

BASIC SCIENCE

Part - 1

Standard VI



Government of Kerala
Department of Education

State Council of Educational Research and Training (SCERT), Kerala
2016

The National Anthem

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

Pledge

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

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

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

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

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Dear children,

How many are the sights we witness, the sounds we hear, and the experiences we pass through everyday!

In fact, the study of science begins exactly when we think about the 'what' and 'how' of things we have seen, heard and experienced. It is not confined to the four walls of the classroom. You have earlier observed a number of things like plants, animals, water, soil and air. Your observation now has to be at a more micro level.

This textbook provides you with ample scope for such activities and tools. It provides you with suggestions to boost your science club activities and hints at ICT possibilities. There are also suggestions at the end of each lesson for activities that you can do on your own. Try to do all of them with the help of your teachers. We can definitely create a society with scientific temper.

With love and best wishes,

Dr.P.A. Fathima

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Certain icons are used in this textbook for convenience



For further reading
(Evaluation not required)



ICT possibilities for making concepts clear
Available in [IT@School, Edubuntu, Applications → School Resources]



Significant learning outcomes



Let us assess



Extended activities



1

Caskets of Life



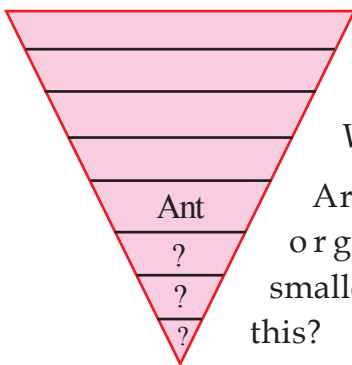
Minnu was walking along the beautiful garden in front of her house, humming a tune. At once something pricked her. It's so painful! She was surprised when she saw a little black insect on her hand. How tiny the creature is!

Even smaller than an ant!

There are so many kinds of plants and animals around us! Big, small, of different colours, shapes and so on.

Try to write down the organisms given below in the order of their size. Let the biggest be the first.

- Goat
- Elephant
- Camel
- Ant
- Horse



Is ant the smallest creature on land?

Which is the smallest creature you have seen?

Are there organisms smaller than this?

Won't there be even smaller organisms in water and air too?

How can we see minute organisms?

Shall we use a hand lens to see these minute organisms?

Observe an ant with the help of a hand lens.

How big does it appear?

Now observe a creature smaller than an ant, using a hand lens.

How can we observe organisms that cannot be seen by the naked eye?



Microscope

Microorganisms that cannot be seen by the naked eye can be observed through the microscope.



How small...!

Try doing this experiment.

Materials required:

Microscope, slide, cover glass, hay-soaked water.

Take a drop of hay-soaked water on a slide. Place the cover glass and then observe it through the microscope.

What can be seen now?

Don't you see tiny organisms moving in it?

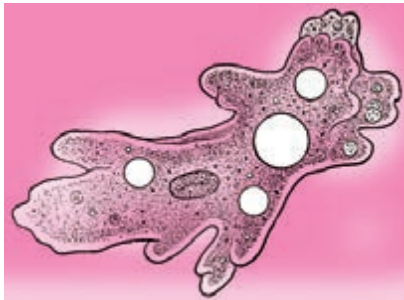
Draw them in your science diary.

Could you observe any of the organisms given below?

While collecting water samples

The following things may be adopted:

- collect water in which hay has decayed from harvested fields.
- collect the remaining water from canals, pond etc., which have started drying up.
- take a handful of hay. Cut it into pieces and boil it in water. Drain the water and cool it. Mix this water with a spoonful of water collected from a stagnated water bed. Observe it after three days.



Amoeba



Paramecium



Euglena

Haven't you learnt about bacteria, virus etc., earlier? These are also microorganisms. Organisms that cannot be seen by the naked eye are microorganisms.

Basis of life

Physiological activities take place in microorganisms too. What are their bodies made of? Find out using the given description.

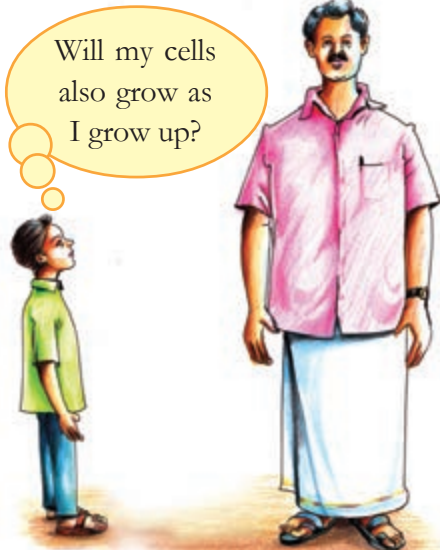
Tiny units of the body

The body is made up of many small units. Even the body of the tiny ant is made up of thousands of such small units. These small units of the body are called cells. There are organisms with only one cell. They are unicellular organisms.

Amoeba, paramecium, euglena, bacteria etc., are unicellular organisms. Organisms with more than one cell in their body are multicellular organisms. Animals and plants are multicellular organisms.



See 'Ekakosajeevikal' in *School Resources in IT@School, Edubuntu.*



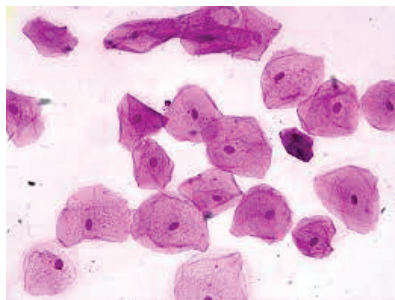
What you observed through the microscope are unicellular organisms. Why is it that these unicellular organisms are invisibly small, while the ant is larger than them?

Do cells grow up with the child? Note down your guess.

Let us observe the cells of two persons of different age groups to find this.

Materials required: Microscope, slide, pure water, methylene blue stain, two new toothbrushes and cover glass.

Observe the cheek cells of a child and those of a teacher through a microscope. Are these cells the same as the figure shown below?



Method of collecting cheek cells

Wash the mouth thoroughly with clean water. Scrape the internal surface of the cheek using a new toothbrush. Place the cheek scrap in the drop of water on the slide. Spread this and add a drop of stain. Cover it with the cover glass and observe the slide through the microscope.

- Do you notice any difference in the size of the cheek cells of the child and the adult? Compare your findings with the guess you made.
- How does the body grow without bringing about any change in the size of the cells?



Observe the picture and draw your inferences.

Do we use big bricks for building big houses and small ones for small houses? What is the reason for the difference in the size of houses?

Based on this, find out the reason for the difference in the size of organisms. Write it down in your science diary.

How many cells!

It is said that there are millions of cells in the human body. If so, how large would be the number of cells in the body of an elephant!



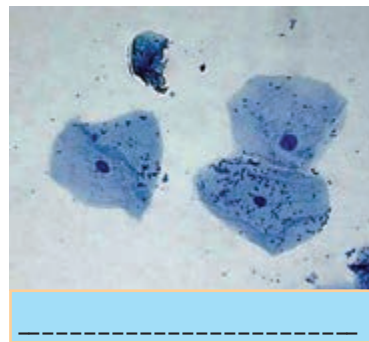
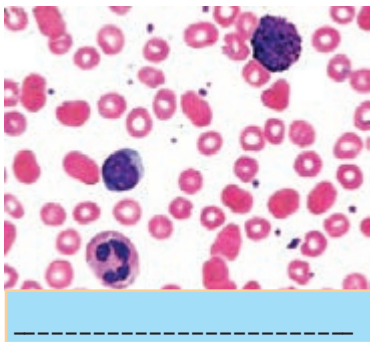
Different types of cells

Is the shape of all the cells in a human body the same as that of cheek cells?

