

Unit

1

Air Pressure



What is required ? Air-absorber rubber-cork and plain glass.

What to do ?

- ☞ Place the air-absorber rubber-cork on the table as shown in the figure and press it.
- ☞ Now try to lift it. What happens ?
- Write your experience.



We are surrounded by air from all sides. **From the surface of the earth up to 800 km air layer is there which is called atmosphere.** When air-absorber of rubber is pressed the air comes out, so pressure inside the air-absorber decreases while the outer air-pressure is more.

We know that air also has mass like other objects. The air-pressure of 9.8N per unit square cm is exerted on our body, then why are we not crushed due to this much pressure of air ?

There is air in our body. The pressure of air inside the body and in surrounding is balanced so we are not crushed.

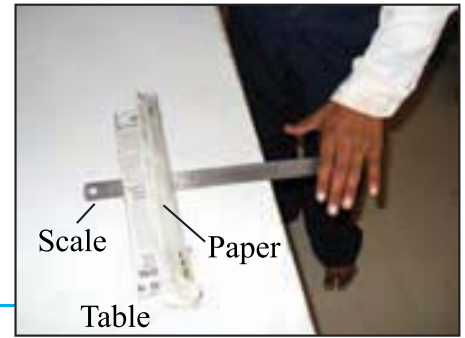


What is required ? Newspaper and scale

What to do ?

- Fold the newspaper four to five times and place it on the table as shown in the figure.

- Place the scale between newspaper and the surface of the table in such a way that one fourth part of it remains outside the table.
- Now, push the scale as shown in the figure.
- What happened ?



- Now unfold the paper and repeat the activity.
- What happened ?



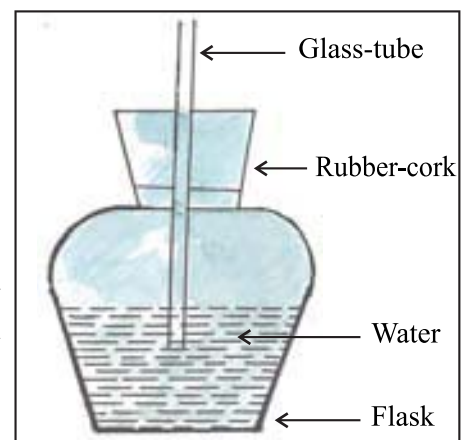
- Why this happened ?



What is required ? Flask, rubber-cork with hole, glass-tube and water.

What to do ?

- Fill the half flask with water.
- Pass the glass-tube from the hole of the rubber-cork.
- Now, insert the cork on the flask and make it air-tight and immerse the lower part of tube in the water.
- How can you take water out from the open end of the tube without sucking it ?





Discuss causes of this.

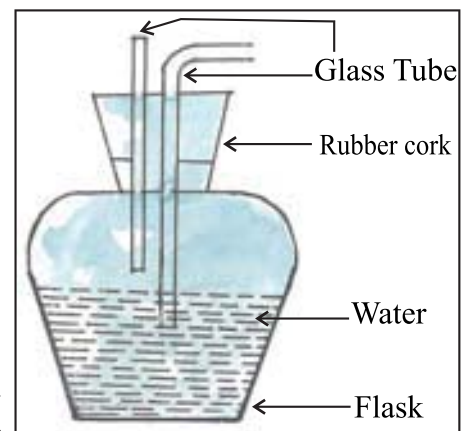


What is required ?

Flask, rubber-cork with two holes, two glass-tubes and water.

What to do ?

- Fill the half flask with water.
- Insert the glass-tubes in the cork as shown in the figure.
- Now, make flask air-tight with cork in such a way that one glass-tube is immersed in water and other is above surface of water.
- Using either of the tube make bubbles in water.
- How bubbles can be produced ? Why ?



What is required ? Glass, straw and water.

What to do ?

- You would have experienced drinking cold drinks with straw.
- Take a glass of water and drink it with a straw.
- While drinking by straw, we suck the air that is there in the straw.



- When the air from straw is sucked the pressure inside it decreases and water rises in it due to pressure of water in the glass.
- Now make a hole at the center of straw and then drink water as shown in the figure.



What happened ?

- Why did it happen ?



What is required ? Bottle with small mouth and a piece of chalk.

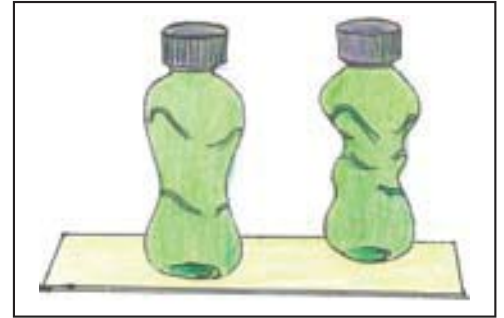
What to do ?

- Take a bottle with small mouth.
- Put the piece of chalk in the bottle as shown in the figure.
- Now, blow with your mouth and push the chalk inside the bottle.
- What happened ?



- Why it happened ?

- Take a plastic bottle.
- Pour hot water into the bottle and put the cap on it.
- After some time pour cold water.
- What happens ?





What is required ? Rubber balloon.

What to do ?

- We play many types of games with balloon.
- Take a balloon and blow air into it. It will inflate.
- The air which in the balloon keeps it inflated.

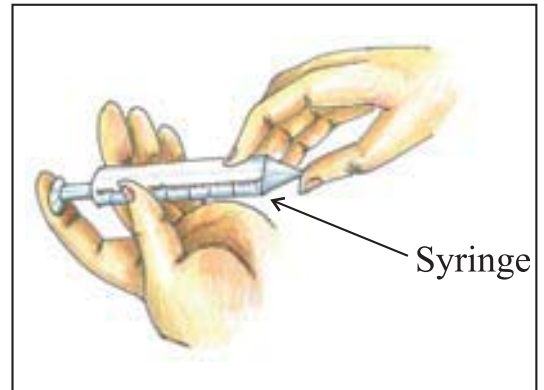
Pressure in the balloon is maintained because molecules in the air constantly collide with the inner walls of the balloon.

so the balloon remains inflated.

- Now, you can say, how more air into the balloon make it burst ?



- Let us experience the air pressure.
- Take a syringe without needle used as injection.
- As shown in the figure close the uppermost part of the syringe with your thumb and push the knob at the other end with your finger and leave it.



What happens ?

- Now, again press the knob of the syringe. Can the knob totally pushed ? Why ?

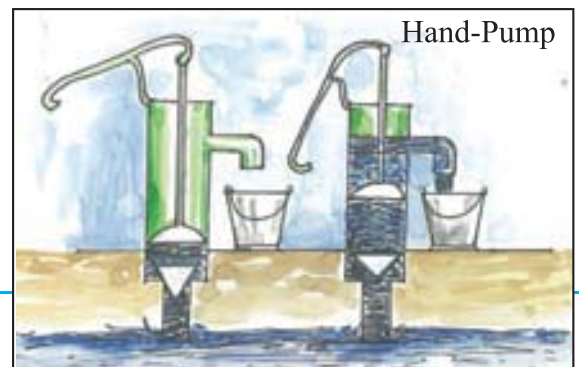


- Excess of air in cycle or motorcycle tyre can burst the tube.
- For the safety of the tube the air-pressure should not exceed certain limit.
- Instrument used to measure air-pressure is called Barometer.
- The unit of measure, air-pressure is bar.



In the given figure of the hand pump try to understand how it works.

Note down the examples of works, which are done by air-pressure in our day to day life.





What is required ?

One straw, scissor, water and a bowl

What to do ?

- Take a long straw.
- Cut the straw into v shape with the scissors as shown in the figure.
- Now as shown in the figure, put the smaller side of the straw into the bowl filled with the water bow air and explain.





- Q.1** If you have any cycle-shop near the house try to understand the structure of the pump ?
- Q.2** Understand the structure of the tube and valve ?
- Q.3** What is the work of the valve-tube in the cycle tube ?
- Q.4** In your day to day life where do you use air-pressure ? Think and write .

: Do yourself :
Make a watergun for yourself.

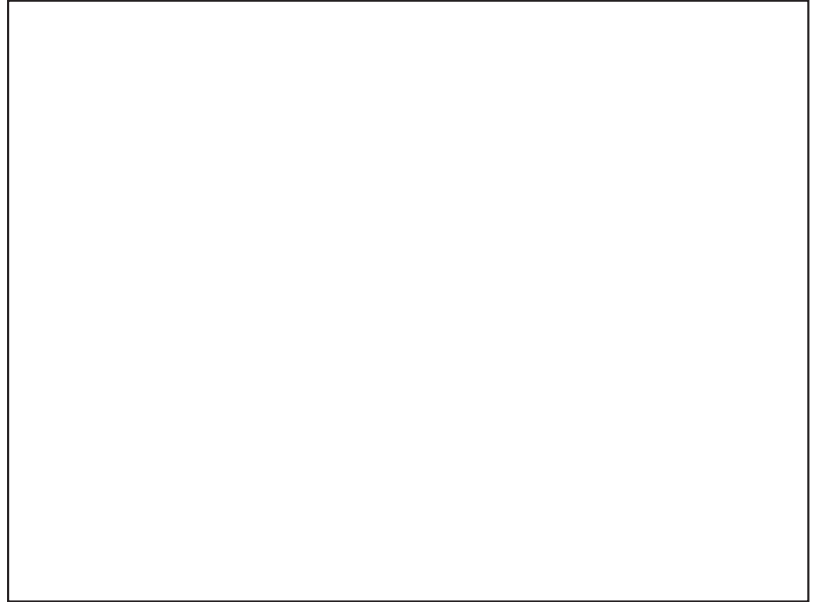


Unit

2

Flower and Fruit

We have studied different parts of plants on the basis of that, draw a labeled diagram of plant showing all organs of plants and fill appropriate colours.



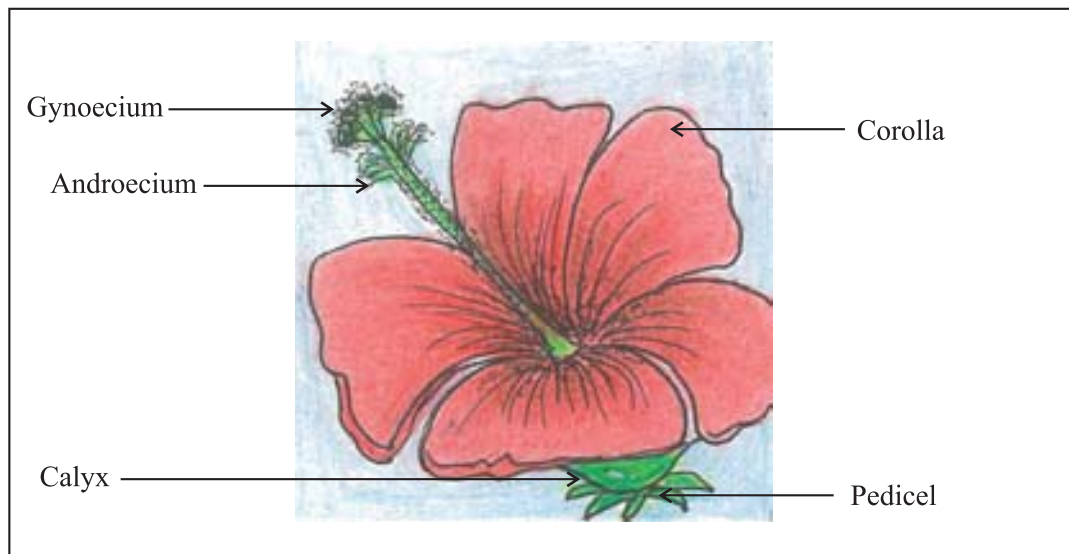
Observe any one around you.

Find the most beautiful and attractive organ of that plant ?

Collect some plants found around you.

- | | | | |
|-------------------|----------------------|--------------------|----------------------|
| 1. Shoe-flower | <input type="text"/> | 2. Vinca (Barmasi) | <input type="text"/> |
| 3. Nerium (Karen) | <input type="text"/> | 4. Night Jasmine | <input type="text"/> |
| 5. Rose | <input type="text"/> | 6. Champa | <input type="text"/> |
| 7. Datura | <input type="text"/> | 8. Mogra | <input type="text"/> |

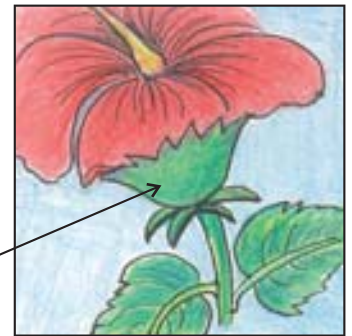
Now, observe the flowers collected by you. Observe whether the parts shown in the diagram are present in that flower or not.



Receptacle :

- The tip region of a peduncle is slightly flattened on which different parts of the flower are arranged.
- Find out the receptacle of the flower collected by you.

Receptacle



Calyx :

- Look at the green coloured leafy structures of the flower,. They are known as sepals. Sepals together form calyx. It protects the flower during its budding stage.
- Identify the calyx of the flowers collected by you.

Calyx



Corolla :

- Look at the colourful structures arranged above calyx. They are known as petals. Petals together form corolla.
- Identify the corolla of the flowers collected by you.
- Observe the flowers collected by you and complete the following table.



Corolla

Sr.no.	Name of flower	Colour of petals	Number of petals	Does it smell?

Corolla is colourful and provides good smell. Their function is to attract insects.

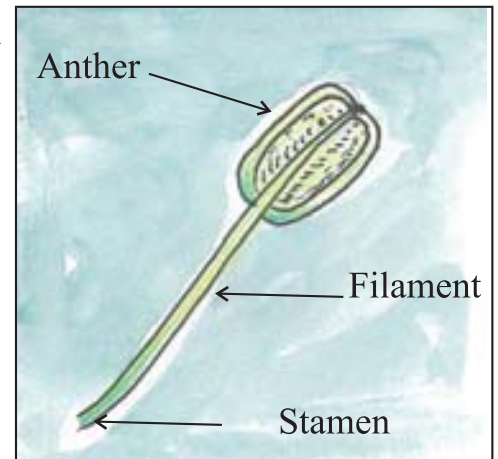


- 1, 2, 3, 5, 8, 13, 21, 34, 55 Those type of series of digit is called Fibonacci series. Here each number is the total of its previous two digits. E.g. $1+2=3$, $2+3=5$, $3+5=8$ Number of petals and sepals of a flower follow fibonacci series.

Androecium :

- Remove petals from the flower collected by you.
- Now observe the filament like structure.
- You will find that the structure in the centre is different from the structures surrounds it.

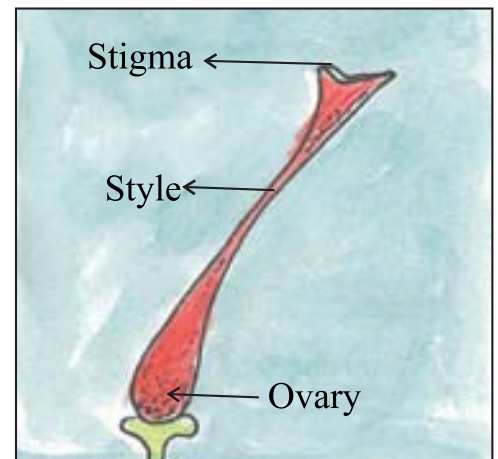
- Structures found are surrounding called stamen.
- Separate all the stamens from its flower and count them.
- Lower part of stamen looks like a thin thread.
- Upper part of stamen is called anther.
- Anther produces pollen grains.
- Identify the androecium in all the flowers collected by you.



Androecium

Gynoecium :

- A tube like structure surrounded by stamens is called Carpel.
- Observe the carpel of the flower collected by you.
- The flatten, upper most region of carpel is called stigma.
- Tube like structure beneath the stigma is called style.
- The swollen portion at the base of carpel is known as ovary.
- Cut the ovary in to two halves with the help of a blade.
- Observe its internal structure.
- Whether the numbers of stamens and carpels are equal in the flower collected by you ?



Gynoecium

- There is only one carpel in most of the flowers. But sometimes there are more than one carpel found in a flower. Carpels unitedly form the gynoecium.
- Identify the gynoecium in all the flowers collected by you.



What is required ? A flower, a paper and magnifying glass.

What to do ?

- ☞ Separate all the stamens from the flower.
- ☞ Strike the anther on a paper with the help of your fingers and separate pollen grains from it.
- ☞ Try to observe those pollens with the help of magnifying glass.

