

Basic Science

Standard

VI

Part

1



Government of Kerala
Department of General Education

Prepared by

State Council of Educational Research and Training
(SCERT) Kerala

2025

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 my parents, teachers and all elders, respect 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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Typesetting and Layout : SCERT

First Edition : 2025

Printed at : KBPS, Kakkanad, Kochi-30

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Dear Friends,

As you know, science is the field of study that helps us to understand and interpret our surroundings and nature. The world of science has always been a wonder for children. This textbook is your companion, inviting you to explore the fascinating realm of scientific inquiry. I am sure that you have innumerable questions to ask about the world around you.

This friend, in the guise of a science textbook, will encourage you to embark on a quest to find the answers to your queries. This book will help you to realise the secrets of the universe and thus become a budding scientist by actively engaging in various activities including observation, experimentation, construction, study tours, seminars, interviews, projects and reading. It is essential for a researcher to own a science kit, right? This book will give you the chance to create your own science kit and to develop it by engaging in exciting experiments in the company of your friends. This book also provides opportunities for additional reading by adding colours to your scientific thoughts. It encourages you to climb the stairs of wisdom by exploiting the possibilities of ICT. At the end of each lesson, there are many activities that can help you track your progress through self-assessment. You can also engage in further exploration with the help of what you have learned. You should participate with enthusiasm in all the activities given in the book. Record your learnings, the questions you wish to explore further and your scientific ideas in your Science Diary and share them in your classroom. Present in the Science Club the knowledge you have gained and also share it with your parents, thus, try making the Science Club active.

By engaging in scientific research activities on your own, and also with your friends, and with the help of your teachers, you can learn with joy and move forward. I hope you will remember to give your opinions and suggestions about this science textbook.

Warm regards,

Dr. Jayaprakash R.K.
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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)

1

Food for Health

Doctor,
I think my daughter
is underweight. She
eats very little food.
What can I do?

Slight weight
loss is not an issue.
Isn't she in a growing
age? She will be fine
soon, but should
ensure adequate
nutritious food.



Did you notice the conversation between the mom and the doctor? Some of you have had this kind of experience. What is meant by nutritious food? Write your guess.

We have a variety of food items around us. We eat different kinds of cooked and raw food items.

Basic Science

Some food items we usually eat are given in the pictures. How can we classify them? Write down in the Science Diary.



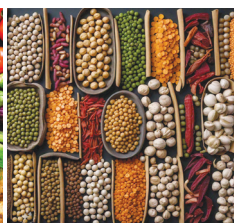
A



B



C



D



E

A. Cereals B. C. D. Pulses E.

What are your favourite food items among them? Any dislikes? Why? Discuss. List the food items you usually eat in a day.

Breakfast	Lunch	Dinner

Should we eat only the food items we like? Pay attention to the conversation below.



Did you notice what the three children said? Will the food they like be enough for the growth and health of these three? Write down your opinion. Present in the class and explain.

Why Food?

Why do we eat food? What do we get from food? Read the write-up from a children's magazine.

Our Health

Food provides energy for our daily physiological activities. Nutrients are the components required for our growth, to maintain health and to prevent diseases. We obtain nutrients from food items. Carbohydrates, proteins, fats, vitamins and minerals are the nutrients present in food items. Though water is not a nutrient component, it is an important requirement for our bodily activities. Fibres present in the food items are also required for bodily activities. All food items may not contain all essential nutrients in adequate quantity. Hence, we eat a variety of food items prepared using different ingredients. The quantity of food we eat, its quality and time of consumption influence our health. So, everyone should eat nutritious food.

Did you read the write-up? Analyse it using the indicators given below.

- ◆ Which are the major nutrients?
- ◆ What is the need for preparing food using different ingredients?
- ◆ Why do we eat nutrient rich food?

Write down your findings in the Science Diary. Let's enquire more about the nutrients in food.

To Obtain Energy

Do we eat food to enjoy the taste and to satisfy hunger alone? What are the activities you usually engage in a day? Observe the picture.



What activities do you see in the picture? Don't these activities require energy? Do these activities require the same amount of energy? From where is the energy required for these activities obtained? Let's examine.

Carbohydrate

Energy required for the body is mainly obtained from carbohydrate. Carbohydrate is found in food items in different forms like starch, sugar, glucose, cellulose and fibres. Starch is present in abundance in cereals and tubers.

What are the food items that should be included more in our diet to get the required amount of energy?



I drink milk daily.
Do I get starch
from milk?



Do all food items contain starch?
What do you think?

How do we find out if starch is present in the food we eat? Let's do an experiment.

Iodine Test

Materials required : two test tubes, milk, diluted iodine solution, rice water.

Activity – Take two test tubes. Take milk in one test tube and rice water in the other one. Add two or three drops of iodine solution to each test tube. Observe the colour change in both test tubes when iodine solution is added. Repeat the same experiment with other food items you eat. Record your findings in the table.

Food items	Change in colour when iodine solution is added
Potato	
Cucumber	
Maida	
Egg white	

When iodine combines with starch a dark blue colour is formed. Depending on the quantity of starch the intensity of blue colour varies.

Find out the food items with more starch content based on the intensity of blue colour formed when iodine was added. You have already listed the food items you usually eat. Analyse the table and examine whether more food items you consume contain starch.



For Further Reading

Millets

Millets are the crops which belong to grass species. Millets contain higher quantities of proteins, vitamins and minerals than rice and wheat. Millets which are rich in fibres play an important role in digestion. In the past, millets were used as food for animals and birds. Humans also started consuming millets after realising their nutritional value. Millets include finger millet, bajra, foxtail millet, maize, little millet etc.



For Growth

Is it enough to include only carbohydrate in our diet? Let's find the other nutrients needed for our body.

Protein



Did you notice what the doctor told the child's mom? Why does the doctor say so?

Read the suggestions given by the dietician in a programme organised by the Health Club in the school.

Protein is a nutrient essential for growth and body building. Protein is required for the health of muscles, hair and skin. Moreover, proteins provide energy. Deficiency of protein causes diseases like Kwashiorkor and Marasmus.

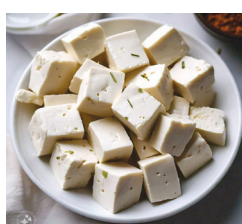


Kwashiorkor affected kid

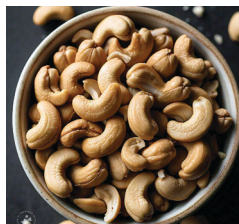
What are the functions of protein? What are the diseases caused by the deficiency of protein? Discuss. Pictures of food items which contain protein are given below. Identify them and write.



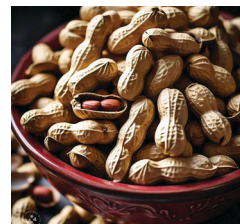
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Paneer



.....



.....



Meat



Fish



.....



.....

Which food items among these are included in your diet? Discuss. There may be vegetarians among you. What food items are to be included in their diet to compensate the deficiency of protein? Find out more food items which contain protein and write down in the Science Diary.

Fat

Like carbohydrate and protein, fat is also essential for us. If we consume equal amount of carbohydrate, protein and fat, we will get more energy from fat.

How can we find out whether the food we eat contains fat? Do this activity to find out the presence of fat in your diet. Take a sheet of paper and put a drop of oil on it. Observe the paper. Likewise put a drop of ghee on another piece of paper. Identify the presence of fat by observing the changes in the paper when ghee and oil were added. Repeat the experiment by rubbing the food items given below on the paper. List them. Discuss your findings in the class.

Food items	Observations
Chips	
Raw banana	
Crushed sesame	
Dried coconut	
Crushed groundnut	

Write down the other food items you are familiar with, that contain fat. Does the list contain food items like oil, ghee, meat, egg, coconut, sesame, mustard, groundnut, milk and butter. We get fat from plant and animal sources.

Observe the pictures given below and write their names.

Classify the given pictures as 'fat obtained from plants' and 'fat obtained from animals'.



.....



.....



.....



.....



.....

Fat obtained from plants	Fat obtained from animals
Coconut oil	Fish oil

Majority of food items like vegetables, rice, wheat etc contain small amount of fat.

Cholesterol

Have you heard doctors advise not to eat too much fatty foods? What could be the reason? Cholesterol is a form of fat. A moderate amount of cholesterol is required for the body. If there is excess cholesterol in the blood, it gets deposited in the inner wall of blood vessels and prevents blood flow. This may cause fatal diseases like stroke and heart failures.

Vitamins

Have you heard of vitamins? Vitamins are essential nutrients required in small quantities for the growth and health of our body. Let's understand the importance of vitamins.



Do you have the same doubt?

Analyse the table given below to understand different types of vitamins and their significance.

Vitamin	Significance
Vitamin A	maintains the health of eyes, skin and hair
Vitamin B	maintains the health of brain, nerves, heart and skin
Vitamin C	for the health of teeth, gum, blood vessels and for immunity
Vitamin D	for the health of bones and teeth and for immunity
Vitamin E	for proper functioning of nerves
Vitamin K	for blood clotting when wounds occur

- ◆ Which vitamins are essential for the health of the skin?
- ◆ What health issues will occur if you don't get adequate quantity of vitamin D?

Haven't you analysed the table? Prepare a note on vitamins and present it in the class.



For Further Reading

Vitamin D and B Complex



Vitamin D is obtained from sunlight. Trace amount of it is also obtained from food. This vitamin is essential for the health of bones and teeth and for immunity. Due to the deficiency of Vitamin D the bones in children become soft and brittle. This condition is called rickets. Sunlight is good for getting vitamin D. B complex is a group of 8 different vitamins, essential for the physiological activities of the body. It plays an important role in maintaining health. B complex is essential for cellular health, formation of red blood cells, eyesight, functioning of nerves and cardiac health.

What food items should be included in the diet to prevent the physical issues caused by vitamin deficiency? Observe the table and identify the food items which contain different types of vitamins. Refer books and elaborate the list by adding more food items.

Vitamins	Food items
Vitamin A	Fish, Carrot,,,
Vitamin B	Matta rice, Spinach,,,
Vitamin C	Gooseberry, Lemon,,,
Vitamin D	Fish, Egg,,,
Vitamin E	Peanut, Almond,,,
Vitamin K	Cabbage, Cauliflower,,,

Examine whether your daily diet include the food items mentioned in the table.

Edible leaves and fruits obtained from our surroundings contain vitamins in abundance.

Haven't you understood the importance of including food items like moringa leaves, spinach, guava, papaya and mango in our diet?

Vitamins B and C are water soluble where as vitamins A, D, E and K are fat soluble. In the absence of fat, these vitamins will not be absorbed by the body. Haven't you understood the importance of including fats in the diet.

Minerals in Foods



All are requested to
report at the auditorium.
Iron tablets will be
supplied at 2 pm today.

Didn't you notice the announcement? Why are iron tablets given to children?

Iron is a mineral. Such kind of minerals are essential for the proper growth and health of the body. Which are the minerals required for our body? How do these minerals support our growth and health? Analyse the table and write them in the Science Diary.

Important minerals	Food items	Significance
Iron	Leafy vegetables, jaggery, fish, liver	Plays a significant role in the formation of haemoglobin in blood.
Calcium	Egg, milk, leafy vegetables, fish	Helps in the formation of bones, teeth etc. and also helps in the clotting of blood.
Iodine	Sea foods	Helps in the functioning of the thyroid gland.

- ◆ Which mineral helps in the formation of haemoglobin in the blood? What food items should be included in the diet to get this mineral?
- ◆ Why should we eat sea food?
- ◆ What health issues will occur if we avoid egg, milk and leafy vegetables? Discuss.



For Further Reading

Haemoglobin

Haemoglobin is the pigment present in red blood cells. It imparts red colour to blood. Haemoglobin carries oxygen to the cells and bring back carbon dioxide. Low level of haemoglobin in the blood leads to a condition called anaemia.

Deficiency Diseases

Vitamins and minerals are required by the body in small quantities only. However, if they are not available to the body in the required quantity, deficiency diseases are bound to manifest. You have already learned about the diseases related to protein deficiency.

Pay attention to the vitamin deficiency diseases listed below.

Vitamin	Deficiency Diseases
Vitamin A	Night blindness
Vitamin B	Glossitis (Swollen tongue and tingling of skin on tongue), Mouth Ulcer
Vitamin C	Bleeding gum (scurvy)
Vitamin D	Rickets



- ◆ Deficiency of which vitamin causes scurvy?
- ◆ What food items will you suggest to include in the diet, if someone in your home suffers from mouth ulcer?
- ◆ Deficiency of which vitamin causes night blindness?
- ◆ Deficiency of which vitamin causes rickets? Analyse the table and write your inferences in the Science Diary.

Night Blindness

Night blindness is the poor vision experienced in dim light and night. Persons with night blindness have no issues in vision during day time and in bright light at night.

Deficiency diseases caused by the lack of minerals are given in the table below. Analyse the table and find answers to the questions.

Minerals	Deficiency Diseases
Iron	Anaemia
Iodine	Goitre
Calcium	Osteoporosis

- ◆ Which disease is caused by the deficiency of iron?
- ◆ What food items should be included in our diet to prevent goitre? Why?
- ◆ What food items are to be included in our diet to prevent osteoporosis?
- ◆ Why are iron tablets supplied in schools? Explain.

Analyse the two tables given above. Prepare a write-up on deficiency diseases and display it on the bulletin board.



For Further Reading

Osteoporosis

Osteoporosis is the condition in which bones become soft and brittle due to the decrease in density of minerals in the bones. This may lead to weakness of bones and fracture.

Goitre

Simple goitre is the condition in which the thyroid gland situated in the throat becomes enlarged due to the lack of iodine in our diet. Iodine is essential for the production of hormones by the thyroid gland.



Goiter

Components other than Nutrients

Just like nutrients, there are certain other components that are required for our health. Let's see what they are.



Banana stem

Cut a banana stem and observe the fibres in it. Which other dietary fibres do you know? Why is it essential to include fibres in the diet? Discuss the note given below. Write down your inferences in the Science Diary.

Fibres

Fibres are the cellulose obtained from plant-based food which can't be digested by our body. Fibres are not nutrient components. However, fibres facilitate digestion and egestion of faeces through the large intestine. Cereals with bran, leafy vegetables, vegetables, banana stem, banana flower etc contain fibres in abundance.

Ask your parents about the dishes prepared out of banana stem or flower in your home. Don't forget to include them in your diet.

Observe the picture



Did you see the mango slices and the strained mango juice? Which has more fibre? Why? Discuss. Won't you try to eat whole fruits like mango, orange and apple instead of their juice?

Water

Don't you know that about 70% of our body is comprised of water. Water is essential for physiological activities like digestion, circulation and excretion. Water is lost from the body through urine and sweat. So, we must drink plenty of pure water. Children should at least drink 10 to 12 glasses of water a day. Vegetables like tomato, cucumber, watermelon etc contain plenty of water. Won't you include them in food?

Balanced Diet

In order to maintain health, we should follow a diet which include protein, carbohydrate, fat, vitamins and minerals in appropriate quantity. Such a diet is called a Balanced Diet. Is there a single food item we discussed earlier that contains all the nutrients in adequate quantity? Don't we compensate the nutrient deficiency in one food item with another one? If so, shouldn't the food we eat be diverse?

Earlier you have prepared the menu for a day. Examine the menu and find out whether it is a balanced diet. If not, make necessary changes in the diet and write down in the table.