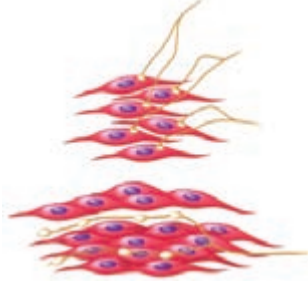
Try to do this activity.

Take the slide of blood cells from the school lab and observe it through a microscope. Is the shape of these cells similar to the cheek cells which we observed earlier?

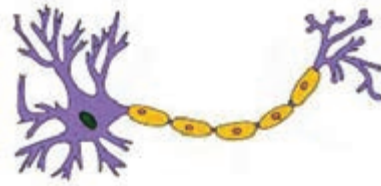
Identify the cells given below and write them down.



There are different types of cells in the human body.



Muscle cell



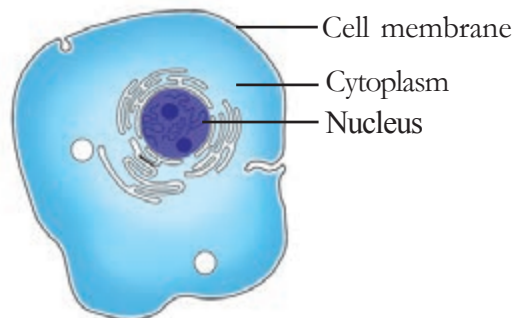
Neuron

There are different types of cells like these in multicellular organisms.

Inside the cell

Now we have learnt about different kinds of cells. There are certain common components in all cells. Examine the figure of the animal cell and note down the parts of the cell in your science diary.

Nucleus, cytoplasm, cell membrane etc., are some of the important parts of a cell. Nucleus is the centre of the cell. Cell membrane is the covering of the cell. The matrix filled inside the cell membrane is the cytoplasm.

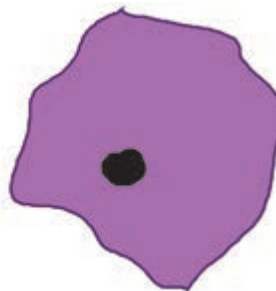


Animal cell

Draw the following figures in your science diary and label the parts.



White blood cell



Cheek cell

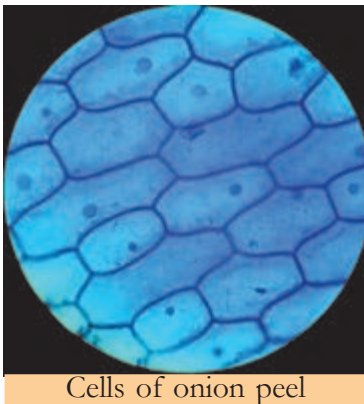
We have identified that the animal body is made up of cells. Now what about the plant body?

Plant body

Let us examine a part of a plant. Observe the onion peel through a microscope. Draw the outline of the shape you have observed in your science diary. Compare it with the figure given below.

Method of preparing slide

Remove the dry outer layers of onion. Then peel off the thin layer from the fleshy part. Keep this in water in a watch glass. After staining (saffranin) it, place a small portion on a slide by using a brush. Cover it with cover glass.



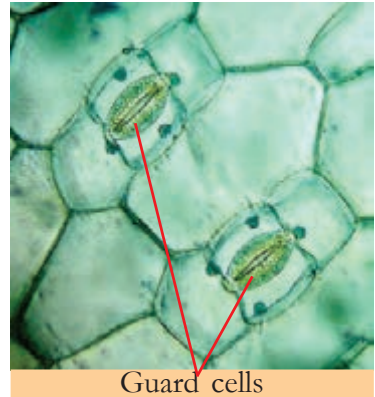
Cells of onion peel

Diversity in plant cells too

Haven't you observed guard cells in your lower classes?

Don't you see other cells also with the guard cells in the given figure?

Are the guard cells, the other cells in the leaves and the cells in the onion



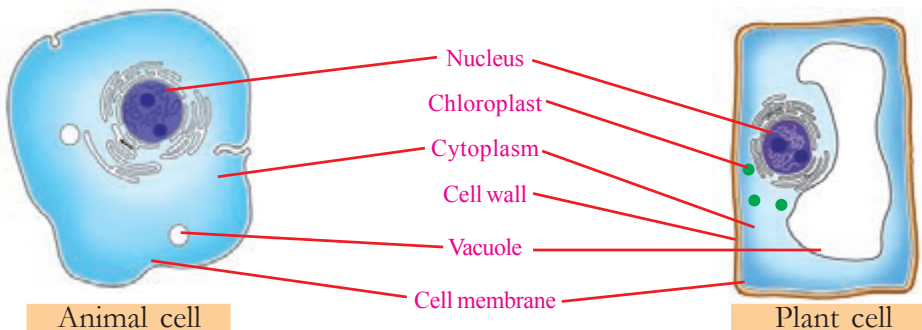
Guard cells

peel same in shape and size? Compare and write the inference in the science diary.



See 'Vathakavinimayam sasyangalil' in School Resources in IT@School, Edubuntu.

- Are the parts you have labelled in animal cells seen in plant cells too?
- Is there any part in a plant cell which is not there in an animal cell?



Animal cell

Plant cell

Compare the figures and consolidate your findings in the table.

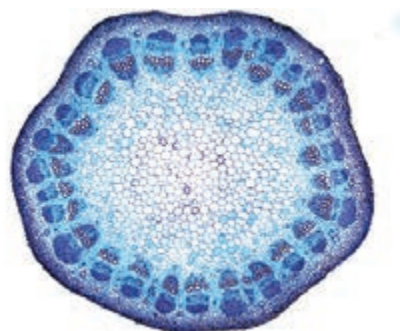
Parts of the cell	Animal cell	Plant cell
• Nucleus	✓	✓
• Cell wall		
•		
•		
•		
•		

You have noticed the differences between plant and animal cells.

Write down your findings in the science diary.

Are the different parts of a plant made up of similar kinds of cells?

Take a cross section of a tender stem of a plant using a sharp blade. It should be thin and complete. Place the section on a slide and observe it through the microscope.



You can see different types of plant cells.

We have learnt that the body of animals and plants are made up of cells. Plants and animals have cells that differ in shape and size. The life sustaining activities take place by the coordination of these cells.



Significant learning outcomes

The learner can

- explain that cell is the fundamental unit of life.
- explain unicellular and multicellular organisms with examples.
- identify and explain that the size of the organism is not based on the size of the cell but on the number of cells.

- identify and illustrate parts of the cell.
- illustrate plant cell and animal cell and find out the similarities and differences.
- observe cells using microscope.



Let us assess

1. Do you agree with the following statements? Explain.
 - a) Hand lens, microscope etc., may be used for observing cells.
 - b) There are organisms on the earth with only one cell.
 - c) The difference in the size of the organisms is due to the difference in the size of cells.
 - d) All cells in an organism are of the same kind.
2. Given below in the table are a few details prepared by a child comparing animal cell and plant cell.

Complete the table by filling parts of the cell.

