Tastes

Umami is a Japanese term that means happiness. Milk, meat, sea food, mushroom etc contain factors that provide the taste of umami. A sixth taste named oleogustus is also identified. It is the taste of lipid.

Indicators

- Taste buds
- Experience of taste.

To detect Smell

We have discussed olfactory receptors in the beginning of the unit. How do we detect smell?

Analyse figure 2.14 and complete the stages in the process of detecting smell in sequential order.

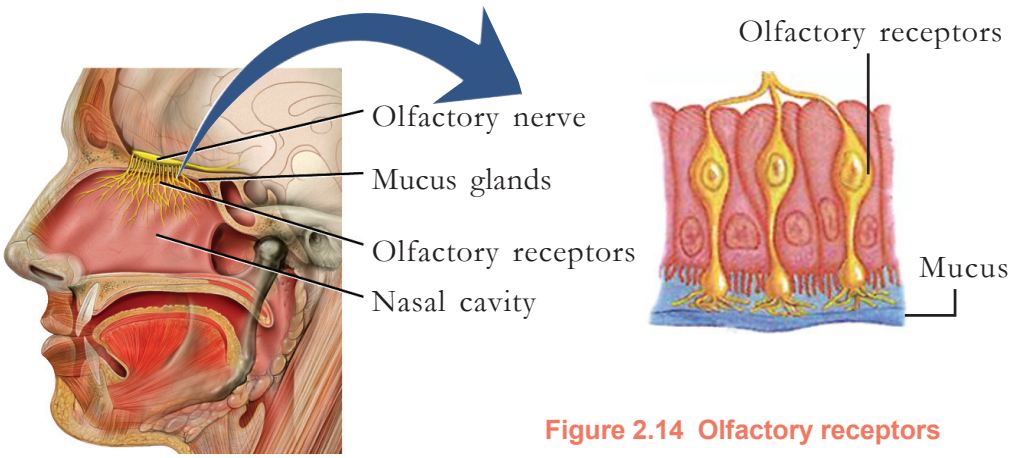


Figure 2.14 Olfactory receptors

Stages

- Aromatic particles diffuse in the air and enter the nostrils.
- These aromatic particles dissolve in the mucus inside the nostrils.
-
-
-

Isn't there a possibility of not sensing the taste of food while suffering from common cold? Discuss.

Receptors in the Skin

You might have seen visually impaired people reading Braille by touching with the tips of fingers. Are these touch receptors uniformly distributed all over the skin? Let us do this activity.

> Take two refillers of any ball point pen. Ask your friend to close his/her eyes and stretch his/her hand. Place the two pointed tips of the refillers on the finger tip first and then on the wrist of your friend. Ask your friend about the experience he/she has felt on the finger tip and the wrist. Is there any difference in the experiences? If so, what might be the reason? Can you now make out how visually impaired people read braille script using their finger tips?

Observe figure 2.15 and understand the various receptors present in the skin to sense the different stimuli.

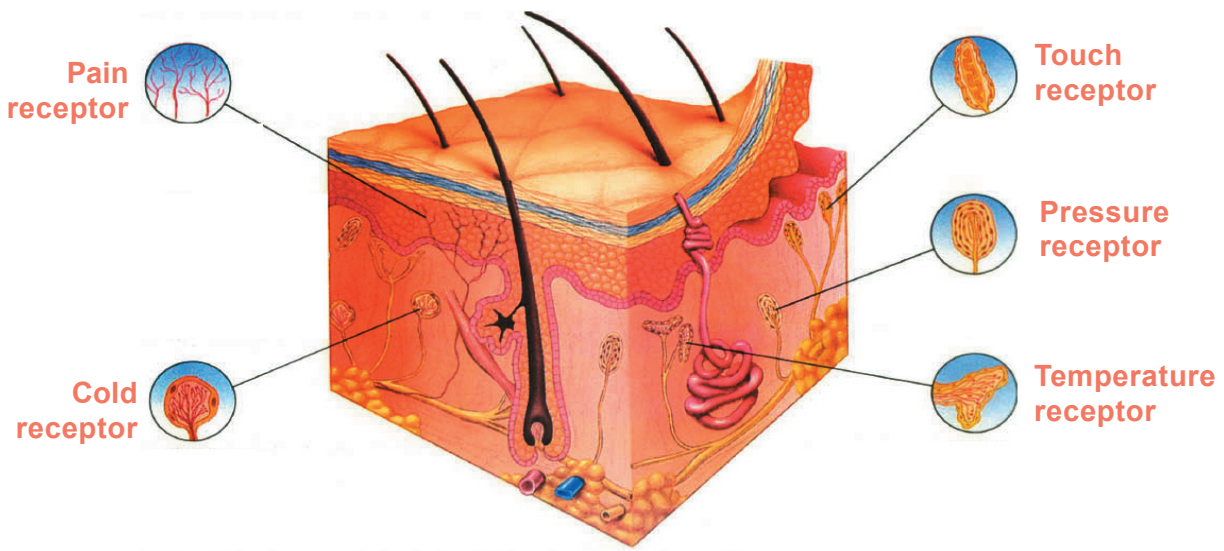


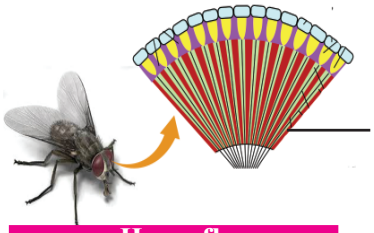
Figure 2.15 Receptors in the skin

Receptors in Various Organisms

All organisms have mechanisms to know their surroundings. The receptors of certain organisms and their peculiarities are included in illustration 2.5. Observe it and add your inferences in the Science diary.

Eye spot
to detect light.

Planaria



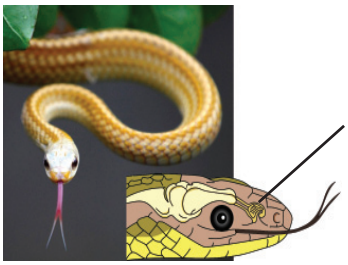
Housefly

Ommatidia
Formed of thousands of small eyes. The eye of an insect consists of a cluster of photoreceptors called ommatidia.

Lateral line
There are receptors in the lateral line on either side of the body which help to detect the change in the balance of body.

Shark

highly sensitive olfactory receptors.



Snake

Jacobson's organ
The aromatic particles that stick on the tongue of the snake reach Jacobson's organ seen on the roof of the mouth cavity. The olfactory receptors seen there get stimulated then.

Illustration 2.5 Receptors in various organisms

Now, have you understood that organisms recognise their surroundings with the help of the receptors present in the sense organs? This helps them to satisfy their needs and survive on this earth.

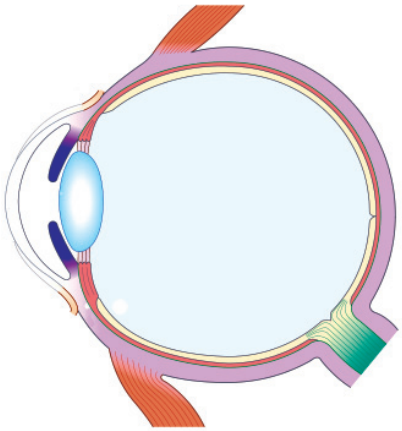
Let us Assess

1. Select the right answer from the following:
   While viewing nearby objects.
   (a) ciliary muscles relax
   (b) curvature of lens decreases
   (c) ciliary muscles contract
   (d) focal length increases

2. Identify the odd one and write down the common feature of the others.

   Malleus, Eustachian tube, Stapes, Incus

3. Redraw the figure. Identify the parts according to the hints and label them.

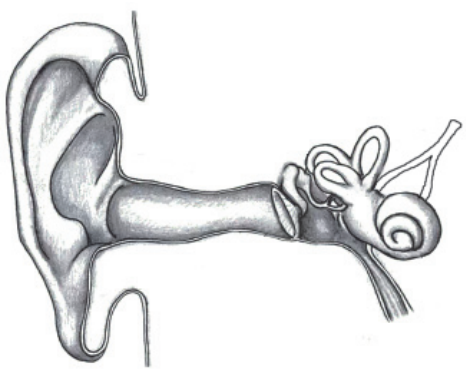


a. The part where the muscles that regulate the size of the pupil are seen.

b. Jelly like fluid.

c. The layer of eye where photoreceptors are seen.

4. Figure of Ear is given. Redraw it and name and label the parts mentioned.



a) Part that receives the vibrations of the ear drum.

b) The tube that connects the pharynx.

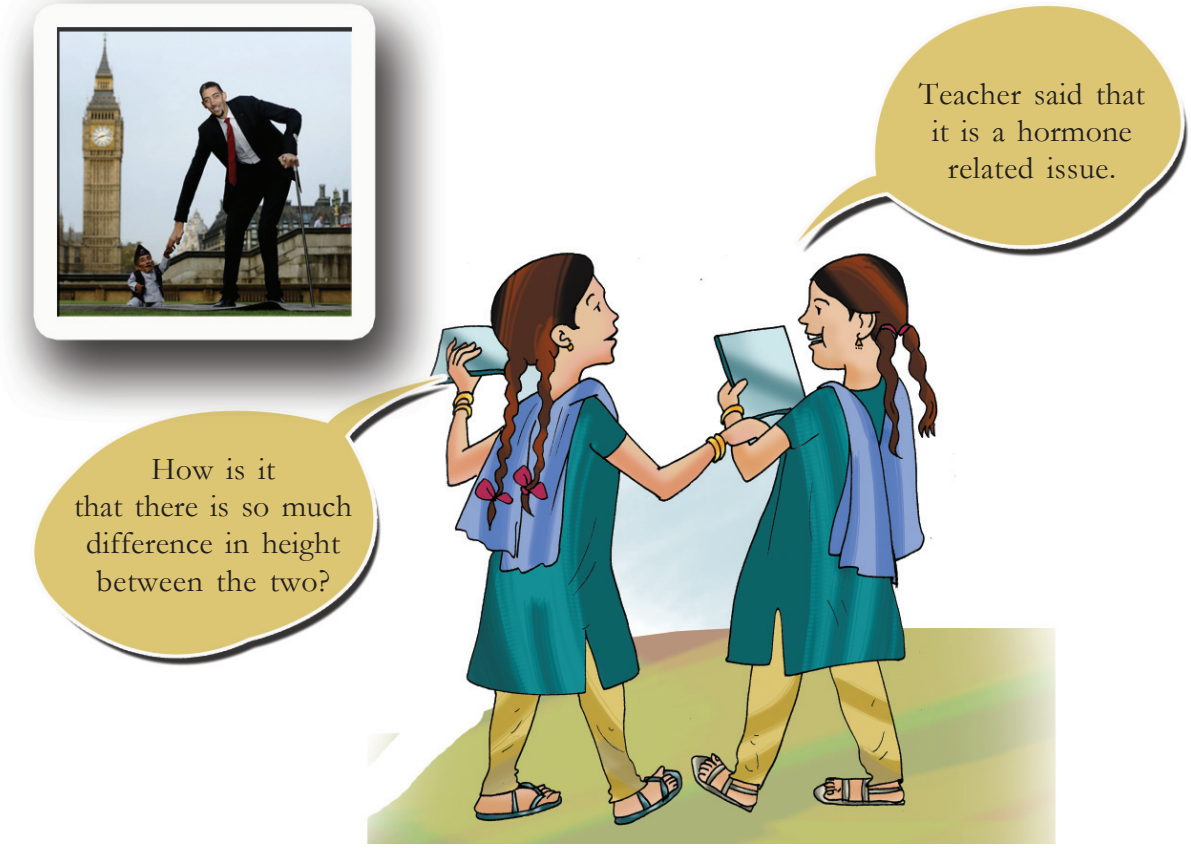
c) Part where the auditory receptors are seen.