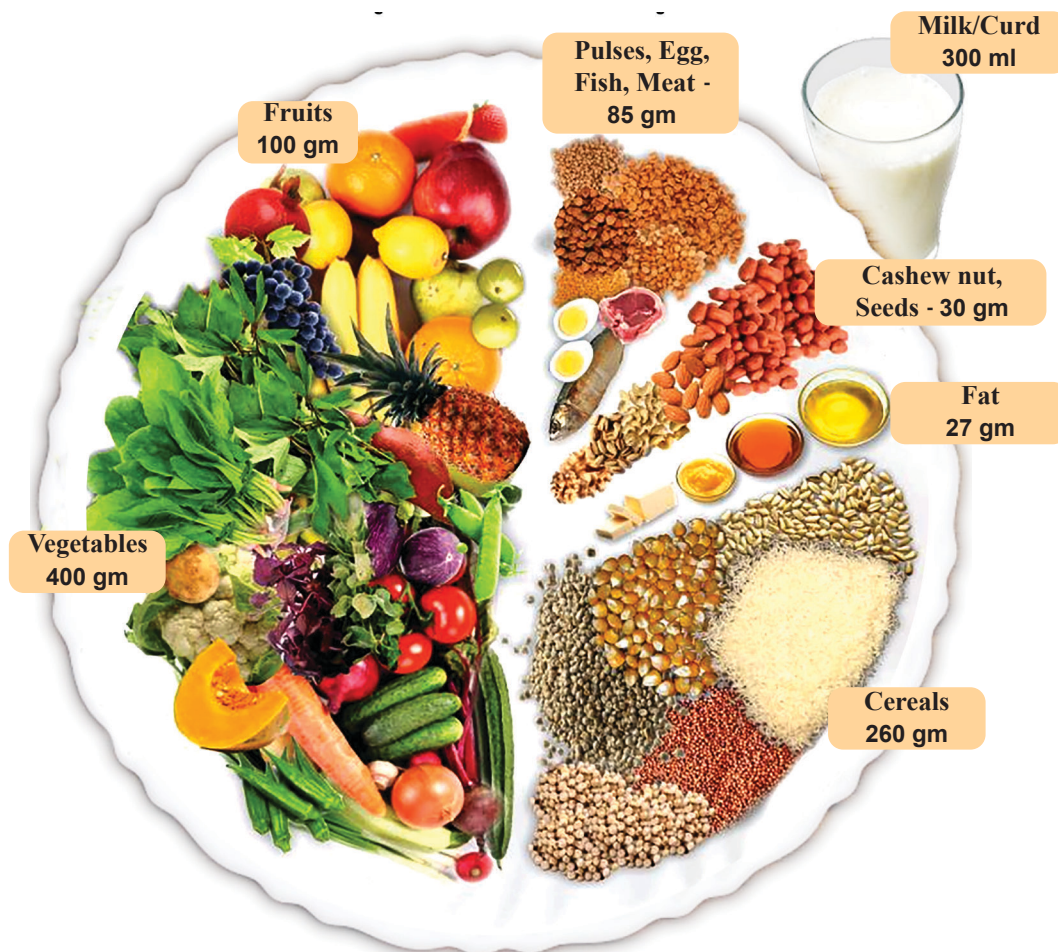
Changes to be made in my diet

Items to be included in breakfast	Items to be included in lunch	Items to be included in dinner

My Food Plate

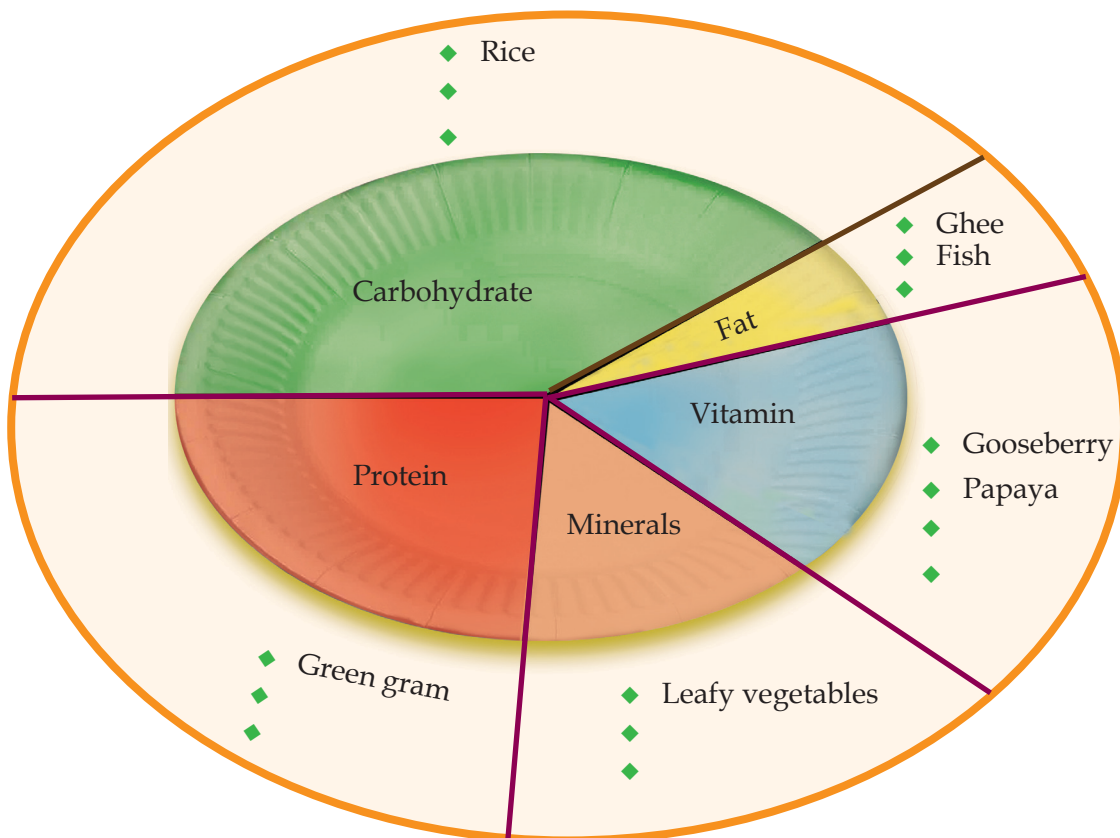
Haven't you understood that none of the nutrients discussed so far can be excluded from our diet? A sample which contains all nutrients is given below.

Find out the quantity of food items to be taken in a day from the picture.



Food Plate - Model

Prepare a food chart for a day including all the nutrients as per your food habit and exhibit it in your home and class.



My food chart for a day

Lunch and its Calorie

Examine the menu of school noon meal for five days. Which food items are included in it? Discuss the menu of each day with the teacher and examine the food items and the nutrients in them. Tabulate your findings.

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Food Items					
Nutrients					

Did you notice the food items and their nutrients for each day? Haven't you understood that the menu for noon meal in schools is prepared to ensure balanced diet for every child?



For Further Reading

Calorie

Calorie is the unit that measures the amount of energy in food items. Energy is required for physiological activities like respiration, circulation etc. A man engaged in physical activities requires about 1900 to 2400 calories of energy per day. A woman having physical activities needs about 1600 to 2000 calories of energy per day. A grown-up child needs an average of 1200 to 1400 calories of energy per day.

A child gets about 750 calories of energy from noon meal. Make it sure to get the remaining amount of calories from the food items you eat at other times.

Can you suggest less expensive and nutritious dishes to improve the noon meal?



What are your suggestions to get the ingredients for preparing these dishes? Discuss.

To Prevent Loss of Nutrients

What are the possibilities for the loss of nutrients while cooking? Discuss and write in your Science Diary.

- ◆ Washing vegetables after cutting them



Did you understand why it is said that fruits and vegetables should not be washed after cutting them? Discuss with the elders in your home the measures to be adopted to prevent the loss of nutrients from food items. Write them in your Science Diary.

Haven't you understood the need to eat nutritious food for growing up healthy? Nutritious food is not only essential for health but it is also our right.

Let's Assess

- Nutrients and food items which contain them in plenty are given below. Match them drawing lines.

◆ Carbohydrate	Leafy vegetables
◆ Minerals	Pulses, Egg
◆ Fat	Cereals
◆ Protein	Oils
- Which is the health issue faced by a person who doesn't eat food containing iodine?

A. Night blindness	b. Rickets
C. Anaemia	D. Goitre
- Our body can't digest fibre. If so, why is it said that we should eat food items which contain fibre?
- Which nutrient is required for the health of teeth? From which food items do we get this nutrient?
- "The teacher gave me an iron tablet today, but I didn't eat it." Do you agree with Aruna? Why?
- Vitamins and minerals are required by our body in lesser quantities. Hence, it is enough to include small quantities of food items which contain them in our diet. This is a child's opinion. Do you agree with this? Why?

Extended Activities

- Prepare the recipe of a food item cooked in your home. Exchange your recipes and read.
- Prepare a balanced diet chart including items available in your surroundings. Exhibit it in the classroom.
- Observe food packets bought from shops and identify the nutrients in them. Prepare a note and present it.
- Conduct a seminar in the class on 'Food and Health'. Collect information related to different aspects of the topic and prepare a report for presenting in the Seminar.

2

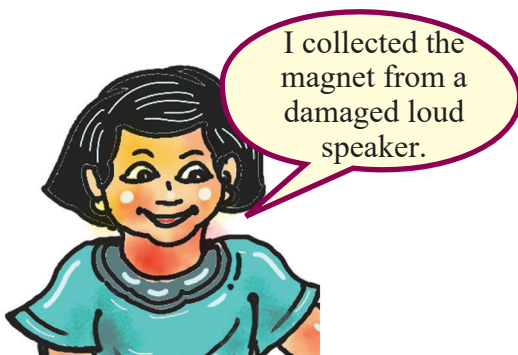
Marvel of the Magnetic Realm



Observe the images. Aren't these objects familiar to you? Write down what they are.

When these things are closed, why do they stick together so easily? Haven't you noticed this? What could be the reason for this? What will happen if you bring a pin near the closing parts of these objects? Can you guess why they stick together so easily? Discuss.

There may be a magnet in your house too. Do you have magnets in your Science Kit? Where did you collect them from?



Take a magnet from the Science Kit. Attach a steel gem clip to it. Does the clip fall if you release your hand? Add another clip to it. Let's see how many clips can be hung up like this.

Shall we have a competition? Take the following materials from your Science Kit.



- ◆ Magnet
- ◆ Gem clips
- ◆ Pin
- ◆ Nail

First, take the gem clips and the magnet. Then, arrange them one below the other, as shown in the figure above. Try to make a chain. Who made the longest chain? How many gem clips are there in the chain?

Don't we usually have different kinds of beads in a chain? Similarly, here, what if we use gem clips of different colours, pins, nails etc.? Check who has made the most beautiful chain.



Magic with a Magnet

Shall we perform a magic in class? **Materials required:**



- ◆ A paper with a picture of a butterfly
- ◆ Safety pin
- ◆ Magnet
- ◆ Chart paper

Cut out the picture of a butterfly. Attach a safety pin to the back of the picture so that it remains hidden. Place it on a chart paper. Try moving a magnet below the chart paper. Doesn't the butterfly move as you move the magnet? What happens when you take away the magnet? Try this with other pictures.

Hold the chart paper vertically and perform this magic before your parents. Thus, you too can become a magician.

Painting Using a Magnet?

Let's draw a picture using a magnet. What materials do we need to draw this picture?

- ◆ A paper plate
- ◆ Acrylic paint/fabric paint/poster colour (two or three colours)
- ◆ Small metal balls (used in bicycles) or gem clips
- ◆ Magnet

Let's start painting. Put some drops of different colour paint at various parts of the plate. Place four or five small metal balls on the plate. Move the magnet underneath the plate. What do you observe? Don't the balls moving over the paint create some patterns? Give borders to this picture and make it beautiful. Exchange these among friends and assess them.



Will a magnet attract all objects? Let's do an experiment.

Objects Attracted and Not Attracted by a Magnet

Which are the objects attracted by a magnet? Take the available items from the Science Kit and do the activity. Tabulate your findings.

Attracted by magnet	Not attracted by magnet



Which objects were attracted by the magnet and which were not?

Magnetic Substances and Non-Magnetic Substances

Magnetic substances are those that are attracted by a magnet. Iron, nickel, cobalt etc., are magnetic substances. Non-magnetic substances are those which are not attracted by a magnet. Paper, plastic, gold, wood, etc., are non-magnetic substances.

Examine more objects and classify them as magnetic substances and non-magnetic substances.

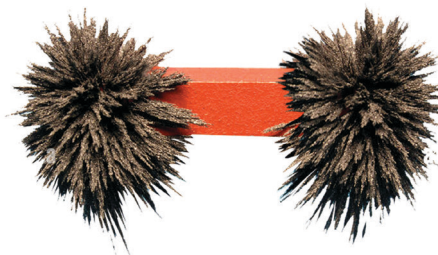
Magnetic substances	Non-magnetic substances
• Nail •	• Cloth •

Magnetic Force at the Poles

Bring the tip of a magnet near some pins. Then bring the middle part of the magnet near the pins. Which part of the magnet attracts more pins? Let's do one more activity to make this more clear. What are the materials we need?

- ◆ A Bar magnet wrapped in paper
- ◆ Iron filings

Bring the wrapped bar magnet close to the iron filings. Won't the iron filings stick to it? We wrapped the magnet in paper to make it easier to remove the iron filings from the magnet.



Do the iron filings stick to all parts of the magnet in the same way? Does any part of the magnet have more iron filings? Why does this happen? Discuss with your friends.

Magnetic Poles

Usually, the force of attraction of a magnet is stronger at its ends. These ends with stronger force of attraction are called the magnetic poles. Every magnet has two poles.

Does a Magnet Exert Force?

Place a magnet on a table. Keep a pin a little away from the tip of the magnet. Slowly move the pin closer to the magnet. What happens to the pin when it comes closer to the magnet? Did this happen due to the force exerted by the magnet? Discuss.

Magnetic Field

The force exerted by a magnet is called magnetic force. A magnetic field is the region around a magnet where magnetic force is experienced. Magnetic field is invisible.

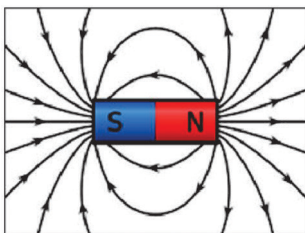
Let's Draw Magnetic Field Lines

You have learned what a magnetic field is. Haven't you found out that magnetic force is experienced in a magnetic field? Let's do an experiment. What materials do we need?

- ◆ A rectangular glass sheet
- ◆ A magnet
- ◆ Iron filings



Arrange the rectangular glass sheet between the books as shown in the figure. Place a bar magnet under the glass sheet and sprinkle iron filings on the upper side of the glass sheet. Gently tap the glass sheet if necessary. What did you observe?



Aren't the iron filings arranged in a specific pattern? This arrangement indicates the magnetic field lines. This is a part of the magnetic field. Draw the magnetic field lines you have observed.

There are magnetic field lines in the magnetic field. Both of them are invisible. Observe the figure. Didn't you understand how to draw the magnetic field lines?



For Further Reading

Making a Magnet

Magnets are made using magnetic substances. An alloy called Alnico a mixture of Aluminium, Nickel and Cobalt is commonly used for this purpose. Many other materials are also used for making magnets. Different types of magnets made of samarium, cobalt, ferrite rubber and neodymium also exist. Among these, neodymium magnets are the strongest.

Magnetic Substances in Soil

Are there magnetic substances in the soil of the school ground and its surroundings? Let's conduct an activity to find out.

Get a magnet from the loud speaker of an old music system. Old speakers can also be found in shops that collect scrap items. Do the given activity in groups. Tie the magnet wrapped with a thick paper to a rope and drag it through the soil for some time. Then check the magnet. Are there any substances stuck to the paper due to the attraction of the magnet? What is the reason for this?

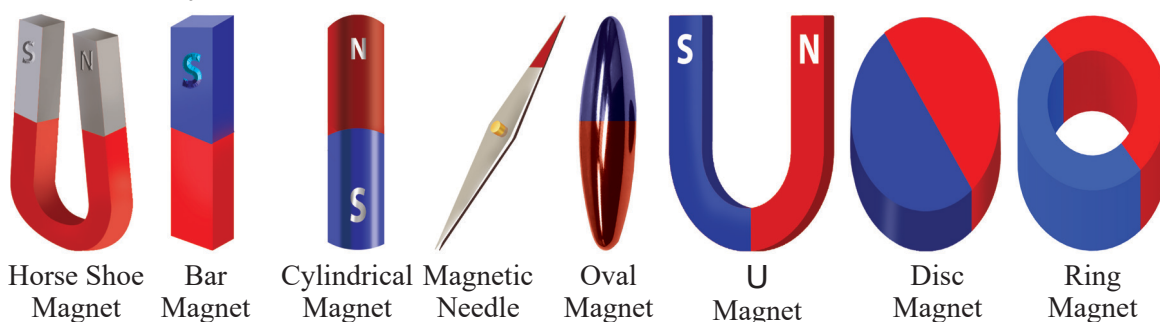


Based on this experiment, can you suggest a method to separate iron from a mixture of soil and iron?

Different Types of Magnets

Do all magnets have the same shape? Examine the magnets in your Science Kit and the laboratory. Are they all the same?

All those shown in the figures given below are different types of magnets. How do they differ in their shape? Compare them.



Are they named according to their shape? Draw pictures of different types of magnets in your Science Diary and write their names.

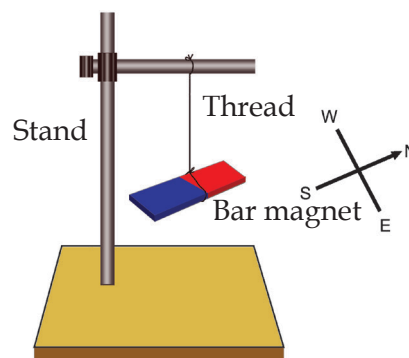
North and South

We have understood that a magnet has two poles. Do these poles have any other special features? Let's examine.

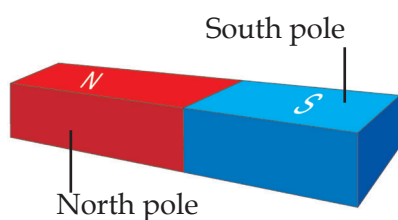
Materials required:

- ◆ Stand
- ◆ Thread
- ◆ Bar magnet

Tie a thread in the middle of the bar magnet and suspend it freely as shown in the figure. When the magnet comes to rest, which direction do the poles point to?