No.	Parts of the cell	Plant cell	Animal cell
1		Yes	Yes
2		Large	Small
3		Yes	No
4		Yes	Yes
5		Yes	No



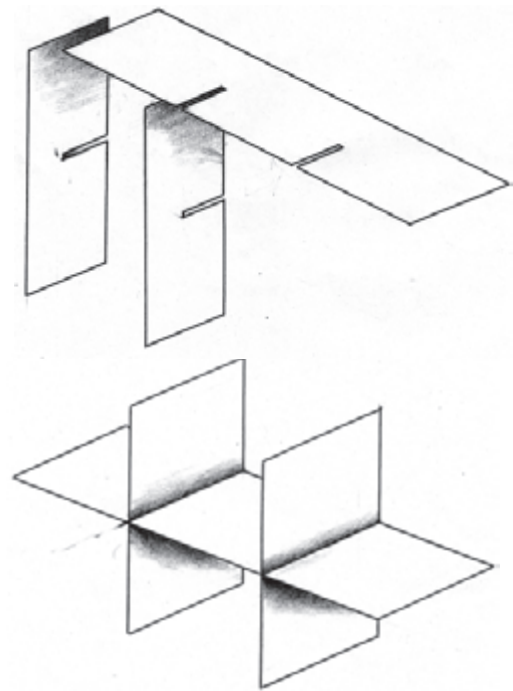
Extended activities

1. Let us make the model of a plant cell.

Materials required: Transparent box with a lid, 2 OHP sheets/transparent plastic sheets, thermocol, appropriate colours, water and glue.

Method of construction

Cut the OHP sheets according to the size of the box as shown in the figure. Cut the sheets to half in order to fix them together at 90° and arrange them as shown in the picture. Cut the thermocol to the shape of the parts of the typical plant cell seen earlier in this chapter. Colour it appropriately and paste it in the OHP sheet. Keep the OHP sheet carefully in a box and pour some water. Now, you will get the three dimensional shape of a plant cell.



The Essence of Change

2



Observe the picture. Don't you see the lush green field, the road, the house, etc.? Isn't all this the result of the hardwork of a number of people?

What are the different activities you see in the picture?

- driving a tractor
-
-
-

Don't you think that the children playing with the ball should have the capacity to do so? Haven't you learned that the energy for this is obtained from the food we eat? Don't you require energy for doing other kinds of work as well?

Energy for everything

The sunlight enables us to see everything during daytime. You know that light is a form of energy. The light produced using electricity helps us during night time.

Heat is used for cooking food. Electrical energy is used to make a fan work.

What are the forms of energy used for doing the different activities shown in the picture?

Which among these different forms of energy can you identify? Complete the table.

Context	Form of energy used
Riding motor Vehicles	Energy from fuels.
Drying clothes	
Bulbs glowing	
Loudspeakers working	

Heat, electricity, light, sound etc., are different forms of energy. Is light energy the only form of energy produced when a bulb glows?

Switch off a bulb after keeping it on for some time. Feel the glass surface of the bulb carefully, with your finger.



What do you feel?

What are the forms of energy produced while the bulb was glowing?

Which form of energy among these do we make use of?

Aren't there other situations in which more than one form of energy is produced?

Different forms of energy

Different situations are given in the table. Complete the table by identifying the different forms of energy produced in each case and the one we usually make use of.

Situation	Forms of energy produced	Form of energy we make use of
A torch is lit		
A candle is burning		
Fire wood is burning in an oven		
An electric bulb is lit		
A cracker is bursting		

Don't you require energy for all the activities mentioned above? Do we make use of all forms of energy that are produced?

Write down your inference in the science diary.

We have familiarised ourselves with a few forms of energy, haven't we?



Which are the forms of energy produced in the following situations?

No	Situation	Forms of energy produced		
		(i)	(ii)	(iii)
1	When a sparkler is lit	Heat energy	-	-
2	While riding a motorcycle	-	-	Mechanical energy
3	While operating a mixer grinder	-	-	-
4	While operating an electric motor	-	-	-

Haven't you found out the different forms of energy produced when a mixer grinder is operated?

Which is the form of energy used to operate a mixer grinder?

We have seen the instance of electrical energy changing into different forms of energy in an electric bulb.

Energy can be transformed from one form to another.

We use electrical energy to operate a mixer grinder and an electric motor. Which is the form of energy used to light a sparkler and ride a motorcycle?

Make use of a reading note and record your findings in the science diary.

Mechanical Energy

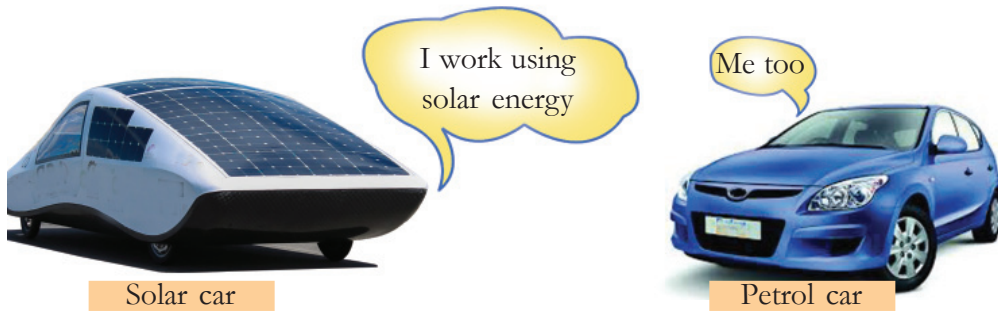
Electrical energy or the energy produced by burning fuels is used to make an engine work and, in turn, to make machine parts move. Working of an engine involves mechanical energy which enables vehicles move.



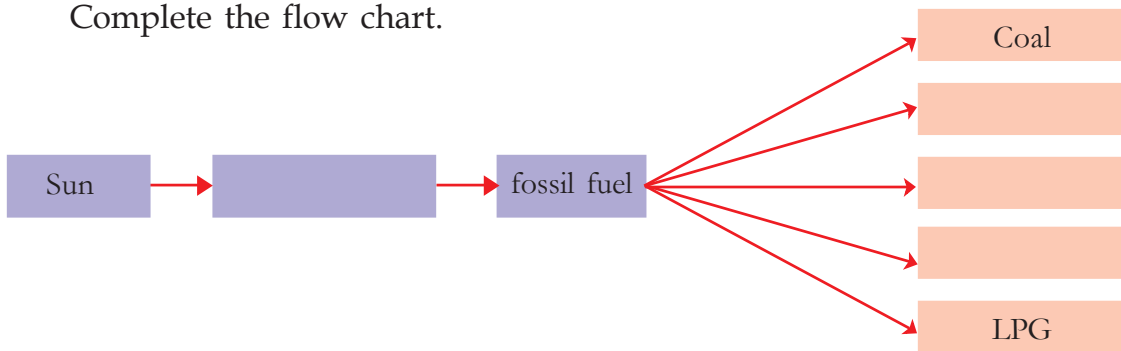
Chemical Energy

The energy contained in a substance is chemical energy. Plants convert solar energy into chemical energy through photosynthesis. Chemical energy thus stored up, reaches animals through food. While burning fire wood too, we get the chemical energy stored up in plants. All substances contain chemical energy.





- How do vehicles that run on petrol and diesel depend on the sun for energy? Haven't you learnt about fossil fuels?
Complete the flow chart.



How many changes!