Extended Activities

- Conduct a seminar in class on the topic 'Eye diseases and protection of the eye'.
- Prepare notes on the peculiarities of sense organs of different organisms by collecting more information.

3

Chemical Messages for Homeostasis



Did you notice the conversation between Neenu and Seena about the picture on the Science Club notice board?

Haven't you heard of hormones?

Which are the hormones you know? List them.

-
-
-

The endocrine system is an organ system that controls and coordinates all activities in the body. This system includes endocrine glands and their secretions called hormones. Hormones are chemical messengers that regulate cellular activities.

Endocrine glands do not have particular ducts to carry hormones to various tissues. Hence they are known as ductless glands. Hormones are transported through blood.

Do the hormones transported through blood function in all cells? Observe the description and illustration 3.1 given below and discuss on the basis of indicators. Note down the inference in the Science diary.

Hormones to target cells

DQCSNA

Hormones reach every cell in the body as they are transported by blood. But each hormone acts only upon those cells which have specific receptors. The cells which are acted upon by hormones are their target cells.

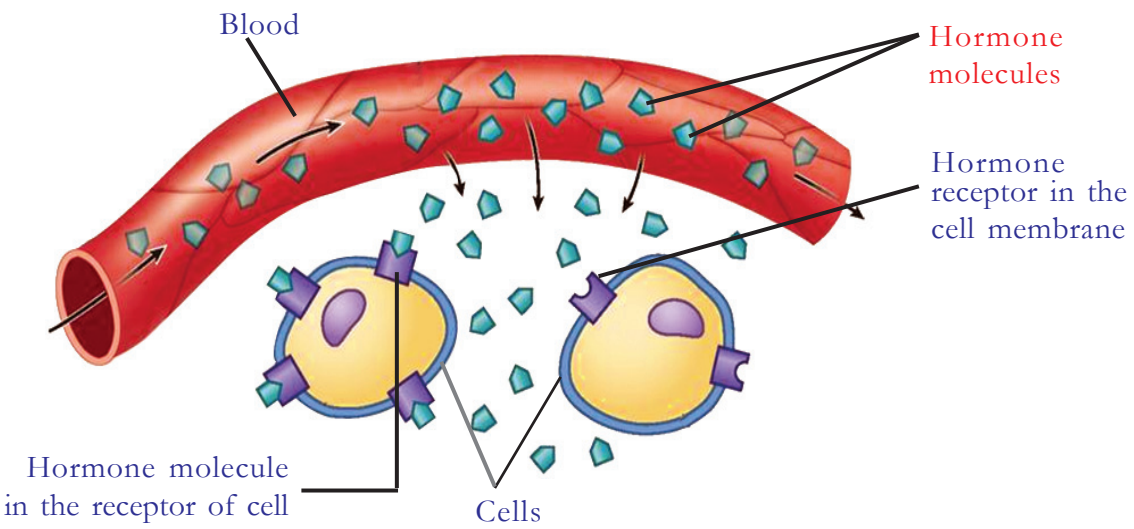


Illustration 3.1 Hormone in the target cell

Only those cells having specific receptors can receive a specific hormone. Each hormone molecule binds with the receptor to form a **hormone-receptor complex**. Following this, enzymes are activated within the cell and certain changes occur in cellular activities.

Indicators

- Target cells.
- Formation of hormone-receptor complex.
- Influence of hormone in target cells.

Let's learn about the various hormones in our body in detail.

After digestion

You have learnt that glucose molecules formed as a result of digestion get absorbed into the blood. These glucose molecules must reach cells to produce energy. The gland called pancreas plays a major role in this activity. Have you tried to understand the role of pancreas in the digestive process?

Observe figure 3.1

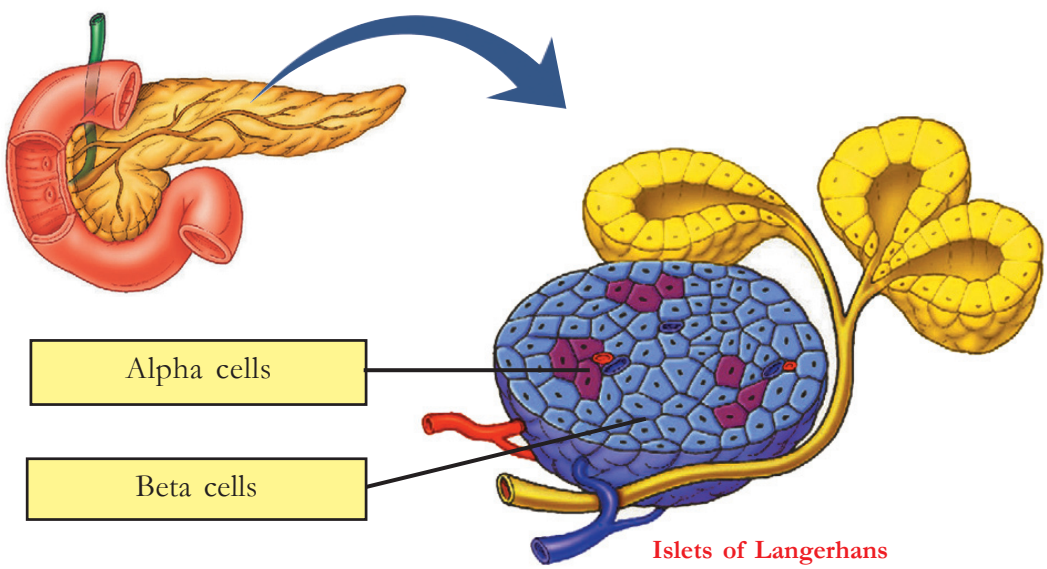


Figure 3.1 Pancreas

Pancreas is the gland that is connected to the duodenum, the continuation of the stomach. The beta cells in the cell cluster of this gland called Islets of Langerhans, produce the hormone insulin and alpha cells produce the hormone glucagon.

Analyse illustration 3.2 and understand the action of these hormones.

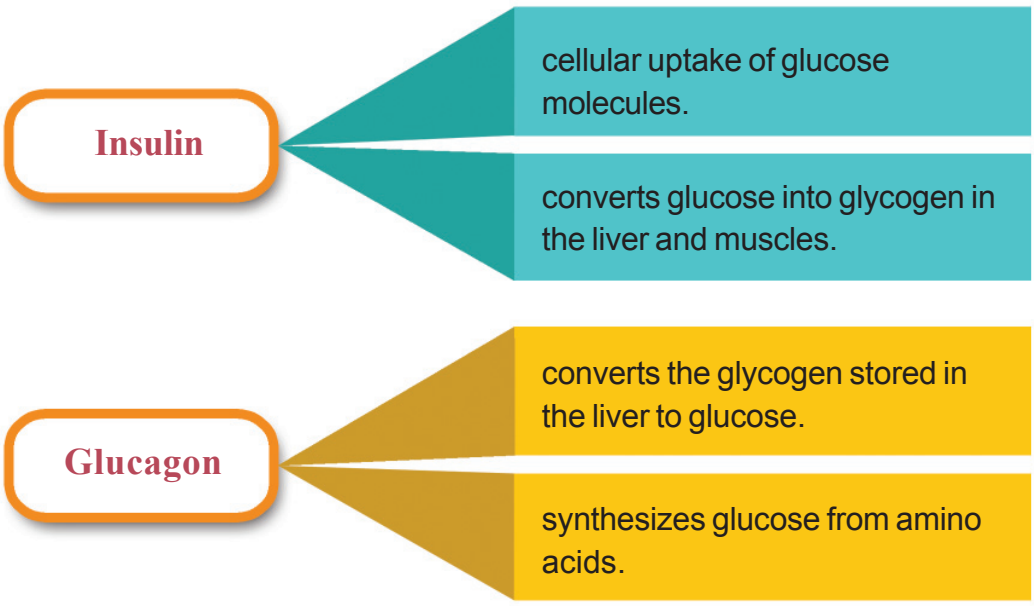


Illustration 3.2 Action of insulin and glucagon

The normal level of glucose in blood is 70-110mg/100ml. The level of glucose in blood is maintained by the combined action of insulin and glucagon.

Complete illustration 3.3 by including the production of hormones that regulate the level of glucose.

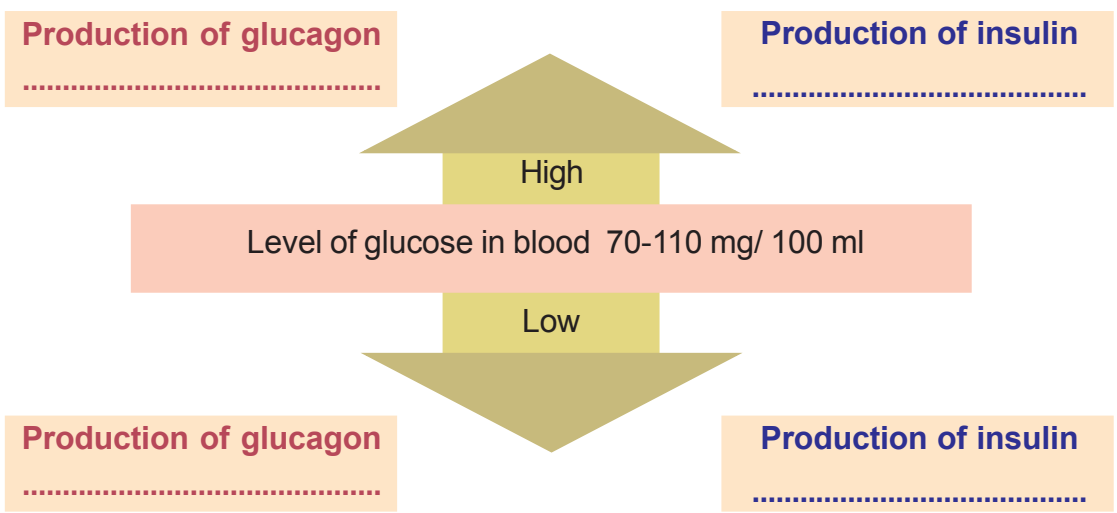


Illustration 3.3 Method of regulation of blood glucose level

When insulin fails

How does the deficiency of insulin or the inability of cells to use insulin affect the body?

Discuss.

Based on the indicators, analyse the description given below and write notes in the Science diary.

Decreased production of insulin due to the destruction of beta cells or the inability of cells to utilize the insulin produced, raises the level of glucose in blood. Excess glucose in the blood is expelled through urine. Normally, there is no glucose in urine. Diabetes is clinically referred to as a condition when the level of glucose before breakfast is above 126mg/100ml of blood. Increased appetite and thirst and frequent urination are the major symptoms of diabetes.

The blood test that precisely determines the level of glucose in blood for three months plays a crucial role in the diagnosis of diabetes.