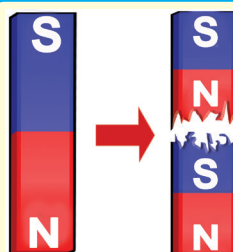


Is it to the east-west direction or to the north-south direction? Change the direction of the magnet and examine again. Does it return to the same direction as before? Based on this activity, name the magnetic poles. Repeat the activity from different places.

**Magnetic Poles**

The pole of the magnet that points towards the Earth's North is the North Pole of the magnet, and the pole that points towards the Earth's South is the South Pole of the magnet. They are denoted by the letters N and S respectively. To indicate the North pole of a bar magnet, a special mark is given. Usually, a white spot is used to mark the north pole.

A freely suspended magnet always points towards the North-South direction. Can we use this property of the magnet to find directions?

**If a Magnet Breaks**

What happens if a magnet is broken into two pieces? These pieces become two small magnets.

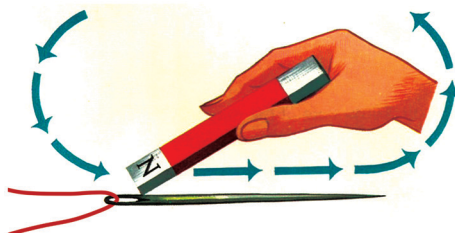
**Let's Make a Magnetic Compass**

In the past people who travelled across the sea and desert used many methods to find the direction. They used to depend on the Pole Star and other constellations for this. After identifying the special property of magnets, finding directions became easier. Which property of the magnet did they make use of? Discuss with your friends.

A magnetic compass is a device which uses a magnet to determine the direction. Get a magnetic compass from the science lab. Using this, find out the direction of the door of your classroom. Now find out the direction of school gate with respect to your classroom. What about the school kitchen and the office room? Find out. Let's make a magnetic compass of our own. What materials do we need?



- ◆ Magnet
- ◆ Needle
- ◆ Thread
- ◆ Cork



Thread the needle. Hold the thread and rub the needle from one end to the other end with a magnet for about 50 times in the same direction. The needle is threaded for holding it conveniently and for safety.

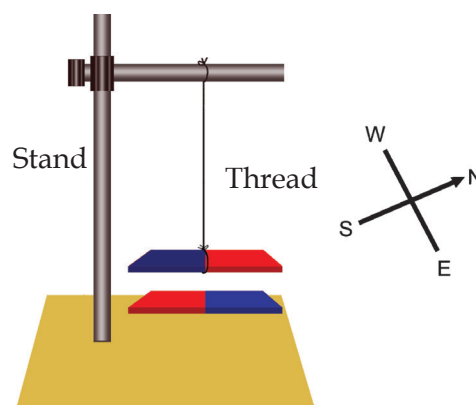
Take a small cork. After removing the thread, pierce the needle into the cork as shown in the figure. Otherwise, you can glue the needle to the top of the cork.

Place this cork in a bowl of water. Observe the direction of the needle on the cork. To which direction does the needle point? Change the direction of cork. Does the needle return to its original position? Write down your inference in your Science Diary. Mark the North Pole on the needle. Can't we make use of this device to find direction?



North-South Direction

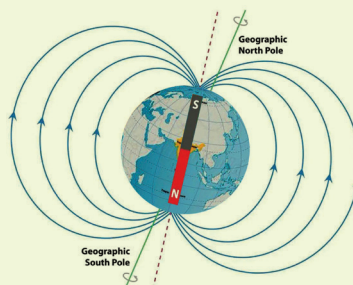
A freely suspended magnet always rests in the North-South direction. This is the directional property of a magnet. What is the reason for this? Let's find out. Take a magnet and suspend it freely. Place another bar magnet in the East-West direction below this magnet. To which direction does the suspended magnet point now? Try changing the direction of the suspended magnet. Does it again come back to the East-West direction? Discuss the reason.



Now remove the magnet placed below. What change do you observe in the direction of the suspended magnet? Why? Isn't there another invisible magnetic force that makes the suspended magnet point towards the North-South direction? Read the following note and discuss.

Geo Magnet

The Earth acts as a magnet. This geo magnet has a magnetic field. The poles of the Earth's magnet are in the North-South direction. The North Pole of the Earth is the South Pole of the geo magnet. The South Pole of the Earth is the North Pole of the geo magnet. That's why a freely suspended magnet always points in the North-South direction.



When Magnets Come Closer

Do magnets attract each other? What is your guess? Discuss it. Let's do an experiment.

Take two bar magnets with their poles marked. Place one magnet on a table. Place one pole of the other magnet on different parts of the magnet on the table. At which regions do they attract?

At which regions do they repel?

Repeat the activity by changing the poles. When the same poles are brought together, do they attract or repel?

What about unlike poles?

Arrange the magnets as shown in the figure and record the observations. Share the observations with your friends. Record it in your Science Diary.

Arrangement	Poles coming closer	Observation
N S S N	S - S	
N S N S		
S N N S		
S N S N		

Attraction and Repulsion

The same poles of different magnets are called like poles, and their different poles are called unlike poles. Like poles repel and unlike poles attract.

Place the magnets in the following manner. In each case, do their poles attract or repel? Discuss the reason.



Figure 1



Figure 2

General Properties of a Magnet

We have conducted various experiments to find out the general properties of a magnet. What are your findings?

- ◆ A magnet attracts magnetic substances.
- ◆ A magnet has two poles.
- ◆
- ◆
- ◆
- ◆

Write down this in your Science Diary and present it in the class.

The History of Magnet

About 2500 years ago, there was a place called Magnesia in Greece and there lived a shepherd named Magnus. One day, he was resting, keeping his iron-tipped staff on a rock. After resting when he tried to pick up his staff from the rock, the shepherd had a strange experience. Hearing this, all the villagers rushed to the spot.

Observe the illustration related to the subsequent incidents.



Analyse this incident in relation to the properties of a magnet.

Later, scientists discovered the real reason behind this. Such rocks would not only attract the shepherd's staff but also all other magnetic substances. In memory of the shepherd, these rocks were called magnets. There are mountains having such rocks with magnetic power in many places on Earth. These rocks known as Lodestones, are natural magnets.

Permanent Magnet and Temporary Magnet

Didn't we make a chain using gem clips? Try to repeat that experiment. Why does a gem clip stick to the other gem clip attached to the magnet? Did it happen because the second gem clip acquired magnetic properties? Does it retain magnetic property when the bar magnet is removed? Why? But isn't the magnetic property of a bar magnet retained permanently?

When magnetic materials are placed in a magnetic field, they acquire magnetic properties. When the magnetic field is removed, they lose their magnetic power. Here the gem clip, nail and pin behave as temporary magnets. The natural magnet Lodestone and various other magnets you became familiar with are also permanent magnets. The magnetic property of permanent magnets persists for a long time.

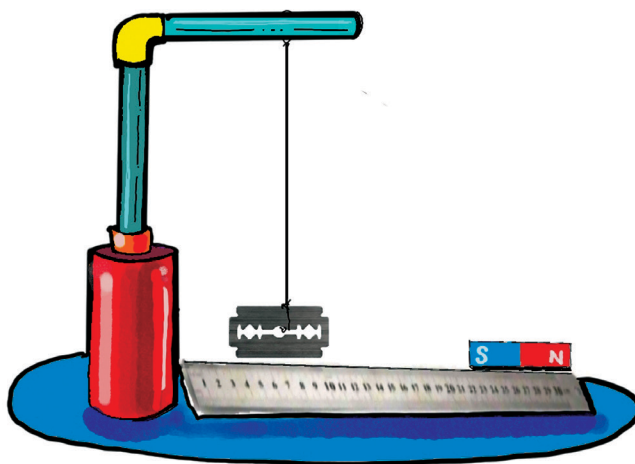
Let's Test the Magnetic Force

Do magnets vary in their magnetic force? Let's do an experiment to test the strength of magnets.

Materials required: Bottle, sand, two pieces of half-inch PVC pipe (50 cm, 15 cm), $\frac{1}{2}$ inch elbow pipe, blade, thread, scale, double-sided tape.

Procedure: Take sand in the bottle and insert the long PVC pipe into the sand and fix it. Fix the short PVC pipe to the top of the long pipe using the elbow pipe. Place the bottle on the table. Place the scale near the bottle as shown in the figure. Stick the scale with the double-sided tape to prevent it from moving. Suspend a blade from the short PVC pipe as shown. Slowly bring a magnet from the far end of the scale towards the blade. When attraction is felt on the blade, note the position of the magnet with the help of the scale. Repeat the experiment using different magnets. Record the observations in the table.

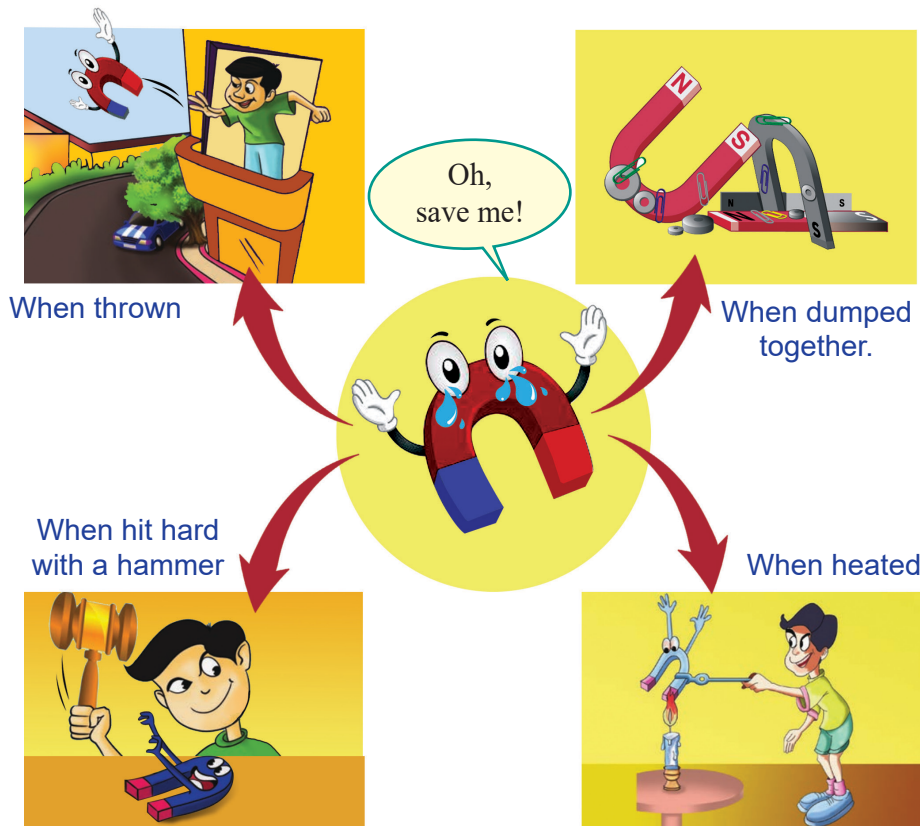
Magnet	The position of magnet when magnetic force is felt on the blade (Scale reading)
Magnet- 1	5 cm in the scale
Magnet- 2	
Magnet- 3	
Magnet- 4	
Magnet- 5	



Of the magnets you have examined, which magnet has the highest magnetic force? Analyse the scale reading and find out.

Don't Weaken Me !

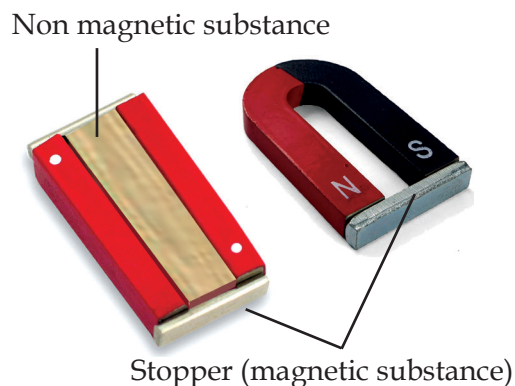
Does the magnetic force decrease as time passes? What is your guess? What could be the reasons? Observe the pictures. Find the reasons and discuss. Record them in your Science Diary



To Retain Magnetic Force

If magnets are dumped together carelessly, won't they lose their magnetic force lost quickly? How can this problem be solved? Observe the picture.

Analyse the methods for storing magnets. How are bar magnets stored?



Are bar magnets stored in pairs? Should unlike poles be on the same side? What should be placed in between two bar magnets? What should be at the ends?

How is a U-magnet stored? Find out the methods to store other magnets. Record your findings in your Science Diary and discuss.

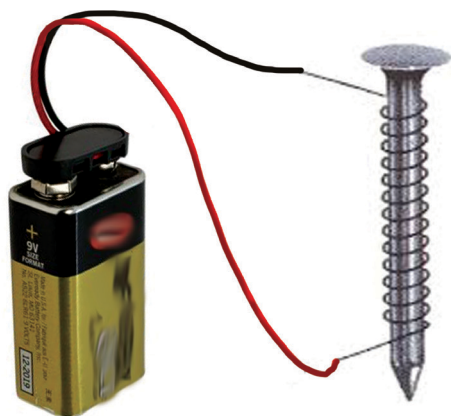
Electromagnet

Can we make a magnet using electricity?

What materials do we need?

- ◆ 9V battery, connector
- ◆ Insulated copper wire
- ◆ Soft iron nail
- ◆ Pins

Wind the insulated copper wire around an iron nail as shown in the figure. Make sure to have many coils. Remove the insulation from both ends of the copper wire. Connect these ends to the battery using a connector. Bring the tip of the nail close to a few pins. Note down the observation in your Science Diary. Disconnect the battery. What happens?



Electromagnet

When electricity passes through a copper wire, a magnetic field is created around it and the nail becomes a magnet. This is an electromagnet. Its magnetic power is temporary. When the electric current is cut off, the electromagnet loses its magnetic power.

Magnets in Daily Life

What are the daily life situations where magnets are used?

Discuss with the help of the figure.



Haven't you noticed magnets being used in each of these devices? Find more situations where magnets are being used. Write them in your Science Diary

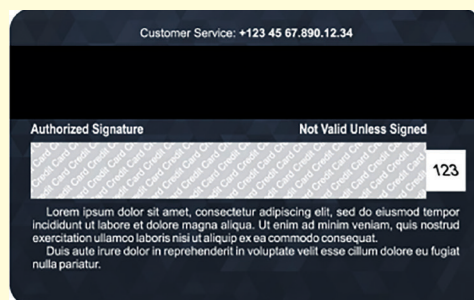


For Further Reading

Inventions that Transformed Life



MRI (Magnetic Resonance Imaging) Machine



Magnetic Strips in Credit and Debit cards

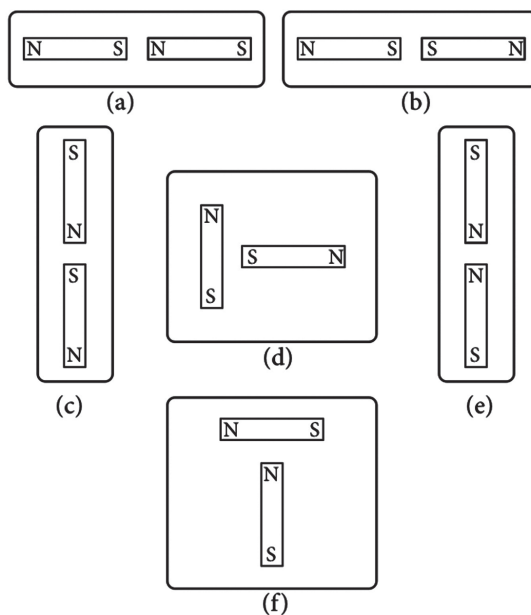


Maglev Train

Similarly, we use magnets in many situations. Collect more pictures of such instances and prepare an album.

Let's Assess

- Which of the following is a magnetic substance?
a) Paper b) Iron nail c) Wood d) Copper wire
- Find the correct statements.
a) A disc magnet has one pole.
b) Like poles of magnets attract.
c) The magnetic power is low at the middle part of a bar magnet.
d) Rubber is a non-magnetic substance.
- During carpentry work at home, some iron nails have fallen into the sawdust. Can you suggest an easy method to separate these nails?
- The mark indicating the pole of a magnet is missing. Suggest some methods to find out the poles?
- Observe the figures. In which situations do attraction occur? In which situations do repulsion occur?



- The key of a vehicle has fallen into the crack of a slab on the road. It can't be taken out with hands. You can see the key through the crack of the slabs. Can you suggest a method to get the key without removing the slab?

Extended Activities

1. Finding Directions

Using the compass you have made, determine the directions of the kitchen, front door, dining table, bedroom, etc. of your home with respect to your position. Discuss your experiences with your friends.

