Basic Science

Standard VII

Part 2

Government of Kerala
Department of General Education

Prepared by

State Council of Educational Research and Training (SCERT) Kerala

2024

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.

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

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Dear friends,

I'm sure this science textbook will prove to be your bosom companion. It will provide you with numerous opportunities for pure enjoyment by leading you to the heights of wisdom through a variety of activities such as observation, experimentation, construction, study tour, seminar, interview, quiz and project. This companion enables you to behold the diversity of nature by putting questions to you and empowering you to ask questions. This book has been envisioned to give you the chance to develop your own Science Kit and engage in investigative activities with your friends. How delightful such learning experiences can be ! These experiences will add wings to your imagination, raising you into the world of extra reading. You can also explore new avenues of knowledge with the help of ICT. You are also being given the opportunity to experience the country's development directly and also to participate in the local development activities. Activities enabling self assessment and leading to further inquiries are included at the end of each lesson. I believe that this book will provide learning experiences to elevate all the learners to higher levels of enlightenment. Your active participation is essential in all the learning activities specially designed for you. I'm sure you will enrich your Science Diary with the concepts you have imbibed through the different learning activities, scientific curiosities, scientific imagination and your vision for national development. I hope you will show interest in planning and implementing various activities of the Science Club in your school. May you be able to move ahead by engaging in scientific inquiries on your own and in the company of your friends, with the help of your teachers.

It will give me immense pleasure to get valuable comments and suggestions from you.

Warm regards,

Dr. Jayaprakash R.K.

Director
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Contents

Additional information related to the concepts in the textbook is given under the heading 'For Further Reading'. It is not subjected to assessment. Please note the icon given to it.

THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a [1]**[SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

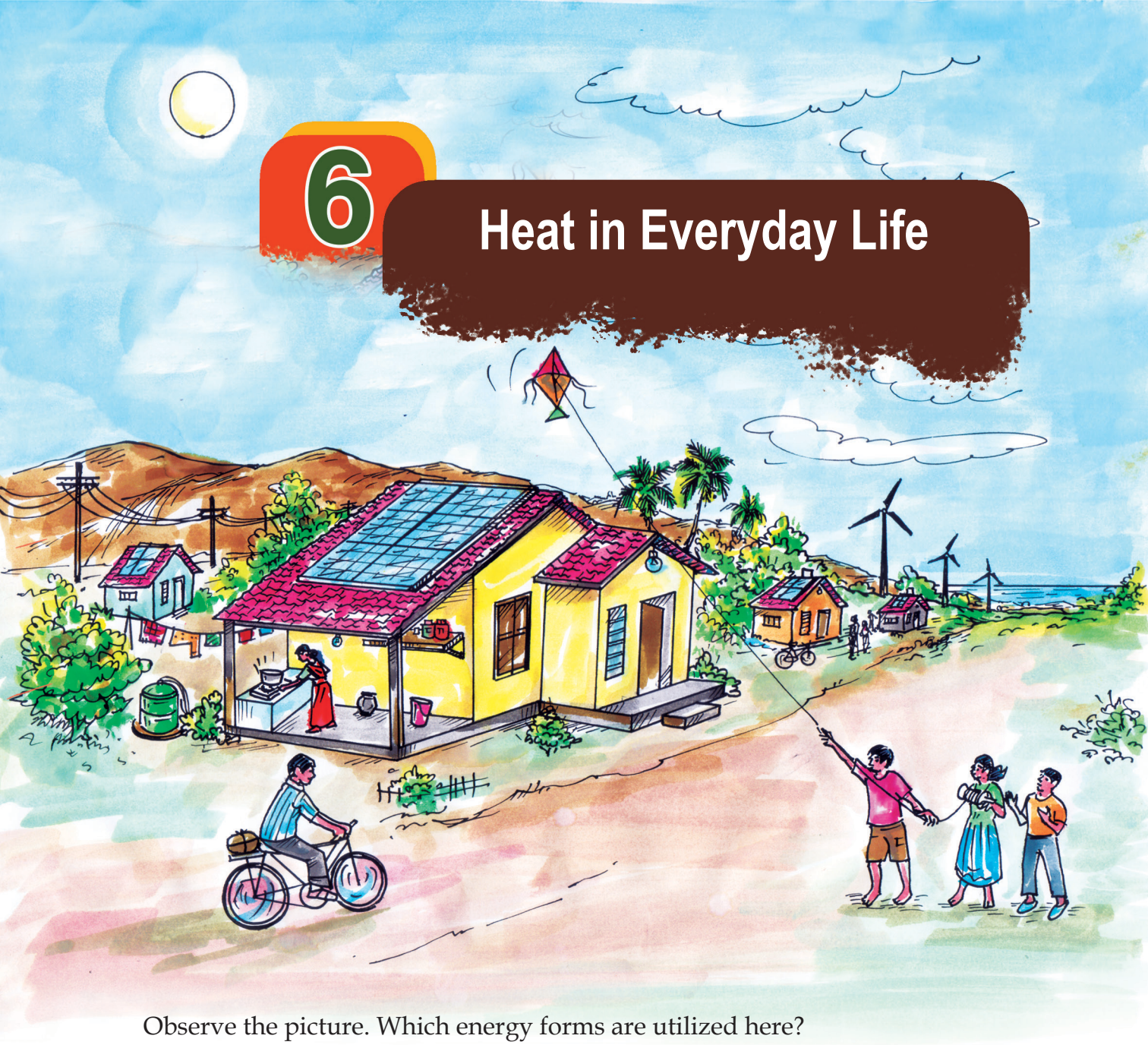
FRATERNITY assuring the dignity of the individual and the [2][unity and integrity of the Nation];

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949 do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

---

1. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Sovereign Democratic Republic" (w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Unity of the Nation" (w.e.f. 3.1.1977)

6 Heat in Everyday Life



Observe the picture. Which energy forms are utilized here?

- Light energy
- Solar energy
-

We make use of different forms of energy in our daily life.

Which are the various situations where heat energy is used? List them.

- For cooking
-

Would you like to know more about heat energy?

You have already observed the changes caused by heat energy on different states of water.

Ice is the solid form of water. What happens when ice is exposed to air?

What happens when water is boiled? Steam is the gaseous form of water.

When substances are heated, they absorb heat energy. Can heat energy change the state of matter? What do you think?

Let's do an experiment to check whether your guess is right.

Melting Ice Cubes

Materials required : 2 Glass tumblers, water at normal temperature, hot water, ice cubes.

Water at normal temperature

Hot water

Take water at normal temperature in one glass tumbler and hot water in another one as shown in the picture. Put some ice cubes in both glasses.

Ice cubes in which glass melt faster? Why? Write it in the Science Diary.

Which form of energy caused the change of state of ice?

Didn't ice get adequate heat from water to melt?

Have you noticed coconut oil solidifying during winter? What is the reason?

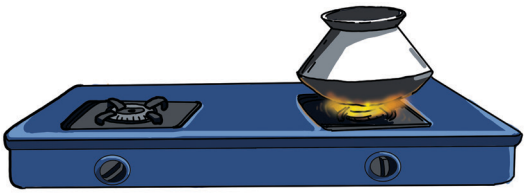
Heat is a form of energy that can change the state of matter.

Does heat get transferred from one substance to another?

What is your opinion?

Discuss in your class.

Transfer of Heat



Observe the picture.

The picture shows a pot of rice being cooked on a gas stove.

How did the rice get the heat energy radiated from the flame of the gas stove? Complete the flowchart by writing the different ways by which heat was transferred.

Rice gets cooked when the heat radiating from the flame of the stove is transferred through the pot and water and reaches the rice.

What do you infer from this?

Transmission of Heat

Transmission of heat refers to the flow of heat from one place to another.

What happens to the pot after turning off the gas stove for a while? Why does the pot lose heat?

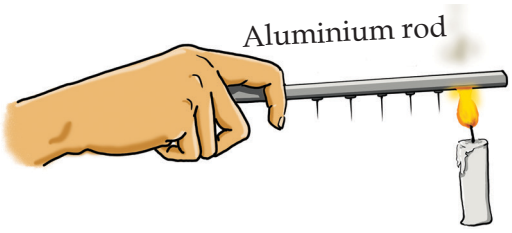
Does the pot alone lose heat? Don't the substances inside it also lose heat? Discuss.

Heat is transferred to the surroundings, not only from the pot but also from the substances inside it. This results in heat loss to the vessel and its contents.

Transmission of Heat in Solids

You know that many things around us exist in solid, liquid and gaseous states. Is heat transmitted in the same manner in all these things? Write down your guess.

Let's do an experiment.



Take a 20 cm long Aluminium rod, some pins, a candle and a match box from the Science Kit.

Fix the pins at equal distances on the Aluminium rod using wax as shown in the picture. Heat one end of the rod with a burning candle. What did you observe?

Did all the pins fall down at the same time? Which pin had fallen first? What causes the pins near the flame to fall first and those farther away to fall later?

Record your observations and inferences in the Science Diary.

This is due to the transmission of heat from the flame through the Aluminum rod.

Repeat this experiment with Copper and Iron rods.

Heat transmission occurs not only in Aluminium but in other metals also.

Repeat the experiment with a piece of wood and a glass rod.

Discuss and record your observations in your Science Diary.

Conduction

When heat is received at one end of a metal rod, the molecules at that end receive the heat and transfer it to the nearest molecules. This method of transmission of heat is called conduction. In solids, heat is transmitted through conduction.

You have understood that heat is transmitted in metals by the transfer of heat energy.

Materials that Conduct Heat

Do all materials conduct heat well?

Haven't you experimented with Aluminium, Copper, wood, Iron and glass rods? Complete the table by classifying them as substances that conduct heat well and those that don't conduct heat well.

Substances that conduct heat well	Substances that don't conduct heat well

Haven't you realised that all solids do not conduct heat well?

Good Conductors and Poor Conductors

Substances which allow heat to pass through them well by conduction are called good conductors and those substances which do not allow heat to pass through them well are called poor conductors.

Find out more examples of good conductors and poor conductors based on your experience and list them.

We make use of good conductors and poor conductors in our daily life.

In the following situations, do we use good conductors or poor conductors?

- To remove a hot vessel from the stove
- To make handles of cooking utensils
- To make cooking utensils

Check the pictures below.

Both good conductors and poor conductors are used in the same vessel. Explain the reason for this. Find more examples of such vessels and present them in the class.

Transmission of Heat in Liquids and Gases

Haven't you understood that transmission of heat in solids takes place through conduction? By which method does transmission of heat occur in liquids and gases?

Why do we put the fire right underneath the vessel while cooking? How about heating the sides of the vessel? What are your responses?

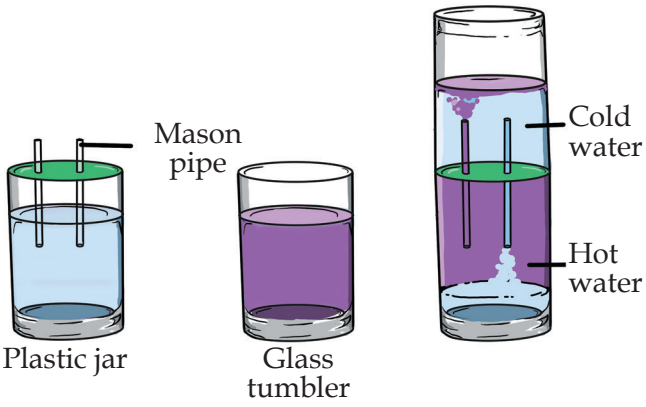
Let's do an experiment.

Materials required : A transparent plastic jar with a lid, a glass tumbler with the same diameter as that of the jar, mason pipe, Potassium permanganate, hot water, cold water.

Make two holes on the lid of the plastic jar. Fix a 10 cm long mason pipe in each hole in an airtight manner. Take hot water in the glass tumbler having the same diameter as that of the plastic jar. Add some Potassium permanganate granules to it.

Take some cold water in the plastic jar and close it with the lid fitted with the mason pipe. Place this plastic jar upside down over the glass tumbler filled with hot water containing Potassium permanganate.

What do you observe? Discuss and record it in the Science Diary.



Does the water in the plastic jar at the top flow down? Can you see the coloured hot water in the glass tumbler flowing upwards?

What causes the water in the jar at the top to flow down through one pipe and the water in the glass at the bottom to flow up through the other pipe?

Write your inference in the Science Diary considering the temperature difference between water in the jar and the glass tumbler.

When hot water flows up through one mason pipe, cold water flows down through the other pipe. This cold water becomes hot and rises up again. Thus heat spreads throughout the liquid.

In this experiment, heat was transmitted from hot water to cold water by the displacement of molecules. Here the heat energy is transferred when molecules move across. Heat transmission occurs in all liquids by the displacement of molecules.

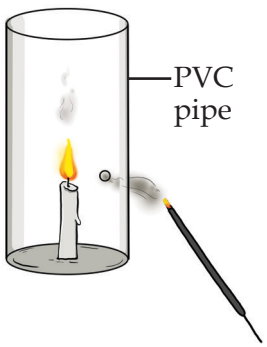
Transmission of Heat in Gases

Does transmission of heat occur in gases as in liquids?

Let's do an experiment.

Materials required: One PVC pipe of 5 cm diameter and 30 cm length, an incense stick, a match box, a candle.

Make a pencil sized hole at a height of 8 cm on one end of the PVC pipe. Place a lighted candle on the table. Arrange the pipe as shown in the figure so that the candle comes inside the PVC pipe. While arranging the pipe, the portion with the hole should come at the bottom. Light the incense stick and watch the smoke rising up. Bring the lighted incense stick near the hole on the pipe. Observe the direction of flow of smoke. What change do you observe?



As the air inside the PVC pipe warms up and rises, cool air flows into that space through the hole. Along with this flow of air, the smoke from the incense stick also enters. The air, thus entered, also gets heated and rises up. Here also, heat is transmitted from one part to another by the displacement of molecules as in liquids. In this way, the heat spreads in the air inside the pipe. In both the experiments you have conducted, transmission of heat was due to the motion of molecules, wasn't it?

Convection

Convection is the method of transmission of heat in gases and liquids by the displacement of molecules.

What is the role of molecules in the transmission of heat by conduction and convection?

Here the molecules serve as the medium.

Can heat be transmitted without the help of a medium?

You know that the Earth gets heat mainly from the Sun. How does the heat from the Sun reach the Earth? We also know that there is a vacuum area between the Sun and the Earth. This vaccum area is spread over 15 crore km. Does heat from the Sun reach the Earth by conduction or convection? There is no medium between the Earth and the Sun. Therefore heat cannot be transmitted by conduction or convection. Still, we know that heat from the Sun reaches the Earth. How does this happen?

Radiation

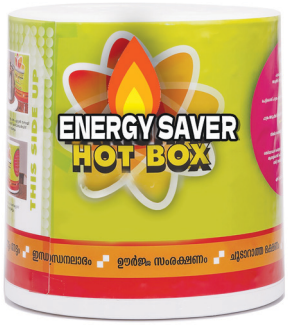
Radiation is the method by which heat is transmitted without the help of a medium. Heat is transmitted to all directions through radiation. Heat from the Sun reaches the Earth by radiation. White or smooth surfaces reflect radiant heat more than black or rough surfaces.

Write down some situations where heat is transmitted by radiation.

- Heat reaches down from a glowing filament bulb.
-

Don’t you adopt various methods at home to keep cooked food hot for a long time? Which are the commonly used devices to reduce heat loss? List them.

Hot Box



What is hot box used for?

A hot box is a system used to reduce the use of cooking fuel and to keep cooked food items from losing heat. In this, food items can be kept without losing heat for an average of 8 hours. If we place half cooked rice inside this box, the fuel required to cook rice can be reduced almost by half. You know that thermocol is used in the hot box. As it is a poor conductor, the heat loss through conduction is reduced. Heat loss through convection is reduced as the hot box is kept closed.

How is heat loss avoided in a hot box? Discuss and write it in the Science Diary.

Ice Box

You know that ice is used to preserve food items like fish. Ice box is used to keep ice from melting too quickly. Shall we make an ice box?

Materials Required: A small box, thermocol, glue, white enamel paint.

Cut the thermocol and glue it inside the small box. The thermocol should be glued on the sides, bottom and the lid. Apply white enamel paint inside and outside the box. Put the ice cubes in the box and close it. Observe how long it can keep ice cubes from melting. Find out the various situations in which such ice boxes are used. Discuss in the class, how the ice box minimizes all the three types of heat loss.