Indicators

- The reason for increase in the level of glucose in blood.
- Symptoms of diabetes and diagnosis.

Plan and conduct Benedict test to detect the presence of glucose in urine with the help of your teacher.

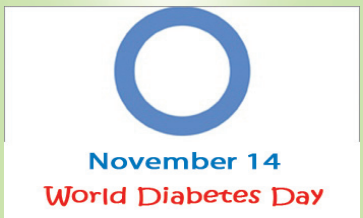
Write the report in the Science diary.

Take 2ml of the sample in a test tube. Add 2ml Benedict solution into it. Heat for 2 minutes. Observe the change in colour. Formulate your inference by comparing the glucose indicator on the reagent bottle.

Diabetes

The reason for Type I diabetes is the defective production of insulin. The reason for this is the destruction of pancreatic beta cells by T lymphocytes, a kind of white blood cells. Providing insulin in proper quantity is the treatment method. The reason for Type 2 diabetes is the inability of target cells to make use of insulin. Obesity and gene defects are the reasons for this disease. This can be controlled through exercise, control of food and use of medicines, if necessary.

The World Health Organisation (WHO) and International Diabetic Federation jointly observes November 14 as World Diabetes Day every year. Its purpose is to create awareness against the increase in diabetes. Blue Circle is its logo.



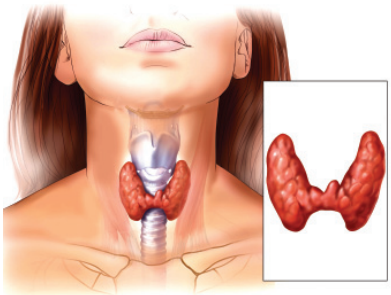


Figure 3.2 Thyroid gland

Thyroid test

Since the activities of the thyroid gland are extensive, disorders of thyroid should be detected through test. Disorders are detected by testing the quantity of hormones directly secreted by the thyroid gland and by testing the quantity of certain other hormones that influence the thyroid gland. Laboratory tests that determine the level of hormones like T3, T4, TSH are used for this.

Regulation of Metabolism

The anabolic and catabolic processes taking place in the body are commonly referred as metabolism. Metabolic activities are also under the control of hormones. The thyroid gland is the main endocrine gland that controls the metabolic activities. Observe figure 3.2 and find out the position of the thyroid gland.

The thyroid gland secretes two hormones – thyroxine and calcitonin. Pay attention to the functions of thyroxine listed below:

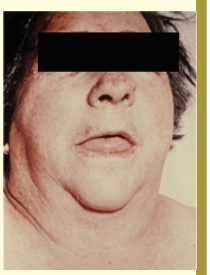
- Increases energy production.
- Raises the rate of metabolism.
- Accelerates the growth and development of the brain in the foetal stage and infancy.
- Regulates growth in children.

How does the rise or fall of the thyroxine level affect the body? Analyse the description given below on the basis of indicators and prepare notes in the Science diary.

Hypothyroidism

Cretinism

This is a condition in which the production of thyroxine decreases. The decrease in production of thyroxine during the foetal stage or infancy, hinders proper physical and mental development. This condition is **Cretinism**. Prolonged deficiency of thyroxine in adults leads to a condition called **Myxoedema**. Low metabolic rate, sluggishness, increase in body weight, hypertension, inflammation in body tissues are the major symptoms of this disorder.



Myxoedema

Hyperthyroidism

This is a condition in which all life activities controlled by thyroxine accelerate due to the continuous and excessive production of thyroxine. High metabolic rate, rise in body temperature, excessive sweating, increased heart beat, weight loss, emotional imbalance are the major symptoms.

Goitre

Iodine is essential for the production of thyroxine. The production of thyroxine is blocked in the absence of iodine. In an attempt to produce more thyroxine, the thyroid gland enlarges. This condition is called **goitre**.

Figure 3.3
Goitre

Indicators

- The importance of thyroxine in controlling life activities.
- The problems caused by excessive production of thyroxine.
- The disabilities due to thyroxine deficiency.
- The relation between iodine and thyroid gland.

DQVJRK

Regulation of level of Calcium

The normal level of calcium in blood is 9-11 mg/100ml. When the level of calcium in blood increases, the thyroid gland secretes a hormone named calcitonin. It lowers the level of calcium in blood. What happens if there is a decrease in the level of calcium in blood? The parathyroid gland situated behind the thyroid gland secretes a hormone called **parathormone**. This hormone increases the level of calcium in blood. The action of parathormone and calcitonin is antagonistic.

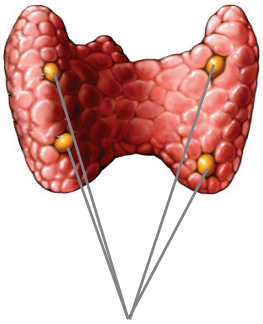


Figure 3.4
Parathyroid gland

Analyse illustration 3.4 showing how the action of these hormones maintains the level of calcium in blood. Prepare notes.

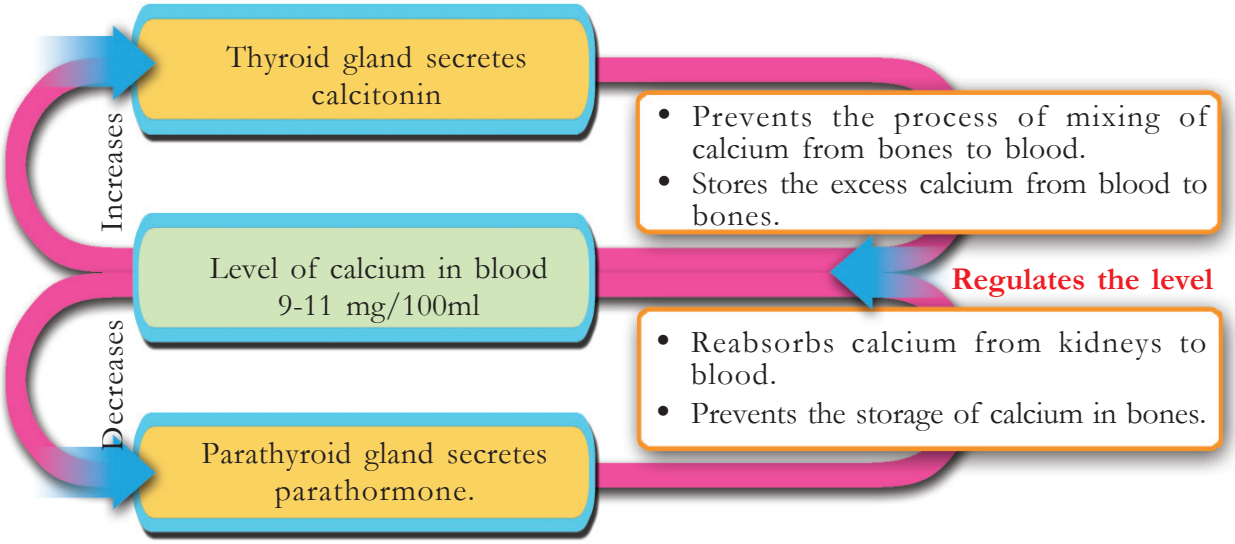


Illustration 3.4 Regulation of level of calcium in blood

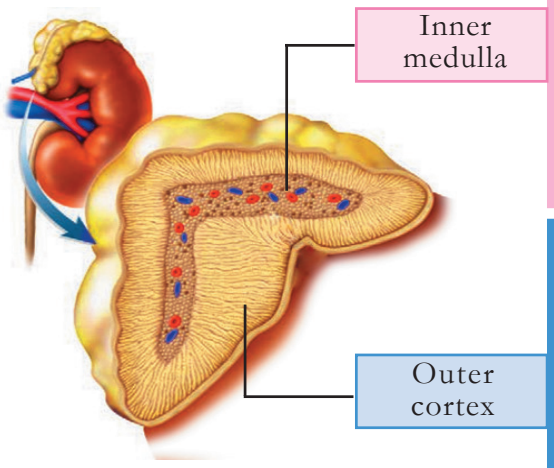
The gland only upto youth!

Figure 3.5
Thymus

Thymus is an endocrine gland situated behind the sternum. This gland is very active during infancy but constricts as we reach puberty. This gland produces a hormone called thymosin. It is also known as 'Youth hormone'. The major function of this gland is to control the activities and maturation of T lymphocytes which help to impart immunity.

During emergencies

The hormones secreted by the adrenal gland equip the body to act during emergencies. Prepare notes on the position and peculiarities of the gland using illustration 3.5 and indicators.



Epinephrine (Adrenaline): acts along with the sympathetic nervous system during emergency. Thus, we can resist or withdraw ourselves from such situations.

Norepinephrine (Noradrenaline): acts along with epinephrine.

Cortisol : The synthesis of glucose from protein and fat. Slows down the action of defense cells. Controls inflammation and allergy.

Aldosterone: Maintains the salt- water level by acting in kidneys. Maintains blood pressure.

Sex hormones: Controls the development and functions of sex organs.

Illustration 3.5 Hormones secreted by the adrenal gland

Indicators

- Position and parts of the adrenal gland.
- Hormonal actions that overcome emergency situations.
- Hormones produced by the cortex and their functions.

The action of epinephrine and norepinephrine prolongs body activities for a longer time, when the sympathetic system gets stimulated. This hormone activity is an example for the coordinated activity of the nervous system and the endocrine system.

Biological Clock

Sleeping and waking up are examples for rhythmic bodily activities. These kinds of activities are controlled by the pineal gland, seen at the centre of the brain. Melatonin, the hormone produced by this gland helps to maintain the rhythm of our daily activities. The production of melatonin is high at night and low during the day.

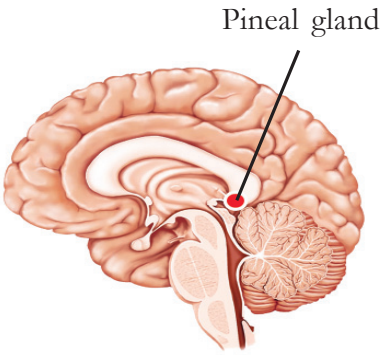


Figure 3.6
Pineal gland

How does the presence of melatonin influence sleep and waking up? Discuss and write down the inferences.

This hormone also controls the reproductive activities of organisms that have definite reproductive periods.

Behind growth

Growth of the body takes place under the control of hormones. The pituitary gland produces the hormone responsible for growth. Analyse figure 3.7 and write down the structure and position of the pituitary gland in the Science diary.