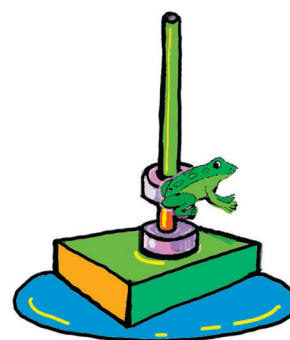
2. Iron-Picking Puppet

Take a puppet and make a slit on its palm. Glue a small magnet inside it. Make sure it is not visible from outside. Bring the puppet's hand closer to a pile of objects made of different materials. It will only pick iron objects. Take your puppet to the class and demonstrate.



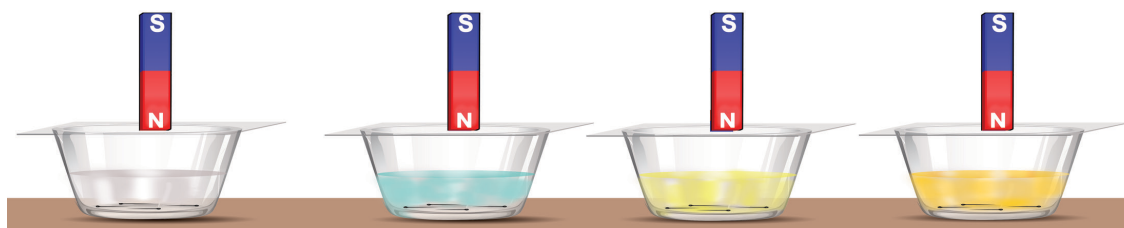
3. Jumping Frog

Fix a stick vertically on a stand. Place two ring magnets over the stick with its like poles near each other as shown in the figure. Can you bring them closer? Why? This principle of repulsion is used in Maglev Trains. Stick an image of a frog on the upper ring magnet. Press the upper ring and release. What do you see? Make such interesting devices and demonstrate them in your class.



4. Magnetic Force Through Liquids

Does magnetic force pass through liquids? Do an activity to understand this. Take equal amounts of water, kerosene coconut oil and palm oil in four identical, small glass vessels respectively. Put three or four pins in each vessel. Cover the glass vessel with a square glass sheet. Move a bar magnet over the glass sheet as shown in the figure. Record your observation and discuss in your class.

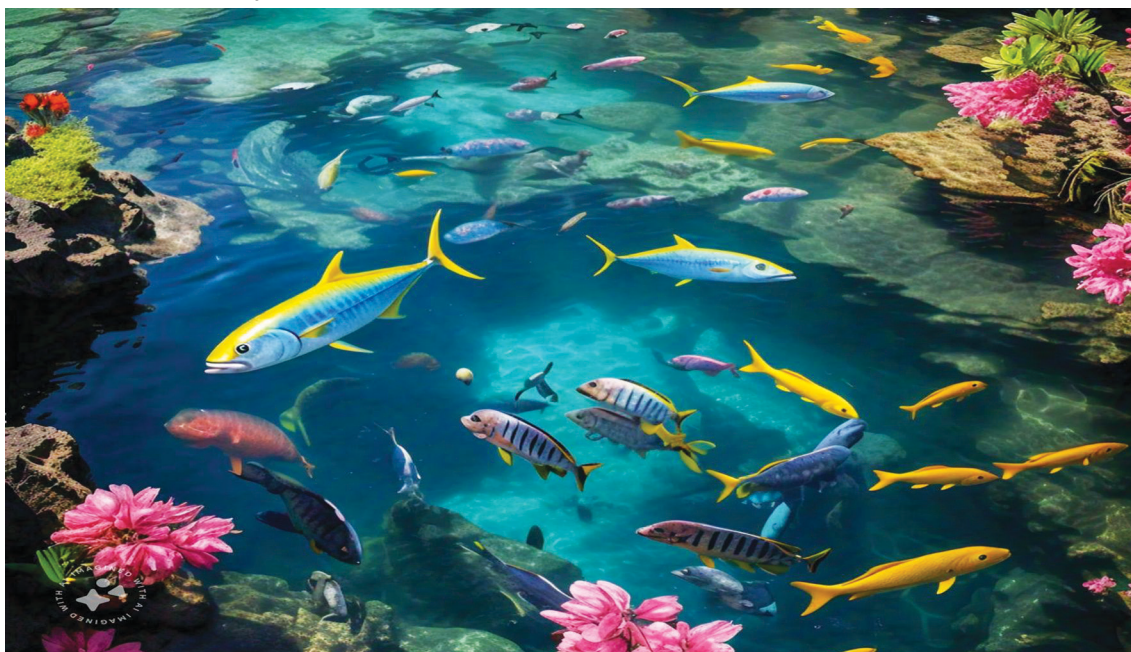


3

Let's Stand Straight



Haven't you noticed that there are different kinds of fish in the water bodies near your school or home? Your home or school might have an aquarium, right? It might also have many varieties of colourful fishes, doesn't it? A picture of a pond is given below. See how beautiful the fishes in it are! Observe each fish carefully.



Are all fishes the same? How are they different from each other?

◆ Shape

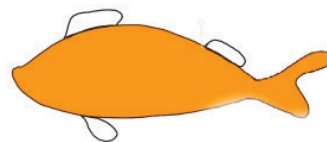
◆

◆

Shall we make a model of fish? What are the materials required for this?

Share your ideas.

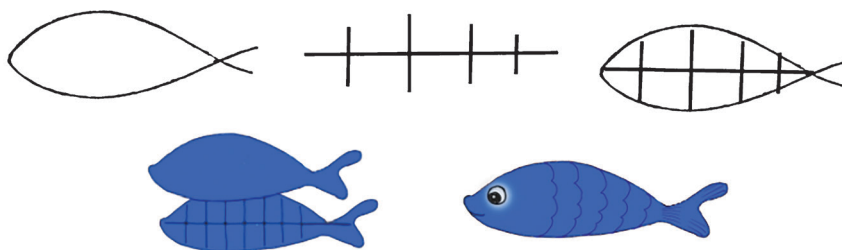
Cut two pieces of fabric in the shape of a fish to the size of your palm. Make the fish beautiful by sticking buttons or beads as its eyes.



Now, hold the tail portion of the fish and try to make it stand upright. Does the fish stand straight?



Next, use midribs of a coconut palm to create shapes as shown in the picture. Use glue or thread to join the palm ribs. Stick the fish shaped pieces of fabric on both sides. Don't we have a beautiful fish now?



Now, hold this fish by its tail portion and make it stand straight. Didn't you succeed? What could be the reason for this? Discuss.

In the table given below, write down the features you observed, when you tried to make both the fishes stay straight by holding their tail portions.

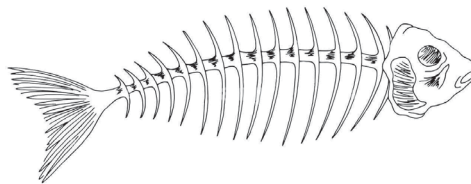
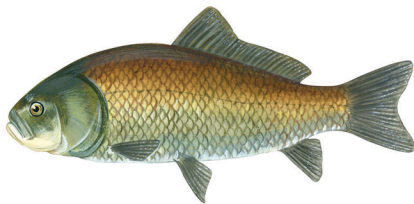
Fish made with fabric	Fish made with fabric and palm ribs

Fabric pieces were used in both instances. Then why is it that only the second fish you made stood straight? Palm ribs were used to make the second fish. What could be the reason for that?

- ◆ To give a shape
- ◆
- ◆

Inside the Fish

You must have observed real fish, haven't you? When you eat fish, don't you see the fish bones inside it? Don't they resemble to the part made with palm ribs in the fish you had made? Observe the picture and find out.

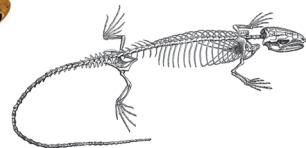
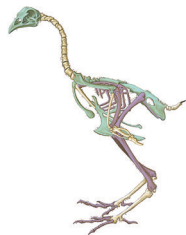


Do only fishes have such parts?



If there were no bones in the chicken, I could have eaten it fully.

Didn't you notice what the child had said? Haven't you noticed such strong bones while you eat chicken? Do all living things have such parts? Observe the pictures and find out.



Haven't you understood that other living beings also have similar parts? This is called the skeleton.

Skeleton

The skeleton is the framework of bones that provides support and shape to the body and protects certain internal organs.

Observe the pictures given below. These are the skeletons of various animals. Can you identify the animals to which these skeletons belong? Write down your answers.



.....



.....



.....

How could you identify the animal by observing the skeleton?

Wasn't it based on the shape? Haven't you understood that all the creatures you have observed have skeletons? Skeletons have weight, right? Then how are birds able to fly?

Skeleton of Birds

There are air cavities in the bones of birds. This makes their skeleton lighter compared to other organisms. This adaptation helps birds to fly.

Do you know the bird in the picture? Penguins cannot fly. Why is it that some birds cannot fly? Write your findings in the Science Diary. Find out and list the birds that can't fly.



◆ Penguin

◆

◆

Bones are inside us too

We also have bones inside our body, don't we? Touch and examine the different parts of your body like hands, legs, fingers, and head. Are all bones the same?



Which are the parts that have long bones?

Where are the short bones found?

The Human Skeleton

Skull, vertebral column, ribs, rib cage, bones of arms and legs and hip bones together form the human skeleton.

Read the information and observe the pictures provided below to learn more about the human skeleton.

Skull



You must have seen this picture in many places. The skull is made up of 22 bones. Among these, there is only one movable bone. Can you identify which one it is? Examine which bone moves while chewing food.

Write down the name of the major organ protected inside the skull. Apart from this, the skull also provides protection to sensory organs such as the eyes, ears, nose, and tongue.

You know that even minor injuries to the brain can cause severe health issues. Observe the picture of the skull to understand the importance given by the human body to the protection of brain.

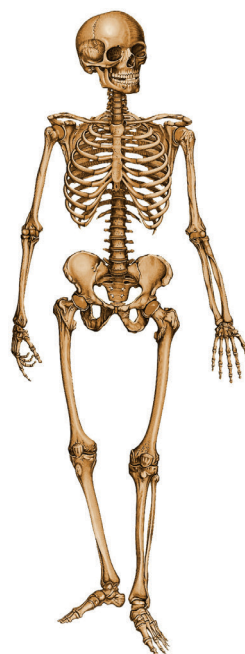
Helmet: The Shield of Life

Pay attention to the news report:

Thiruvananthapuram: The Motor Vehicles Department has directed the police to ensure that both riders and pillion riders wear helmets and strictly follow traffic rules. The department also instructed that fine be imposed on those riding two-wheelers without helmets.

Don't you wear a helmet while riding a scooter or other two-wheelers?

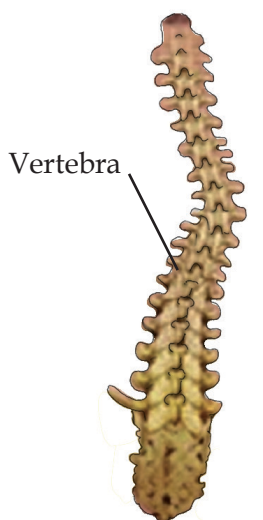
Can you explain the need for wearing helmets while riding two wheelers? Discuss in the class and write it in your Science Diary.



Human skeleton



Vertebral Column



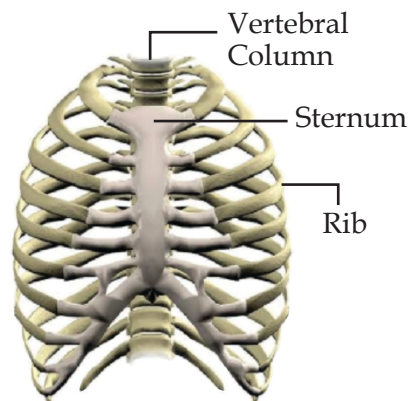
Vertebral column

Where is our vertebral column found? Check yourself and find the location of the vertebral column.

The vertebral column is a series of bones that help the body stand straight and move. The bones in the vertebral column are called vertebrae. The vertebral column consists of 33 vertebrae. Observe the picture to understand how orderly these vertebrae are arranged. The spinal cord, which is an important part of the nervous system passes through the vertebral column. Hence, it acts as a protective shield of spinal cord. If the vertebral column is severely damaged, it will be difficult to stand or walk.

Ribs

Where are the ribs located? Try to feel it yourself. There are 12 pairs of ribs in the human body. The ribs enfold and protect the heart, lungs, and some major blood vessels. The ribs are connected to the vertebral column at the back and to the sternum in front.



You have understood a few things about the skull, vertebral column and ribs. Now, answer the following questions and write them in your Science Diary.

- ◆ How many bones are there in the skull?
- ◆ Among the bones in the skull, which one is capable of movement?
- ◆ How many vertebrae are there in the vertebral column?
- ◆ Which is the protective covering of spinal cord?
- ◆ What is the main function of vertebral column?
- ◆ Which bones protect heart and lungs?
- ◆ Which are the major organs protected by the skull?

Aren't there any other bones in different parts of the body apart from the ones you have recognized? Let's discuss.

Bones in Arms and Legs

How many bones are there in each human arm? Observe the picture of the bones in the human arm. Each human arm has 32 bones.

Humans have the ability to stand on two legs. Bones in the legs are stronger than those in the arm. Why is it so? Discuss and share your inference with the class. There are 31 bones in each leg of the human body. Which is the longest bone in the human body? Observe the picture and write it down.

The longest bone in the human body :

Do the arms have more mobility than the legs? Move both your arms and legs and find out.

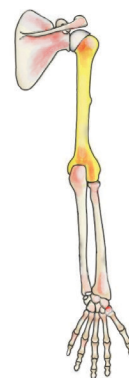
Observe the skeleton in your school laboratory and identify the bones in each part of the body. Understand the peculiarities of different bones.

At birth, our body has about 300 bones. As we reach adulthood, many of these bones fuse together and the number reduces to 206. Make a list of the number of bones found in each part of the human body. Calculate the total number of bones in the human body.

Part of the body	Number of bones	Part of the body	Number of bones
Vertebral column	33	Sternum	1
Both arms		Ribs	
Both legs		Skull	
Total			

You have now understood more about the skeleton. Bones are responsible for the production of blood cells and the storage of minerals. Consolidate the functions of bones and write them in your Science Diary.

- ◆ The skeleton gives shape to the body.



Bones in the Hand



Bone in the Leg

Cartilages

Examine your ears and nose. Do they feel as strong as the bones in your arms and legs? Can't you bend them? Why is it possible? What type of bone is present there? Let's discuss.

Cartilages are flexible parts which provide support and strength to the body like bones. They are softer than bones and are found in both the human body and the bodies of other animals. Primarily, cartilages are found in the ears, nose, elbows, knees, ankles, trachea and the discs between the vertebrae.

Joints

Can't we bend and straighten our arms, legs and fingers easily? How is this possible?

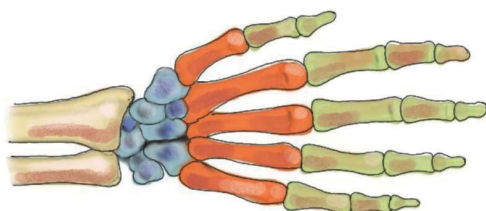


Figure 1

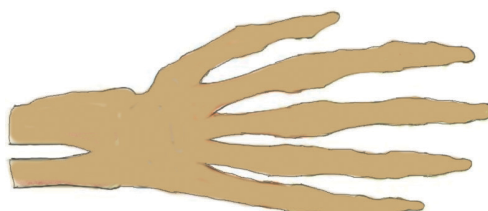


Figure 2

The picture of the bones in the human hand (Figure 1) and a model made of cardboard (Figure 2) are provided above. Carefully observe the figures and identify the differences between the two figures in relation to the movement of the hand.

Figure 1 :

Figure 2 :

What if our hand was like the one in figure 2? Let's do an activity. Take thin pipes used for wiring and put it on your fingers as shown in figure 3. Now, try writing in a book with that hand using a pen. Are you able to write? What is the reason?

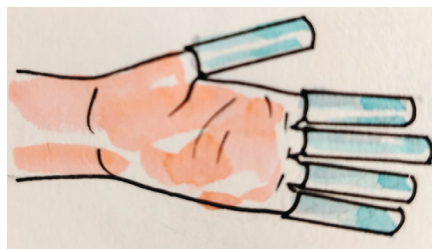


Figure 3

What if all the bones in our body were just a single bone? What difficulties would we face? Try to guess. We are able to move our bones because we have joints.

Joint

A joint is the part where two or more bones meet. There are different types of joints in our body. Some joints are movable and some immovable.



Elbow

Hinge Joint

Like the hinges in a door or window, the bones in the elbow and knee can be moved only in one direction. This type of joint found in the elbow and knee are called hinge joint. Complete the table and discuss the locations and characteristics of hinge joints. Record them in your Science Diary.