Thermal Expansion of Solids

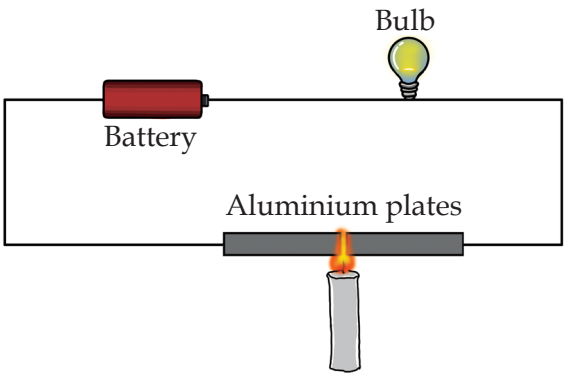
Do solids expand when heated? Let's do an experiment.

Materials required: A battery, a bulb, a connecting wire, two Aluminium plates, a candle, a matchbox.

As shown in the figure, arrange an electric circuit on a board using battery, bulb, connecting wire and the two Aluminium plates.

The Aluminium plates should be placed on both sides of the wire very closely, without touching each other. Heat the Aluminium plates using the candle. What did you observe?

Didn't the bulb glow? Why did the bulb glow? Note down your opinion. What happened to the Aluminium plates when they were heated? When heated, they expanded, came into contact with each other and completed the circuit. Now, remove the candle and observe. What happened to the glowing bulb? Why?



Why did the circuit become open on cooling?

Write down your inference from this experiment.

When heated, the Aluminium plates get expanded, the circuit is completed and thus the bulb glows. When heat is lost, the plates contract and the circuit is disconnected. So the bulb goes off.

Repeat the experiment using Copper and Iron plates instead of Aluminium. Record the findings in the Science Diary.

Thermal Expansion of Solids

Solids expand when heated and contract on cooling.

Which are the situations you have noticed in daily life related to thermal expansion of solids? Write them in the Science Diary.

Haven't you seen the wires on the electric pole for distributing electricity? Why do these wires get sagged in summer?

Let's find out the reason behind this by analysing the following situations.

- A very tight pen cap is removed by heating gently.
- The tight lid of a steel tiffin box is opened by gently heating.

Analyse these contexts discuss and note down your findings in the Science Diary.

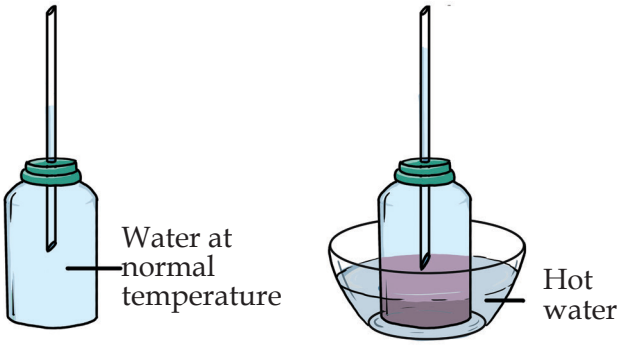
Do Liquids Expand When Heated?

Let's find out through an experiment.

Materials Required: An injection bottle, a cork that fits the injection bottle, an empty refill tube of a pen, a bowl, potassium permanganate, hot water, water at normal temperature.

Fill the injection bottle with water and add some Potassium permanganate granules. Make a small hole in the rubber cork. Fix the refill tube in the hole. Close the injection bottle with the cork.

Tie a thread to mark the water level in the refill.



Take hot water in the bowl and place the injection bottle in it.

What happens to the water level in the refill? Why?

Wasn't this change caused by the expansion of water due to the heat received?

If the water in the injection bottle cools down, will the water level return to its initial position?

What is your inference from this experiment?

The water in the bottle expands and rushes into the refill. Hence the water level rises. Water contracts when it cools. Hence the water level is restored.

Thermal Expansion in Liquids

Liquids expand on heating and contract on cooling.

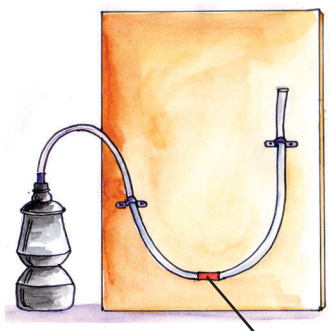
Thermal Expansion of Gases

When heated, do gases undergo the same changes as in solids and liquids? Do gases also expand when heated?

Let's do the experiment and find out.

Materials Required: An Aluminium lamp, a plastic tube, a board, coloured water, hot water, cold water.

Fix the plastic tube on the Aluminium lamp as shown in the figure. Fix the remaining part of the tube in U shape on a board. Pour two or three drops of coloured water into the plastic tube.



Aluminium lamp

Coloured water

Hot water

Cold water

Place the Aluminium lamp in hot water. What happens? Why?

Now place the Aluminium lamp in cold water. What do you observe? Why?

When the Aluminium lamp becomes hot, doesn't the air inside it also become hot? As this hot air expands, the coloured water in the tube moves upwards.

If so, what happens to the gases when they become cool?

As the Aluminium lamp cools down, the air contracts, causing the colored water to move back in the tube and reach its initial position.

Thermal Expansion of Gases

Gases expand on heating and contracts on cooling.

Temperature

You know that units are used to express the measure of length, width, height, area, volume and so on. Similarly, units are used to indicate the temperature also.

Temperature is the term that indicates the degree of hotness. The units used to indicate temperature are degree celsius (^{0}C) and degree fahrenheit (^{0}F).

In your daily life, don't you need to know the temperature?

What happens to body temperature when you have a fever?

Haven't you checked your body temperature at a hospital? Which instrument is used for this?

A clinical thermometer is used to measure body temperature.

Normal temperature of human body is 37^{0}C (98.6^{0}F).

Clinical Thermometer

Observe a clinical thermometer.

Find out the degrees at which the measurements start and end. Write them down in the Science Diary. Why is such a limit fixed? With the help of the teacher, find the body temperature of your classmates using a clinical thermometer and record the readings.

Laboratory thermometer is an instrument used in a laboratory to measure temperature.

Let's do an experiment with a laboratory thermometer.

Laboratory thermometer

Heat water in a beaker. Using a thermometer, find the temperature in every 5 minutes and tabulate it.

Time (minutes)	Temperature (degree celsius)
5	
10	
15	
20	

Atmospheric Temperature

When does the temperature of the atmosphere rise? During the day or at night? Why?

Do we experience the same temperature in the morning and at noon? What about the evening?

Can changes in atmospheric temperature cause natural phenomena?

The sand and the water on the Earth get heated due to the heat from the Sun.

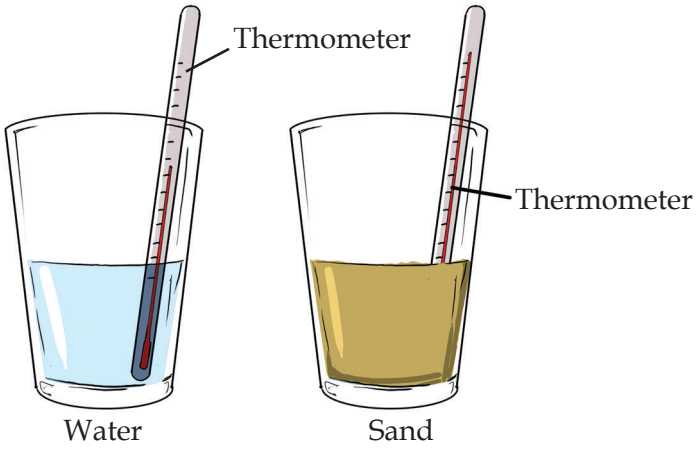
If soil and water are placed under sunlight at the same time, which one will get heated faster? What is your guess?

Let's do an experiment to check if your guess is correct.

Be sure to do the experiment on a sunny day.

Materials Required: Two glass tumblers, two laboratory thermometers, water, sand.

Take sand in one glass tumbler and water in another as shown in the figure and check the temperature with a laboratory thermometer. Place both the glasses in the sun. Then measure the temperature of sand and water with a thermometer at an interval of 20 minutes and record it in the table.



Time (minutes)	Temperature	
	Sand	Water
20		
40		
60		

Which one gets heated faster? Sand or water?

Now move both the glasses from the sun to a shade. Measure and record the temperature at an interval of 20 minutes.

Time (minutes)	Temperature	
	Sand	Water
20		
40		
60		

Which one cools faster? Sand or water?

Analyse the tables. Record your findings in the Science Diary and discuss in the class.

Land Breeze and Sea Breeze

Haven't you found that water heats up slowly and sand heats up quickly? Haven't you understood that hot sand cools down quickly and hot water cools down slowly?

There is both land and sea on the Earth. Which one heats up faster in sunlight? Land or sea?

Which will cool down faster at night? Compare the findings from the previous experiments and form an inference.

Sea Breeze

Land heats up and cools down faster than water. Therefore, the land is warmer than the sea during day time.

Sea Breeze

The air just above the land gets heated. This air expands and rises up. The air over the sea is cooler compared to that over the land. As the warm air over the land rises up, the cold air over the sea moves towards this place. Thus, sea breeze is formed.

What about night?

Is the air cooler at night over the land or sea?

Land Breeze

Land cools faster than sea. So, the air over the sea is relatively warmer. Therefore, it will be the air above the sea that is more expanded. Then the cold air above the land flows towards the sea. This causes the land breeze.

Land Breeze

Haven't you understood that sea breeze and land breeze are natural phenomena associated with the temperature of the sea and the land? Collect news reports and pictures related to such natural phenomena and prepare a journal.

Let's Assess

1. Consider some situations in everyday life.

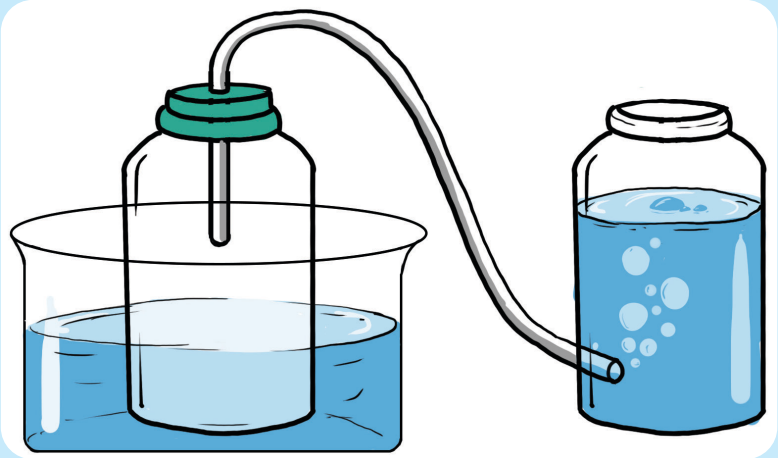
   - Tightly bound electric wires get sagged in summer.
   - One end of a PVC pipe is heated and the end of another pipe of the same diameter is inserted into it to join them.

   a. Which property of matter with respect to heat is evident in the above two cases?

   b. Based on this, can you explain why a fully inflated balloon bursts when exposed to sunlight?

2. Observe the arrangement of an experiment shown in the picture.

   An injection bottle fitted with a plastic tube is placed in a beaker of hot water. The tip of this tube is inserted into the hole at the bottom of another jar filled with water.



   a. What do you observe?

   b. What inference can be drawn from this?

3. Classify and tabulate the following materials on the basis of thermal conductivity.

   Iron, Paper, Bakelite, Copper, Wood, Steel, Aluminium, Cloth.

4. Haven't you noticed the utensils used for cooking? What is the difference between the materials used to make the utensil and its handles? Explain this on the basis of thermal conductivity.

5. Hot tea of same quantity is kept in an open steel tumbler and in a closed glass tumbler of same size. Tea in which tumbler stays hot longer? Explain your finding on the basis of heat transmission.

Extended Activities

Dismantle a thermoflask with the help of elders. Examine whether it has the following mechanisms to prevent heat transmission.

Method of heat transmission	Preventive mechanism
Conduction	Vessel made of poor conductor
Convection	Evacuated double wall
Radiation	Silver coated interior of double wall

7 Human Body- A Wonder

Circulation, Excretion and Nervous Co-ordination

Observe the picture.

A child who had not taken any food for two days and had become weak due to severe fever was admitted in the hospital. The doctor prescribed glucose drip along with the medicine.

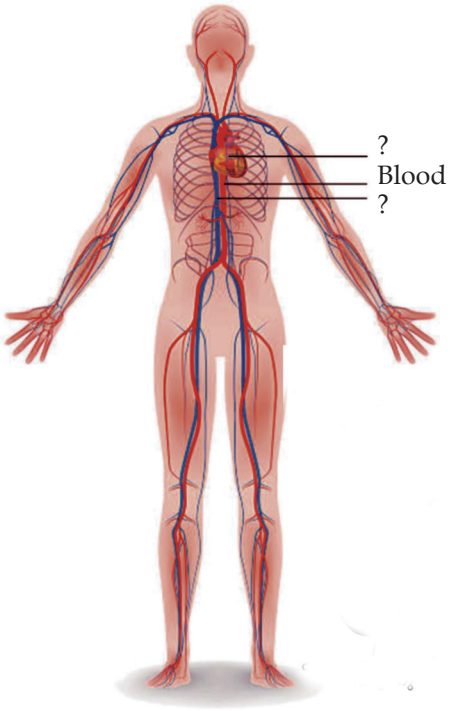
Why are some drugs and glucose injected directly into the blood? Does the glucose injected into the blood reach all parts of the body? Discuss.

The nutrients that are released when the food is completely digested in the small intestine and the oxygen that reaches the lungs as a result of breathing should reach the cells. How do they reach the cells?

Write down your assumption.

Circulatory system

Nutrients that are absorbed by the villi in the small intestine and oxygen obtained as a result of breathing reach in cells. All these functions are performed by blood. The system which consists of blood, blood vessels and heart is the circulatory system.



Observe the picture and write down the parts of human circulatory system.

-
-

An important function of the circulatory system is to transport nutrients and oxygen-rich blood from the heart to all parts of the body, and also to carry carbon dioxide-rich blood from different parts of the body to the heart.

Human blood

Do you know the colour of our blood?

Why is blood red in colour?

The red colour of the blood is due to the presence of a pigment called haemoglobin. Iron and protein are the main components of haemoglobin. Haven't you understood the necessity of consuming iron rich food?

Observe the picture of some food items containing iron. Find out other food items containing iron and record it in the Science Diary.


Dates

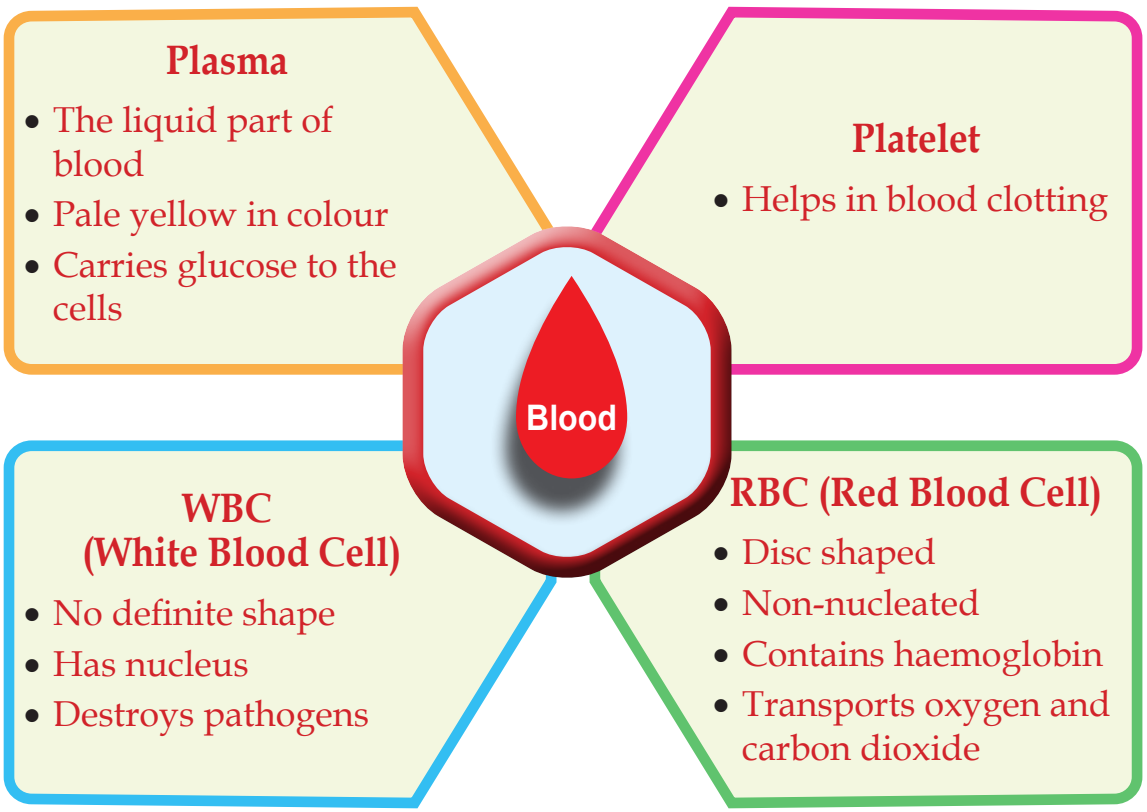

Egg


Moringa leaves

Haemoglobin plays an important role in carrying oxygen from the lungs to the cells and carbon dioxide from the cells to the lungs.