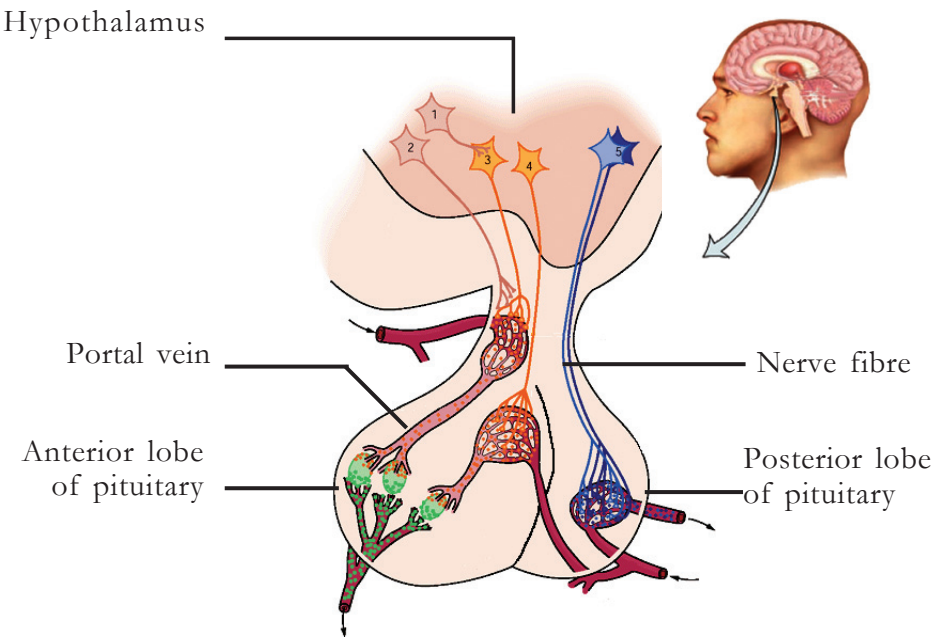


Figure 3.7 Pituitary gland

The hormone that promotes growth of the body during its growth phase is the growth hormone (Somatotropin).

Analyse the description given below and draw inferences on how the variation in the production of this hormone affects growth.

Figure 3.8
Dwarfism and gigantism

If the production of somatotropin increases during the growth phase, it leads to the excessive growth of the body. This condition is called **Gigantism**. It leads to another stage called **Dwarfism** when its production decreases during the growth phase. **Acromegaly** is the condition caused by the excessive production of somatotropin after the growth phase. It is characterised by the growth of the bones on the face, jaws and fingers.

Figure 3.9
An acromegaly affected person

The anterior lobe of the pituitary gland produces hormones which regulate the functions of other endocrine glands. These are tropic hormones. Hence, the pituitary gland has great significance in the endocrine system.

Analyse table 3.1 showing the hormones produced by the anterior lobe of the pituitary and write down the inferences in the Science diary.

Hormones secreted by the anterior lobe of the pituitary gland	Function
Thyroid Stimulating Hormone (TSH)	stimulates the activity of the thyroid gland.
Adreno Cortico Tropic Hormone (ACTH)	stimulates the activity of adrenal cortex.
Gonado Tropic Hormone (GTH)	stimulates the activity of testes in males and ovaries in females.
Growth Hormone (GH) Somato Tropic Hormone (STH)	promotes the growth of the body.
Prolactin	production of milk.

Table 3.1

Childbirth, Breast feeding, Maintenance of water balance

The hormones oxytocin and vasopressin, which are secreted from the posterior lobe of the pituitary gland are produced by special neuro secretory cells of the hypothalamus. The posterior lobe of the pituitary gland stores these hormones and releases into blood when required.

Analyse figure 3.7, and table 3.2 and prepare notes.

Hormone	Function
Oxytocin	• facilitates child birth by stimulating the contraction of smooth muscles in the uterine wall. • facilitates lactation.
Vasopressin or Anti Diuretic Hormone (ADH)	• helps in the reabsorption of water in the kidney.

Table 3.2

Vasopressin regulates the level of water in the body through the reabsorption of water in kidneys. Based on the indicators, discuss illustration 3.6 given below and write notes in the Science diary.

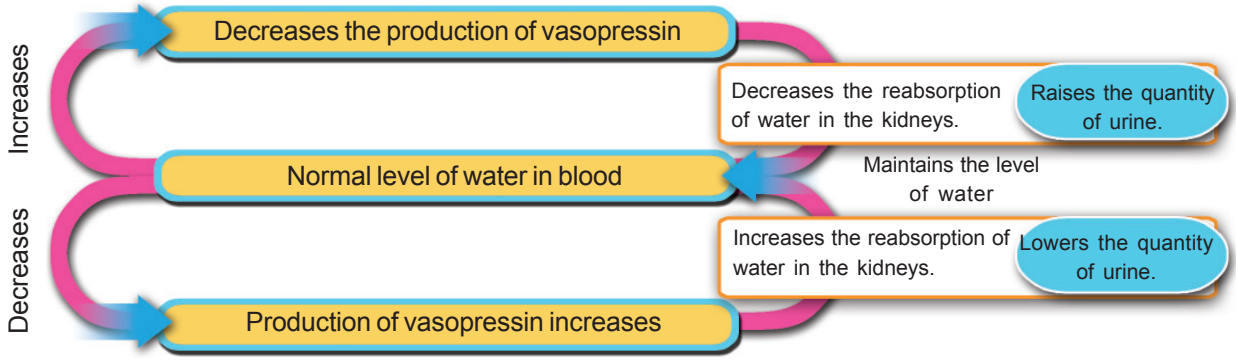


Illustration 3.6 Maintenance of the level of water in blood

The production of vasopressin is high in the summer season during which water loss is excessive through sweat. But its production is less during the winter and rainy season.

Find out the reason for the change in quantity of urine expelled during the summer and rainy season?

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How does decrease in the secretion of vasopressin affect the body? Note down your assumption.

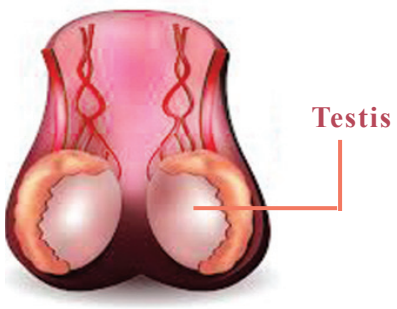
When the production of vasopressin decreases, the reabsorption of water in the kidney is decreased and excess amount of urine is eliminated. This condition is known as diabetes insipidus. Frequent urination, increased thirst etc., are the symptoms.

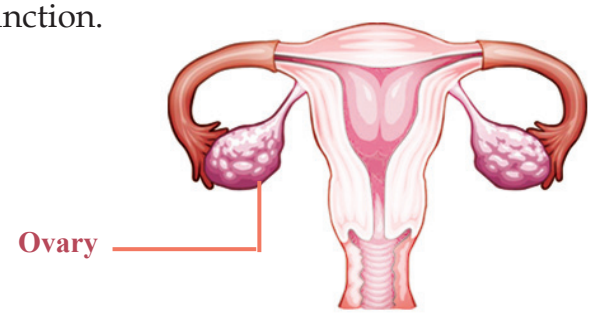
Indicators

- The function of vasopressin in kidneys.
- Production of vasopressin and quantity of urine.
- Diabetes insipidus.

Behind sexual characteristics

The ovary and testis secrete sex hormones. Analyse illustration 3.7 and prepare a table by including hormones, centre of production and function.





Testosterone

Controls secondary sexual characters (change in voice, growth of hair, development of reproductive organs) and sperm production.

Estrogen

Controls secondary sexual characters, ovulation, menstrual cycle etc.

Progesterone

Controls ovulation, menstrual cycle and implantation of embryo in the uterus.

Illustration 3.7 Sex hormones

Prime Controller

Hypothalamus, a part of the brain is an endocrine gland too. It controls the pituitary gland and thereby other endocrine glands.

Based on the indicators, analyse illustration 3.8 and write down inferences in the Science diary.

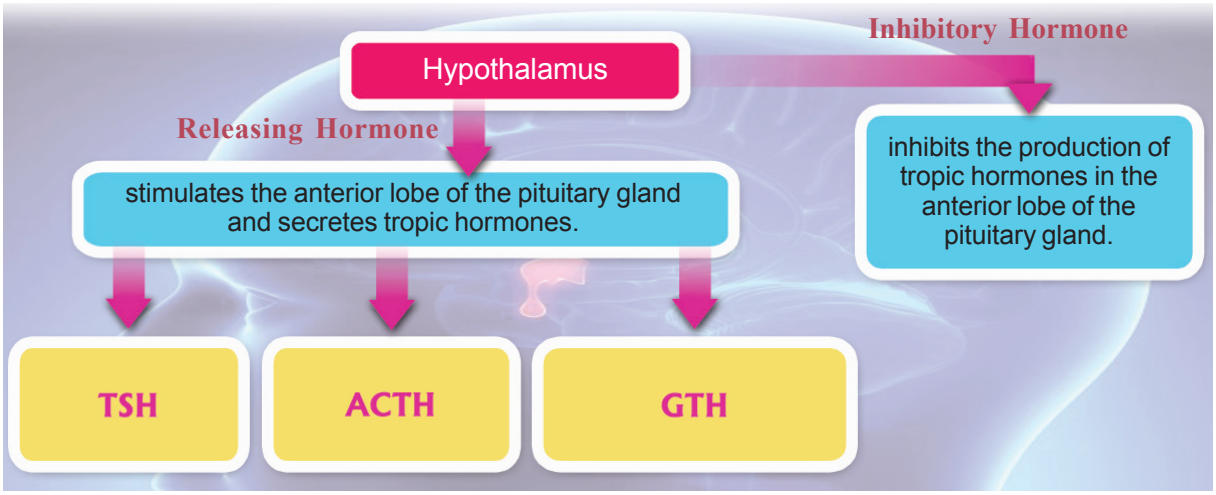


Illustration 3.8 The relation between hypothalamus and pituitary gland

The hypothalamus controls the pituitary gland and thereby the entire endocrine system by producing a variety of releasing hormones and inhibitory hormones.

Indicators

- Action of releasing hormone.
- Action of inhibitory hormone.
- Action of hypothalamus as prime controller.

Chemical messages for communication

Haven't you noticed ants moving in a line along a particular trail? The reason behind this movement is the production of certain chemical substances.

Such chemical substances that are secreted by certain animals to the surroundings to facilitate communication are called pheromones. Pheromones help in attracting mates, informing the availability of food, determining the path of travel, signalling dangers etc. The chemical messages of pheromones also help honey bees and termites to live in colonies.

The muscone in the musk deer, the civeton in the civet cat, bombykol in the female silk worm moth etc., are examples for pheromones.

Artificial pheromones are used for pest control in agricultural fields.

Plants too have hormones

Plant hormones control and coordinate life activities in plants. These are also called plant growth regulators.

Observe illustration 3.9 which shows plant hormones and their functions. Complete table 3.3 suitably.