Pollination :

Migration of a pollen grain from stamen to stigma of a carpel is called pollination. There are two types of pollinations.

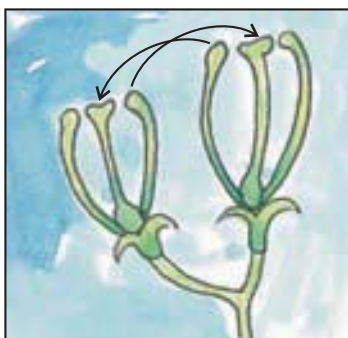
- (1) Self-pollination
- (2) Cross-pollination

(1) Self-pollination : Pollination taking place within the flowers of same plant.

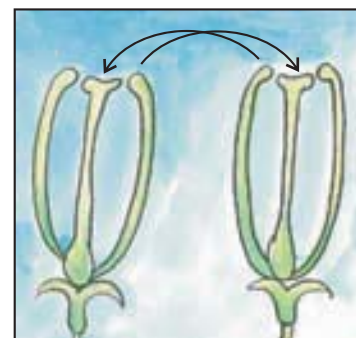
(2) Cross-pollination : Pollination taking place between flowers of two different plants of same species.



Self pollination



Self pollination

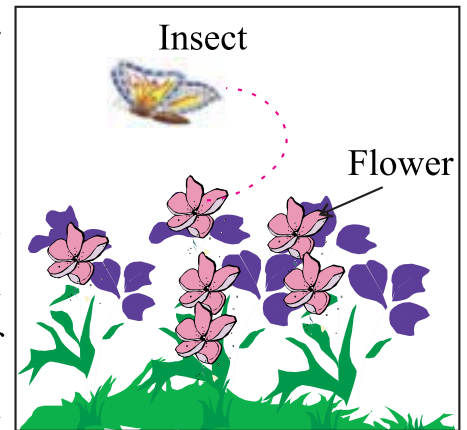


Cross pollination

Careers of pollination :

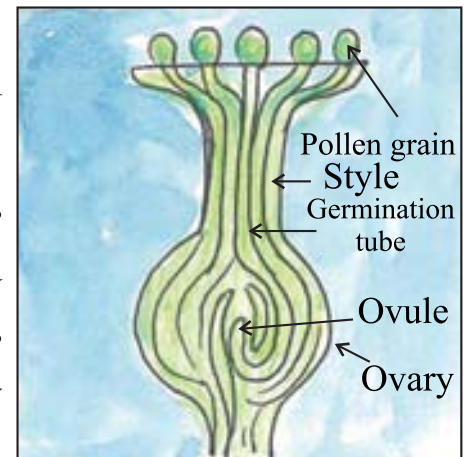
How does a pollen grain do move from one flower to another flower ?

Pollen grains are very light in weight it can fly with air or flow with the water. While sometime some insects like butterfly, bee and honeybee are attracted by the colorful and fragrant petals of the flower and pollen grains stick to their body. Thus, wind, water and insects are the carriers of pollen for the means of pollination. Even birds are bat also play an important role in pollination.



Fertilization :

Pollengrains reach stigma due to pollination. Pollen grains develop pollen-tube which reaches the ovary. Male gamete travelling within the pollen-tube binds with the egg cell of ovary. This process is called fertilization. After fertilization the egg cell converts into an embryo, ovule converts in to seed and ovary converts into fruit.



Fruit :

There are two types of fruits : (1) Fleshy fruits (2) Dry-fruits.

1. Fleshy fruits : Wall of ovary becomes flashy and bulky in some fruits. E.g. Mango, Papaya, Lemon, Tomato etc. These types of fruits are called Fleshy Fruit.



Fleshy fruit

2. Dry fruits : The wall of ovary becomes dry in some fruits at their maturity, E.g. Field bean, pea, pigeon pea, green gram. These type of fruits are known as dry-fruit.



Dry-fruits

Prepare a list of fruits you know.

Classify those fruits in following table :

Fleshy fruits	Dry fruit



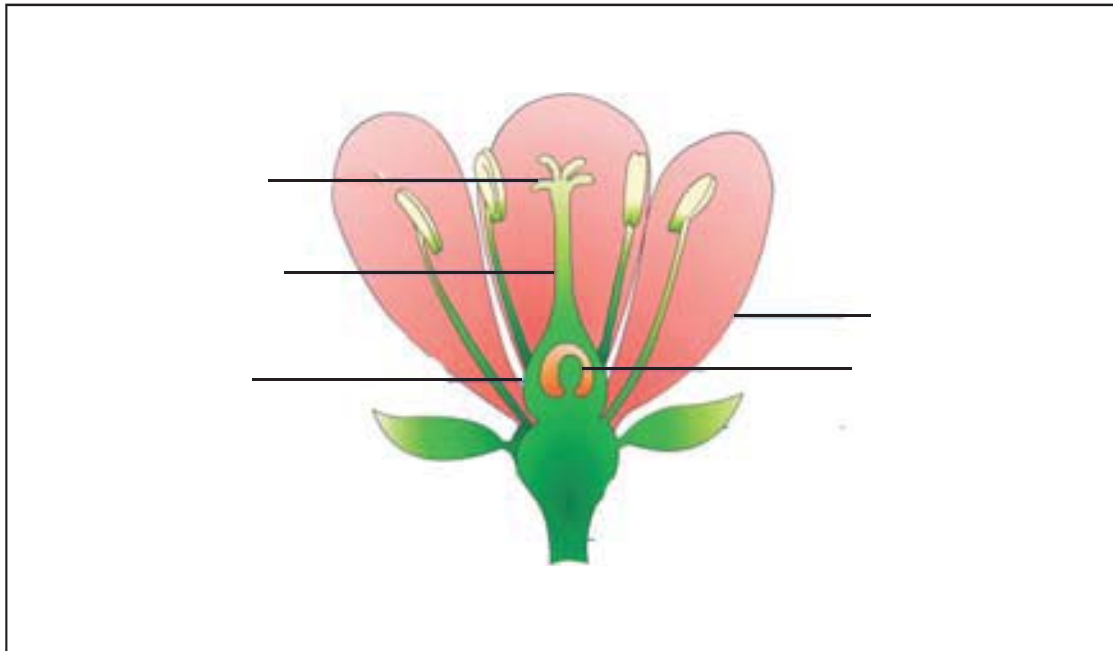
- Those fruits are known as a Legume of pod-which are formed by one chambered ovary. E.g. Field bean, cow pea, pea etc.
- Those fruits are known as Capsule, which are formed by bicarpellary or polycarpellary ovary. E.g. Cotton, bhindi (ladyfinger).
- If the pericarp remains fused with the seed coat than type of fruit is known as caryopsis. E.g. Wheat, maize, pearl millet.



Q.1 Tell me, who am I ?

1. Flowers are arranged on me _____.
2. I protect the flowers in bud condition _____.
3. I am a colorful part of the flower and I am also full of fragrance _____.

Q.2 Label the following diagram of a flower :



Q.3 Classify the following fruits into fleshy fruits and dry-fruits :

Ground nut, Lemon, Tomato, Cucumber, Bottle Guard, Pea, Mango, Bengal Gram, Brinjal, Bitter guard, Egg plant (jamun).

Fleshy fruits	Dry-fruits



Unit
3

Modern Agriculture

Agricultural land is decreasing due to urbanization in modern time. To increase agricultural production, we have to use modern equipments, improvised seeds, modern irrigation methods and scientifically authorized agricultural methods.

Modern equipments : See and write name of each in blank space :



- Where does the tractor being used in agriculture ?

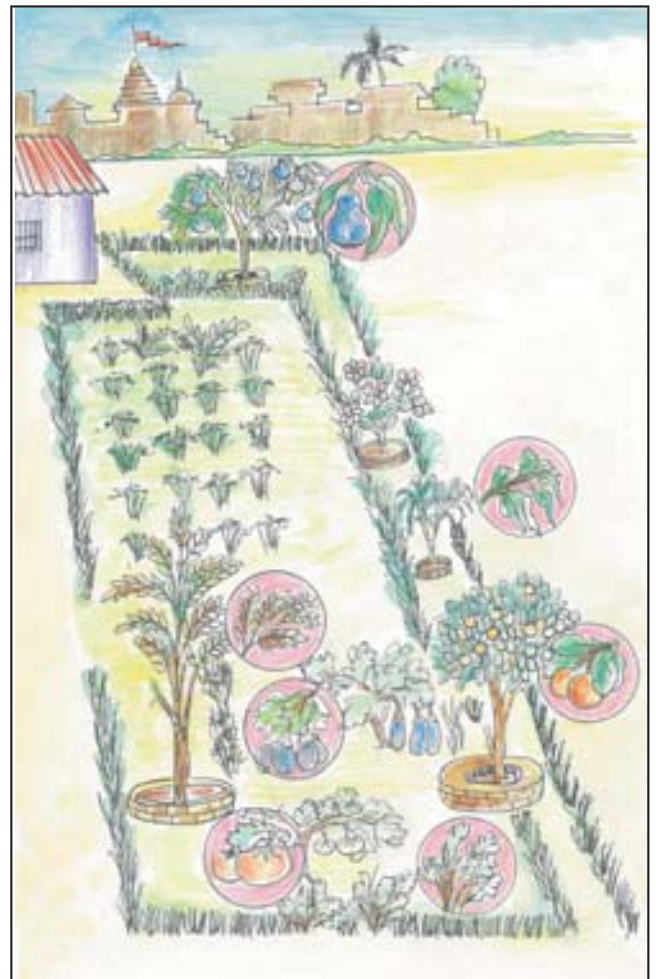
Which instruments are being used to separate seeds from its cob ?

Which instruments are being used to spray insecticides ?

Vehicle like tractor is used to remove weeds. Harvester is used to take crop in large fields. While thracer is useful to separate cereals and pulses.

Kitchen-Garden :

Cultivate Goose berry (amla), Drum stick tree (Saragavo), Sweet neem etc in the land surround your house of school. Cultivate broad bean, Bottle gourd, Bitter gourd and Goosberry along with them. Also grow vegetables like Amaranthus, Spinach, Chilly, Brinjal and Tomatoes.



Terrace-Garden :

As there is scarcity of land in big cities, one can grow a small garden on the terrace of house. We can grow plants in small pots or spreading a plastic sheet on the roof and spreading a 9 inch thick layer of soil over it. We can grow vegetables and flowering plants there. One can also grow climbers and grapes.

**Net-House :**

A net is tied on the sides and also on the top of the farm to protect plants against heat. This is called net-house. Plants can grow better due to moderate temperature. Net-house is used generally for germination seedlings to grow crops like tomato and to produce fertilizers like wormy compost.

Horticulture :

We can use small patch of land for horticulture. Horticulture is very important way of farming in modern age. This farming is very useful to earn more profit in less time and less availability of resources. Strawberry, grapes, papaya, water melon, mango, chiku, pomengranate, guava, citrus like fruits and many types of flowers can be grown using this method.

Grafting is very useful method in horticulture. A farmer can gain more profit by growing 'cuttings' of fruiting trees. One can gain more benefit by producing cuttings of good varieties of crops. Inter crops of vegetables can be taken in the gardens of mango, chiku and coconut. Horticulture is very useful for the prosperity of farmers. We can avoid wastage of water by using drip irrigation method in horticulture.



- Government provides financial support for drip-irrigation and agriculture research.

Seeds Production :

With the help of artificial pollination, hybrid seeds can be produced to get better seeds. Farmers produce hybrid seeds of sunflower, cotton, castor, rice etc.

Hydroponics :

Hydro means water while ponics means hard work. Hydroponic agriculture means growing plants without soil. This method is used in those area where there is a scarcity of agricultural land or agricultural land is unavailable.

There are three methods of hydroponics :

- (1) Water culture method
- (2) Gravel-culture method
- (3) Sand-culture method.

Water-culture method :

One PVC pipe is taken and holes are created at distance. Roots of plants are kept in these pores. Water having minerals like K, Ca, Fe, Mg, Bo and Zn are flown in these pipes. Minerals and water useful for the growth of the plants are is provided by pipe.

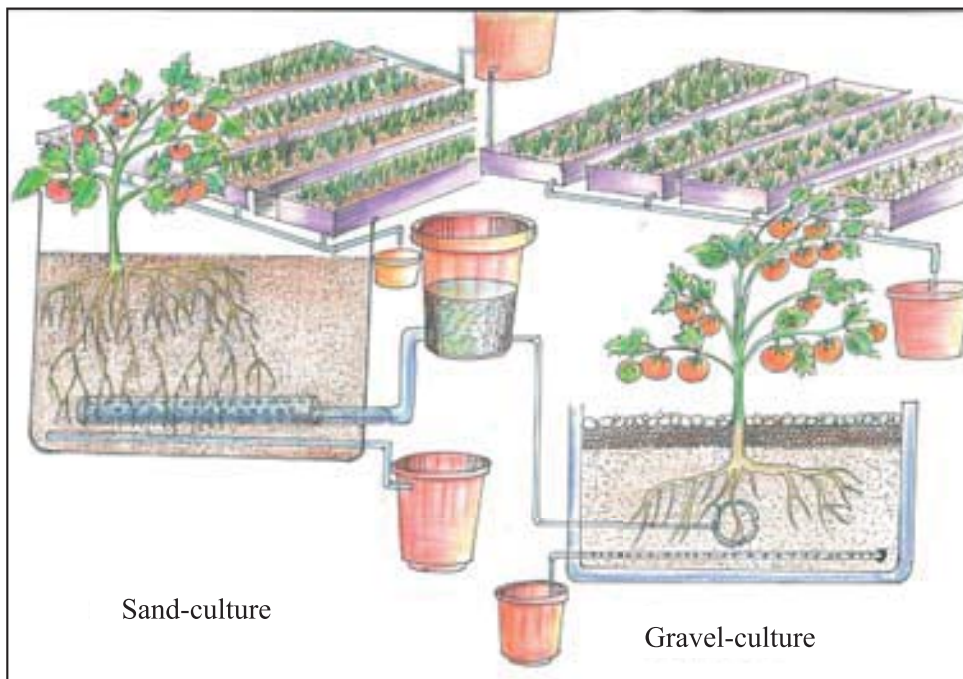


Excess water is collected and flown again in the pipe. Thus, water and fertilizers can be saved.

Gravel-culture method and culture method :

First of all the roof of the building is covered with plastic and a layer of soil (sand) is spread over it. To keep the plants erect, layer of gravel is made over the layer of sand. Plants are grown at a proper distance in the gravel layer. Water having nutrients is spread on these plants. Similarly plants can be grown in the sand culture method by making a layer of sand.

We can cultivate small flowering plants, vegetables, grapes and strawberry by using hydroponics. Growth of plant is faster in this method, hence production of crop is better.





Buried Irrigation method :

In this type of method pipe used in drip irrigation is dug 50 cm deep in the soil. Small roots are prevented to enter in to this pipe with the help of tury plan. Entry of soil is prevented in the pores of pipe. Effective farming can be done by this method.

Sprinkling :

Sprinklers are kept at proper distance in this method. Plants are given water by sprinklers starting them at proper time. Fruitbeds, gardens and net-houses are using method. 30 to 300 liter water can be irrigated by this method.

Management of irrigation :

Computer is used to maintain proper water-level. Proper proportion water can be maintained by using proper irrigation method and the supply is cutoff automatically when it is not needed.

Computer is provided information regarding the humidity of soil with the help of measuring equipments set under the soil. These equipments are connected to computer.



- Q.1** Which plants can be grown in kitchen-garden ?
- Q.2** Why modern equipments are used in agriculture ?
- Q.3** What is the difference between hydroponics and agriculture on land ?
- Q.4** What type of production can be taken with the help of cutting method ?

Do this : Visit a net-house and collect information.

Try to develop kitchen-garden.



Unit

4

Microbes



Discuss with your family members and answer the following questions :

1. Has any member of your family got any diseases during last six months ?

2. If the answer is yes, then which was that disease ?

3. Which type of symptoms does he/she had shown during that disease ?

4. Was any household treatment given during that disease ?

5. If your answer is yes, then which type of treatment was given ?

6. Had any doctor treated along with household treatment ?

7. Which types of precautions were advised to be taken by the doctor ?

- Discuss with your friends about the information collected by you.
- 1. Which disease came to your knowledge during the discussion with your friends ?

- 2. Which precautions were advised against that disease ?



With help of your teacher visit a clinic of any doctor. Ask some questions regarding those diseases, their remedies and precautions.

- 1. Which disease are found very frequently ?