How often do we use energy changes in daily life? Let's try to tabulate a few domestic uses of energy.

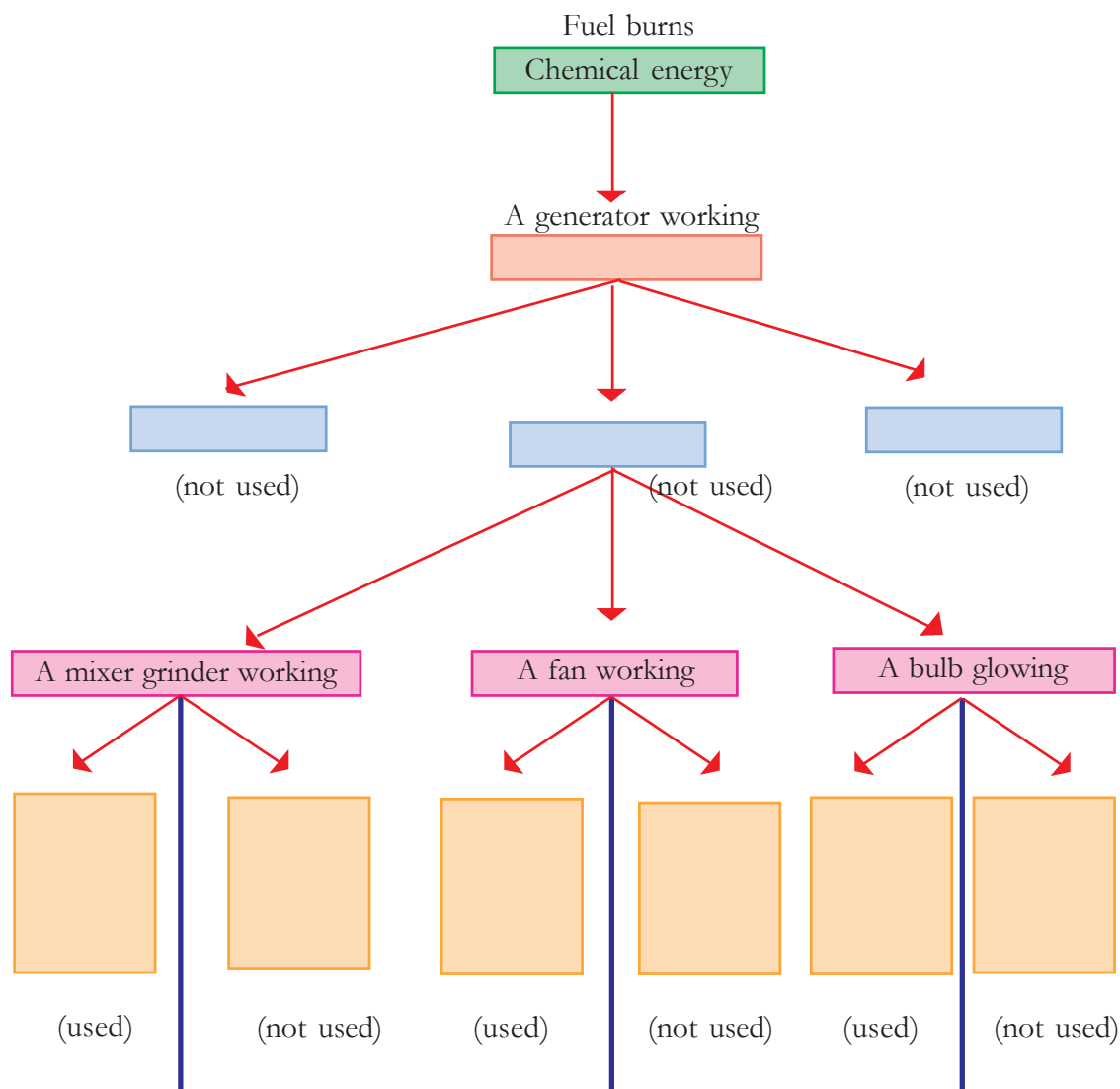
Situation	Energy conversions taking place
Bulb glowing	Electrical energy → Light + Heat
Working an electric motor to pump water → +
Lighting a match stick	
Working a mixer grinder	
Listening to the news on a radio	

Add more situations to the table and expand it.

What are the forms of energy we use more often in daily life?

To make the maximum use of energy, energy loss in appliances should be minimised.

You might be familiar with the various activities carried out using a generator. Identify the forms of energy used, the forms of energy produced and energy changes that occur in each case and record them in the flow chart shown below. Try to find out those forms of energy that are not used as well.



Examine the pictures.



- Which form of energy undergoes change in each situation? What are the forms of energy produced?
 (1), (2), (3)
- Which situation in the given picture does not use light energy?
- In which situation is sound energy produced?
- In which situation is heat energy made use of?

We have understood that there are different situations where one form of energy transforms into other forms of energy.

What is the change that takes place in a substance when it receives energy?

When ice melts

Try doing the experiment given below and write down your observations.

Take some ice cubes in a beaker and heat it as shown in the figure. What changes do you observe?

-
-

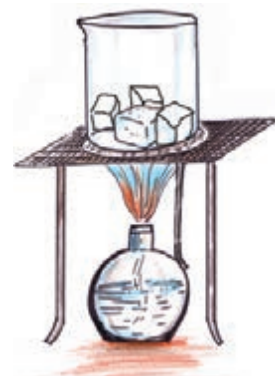
Which form of energy was utilised by ice to undergo the changes?

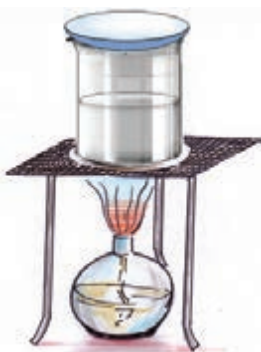
-

Now heat the water obtained when ice melted. Note down the changes.

-

Can the steam be converted back into water? What change should be brought about in this experiment to make this possible?





Examine the figure and discuss the materials to be used to conduct this experiment.

Can the experiment be carried out more effectively by placing an ice cube on the watch glass?

The steam is again converted into water through this experiment. Now can the water be converted into ice again?

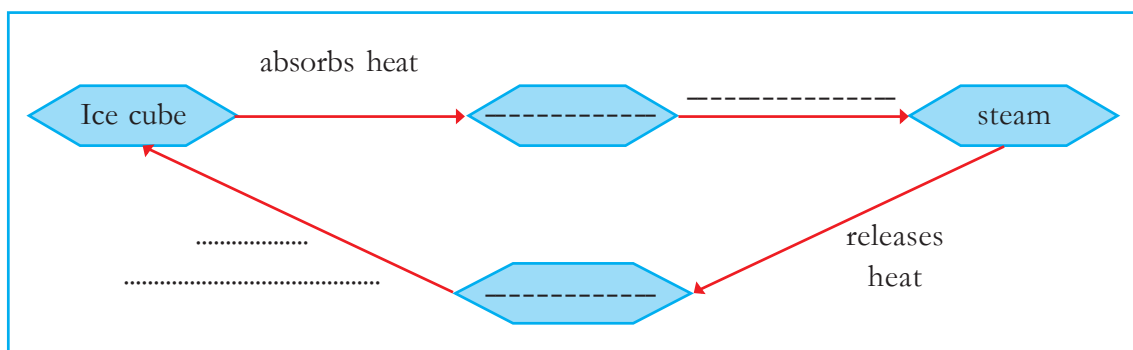
What method can be adopted for this?