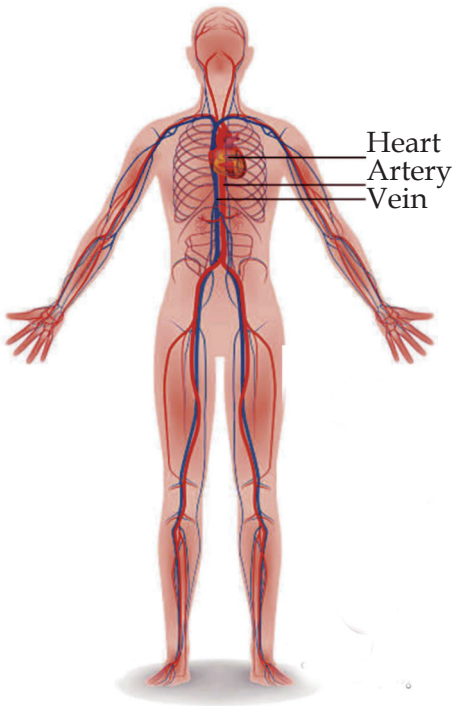
Major Components of Blood

Observe the illustration given below.



Analyse the illustration and write the answers of the following questions in the Science Diary.

- Which is the liquid part of blood?
- Which are the blood cells?
- What is the function of platelets?
- In which blood cell is haemoglobin found?
- Differentiate RBC and WBC

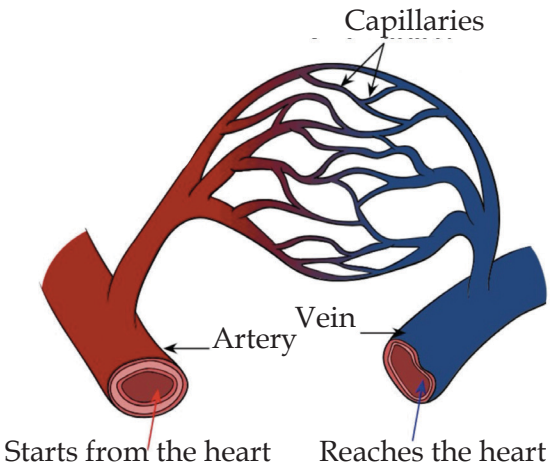


Blood Circulation

Blood flows through blood vessels to all parts of the body.

Observe the pictures and find out how many types of blood vessels are there in our body.

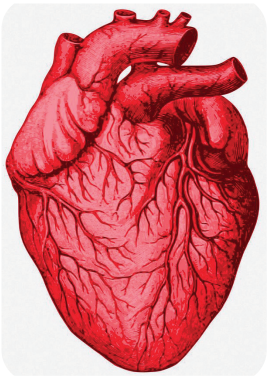
-
-
- Capillaries



Arteries, Veins and Capillaries

- Arteries are the blood vessels that carry oxygen-rich blood from the heart to different parts of the body.
- Veins are the blood vessels that carry carbon dioxide - rich blood from different parts of the body to the heart.
- Capillaries are the thin blood vessels that connect arteries and veins.

Heart



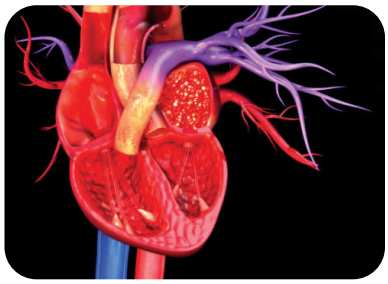
The heart is the centre of the circulatory system. It pumps blood to all parts of the body. Feel your own heart beat and locate your heart.

The heart is located in the thoracic cavity between the lungs. It is protected by the ribs.

What are the characteristics of human heart?

Observe the pictures of human heart.

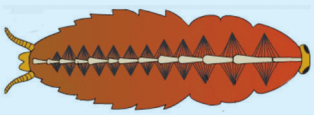
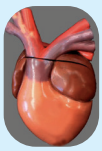
- The heart is about the size of a clenched fist.
- The heart is covered by a double layered membrane called pericardium.
- The human heart has four chambers.



Do all organisms have heart?

Do the hearts of other organism also have four chambers?

For further reading

Organism	Picture of Heart	Chambers of the heart
		5 pairs of lateral hearts
		13 chambers
		2 chambers
		3 chambers
		4 chambers

Heartbeat

Doesn't the doctor check your heartbeat and pulse when you go to a hospital? What is heartbeat? What is pulse?

Heartbeat and Pulse

Heartbeat is defined as the rhythmic contraction and relaxation of heart muscles. The heart of a healthy adult beats 72 times per minute. This is heart rate. Pulse is the wave produced in the artery as a result of heartbeat. The heart rate and pulse rate are equal.

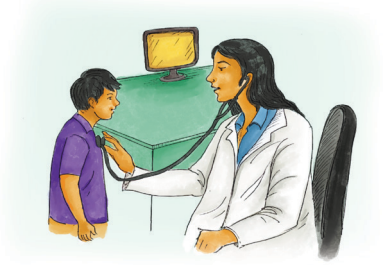
Check your own heartbeat and write down how many times it beats per minute.

Observe the picture. Which are the body parts that are examined to feel pulse?

- The wrist
- Both sides of the forehead
-
-

Observe the picture of a doctor examining a child.

What instrument does the doctor use?
What is its use? Write it in the Science Diary.



For further reading

Rene Laennec

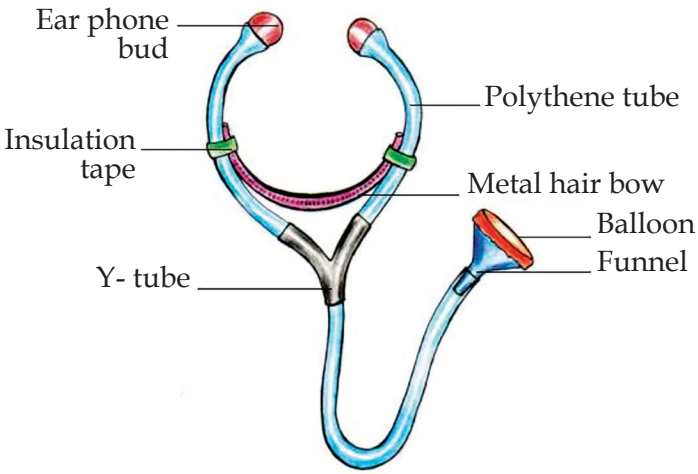
Stethoscope is an instrument used to check the heartbeat. It was invented by Rene Laennec.

Stethoscope

Let's Make the Model of a Stethoscope

Materials required: Plastic tube, Y- tube, funnel, polythene tube, balloon, two ear phone buds, metal hair bow, insulation tape.

Observe the picture and make the model of a stethoscope.



Can you feel your own heartbeat using the stethoscope you have made?

Find out the heart rate and pulse rate of your friends.

Name of the Child	Heart Rate	Pulse Rate

Compare the heart rate and pulse rate. What are your findings? Record them in your Science Diary.

Won't the heart rate and pulse rate be the same?

Will there be any change in the heart and pulse rates during strenuous activities?

Find out the change in the heart and pulse rates of your friends who have been running around for some time. Write them down in your Science Diary.

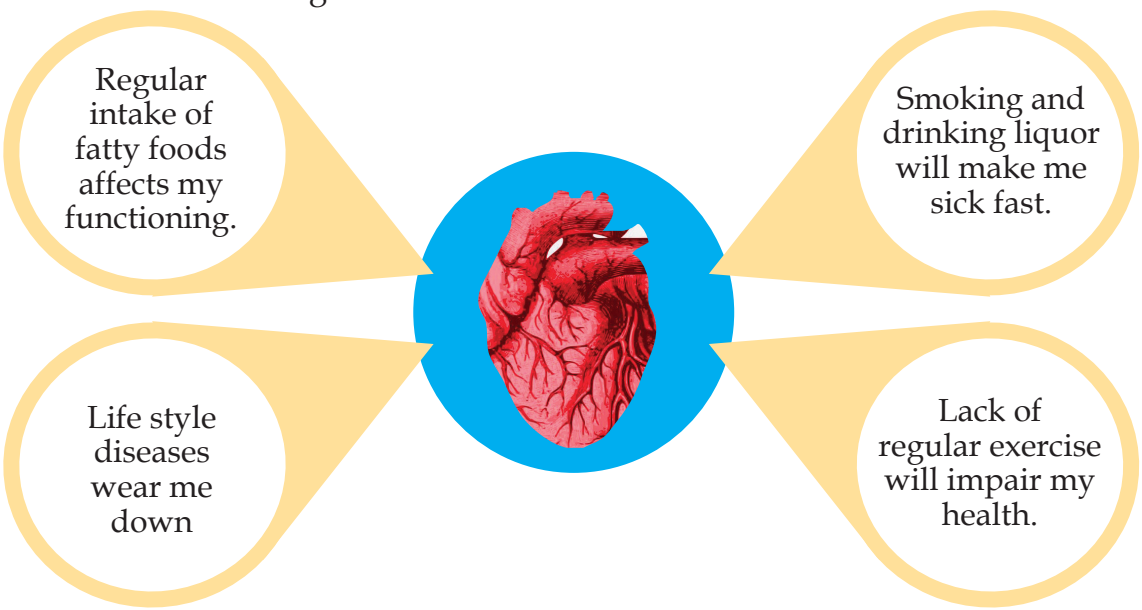
Name of Child	Heart Rate	Pulse Rate

Does heart rate and pulse rate vary with age and medical condition?

Check the heart and pulse rates of the elders at your home and record them in the Science Diary and present in the class.

Cardiac Wellness

Listen to the monologue of the heart.



What are the things we should take care of to maintain a healthy heart?

After analyzing the illustrations, record your findings in the Science Diary.

We can protect the health of the heart through good food habits, regular exercise and better life styles.

In Case of Injury

You have understood that the heart, blood and blood vessels are parts of the circulatory system.

What will happen if blood vessels are cut?

While playing, your friend's hand gets injured and it is bleeding. What will you do?

What first aid can be given to a person who is injured?

- Clean the wound with fresh water.
- Press the wound with your hand.
- If the wound is on the hand, hold it up.
- If bleeding doesn't stop, wrap the wound with a clean cloth or bandage.
- Get medical help quickly.

For further reading

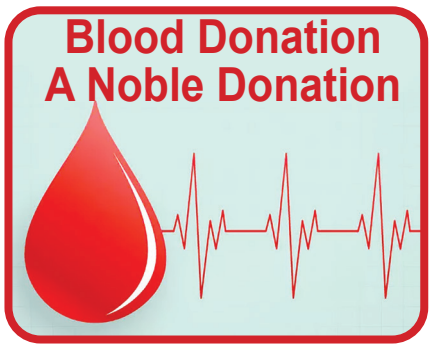
Transplant the Heart

Heart transplantation is performed on people with severe heart disease. Usually, the heart of a brain dead person is transplanted onto the patient. The first successful heart transplant was done by Dr. Christiaan Barnard in 1967.

Blood Donation - A Noble Act

A healthy person has about 5.5 litres of blood in his body. What is to be done if there is a decrease in the volume of blood due to accidents or illness?

Observe the picture.



Blood donation is the voluntary donation of blood by a person to another or for further use through its scientific preservation. You can also be a part of this social service when you turn 18. Prepare slogans related to blood donation and display in the class.

Excretory System

So far, we have discussed life processes such as digestion, circulation and respiration.

Which is the gas produced as a result of respiration? Which organ eliminates it? What are the other waste materials produced in our body?

What are the mechanisms available to eliminate these waste materials?

Excretion

Excretion is the process of elimination of urea, excess water, salts etc. that are produced in the body as a result of life processes.

Kidney

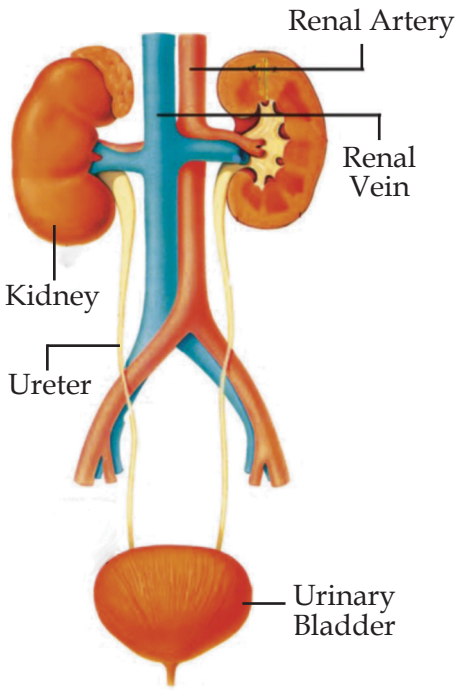
Kidneys are the most important excretory organs in our body. They act as filters in the human body.

Observe the picture and identify the shape of the kidney.

Discuss the given questions with the help of the following notes and picture. Record your findings in the Science Diary.

Kidney and Filtration

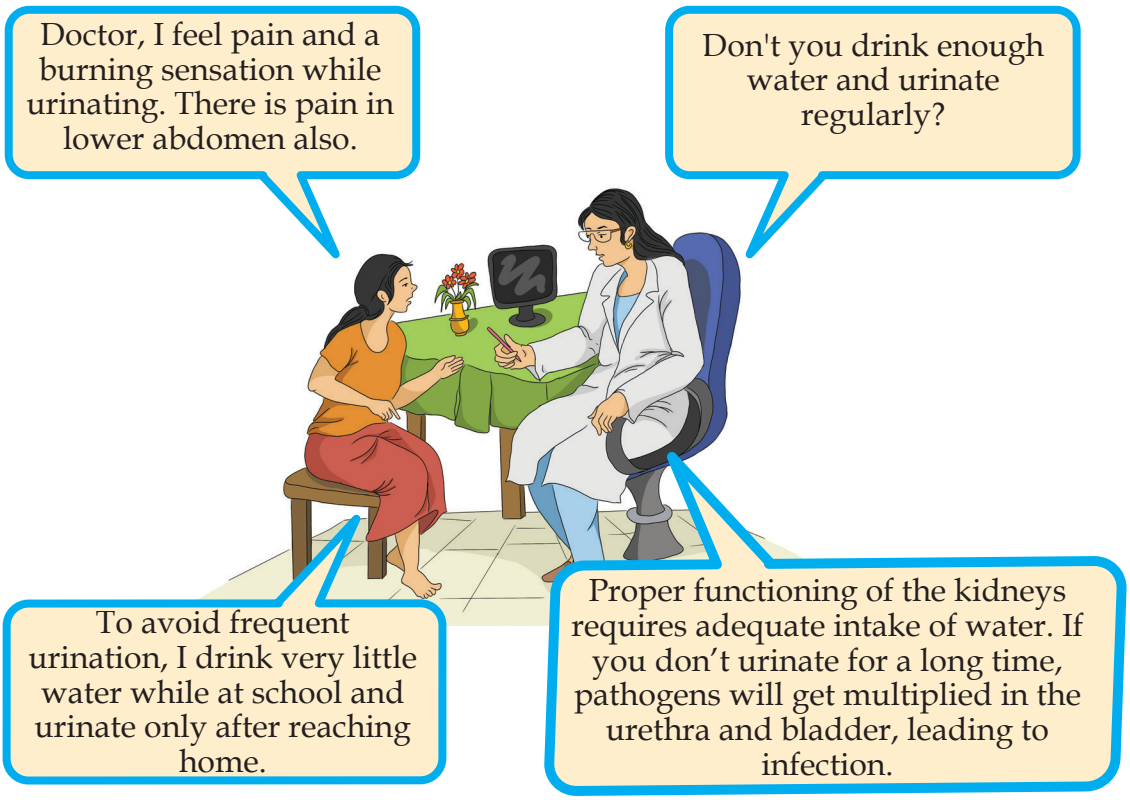
Kidneys are bean-shaped and are located in the abdominal cavity on either side of the vertebral column. The renal artery carries blood to the kidneys. This blood contains urea, glucose, salts, oxygen and other components. But the blood returning through the renal vein after filtration contains comparatively less amount of urea, glucose, salts, oxygen, and other components. The waste products in the blood thus filtered by the kidneys are eliminated through urine. Kidneys play an important role in maintaining the proper concentration of water and salts in the body. The average daily output of urine from a healthy person is 1.5 litres.