- 2. What can be the reasons for those diseases ?

- 3. Which are the main symptoms of each disease ?

- 4. What precautions should be taken to prevent that disease ?

- 5. Which micro-organisms are responsible for that disease ?

- 6. How micro-organisms spreads ?

Name of Disease	Causes	Symptoms	Precautions	Does any micro-organism responsible for that? If yes, than which one?

Thus, you see that many microbes disturb our biological processes. Now, we shall collect more information regarding microbes.

Collect more information from the book 'Health and Hygiene' available in your school library.

There are five types of microorganisms :

1. Fungi
2. Protozoa
3. Bacteria
4. Virus
5. Algae

Fungi :

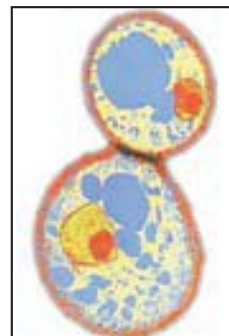
What is required ?

Bread or Roti (Loaf), Plastic bag, Thread, magnifying glass.

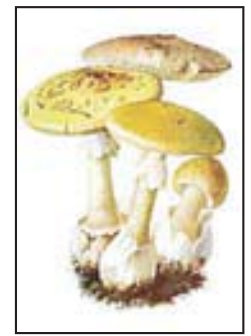
What to do ?

- ⇒ Take a piece of bread or roti in a plastic bag and shut the mouth of the bag.
- ⇒ Take piece of bread or roti out of the bag after three to four days and observe it with the help of magnifying glass.
- ⇒ You will find white fibrous structures as well as greenish black spots developed on that piece.
- ⇒ Those white fibres or greenish black spots are of fungus. Fungi show many variations.
- ⇒ During monsoon season fungi is found on the dead materials like roti, pickles, wet clothes, shoes and other leather goods. Fungi may be unicellular or multi cellular.
- ⇒ There are two main types of fungi :
(1) Yeast (2) Mold (Found on bread)

Mushroom is one type of mold. It grows on decaying material and grows in monsoon season in fields and dunghills.



Yeast



Mushroom

Benefits :

- Yeast is useful for the fermentation for the preparations of food like dhokla, idli, dhosa.
- Yeast is also useful in the preparations of bread, biscuit and cake.
- Penicillin is used to prepare antibiotics.
- Fungus like mushroom can be used directly as food.
- Cheese can be made tasteful by using fungus.

Harmful effects of fungi :

- Some fungi produce bad effects to food material.
- The fungus is responsible for the decomposition of leather.
- Ring worm, Itches, Eczema.

Protozoa :

What is required ? A sample of stagnant water, compound microscope, slide, coverslip.

What will you do ?

- Observe the sample of stagnant water under compound microscope.

You will find some unicellular organisms in that water moving here and there. They are protozoans.

- Amoeba, paramoecium and plasmodium are the examples of protozoans.
- Shape of Amoeba is indefinite. Locomotion takes place by constantly changing shape of its body.
- Paramoecium is having a definite shape. That shape is slipper like. This organism swims rapidly using the cilia that surround its body.
- Plasmodium is a parasitic protozoan.



Amoeba



Paramoecium

Benefits :

- Useful in scientific research.
- Useful in the study cell division and regeneration.
- Useful as animal's food.
- They can decompose organic matter hence useful for cleaning dirty water and waste.

Harmful effects :

Amoeba is responsible for causing amoebic dysentery.

- Plasmodium is responsible for causing malaria.
- Elephantiasis is also caused by them.

Bacteria :

- ⇒ Can you imagine that how minute structures are the bacteria ?
- ⇒ According to one estimate, total number of bacteria present in a spoon fill soil is equal to the total number of human population of the world.
- ⇒ If we think about the environment, bacteria are found everywhere. In air, water, food, soil, in the body of animals as well as on plants.
- ⇒ Thus, bacteria are present in entire environment.

Benefits : In the making of curd and cheese from milk.

- ⇒ It softens the hard muscles.
- ⇒ Helpful to animals to digest plant material.
- ⇒ Decomposition of complex structures into simple nutrients.
- ⇒ Helpful in pretreatment for making leather goods.
- ⇒ Increase the fertility of soil.

Harmful effects : Produces different diseases.

- ⇒ *Vibrio cholera* causes cholera.
- ⇒ Diphtheria is caused by *Coryne bacterium diphtheria*.
- ⇒ T.B. is caused by *Mycrobacterium tuberculosis*.
- ⇒ *Salmonella typhosa* causes typhoid fever.
- ⇒ *Microbacterium leprae* causes Leprosy.
- ⇒ Above all these diseases like tetanus, plague, pneumonia, dysentery like disease are also caused by bacteria.

Virus : We usually believe that bacteria are the smallest organisms. But there are some smaller organisms than bacteria which can enter in to the body of bacteria and kill bacteria They are virus.. We cannot see virus even with the help of compound microscope. It can be seen only with the help of electron microscope.

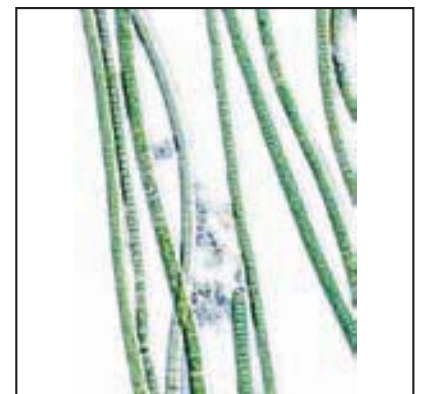
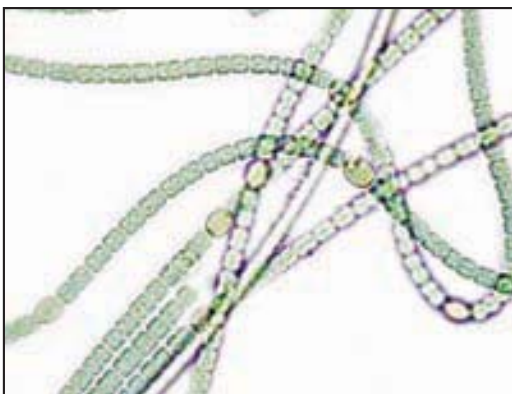
Virus can grow only after entering in any living cell. When they are outside of living cell; they remain inactive and behave as non living, but when they enter any living cells, they become active and behave as a living organism as well as they reproduce to give rise to next generation of virus. Thus, they are called connecting link between dead and living ones.

Harmful effects :

- Virus can cause cold, small pox, chickenpox, jaundice, polio, eye disorders, chicken guinea, swine flu, AIDS, dengue or rabbis (hadakwa). Thus, virus is the biggest enemy of human being.
- Due to vaccination program for chicken pox (shitla), we are able to eliminate the very dangerous disease like chicken pox from the world. Polio movement is running to remove polio from our country.
- Vaccination is actually a bulk of inactivated organism causing the disease. In this inactive form they are introduced in to our body. Due to this, our white blood cell can be prepared to fight against disease in advance hence they can fight in better way particularly against that disease when they actually attack our body. Different vaccines have been developed against different diseases.

Algae :

Algae are found in fresh water, in ocean, in farms, on rocks, on wall etc. They are also found in hot water streams, turbid water as well as on the trunk of trees. Algae may be brown algae. They are unicellular or simple multicellular. Algae contain photosynthetic pigment such as chlorophyll, there for they are autotrophic.

**Algae****Benefits :**

- Algae are used as food in many countries.
- It is also used to prepare filters, glass and china clay (used in making of cup - saucers).
- A freezing substance can be extracted from the algae known as Jelledium.

Harmful effects :

- Algae decrease the depth of waterbodies.
- Water of some waterbodies becomes undrinkable due to algae.
- Algae causes accidents by making the surface very slippery.
- Observe algae found in your school campus and around water tank.

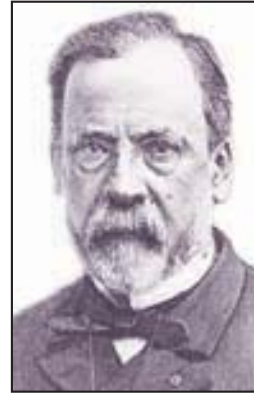
Proper age for a child for different vaccines

Vaccine	Proper
B.C.G. (T.B.)	After 1 month of birth
D.P.T.	Dose 1 : at the age of 1 and half month Dose 2 : after 1 month after first dose Dose 3 : 1 month after second dose
Polio	Dose 1 : at the time of birth Dose 2 : at the age of 1.5 month Dose 3 : 1 month after second dose Dose 4 : 1 month after third dose Dose 5 : 1 month after forth dose
Chickenpox	At the age of nine month
Chicken pox, Mumps Germen chickenpox	At the age of fifteen month
D.P.T. & Polio (First buster dose)	At the age between 1.5 to 2 years
D.P.T. & Polio (Second buster dose)	At the age between 5 to 6 years
Hepatitis B	Dose 1 : at the time of birth Dose 2 : 1 month after first dose Dose 3 : 5 months after second dose
Smallpox	1 dose after the age of 1 year
Typhoid injection	1 dose after the age of 2 year





Lue pasture
who discovered the vaccine
against rabbis



Adverd Jenner
Who discovered the vaccine
against small pox



Answer in short :

1. What is microorganism ? Give their types.
2. How does algae differ from other plants.
3. How many types of fungi are there ? Which are they ?
4. Give names of two diseases caused by bacteria.
5. Give names of two diseases caused by virus.
6. Where do we find algae ?
7. Which types of colours are found in algae ?
8. Which is the reserve food material in fungi ?
9. Which protozoan is causing amoeboid dysentery ?
10. What is the shape of amoeba ?
11. What is the shape of paramoecium ?
12. Why does virus been called the connecting link between living and non-living ?
13. Micro organisms are considered as friends and enemies of human being. Why ?
14. Give the name of virus in tobacco.



Unit
5**Nervous System and Endocrine System**

We perform many various types of functions everyday. Just like opening and closing of our eyes, movement of hands, standing up, sitting down etc. We can see these processes. While some processes are those, which we can't see. Just like to think, to learn, to remember etc. While some processes are those, which we can feel only like to hurt, to become hungry to become thirsty etc.

Discuss with your friends and answer these questions :

- Why do we use woolen clothes during winter ?

- When do we take water ?

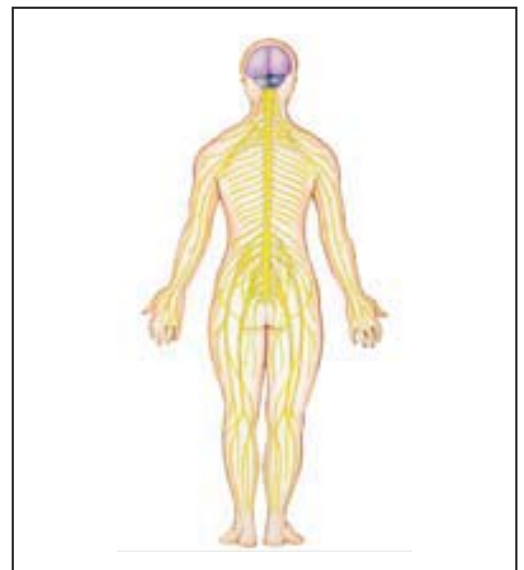
- Why do we take rest ?

How do these processes are regulated in our body ? Let us understand.

In humanbody different organ systems work differently. Humanbody can work properly only if it works as a unit. This regulation can be done only with the help of nervous system (with the help of endocrine system).

The nervous system comprises brain, spinal cord and the nerves arising from them.

The nervous system coordinates and regulates all the processes of our body. Nervous system contains many nerves.



Nerves are connected with all the parts of our body. All the parts of body are regulated with the help of these nerves. Nerves comprise of highly specialized cells, called the neurons.

On the basis of the functions nervous systems can be classified in to three major parts.

1. Central Nervous System
2. Peripheral Nervous System
3. Sense Organs

1. Central Nervous System :

It is comprised of brain and spinal cord.

Brain :

Brain is main organ of the nervous system.

Brain is divisible in to three parts :

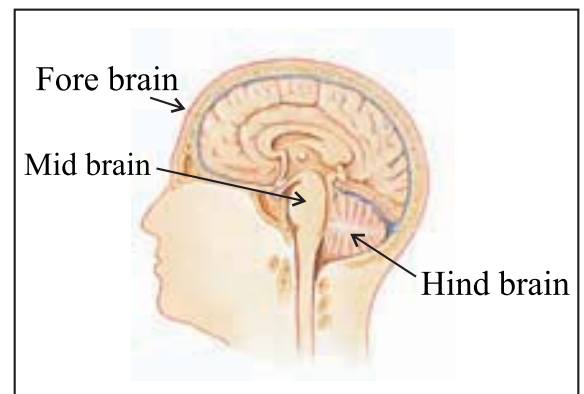
(1) Fore brain (2) Mid brain (3) Hind brain

(1) Fore brain : It forms the greater part of the brain. It possess the centers for the functions like speech, thoughts, memory and identification.

(2) Mid brain : It contains the centers for controlling the organs like hands, legs, and other organs. And thus it balances the body.

(3) Hind brain : It contains such vital centers as cardiac, respiratory and digestion like involuntary functions.

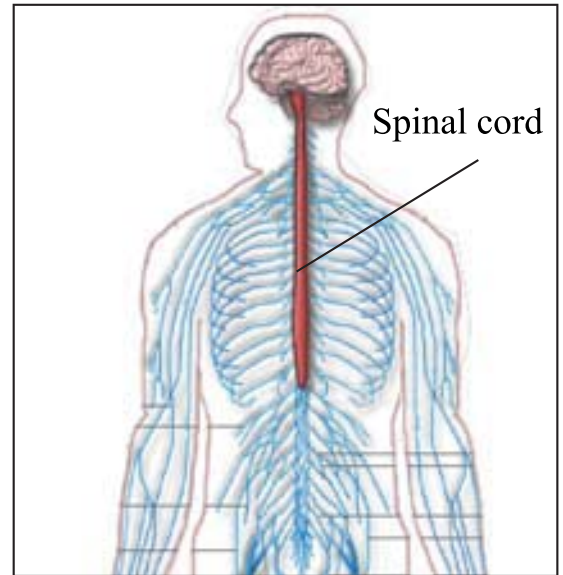
Brain also possesses centers for the activities like listening, smelling and testing.



Spinal cord :

Spinal cord is protected in vertebral column.

Spinal cord extends from the posterior end of brain and it is a cord like structure made up of many veins. It passes through vertebral canal of the vertebral column and reaches to the end of waist. It acts as the link between the brain and the nerves those stretch out throughout the body.



Blinking of an eye, when a particle of dust touches our eyelids. Taking away of one's hand while touching any hot thing. These are the examples of reflex action during which brain is not involved but spinal cord releases the impulse for that action.

Peripheral Nerve System [PNS] :

The peripheral nervous system constitutes the different nerves those arise from the brain and the spinal cord. These nerves are scattered over entire body.

There are types of nerves found in human body :

(1) **Sensory Nerves**

(2) **Motor Nerves**

(3) **Mixed Nerves**

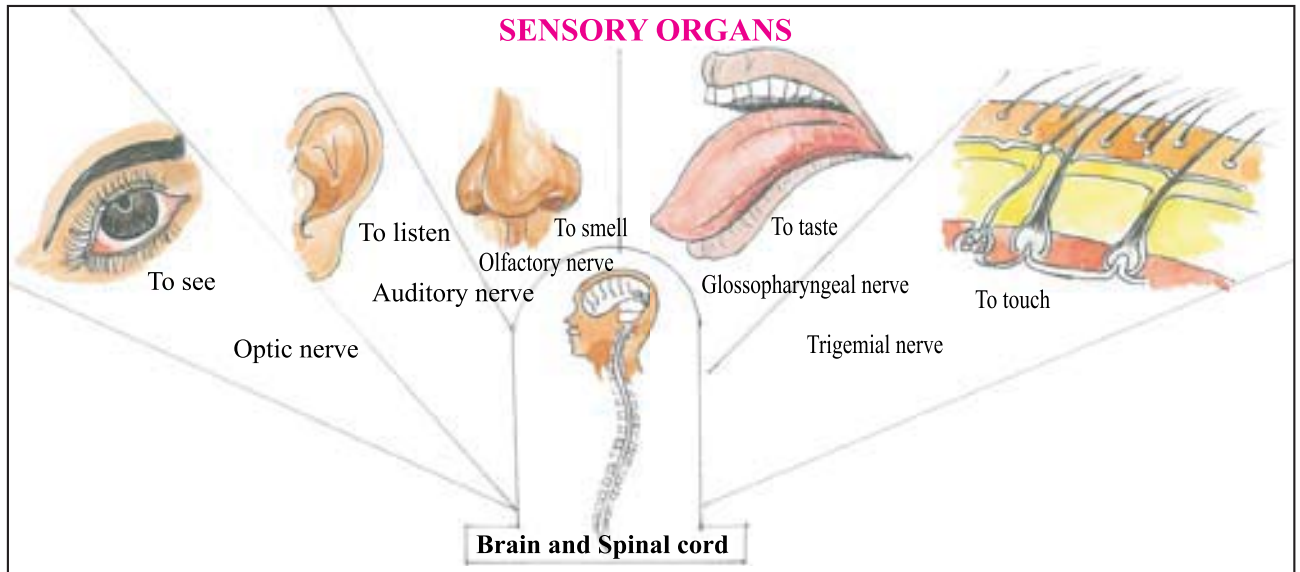
(1) **Sensory Nerves** : They carry the messages (impulse) from the different parts of the body to the brain.