Ice absorbs heat energy and changes into water, its liquid state. Water further absorbs heat energy and gets converted into steam. When steam loses heat energy it again changes into water. When heat energy is further lost, the water, in turn, gets changed into ice.

Change of state

Substances undergo change of state when they absorb or release adequate heat energy. On absorbing heat energy, they change from the solid state to the liquid state and then to the gaseous state. Substances get converted from the gaseous state to the liquid state and then to the solid state by releasing heat energy.

Note down in the flow chart given below how heat affects the change of state of water.



We have seen that ice, water and steam are the three states of water.

- Is energy absorbed or released when steam is changed into water and then into ice?

- Which among the three states has the maximum amount of energy?
- Which state has the minimum amount of energy?

Let's make an ice doll

How can you utilise the change of states of matter in the following situations?
Discuss in the class.

- making the model of an egg using wax for exhibition.
- suspending an ice ball using a thread.
- making wax dolls.

Find methods to make them after discussing in groups.

Make attractive models and exhibit them in the school science club.

Plan interesting activities using the concept of change of states of matter.

It is the change of state that gave us these beautiful shapes.



Examine some of the situations in daily life given in the table.

Situation	Change taking place in state or in shape
Heating solid ghee	melts
Cutting vegetables	becomes smaller pieces
Heating a PVC pipe	expands
Heating wax	melts
Tearing paper	becomes smaller pieces
Breaking a bottle	becomes smaller pieces
Heating lac	melts
Crumpling paper	changes shape

Analyse the table and find out the peculiarities of the changes. Write them down. Make use of the hints given below.

- Are new substances formed in any of the above situations?
- What are the changes of state that occur?
- Which among them involve a change in shape?
- Which among them involve a change in size?

Physical change

Change in the physical properties such as state, shape or size is termed as physical change. Expansion, melting, breaking, tearing etc., are all physical changes. New substances are not formed during physical changes.

Permanent change

Are all changes physical changes?

Let's do the following activities.

Take some sugar in a spoon and heat until it melts.

Observe the changes.

Taste it after heating. How does it taste?

Heat again.

Do you observe a change in the colour? Taste it again after cooling.

How does it taste now?

Does the residue left in the spoon possess all the properties of sugar?

What differences did you find in the changes that occurred while heating wax and sugar? Complete the table and record it in your science diary.



When wax is heated	When sugar is heated
Absorbs heat
.....	Melts
.....	Changes colour
No new substance is formed

Let's do some more experiments.

1. Burn a magnesium ribbon
2. Burn a piece of paper

Can you change the substances formed on burning magnesium ribbon and paper back into their original states?

Record your observations and findings in the science diary.

Make inferences about the changes these substances undergo due to the absorption of heat energy.

Make use of the reading material as well.

Chemical change

The process in which substances change into new substances by absorbing or releasing energy is termed a chemical change. Chemical change is a permanent change.

Different types of chemical changes

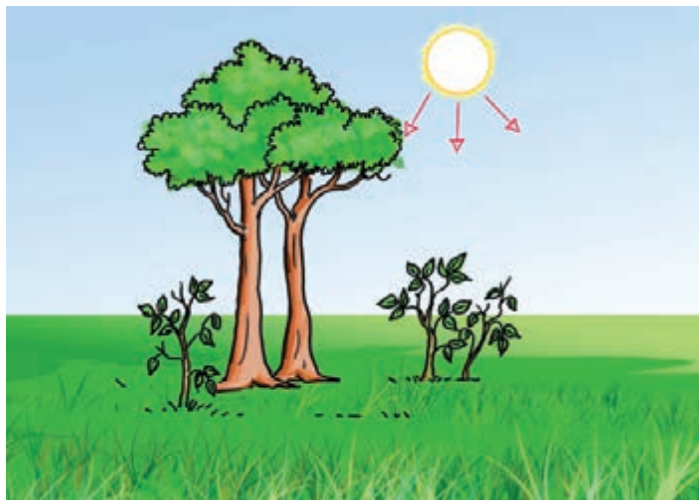
A large number of chemical changes take place everyday in the human body as well as in nature.

Find out more examples and write them down in your science diary. You can make use of the hints given below.

- cooked rice tastes sweet when chewed for some time.
- the colour of the film changes while taking X-rays.
- the colour of clothes fades when exposed to sunlight.
- iron rods rust.
- mangoes ripen.

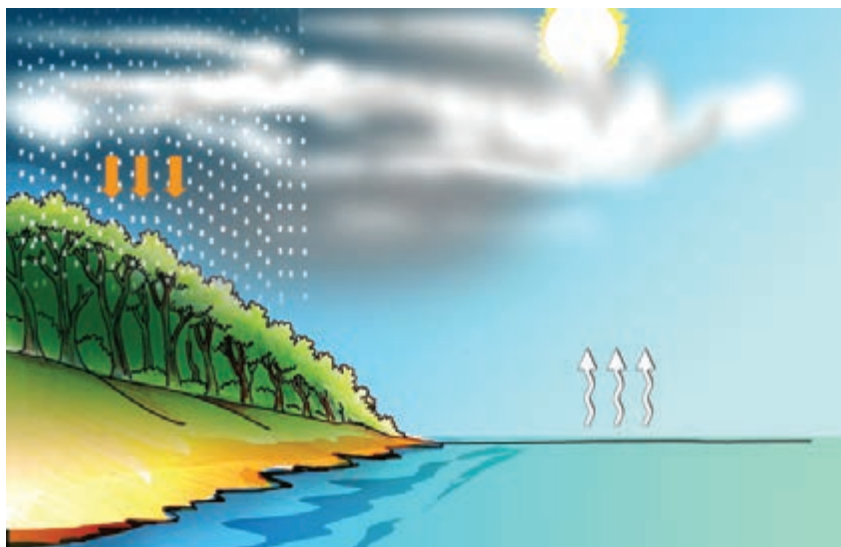
Analyse the picture

- Which is the chemical change indicated in the picture?
- Note down the energy change during this chemical change.



Observe the picture given below.

What are the physical changes that can be identified from the picture?



We make use of several chemical and physical changes in our daily life. Can you prepare a list of physical and chemical changes that take place in a kitchen on a day? Classify and record.



Significant learning outcomes

The learner can

- give examples for different forms of energy and the situations in life where they are made use of.
- explain the energy conversions that take place during different situations in life.
- identify and explain that change in the temperature of substances causes change of their state.
- explain ideas such as physical and chemical changes.
- make curios using wax and ice.
- handle instruments and engage in experiments related to energy conversion.



Let us assess

- The blister caused by steam is more severe than the same caused by boiling water at the same temperature.
 - Do you agree with the statement?
 - Justify the statement on the basis of physical change.
- We know that heat is emitted along with light when a bulb glows.
 - LED lamps are better than filament bulbs for maximum reduction in the consumption of electrical energy. Explain.
 - Are there situations where filament bulbs are used for producing heat energy? Give examples.
- Thunder and heavy rain during the monsoon. Rahim and Deepa, who have learnt about conservation of energy, are engaged in a game related to it. Let's take a look at it. When one of them mentions a situation, the other indicates the change of energy involved in it.

Deepa	Rahim
When it rains	the cloud releases heat energy.
.....	the cloud is formed
Sound energy is produced.
.....	light energy is released.
Electrical energy is produced



Extended activities

- Identify the situations where electrical energy is stored up as chemical energy.
- You can make a small generator to convert mechanical energy into electrical energy.