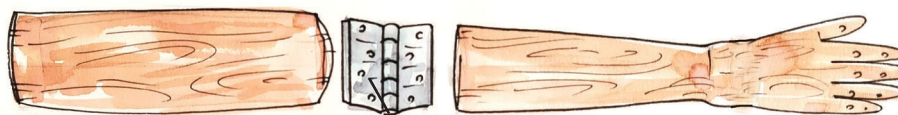
Knee

Joints	Part of Body	Characteristic
Hinge Joint		Like hinges, these can be moved in only one direction

Let's make a model of a hinge joint.

For this, let's do the activity in groups. The pictures and descriptions provided below can be used.

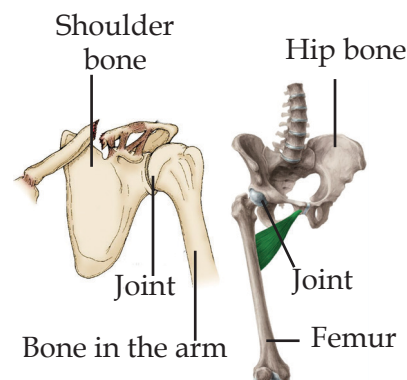
To make a hinge joint, make separate pieces of cardboard or multiwood in the shapes of the parts of a hand as shown in the picture. How can these two parts be joined? Write in your Science Diary how these parts can be joined using a hinge to make it movable. What are the similarities between the movement of the elbow and that of the model of the hand?



Hinges

Ball and Socket Joint

Is the movement of the shoulder joint similar to that of elbow and knee? Try moving your arms sideways. Can't the shoulder joint be moved in all directions? Try doing it. How is this possible?



Observe the picture and try to understand more about the movement of the shoulder bone and hip bone.

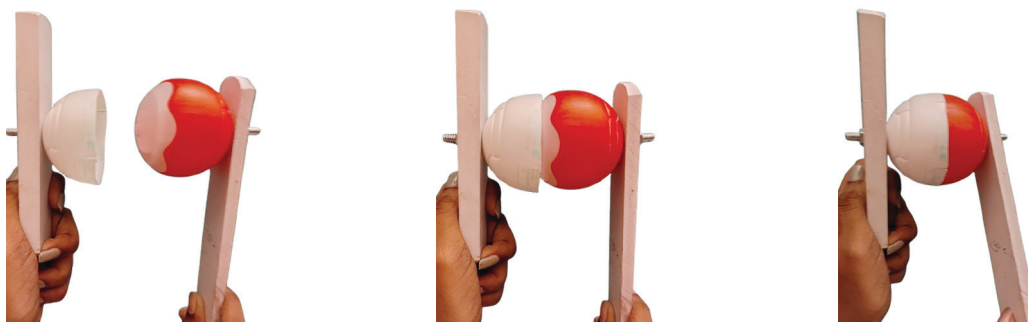
The ball and socket joint is the joint with maximum freedom of movement. It is arranged in such a way that the round end of one bone (ball) is able to rotate in the cavity (socket) of another bone. Therefore, it is called the ball and socket joint. This type of joint is found in the shoulder and hip. Identify the areas in our body where the ball and socket joints are found. Complete the table and write it in your Science Diary.

Joint	Part of the Body	Characteristics
Ball and Socket Joint		The joint with the maximum freedom of movement.
		The rounded end of one bone rotates in the cavity of another bone.

Let's make the model of the ball and socket joint. Make use of the materials provided for that.

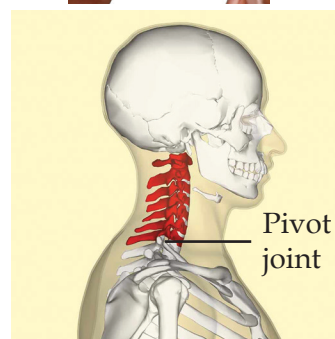
Materials : 2 ice cream balls (big - 1, small - 1), Wooden scale - 2, Nuts and bolts - 2 each

Cut off a small part of the big ice cream ball in such a way that the small ice cream ball remains fitted inside it. Fix the two ice cream balls on the wooden scales using nuts and bolts, as shown in the picture. Hold the scale with the large ice cream ball in one hand and try rotating the scale with the small ice cream ball. Doesn't it resemble the shoulder movement?



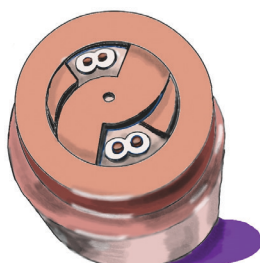
Pivot Joint

What is the peculiarity of the neck joint? Try moving the neck. Aren't you able to move it forward, backward, towards left, and right? How much can it be rotated? This type of joint is called a pivot joint. Observe the table showing the body parts where pivot joints are found and their characteristics.



Joint	Part of the Body	Characteristic
Pivot joint	Neck	A bone that moves forward, backward and side-to-side in another bone.

Let's make a model of the pivot joint with your friends.



Powder tin

To make a model of the pivot joint, take a powder tin as shown in the picture. Have you noticed the lid of such a powder tin? How does the lid move? Does it have any similarity with the movement of our neck? Fix the head of a doll on the lid of the powder tin for making a model of the pivot joint. Just as we turn our neck sideways, can't the doll's neck also be turned?



List out the three types of joints in our body and their characteristics, in the table. Present it before the class. Record it in your Science Diary.

Fracture

Look at the right arm of the child in the picture. What happened? Have any of you faced such problems? Why is it necessary to keep it bound in such a way?



X - ray sheet

Haven't you seen an X-ray sheet like the one in the picture? Which part of the body is shown in the picture? Does the bone in the picture have a fracture or crack?



Fracture

A fracture is the breaking or cracking of a bone. Fractures can occur in three ways. A simple fracture occurs when the bone cracks, breaks or dislocates. The fracture in which the bone breaks and comes out piercing the muscles is called a compound fracture. Here wounds may also occur along with the fracture. A compound fracture that occurs near the internal organs is a complicated fracture. In such cases, the bone breaks and causes injury to the internal organs.

Prepare a note on different types of fractures and present it before the class. Discuss the situations in which fractures or cracks can occur.



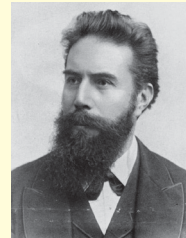
For Further Reading

X - Ray



X-ray sheet

X-ray was discovered in 1895 by Wilhelm Conrad Rontgen a German physicist. It was Rontgen who took the photographic image of the bones in the human hand using X-ray. X-rays can pass through the muscles but not through the bones.



W C Rontgen

How can we understand if there is a fracture?

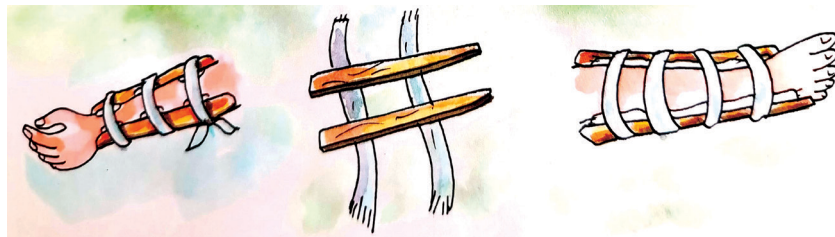
- ◆ Pain in the injured area.
- ◆ Difficulty in moving the injured part.
- ◆ Differences when compared with similar parts.

If these symptoms are present first aid should be given immediately.

First Aid

What is the first aid that should be provided to someone with a fracture? What happens if the fractured part is moved or shaken? How can we keep it immobilized? Share your ideas.

The injured part should be kept immobilized. For that, the injured part can be bandaged using a splint. The splint should be made with a strong plate of wood, metal or plastic. Do not try to move the injured part. A person with a bone fracture should be taken to the hospital immediately after giving first aid.



Observe the picture and understand how to fix the splint. In emergency situations do this with the help of adults.

Act out the following scenario in groups in the class.

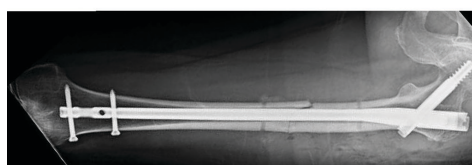
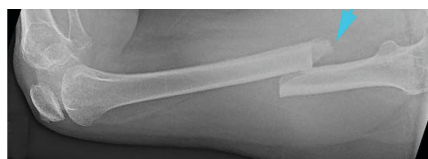
"A child falls while playing, severe pain in the leg; examination of the fracture; giving first aid; hospitalisation".

Let the groups assess each other's performance.

Listen to the doctor.



Fracture is there. Metal rods are to be fixed.



Metal rod is fixed on to the fractured portions using screw

Why do we use the metal rod for fixing a fractured bone? Usually the fractured part is properly joined and fixed by screwing on metal rods. This helps the bones to stay stable and heal quickly.



For Further Reading

Knee Replacement

Weight gain and decreased calcium in the bones can cause wear and tear of the knee. Knee pain also occurs with aging. After a medical examination of the joints, the process of removing a diseased or worn-out knee bone and replacing it with an artificial knee consisting of ceramic, metal, and plastic components is called Knee replacement. It can work effectively up to 20 years. One may experience some minor discomfort in the replaced knee after replacement surgery. It can be solved with medication and physiotherapy.

For Bone Health

You have learned about nutrients in the lesson 'Food for Health'. Which minerals are essential for healthy bones? From which foods can these be obtained? Discuss.

List the nutrients and nutrient rich foods that are necessary for the health of bones and teeth.

Nutrients for healthy bones and teeth	Nutrient-rich foods

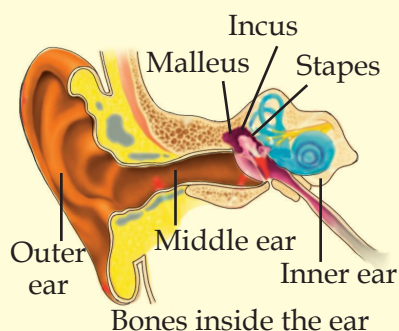
Haven't you understood why milk and eggs are served in your school? They are essential for the health of your bones.



For Further Reading

Bones Inside the Ear

Our ear has three parts. It has three small bones in the middle ear. These are the malleus, incus and stapes. They are capable of vibration. We hear sounds due to their vibration. When they vibrate, sound is transmitted from the outer ear to the inner ear. The stapes is the smallest bone in our body. Femur is the largest.



Skeleton Outside the Body



So far, we have been discussing organisms with skeleton inside their body. Are there animals whose skeletons are seen outside their bodies? Which is the animal seen in the picture? Have you observed where its skeleton is situated?

Observe the pictures of the animals given below. Do they have skeletons? Where are their skeletons found? Inside or outside the body? All these animals have a skeleton outside their body. Identify and write their names.



.....

.....

.....

.....

.....

How does the outer skeleton benefit these organisms? They help to protect and give shape to their body and offer protection from enemies.

Exoskeleton and Endoskeleton

Snails, some types of beetles, mussels and crabs have thick outer covers. Organisms such as millipede, centipede, cockroach and prawn have relatively thin shells. Such coverings outside the body are called exoskeleton.

Animals such as cats, frogs, mice, cows and humans have skeletons inside their body. This is the endoskeleton.

Can both exoskeleton and endoskeleton be found in the same organism? What kind of skeleton is found in crocodile and turtle? Guess. Observe the pictures.



Haven't you understood that animals like turtles, crocodiles and alligators have both endoskeleton and exoskeleton.

Classify some familiar organisms into those having endoskeleton, exoskeleton, and both.

Organisms with endoskeleton	Organisms with exoskeleton	Organisms having both exoskeleton and endoskeleton

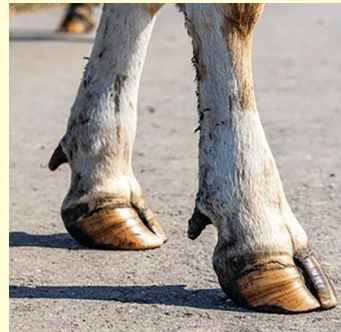


For Further Reading

Exoskeleton



Most invertebrates have an exoskeleton. The largest number of living beings with exoskeletons are insects. The exoskeleton may be shed over a period of time. Organisms with endoskeleton have some parts similar to exoskeleton. Examples include scales of fish and reptiles, feathers of birds, hair nails, horns, and hooves of animals.



Wonders from Exoskeleton

Observe the pictures below. Haven't you seen such handicrafts? All of these are made from the exoskeletons of various dead organisms.



Make crafts using these types of exoskeleton of mussels, clams and conchs available around you and display them at home and in the class.

Let's Assess

1. Which of the following is not a function of the skeleton?

- ◆ Gives shape
- ◆ Gives stability
- ◆ Provides protection
- ◆ Gives energy

2. Draw and match the correct ones.

Ball and socket joint

Can move only to one side

Hinge joint

One bone rotates on the other to both sides

Pivot joint

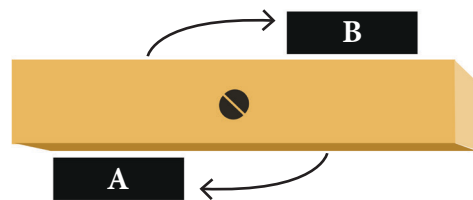
The round end of one bone rotates in the cavity of another bone

3. Which food items should be included in the diet for healthy bones?
4. Your friend fell down during a football game and fractured his arm. What first aid would you give?

Extended Activities

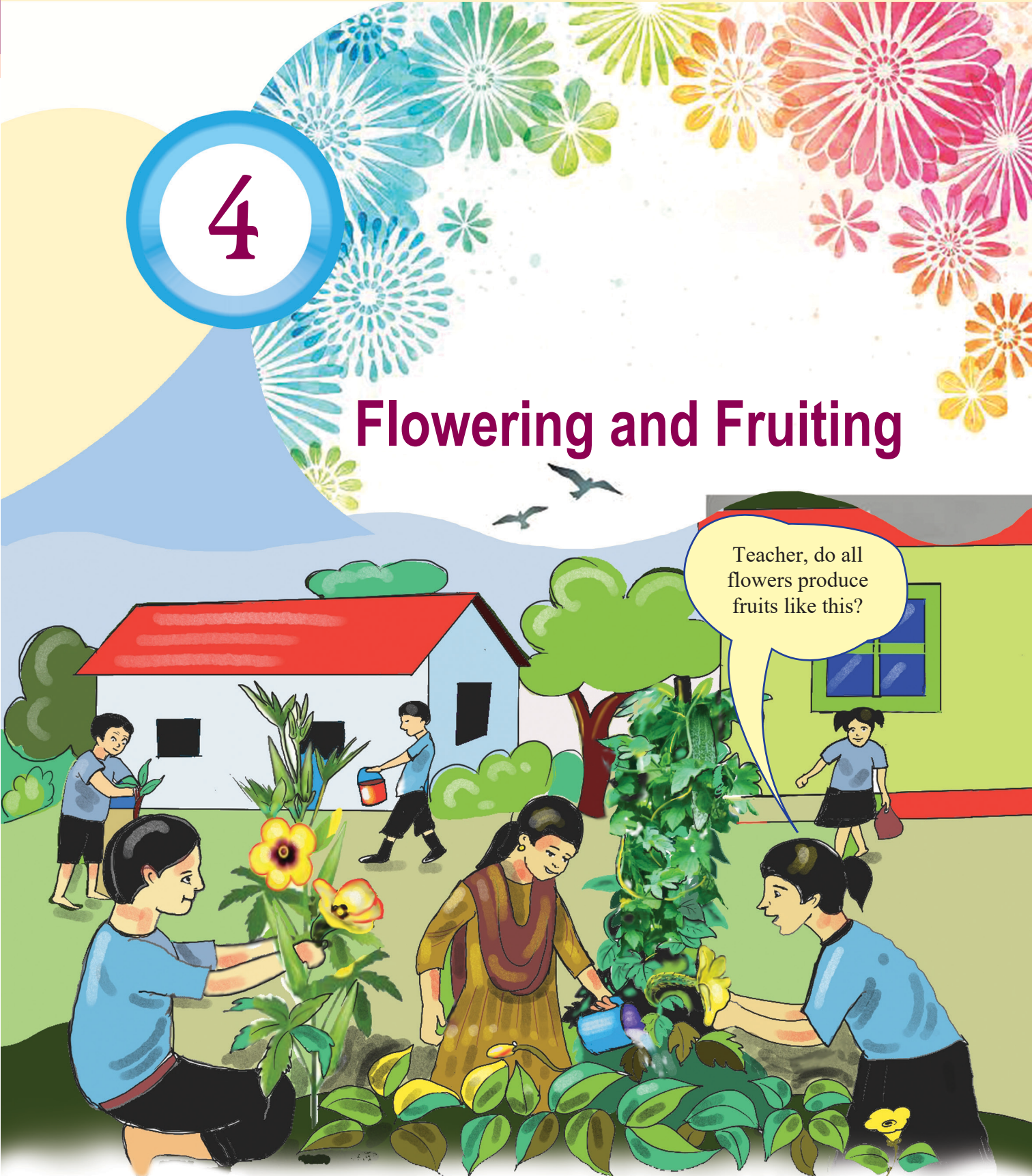
1. Haven't you ever seen variety of insects and beetles with colourful exoskeletons? Collect pictures of such organisms and prepare a digital album.
2. Observe animals and see how they can move their body parts.
3. Let's construct a pivot joint.