Discussion points

- Which blood vessel carries blood to the kidneys?
- Which blood vessel carries blood back from the kidneys?
- How does the blood in the renal artery differ from that in the renal vein?
- Which tube carries urine from the kidneys?
- In which part of the excretory system is urine collected?

Listen to the conversation between a child and a doctor.



What are the health problems that will occur if you don't drink enough water and urinate at regular intervals? Interview a doctor and write them in the Science Diary.

Examine the illustration below.

What are the measures we should take care of to protect the health of our kidney? Discuss in the class and record them in the Science Diary.

What are the means to save someone suffering from kidney failure.

- Dialysis
-

Kidney Transplantation

Kidney transplantation is the process of transplanting one kidney from a healthy donor to a person whose both kidneys are impaired. Kidney transplantation will be possible only if certain vital factors, including the blood group of the donor and the recipient, are compatible. Any healthy person above 18 years can donate a kidney.

Other Excretory Organs

Sweat is produced in our body during summer and rainy seasons.

How is it eliminated from the body?

What materials are expelled from the body through sweat?

- Water
-

Analyse the given note and find out the functions of skin. Write them in your Science Diary.

Sweat

Sweat is produced by sweat glands in the skin. Excess water and salt in the body are eliminated through sweat. The heat to evaporate sweat is taken from our body. Sweating thus helps in our temperature regulation. Protecting the body by covering it and sensing touch are also the functions of skin.

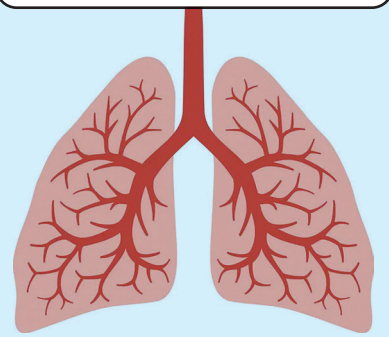
Sweat comes out from the sweat glands through the minute pores in the skin. If the sweat accumulates in the skin, it will cause diseases. Therefore, skin must be thoroughly cleansed while bathing.

Haven't you understood the importance of personal hygiene in healthcare?

Apart from kidney and skin, lungs and liver also play a role in the excretory process.

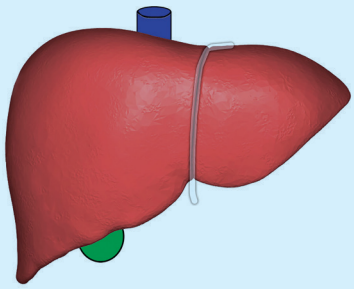
Read the notes on lungs and liver. Discuss the points given below with your friends and record them in the Science Diary.

Lungs



Lungs eliminate the carbon dioxide produced in the cells.

Liver



Liver is the largest gland in the human body. It destroys the harmful chemical substances reaching through the blood. Bile that is essential to digest fats is also synthesized in the liver. When nutrients break down ammonia which is harmful to the body, is produced. Liver converts this into urea, which is comparatively less toxic.

Discussion Points

- Which organ eliminates carbon dioxide produced in the cells?
- Name the largest gland in the human body.
- Which chemical substance is produced by the liver?
- What are the functions of the liver?

Plants are also living things. Excretion takes place in them too. We will study about different methods of plant excretion in higher classes.

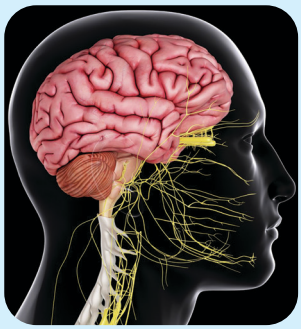
Nervous System

There are different organs in our body. Does only one organ function when we work? Imagine that a pen fell down from your hand. Which are the organs that function when we pick it up? Write them down.

All bodily activities are possible only through the coordination of various organs in the body. How is the coordination of various activities possible in our body? Don't you close your eyes instinctively if an insect flies towards your eye? How about lighting a torch into your eyes? How will we respond to such situations?

Read the note given below and find answers to the questions. Write them in the Science Diary and present in the class.

Nervous System



Nervous system helps us to respond according to the circumstances. It is composed of the brain, spinal cord and nerves. Brain is the most important organ in the body. It is protected inside the skull. Some of the major functions of the brain are: to control movements of various muscles of the body, coordinate all activities of the body and give instructions to the cells. The brain is the centre of vision, hearing, memory, intelligence, imagination and emotions. Even the most modern computers are less efficient than a human brain. A computer has the ability to work only according to the programmed software. On the other hand, the brain can react to its surroundings, learn and imagine new things. Brain is active not only when you are awake but also when you are asleep. All the body functions are controlled and coordinated by the nervous system. The use of alcohol and drugs, adversely affects the functions of the nervous system.

- What are the main functions of the brain?
- Name the bony covering that protects the brain?
- What are the main parts of the nervous system?

Adolescence and Health

You are growing day by day and are now passing through adolescence. Adolescence period is from the age of 10 to 19 years. Biologically, it is a period with many peculiarities. As a natural biological process, many physical changes occur during this period. Brain development, sudden increase in height and weight, increased efficiency of glands etc. are the characteristics of this period.

What are the physical changes that take place during this period? Discuss.

Physical Changes during Adolescence

Boys	Girls
Rapid growth	Rapid growth
Fast growth of reproductive organs	Fast growth of breast and reproductive organs
Hair develops around reproductive organs, underarms, chest and face	Hair develops around reproductive organs and underarms
Voice gets deeper	Voice becomes sweeter
Start spermatogenesis	Start ovulation and menstrual cycle

Haven't you started experiencing such physical changes of adolescence?

Menstruation

Many kinds of preparations for reproduction take place in the uterus of a woman every month. Numerous blood vessels and tissues develop in the inner layer of uterus. If pregnancy does not happen, these preparations become futile. Then the newly formed blood vessels and tissues collapse. Blood vessels and tissues shedded off from the uterine wall gets expelled from the body along with blood. This process is called menstruation. The menstrual bleeding may last for seven days. Some people may experience severe abdominal pain, vomiting, back pain and leg cramps before and during menstruation. Some people may also develop excessive anger and anxiety during this period.

Menstrual cycle is a normal physiological process that occurs in every 28 days. There may be slight variations in this. Consult a doctor if your menstrual cycle is irregular.

Menstrual Hygiene

What methods do girls adopt to manage menstrual blood?

Discuss the advantages and disadvantages of using sanitary napkins during menstrual periods.

Advantages	Disadvantages
	Difficulty in disposing

Menstrual Cup

Don't you know that menstrual cups are now available which are more convenient to use during menstruation. Discuss with health workers and learn more about the use of menstrual cups and adolescent hygiene.

What are the benefits of using a menstrual cup? Discuss and record them in the Science Diary.

Wash your hands with a soap or mild disinfectant before and after using menstrual cup, sanitary napkins or cloth. Care should be taken to change sanitary napkins or cloth after every four to five hours as part of cleanliness.

Adolescent Nutrition

What kind of food should we take during adolescence? Discuss based on the indicators given below.

- Body growth during adolescence is rapid.
- A girl loses about 0.6 litre blood during menstruation.

Considering the blood loss and rapid body growth, how should adolescents adjust their food habits? Discuss and write in the Science Diary.

Haven't you understood that our body is a storehouse of many wonders? Visit medical exhibitions to view and understand more about the internal organs we have learned about.

Sexual Exploitation

Boys and girls, including small children, are subjected to various kinds of physical, mental and sexual abuse in the society. They often become victims of abuse in their own homes, relatives' houses, vehicles, schools and other public places.

You need to be careful about the following types of people while interacting with relatives, classmates, friends and strangers.

- Those who try to touch your body parts without permission
- People who talk and look with a sexual intent
- Those who encourage you to view pornographic images and videos
- Those who show fake love and give gifts

If you face any difficulty in the above-mentioned ways, you should speak openly without fear to your parents, classmates, teachers or school counselor. You should practice saying 'NO' firmly when you recognize bad touch by someone on your body parts.

If you don't get enough support from your near and dear ones even after opening up about the harassment you or your classmates had faced, you can contact the Child Helpline number.

It is the child's right to get protection from all kinds of exploitations.

Let's Assess

1. Which among the following organs does not perform the function of excretion?

   a. Kidney
   b. Liver
   c. Heart
   d. Lungs

2. Which of the following statements is correct?

   a. Pulse rate increases while running
   b. All individuals have the same pulse rate.
   c. Pulse rate can be checked at the wrist only.
   d. Pulse rate and heart rate are different

3. What should be done to prevent urinary infections?
4. What are the physical discomforts that may occur during mensturation?
5. The most important organ in the human body is the brain. Substantiate.

Extended Activities

1. Prepare and display a chart showing measures to be taken to maintain a healthy heart.
2. Prepare posters as part of anti-drug awareness campaign, and display them in your school.
3. Prepare an interview schedule to conduct an interview with the doctor on the topic 'Adolescent Health and Eating Habits'.

8 Wonders of Sky

Kerala Celebrates Solar Eclipse!

Thiruvananthapuram: Hundreds of people flocked to Kanakakunnu Palace to observe the solar eclipse. Arrangements had been made at schools in different parts of the state to witness the solar eclipse.

Haven't you read about solar eclipse, a celestial wonder? Have you ever seen a solar or lunar eclipse?

How does an eclipse occur? Discuss.

To understand such celestial wonders, we should have an idea about shadows.

Shadow

You might have seen your own shadow. How is it formed?

Observe the picture.

- In which direction will the shadow of the tree be seen in the morning?
- In which direction will the shadow of this tree be in the evening?
- What change can you see in it at noon?

Observe the changes in the size and the direction of the shadow of the tree in the above situations. Record it in your Science Diary.

Draw the position of the Sun by looking at the shadow shown in the picture.

Will the shape of the shadow be the same at all times? Let's do a simple experiment.

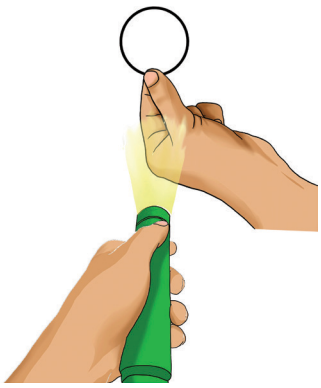


Figure - 1

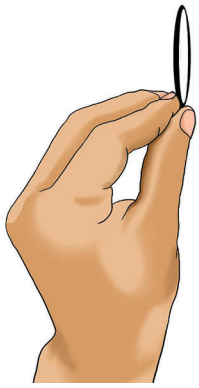


Figure - 2

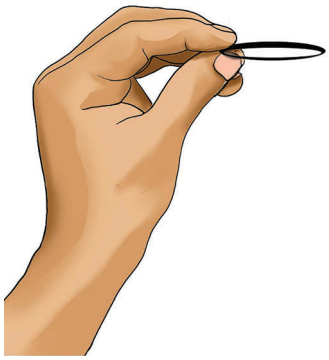


Figure - 3

Hold a bangle as shown in the figure 1. Light a torch against it. Observe the shape of the shadow formed on the wall. Hold a bangle as shown in the figures 2 and 3. Repeat the process. Are the shapes of all the three shadows the same?

Repeat the experiment using the following objects given in the Science Kit.

Materials: Pen, cricket ball, piece of glass, instrument box, plate, steel glass, football.

Hold each object against the wall in different ways and light the torch onto them. Tabulate your observations.

Object	The Shape of the Shadow
Pen	The shape changes
Football	

Analyse the table. Do all the objects cast shadows?

On which side of the source of light is the shadow formed?

Which were the objects that always formed shadow of the same shape?

Shadow and Light

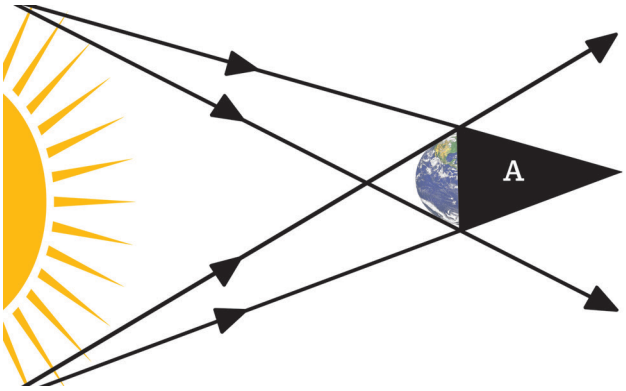
All opaque objects form shadows. Shadow forms in the direction opposite to that of the source of light. Only spherical objects always form circular shadow.

Try to get different shapes of your shadow as shown in the figure.

The Shadow of the Celestial Spheres

The Earth, the Moon and other celestial bodies are opaque objects. Do they form shadows?

We have learnt that the Sun, a source of light is very large and that the Earth is relatively small in size.



Observe the ray diagram of the sunlight reaching the Earth.

The Earth does not allow sunlight to pass through it. Hence shadow is formed on the other side. Observe the shaded part A in the figure in which the shadow of the Earth is formed.

Look at the shape of the Earth's shadow. Doesn't it look like a cone ice cream cup?

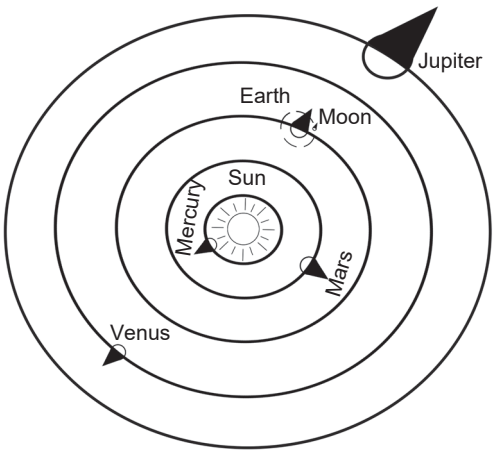
What are the facts you have understood about the Earth's shadow?

- Being an opaque object, the Earth forms its shadow.
- The shadow of the Earth is always formed in the direction opposite to the Sun.
- The Earth's shadow gradually diminishes and finally disappears as it moves away.

You have now understood the shape of the shadow of the Earth. Guess whether it will be day or night where the Earth's shadow is formed. Write it down.

Discuss with the teacher and check whether your guess is correct.

Observe the picture.



Are all celestial bodies of the same size? The size of the shadows varies with the change in the size of the celestial bodies.

Doesn't the moon also cast a shadow like this?

In a celestial sphere, it is day where the light falls and night where the shadow is formed.

Moon in Earth's Shadow

We know that the Moon is a sphere that revolves round the Earth. Among the following, which is the probable position of the Moon in the shadow of the Earth?

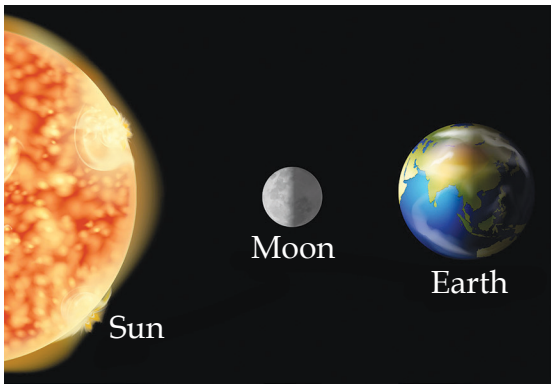


Figure - A
The Moon comes in between the Sun and the Earth

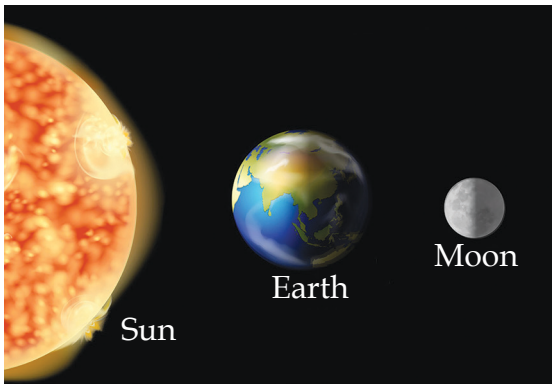
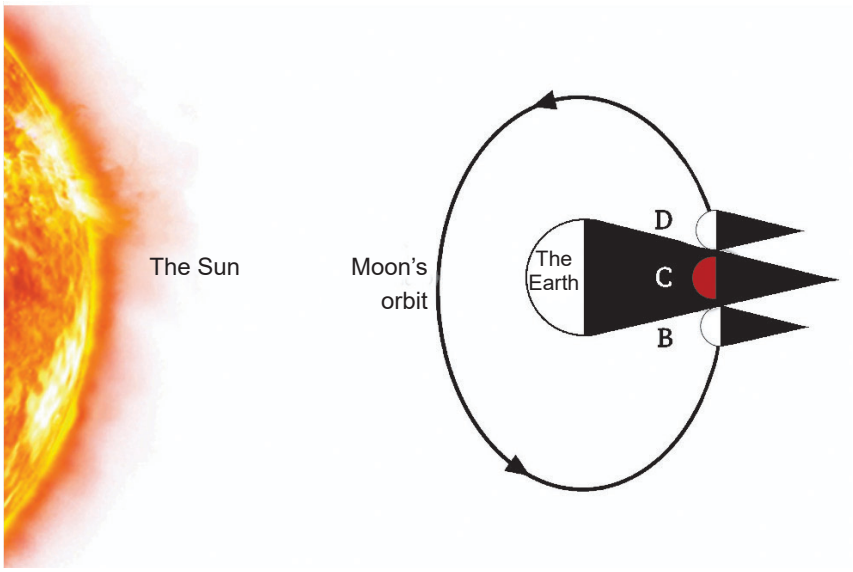


Figure - B
The Earth comes in between the Sun and the Moon

Discuss and record your answer in the Science Diary.