(2) **Motor nerves** : They carry the messages (impulse) from brain to different organs of body.

(3) **Mixed nerves** : They carry the messages (impulse) in both the directions.

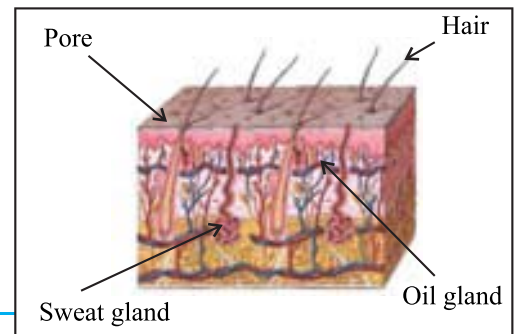
3. Sensory organs :

We feel the heat, cold, pain, taste, smell and also the presence or absence of light. These all are known as sense. We use different organs of our body to feel these type of external changes occurring in our surroundings. These type of organs are called sensory organs.



Skin :

- Rub your both palm against each other and let it touch your chick.
- What do you feel ?



- Keep an ice in your hand for some time.
- What do you feel ?



- Our skin feels the different senses like cold, heat, pain, touch and pressure.
- The skin is the outer envelop of our body.
- It protects our body.
- It possesses specialized cells to experience different senses like touch, pain, heat, cold and pressure.
- These cells are connected with the nerves.
- These nerves conduct the impulses to the brain.



Ask your friend to close his eyes. Now, touch your friend's hands-legs, forehead, head, back etc with your fingers. How many fingers touch your friend ? Ask this question to your friend. Does your friend can answer the questions correctly ?

- We can sense our tips of fingers better than other organs of our body.
- Have you seen blind men reading with the help of their finger tips.
- Skin contains an important plastid called melanin. A person looks white if he is having less proportion of melanin and a person looks dark if he having more proportion of melanin.

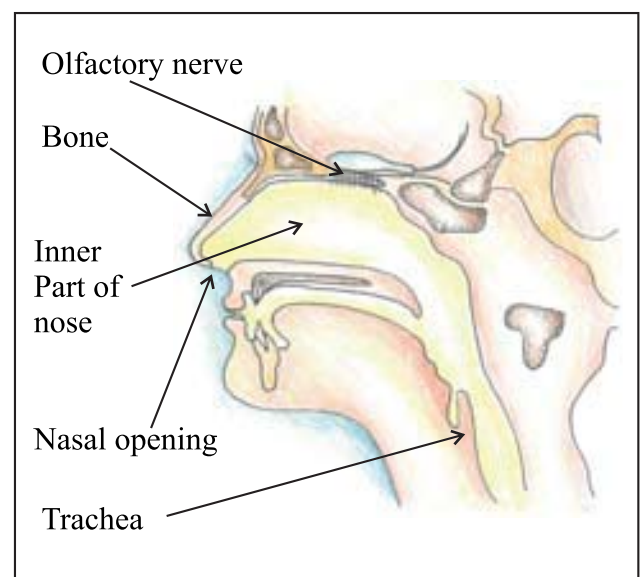


Nose :

What is required : Lemon, leaves of sweet neem, asafoeteda, garlic, cardamon, onion, tulsi, ajwain etc and other things having strong and distinct smell.

What will you do ?

- Close your eyes.
- Ask your friend to give any one



thing out of the above said things. Try to identify that thing by smelling it and avoid it to see or to taste. Identify all above said things one after another.

- We recognize the smell of things with the help of our nose.
- We also breathe with our nose.
- Nose contains specialized cells to sense the smell. They are known as olfactory cells.
- These olfactory cells carry olfactory impulse to brain through olfactory nerve.
- The inner surface of nose remains covered by mucous.

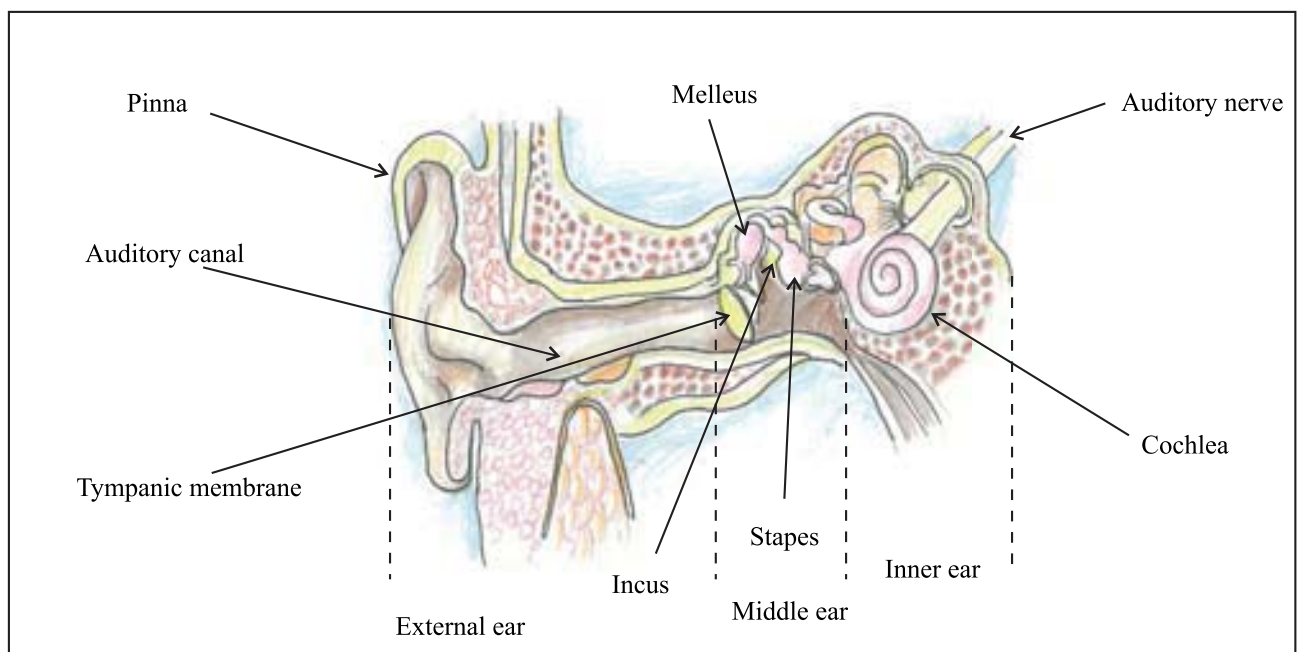


Some animals have more powerful olfactory sense than human beings
E.g. Snifer dog.

Ear :

In human the ear is made up of three parts :

- (1) External ear (2) Middle ear (3) Internal ear



Functions :

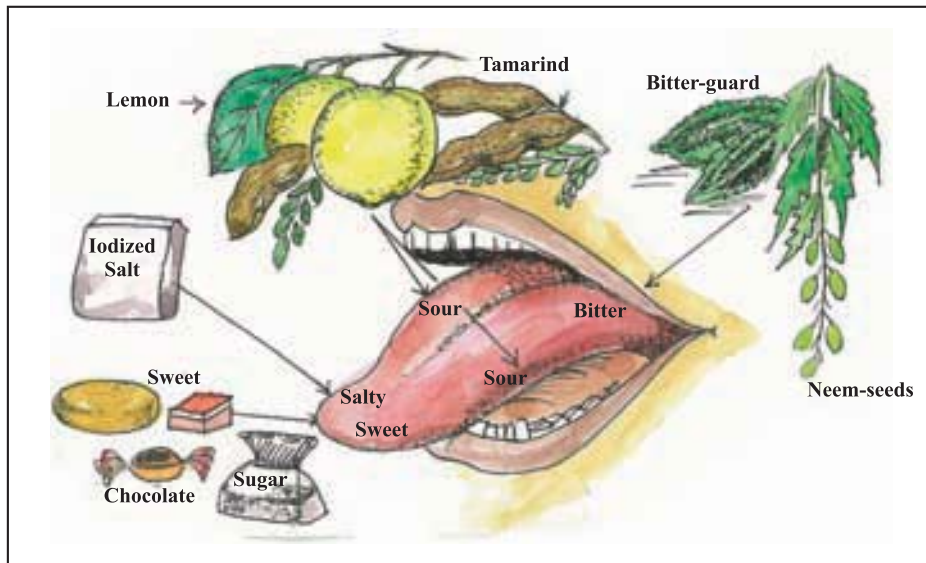
- The function of external ear is to collect the sound vibration from the atmosphere and carry them to the middle ear.
- The tympanic membrane vibrates when sound waves strike it.
- Three bones named malleus, incus and stapes also fill vibrations.
- Due to that the perilymph (liquid present in internal ear) also vibrates. The impulse of this vibration reaches to brain with the help of auditory nerve. We can hear the sound at that time.
- The perilymph is also useful to balance our body.
- What will you do ?
- Ask your friend to close his eyes.
- Close any one of your ears with the help of your palm.
- Move to a distant place in your classroom and clap.
- Your friend about your exact position and repeat this activity.
- Is your friend is able to locate you exactly ? Note down your experience.

**Tongue :**

What is required ? Sugar, lemon, neem leaves

What to do ?

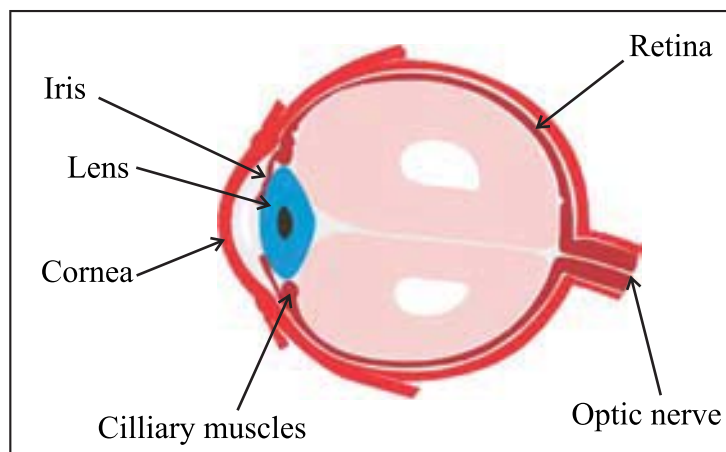
- Ask your friend to close his eyes and nose.
- Take some sugar.



- Put it on the tongue of your friend, which taste does he/she feel ? Ask him.
- Then tell him to wash his mouth with water.
- Try to experience everything one after another. Wash mouth after each activity.
- Does your friend able to identify the perfect taste every time ?

Different regions of tongue can feel different type of taste. The tongue contains different taste buds to detect different taste. Taste buds contain specialized cells. These cells are connected to the IXth nerve and carry impulse of taste to the brain.

Eye :



Organ	Location and description	Function
Corena	Outermost glass like transparent layer is known as cornea.	It allows the light rays to pass to through it.
Pupil	An aperture like structure situated behind the cornea is called pupil.	It focuses the light rays on the lens.
Iris	It is circular shelf like diaphragm. It may be blackish, dark brown blue, green, gray or yellow.	Iris works like a diaphragm of a photographic camera.
Lens	A structure made up of soft tissue and it is alike transparent magnifying glass, situated behind the pupil.	Lens focus the image of the object on retina.
Retina	This is a thin and innermost coat of eyeball. It comprises of many cells which are sensitive to the light.	An image of an object is focused on the cornea. The impulse of the light is collected by the cells of cornea and it is passed to the optic nerve. Optic nerve carry that impulse to the brain.



What to do ?

- Stand in front of the sun beside your friend.
- Observe the pupil of each other. Now, come back to your classroom and immediately observe the iris. What type of difference occurs in the area of the iris ? Note down that.

When do you observe following type of pupil ? Note down that ?



Note :



Note :



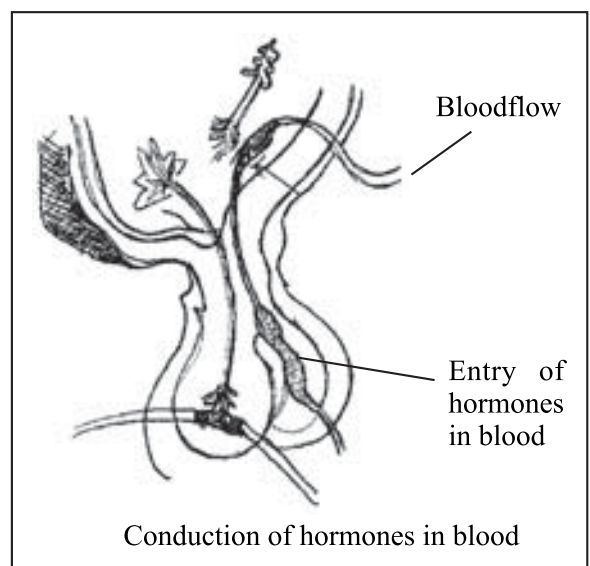
Endocrine system :

The effective regulation of the functions of the body require not only the constant modulation and integration by the nervous system but also by the endocrine system.

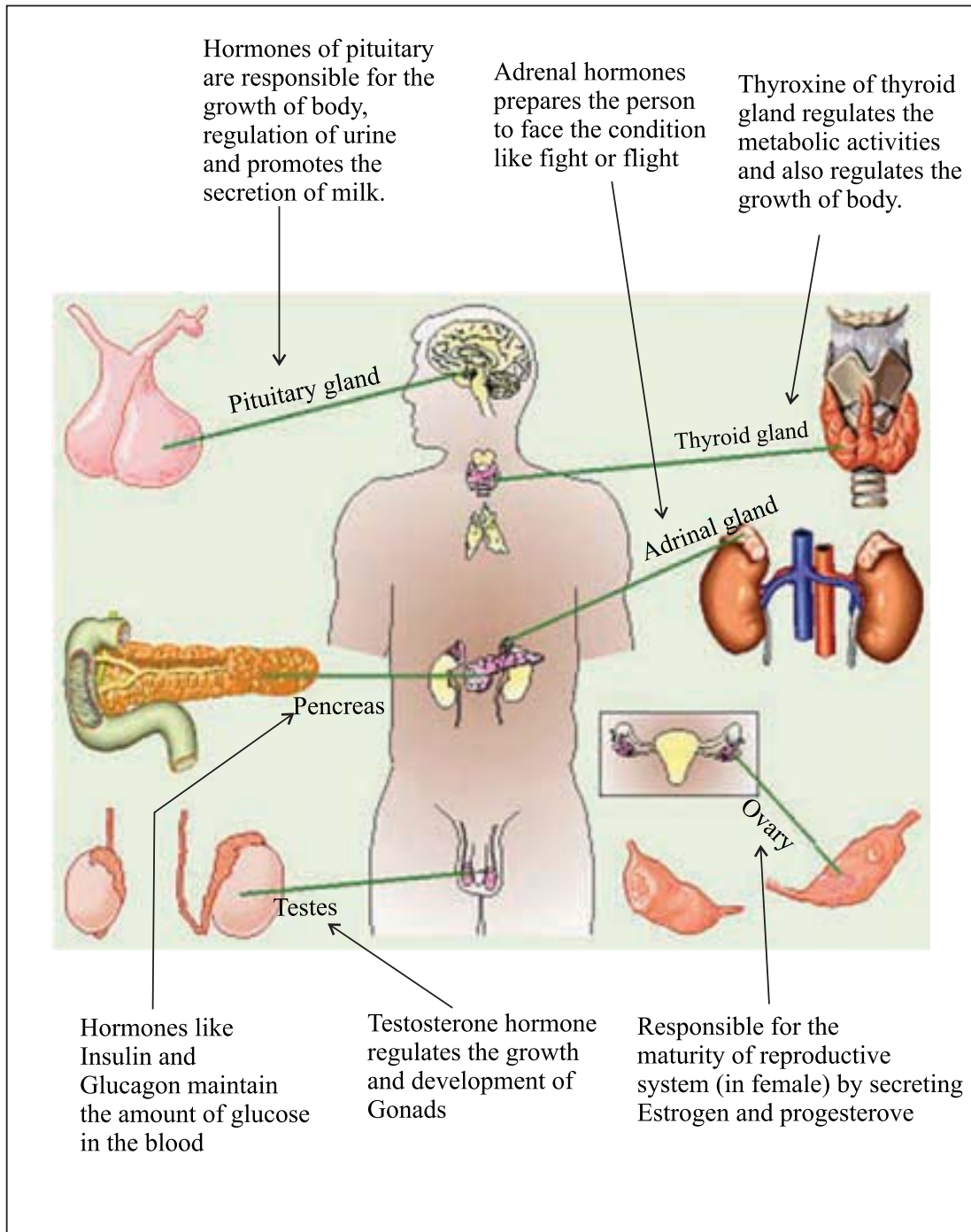
You may have experienced the feelings of happiness and sadness. You may have found unusual weight of some people (very high or very low). All human being show variations in their voice, development of mustache and beard, development of organs. Hormones are responsible for that.