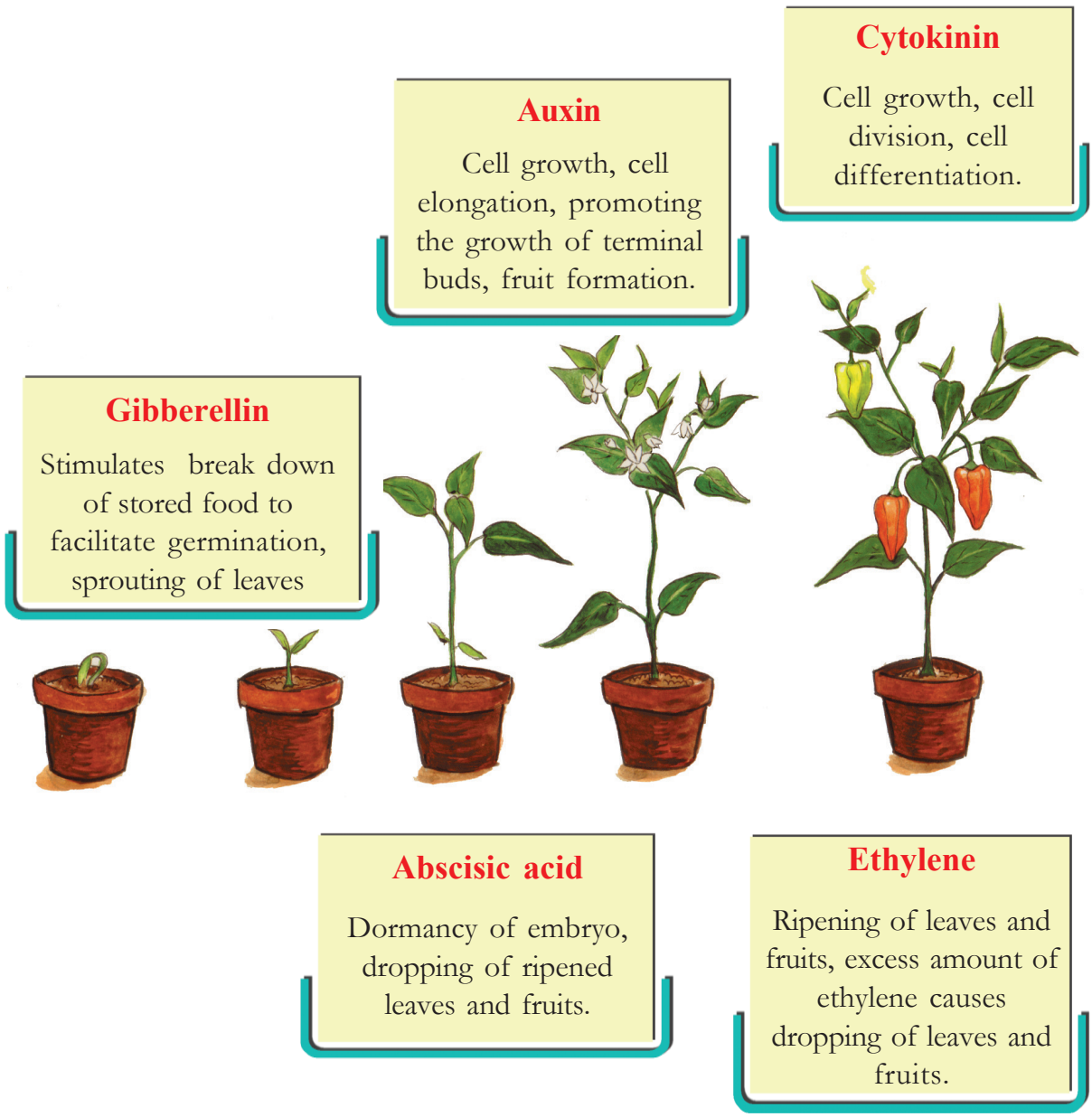


Illustration 3.9 Plant hormones

Plant hormones	Function
Auxin	
Abscisic acid	
	break down of stored food in the seed
	helps in the ripening of fruits

Table 3.3

Artificial Plant Hormones

Plant hormones are synthesized artificially by identifying the chemical structure of the hormones. Use of such hormones has contributed a lot to the progress of the agricultural sector. Let us familiarise ourselves with some such artificial plant hormones.

Auxins

It is used in the agricultural field to prevent the dropping of premature fruits, for the sprouting of roots and as a weedicide.

Gibberellins

It is used for increasing fruit size in grapes and apple and also for preventing ripening of fruits to assist marketing.

Ethylene

Ethylene is used for the flowering of pineapple plants at a time and for the ripening of tomato, lemon, orange etc. Ethyphon, a chemical which is available in liquid form, gets transformed into ethylene, when used in rubber trees and it increases the production of latex.

Abscisic acid

It is used for harvesting fruits at the same time.

Hormones also make the fruits seedless

Seedless orange, grape and watermelon are produced by using artificial auxin. This process of formation of fruit from the ovary without fertilization is called parthenocarpy. Gibberellins also lead to parthenocarpy. Artificial auxins like Naphthelene Acetic Acid (NAA), Indol Butyric Acid (IBA) etc., are used to prevent the dropping of premature fruits and for the sprouting of roots. 2, 4 - D (2, 4 -Dichloro phenoxy acetic acid) is used as a weedicide.

By now, you are familiar with plant hormones too. It is a fact that the uncontrolled use of these chemicals causes many health and environmental issues.

Hormones play a major role in the control and co-ordination of life activities. They are the chemical messages that help to maintain the homeostasis of body activities. The nervous system and endocrine system work along with each other to ensure homeostasis in animals.

Let us Assess

1. Identify the word- pair relationship and fill in the blank.

   Thyroxine : Thyroid gland

   Epinephrine : .....

2. Analyse the information given in the box and answer the questions.

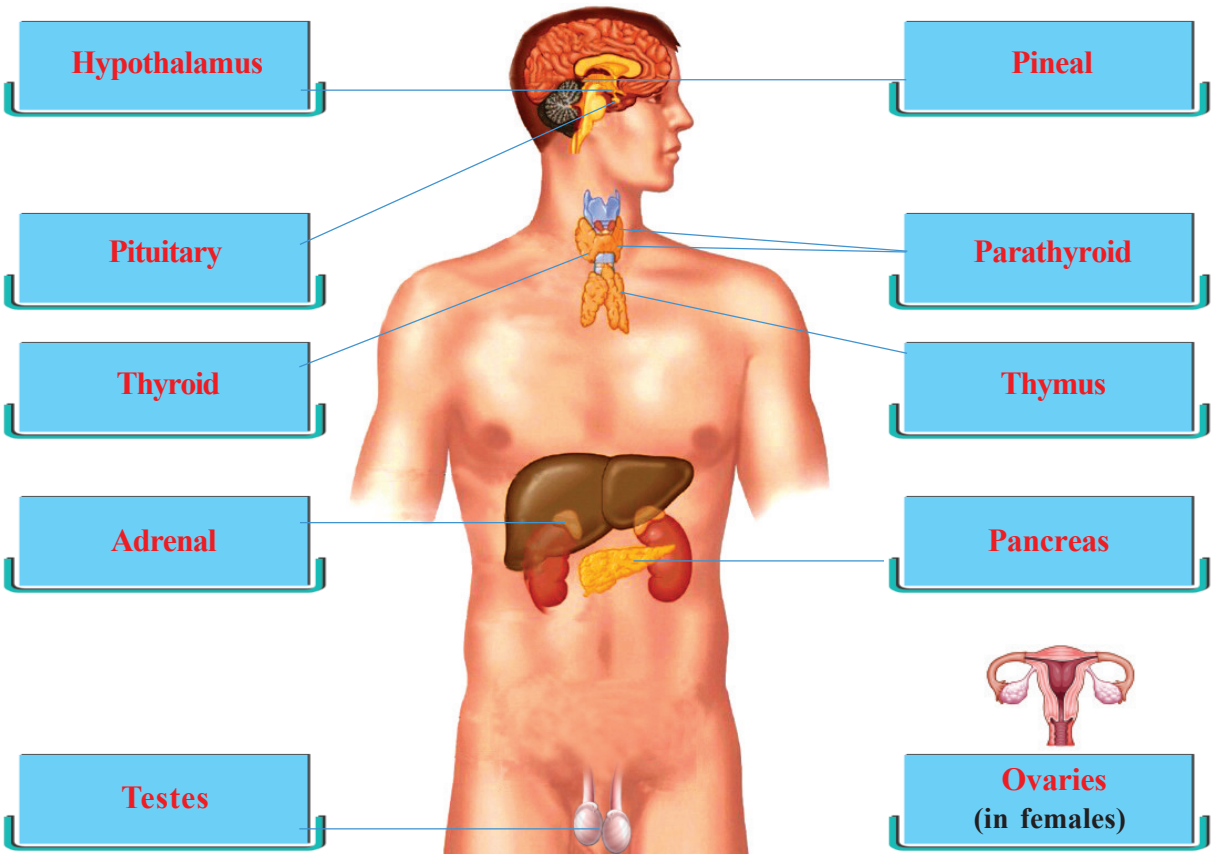
   X - The production of this hormone is more in night and less in day time.

   Y - Hormones from the adrenal gland work along with the sympathetic system.

   (a) Identify and name the hormone 'X' and its gland.

   (b) Identify the hormones indicated as 'Y'.

3. Analyse the illustration and complete the table appropriately.



Gland	Location	Hormones

4. The hormone that helps in the reabsorption of water in the kidneys.

   (a) TSH

   (b) ACTH

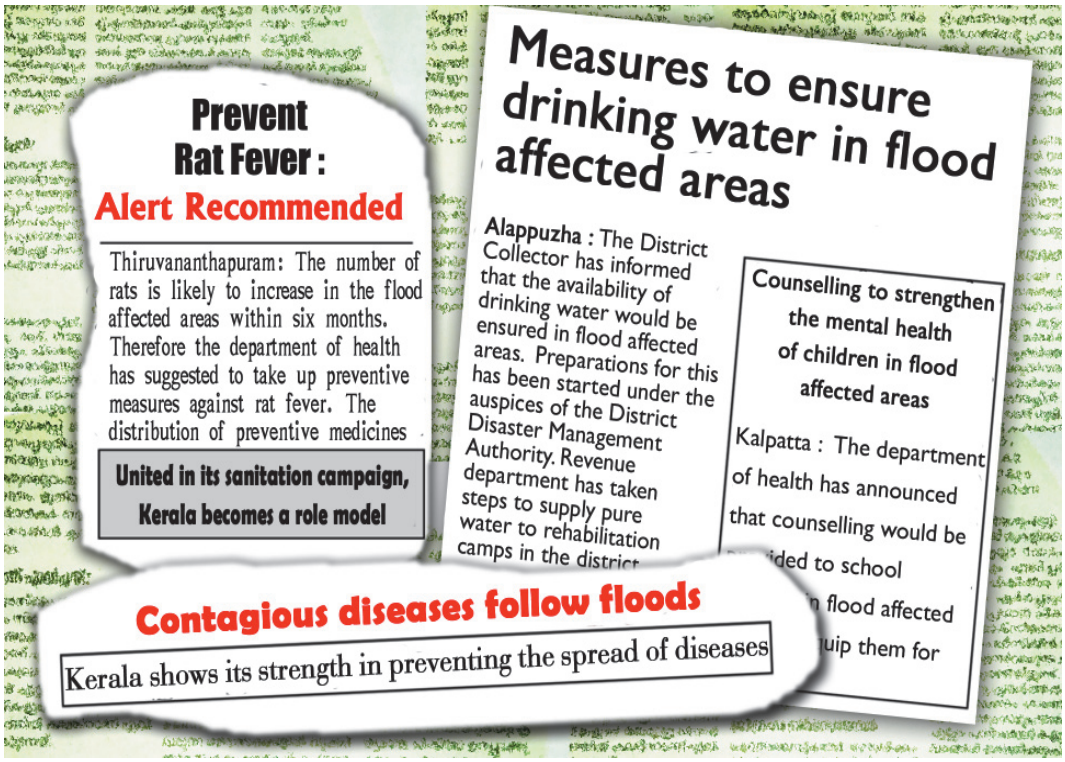
   (c) ADH

   (d) GTH

Extended Activities

- Conduct a seminar on the topic – The Role of the Endocrine System in maintaining Homeostasis.
- Conduct a debate on 'Use of artificial plant hormones-problems and possibilities'.
- Collect information about novel laboratory tests related to diagnosis of diabetes and conduct an exhibition on World Diabetes Day.