Materials Required: A mini motor, two pieces of thin wire, LED (low voltage)

Method of construction: Connect the two terminals of a mini motor to an LED using two thin wires. With your hand, turn the projected shaft of the mini motor strongly. We can see the LED glowing. Rubbing the shaft of the mini motor on a table or a bench will enable the LED glow brightly.



3

Flower to Flower



Flowers and butterflies are always a wonderful sight to us.

Have you ever observed the different kinds of butterflies that visit the butterfly park in the school? Do all the butterflies visit all the flowers? We see varieties of flowers everyday. Are gardens the only place where we find flowers?

Mention the names of flowers you know.

-
-
-
-

Are all flowers alike? In what respects are they different?

- Number of petals
-
-



Caesalpinia

Don't we use different kinds of flowers for decorations and celebrations? What may be the use of flowers for plants?

A spectacle of flowers

Let us go to a garden and observe each flower carefully. Can you identify the parts of a flower?

- Do all flowers have petals?
- Which is the part that connects flowers to the plant?

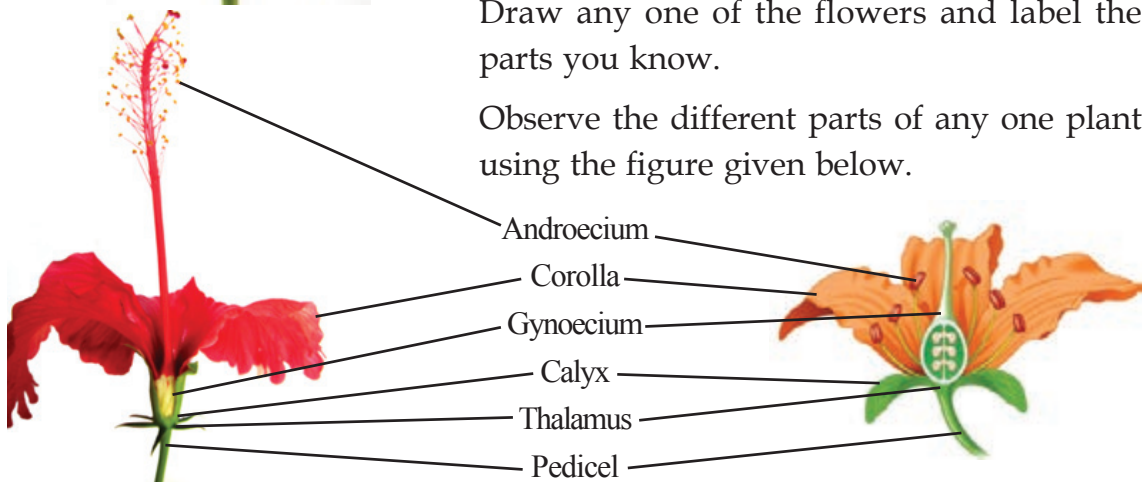


Observe the flowers and identify their parts.



Draw any one of the flowers and label the parts you know.

Observe the different parts of any one plant using the figure given below.



Have you labelled all these parts in the figure you have drawn?

Collect different types of flowers. Dissect them longitudinally and observe it using a hand lens. You can see the parts mentioned in the figure.





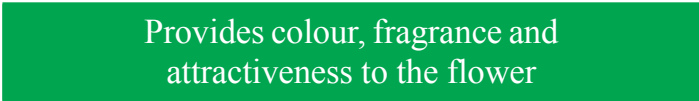


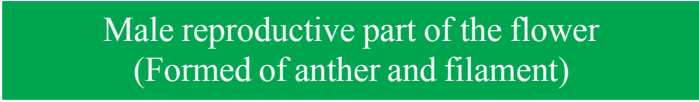

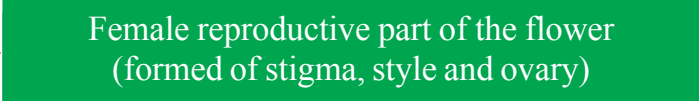

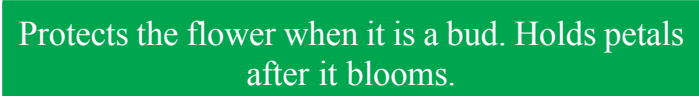
Functions of a flower

Now we are familiar with the different parts of a flower.

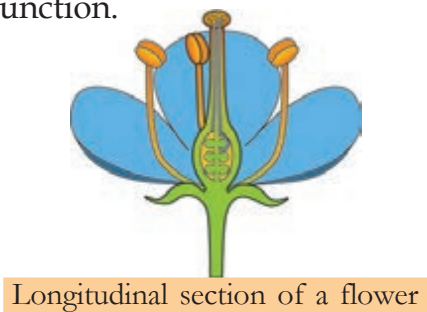
- What is the use of each part?
- What may be the use of the pedicel?

Won't the other parts also have similar functions?

The important parts of a flower and their functions are given below. Match them.

The longitudinal section of a flower is given below. Label each part and write down its function.



.....



.....

.....

.....

.....

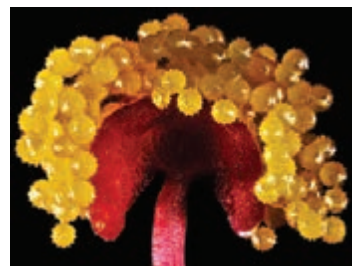
- Where do fruits and seeds develop on a plant?
- What is the benefit of the formation of the seed for a plant?
- What may be the function of flowers then?

Flowers	
 <p>Mango tree-inflorescence</p>	 <p>Mango</p>
<p>You know that fruits are formed from flowers and seedlings are produced by the germination of seeds, seen inside fruits. Reproduction is the process by which organisms produce their young ones to retain their ancestry. Flowers perform the function of reproduction in plants. Flowers are the reproductive organs in plants.</p>	

- How does the process of reproduction occur in a flower?

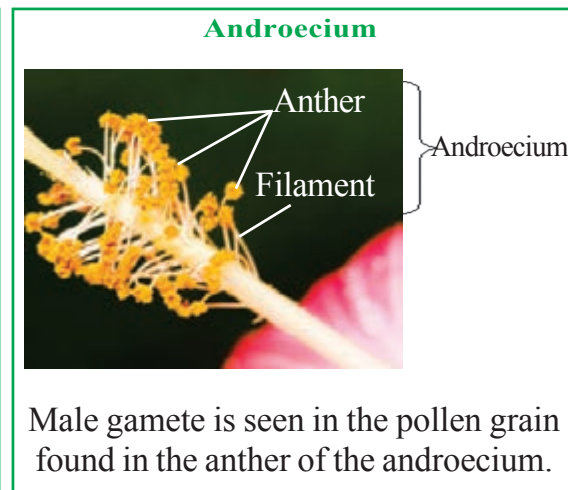
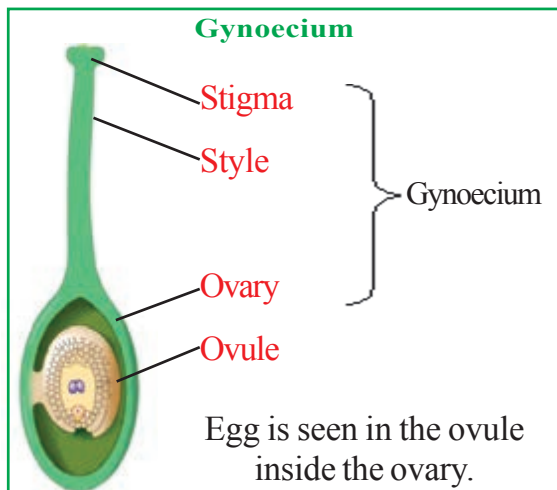
Now you are familiar with the important parts and functions of a flower. Now let us observe flowers more closely. Most often, the pollen of flowers stick on to our hands. Place the pollen on a slide and observe it through a microscope.