Hormones are secreted in a very small quantity in our body. But they have a big dominance over different organ systems.

- They are chemicals those carry the messages.
- Hormones are synthesized in endocrine glands.
- Hormones reach to different organs with the help of blood.
- Effect of different hormones are Different.



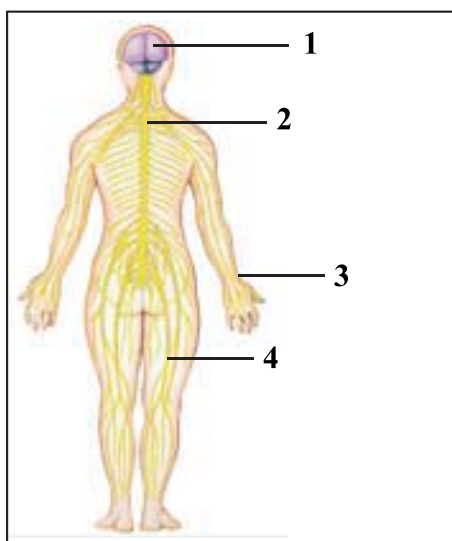
Where do the endocrine glands situated in our body ? Observe the following diagram and fill in the blanks in the table given on the next page.



Sr. No.	Name of Endocrine Gland	Location of the gland	Hormones secreted by the gland	Functions
1				
2				
3				
4				
5				
6				



Q.1 Label the following diagram of human nervous system and write down their functions :



Functions :

1. _____
2. _____
3. _____
4. _____

Q. 2 Answer following questions :

1. Which types of nervous system are found in our body ?
2. Which organs are included in central nervous system ?
3. What is an endocrine gland ?
4. Give names of human endocrine glands.

Q. 3 Fill in the blanks in the following table :

Sr. No.	Name of an organ	Connecting nerve	Function
1	Skin		
2	Nose		
3	Ear		
4	Tongue		
5	Eye		

Q. 4 Which sensory organ can sense the following impulse ?

1. Climate becomes cool at the time of raining.
2. Jigisha has sprayed scent on her clothes.
3. Slush is sour
4. Het is singing a sweet song.
5. Photograph of the Himalaya are very beautiful.

Do it yourself :

Close your eyes and ask your friend to give you a thing which can not harm you by its touch, smell or taste. Try to identify that thing by touching, smelling or tasting it.

Unit

6

Types of Energy

Have you ever thought in which form of energy is associated with the wind and flowing water ? Energy is in which form in coal, LPG & CNG ? Whether the energy used in bulb and energy emitted by it are of same type ? Will the tube-light at your home give light with the help of petrol ? How do different equipments work which use energy ?

In standard 7 you have learnt about sources of energy. There are mainly two sources of energy. Make a list of both the sources of energy. Write the information in the given table.

Renewable sources of energy	Non-renewable sources of energy

Compare the list with your friends and make it complete. Now keep in mind the list during following activities.

Form of energy :

Energy in any substance can be divided into two types :

1. **Potential Energy**
2. **Kinetic Energy**

**What is required ?**

One and half meter long and 10 cm wide sheet of cardboard or foil and a ball

What to do ?

- Make a sloping structure of the main cardboard as shown in the figure.
 - Now put a small car at one end.
 - Now release the car and observe what happens.
 - You will see that the car goes up at a particular height. So from where does the car gets the energy to climb up the other end ?
- Do the same experiment with the help of a ball.



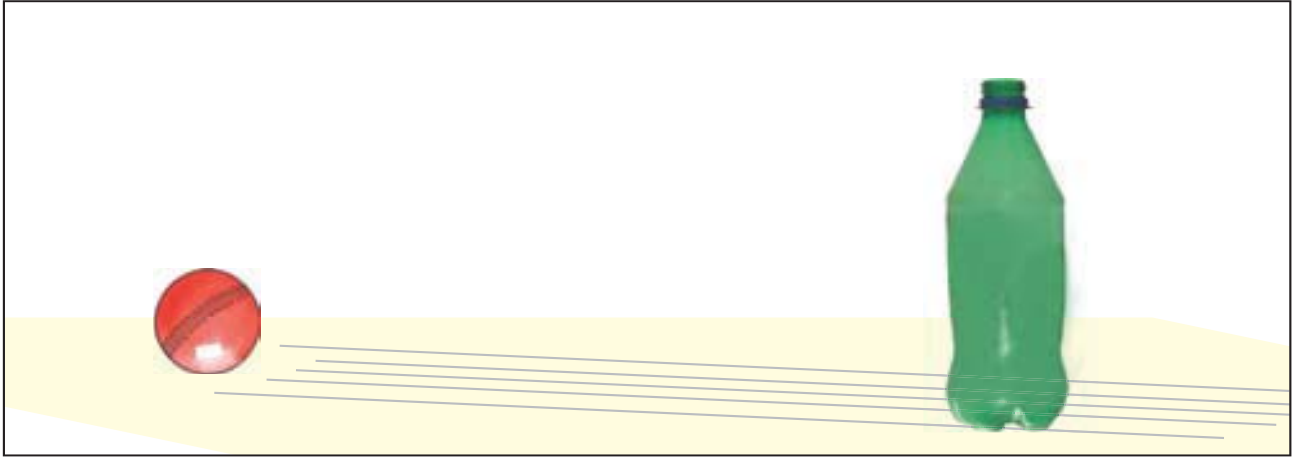
Here at some height, the car or a ball had some amount of energy. This energy is called potential energy. Now, when the ball or car is released potential energy is converted into kinetic energy, with which it can climb up to a certain height.

1. How does a toy with a key-functions ?

2. Make a list of substance possessing potential energy, e.g. Stretched rubber



What is required ? Plastic bottle, a ball



What to do ?

Place the bottle in the standing position as shown in the figure.

Roll the ball towards plastic bottle.

- **What happened ? Why ?**

- Due to energy associated with moving ball the bottle will fall.
- **Energy possessed by the object due to its motion is called kinetic energy.**

1. **Why does a bullet from a gun penetrates wood ?**

2. **Why the objects are dragged during flood ?**

Generally due to position and motion of the object potential energy and kinetic energy is associated with it.

The summation of this potential energy and kinetic energy of the object is called mechanical energy.

e.g. When water is released from the dam on the river its potential energy is converted in to kinetic energy due to which turbine is rotated. In this, kinetic energy is converted in to mechanical energy.

$$\text{MECHANICAL ENERGY} = \text{POTENTIAL ENERGY} + \text{KINETIC ENERGY}$$

Energy in the objects can be categorized in different form. Let's take idea about such forms of energy with different activities.



What is required ? Candle, spoon, pieces of wax and a match-box.

What to do ?

- Light the candle and keep it on the table.
- Now take a spoon with wax piece and keep it on the flame of candle.
- What happens to the wax pieces ?

-
-
- Energy required to melt the piece of wax was acquired from the flame of the candle. Isn't it ?

In this way heat is a form of energy. Which we say heat energy. This heat energy is used for cooking purpose. We can also get heat energy from sun. Now, write different uses of heat energy below :

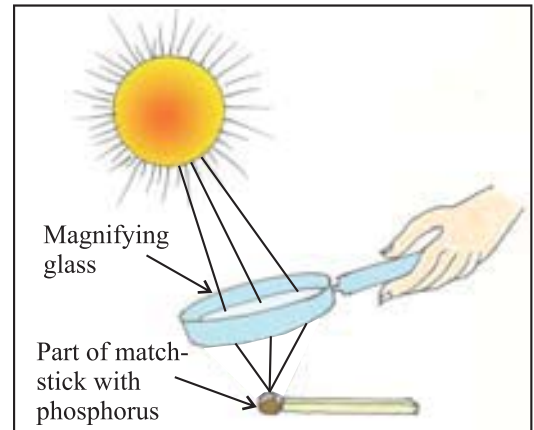


What is required ? Magnifying glass and match-stick.

What to do ?

- Obtain the spot image of the sun-rays using magnifying glass on the floor as shown in the figure.

- Now, place the stick in such a way that the spot of the sun-rays incident on its black part.
- Take care that the magnifying glass should be steady. Observe that what happens in a minute or two.



- Discuss with your friends why the match-stick burns ?
- The energy from the sun reaches on the earth in the form of light.
- The energy associated with these rays is called light energy. Plants get light energy from the sun and using it in the process of photo synthesis prepares it's food. With the help of sunlight we can cook food and water can also be heated.
- Write another use of light energy.



What is required ?

Lime stone, glass and water

What to do ?

- Take a glass of water.
- Put two or three pieces of limestone into the glass.
- Observe the water in the glass. Touch the outer side of the glass and try to guess the temperature. What happened ?

Do you feel the glass warm from outside ? From where we get this heat i.e. Heat energy from ?

When you mix water with limestone there is a chemical reaction between lime stone and water. Because of this reaction the energy in the lime stone is released. The energy present in the lime stone is called chemical energy. The fire crackers too have a chemical energy.

Usually energy in different fuels, electric cell and even in food we eat, the energy is stored in the form of chemical energy.

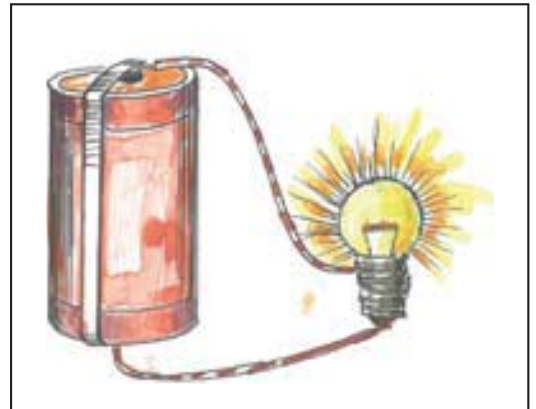


What is required ?

Battery, a piece of wire and a bulb

What to do ?

- As shown in the figure attach the bulb to the battery with the help of a piece of wire.
- What happened ?
Due to which energy the bulb is light up ?



Due to chemical energy present in battery, we get Electric energy. Electric energy is such type of energy which can be easily transported from one place to another. In your home, which instruments uses electrical energy ? Make a list of such devices. Discuss the list in detail in your classroom.



What is required ?

Beaker, balloon, rice pulse, steel plate and a spoon

What to do ?

- Place the balloon on the mouth of the beaker. Make sure that mouth of the balloon is stretched.
- Place three to four pulses on the balloon.

- Now, bring the steel plate near the beaker and make sound with the help of spoon.
- What happens with seeds ?
- How does the pulses get energy to jump ?

Here the seeds jump up and down due to the sound produces by the plate. Therefore the energy associated with the sound is called Sound Energy.



Due to bursting of fire creakers the steel vessels in your house vibrates. Why ?

- **Give other examples of sound energy.**

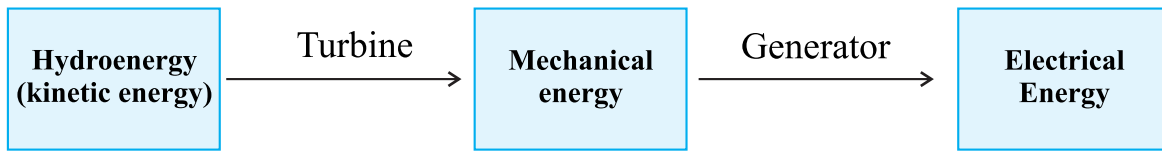
Transformation of energy :

When we pour pieces of limestone in the glass-water, the water becomes warm. Here chemical energy is transformed into heat energy.

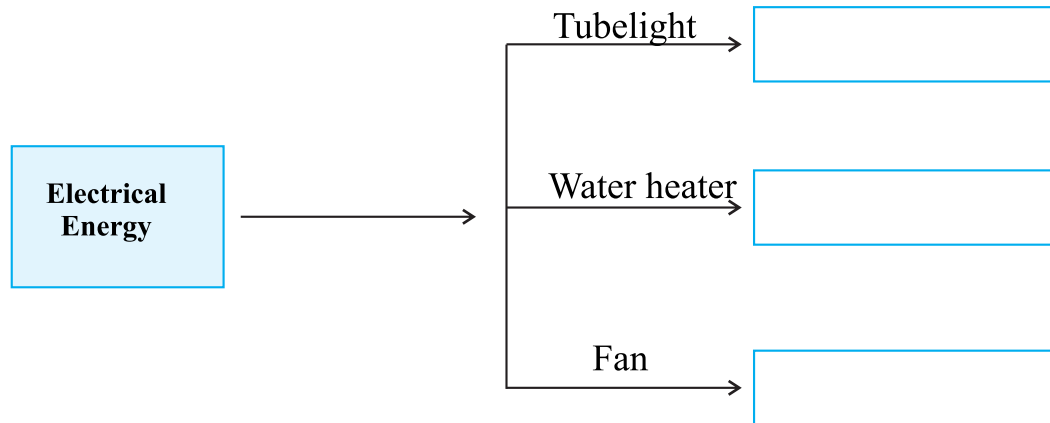
- Write the transformation of energy taking place in case of match-stick burned with the help of magnifying glass.

- Write the transformation of energy in case of electric bulb lighted with the help of battery.

In this way, there are many other devices, which work due to the transformation of energy in our day to day life. Transformation taking place in case of Hydral Electricity is as shown in below chart.



When this electrical energy is supplied in our house, than in which different form it is transformed ? Note down below ?

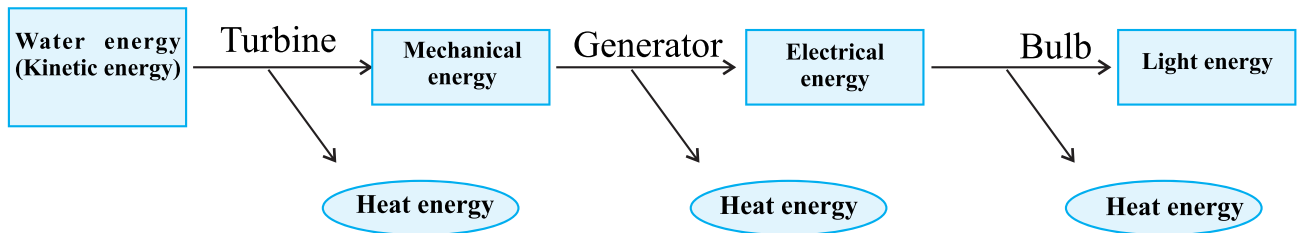



Now, write down the transformation of different types of energy given below and fill in the blanks.

- Scooter → **Chemical Energy** into
- Man → into
- Plants → into
- Bulb → into
- Television → into

In this way, different devices as well as living things work due to the transformation of energy. But one question arises that, is there a loss of energy due to the transformation of energy ?

When you switch on the bulb you get light energy. As well as bulb gets heated, isn't it ? Can we use this heat energy ?



In the above chart we can see different types of energies are transformed in the form heat energy. They are shown in  in the chart. This heat energy cannot be used. This heat energy is called loss of energy. During different stages of transformation of energy this type of energy loss takes place. In this way we can say that, we should use energy in such a way that transformation has least stages, isn't it ? In this way, we should also take care of saving energy ?