4 Keeping Diseases Away



Prevent Rat Fever :

Alert Recommended

Thiruvananthapuram: The number of rats is likely to increase in the flood affected areas within six months. Therefore the department of health has suggested to take up preventive measures against rat fever. The distribution of preventive medicines

United in its sanitation campaign, Kerala becomes a role model

Measures to ensure drinking water in flood affected areas

Alappuzha : The District Collector has informed that the availability of drinking water would be ensured in flood affected areas. Preparations for this has been started under the auspices of the District Disaster Management Authority. Revenue department has taken steps to supply pure water to rehabilitation camps in the district

Counselling to strengthen the mental health of children in flood affected areas

Kalpatta : The department of health has announced that counselling would be ...ided to school ...n flood affected ...uip them for

Contagious diseases follow floods

Kerala shows its strength in preventing the spread of diseases

Kerala withstood the incomparable floods with unity.

What threatended the state again, soon after the great floods?

Analyse the news reports and present the findings.

-
-

What are the reasons for the spread of diseases in such situations? Discuss.

Conditions suitable for the multiplication and transmission of pathogens exist in abundance and this may cause the spread of various communicable diseases. Most of the pathogens are microorganisms.

Microorganisms and Diseases

You have learnt that there are many microorganisms that are useful to humans. But some of them are pathogens.

Expand the list given below by including pathogenic microorganisms.

- Bacteria
-
-
-

Not only humans, but other animals and plants are also affected by these pathogens. How are pathogens transmitted from one person to another?

Analyse illustration 4.1 given below and formulate inferences.

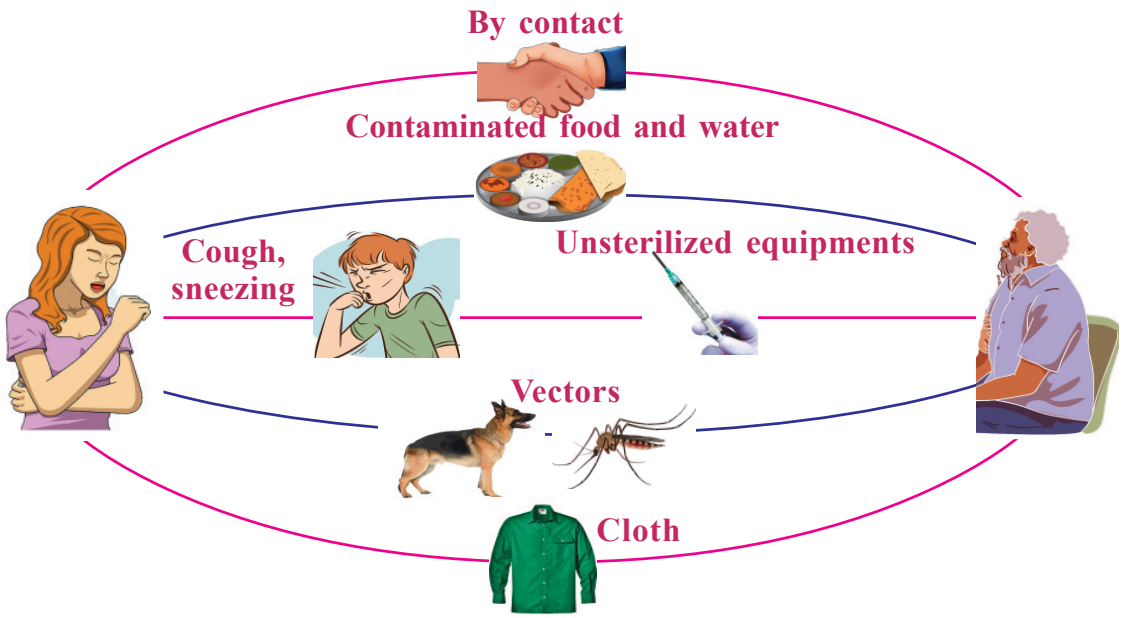


Illustration 4.1 Modes of transmission of diseases

Collect information on other modes of transmission of diseases and expand the illustration.

Identify various methods for the prevention of communicable diseases, prepare a similar illustration and exhibit it in the classroom.

A possible disease that may spread in flood affected areas is rat fever. Analyse the information given below on the cause, mode of transmission and preventive measures of rat fever and write notes in the Sicence diary.

Rat fever (Leptospirosis)

Rat fever is a bacterial disease. Bacteria is a prokaryote. They enter the body and multiply through binary fission. The toxins produced by them destroy cells and cause disease.

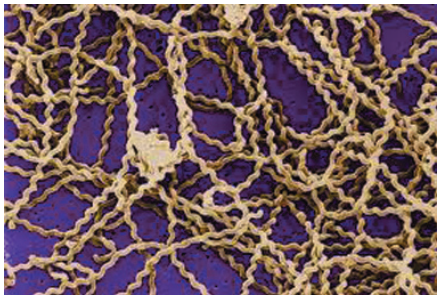
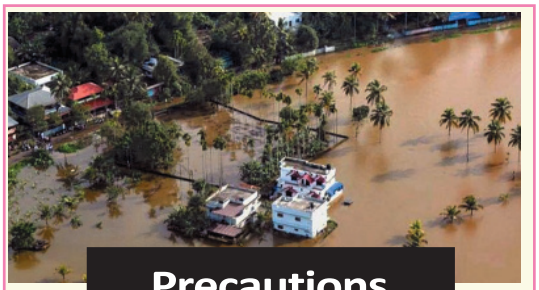


Figure 4.1 Leptospira bacteria

Leptospira is the bacteria that causes rat fever. The bacteria that comes out through the urine of rat, dog and certain other animals remain alive in stagnant water and moisture. When bacteria reach blood through wounds, they affect body cells and produce certain toxins. They cause damage to blood capillaries which in turn leads to internal bleeding. Severe fever, headache, muscle



Precautions after Flood

The Department of Health has given numerous instructions to avoid health issues that may arise after overcoming the emergency situations. Drinking boiled water and water purified using enough quantity of Chlorine prevents water borne diseases. As there is a chance for the multiplication of mosquitoes in stagnant water, proper measures to check increase in mosquitoes should be adopted. For controlling diseases like rat fever, eliminate the vectors and take preventive medicines as per the directions of experts. Disease affected persons must undergo diagnostic tests to confirm their illness and should take proper medicines. People living in unsafe places must shift to safe places as per instructions. Ensure personal hygiene and environmental hygiene at the rehabilitation centres and create an atmosphere to protect health.

pain, redness in eyes, etc. are the major symptoms. Rat fever can be completely cured through early diagnosis and treatment. The realization that immunization is better than treatment is very important to stop the spread of disease.

What are the measures to be taken to prevent the transmission of rat fever? Discuss and present suggestions.

Bacteria cause many other diseases like rat fever.

DRN7HI

Other Bacterial Diseases

Diphtheria

Diphtheria spreads through cough, sneezing or directly from the infected person to another person. Analyse the information and figure 4.2 related to diphtheria and prepare a table including the pathogen, symptoms and treatment for the disease.

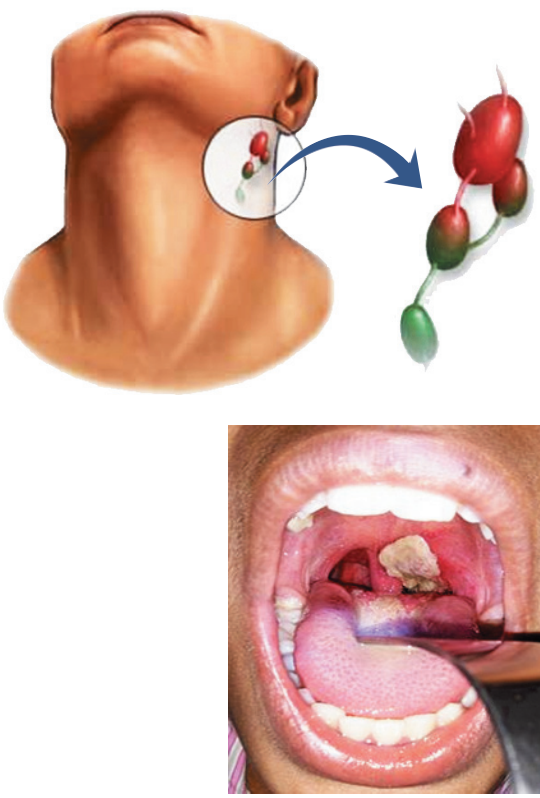


Figure 4.2
Coating in the throat caused by diphtheria bacteria

Diphtheria affects the mucus membrane of the nose and the throat. *Corynebacterium diphtheriae* is the pathogen. Toxins produced by the bacteria cause fever, throat pain and inflammation in the lymph glands of the throat. Cells in the mucus membrane which are destroyed by the toxins produce an ash coloured thick coating in the throat within two or three days. Gradually brain, heart and kidneys are affected.

Antitoxins which act against the toxins are used to protect the uninfected cells. But, if the disease becomes severe the patient cannot be recovered through medication. So vaccination is the best preventive method.

Tuberculosis

Tuberculosis was a dreadful disease earlier. Analyse the information given below and prepare a wall magazine on the main points relating to tuberculosis.

Pathogen	*Mycobacterium tuberculosis.*
Major Symptoms	Loss of body weight, fatigue, persistent cough
Transmission of Disease	When the patient speaks, coughs or sneezes, the pathogens spread into the air and thereby to others.
Organs/Body parts Affected	Tuberculosis mainly affects the lungs. But kidneys, bones, joints, brain etc. are also affected by this disease.
Treatment	By administering antibiotics
Vaccine	BCG is used as preventive vaccine against tuberculosis.

Prepare a chart based on the information collected on the National Tuberculosis Prevention Programme and exhibit it in the class.

Collect additional information on other bacterial diseases and their mode of transmission and prepare a table. Exhibit it in the class.

Viral Diseases

Nipah spreads as a scare

Medicine for Nipah virus arrived

Haven't you noticed the news reports?

Nipah was the most fatal of the diseases that Kerala faced recently. This is a viral disease. Analyse illustration 4.2 and find out how Nipah virus causes the disease.

Based on the indicators, prepare notes in the Science diary.

Virus

Virus has the simple structure with a DNA or RNA molecule within a protein coat. Virus has no cell organelles as seen in normal cells. Hence virus multiplies by taking control over the genetic mechanism of the host cells. Viruses infect not only human beings but also plants, other animals and even bacteria.