The figure below shows the celestial spheres the Sun and the Earth and the Moon's orbit. B, C and D are the various positions in the path through which the Moon revolves round the Earth.



At which of these positions does the Moon enter the Earth's shadow? B

At what position does the Moon enter completely in the Earth's shadow? _____

At which point does the Moon come out of the Earth's shadow? _____

In the above picture, the part of the Moon where sunlight falls is facing the Earth. On this day, the Moon can be seen from the Earth. But when you reach position C, you cannot see the Moon. Why? Isn't it because the Moon comes in the shadow of the Earth?

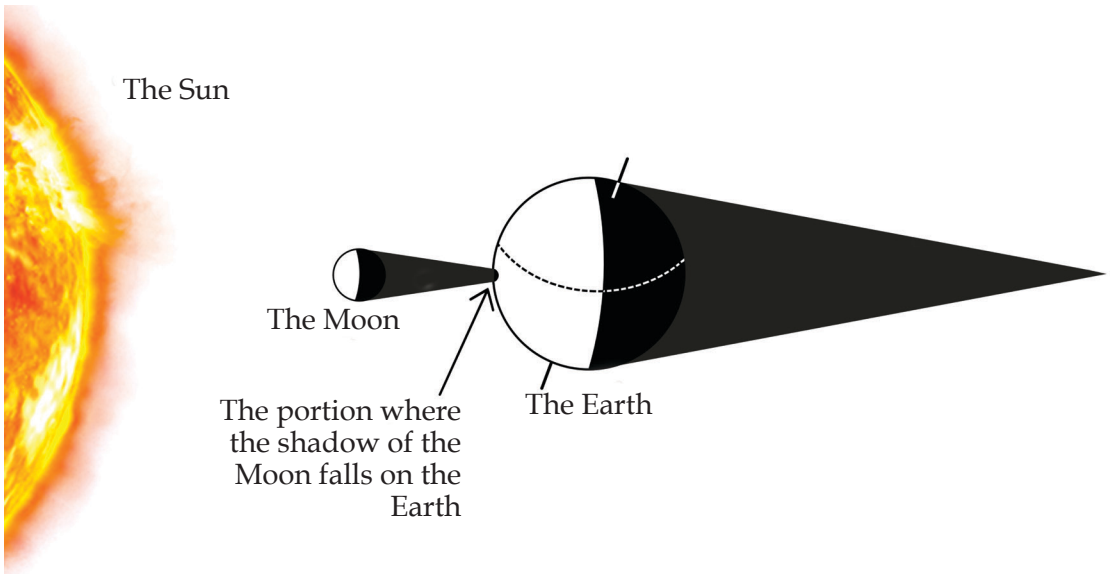
Lunar Eclipse

As the Moon revolves round the Earth, the Earth sometimes comes between the Sun and the Moon in a straight line. At this time the Moon will be in the shadow of the Earth. This is the lunar eclipse.

Lunar eclipse is one of the most beautiful phenomena visible in the sky. During a total eclipse, the Moon appears dim in orangish red colour. Remember to observe the upcoming lunar eclipse without fail.

Earth and Moon's Shadow

What happens when the Moon comes in a straight line between the Sun and the Earth? The Moon is a smaller sphere than the Earth. Can the shadow of the Moon completely cover the Earth? Observe the picture and record your inference in the Science Diary.



Now you might have understood that the Moon's shadow does not completely cover the Earth. Can those people, on the side in which the Moon's shadow falls on the Earth see the Sun at that time? The Sun cannot be seen at that time because the Moon is covering the Sun. This is solar eclipse. Does this phenomenon occur during the day or at night? Analyse the figure, arrive at an inference and discuss in the class.

Solar Eclipse

When the Moon revolves round the Earth, the Moon rarely comes in between the Earth and the Sun in a straight line. At this time the Moon's shadow falls on the Earth. People in the area where the Moon's shadow falls cannot see the Sun because the Moon covers the Sun. This is solar eclipse. A solar eclipse is visible only to those in the lunar shadow.

Look at the pictures of different solar eclipses.

Total solar eclipse

Annular solar eclipse

Partial solar eclipse

We can observe total solar eclipse, annular solar eclipse and partial solar eclipse. Analyse the above pictures. Discuss their characteristics and record them in the Science Diary.

Observing a Solar Eclipse

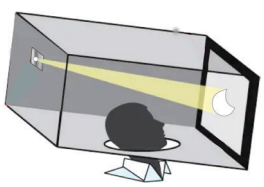
You might have noticed the news related to the solar eclipse in newspapers. Places suitable for observing solar eclipse and the precautions to be taken usually appear in the news.

How can we observe a solar eclipse safely? Read the following note and write down your findings in Science Diary.

Methods of Observation

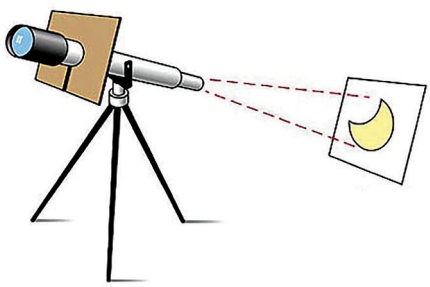
Lunar eclipse can be observed directly. But observing the solar eclipse directly is harmful to the eyes. Hence the solar eclipse must be observed only by using filters and reflecting the Sun's rays in different ways. Eclipses can be observed using quality filters in telescopes and binoculars. Decorative glitter papers and unsafe X-ray films should not be used for observing solar eclipse.

Solar filter spects



Pinhole projector

Solar filter used in the telescope



Method of projection using telescope

For further reading

Predicting an Eclipse

There are many softwares and apps available to predict the eclipse. With such apps or softwares we can find out in advance when the eclipse will be most beautiful. These can also be used to watch the scenes of past eclipses again and again.

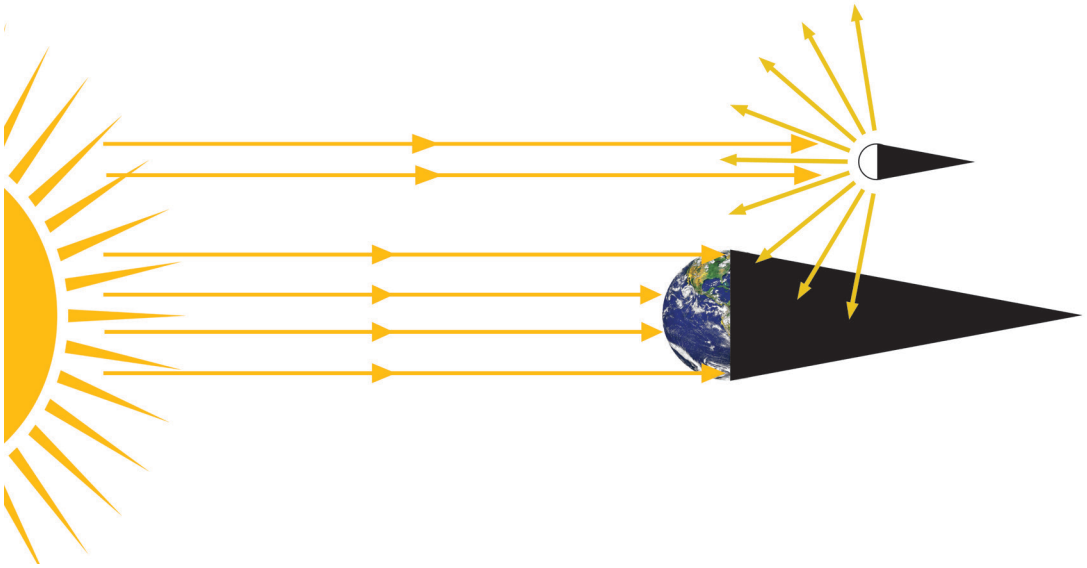
Meaning of the Moonlight

Haven't you seen a beautiful glowing Moon in the sky at night?

How is it possible for the Moon to shine so brightly, when it can't shine by itself? Observe the image. What would be the reason for the brightness of the moon?

In the picture given below, can't you see the sunlight falling simultaneously on the Earth and the Moon?

Since these are opaque objects, won't the light be reflected?



The image shows the light falling on the Moon reach the Earth after reflection.

Moonlight is sunlight reflected from the Moon. The surface of the Moon is rough. If so, is it due to regular or irregular reflection? Discuss and write it down in your Science Diary.

Moonlight

The sunlight falling on the Moon's surface gets scattered and reaches the Earth. This is the moonlight that we see at night.

At night you have experienced bright as well as dim moonlight. Let's try to find out the reason for this.

Phases of the Moon

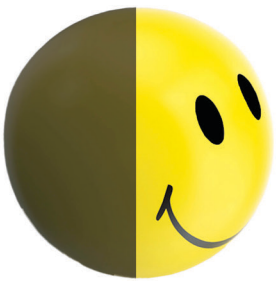
We see the Sun in the same shape every day. But what about the Moon?

Observe the shape of the Moon on different days and draw them in the Science Diary.

Why is the spherical Moon seen in different shapes on different days? Let's do an activity.

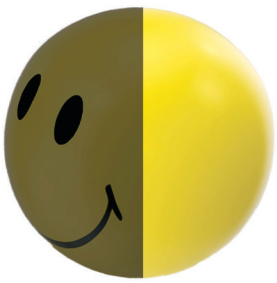
Materials needed: Three smiley balls, black paint

Examine the pictures and notes in the boxes given below. Paint half of each smiley ball with black paint as suggested in the notes in the boxes.



Paint the other side of the smiley face completely.

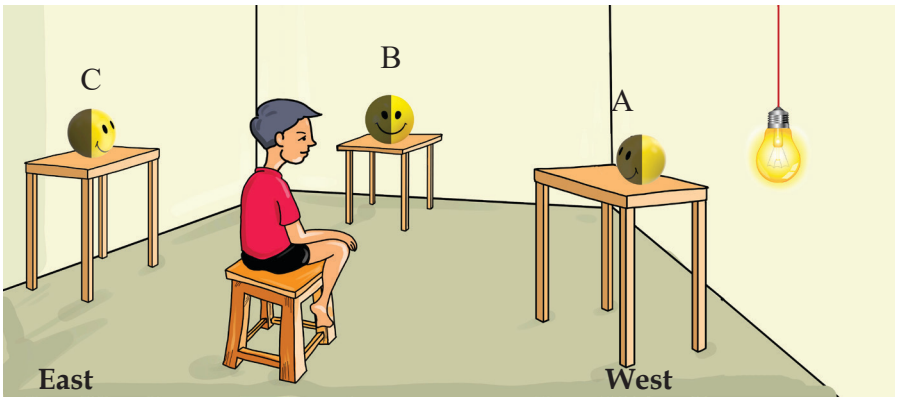
Paint, covering half of the smiley face.



Paint, covering the entire smiley face

The black painted part represents the shadow side of the Moon. The unpainted part represents that part of the Moon where light falls.

Place the balls in the class in east-west direction as shown in the picture below. The unpainted part of the smiley ball should face the light and the black painted part should face the side opposite of light. Imagine the smiley ball as the Moon and the bulb as the Sun. A,B and C are the positions when the Moon revolves around the Earth.



The child should sit in the middle of balls A and C and observe.

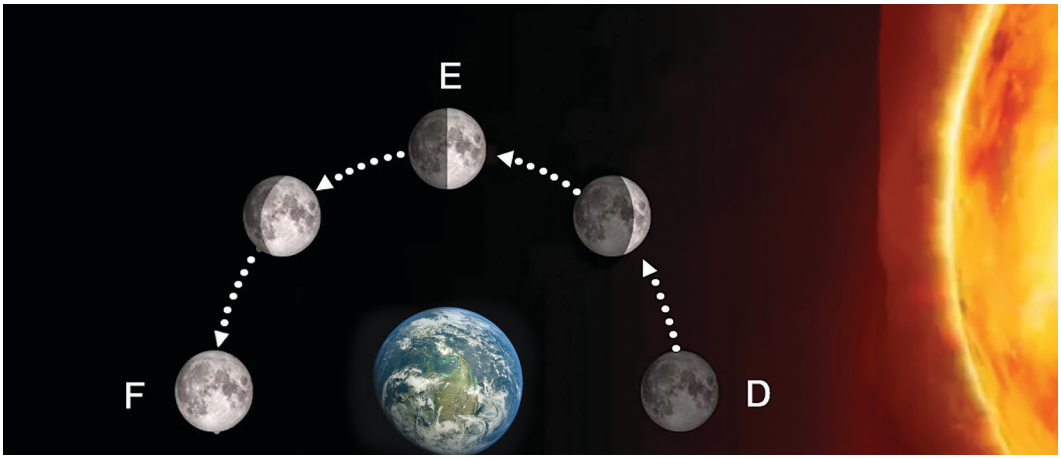
As per the picture, how will the child be viewing all the three balls?

On which ball can the child see the shadow portion completely? ( )

Ball placed at which position enables the child to view half illuminated and half shadow portions? ( )

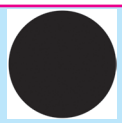
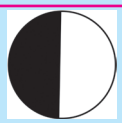
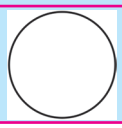
On which ball can the child see the illuminated portion completely? ( )

Given below are the positions and shapes in which a child observed the Moon in the sky after sunset on different days. Analyse the given picture based on the activity you have done.



Doesn't the illuminated part of the Moon viewed from the Earth show a difference at each position?

Examine the table given below and record your inferences in your Science Diary.

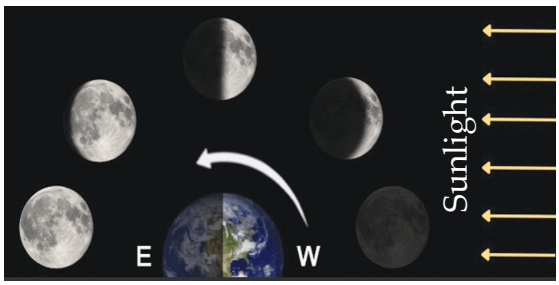
When the Moon reaches the position D	The shadow side of the Moon completely faces the Earth	
When the Moon reaches the position E	Half the illuminated and half the shadow sides face the Earth.	
When the Moon reaches the position F	The illuminated side completely faces the Earth.	

New Moon and Full Moon

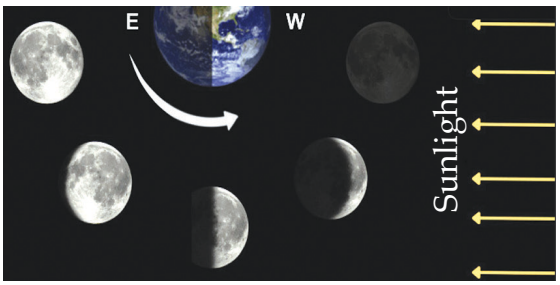
New Moon occurs when the shadow side of the Moon completely faces the Earth. We cannot see the Moon on this day. Full Moon occurs when the illuminated part of the Moon completely faces the Earth. Half Moon is seen when the half illuminated and half shadow portions of the Moon face the Earth.

Waxing and Waning

Observe the pictures given below. The two pictures A and B represent the revolution of the Moon from New Moon to Full Moon and vice versa. Are both the pictures alike? What differences can you observe in these pictures?



Picture - A



Picture - B

Which picture shows the illuminated portion of the Moon getting increased, when viewed from the Earth? ( )

Which picture shows the illuminated portion of the Moon getting decreased, when viewed from the Earth? ( )

Waxing and Waning

When viewed from the Earth, the illuminated part of the Moon keeps on increasing from the New Moon to Full Moon. This period is known as the waxing or white halo.

When viewed from the Earth, the illuminated part of the Moon keeps on decreasing from the Full Moon to New Moon. This period is known as the waning or black halo.