Take a wooden block of 15 cm. Secure it to a table with a screw as shown in the picture, so that it can be turned in any desired direction. Fix the stoppers - A and B on both sides above and below the ends of the piece of wood as shown in the figure. Try turning the wooden block. Don't you see a movement similar to that of a pivot joint.



4

Flowering and Fruiting



Teacher, do all flowers produce fruits like this?

Have you noticed the children's doubt? What is your opinion? Write in the Science Diary.

Some of the flowers seen around you are given in the picture below. Which of these flowers can you identify? Identify the flowers in the picture along with your friends and note them.



◆ Mukkutti

◆

◆

◆

You know that all flowers are not similar. In which ways are they different? Observe the flowers around you. Identify their diversity and complete the list.

Name	Colour	Fragrance	Single flower/ Inflorescence	No. of Petals
Rose	Red	Have smell	Single flower	Many petals

You have noticed that the different flowers you observed differ in colour, smell and number of petals.

Do flowers have only petals? Are there no other parts? Observe them. Are the parts the same in all the flowers you have observed?

Parts of flowers

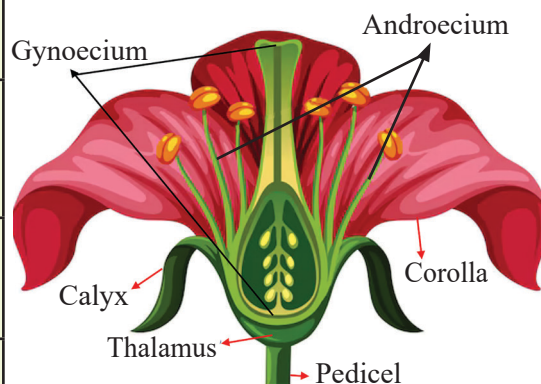
Let's learn more about the parts of flowers. Observe a Shoe flower. Which all parts can you identify? Label those parts in the figure given below.



Shoe Flower

The main parts of a flower are given in the table below. Analyze the table and make a note on the main parts of a flower and their functions. Present it in the class.

Parts	Functions
Pedicel	Attaches the flower to the stem.
Thalamus	Provides the seat for other parts of the flower.
Calyx	Formed of sepals. Protects the flower bud by covering it.
Corolla	Formed of petals. Gives beauty and charm to the flower
Androecium	Formed of stamens. Male reproductive part of the flower.
Gynoecium	Female reproductive part of the flower. Gynoecium consists of one or more carpels.



After analyzing the table, you have understood that all the parts of the flower have different functions.

Copy the table on a chart paper and display it in the class.

Let's Observe and Learn

Let's observe each part of the flower closely. What are the materials required?

Materials required: Different types of flowers, hand lens, forceps and a sheet of white paper.

Observe each flower with a hand lens. Can you see all the parts given in the table? Carefully separate the parts of a flower you have observed and display it on a sheet of paper.

Prepare a longitudinal section of gynoecium with the help of your teacher and observe it using a hand lens. Do you see the four parts, namely sepals, petals, androecium and gynoecium in the flower you displayed? Record the findings in the Science Diary.

Complete Flower

Calyx, Corolla, Androecium and Gynoecium are the four main parts seen in a flower. A flower with all these four parts is a complete flower.

Let's do a Project

Are all flowers complete flowers?

Observe the different types of flowers in your home and school.

Record the observations in the table below.

Flower	Pedicle	Thalamus	Sepal	Petal	Androecium	Gynoecium

Analyze the list. What are your assumptions?

Prepare a report and present it in the class.

Non-flowering Plants

Do all plants flower? Are there non-flowering plants in your home and surroundings? Observe and find out.

Don't you know that there are flowering plants as well as non flowering plants in the plant world? Observe the picture and understand which are the non flowering plants.



Pine



Cycas



Ferns

Apart from these, small plants like algae also do not flower.

Visit your school garden and find out which plants are non-flowering and record it.



For Further Reading

Neelakkurinji (*Strobilanthes kunthiana*)

Neelakkurinji is a shrub that beautifies the Western Ghats with its blue flowers. They grow in the grasslands and Shola forests at an altitude of 1200 meters above sea level. Neelakkurinji is only one among the various species of Kurinji found in the Western Ghats. They flower once in every twelve years. Their flowering season is from August to October.



Functions of Flowers

What are the benefits of flowering in plants?

Analyse the illustration below and write in your Science Diary, how flowers benefit plants.



- ◆ Fruit is formed from flower.



Fruit and Seed

From the illustration, you have understood that the fruit is formed from the flower and a new plant arise from the seed within the fruit.

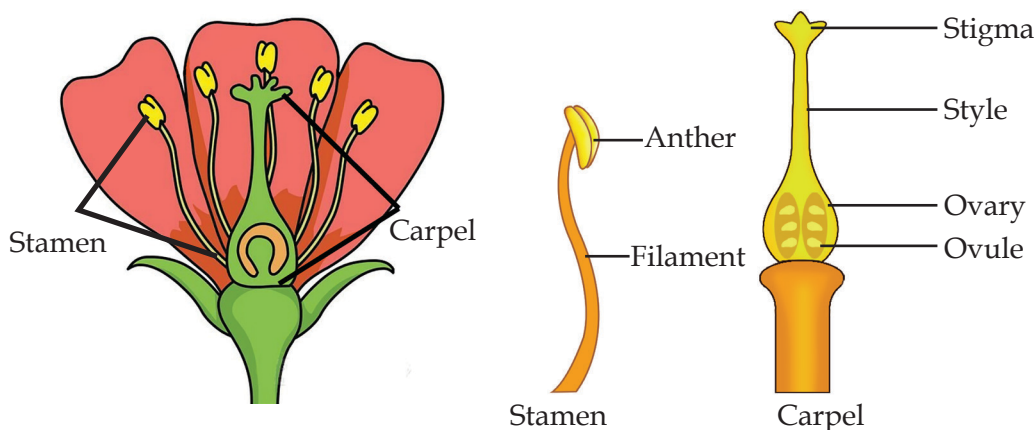
How does a flower produce fruit and seed?

Fruits and seeds are produced from flowers through reproduction. Which are the reproductive parts of a flower? List them using the information learned so far.

Male reproductive organ :

Female reproductive organ :

Look at the pictures below and understand the parts of a stamen and carpel.



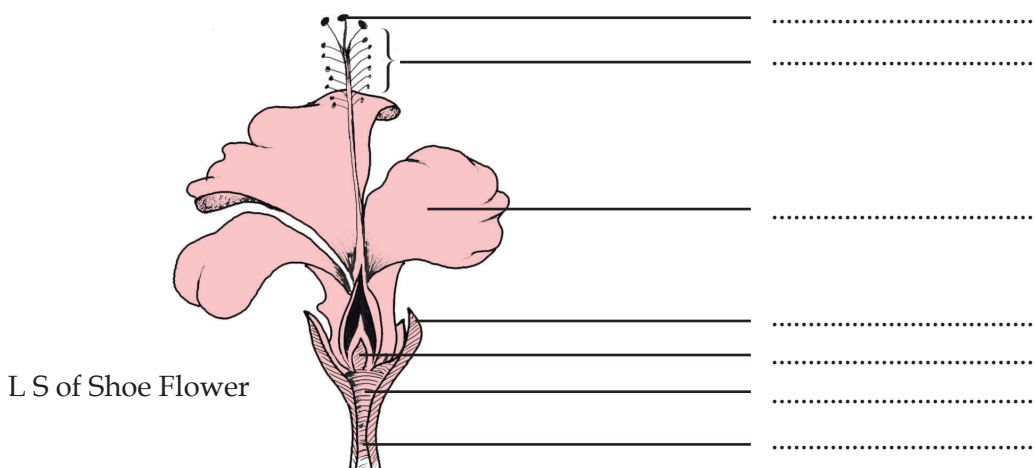
Observe the androecium and gynoecium of a shoe flower using hand lens/ microscope.

Androecium: Androecium is composed of stamens. Stamens have parts called filament and anther. Pollen grains are present in the anther chambers. Pollen grains contain male gametes.

Gynoecium: Gynoecium is the female reproductive part of a flower. The carpel consists of stigma, style and ovary. The egg or female gamete is found within the ovule in the ovary.

- ◆ Which are the parts of a stamen?
- ◆ Where are pollen grains found?
- ◆ Which are the parts of the carpel?
- ◆ Where is female gamete seen?

You have identified the parts of gynoecium and androecium. Given below is a picture showing the longitudinal section of a shoe flower. Label the parts on it.



Draw the L.S of Shoe flower in the Science Diary and label the parts.

Can a flower have more than one ovary? What is your guess?

Examples of flowers having multiple ovaries in a single flower are - champak, lotus, custard apple and *Polyalthia*.

Male and Female Flowers

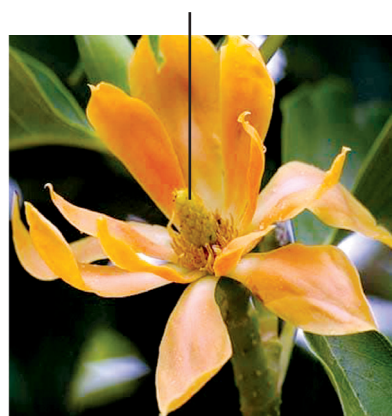
Are there male and female flowers?

Let's do an activity in groups to find out whether androecium and gynoecium are found within the same flower in all the flowers you have observed.

Materials required: Flowers of lady's finger and pumpkin, hand lens

Observe the flowers of lady's finger and the pumpkin. Find their androecium and gynoecium. Are androecium and gynoecium found in the same flower in both of these? How do the two flowers differ in this regard?

Ovaries



Champak flower



Lady's Finger flower



Pumpkin flowers

List your findings.

Flower	Observations
Lady's finger	Androecium and gynoecium are found in the same flower.
Pumpkin	

Analyze the table.

In some flowers, androecium and gynoecium are found in the same flower. But there are plants in which androecium and gynoecium are seen in separate flowers. Haven't you understood this from the table?

Male flowers are flowers with androecium only.

So, what is a female flower? Discuss.

Can male and female flowers be called unisexual flowers?

Are the flowers of pumpkin unisexual? Discuss and write in the Science Diary.

You have found that in a lady's finger flower the androecium and gynoecium are both present in the same flower.

Is the lady's finger flower unisexual or bisexual? Why? Discuss and record the assumptions in the Science Diary.

Unisexual and Bisexual Flowers

Flowers which possess either androecium or gynoecium are unisexual flowers. Bisexual flowers have both androecium and gynoecium in the same flower.

Observe the flowers around you and find out the unisexual and bisexual flowers. Write your findings in your Science Diary. Present in the class

Unisexual Flowers	Bisexual Flowers
Bitter gourd	Shoe flower

Discuss which type of flowers are more among the ones you have observed- unisexual or bisexual?

Male and Female in plants too!

Are there plants with only male flowers and plants with only female flowers? Discuss. There are plants with only male flowers and plants with only female flowers around us. Plants with only male flowers are called male plants and plants with female flowers only are called female plants.

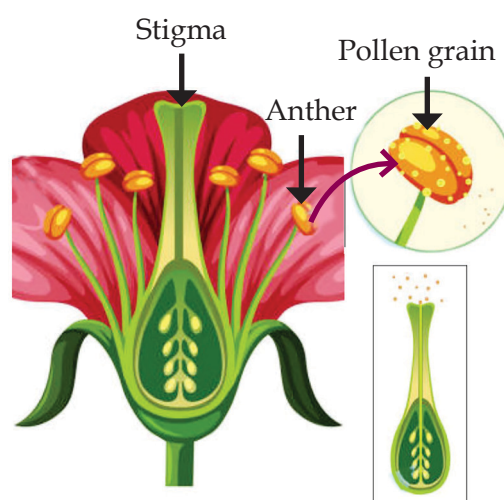
Dioecious and Monoecious Plants

If the male flowers and female flowers are found in different plants, such plants are called dioecious plants. Examples of dioecious plants are date palm, malabar tamarind, nutmeg and papaya. Monoecious plants have both male and female flowers in the same plant. Cucumber, pumpkin, ash gourd, snake gourd, coconut etc. are monoecious plants.

Find and write more examples of dioecious and monoecious plants.

You have discussed about the reproductive organs in flowers and their functions. Shouldn't the male gamete and the egg fuse for the flower to produce a seed? How is this possible?

You know that the male gamete is found in the anther and the egg, in the ovary. Don't the pollen grains need to reach the stigma of the gynoecium for the male gamete and the egg to fuse? How does this happen?



Pollination

Transfer of pollen grains from the anther to the stigma is pollination.

Friends of Flowers

Observe the given pictures.



What are the reasons for insects and birds getting attracted to flowers? Write down your guess.

How do flowers benefit when they collect honey from the flowers? Do they help to pollinate flowers? Discuss.

What factors help in pollination? You know that insects and birds help in the process of pollination. These are pollinators.

Are insects and birds the only pollinators?

Besides living beings, which are the other pollinators?

Observe the pictures below and identify the pollinators.

We require water for pollination



Black pepper.....



Rice.....

For us, pollination takes place with the help of wind. It is possible because we have lots of lightweight pollen grains.

Do plants pollinated in this way require factors such as colour, nectar, and fragrance to attract pollinators? Record your assumptions in the Science Diary.

Which are the pollinators you have come to know about so far?

◆ Insects

◆

◆

◆

Formulate a definition for pollinators.

Self pollination and Cross pollination

Observe the figures and understand the different methods by which pollination is made possible..



Figure 1



Figure 2

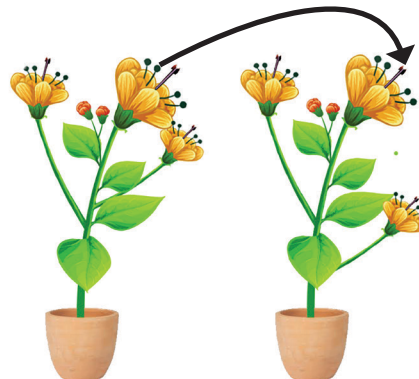


Figure 3

In the first figure, aren't the pollen grains of a flower falling on the stigma of the same flower? What happens in the second figure? What about the third figure? Discuss and write.

Figure 1 : Pollen grains transfer to the same flower.

Figure 2 :

Figure 3 :



For Further Reading

Vanilla

Vanilla is a spice cultivated in our country. It is a plant native to South America. Vanilla is pollinated by a type of bee. But since this bee is not seen in our place, the farmers produce seeds by artificially pollinating the flowers.



Self-Pollination and Cross-Pollination

Transfer of pollen grains to the stigma of the same flower or the stigma of another flower of the same plant is self pollination.

Cross Pollination is the transfer of pollen grains from one flower to the stigma of a flower of another plant of the same species.

In the figures you have observed in which flowers does self pollination take place? In which flower does cross pollination take place? Find and write.

Analyse the given statements regarding pollination. Put (✓) mark against the correct one.

In dioecious plants, only cross pollination takes place. ☐

In monoecious plants, only cross pollination takes place ☐

Both self pollination and cross pollination take place in bisexual flowers. ☐



For Further Reading

Nature Which Encourages Cross-Pollination

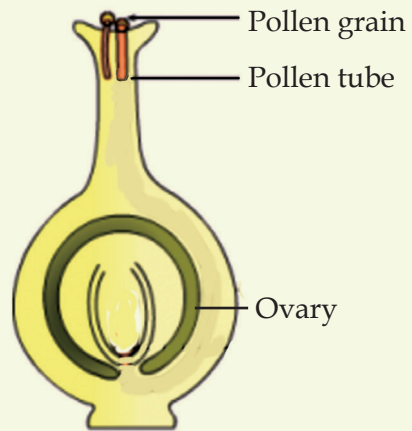
Nature itself prevents self pollination and encourages cross pollination to produce better and more diverse varieties of plants. In the flowers of some plants the male and female reproductive organs mature at different times. For example, in sunflower, the development of the gynoecium is completed only after the stamen has reached full maturity. In Avocado, the development of gynoecium and stamen are completed at different times. Stamens and gynoecium are situated in opposite directions to prevent self pollination in *Gloriosa*.

After Pollination

What happens to pollen grains after pollination? Write the processes that take place after pollination by analysing the given note. Make use of the discussion points also.

Fertilisation

After pollination, the pollen grain grows down through style towards the ovary in the form of a tube. Male gamete reaches the ovary through this tube and fuses with the egg. The process of fusion of male gamete and egg to form zygote is called fertilisation.



Discussion Points

- ◆ What happens to the pollen grain after pollination?
- ◆ How does the male gamete reach the ovary?
- ◆ What is fertilisation?
- ◆ By which name is the fertilised egg known?