Pollens are also known as pollen grains. Take a flower and observe its androecium and gynoecium using a hand lens. Don't you see the parts given below?



Pollen grains observed under the microscope

Draw and label the observed parts in your science diary.



Inside the flower

Observe flowers of pumpkin, cucumber, hibiscus, bitter gourd, ixora, clitoria, frangipani and snake gourd using a hand lens. Can you see the androecium and the gynoecium?



Oleander



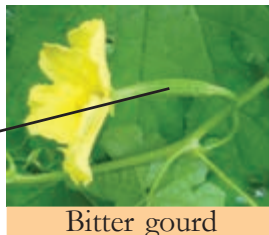
Pumpkin



Pumpkin



Bitter gourd



Bitter gourd



Clitoria

Classify the flowers you have observed as indicated below.

Flowers having both androecium and gynoecium (Bisexual flower)	Androecium and gynoecium in separate flowers (unisexual flowers)
<ul style="list-style-type: none"> • • • • 	<ul style="list-style-type: none"> • • • •

What inferences can be drawn by examining the table?

Male and female flowers

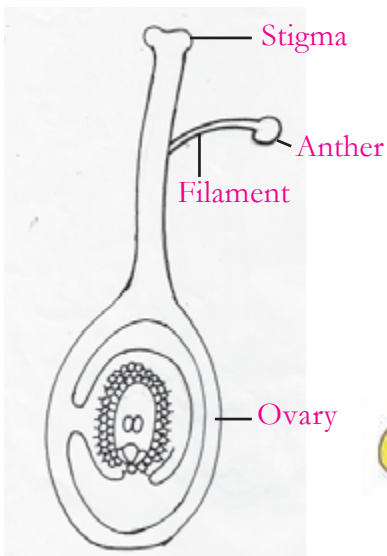
Flowers that have only androecium are male flowers and those with only gynoecium are female flowers. Pumpkin, cucumber, bitter gourd, snake gourd, ash gourd, coconut and arecanut trees have both male and female flowers.

Seed formation

Have you ever thought how seeds are formed in flowers?

There are certain processes behind this. The male gamete from the pollen grain should reach the ovary and fuse with the egg. Fusion of male gamete with the egg is called fertilization. Fruit is formed in plants after fertilization.

Observe the figure.



Male and female plant

There are male and female plants among fan palm, gamboge (kudampuli), nutmeg etc. The male plant has only male flowers and the female plant has only female flowers.



Fan palm (*Kudappana*)



Nutmeg

- Where is the male gamete seen in a flower?
- Where can we see the egg of a flower?
- Where does fertilization take place?

First the pollen grains from the anther should reach the stigma for fertilization. From there, the male gamete should reach the ovary. Draw the pathway of the pollen grain and male gamete in the figure shown.

How fortunate you are! Don't you get honey everyday?



We don't just keep drinking honey.



Did you listen to the bee's response? What else does the bee do?

On the wings of butterflies

Pollen grains from the anther should reach the stigma first. How does it happen? Who all help in this?



Pollination

Transfer of pollen grains from the anther to the stigma is called pollination. Factors that help pollination are called pollinating agents.

Name the organisms that help in pollination.

-
-

For you dear butterfly...

Butterflies, honey bees, birds and many other insects visit flowers.

What are the peculiarities seen in flowers to attract pollinating agents?

-
-

Notice the peculiarities of these flowers.



Lantana



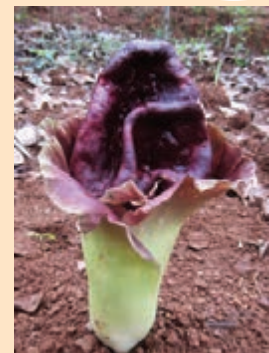
Mussaenda



Bougainvillea

Flowers with foul odour too...

Have you ever experienced the foul smell of the elephant yam flowers? In the elephant yam and taro, pollination is done by flies. The foul odour is to attract flies.



- Small flowers grow as inflorescence. Why?
- What is the advantage of the leaves surrounding a mussaenda flower changing colour and appearing like the flower?
- Are the parts in bougainvillea, that change colour, flowers?

Now, you have understood various peculiarities of flowers to attract pollinating agents. Observe the plants in your surroundings and write down the peculiarities of each in the science diary.

Are all flowers pollinated by animals?

Floating with the wind

Have you seen the flowers of paddy? Haven't you noticed the fluttering paddy flowers?

How do the pollen grains of paddy reach the stigma? Let's observe certain features of such flowers.

- Have a large number of pollen grains.
- Pollen grains are lighter in weight.

Water and wind are also pollinating agents. Pollination in plants like paddy, wheat, maize and sugarcane occurs through wind. The pollinating agent in pepper plant is water (dew drops).

In which season does pollination occur in the pepper plant?

Can you identify the pollinating agents by observing the features of flowers?

Notice the features of a few flowers. Which pollinating agent among those given below, matches the features?

- Light weight pollen grains -
- Colourful flowers -
- White flowers that bloom at night -
- Pollination in moisture -

Water (dew drops), moth, wind, honey bee



Flower of paddy



Pepper



Artificial pollination

Pollen grains from superior quality plants are collected and dusted on the stigma of other plants to produce high quality seeds. This is artificial pollination. A variety of honey bee called melipona pollinates the vanilla that grows in Mexican forests. We had to adopt artificial pollination to cultivate vanilla in our country, as there were no melipona bees.

The journey of pollen grains

Is it necessary that the pollen grains of a particular flower should fall on the stigma of the same kind?

They may fall on the stigma of different flowers.

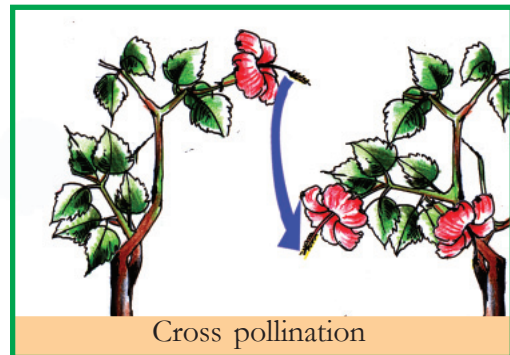
In which of the following situations does pollination become effective?

Put ✓ mark.

- Pollen grains of pumpkin flower falling on the stigma of ash gourd flower.
- Pollen grains of ash gourd flower falling on the stigma of another ash gourd flower.

Pollination becomes effective when the pollen grains fall on the stigma of flowers of the same kind. Pollen grains that fall on the stigma of other kinds of flowers may get destroyed.

What are the ways in which pollination may occur? Observe the pictures.



- Explain self pollination and cross pollination and write down in your science diary.

Self pollination -----

Cross pollination -----

Now we know that self pollination is of two types.