Waxing and waning (Vridhikshayam) is the difference in viewing the illuminated and shadow portions of the Moon as it revolves around the Earth.

For further reading

India's Wonder that Landed on the Moon

India's pride Chandrayaan-3 is the first probe to land near the South Pole of the Moon. Launched on 14 July 2023, Chandrayaan-3 landed safely near the South Pole of the Moon on 23 August 2023. India is the fourth country to have made a soft landing on the Moon. ISRO is moving ahead with Chandrayaan missions to bring rocks and soil from the Moon to the Earth in the future. Gaganyaan, a human space probe and Mangalyan-2, a Mars rover are some of the future missions of ISRO. Get information about India's space missions from the official website - isro.gov.in of ISRO.

How will you find out the New Moon day and Full Moon day from a calendar? Which are the symbols used in the calendar to indicate these days?

The symbol ● and the symbol ○ are used in a calendar to represent New Moon and Full Moon respectively. Observe the given calendar. Don't you see these symbols in the calendar? By looking at the calendar, can you find out how many days it takes for the Moon to reach the New Moon from Full Moon.

The date of Full Moon in the calendar	May 5
The date of New Moon in the calendar	
Number of days taken to reach New Moon from Full Moon	

Examine the next month's calendar also . Find out how many days are needed for the Moon to reach the next New Moon from the Full Moon?

The date of Full Moon	
Date of New Moon in the calendar	
The number of days between two consecutive New Moons by checking both the calendars.	

Didn't it take 30 days for one New Moon to reach the next?

The Moon takes 27 $\frac{1}{3}$ days to revolve round the Earth once. What is the reason for this difference? Discuss.

From New Moon to New Moon

The Earth needs 365 $\frac{1}{4}$ days to revolve around the Sun once. By the time the Moon revolves around the Earth once, the Earth would have travelled some distance in its orbit with the Moon around the Sun. Thus a change occurs to the position of the Earth. Hence the Moon will have to travel some more distance in the same path to repeatedly see the phases of the Moon. It takes more than two days for this. That is why it takes 29 $\frac{1}{2}$ days from one New Moon to the next New Moon.

Check the following months in the calendar also. Aren't your findings right?

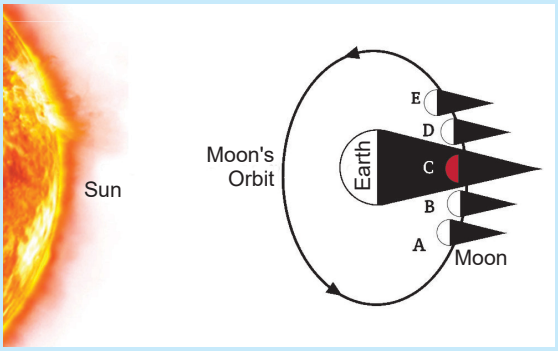
Let's Observe

We have searched the reasons for the beautiful sights of the sky. Find out the New Moon and Full Moon days in this month's calendar and observe the Moon every day after the sunset from New Moon to Full Moon. Share your findings with your friends.

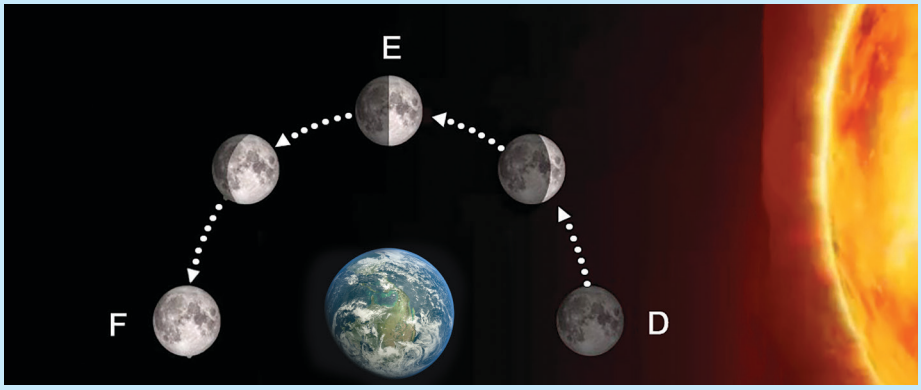
Let's Assess

1. Observe the picture. Check the orbital path of the Moon around the Earth and complete the table below:

The starting position of the lunar eclipse	
The position of complete lunar eclipse	
The position where the lunar eclipse ends	



2. Observe the picture and complete the table by matching the boxes appropriately.



When the Moon reaches the position D	Half Moon
When the Moon reaches the position E	Full Moon
When the Moon reaches the position F	New Moon

3. Some statements are given below. Tick (✓) the correct ones.
   - A Full Moon is the day when the part of the Moon on which the sunlight falls, is completely visible from the Earth.
   - The waxing crescent Moon is visible overhead at sunset.
   - The period of revolution of the Moon and the period during waxing will be visible are the same.
   - Solar eclipse occurs only on New Moon day.
   - Lunar eclipse occurs only on Full Moon day.
   - Lunar eclipse occurs on all Full Moon days.

Extended Activities

1. Let's do an activity to find out how Solar Eclipse occurs.

   Preparation

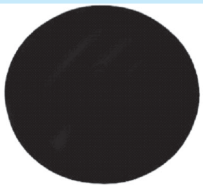
   Place a football on a table.

   Let a child stand facing the table at a distance of one and a half meters.

   Let the child hold a small ball fixed on a stick as shown in the picture.

   Close one eye and hold the small ball closely in front of the other eye and look at the football on the table.

   - Is the football the only thing to disappear from the view?
   - Slowly move the small ball forward away from the eye. What change occurs in viewing the ball?
   - How far should the small ball be held from the eye for the football to be completely hidden?
   - If the small ball is further moved away from the eye, what change can be observed in the hidden football?
   - How should you hold the small ball to hide the football partially?



When football is hidden completely

When the small ball is held slightly away from the eye

When the small ball partially covers the football.

Compare the observations you had during the above experiment with the different pictures of solar eclipse given below.

2. What are India's achievements in Space Science? Collect information and prepare an article. Conduct a seminar exploring the ICT possibilities.

9 Hurt not the Environment

How beautiful our Kerala is! We have countless scenic beauty around us. At the same time we can also see some painful sights caused by unscientific human interventions. Such pictures are given below. Observe them.

What sights do you see?

- Organisms that suffocate due to fumes released while burning solid waste including plastic.
- Stagnant water bodies due to the dumping of solid waste.

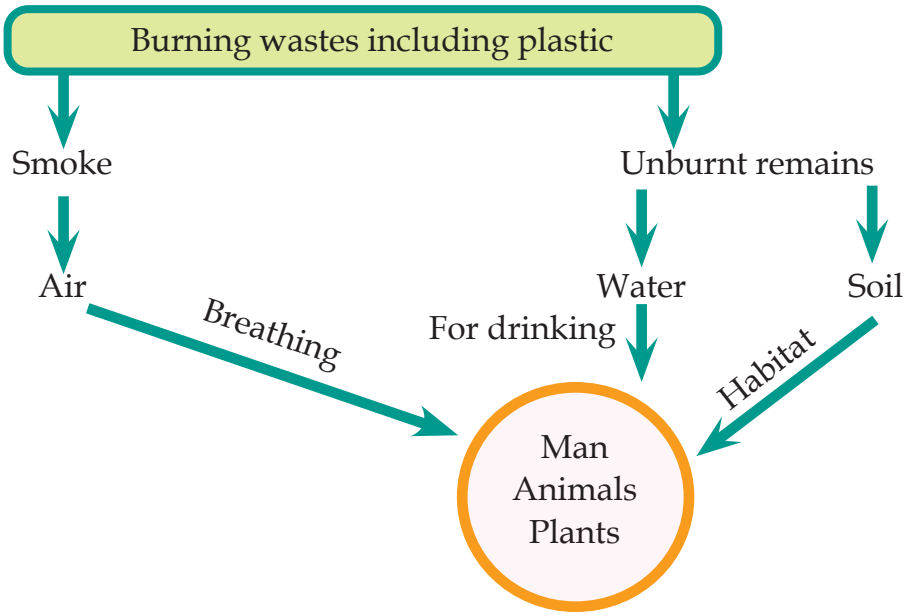
Have you seen such sights? List such situations you have observed and the problems caused by them.

Situations	Problems
Plastic being burnt	Air gets polluted due to smoke

You might have recognised some of the problems caused by pollution. Let's explore more about pollution.

Burning of Garbage and Air Pollution

Which are the substances produced when solid waste, including plastic, are burnt? Won't there be unburnt remains while burning plastic and other materials? What will happen to these unburnt remains when it rains? What are the consequences of such situations? Analyse the illustration given below and write your findings in the Science Diary.



Now you are convinced that the smoke and unburnt remains generated by burning wastes, including plastic, have an adverse impact on air, soil, water and living organisms. What chemical substances are present in the smoke produced when plastic is burnt? How do they affect our health? Analyse the table given below and find it out.

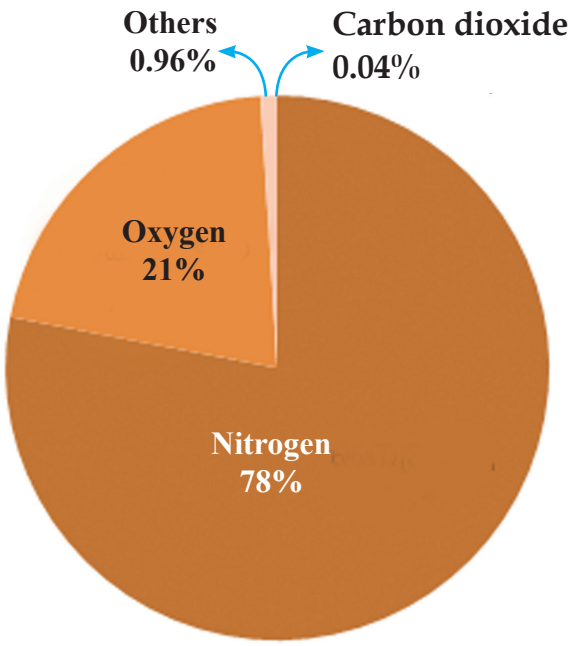
Chemical substances produced when wastes including plastic are burnt	Health issues affecting humans
Carbon monoxide	Even when a small amount reaches the body problems like headache, fatigue, blurred vision and memory loss occurs. Inhalation of large quantity of carbon monoxide leads to death.
Sulphur dioxide	Causes cardiovascular and respiratory diseases.
Nitrogen dioxide	Causes respiratory diseases.
Particulate matter	Inhalation causes itching in throat and eyes, allergy, asthma and lung cancer.
Dioxins	Increase the risk of cancer, cause thyroid related problems and respiratory diseases.

Which are the chemical substances released while burning waste materials including plastic? What are the health issues caused as a result of this? Write them in the Science Diary.

Does air pollution cause changes in the components of air?

Components of Air

Which are the elements found naturally in air? Observe the given pie diagram and tabulate their quantities.



- What are the components present in atmospheric air?
- Which is the most abundant component?
- What is the quantity of oxygen in air?

Analyse the pie diagram, complete the table and record the quantity of each component.

Components of Air	Quantity
Nitrogen	78%

When the atmospheric air is mixed with chemical substances, the quantity of natural constituents in the air changes.

Air Pollution

Air pollution is caused by the mixing of smoke, toxic gases and other chemical substances in the atmospheric air. Wildfires and natural phenomena like volcanic eruptions and earthquakes also contribute to air pollution. Indiscriminate actions of human beings are the main cause of air pollution.

We have discussed the pollution caused by the burning of materials. What are the other ways by which air pollution is caused?

Cooking Fuels and Air Pollution

Which types of stoves are used for cooking?

Observe the pictures of stoves given below. Identify the fuel used in each?

Firewood stove

Kerosene stove

Gas stove

Stove	Fuel Used
Firewood stove	
Kerosene stove	
Gas stove	

When fuels like wood, kerosene and cooking gas are burnt, various chemical substances are released.

The chemical substances released are mainly carbon dioxide, carbon monoxide, nitrogen dioxide, particulate matter etc. You have already understood the major health problems caused by excessive inhalation of these gases.

What measures should be taken to control air pollution in the kitchen due to the burning of cooking fuels? Discuss with friends and write in the Science Diary.

- Construction of chimneys
- Proper ventilation
-

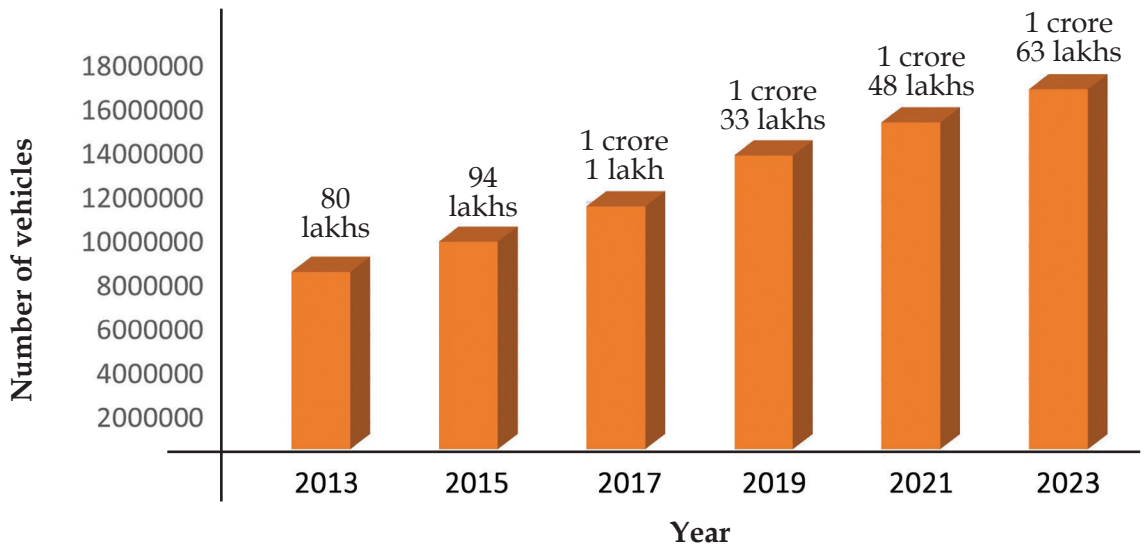
As in the kitchen, don't we use different types of fuels in our vehicles? Which are the fuels commonly used in vehicles? Write them in the Science Diary.

Automobiles and Air Pollution

When automobile engines are operated using fuels like petrol and diesel, sulphur dioxide, nitrogen dioxide, carbon monoxide and particulate matters are released. Mixing of these with atmospheric air also causes air pollution.

Vehicle Inflation in Kerala

The change in the number of automobiles in Kerala since 2013 is shown in the bar diagram below.



- What was the approximate number of vehicles in 2013?
- What was the number of vehicles in 2023?
- What is the change in the number of vehicles from 2013 to 2023?

Discuss with your friends and write in the Science Diary.

How does the increase in petrol/diesel vehicles affect the air? Haven't you seen instances where only one person is travelling in one vehicle which can accommodate more passengers? Shouldn't this be avoided as much as possible? Use of public vehicles must be encouraged over private vehicles. How does the use of vehicles like bicycles benefit the environment? Present your findings in the class.

Smoke Testing

Look at the picture given below. Haven't you seen smoke testing of vehicles being done at Pollution Testing Centres?

Smoke testing is carried out to find out whether the smoke of vehicles contains more than the permissible amount of harmful chemical substances. By smoke testing, it can be detected whether vehicle emissions contain more harmful chemical substances due to engine failure, age of vehicles and impurities in fuel.

How does smoke testing help to reduce air pollution? Discuss in your class. Visit a Vehicle Pollution Testing Centre and find out the activities going on there.

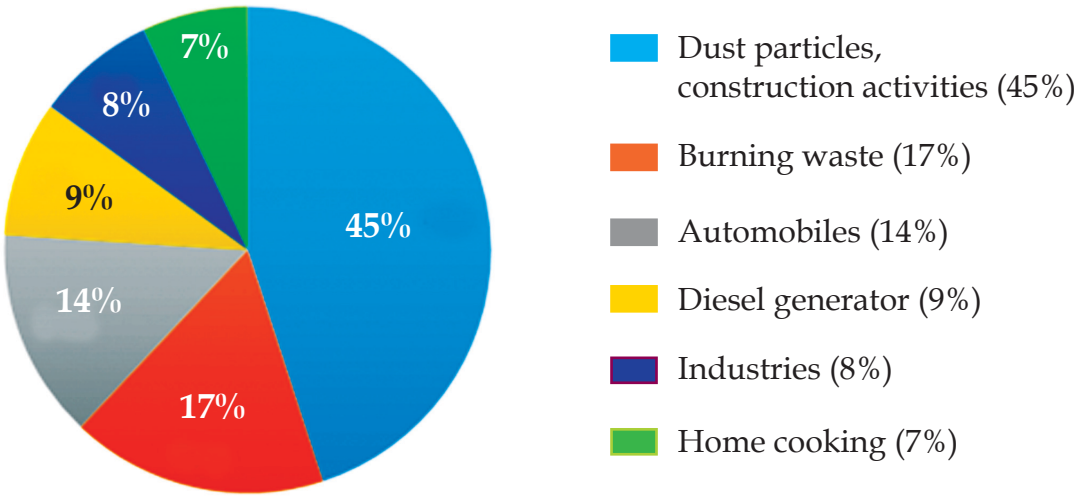
Electric Vehicles

Have you seen vehicles having green name plates with EV printed on them? They do not emit carbon or smoke like petrol/diesel vehicles. Electric vehicles are a solution for air pollution caused by vehicles.