After Fertilisation



The picture shows the changes in the tomato flower after fertilisation. Analyse the pictures and find out the changes that occur to the parts mentioned below. Discuss and write.

- ◆ Petals - Wither off
- ◆ Sepals -
- ◆ Pedicel -
- ◆ Ovary -
- ◆ Androecium -

Do the same changes occur in all flowers you have observed.

After fertilisation, the zygote becomes the embryo, the ovule becomes the seed, and the ovary becomes the fruit.

Fruits

It is understood that the ovary develops into fruit after fertilisation. Is there any relation between the number of ovaries and the number of fruits? Observe the picture.

A bitter gourd flower has only one ovary. So how many fruits are formed from it? Observe the picture and find out.



Bitter gourd flower

Like bitter gourd's flower, the flowers of mango, lady's finger, pea, papaya etc. also have only one ovary.

A simple fruit is a fruit that is formed from a single flower. Can you find more examples of simple fruits? If a flower has more than one ovary, can it produce more than one fruit? There is more than one ovary in the custard apple flower.



Custard apple flower



Custard apple

Haven't you realized that if a flower has more than one ovary, it will produce more than one fruit? A fruit that develops from a single flower with multiple ovaries is called an aggregate fruit. Custard apple is an aggregate fruit.

Find more examples for aggregate fruits and write them in your Science Diary.



For Further Reading

Seedless Fruits

In some cases, the ovary develops into fruit without fertilisation. Such fruits do not have seeds. This phenomenon is known as Parthenocarpy. Seedless fruits may



Pineapple



Banana

occur naturally. They are also made artificially. Banana and pineapple are natural seedless fruits. We have artificially developed seedless varieties of grapes, tomatoes and watermelons.

Inflorescence

Have you observed fruiting of inflorescences?



Inflorescence in mango tree



Inflorescence in banana plant





Inflorescence of jackfruit tree

Have you noticed that each flower of the inflorescence in mango tree turns into a mango? In the inflorescence in banana plant also, each flower becomes a fruit. But does this happen in the inflorescence of jackfruit tree? Discuss your finding.

The fruits formed from the inflorescences of mango tree and banana plant are seen as separate fruits. But fruits formed from the inflorescence of jackfruit tree combine to form a single fruit. Fruits formed from an inflorescence are combined together to a single fruit. Such fruits are called multiple fruits. Pineapple, wild jackfruit and breadfruit are multiple fruits.

Pseudo Fruits

Do all the fruits that we see develop from ovaries?

How about a cashew fruit? Observe the pictures.



Which part of cashew looks like a fruit? How is cashew different from other fruits? Discuss.

In normal flowers, the ovary develops into fruit. Sometimes, parts of the flower other than the ovary also become fruit. These are pseudo fruits. In cashew the pedicle develops into fruits. Find more examples for pseudo fruits.

Haven't you eaten apple and sabberjelly? These are also pseudo fruits. Their thalamus grows and become fruits. Don't you understand why they are called pseudo-fruits? Classify and tabulate the following fruits and present them in the class.

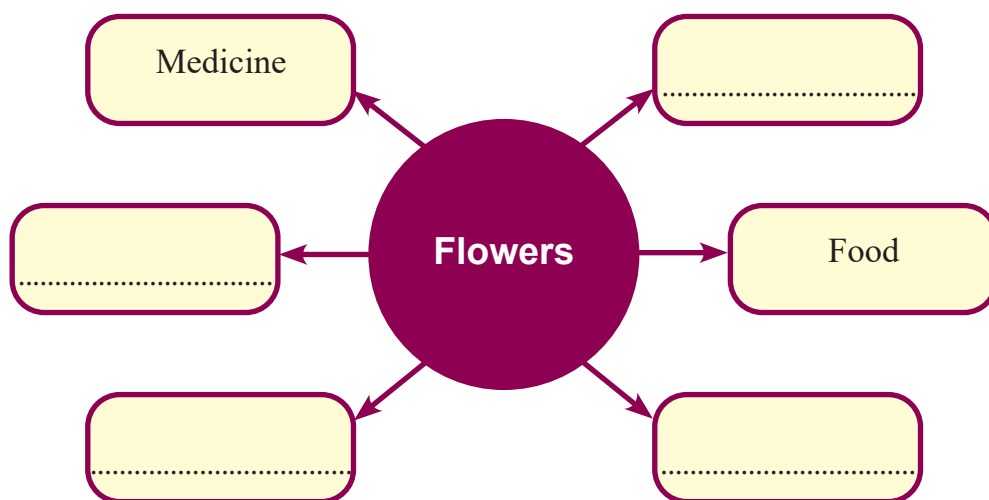
Mango, Pineapple, Papaya, Custard apple, Cashew apple, Strawberry, Guava, Rose apple, Polyalthia fruit, Apple, Breadfruit.

Simple fruit	Aggregate fruit	Multiple fruit	Pseudo fruit
Mango			

Expand the list by finding more examples of each.

Floriculture

How to flower benefit us? Are they useful only in pleasing our eyes? Complete the word sun given below. Discuss the uses of flowers, make notes and present it in the class.



Check your school's biodiversity garden for flowering plants with different uses. If there are no such plants, do enrich the garden by including them.

Isn't it profitable to grow flowers commercially?



Have you visited places where flowers are cultivated? How beautiful is it to see the gardens with different coloured flowers!

Floriculture

Flower farming or floriculture is the process of developing, growing and nurturing flowering and ornamental plants commercially.

What are the benefits of farming flowers? Discuss.

Which are the commercially grown flowering plants?

◆ Rose

◆

◆



For Further Reading

Anthurium

Anthurium is an important plant in floriculture. The most attractive part of it is the modified leaves. Such coloured parts found near the flower are called Bracts. The function of bracts is to attract pollinators. Attractive bracts are also seen in the banana and bougainvillea plants.



Haven't you understood that flowers are not merely wonderful sights which refresh our eyes, but they also have many other benefits as well?

Now, you have learned that the main function of flowers is to produce seeds and maintain the generation of plants. Let us conserve plants and flowers.

Let's Assess

1. Compare the flowers and fruits of mango, banana and jackfruit plants and write the differences.
2. Which of the following statements regarding coconut is NOT true?
 - a) It is a monoecious plant.
 - b) Coconut has separate male and female flowers.
 - c) Coconuts are produced from female flowers.
 - d) Androecium and gynoecium are present in the same flower.
3. Draw and match the correct ones.

Aggregate fruit

Single fruit formed from single flower

Multiple fruit

More than one fruit formed from a single flower

Simple fruit

More than one fruit formed from an inflorescence.
These fruits combine to be a single fruit

Extended Activities

1. Collect different kinds of flowers from your surroundings and prepare a flower carpet or organize a flower show in the class.
2. Flowers can be dried and preserved just like leaves in a herbarium. Select suitable flowers. Press them by keeping it inside a paper or book. Keep the flowers for about two weeks inside the paper. Display it in class.

5

Association of Substances



You might have guessed what the boy is talking about. What are the different items in this snack? Examine the snack and find out the items in it. Discuss in groups and make a list.

- ◆ Groundnut
- ◆ Fried gram

We use a variety of items like this in our daily life. You already know many items that are used for preparing food. Haven't you noticed that new substances are produced by mixing different items in the fields of agriculture, health, construction etc.? Observe the picture.

You are familiar with these substances, aren't you?



Concrete



Compost

Which are the substances used to make concrete?

◆ Cement

Which are the household bio-wastes used to make compost?

What are the peculiarities of concrete, compost and mixture? Aren't they made by mixing more than one substance? Discuss.

Pictures of two common home made dishes are given below. Observe them



Salad



Mango Pickle

Which are the ingredients usually used in salad and mango pickle?

Aren't the ingredients and their quantity important in making the food delicious?

Let's Prepare a Salad

Shall we prepare a delicious salad in the class? What are the ingredients required to prepare a salad? Discuss in groups and prepare a list.

Materials required:

◆ Onion

◆ Tomato

◆ Salt

◆

◆

◆

Now let's start making the salad.

Each group can take the necessary ingredients, make the salad and share it in the class. Each group should write the recipe of the salad that they have prepared. Present it in the class.

You have prepared the salad by mixing different substances in different ways. The food we eat daily is made up of many such substances. List more examples. Discuss on how to prepare a mango pickle. Write the recipe and present it in the class.

You have understood that concrete, compost, mixture, salad and mango pickle have more than one component. All these are mixtures. Similarly, there are many substances around us that are composed of more than one component. Find them and identify their components.

Mixtures

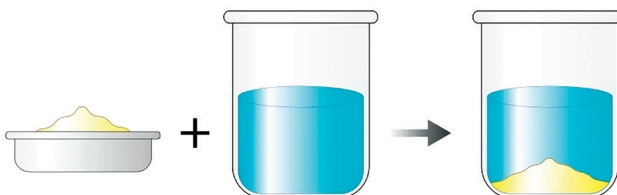
A mixture is a combination of more than one substance.

Let's Make Mixtures

Take the following materials from the Science Kit. How many mixtures can be made from them?

Materials required: Water, salt, sugar, chalk powder, lemon, blue vitriol, potassium permanganate, iron powder, rava, green gram, bengal gram, paddy, transparent vessels, glass tumblers, small vessels and spoons

Prepare different mixtures and display them in suitable containers. Name them appropriately. Tabulate the name of the mixtures made by each group and their components.



Mixture prepared	Components
Lime juice	

- ◆ Do all the ingredients in the mixtures you have prepared belong to the same state of matter?
- ◆ Which are the mixtures in which a solid is dissolved in a liquid?
- ◆ Are there any mixtures of two solids?
- ◆ Which are the mixtures with more than one solid dissolved in a liquid?

Discuss your findings in the class and note them in your Science Diary.

Mixtures with solid dissolved in liquid

- ◆ Salt water

◆

Mixtures of solids

- ◆ Rava mixed with salt

◆

Mixtures with more than one solid dissolved in liquid

- ◆ Potassium permanganate and salt dissolved in water

◆

Now let's find out more about mixtures.

- ◆ Mixtures in which all components are visible.
- ◆ Mixtures in which all components are not visible.

Record the findings in the Science Diary and present them.

Mixtures in which all components are visible.

- ◆ Chalk powder in water

◆

Mixtures in which all components are not visible.

- ◆ Salt solution



You have prepared many mixtures, haven't you? In which of these mixtures is one substance dissolved in another one? You have learnt that such mixtures are solutions.

You know that solutions are formed by dissolving a solute in a solvent. Find more examples for solutions. Tabulate them and present in the class. Discuss their components.

Solid-liquid solution	Liquid-liquid solution	Gas-liquid solution	Gas-gas solution
◆ Potassium permanganate solution ◆ ◆ ◆	◆ Vinegar ◆ ◆	◆ Soda water ◆	◆ Air ◆

Wouldn't you like to know more about different types of solutions?



For Further Reading

Diversity in Solutions

There are solutions formed by dissolving a gas in a solid and a solid in another solid. The solution of palladium and hydrogen gas is a solid-gas solution. Alloys such as gold, brass, and bronze used for making jewellery are solutions formed by dissolving solid in another solid. Haven't you heard of 916 gold? When 1000 grams of gold is made by mixing 916 grams of gold and 84 grams of other metals (silver and copper), it is called 916 gold. This is also a solid in solid solution.



We have prepared different types of mixtures. Take equal quantities of water in glasses of same size. Prepare the following and observe.

Mixture 1. Water with sugar dissolved in it.

Mixture 2. Salt solution

Mixture 3. Water mixed with chalk powder

Examine the mixtures you have prepared and discuss the following.

- ◆ Are these mixtures alike?
- ◆ What are the similarities between sugar solution and salt solution?
- ◆ What is the difference between water mixed with chalk powder and salt solution?

Let's do one more experiment. Take the sugar solution you have prepared earlier. Take the same amount of water and sugar in a similar glass and keep it unstirred. Using a straw, carefully taste from different parts of the water with dissolved sugar and the unstirred mixture of sugar and water. Record the differences in taste in the table below.

Mixture	Taste in different parts		
	Top	Middle	Bottom
Water with dissolved sugar			
Water with unstirred sugar			

- ◆ Is the sweetness the same everywhere in the well-stirred sugar solution?
- ◆ What about the taste of the solution taken from different parts of the unstirred sugar solution?
- ◆ Aren't the components the same in both? Yet what could be the reason for the difference in taste?

Analyse the table and record your findings in the Science Diary. The solution with dissolved sugar is a homogeneous mixture and the water with undissolved sugar is a heterogeneous mixture.

Homogeneous Mixtures and Heterogeneous Mixtures

The mixture that shows the same properties throughout all its parts is called a homogeneous mixture. The mixture that shows different properties in different parts is called Heterogeneous mixture.

Examine the following issues based on the concepts you have understood.

- ◆ Are the mixtures with dissolved salt and that with undissolved salt the same? How are they different?
- ◆ Is the mixture of chalk powder and water, homogeneous or heterogeneous? Why?
- ◆ Are compost, concrete mix and the edible mixture, homogenous or heterogeneous? Why? Discuss. Record them in your Science Diary.

Classify the mixtures you have prepared so far into homogeneous mixtures and heterogeneous mixtures and write them in the table below.

Homogeneous mixtures	Heterogeneous mixtures

Expand the table by including other mixtures you are familiar with.



All solutions are mixtures,
but not all mixtures are solutions.

What is your reaction to the child's statement? Record your response and explanations in your Science Diary. Examine more solutions and confirm whether your findings are correct.

Mixtures in Daily Life

Check the menu of noon meal in your school. Aren't variety of food items included in it? Discuss how much we are using various mixtures in our food for a healthy life.

You have learnt that the air we breathe is a mixture. What are the components in it? Analyse the table.

Gas	Quantity
Nitrogen	78%
Carbon dioxide	0.04%
Oxygen	21%
Others	0.96%

What are the components in air? Compare their quantities. You have understood that air is a mixture. Shouldn't these components in air be maintained in the same quantity? Which components of air are being used in activities such as respiration and photosynthesis? What will happen if the level of carbon dioxide increases and that of oxygen decreases in air? Discuss.

The smoke produced by burning plastic contains various toxic substances. If these substances get mixed with air, it will affect the equilibrium of air and can have adverse effects on the health of living beings including humans. Don't you now understand the need for protecting the equilibrium of elements in the air from human interferences?

Hide and Seek of a Solute

Sugar solution has both water and sugar. But we cannot see the sugar once it is dissolved in water. Why is it so? Where did the sugar disappear? What happened to sugar? Let's find out.

Materials required: Large plastic jar (1 litre), gravel (500 g), green gram 100 g, Rava 100 g.

Activity: Put the gravel in a plastic jar and shake it well. Using a marker pen, mark the level of gravel on the outer surface of the jar. Add some green gram to this and stir the jar. Does the level of gravel rise now? Write the measurement in the table. Then put some Rava in the plastic jar and shake it well. Does the height of the gravel change after this? Record the observation in the table below.

Activity	Height of gravel in the jar
After shaking and pressing the gravel in the jar	
After adding the green gram in the jar and shaking it	
After adding the rava in the jar and shaking it well	

Analyse the table below.

- ◆ Does the level of the gravel inside the jar change after adding green gram and rava and shaking them down? Why?
- ◆ Where have the green grams settled?
- ◆ Where have the rava grains settled?
- ◆ When rava and green gram are added to the gravel in the jar and shaken, was there any difference in the total space required for all the three?

How can green gram stay along with gravel and rava grains settle in between the two? Discuss and record the inference in the Science Diary.

In this experiment, we can see two substances occupying the space between the gravel pieces

Does the same thing happen when substances dissolve in water?

By tasting the sugar solution obtained by dissolving sugar in water can we understand the presence of sugar in it? Based on the above experiment, explain where the sugar granules in the solution got hidden. Record your inference in your Science Diary.

Building Blocks of Matter

We cannot directly see the sugar particles in the sugar solution. But the sweetness of sugar is present everywhere in the solution. What is its secret ?

Let's see how sugar is hiding in water as very small granules. What are the properties of sugar?

Colour Taste State

Crush a little sugar. Take a small granule of it and examine. Does this granule possess all the above features?

Let's see how sugar grains can be made even smaller, and still retain all the properties of sugar.

Materials required: Sugar, small hammer, microscope, slide, cover slip, brush.

Activity

Take some sugar in a paper, keep it on a firm surface and crush it with a hammer. Take the smallest granule from it and taste. How does it taste?