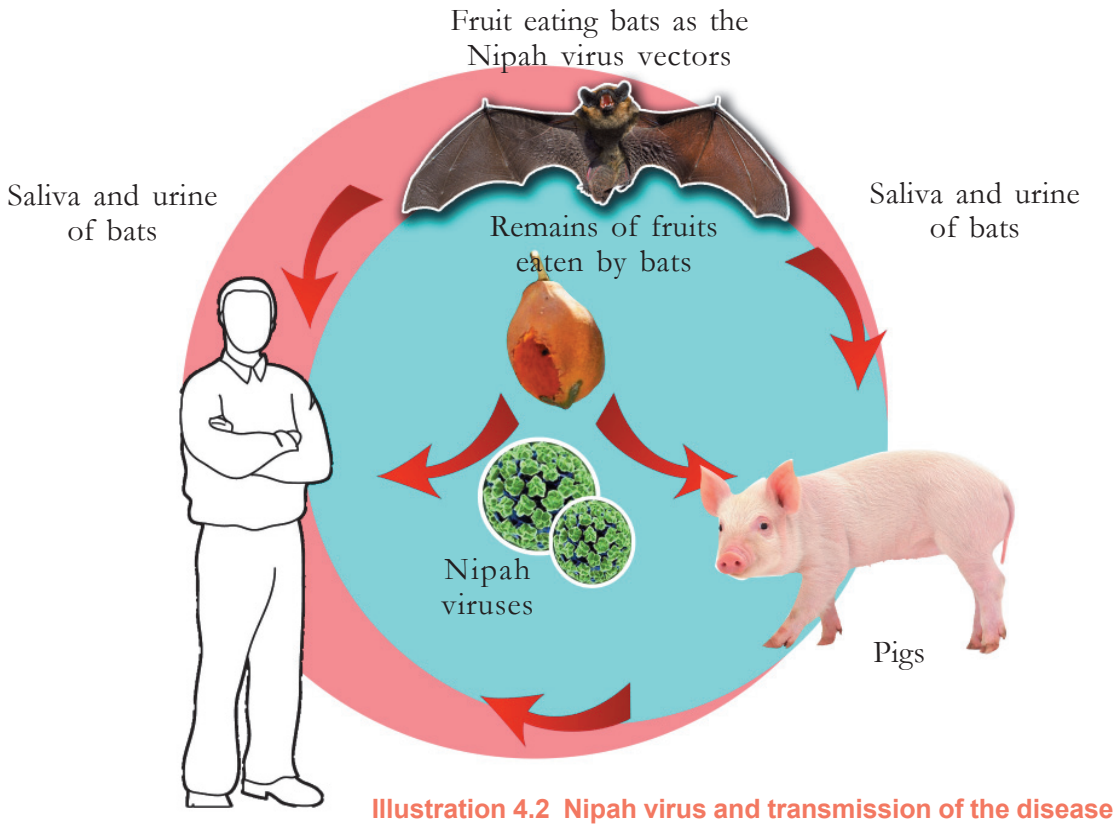


Illustration 4.2 Nipah virus and transmission of the disease

Indicators

- Natural vector of Nipah virus.
- Situations that enable the virus to enter humans.

Haven't you heard of AIDS? A note on this disease is given below. On the basis of the indicators, discuss the note and write your inferences in the Science diary.

Figure 4.3
HIV

AIDS

AIDS (Acquired Immuno Deficiency Syndrome) is a dreadful disease that has gripped the world by fear. Lymphocytes play a major role in providing immunity to the body. HIV (Human Immuno deficiency Virus) enters the body and multiplies using the genetic mechanism of lymphocytes. Hence the number of lymphocytes decreases considerably and reduces the immunity of the body. Various other pathogens which enter the body in such a situation make the condition of AIDS even more fatal.

Indicators

- How does HIV multiply in the human body?
- The number of lymphocytes and AIDS.
- Condition that makes AIDS fatal.

What are the ways by which one gets infected with HIV?

Write your inferences in the Science diary by analysing illustration 4.3 given below.

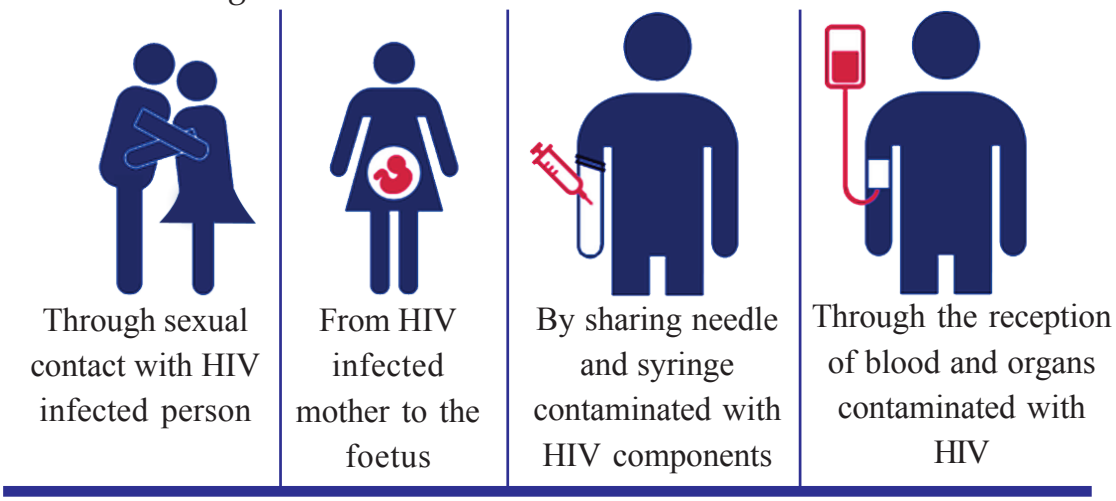


Illustration 4.3 Mode of transmission of AIDS

AIDS does not spread...

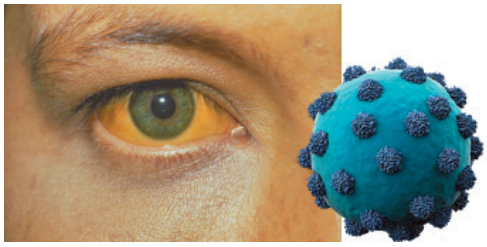
- by touch, shaking hands, coughing, sneezing etc.
- through insects like mosquitoes, houseflies etc.
- by staying together and sharing food.
- by using the same toilet.
- by taking bath in the same pond.

Should we be scared of AIDS patients?

What should be our attitude towards them? Discuss.

Hepatitis

Hepatitis is a liver disease. Hepatitis is also caused by virus. Inflammation of the liver is its major symptom. When the flow of bile secreted by the liver is blocked, an increase in the level of bile pigment called bilirubin in blood is noticed. This imparts dark yellow colour to the



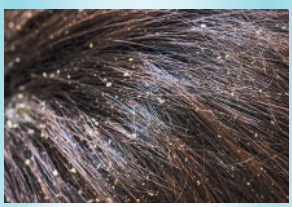
mucus membrane, white portion of the eyes and the nails. This is the external symptom of the disease. Disease gets transmitted through contaminated food and water, blood components and excreta of the patient. Certain hepatitis do get transmitted in the same way as the transmission of HIV.

Discuss the preventive measures of this disease and present your inferences.

Hepatitis can also occur due to reasons other than virus infection. Collect more information about such reasons.

Dengue fever and Chikunguya that are common in Kerala are also viral diseases. These diseases are transmitted through mosquitoes. Discuss the precautions to be taken to prevent the transmission of these diseases. Collect information on other viral diseases and their modes of transmission and prepare a table. Exhibit it in the class.

Dandruff

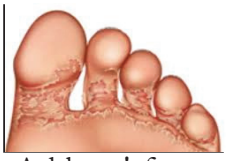


When dead cells fall off, skin cells are continuously regenerated. At times the cells divide faster than falling off and become scales. This condition is **dandruff**. Certain fungi that affect the skin at this time cause itching and other infections. The scales may fall off as white dusts and may cause loss of hair.

Fungal Diseases

Fungi are of various types. Some fungi are pathogenic. The toxins produced by the fungi cause diseases. Analyse figure 4.4 and the description on some fungal diseases that affect human beings and prepare a table enlisting the diseases, symptoms and modes of transmission.

Ringworm



Athletes' foot

Figure 4.4 Fungal diseases

Ringworm is a skin disease caused by certain types of fungi. The disease manifests as round, red blisters on the skin. This disease spreads through contact. **Athletes' foot** is a fungal infection which manifests on the sole of the foot and between the toes. Appearance of reddish scaly rashes that cause itching is the major symptom. Pathogens enter through the toes when they come in contact with contaminated water and soil.

Diseases Caused by Protozoa

Protozoans are unicellular eukaryotes. Malaria is an example of a disease caused by protozoa. Prepare a note by analysing illustration 4.4 and the information give on malaria.

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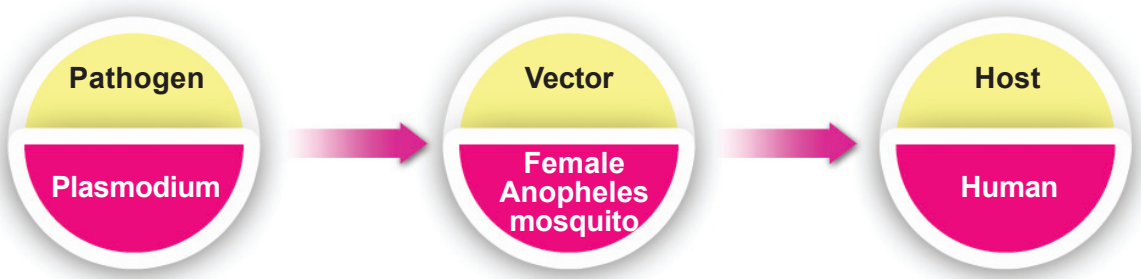

Illustration 4.4 Malarial infection

High fever with shivering and profuse sweating are the major symptoms of malaria. Other symptoms include headache, vomitting, diarrhoea, anaemia, etc.

Worms as Pathogens

Filariasis is caused by filarial worms that are spread by Culex mosquitoes. The worms stay in the lymph ducts and obstruct the flow of lymph by blocking the ducts. This causes swelling in the lymph ducts.

Polluted surroundings promote the multiplication of pathogens. The increase in the number of vectors like mosquitoes, houseflies etc leads to the spread of communicable diseases much beyond control. In order to control the spread of communicable diseases, it is necessary to avoid situations that lead to the multiplication of pathogens and vectors. It is our duty to keep our surroundings clean.

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What is the significance of observing 'Dry Day' in schools and at home? Discuss.

Nonpathogenic Diseases

Are diseases caused only by pathogens? Are they caused by other factors too? Observe illustration 4.5.

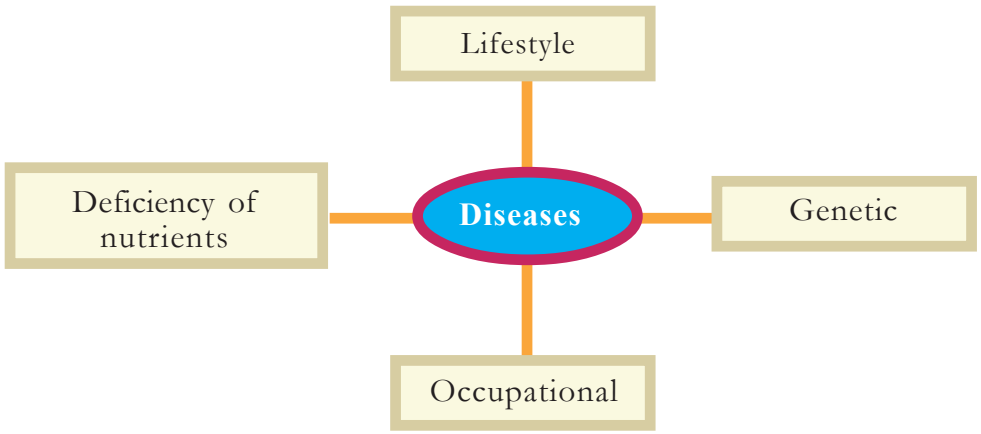

Illustration 4.5 Non-communicable diseases

Occupational Diseases

Occupational diseases are caused by situations in work sites. Some examples for occupational diseases are given below. : Pneumoconiosis, affecting the labourers engaged in coal mining; Silicosis, affecting mining workers related to gold, tin, mica and labourers in quarry; pottery and ceramics. Asbestosis, affecting workers in asbestos factories.