What are your comments on the use of vehicles regarding air pollution control? Write them in your Science Diary and present them in the class.

So far, we have discussed air pollution caused by burning fuels and other substances. Apart from this, what are the other ways by which air gets polluted?

Analyse the Pie diagram given below and find out how air pollution occurs in our country.



How does air pollution occur? Based on the Pie diagram, prepare a note on your findings and present it in the class.

You have understood the various ways in which air gets polluted and its consequences.

Conduct a seminar in your class on air pollution, its causes and remedies.

Similarly, is water subjected to any kind of pollution?

Water on the Earth

You know that two third of the Earth is water. Observe the pictures given below.

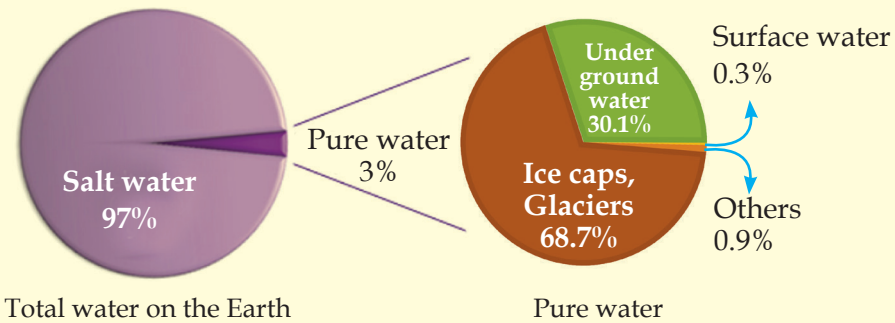
What are the different forms of water found on the Earth?

- Ice caps, glaciers etc.
- Water vapour
-

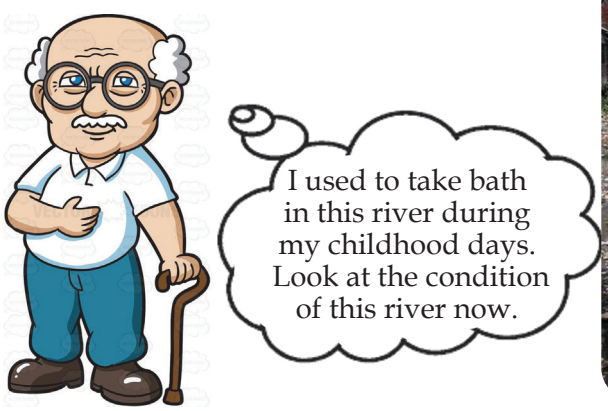
For further reading

Water, Water, Everywhere...

Ocean water constitutes 97% of the Earth's water. Only 3% is freshwater (water without salt). About 69% of freshwater is found as ice caps and glaciers. We cannot use this also. 30% is groundwater. All water bodies including rivers, lakes and ponds contain only 0.3% of fresh water.



River - Then and Now



How do water bodies get polluted?

- Disposal of plastic wastes
- Spillage of chemical substances
-

Given below is the picture of a water body polluted by algae.

What is the reason for this condition of the water body? Read the note given below and record it in the Science Diary.

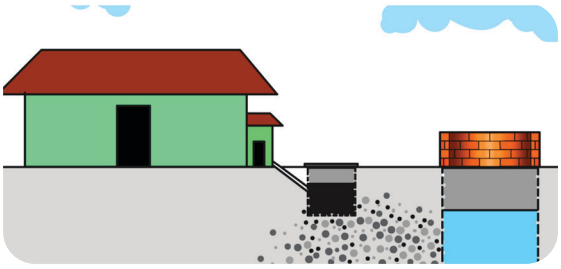
Eutrophication

Excess growth of water plants like algae in water bodies is caused by a phenomenon known as eutrophication. This happens in water bodies where fertilisers containing nitrogen and other similar substances flow in. It is such flowing excess nutrients that cause excessive growth of aquatic plants. These aquatic plants use oxygen dissolved in water excessively. Due to this, other plants and animals in water die without getting oxygen and the ecosystem that existed in the water body gets disturbed.

Now it is understood that water pollution is a reason for the destruction of ecosystem.

By analysing the pictures given below and observing your surroundings, find out the situations that cause water pollution and write them in the Science Diary.



- Excessive use of chemical pesticides
- Discharge of waste water into drainages
- Dumping of slaughterhouse waste in land and water bodies
- Discharge of waste from industries into water bodies
-

You have listed the situations related to water pollution. Discuss its consequences and write them in your Science Diary.

It is our duty to protect water sources from all types of pollution. What measures can we adopt to make water sources free from pollution? Discuss.

Drinking water sources are the most important among water sources. Which are the sources of drinking water in your school?

Which are the qualities drinking water should have?

In the following statements, put a tick (✓)mark against the qualities that drinking water should possess.

- Clear water ☐
- Colourless and odourless ☐
- Free from germs ☐
- Absence of hazardous chemical substances ☐
- Presence of adequate mineral salts ☐
- Salty taste ☐
- Neither acidic nor basic ☐

You have identified the qualities that drinking water should possess. Does the water you use in your house and school have these qualities? You can test certain qualities of drinking water even in your classroom.

Testing Drinking Water

Collect samples of drinking water and test the following characteristics:

- Colour
- Odour
- Acidic/basic nature
- Presence of insoluble impurities

What materials are required for doing the experiment?

- Hand lens
- Filter paper
- Universal indicator
-

How can we observe the colour and odour of water?

What characteristics of water can be identified using filter paper and hand lens?

Can't you find out whether water is acidic or basic, using universal indicator?

Check the samples of drinking water you have collected. Collect data and tabulate. Analyse the data and record the results in your Science Diary. Present them before the class.

Shouldn't the drinking water be purified if it is contaminated with impurities?

Let's familiarise with certain methods of water purification.

Purification of Drinking Water

What methods do you know to purify drinking water if it is contaminated with impurities? List them out.

- Sifting
-

Some methods to purify drinking water are given below:

Analyse them, find out the merits and demerits and present them before the class.

Boiling	Boiling for at least one minute will kill the microorganisms in the water. But the dissolved components in the water will remain.
Sifting	Undissolved impurities in water are separated by filters. But microbial and dissolved components are not removed.
Sedimentation	The undissolved impurities are allowed to settle down. The water that appears on top can be separated and used. Microbes and dissolved components cannot be completely removed by this method.
Chlorination	Adding sufficient quantity of bleaching powder will kill the microorganisms in water. But the components dissolved in the water cannot be removed.
Distillation	It is the method of boiling water into steam and cooling it to collect pure water. There will be no dissolved components in the water collected in this way.

Enquire other ways to purify drinking water. Record them in Science Diary.

Which of the above methods are used in your home and school? Write them in the Science Diary.

Pollution in Soil Too

Observe the headlines and the picture of the news given below.

Dumping of garbage : Give information, you will get ₹ 2500.

What are the things mentioned in this news? How do such habits of some people in our society affect the environment? Write your findings in the Science Diary and present them before the class.

Household Waste

List out the different kinds of waste formed in a household?

- Fruit peel
- Vegetable waste
- Plastic covers
-

You know that if a fruit peel is left in the soil for a long time, it may get dissolved into the soil as a result of the action of soil microbes. Biodegradable wastes are such wastes that decompose and get dissolved in the soil due to the action of microbes. Instead, if it is a piece of plastic, will it degrade into the soil like the fruit peel? Microorganisms in soil cannot breakdown plastic waste, glass pieces, metals, electronic waste, thermocol and the like. Such substances are non-biodegradable wastes.

Classify wastes into biodegradable and non-biodegradable.

Biodegradable	Non Biodegradable
◆ Banana peel	◆ Plastic covers
◆	◆
◆	◆
	◆

Out of these, which type of wastes cause soil pollution? Discuss.

Nonbiodegradable wastes such as plastic products, pesticides and chemical substances pollute the soil. Metals like Mercury and Cadmium present in CF lamps, computers and electronic products also cause soil pollution.

Separating Household Wastes

Certain household wastes are mentioned below:

Bulbs, food wastes, CF lamps, paper, paper cups, footwear, bags, clothes, pesticide containers, paint containers, plastic bags, vegetable wastes, cardboard packing materials, plastic cups, mobile phone battery, plastic bottles, glass bottles, empty toothpaste tube, fish and meat waste.

Classify and tabulate them in such a way that they can be deposited in the appropriate bins shown in the figure.

Haven't you properly sorted out the garbage? Do you practice this method at home and school? What is the advantage of sorting waste at its origin itself?

What should we do after sorting those garbage? Let's discuss.

Scientific Methods of Waste Management

The most appropriate method is to dispose the waste at the source itself. This is known as waste management at source. Its first step is to segregate the waste at the source itself. Some of the waste you have sorted out can be used to make organic manure. Which are they?

Organic waste can be broken down into simpler chemical compounds with the help of microorganisms. They decompose to form nitrate, phosphate and sulphate which are helpful for plant growth. Hence, they can be used as fertilisers. Bio waste can become organic manure only if it is treated in proper way. There are three main methods of biowaste management at household levels.

- Vermi composting
- Air contact composting
- Production of biogas

Earthworm compost

Vermicompost is a fertiliser produced using earthworms. This is also a method of waste management. Plastic containers, large pots and cement tanks are used for vermicomposting. Earthworm takes in organic matter and their excreta turns into manure.

Manure produced by vermi composting is superior to other manure.

Air Contact Composting

Observe the picture. Are you familiar with this system?

A biocomposter bin consists of specially designed containers for waste management. They are arranged in tiers as shown in the figure. The process taking place in it is air contact composting. Find out how it works.

Biocomposter bin

Biogas Production

Biogas Plant

A biogas plant is a system that converts waste into fuel in the absence of oxygen. In this method, along with waste management, cooking gas is also obtained as a product. Visit a biogas plant and learn about its working. Write it in the Science Diary.

We can manage biodegradable waste generated at home and school using the above methods. Collect more details about each method.

Any one of these methods can be adopted to manage biodegradable waste in your home.

Paper and paper products can be recycled. But can all nonbiodegradable waste be disposed in the same way? Plastic products that are very thin cannot be recycled. What would be the reason for banning the production and distribution of very thin plastic covers? What measures can be taken to reduce nonbiodegradable waste?

Haven't you heard of 3 R's? What does it indicate?

- Reduce
- Reuse
- Recycle

It is a strategy adopted worldwide to reduce the amount of nonbiodegradable waste. It has to become a part of our life and culture.

R- Reduce (minimised use)	R- Reuse (Reusable) (Only those with standard grades)	R- Recycle (Recyclable)
Plastic cups	Plastic bags	Metal products
Plastic, thermocol plates	Plastic jars	Plastic products
Mineral water bottle	Plastic utensils	◆
◆	◆	◆

Haritha Karma Sena

In our state, Haritha Karma Sena is playing a major role in transporting nonbiodegradable waste to the treatment centers. Enquire more about the activities of Haritha Karma Sena and write them in the Science Diary. Local Self Governments are implementing various activities to avoid environmental pollution. Collect information about such activities, prepare a report and present it before the class.

Pollution Problems in My Locality (Investigatory Project)

We have understood the various situations in which air, water and soil are polluted and their consequences. Conduct a study to find whether such conditions exist in your locality for air, water and soil.

Write your hypotheses regarding this topic in your Science Diary.

What observations are needed for conducting the study? What information are to be collected?

Analyse the data and prepare a project report including your findings and recommendations. Present it before the class and invited guests and discuss.

Waste Free Green School

Discuss in class, the steps you can take to make your school a waste free green school.

Objectives	Actions to be taken
Garbage disposal of noon-meal	
Paper waste disposal	
Plastic waste disposal	
Constructing Biodiversity Park	

Carry out the activities you have planned with the help of everyone in the school. Achieve the goal of a Zero Waste Green School through it.

It is the duty of every human being to protect water, soil and air from being polluted.

Let's Assess

1. Observe the diagrams given below. Find out how the air is gets polluted in each situation and complete the table.





Situation	Ways of air pollution	Consequences
• • • •		

2. Prepare posters calling for the prevention of environmental pollution.
3. Identify the correct statements regarding plastic waste management from those given below:
   a) Thin plastic products should be burnt.
   b) Plastic products should be recycled as much as possible.
   c) Plastic products should be reused as much as possible.
   d) Use of plastic products should be minimised.

4. Which method of purification can be adopted to separate freshwater from seawater?

   a) Sifting

   b) Chlorination

   c) Distillation

   d) Sedimentation

Extended Activities

1. Take moist soil in a pot. Bury a fruit peel and a plastic wrap in the potting soil simulataneously. Observe them after two weeks. Prepare a note based on your findings.
2. Prepare a speech on 'Vehicles and Air Pollution.'
3. Prepare a short note based on an activity carried out at your home on a project implemented by the Local Self Government for waste management. Present it before the class.
4. Create and display a logo in connection with making your school a Zero Waste Green School.

10 Safe Food

Observe the picture. What a variety of food items we have!

You might have tasted most of them.

List out the food items you usually eat in the Science Diary. Read out the items each of you have listed. Isn't it a long list?

What may be the reason for such a diversity in food items?

Humans always have paid special importance to food. We also experiment with food items and make changes.

Do you think that all the food items you have listed are healthy for us?

Is it healthy to eat certain food items regularly?

Poor quality food items adversely affect our health.

Why Food?

Why do we eat food? Discuss and note your opinions in the Science Diary.

- For healthy growth
- For energy to work

Where Do We Get Food From?

How many times a day do you eat? Which are the dishes you generally include in your diet? From where do you get the ingredients for these dishes? The following table gives a child's lunch, the ingredients used to prepare the dishes and their sources. Analyse it.

Lunch	Ingredients used	Sources of the Ingredients
1. Boiled rice	Rice	From the shop
2. Fish curry	Fish, shallots, tomato, tamarind, garlic. Chilli powder, turmeric powder, salt. Green chilli, coconut oil, curry leaves. Water.	From the market From the shop From home From the well
3. Thoran	Pea, coconut, coconut oil, mustard, chilli. Turmeric powder, salt. Water.	From home From the shop From the well
4. Mango pickle	Mango, chilli powder, asafoetida, salt, oil, fenugreek powder, mustard and turmeric powder.	From the shop

- From where do we procure the ingredients required for cooking the dish? Out of these items, which were bought from a shop?

List your menu for one meal in the table given below.

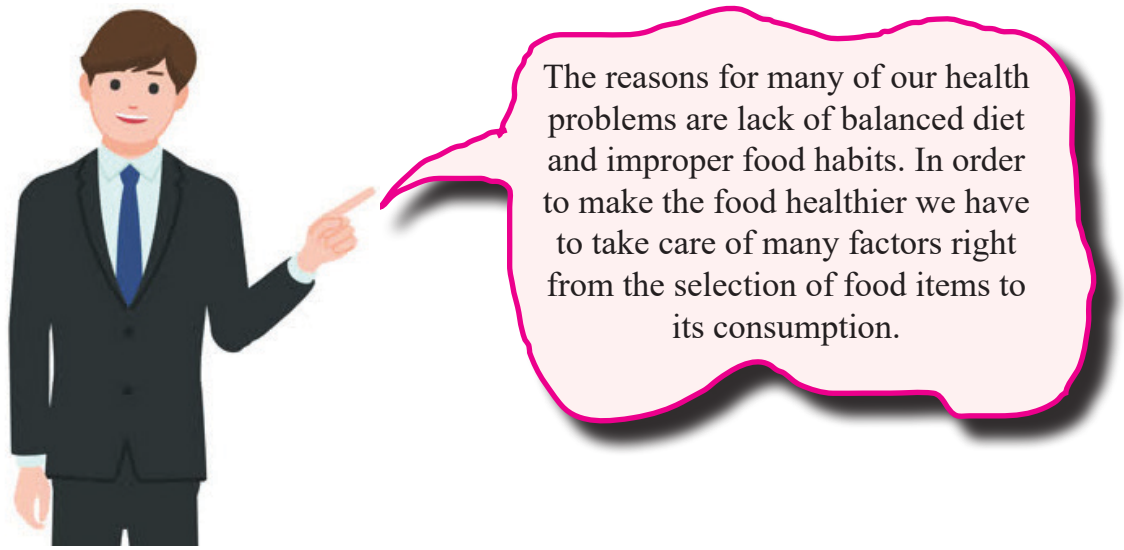
Food	Ingredients used	Sources of the Ingredients used

Various ingredients are used for cooking different food items. These items are procured from different places. You have realised this when you analysed the table.