Law of conservation of energy :

Here we have seen that energy is wasted and we cannot use it. For example, the heat energy produced in bulb cannot be used. Moreover electrical energy is also used in bulb. This used energy is transformed into light energy plus heat energy. Means there is only change in the form of energy. In this way, **'Energy can neither be created nor destroyed, it is only converted from one form to another form. Total energy in the universe remain constant.'** This statement is called law of conservation of energy.

Transformation of energy from one form to another form results into the loss of energy. Due to this reason, we get less amount of energy in use. In this way we should make use of energy carefully. We should switch off the lights and fans at home or at school when, we do they are not required.



Write different steps you take to save energy in your day to day life, discuss it with your friends.



Q.1 For the following examples, write the type of energy is transformed into which form of energy :

- | | |
|--------------------------|-------------------------|
| 1. Bulb is on | 2. Candle is light up |
| 3. Sparkle is light up | 4. The bomb burst |
| 5. Wind mill is rotating | 6. Coal is burnt |
| 7. Iron is switched on | 8. Plant cook it's food |

Q.2 Decide yourself that weather the loss of energy takes place in following conditions. If energy is lost then give your suggestions to avoid loss of energy :

1. Daily Kajal do her homework at night.
2. Different televisions are there in a family per person.
3. All members of Jaimin's family eat together.
4. All teachers of school stay in the same society but they use individual vehicle to go to school.
5. All students go to school in school bus.
6. Biogas plant is constructed in your village.

Q.3 With discussion in your classroom, note down the measures to step energy loss.

Q.4 Explain difference between potential energy and kinetic energy.

Q.5 Explain law of conservation of energy with an example.

Q.6 Give five examples of energy transformation.

Q.7 In your house mainly which energy is used ? From where it comes ?

Q.8 Where the solar energy is used in your village/city ?



Unit
7
Manmade Materials

In our daily life we use many types of materials. Out of which many are obtained directly from nature and many are made according to the necessities.

Materials which are made by men are called Manmade Material. Now, let us recognize these materials.



What is required ? Two boxes

What to do ?

- ⇒ Collect materials from the surrounding environment.
- ⇒ Out of two boxes, on one box write Natural Materials and on the other write Manmade Materials.
- ⇒ Observe the materials you have collected and identify them and keep them in the corresponding box.
- ⇒ Write down the materials you have collected in both the boxes in the following table.

Natural materials	Manmade materials

Natural Fibres : Cotton, silk, jute and coconut fibres are obtained naturally.

Natural fibres	Product	Uses
Cotton	Cotton is separated from cotton pod. Fibres are drawn from cotton and threads are made from them.	Cotton cloth, threads, pillow, mattress, bandages for hospitals, surgical cotton are all made from cotton.
Silk	Silk-worms are cultivated on mulberry trees. Silk-worms produce cocoons and from these cocoons fibres are drawn and fine threads are made.	It is used in preparing silk clothes and carpets etc.
Jute	Jute plants are cultivated and when they are matured their skin is peeled out and after cleaning it fibres are drawn from it.	Jute fibres are used to prepare strings, ropes and flex i.e. Jute-cloth.
Coconut Fibres	Fibres are separated from the coconut fruits.	It is used in preparing coir, feet-wiping mats etc.

From the school library get more information from the book 'Process'.

Manmade (Artificial) Fibres :

After performing chemical reactions with natural fibers artificial fibres are prepared. Nylon, Terylene, Acrylic are manmade fibres.

Artificial fibres	Properties	Uses
Nylon	It looks like silk. It is strong and hard and also water resistant.	To make cloth, socks string, ropes strings for tyres, carpets, fishing nets and cloth for parasuits.
Tyrylene	These fibres do not absorb any water hence after washing clothes they dry up very fast.	It is used to prepare shirts, sarees and in the preparation of cloth for other garments, water-pipes and in the preparation of sails for boats.
Acrylic	Some acrylic fibres are like wool. some other acrylic fibres are like galss.	It is used in preparing sweaters, blankets. It is used in preparing glass for windows and doors, cups and saucers, glasses and bottles.

Plastic :

- Now a days plastic is very much used in a large quantity.
- Plastic is prepared by chemical reactions with crude oil and natural gases.

Properties of Plastic :




- It is non-effective and water resistant hence it does not get rusted and decayed.
- It is a bad conductor of heat and non-conductor for electricity.
- It is light in weight hence it is easily transferable from one place to another.
- Some plastic are elastic and hard.

- Due to the above mentioned properties plastic becomes cheap hence it is vastly used in domestic useful things and industries.

There are two types of plastic : (1) Thermoplastic (2) Thermosetting plastic.



1. Thermoplastic :

- Plastic which becomes soft by heating at normal temperature but while cooling it regains its original state is called thermoplastic.
- Different thermoplastic substances and their uses are as given below :

Thermoplastic Substances	Uses	Product Specimen
Polyvenile Chloride (P.V.C.)	It is used in the preparation of rain-coats, hand bags, bottles, pipes, foot-wears etc.	
Polystyrene	It is used in preparing domestic things like toys, buckets, tubs. It is also used as heat-resistant in radios and refrigerators and machine-gears.	
Polythine	It is used as insulators on electric wires, in preparations of different types of bags and useful domestic things, laboratory instruments and pipes to spray water.	

2. Thermosetting plastic :

- ◆ In spite of heating at a high temperature the plastics, which do not become soft are called 'Thermosetting plastic'.
- ◆ Its different types and uses are as given below :

Type of Thermosetting Plastic	Uses	Product Specimen
Backelite	It is useful in preparing telephones, light-switches and also electrical instruments.	
Malamine	It is used in preparing crockery, unbreakable cups and saucers, different types of trays. It is also used in preparation of certain parts of aero plane engine.	

Caution regarding plastic

- Plastic does not decompose naturally and hence it pollutes air, water and land.
- Burning the plastic waste spreads poisonous gases, which are very harmful to health.
- Sometimes animals eat useless plastic bags with food and die.
- We should not use the prohibited plastic bags for collection of edible things.
- It is prohibited to use plastic thinner than 20 micron.
- It is not advisable to use recycled plastic for preserving edible things.

Rubber :

There are two types of rubber : 1. Natural rubber 2. Manmade (Artificial) rubber.

1. Natural rubber :

Putting a cut on the trunk of a rubber tree, milk like juice is collected and from it natural rubber is prepared.

2. Manmade (Artificial) rubber :

Manmade rubber is obtained by chemical reactions of natural rubber with certain substance. This rubber is known as artificial rubber also.

Artificial rubber is more durable. Elastic and strong. There is no effect inflammable materials like acid on this kind of rubber.



What is required ?

Rubber string, small plastic ball, small stones or sand and a match-box.

What to do ?

- Making a hole in the plastic ball, fill it with sand or small stones.
- Tie a match-stick at one end of the rubber string.
- Fit the match-stick tied end in the plastic ball.
- Now, catch the other end of the rubber string and throw the ball up. Do this activity for two to three times.

You will enjoy playing with the toy thus made.

As per our needs we make use of certain particular types of artificial rubber.

Vulcanized rubber :

- Ordinary rubber is heated at a proper temperature with sulphur and vulcanized rubber is prepared.
- This type of rubber is very strong and elastic.

Uses :

- It is used in preparation of tires and tubes for vehicles, machine-belts, gloves for hands and legs.
- It is used in preparing solid punctures for tubes and tires of vehicles.



If tires of vehicles are burnt it creates pollution. Therefore instead of burning them they are used in the work of repairing old tires and shoes and also in preparing soles for chapples.

Neoprene rubber :

- There is no effect of inflammable substances like acid and petrol on this rubber. Also it remains unaltered at a very high temperature.



Uses :

- Neoprene rubber is used in preparation of electric cables, machine-belts, pipes to draw crude oil and conveyer belts in the roller of printing machines.
 - In daily life where do we use rubber ?
-
-
-





Glass :




- Make a list of things made of glass which you have seen.
-
-

- Glass is a mixture of silica (sand), soda-ash, sodium carbonet and lime-stones. This mixture is heated at a very high temperature and after it becomes homogeneous liquid, it is cooled down, then it becomes glass.

Common Properties of Glass :

- It is a transparent substance.
- Generally it is brittle.

Types of glass	Uses	Product specimen
Colourful Glass	It is used in preparing colourful objects, window glass and artificial diamonds.	
Transparent Glass	It is used in preparing spectacles, cameras, telescopes, microscopes.	
Bulletproof Glass	This glass is very strong, hence it is used in aeroplanes and windows of some vehicles.	
Photochromic Glass	This type of glass is used in the instruments made for prevention of sunlight. It is used also in goggles.	

Types of glass	Uses	Product specimen
Optical Fibres	Optical fibres are used in endoscope, message-transmission, in preparing toys and decorative articles.	
Glass wool (wool of glass) Fibres	This glass is heat resistant therefore it is used in refrigerators, electric stoves, thermos, solar heaters and ovens.	
Toughen Glass	This type of glass is very strong. It is used in preparation of glass for vehicles, for drawers inside refrigerators and also outside the walls of modern buildings.	

Papers :

Worn out clothes, fish-catching useless nets, non-smooth fibres and grass were used first time in preparation of papers. After that grass grown in water, strings, waste parts of sugarcane and objects containing fibres like asbestos, were used in the preparation of papers. In the present times fibres from tree are used for preparing papers.

The necessity of papers have increased so much that we are forced to cut more and more trees and jungles are destroyed and reduced very much hence a risk is created for natural balance. It is our sincere duty to use papers very carefully. We should reproduce papers again and again and use them.

Reproduction (recycling) of papers :

The process of dissolving the used papers and making them into paste and preparing of newspapers is called reproduction (recycling) of papers.

- Thus, new papers are produced from used and useless papers.
- There will not be any need to cut new trees with the use of recycled papers. It will maintain natural balance.

Thus, manmade materials have been so necessary in our routine life that we should make use of it with precaution. Where ever it is possible we should make use of recycled objects and be helpful in preserving the environment.

Instead of one ton of papers made from the fibres of new trees, the one ton of papers made from the useless and wasted papers has the following advantages :

- ◆ 17 trees are protected.
- ◆ 1100 kilowatts of energy (which can be used in a house for six months) can be preserved.
- ◆ 26000 litres of water is saved.
- ◆ Air-polluting materials of 27 kilograms can be prevented from use.



☆ As responsible citizens we should use objects, keeping the principle of 4R :
(1) Reduce (2) Reuse (3) Recycle (4) Recover in mind.

☆ Write on both the sides of papers.

☆ Make bags from the used papers.

☆ Do not throw away the note-books which you have already used previous year but use them for practicing the sums of mathematics or even you can bind the unused papers and make new note-books.

☆ You can give the used papers to schools or private industries, they will make use of them in different ways. Computer papers, which are used only on one side can be used on the other side.



Q. 1 Why should we use manmade materials with precautions ?

Q .2 Classify the following objects as per the table given below :

Tyrolean, jute, vulcanized, polythene, toughen glass, nylon, cotton, photo chromic Bakelite, neoprene

Glass	Plastic	Rubber	Natural fibers	Manmade fibers

Reproduction (recycling) of papers :



1. Make small pieces of useless and wasted papers and keep them for one night in heated water with washing soda. (Sodium Carbonate)
2. The next day stir this mixture well, so that pieces of papers turn into dense liquid.
3. Fill the liquid thus prepared in a large and shallow vessel and let it freeze.
4. Now, take a wooden frame fitted with thin iron net or a strainer. Deep the strainer in the dense liquid. Then lift it slowly so that there will come out a thin layer of paper paste on it. Now, turn this strainer upside down carefully on a soft cloth or a blotting paper.
5. Now, on the cloth with the layer of paper paste keep another cloth or blotting paper and giving some light pressure on it remove the extra water from it. Let this paper dry for two days. In such a manner performing recycling of papers new papers are produced.

Unit

8

Adaptation



Go out of your classroom and note down the names of living organisms found around you.

Now, note down the names of those organisms which are not found around you but you known know them. Like crocodile, tiger etc....

Now, classify those both types of organisms in the following table :

Flying live elements in the sky	Live elements swimming in the water	Live elements living on land

- Bony animals, which can fly in the air are known as avions.
- Animals living in the water are known as aquatic animals.
- Animals living on land are known as terrestrial animals.



- Animals whose forelimbs are converted into wings and those who have bones are known as avains. Bee - mosquito are classified as insect.
- Bat has wings. It can fly in the air. It possesses bones. It gives birth to young ones (not laying eggs). Hence it is classified as mammal.



Frog can live on land as well as in water. How shall we classify them ?

Animals which can live on land as well as in water are known as amphibians. Give some names of other amphibians you have seen.

Gather some more information from the book 'Animal World' bringing it from your school library.



Do you ever think about that, why did the nature do so ?

Nature has kept some animals on land and kept some flying in the air.

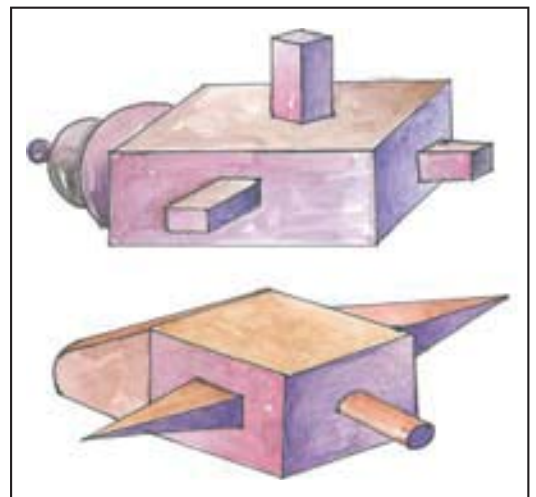
Can we live with the fish in water ?

Can we fly in the air like bird ?

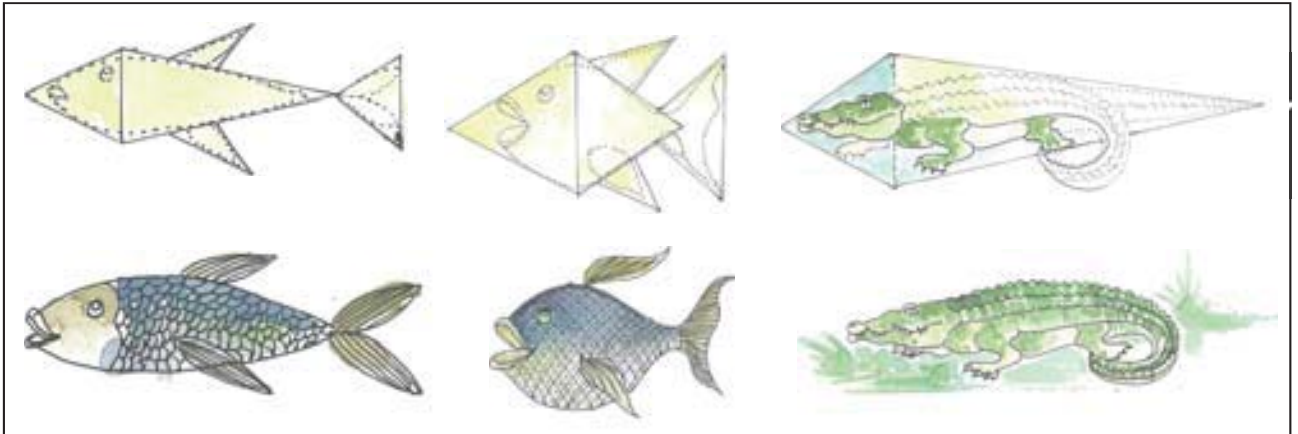
Every organism changes its structure according to its environment and its requirements.

Changes occurring in the structure of organism to cop up successfully with the changing environment are called adaptions.

Look at the picture. Have you seen any fish like this ? What happens if any fish have this type of shape ? Note down.



Link up the dotted line in the following pictures and which type of shape is formed. See that.