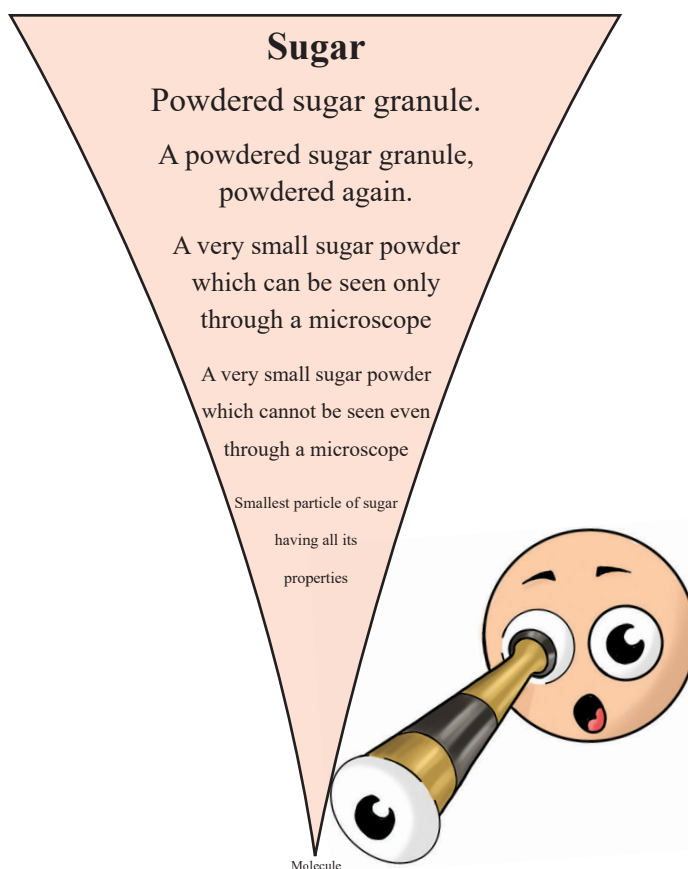
Pick one of these small granules of sugar with a brush and place it on a slide and observe under a microscope. Doesn't the small granule appear big? Didn't you realize that it could be made even smaller again? Imagine the smallest sugar granule that cannot be seen with an ordinary microscope, yet having all the properties of sugar. What would be the peculiarity of such a particle?

That particle shows all the properties of sugar.

Such small particles are molecules. All substances are made up of their molecules. A molecule will have all the properties of that substance.

Look at the illustration.

Now you have understood what the molecule of a substance is and how small it is.



Molecule

Molecule is the smallest particle of a substance having all its properties. All substances are made up of molecules.

Haven't you understood the secret of sugar retaining its sweetness equally every where in the solution though it is invisible in sugar solutions? The sugar molecules in sugar solutions spread throughout the water. Now, you have understood that this sugar solution is a homogeneous mixture.



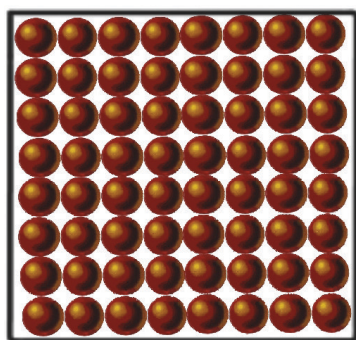
For Further Reading

Kanada

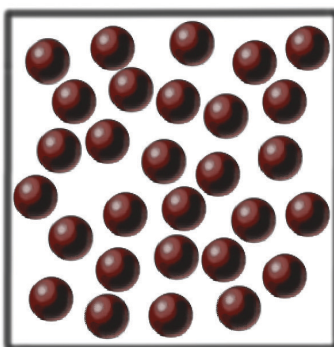
Kanada was a philosopher and scholar of ancient India. He is believed to have lived in 6th or 2nd century BC. Kanada believed that all matter is composed of indivisible microscopic particles called Paramanu.

Molecules Near and Far

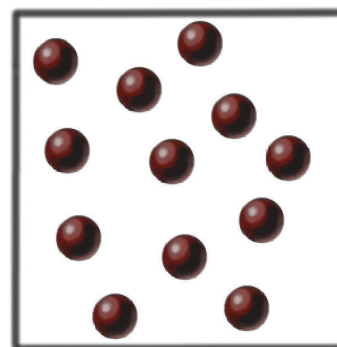
You know that matter has solid, liquid and gaseous states. How can substances exist in these states? Let's think in terms of molecules. Check the illustration given below to know how the molecules are arranged in solids, liquids and gases around us. Find out how the molecules exist in each state.



Solid



Liquid



Gas

- ◆ In which state of matter are the molecules the closest?
- ◆ In which state of matter are the molecules the farthest?
- ◆ Why do solids have a definite shape while gases and liquids don't have?

Haven't you understood how the molecules of a matter exist in all the three states? Why are liquids able to flow? How can gases spread fast? Solids cannot flow or spread. Why? Explain these in terms of arrangement of molecules. Record your explanation in the Science Diary and present.

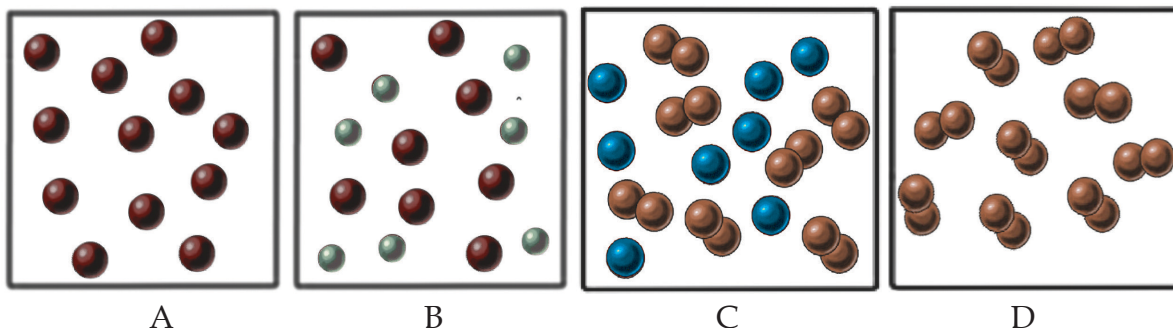


For Further Reading

Atoms

Atoms are smaller particles than molecules. Molecules are made up of atoms. A water molecule is formed by combining two hydrogen atoms and one oxygen atom. A sugar molecule consists of 12 carbon atoms, 22 hydrogen atoms and 11 oxygen atoms.

A mixture is a combination of more than one substance. So wouldn't there be more than one type of molecule in a mixture? Note the illustration showing the molecules in different substances.



Haven't you observed the illustrations? How many types of molecules are there in Substance A? What about B? Which substances have different types of molecules?

Which substances have the same type of molecules? Observe the picture and write.

You have already understood that mixtures are made up of different types of substances. Which are the mixtures in the picture? Discuss.

Some substances are made up of same type of molecules. These are pure substances. Some are composed of different types of molecules. Didn't you understand these from the picture? There are substances around us, containing the same type of molecules and those containing different types of molecules.

From the above illustrations of substances A, B, C and D, identify pure substances and mixtures.

Pure Substances

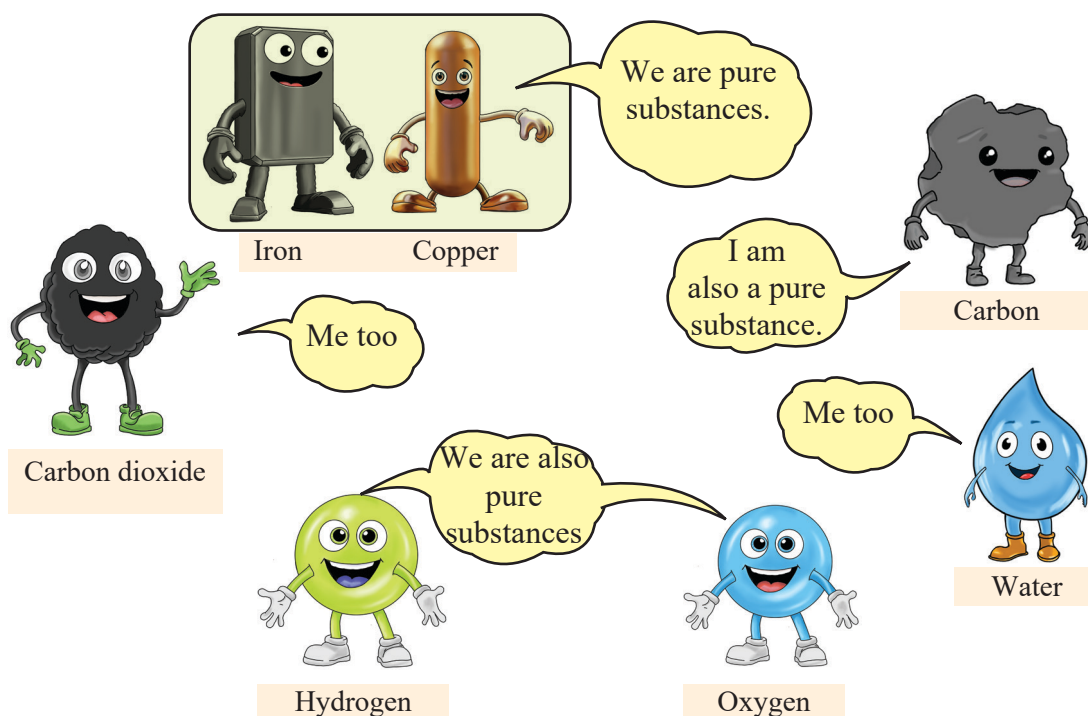
Pure substances are substances made up of same type of molecules. Mixtures will have different molecules in them.

Are mixtures pure substances? Why? Discuss.

Basic Science

Water without any impurities is a pure substance. Why? Record your inference in your Science Diary.

Which are the other pure substances you know? Look at the illustration below.



Classify the following substances as pure substances and mixtures and complete the table appropriately.

Substance	Molecules involved	Pure substance/ Mixture
Porridge	Water, salt and other substances	
Pencil graphite	Graphite	
Sugar	Sugar	
Soda water	Carbon dioxide, water	
Buttermilk	Water, salt and other substances	
Pure water	Water	
Potassium permanganate	Potassium permanganate	
Gold jewels	Gold, silver and copper	
Gold	Gold	

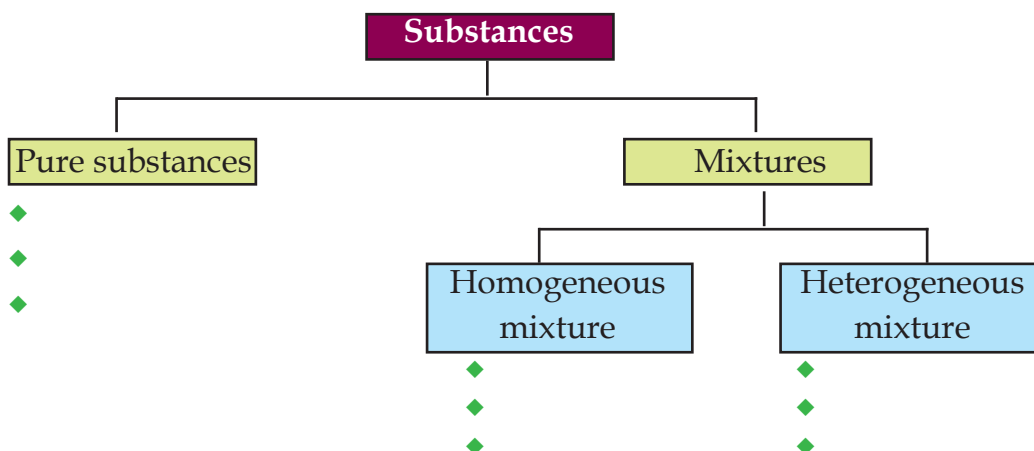


For Further Reading

Is Pure Coconut Oil a Pure Substance?

You might have seen advertisements of pure coconut oil, pure milk, pure ghee etc. But the word “pure” used in science does not mean the same as in advertisements. In the market, pure coconut oil means that it does not contain any other oils or components. Scientifically, coconut oil is a homogeneous mixture of molecules of many components.

You have understood the difference between pure substances and mixtures. Find more examples for each category and complete the table.

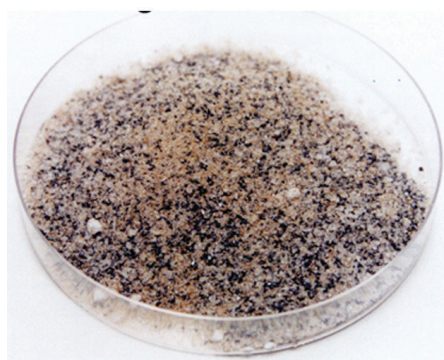


Separating Mixtures

Mixtures are the combination of more than one substance. Notice the following mixtures. How can we separate the components from these mixtures? Discuss.



Rice mixed with stones



A mixture of sand and iron powder

Which are the components of these two mixtures?

Examine the following questions.

- ◆ Do rice and stone have same colour? Do they have same shape and size?
- ◆ The components of which of these mixtures can be separated by hand?
- ◆ If the stones have the same size and colour that of rice, would it be possible to separate them by hand?
- ◆ Can iron dust be separated from sand?
- ◆ Can iron powder be separated from sand by making use of any other property of iron powder?

Which properties of the components do we make use of in these two methods of separation? Record your findings in the Science Diary.

Find out more instances of separating components in the same way and list them in the table below.



Picking up

- ◆
- ◆
- ◆



Separation using magnet

- ◆
- ◆
- ◆

You have learned that the properties of the components are made use of in the process of their separation. Discuss the different types of separation used in the following situations. Examine the properties of the components utilized in each situation.

- ◆ How do we separate tea dust from tea?
- ◆ How are small stones removed from rice while washing it before cooking?
- ◆ Which are the ways by which muddy water can be purified?
- ◆ How are gravel and other waste materials separated from the sand used for construction works?

There are even more methods of separation. Observe the pictures.



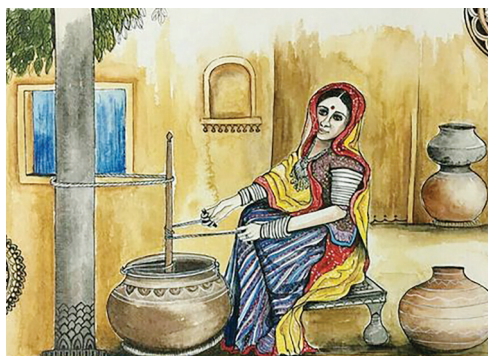
Separating salt from sea water collected in the salt - field



Separating iron powder from sand



Separating the chaff from paddy



Separating butter from curd

Analyse each image. Using the following clues, find the methods for separating the components. Tabulate them.

Situations	Method of separation
Salt is separated from seawater collected in salt fields.	
Butter is separated from curd.	
Iron powder is separated from sand.	
Paddy and chaff are separated.	

- ◆ From the table, identify the context that utilises the change of state of matter for the separation of dissolved component.
- ◆ How is the process of separating butter from curd different from others?
- ◆ Which situation makes use of the magnetic property of the component for separation?
- ◆ Which property is used to separate chaff from paddy?

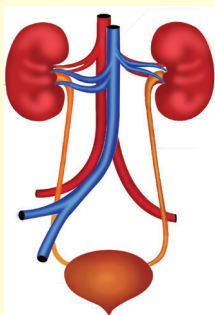
You have understood that the method of separation also varies according to the nature of the components. Explore and find out more methods of separation we use in our daily life.



For Further Reading

Process of Elimination of Impurities within the Body

Kidneys are filters that separate waste from blood. Our body has about 5 litres of blood. This blood is subjected to constant filtration by



our kidneys. This is a natural process of separation in the body. If kidneys fail, this filtering process gets slowed

down and the patient becomes critically ill. Such patients are assisted through an artificial filtering process called dialysis.



Haven't you understood that we use pure substances and mixtures in many situations in our day to day life? Why should we understand the properties and uses of mixtures and pure substances? Isn't it useful for us to lead our daily life in a better way? Besides we should be able to make new substances when needed and also make use of the different methods of separation.

You will learn more about pure substances and mixtures in higher classes.

Let's Assess

1. A drink is prepared by mixing, salt and sugar to soda water.
 - a) What are the components of this mixture?
 - b) Is this drink a homogeneous or heterogeneous mixture?
2. One spoon of salt is added to a glass of water. There is undissolved salt in the glass. What should be done to make it a homogenous mixture?
3. Examine the following statements about iron, brass, gold ornament, bronze, carbon dioxide and aluminium. Tick (☐) the correct ones among these.
 - a) All these are not pure substances.
 - b) Brass, Iron and bronze are metallic mixtures.
 - c) Gold ornament is a mixture.
 - d) Carbon dioxide and aluminium are pure substances.

Extended Activities

1. Let's make an overflow jar.

Pour some coconut oil in a glass tumbler filled with water and observe. How can we separate a mixture of oil and water?

Shall we make a device for this! Draw an outline for this purpose and discuss your idea in the group. What materials can be used for this? List them out.

Look at the given materials.



Mason pipe



Scissors



Transparent plastic container



Glue

How can these be used for making this device? Think about it in groups and find a suitable method. Present it in class and modify. Make the device. Write a note on this method of preparation in your Science Diary. Using this device, separate the oil from water.

2. Prepare a note on natural drinks consumed during summer, their method of preparation and present it in the class.