The food we eat must be nutritious and safe. Hence, care must be taken to ensure the quality of both the ingredients used for preparing the dishes and the method of preparation.

Safe Food

Listen to the dietician.



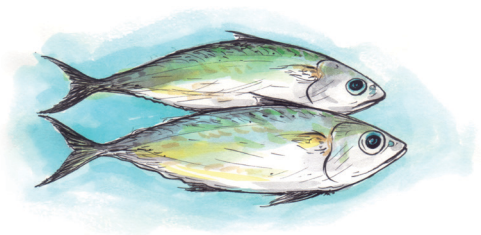
What are the factors to be considered from the selection of food items to its consumption to get safe food? Write them down.

- Selection of food items
- .....
- .....
- .....
- .....
- Consumption of food

While Selecting Food Items

We buy cooked food items and ingredients for cooking food items from shops, hotels and markets. Do you ensure their quality while you select each of them? Let's take one example.

While Choosing Fish



Fresh fish

Rotten fish

To choose	To avoid
When the finger pressed over the fish is released, the depressed part on the flesh restores its shape.	The depression on the fish caused by pressing it with a finger remains.
Slightly wet and shiny outer skin	Flesh gets detached from the bone
Shiny and pinkish gills	Slightly greenish or ash-coloured gills
Intact eyes with normal colour	Sunken eyes
No foul smell	Foul smell

From the table, find out the precautionary measures to be taken while selecting fish and record them in the Science Diary.

Milk and Milk Products

In your house, where do you get milk from? Discuss.

- Buys packet milk
-
-

What factors are to be considered while selecting milk and milk products from shops? Examine the given statements and put (✓) mark in the appropriate boxes.

- Milk packet with a logo
- Discoloured milk
- Unpacked milk and milk products
- Date of packing and expiry printed on the packet
- Quality of the source
- Packed and sealed cheese and paneer

Haven't you understood the measures to be taken care of while purchasing milk and milk products from shops?

Fruits and Vegetables

Don't you buy fruits and vegetables from shops? What factors are to be considered while selecting them? Complete the table.

To be selected	To be avoided
• Undamaged outer skin • •	• • •

While Choosing Packed Food Items

Nowadays many food items like biscuits, chocolates, chips and juice are available in packets. Have you noticed the information regarding the products that is recorded on such packets? Bring an empty food packet (biscuit, bread, chocolate etc.) from your home and examine the label on it using a hand lens. What information are you able to collect? Record them in the Science Diary.

Find out which among the following information are present in the label of the packet you have examined.

- Name of the food item
- List of ingredients
- Information regarding nutrients
- Calorific value
- Vegetarian / non vegetarian symbols
- Quantity, weight
- Date of manufacture, date of expiry
- Place of production, address of producer
- Added preservatives
- Colouring materials used
- License number and *fssai* logo
- Method of use

Discuss your findings and present them in the class.

Haven't you understood the measures to be taken care of while choosing packed food items?

Adulteration

Food adulteration is an area of great importance while considering the quality of food items. Analyse the news report on adulteration and answer the questions given below.

Excessive Adulteration in Jaggery

The Department of Food Safety seized 3500 kg of adulterated jaggery from different parts of the state. Jaggery mixed with Rhodomin B, a synthetic dye that

imparts colour to fabrics, was seized by the Department. The presence of even a minute amount of Rhodomin B in the body can cause fatal diseases like cancer.

- Why is Rhodomin B added to jaggery?
- What is the harm in adding Rhodomin B?

You may have noticed similar kinds of adulteration in various food items. In food items like chilli powder, turmeric powder and tea dust, substances that resemble them are added as adulterants.

Adulteration

Addition of similar, cheap and poor quality substances to food items is called adulteration. Selling food items after the removal of its quality components and unauthorised addition of colours to food items to give the appearance of quality can also be branded as adulteration.

Many of the food items you consume may be adulterated. Hence while selecting food items, maximum quality should be ensured. How can we detect food adulteration? Let's examine some food items.

Adulteration in Honey

Which one of the following can be a probable adulterant for honey?


Water


Jaggery solution


Sugar solution


Rice soup

Pure honey is very expensive. Usually sugar solution or jaggery solution is mixed with honey. Dip a cottonwick in honey and light it. If it burns well, honey is not adulterated. If the lighted wick burns with a crackling sound, the honey is adulterated. This sound is due to the presence of water in the sugar or jaggery solution added to honey. When pure honey is poured into water, it settles down. If the honey is adulterated, it immediately dissolves in water. Conduct both these experiments and write down the findings in the Science Diary.

The adulteration in certain food items and the methods to identify them are given below. Observe them carefully.

Turmeric

Take water in a glass tumbler and sprinkle a pinch of turmeric powder into it. Colour will spread to the bottom if it is adulterated with synthetic dye. If not adulterated, turmeric powder will settle down at the bottom without the colour spreading.

Coconut Oil

Fill half of a glass tumbler with coconut oil, keep it in the freezer for 30 minutes and observe it. If the coconut oil is pure, it would have frozen completely. If any other oil had been added to coconut oil, the adulterant oil will float above the coconut oil in the liquid state itself.

Asafoetida

Take a piece of asafoetida in a spoon and burn it. If it does not burn like camphor, it may be assumed that it is adulterated.

Based on the descriptions given above, carry out the following activities to find out the adulteration in food items like turmeric powder, coconut oil and asafoetida available at your home. Tabulate your observations and inferences.

Activity	Observation	Inference
Take some water in a glass tumbler and sprinkle a pinch of turmeric powder into it.		
Take a piece of asafoetida in a spoon and burn it.		
Keep a glass tumbler half filled with coconut oil in the freezer for 30 minutes.		

Present your inferences in the class and Science Club.

Prepare a notice or poster to disseminate the message, 'Adulteration is a Social Evil'. Exhibit it in the Science Club and public places.

Safe Storage of Food Items

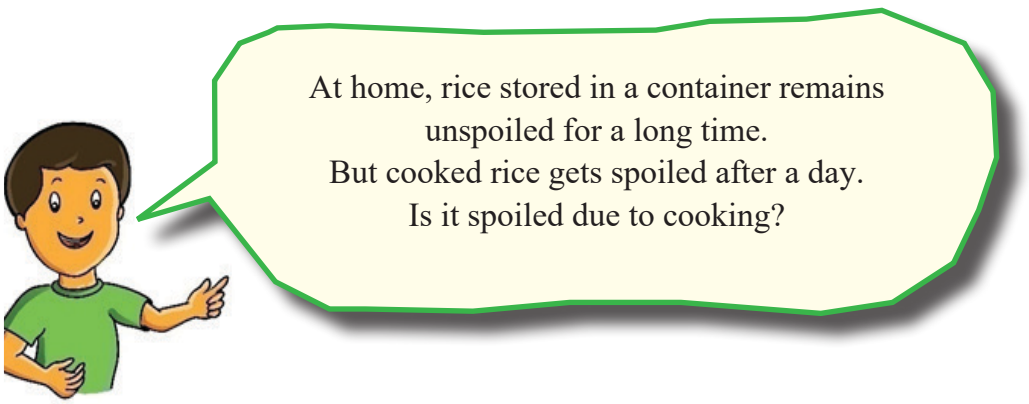
We have been discussing the measures to be taken to ensure safety of food items while selecting them. Equally important is the preservation of food items. Why is preservation essential? Discuss the points given below.

- Many food items are produced at various places in different seasons, aren't they? Are they all consumed in the respective seasons themselves?
- Are the fruits, vegetables and other food items fully consumed at home on the same day of purchase itself?
- Do you have leftovers of cooked food?

Analyse these instances. Find out the reasons for preserving food items.

- To overcome food scarcity
-

What will happen if the food items are not properly preserved?



Do you have the same doubt? Read the note given below:

Spoilage of food items is mainly due to the decomposition action by micro-organisms like bacteria and fungus. Micro-organisms become inactive at very high and very low temperatures. Moreover, micro-organisms cannot be active in the absence of moisture. They cannot act on food items which are packed air tight.

What could be the reason for rice stored in a jar not getting spoiled for a long time and cooked rice getting spoiled after a day? Discuss.

Take out a slice of bread from a packet.

Sprinkle one or two drops of water over the bread.

Observe the bread after three days using a hand lens or a microscope. What do you see on the bread? What is the reason for this? Write your observations in the Science Diary and draw the fungus you have observed.

Methods of Food Preservation

Observe the pictures.

You have seen the storage of different food items in different ways. Complete the table by finding out the method of preservation of each.

Food Item	Method of Preservation	Reason for Non-spoilage
Chilli	Dried and stored	Micro-organisms cannot act in the absence of moisture
Cherry		
Gooseberry		
Pineapple		
Chips		
Drinks		
Vegetables		

Haven't you understood the various methods by which food items are preserved? Find out more examples of food items which are preserved under each method and expand the table. Present before the class and discuss.

Dried and stored	Preserved in salt solution	Preserved in sugar solution	Preserved in low temperature	Preserved in air tight container
• Rice • •	• Gooseberry • •	• Cherry • •	• Milk • •	• Biscuit • •

Salt Solution and Sugar Solution

Micro organisms cannot survive in sugar and salt solutions. Why is it so?

Let's do an activity.

Materials required: Two Taro leaves with petioles, two beakers, water, salt.

Procedure: Take two beakers. Take pure water in one beaker and concentrated salt solution in the other. Place Taro leaves with petioles in both the beakers. Observe after one day. What change has occurred? What may be the reason for the change?

Water from the cells of the Taro leaf placed in salt solution flows into the salt solution. Due to this, the cells of the Taro leaf shrink and the leaf withers.

Likewise, water from food items preserved in salt solution moves into the salt solution. Salt absorbs water not only from the food items but also from the cells of the micro organisms present in them. Micro organisms get destroyed when their cells lose water. The same thing happens when food items are preserved in sugar solution.

Haven't you eaten mangoes preserved in salt solution? Based on the above experiment, find out the reasons for the shrinkage of tender mangoes preserved in salt solution and write them in your Science Diary.

Jam is an example for the preservation of food items in sugar. Let's see how jam is made.

Let's Prepare Jackfruit Jam

Grind one kilogram of fully ripened jackfruit. Cook until it thickens. Add 500 g of sugar to it and stir well for 10 minutes. Allow it to cool for sometime and add a spoonful of lemon juice. After it has cooled down, transfer it into a clean and dry airtight container.

Prepare jam at school using any fruits like papaya, pineapple etc.

Pasteurisation

Have you seen the labeling 'pasteurised milk' on the milk packets? What does it mean?

Pasteurisation is a method to prevent spoilage of milk. Heat milk to 70^0C for 30 seconds and cool it to 10^0C immediately. This sudden temperature difference leads to the rupturing of the cell membrane of the micro organisms. As a result, they get destroyed. This process was invented by a French Scientist, Louis Pasteur. Hence, this process is named as pasteurisation. Wine and fruit juices are also preserved by pasteurisation.

Louis Pasteur
(1822 - 1895)

Adulteration in Ice, Too!

Observe the picture.

It takes many days for the deep sea fishing boats to reach the shore. Small scale vendors will take still more time to distribute the fish to other places. How is it possible to preserve fish for such a long time?

You may have seen the use of ice to prevent the decay of fish. While making ice, a chemical substance called Ammonium Chloride is added for the quick condensation of water, to prevent melting and to maintain low temperature. Ammonium Chloride is harmful to our body. Therefore fish must be cleaned well using plenty of water before cooking.

You know that food items are kept in refrigerator to prevent spoilage. The temperature in all the compartments in a refrigerator is not the same. We store different food items in different compartments. Micro organisms cannot be active at very low temperature. That is why food items don't get spoiled. What will happen to food items when they are taken out of the refrigerator? Micro organisms will start functioning and the food will be spoiled.

Enquire how food items should be arranged scientifically in the refrigerator. Write it down in the Science Diary and present it in the class.

Hygiene for Safety

Do you wash your hand and mouth properly before and after having food? Shall hygiene related to food items be ensured by practicing this alone?

The following should also be taken care of to maintain hygiene.

- The place from where food items are bought
- Storage after purchase
- Cooking
- Eating
- Storage of the left overs

What are the things to be considered in relation to the above mentioned aspects? Discuss and present them in the class.

Do you consider the following things related to food? Put a (✓) mark against the ones you consider and (×) mark against those you don't.

- The places/markets from where you purchase fruits, vegetables, fish and meat are hygienic.
- Vendors wear gloves and masks.
- Food items are kept clean in the market.
- Food items are kept covered.
- Pure water is used for cooking.
- Knives, utensils, cutting board and food items are used after washing them thoroughly.
- Fruits, vegetables, fish, meat etc., are cut only after washing.

- The prepared food is kept covered.
- Hands are washed using soap before serving and eating food.
- Clean plates are used for eating.
- Food is taken not long after it is cooked.
- All members in the home take food together at a hygienic place.
- Left overs are preserved, only if they can be used later.
- The place where food is served is cleaned up.

Give one score to each right answer and find out your total score. Is your score low? If so, what are the things that need your attention?

Clean, safe and healthy food is our right. Cooking with quality ingredients alone will not guarantee quality food. Food can be healthy only if the place where food is stored, temperature and cooking method are apt. Only then can we maintain better health.

So far we have been discussing the measures to be taken to ensure this. Let's conduct a food fest at school considering all these criteria.

Items can be prepared individually or in groups.

What are the arrangements to be made?

- Deciding the proposed dishes and their quantity
- Listing of required food items and their procurement
- Safe cooking
- Arranging the dishes in hygienic and attractive way
- Cleaning activities after the conduct of food festival

Plan the activities to organise the food fest. Prepare posters and exhibit them. Prepare a report after the conduct of the food fest and present it in the Science Club.

Let's Assess

1. Which adulterant can probably be added to pepper?
   a. Green gram
   b. Tamarind seed
   c. Papaya seed
   d. Bengal gram
2. Can the ice cubes used in fish markets be used to prepare cool drinks? Why?
3. What are the things to be taken care of while you purchase fruits from shops?
4. Milk, tomato, fish, cucumber, lady's finger and meat are to be kept in the refrigerator. Out of these,
   - Which are to be kept in freezer?
   - Which are to be stored in compartments other than the freezer?

Extended Activities

1. With a hand lens, examine the food packets stored in the kitchen. Are there any expired ones?

2. Do you dry and store lentils, chilli, bitter gourd, lady's finger, scarlet gourd, jackfruit etc. when available in plenty? Do you have to add salt before drying them? Do the activity with the help of your family members.

3. Prepare a speech on the topic 'Safe Food: A Human Right' and present it in the class.

NOTES

CHILDREN'S RIGHTS

Dear Children,

Wouldn't you like to know about your rights? Awareness about your rights will inspire and motivate you to ensure your protection and participation, thereby making social justice a reality. You may know that a commission for child rights is functioning in our state called the ***Kerala State Commission for Protection of Child Rights.***

Let's see what your rights are:

- Right to freedom of speech and expression.
- Right to life and liberty.
- Right to maximum survival and development.
- Right to be respected and accepted regardless of caste, creed and colour.
- Right to protection and care against physical, mental and sexual abuse.
- Right to participation.
- Protection from child labour and hazardous work.
- Protection against child marriage.
- Right to know one's culture and live accordingly.
- Protection against neglect.
- Right to free and compulsory education.
- Right to learn, rest and leisure.
- Right to parental and societal care, and protection.

Major Responsibilities

- Protect school and public facilities.
- Observe punctuality in learning and activities of the school.
- Accept and respect school authorities, teachers, parents and fellow students.
- Readiness to accept and respect others regardless of caste, creed or colour.

Contact Address:

Kerala State Commission for Protection of Child Rights

'Sree Ganesh', T. C. 14/2036, Vanross Junction

Kerala University P. O., Thiruvananthapuram - 34, Phone : 0471 - 2326603

Email: childrights.cpcr@kerala.gov.in, rte.cpcr@kerala.gov.in

Website : www.kescpcr.kerala.gov.in

Child Helpline - 1098, Crime Stopper - 1090, Nirbhaya - 1800 425 1400

Kerala Police Helpline - 0471 - 3243000/44000/45000

Online ***R. T. E Monitoring : www.nireekshana.org.in***

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.