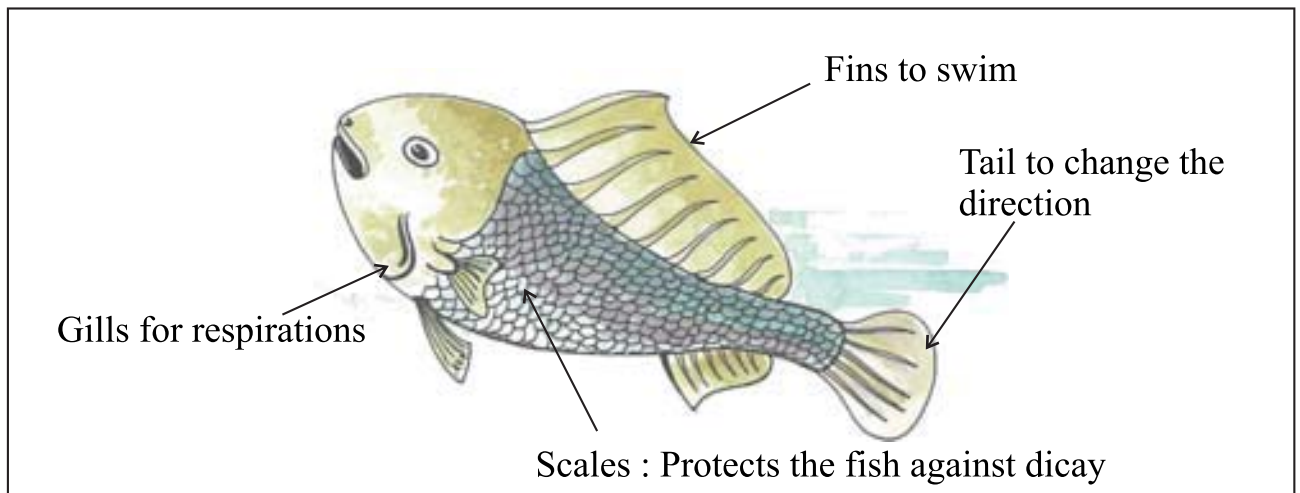


All fishes or aquatic animals have the such type of shape. They are narrow at its anterior and posterior ends and swollen in the middle region. This type of shape is called aerodynamic shape, which helps the animals to swim by reducing the resistance of water and thus they can swim very swiftly in the water.



You may have seen the shape of a boat and a steamer. What are the similarities between the shapes of a boat and a fish ? Why ? Discuss it and note down.

Thus, shape of a fish is its adaptation to live in water. The body of the fish is covered by smooth and sticky scales made up of wax, hence the body of fish never becomes wet or decay even if it lives in water. Thus, one cannot live in water if only he knows swimming. There are certain other adaptations found in the fish, we shall understand them with the help of following picture.



Now, tell that fish posses which organ in place of nose ?

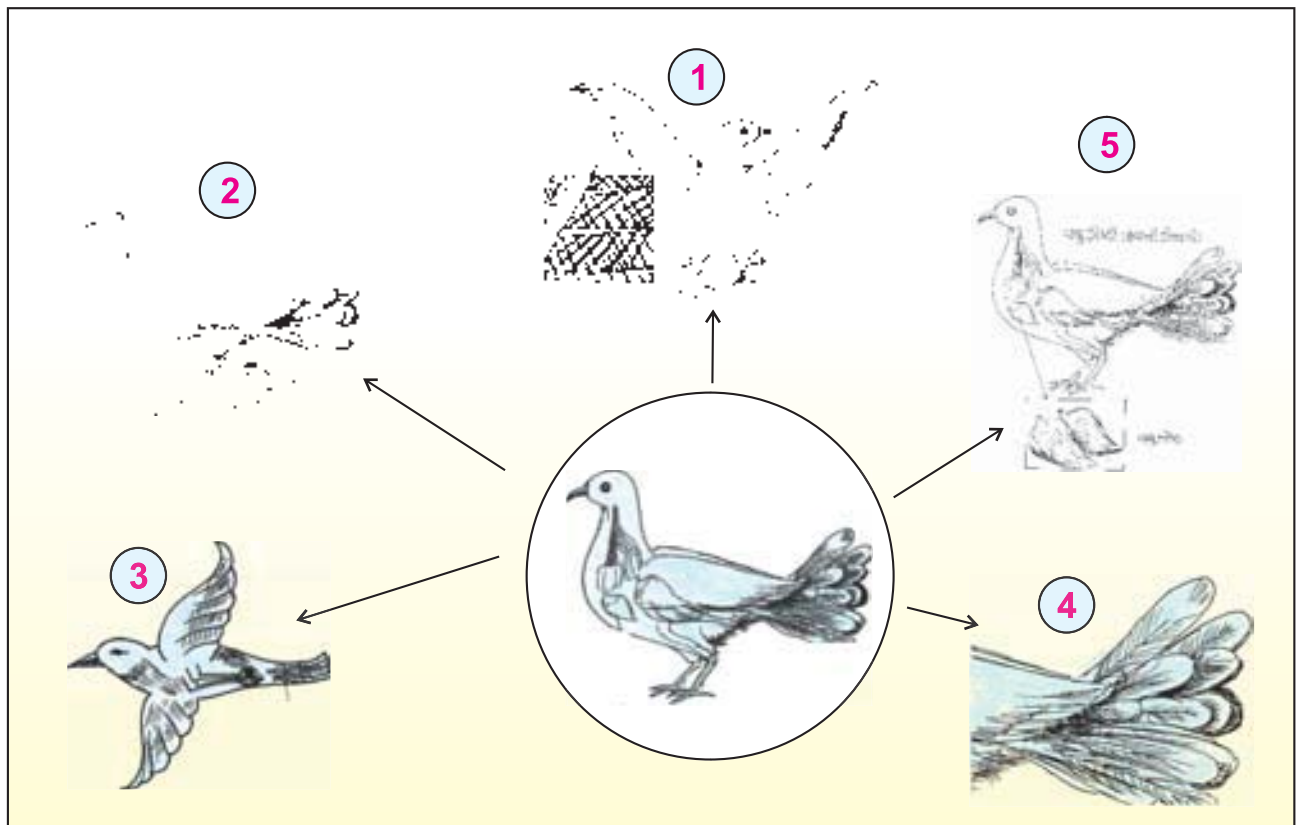


Select any two aquatic animals from your list and discuss about their adaptations and note them here.



We always wish to fly while we see a flying bird. Can we fly if we are provided with wings ? Birds also have some adaptations for flying in the air. Discuss about the differences between humanbody and the body of birds.

	Human	Bird
Size of the body		
Shape of the body		
Weight of the body		
Comparison between their hands, legs, nose, eyes etc.		



1

The forelimbs of birds are modified into wings for flying.

2

The bones, forming the skeleton, are spongy and light in weight to reduce the body weight.

3

They can fly easily in the air due to their special type of shape.



4

Tail is useful to balance the body.

5

They fill their air sacs with the air before flying, which help them in their flight. Birds possess such nine air-sacs.

Man has developed the shape of an Aeroplane inspiring from birds shape, hence it also can fly easily in the air. Moreover birds show variations in their beaks on the basis of their habitat and food. This is also one type of adaptations.

A	B	Identify the name of the bird on the basis of its beak and tell something about their food habit		
		Description	A	B
		Name of the bird		
		Food		

We have understood the adaptations of aquatic animals and avians, but if you look at the animals surrounding you than you will find many variations amongst them.

Make a list of the terrestrial animals and write down in the following table :

Name of animal	Living on tree	Living in burrow (Hole)	Living on land	Domestic animals

Animals live on trees :



Animals living on the trees are known as arboreal. E.g. Squirrel, garden lizard and monkey.

These animals have a long, thin, whip, like tail. Their tail is useful to twine around the twing of tree while their tongue is useful to catch insects. They have two independent eyes on both the sides Some animals change their colour according to the colour of the leaves of the tree. This type of animals is found just in your surroundings. Find it and note down here.

Burrowing animals :

Observe the similarities between the burrowing animals and write down them in the following table :

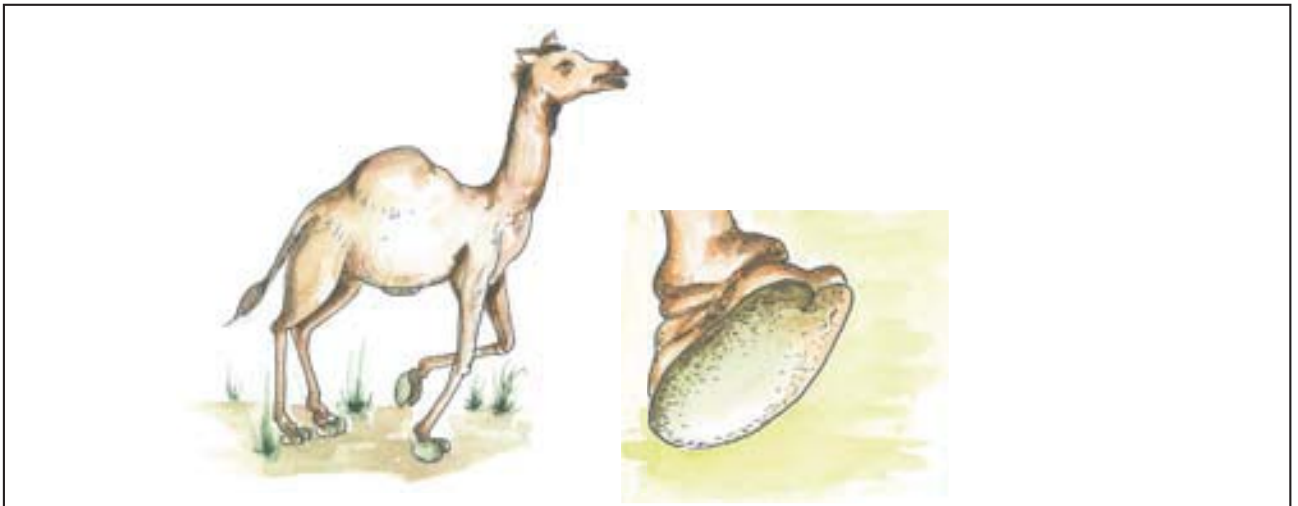
Rat	Snake	Screw (Chhachhunder)

Desert animals :

Water scarcity, less number of trees and sandy soil are the characteristics of a desert. Climate is very hot there. Animals live there show many adaptations due to these reasons.

Snake, rat and scorpion living in the desert show many specific characteristics in their structure.

Animals like horse can't walk in the sand of desert. People use only camel to travel in the desert.

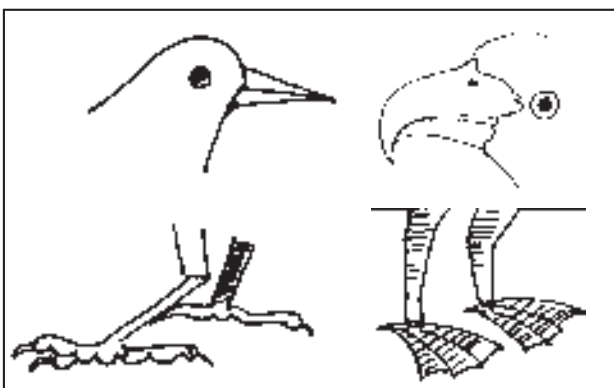


You may have seen and you must have an idea that camel has a hoof. It stores fat in this hoof. When food is not available in the desert at that time camel gets energy from this fat.

- It can be alive for a long time without water.
- Colour of its body matches with the colour of desert.

Thus, animals show adaptation according to their habitat, food, environment etc and thus diversity is found in animal kingdom.

Identify the animals in the following picture and give reasons for having such organs.





Movement of a cut tail is also an adaptation. What can be the reason behind this ?



Lizard can developed a new tail in place of cut tail.

Not only animals but plants also show adaptation. Plant show their adaptation generally on the basis of availability of water and proportion of salinity.



What is required ? Water, three bottles, money plants (pothos), *Calotropis/Zizyphus*, *Vinca* (Barmasi) ?

What to do ?

- Take plants having roots of *Vinca*, money plant and *Calotropis/Zizyphus*.
- Keep the plants in different bottles filled with water in such a way that they get enough sunlight. Observe them after 5-6 days.
- Condition of money plant _____
- Condition of *Calotropis/Zizyphus*. _____
- Condition of *Vinca* _____

Do you know why does this occur ? Requirement of water is different for each

- Some plants can survive in very less availability of water. These plants are called xerophytes. E.g. *Zizyphus*, *Calotropis*, *Acacia* (Babul).
- Some plants grow only under the water. They require no land to germinate. These plants are called hydrophytes. E.g. Lotus, *Typha*, Water chesnut (*Trapa*), Money plant.
- Some plants require adequate amount of water. These types of palnts are known as mesophyte. E.g. Neem, *Vinca*, Mango-tree.

Bring the book 'Plant kingdom' from your school library and collect more information.

Xerophytes grow in the desert where water is available in least amount and climate is very hot.

Root system of this type of plant is well developed and reaches to deep layers of soil. They can absorb water from the deep soil. Leaves are few and small, to reduce the rate of transpiration.

- ◆ Some plants convert their leaves into spines.
- ◆ Stem becomes green and fleshy in such plants, which can store water and food. E.g. *Opuntia*.
- ◆ Some plants grow in pond or ocean. They show characteristics to grow under water.



Like.....

- ⇒ Their leaves never decay even though remain in water.
- ⇒ Water is available in sufficient quantity hence they have poorly developed root system.
- ⇒ Their stems are hollow, thin and weak so that they can move with the water current.
- ⇒ Leaves of some hydrophyte are big and broad so that they can float on water and perform photosynthesis E.g. Lotus, Water chestnut (*Trapa*).
- ⇒ Some of them show their roots touching ground while some of them have roots free from soil.
- ◆ Compare the plants of *Zizyphus* and Money plant and note down in the following table :



Observed organ	A plant of <i>Zizyphus</i> / <i>Acacia</i> / Date palm	A plant of money plant/ Water chest nut (<i>Trapa</i>)/Lotus
Root system		
Stem		
Leaf		
Other		

Plants with moderate requirement of water are known as mesophytes. There are many mesophytes found around you.

If more amount of water is available then the plants die due to decaying and if they get less amount of water they burn due to heat. E.g. *Vinca*, Rose, *Ficus*

- Roots of such plant are well developed.
- Stems are branched and strong.
- Stomata are found on both the surface of leaf for means of transpiration.

We can estimate the quantity of water in the soil by observing the plants grown there.



- An Indian scientist '**Varah Mihir**' had a capacity to tell that in which soil you will get water and in which soil you will get (natural oil) crude oil by observing the vegetation of a particular area.

Observe the leave of *Ficus*, lotus and *Acacia* and note down the differences among them. Thus, every organisms show adaptation to survive and to live successfully.



- Frog is a cold blooded animal (body temperature do not remain constant = poikilothermic). It show no metabolic activity except breathing. Hence, during winter it digs down into the damp earth. This is called winter sleep (hibernation). Similarly during summer it goes underground. This is called summer sleep (estivation). During these sleeps lung breathing is stopped, while skin respiration continues. Respiration is the only process shown by frog during these stages.



- Q.1** Why does the upper surface of leaf is smooth and the lower surface of the leaf is rough ?
- Q.2** Why do different birds show different shapes of beak ?
- Q.3** Hairs are found in more number on the skin of animals living in cold regions ? Why?

Do it yourself :

Make a list of plants, animals and insects found in your area. Note down the specialty of each organism. Try to collect information of more and more organisms. Prepare your own book '**Organism surrounds me**'.

Unit
9**Refraction of Light**

Many times we see the things which is differ from the original things. Such as the star present in the sky is steady still they look like twinkling. Moreover on road, when we look at farther distance it feels like there is water on the road, but when we go near we see that there is nothing expect the road.

You may have seen such things. Note them down.



What is required ?

Glass, water and 1 rupee coin, pencil.



What to do ?

- ☞ Place the 1 rupee coin on the table.
- ☞ Place the empty glass on the coin as shown in figure.
- ☞ Observe the coin.
- ☞ Look at the coin continuously and pour water in glass.
- ☞ Can you see the coin in the glass ?



Where is the coin ?

Now, look in the glass from the top. What can you see ?

Where can you see the coin ? Inside the glass or outside the glass ?