Have you learnt about diseases caused by the deficiency of nutrients? Let's examine other reasons and conditions that cause diseases.

Genetic Diseases

Genetic diseases are caused by defects in the genes that control the cellular activities. Haemophilia, sickle cell anaemia, etc. are examples of genetic diseases.

Haemophilia

Blood clots with the help of some proteins present in blood plasma. What will happen when the genes that control protein synthesis become defective? Discuss.

DSPR44

Haemophilia is the condition in which excess blood is lost even through minor wounds. As haemophilia is a genetic disease, a complete cure is not possible at present. Temporary relief is brought in by identifying and injecting the deficient protein.

There are social organisations which work for haemophilia patients who need special care and attention. These organisations volunteer to provide adequate care to haemophilia patients and make their relatives and the public aware of it.

Sickle cell anaemia

The defects in genes may also cause deformities in the sequencing of amino acids which are the building blocks of haemoglobin. As a result of this, the structure of haemoglobin changes and this in turn decreases its oxygen carrying capacity. Observe the changes that occur in the red blood cells of sickle cell anaemia patients given in illustration 4.6. Write your inferences in the Science diary based on the indicators given.

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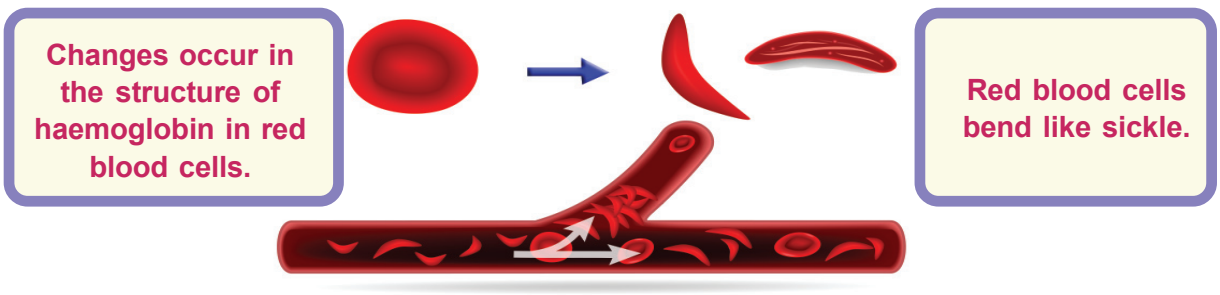

The oxygen carrying capacity of red blood cells decreases. The sickle shaped RBCs get collected in the blood vessels and block the flow of blood in them.

Illustration 4.6 Sickle cell anaemia

Indicators

- Why do haemophilia patients lose blood excessively, even through minor wounds?
- How does the deformity of red blood cells in sickle cell anaemia patients affect their body?

Cancer

Cancer is caused by the uncontrolled division of cells and their spread to other tissues. The normal cells get transformed into cancerous cells when the control system of cell division fails. This may be due to environmental factors, smoking, radiations, virus, hereditary factors, etc. The disease may become complicated with

the spread of cancer cells to other parts of the body through blood and lymph.

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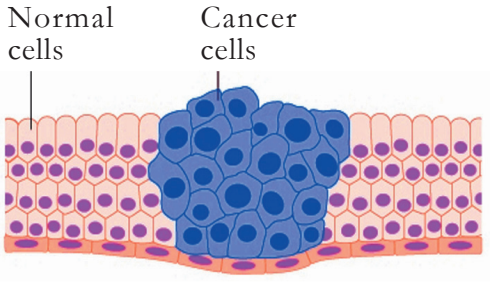

Illustration 4.7 Cancer cells

Cancer and Kerala

The studies conducted by the Regional Cancer Center in Thiruvananthapuram has revealed that every year there are more than 50,000 newly affected cancer patients in Kerala and about 20 percent of cancer are due to some components in food. 50 percent of cancer among males are related to mouth, throat and lungs. The main reasons identified for this are smoking and alcoholism. Though the rate of infected persons are increasing, the number of people recovering from the disease is also on a steady increase. Even though cancer is a genetic disease, it is not considered as a hereditary disease.

Surgery, chemotherapy, radiation therapy etc., are extensively used in the treatment of cancer. As recovery from the disease is difficult if the disease becomes severe, early diagnosis of the disease is crucial in the treatment of cancer.

Discuss with cancer specialists about the life style and food habits that will help us to get rid of cancer. Also collect more information in this regard from other sources.

What is the importance of voluntary organisations that offer palliative care to cancer patients? Love and care are as important as food and medicines. Discuss.

Look at the collage.

Don't these newspaper reports point to the ill effects of unhealthy life styles?

Lifestyle Diseases

Lifestyle diseases are caused by unhealthy living styles. The changes in food habits, lack of physical exercise, mental stress, bad habits like consumption of alcohol, drug abuse, smoking, etc. lead to various lifestyle diseases.

Analyse table 4.1 about certain lifestyle diseases and conduct a classroom presentation on healthy habits to be followed to avoid such diseases.

Disease	Cause
Diabetes	deficiency of insulin or its malfunctioning
Fatty Liver	deposition of excess fat in the liver
Stroke	rupture of blood vessels in the brain, block of blood flow
Hypertension	decrease in the diameter of arteries due to deposition of fat
Heart attack	block of blood flow due to deposition of fat in coronary arteries which carry blood to the heart.

Table 4.1 Different lifestyle diseases

Observe illustration 4.8 on some of the health problems associated with smoking.

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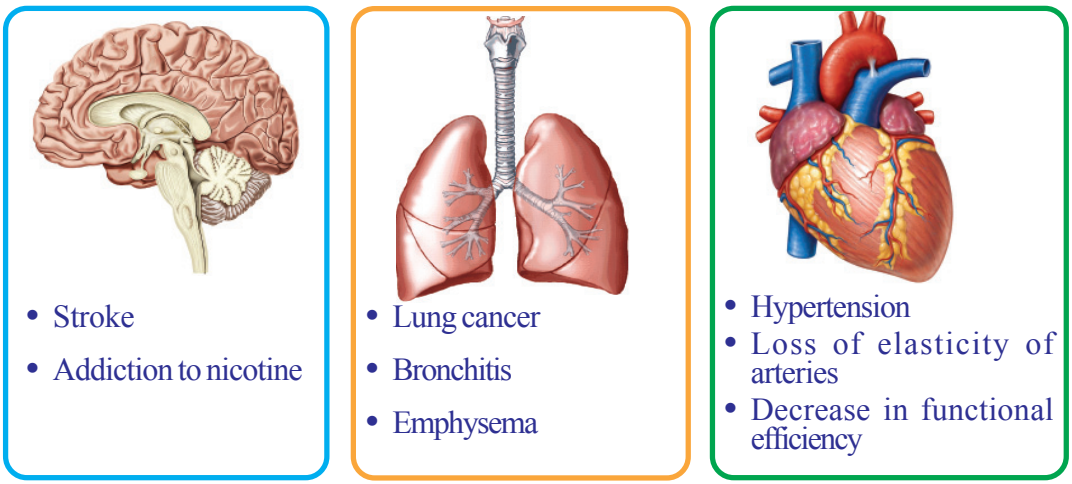

Illustration 4.8 Smoking and health hazards

Collect more information on the bad effects of smoking and write it in your Science diary.

Conduct a poster exhibition to make people aware of drug abuse.

Animal Diseases

Not only human beings, but animals are also affected by diseases. Observe table 4.2 about some animal diseases.

Disease	Pathogen
Anthrax, Inflammation of udder	Bacteria
Foot and mouth disease	Virus

Table 4.2 Some animal diseases

Elaborate the table by including details of other animal diseases.

Plant Diseases

Plants are also affected by various diseases. Examine table 4.3 to identify some of the plant diseases caused by microorganisms like bacteria, virus and fungi.

Pathogen	Disease
Bacteria	Blight disease in paddy, Wilt disease in brinjal
Virus	Mosaic disease in peas and tapioca, Bunchy top of banana
Fungus	Quick wilt in pepper, Bud rot of coconut.

Table 4.3 Some plant diseases

Collect more information on plant diseases that adversely affect food production and write it in your Science diary.

You may also make use of agricultural publications for collecting additional information.

Try to understand the problems faced by farmers in your locality and participate in preventive activities against plant diseases.

The state of complete physical, mental and social well-being of a person is called health. Healthy people are the real wealth of a society. The attitude towards patients is as important as keeping away from diseases by practising healthy habits. It is our duty to console those who are affected by noncurable and fatal diseases.

Let us Assess

1. Which among the following is not a bacterial disease?

   a. Tuberculosis b. Nipah

   c. Diphtheria d. Anthrax

2. "Food safety will be adversely affected with the spread of plant diseases."

   a. Do you agree with this statement? Why?

   b. Give two examples of plant diseases.

3. Prepare a pamphlet including the major measures to be taken to prevent rat fever.

4. What is the importance of vaccination in preventing diphtheria?

5. What health habits should be adopted to prevent lifestyle diseases?

Extended Activities

- Prepare a check list and collect information on various lifestyle diseases. Find out the lifestyle diseases that are observed commonly.
- Prepare and exhibit posters highlighting the fact that social hygiene is as important as personal hygiene.

Its high time we protected nature and natural resources….!

Forests have a great role in conserving the health of the environment in which we live. Forests are decisive in many respects. Source of the water we drink and the air we breathe, balancing atmospheric temperature, determining weather, managing agriculture, source of our food etc., are some of those areas.

Wild animals inhabit forests. Each animal has a function to perform in the environment in which it lives. Thus wild animals have a vital role in aspects like pollination of plants, dispersal of seeds, sustenance of forests etc.

It is our duty to protect and preserve forests, lakes, rivers, wild animals etc,which are all part of our nature. Also, Article 51(g) of our constitution reminds every citizen of India to have a compassion for living creatures.

Activities taken up for the conservation of forests and wild life by the Forest Department:

- Establishing Forestry clubs in schools, for spreading knowledge about forests.
- Establishing Eco-tourism centres as a part of encouraging eco-friendly tourism.
- Conducting Nature study camps as a part of forest and wild life education.
- Making public places green.
- Providing financial aid to conserve *'kaavu'*.
- Turtle conservation project.
- Instituting 'Vanamitra award' for promoting creative contributions in the field of green projects.
- Instituting 'Prakritimitra award' for conserving habitats outside forests and biodiversity.
- Conducting the 'Citizen Conservator Programme' for ensuring the role of public in forest conservation.

Toll free number of Forest department: 18004254733