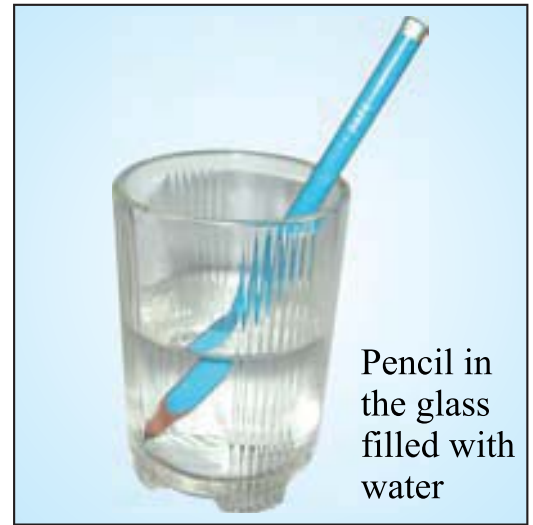
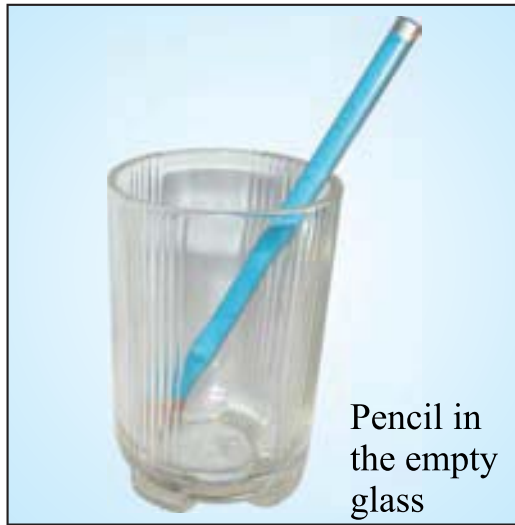
Why does it happen ?

Now, as above experiment put the coin in glass filled with water and observe. Where do you see the coin in glass ?



Why does it happen ?

Now, keep the pencil in the glass filled with water and observe.



How does the pencil appear, when it is kept in glass full of water ?



Why does it happen ?

Appearance of the coin inside the glass-when it is kept outside, appearance of the coin slight up side then it is present in the glass, appearance of pencil as if broken or bend in the glass filled with water, for this various phenomena, refraction is responsible.



Activity

What is required ? Rectangular glass slab and drawing-paper, pencil, pin, laser torch, thermocol sheet, scale for measurement.

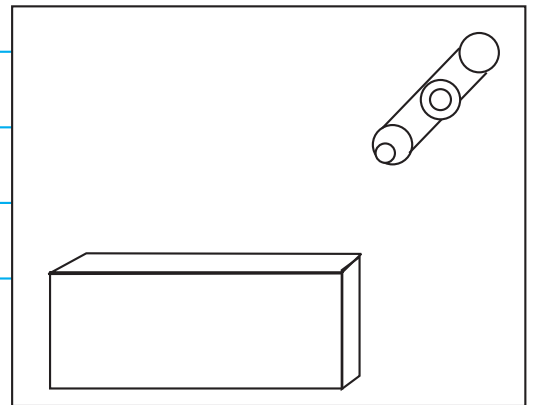
What to do ?

- Adjust the drawing-paper on the thermocol sheet.
- Then after adjust the rectangular glass slab on it.

- Now, as shown in the figure, project the beam of laser light on the glass slab such that it touches the surface of the drawing-paper.
- What happens when light passes through the rectangular glass slab ?

- Repeat this experiment two to three times and note down the changes, which you observe and draw path of beam in the figure.

Show the path of light rays.



- ☞ Does the light ray pass straight ? Yes / No

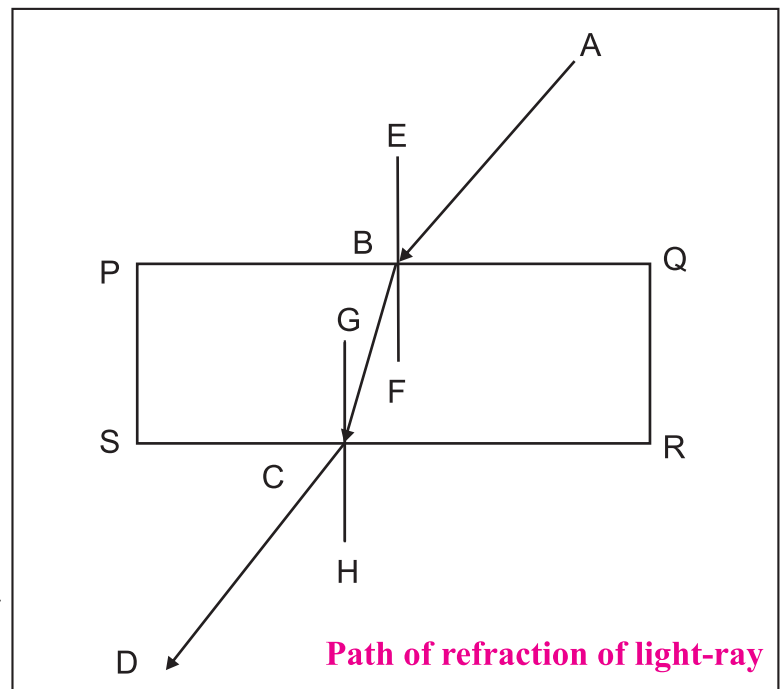
- ☞ Through which medium the light ray passes ?

Here the bent ray of light passes from rarer medium like air to denser medium like glass meanwhile it slightly bends at the surface separating two mediums.

When light ray passes from rarer medium to denser medium it changes its direction at the surface separating mediums, this phenomenon is called refraction.

Now, in above activity, mark the position of the rectangular surface with pencil. Mention the points of the rectangle P, Q, R, S. Now, as shown in the figure, project the beam of light from laser in such a way that it projects slantly on the rectangular surface PQ. Mark this ray as A. And the point where the ray touches PQ surface, mark it as B.

Now observe the slightly bent ray passing through the rectangular slab. This ray comes out from the other surface RS of the rectangle. The point through which this ray comes out is marked as C. Now, the ray coming out is marked as D. Now, remove the rectangular slab. Now, connect the points A, B, C, D. You will observe the figure as shown below. This figure represents the path of refraction of light. Now, draw line EF at point B on the PQ surface of the rectangle as



shown in the figure. Similarly draw line GH at point C on the surface RS of the rectangle as shown in the figure.

Ray AB is called Ray of Incidence and the angle produced between the ray and line EF is called angle of incidence.

- Which angle in the figure is the incident angle
- What is the value of incident angle ?
- **Ray of refraction :** The ray propagating through rectangular slab is called ray of refraction.
- **Angle of refraction :** The angle between the refracted ray and normal is called angle of refraction.

Which angle in figure is angle of refraction ?

- What is the value of angle of refraction ?

We have studied that the light ray travels from rarer medium like air and enters the denser medium like glass.

During this process, the light rays are slightly bent from the path.

In the previous activity, the path of motion of light ray is given by ABCD.

The refracted ray for surface RS becomes its incidence ray and the emergent ray becomes its refracted ray.

Where for both sides of the rectangle incident ray and emergent ray are same and $\angle DCH$ is called Emergent angle.



What is the angle of incidence for side RS ?

What will be the angle of refraction ?

Now let us change the value of incidence angle and repeat the experiment, note down your readings in the below table.

Sr No.	Medium of incidence ray	Medium of refracted ray	For PQ side of the rectangle		For RS side of the rectangle	
			Angle of incidence	Angle of refraction	Angle of incidence	Angle of refraction
1						
2						
3						

From the above activity, we can say that for side PQ the angle of incidence is greater than angle of refraction.

Where for side RS, the angle of incidence is less than angle of refraction. Moreover it obeys following laws of refraction.

Laws of refraction :

- (1) Incidence ray and refracted ray are on opposite sides of normal and are in different mediums.
- (2) Whenever light ray enters from rarer to denser medium, it slightly bends towards the normal and when it enters from denser to rarer medium it bends away from the normal.
- (3) The ray incident normal to the plane is not refracted.
- (4) Incident ray, critical ray and normal to the plane are in same plane.



When does the refraction of light takes place ?

- (A) When there is obstacle in the path of light.
- (B) When the medium of path of light changes.
- (C) When the light increases or decreases.

We know that in different mediums light has different velocities. In some mediums the velocity of light is as given in the below table :

No.	Medium	Velocity of light
1	Vacuum / air	3,00,000 km / second
2	Glass (simple transparent glass)	1,80,000 km / second
3	Water	2,25,000 km / second

In vacuum the velocity of light is maximum. Where as in other mediums it is less. Thus, the velocity of light in different transparent mediums is different so when the light ray travels from one medium to other medium its velocity changes. Therefore the refraction of light occurs.

The refraction of light measured with the help of Refractive Index of light.

The ratio of velocity of light in vacuum to the velocity of light in medium is called the Absolute Refractive Index of that transparent medium.

It means that Absolute Refractive index of medium = velocity of light in vacuum / velocity of light in medium.

Its symbol is μ .

When the light ray enters from one medium to other medium instead of absolute refractive index we consider its relative refractive index. For example, in order to calculate the refractive index using formula for the ray of light entering from air medium to glass medium, then its relative index can be obtained as follows :

$$\text{Refractive index of glass with respect to water} = \frac{\text{velocity of light in air (3,00,000 km/second)}}{\text{velocity of light in glass (1,80,000 km/second)}}$$

$$\text{Where, air } (\mu) \text{ glass} = \frac{(3,00,000 \text{ km/second})}{(1,80,000 \text{ km / second})}$$

$$\text{So, air } (\mu) \text{ glass} = 1.66$$

Where, air (μ) glass is called refractive index of glass with respect to the air.

With the same method find the refractive index of water with respect to air.

Refractive index of water with respect to air =

Where, air (μ) water =

So, air (μ) glass =

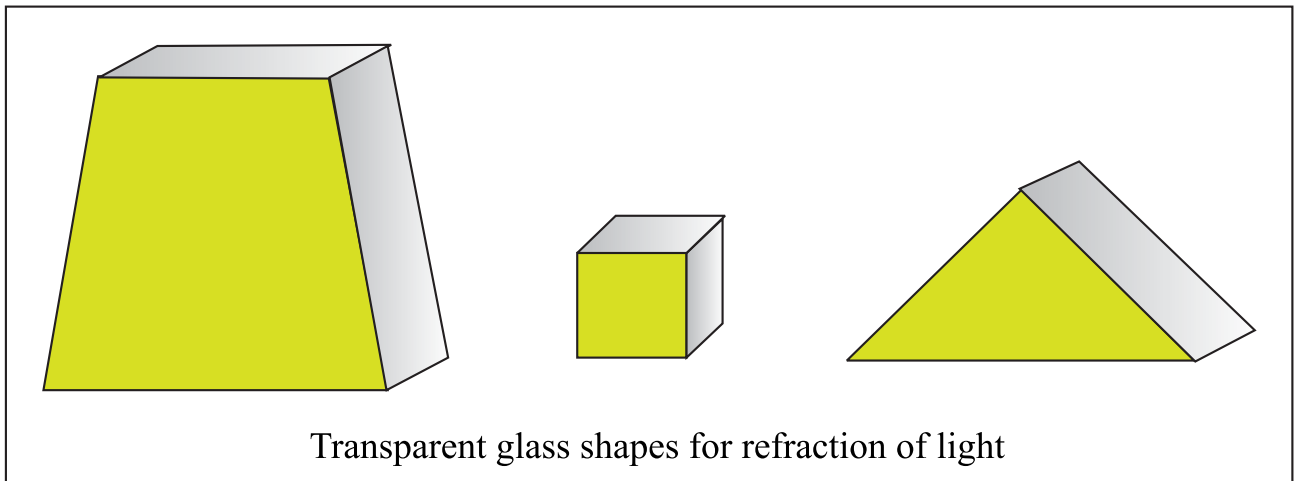
Where. Air (μ) water is called refractive index of water with respect to the air.

As refractive index of medium is more the refraction of light in that medium is more.



Let us observe the refraction of light with the help of different transparent glass shapes.

What is required ? Drawing-paper, laser torch and glass cube of different shape.

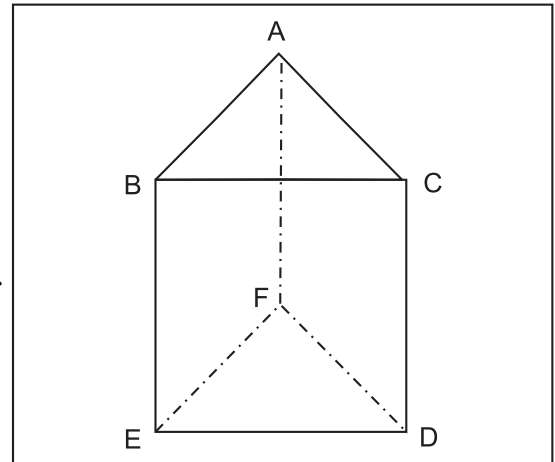


What to do ?

- Place the slab of glass of different shapes on drawing-paper.
- Now mark the surface surrounding and give name to corners of the glass slab as A, B, C, D.
- Now, incident the ray of laser light with the help of torch on any one of its surface.
- Note down your observation.
- From the above figure, do you observe the difference in the path of refraction of light in different slabs ? Yes / No.
- **What difference is observed ?**

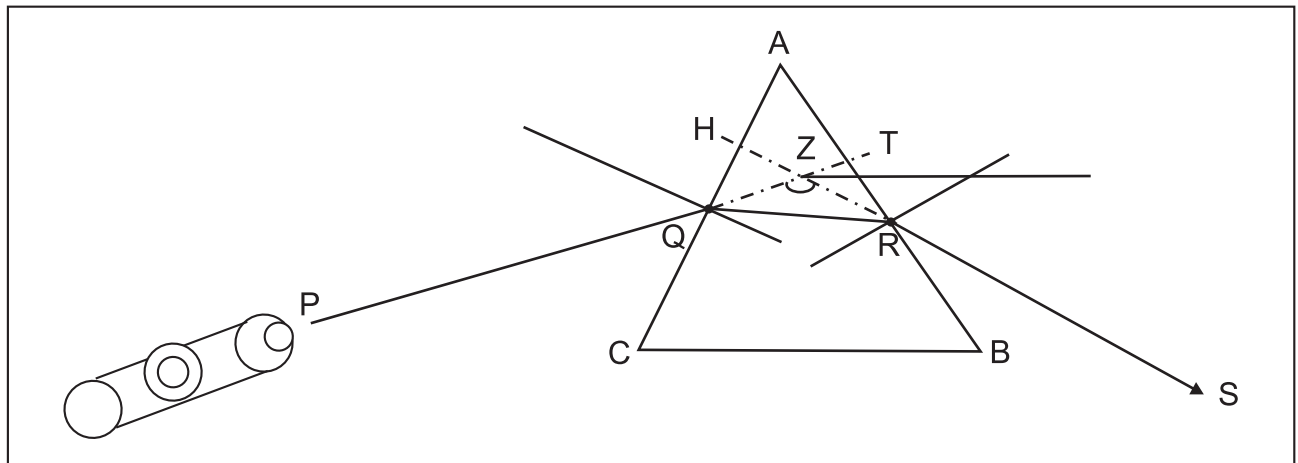
Observe the ABCDEF figure. This figure looks like a triangle. Actually it is not a triangle but a special construction of transparent glass. This is called prism. Its mutually opposite sides are in the shape of triangle. Other than these, three mutually opposite sides are in the shape of rectangle.

Find out a prism and observe it.



Now, let us observe the refraction of light with the help of prism.

What is required ? Prism, laser torch, drawing paper, pencil and scale.



What to do ?

- As shown in the figure, arrange the drawing-paper on the surface.
- Now, place a prism in such a way that its triangular surface touches the drawing-paper.
- Now, mark the surface of prism with the help of pencil as ABC.
- As shown in the figure incident the ray PQ from laser light on the plane AB of prism.
- Similarly mark the emergent ray. Now, remove the prism. Join two points Q and R.

Observe the path of refraction of light ray with the help of prism and complete the following information :

- Mention the incident ray
- Mention the ray of refraction

Which is the emergent ray ?

Which is the angle of incidence for AC surface ?

Which is the angle of refraction for AC surface ?

What is the value of angle of incidence on the surface AC ?

What is the value of angle of refraction on the surface AC ?

• In which direction the emergent ray bent ? Upward / downward towards base.

In the above figure extend the incident ray PQ towards T by dotted line. Now, extend emergent ray RS towards point H in backward direction by dotted line. Both the rays meet each other at point Z. There the angle RZQ is formed. This angle is called angle of deviation.

The angle between incident ray and the emergent ray is called angle of deviation. It's symbol is (δ) delta.

Repeat this activity two-three times and observe the deviation of emergent ray and note down. Upward / downward towards base.

The light ray incident on any surface of the prism when emerge from the opposite side it deviate towards the base of the prism.



Q.1 Do the experiments of refraction, which you know, with your friends. Discuss it and note down.

Q.2 For the given figure decide the light ray and different angles.