Do both types of pollination occur in plants like cucumber, bitter gourd, pumpkin etc.? Why?

Withering petals

After pollination, the male gamete reaches the ovary and fuses with the egg to form fruit. Have you noticed the withering of petals and androecium during this stage?

Using a hand lens, observe the petals of a flower that has begun to wither.

- Which are the parts that remain?

What changes occur in the various parts of a flower when it becomes a fruit?



Tomato flower



Tomato



Cucumber flower



Cucumber

Part of the flower	change
Pedicel	
Thalamus	
Calyx	
Corolla	

Complete the table and write it in your science diary.

Examine the picture.



Ash gourd flower



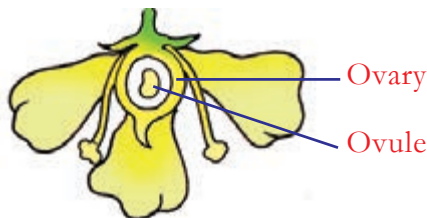
Ash gourd-Longitudinal and cross sections

- Which part grows into a seed?
- Which part grows into a fruit?

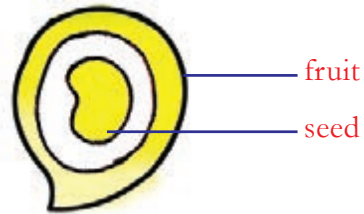
Fruits develop from flowers. If so, wouldn't certain features of flowers be seen in fruits too?

Only one fruit

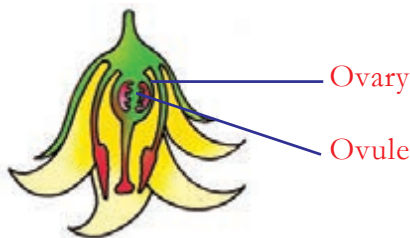
Observe the figures given below.



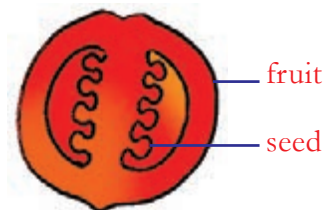
Mango flower



Mango



Tomato flower



Tomato

Only one fruit is formed from each flower. These fruits are called simple fruits.

Add more to the examples of simple fruits in your science diary.

- How many seeds are there in a mango?
- Does a tomato have only one seed?
- What may be the reason for the difference in the number of seeds?

Find out more examples of fruits with one seed and fruits with more than one seed and note them down in your science diary.

One flower, many fruits

Have you seen frangipani flowers? Take a flower and observe the ovary and gynoecium after removing the petals. You can use a hand lens for this.



Frangipani - flower



Frangipani-gynoecium

Does the flower have only one ovary?

If so, how many fruits may be formed from one flower?

If more than one fruit is formed from a flower, such fruits are called aggregate fruits. Custard apple, black berry, polyalthia fruit etc. are examples of aggregate fruits.



Custard apple flower



Custard apple



Polyalthia fruits

Looks one, though not one

Have you seen the flower of the jack tree? Many small flowers are arranged on a stalk. Observe the inflorescence of the jack tree using a hand lens.

There are hundreds of flowers in an inflorescence of a jack tree. Can you imagine the number of fruits formed from this inflorescence? Each such fruit is the *chakkachula* and the seed *chakkakuru*. What happens to flowers that do not turn into fruits?



Jack tree-inflorescence

They turn into *chakkachavini*. They are all arranged inside a common covering, as a single fruit. Such fruits are called multiple fruits.



Jackfruit-section



Pineapple flower



Pineapple

Which is more in a jackfruit - the fruit or the unfertilised flowers that do not become fruit?

Now you are familiar with different kinds of fruits.

Examine the fruits used at home and identify the peculiarities of the ovary of the flowers. Use the following indicators.

- How many ovaries are there in a flower?
- Is there more than one ovule in the ovary?
- How are the ovules arranged in the ovary?

The disguised

We learnt that fruits are formed from the ovary after fertilization. Examine the following pictures.



Cashew flowers



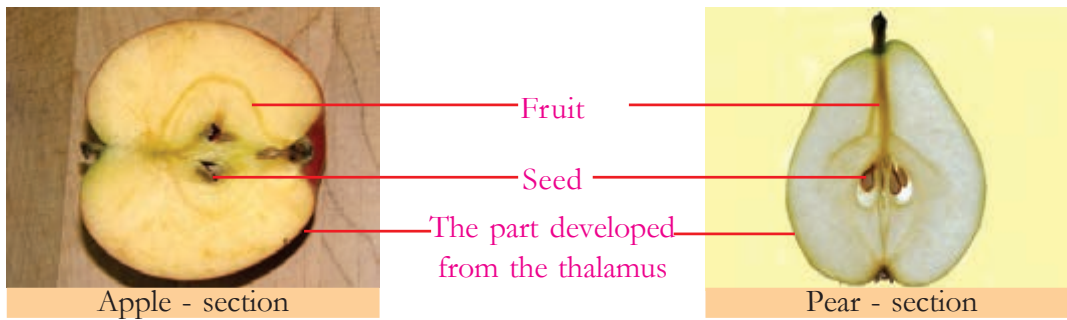
Cashew nut



Cashew apple

Which part developed to form the cashew apple?

In some plants, parts like the pedicel, thalamus etc., develop into fruit like structures. These are called false fruits.



You have already studied how the seeds of a plant are dispersed. Explain the advantage of false fruits based on seed dispersal. Examine apple and cashew apple and find out the true fruit and the false fruit.

Fruit and flower

Examine the figures given below and find out the right statement related to each fruit.



Strawberry



Chilli



Arecanut

Flowers are seen as inflorescence

More than one ovary in a flower

Flowers are seen one by one (Single flower)

We see flowers of different sizes everyday. How many kinds of fruits we eat! Do you observe them closely? Observe the grass, climbers and other kinds of plants seen in your surroundings. How interesting it is to watch the flowers in them and the pollinating insects that come to them. Write the observation note in your science diary. Collect the pictures of various flowers and fruits, and arrange and paste them in an album.



Significant learning outcomes

The learner can

- identify and explain important parts and functions of a flower.
- classify flowers into unisexual and bisexual flowers.
- explain concepts like pollination, self pollination and cross pollination.
- identify the relation between pollinators and floral peculiarities.
- classify fruits into simple fruits, aggregate fruits and multiple fruits.
- engage in activities to protect butterfly parks.



Let us assess

1. Observe the picture



What inferences can be made about bitter melon flower.

2. Parts like petals, androecium etc., wither and fall down after fertilization. The pedicel, thalamus and calyx become stronger. Explain the reason.



Extended activities

1. Identify the season when the pepper vine blooms.
2. Observe the peculiarities of the beaks of birds that suck honey.



4

Along with Motion

Which are the objects on the earth that do not move?

It was with this question that Bindu teacher came to the class that day.

Buildings, rocks, mountains

The children went on answering. They were surprised when the teacher remarked that all these objects are constantly in motion at great speed.

“Uh... if that's the case, our house wouldn't be there when we get home from school”, Aswathy quipped. Do you agree with this?

Observe the picture.



You may be aware of the fact that all planets move around the sun. Can you explain what the teacher said on the basis of the motion of planets? Discuss it on the basis of the following indicators.

- Which are the motions of the earth you are familiar with?
- Which are the objects that move along with the earth when it moves?
- Can you be in a state of rest at least for a second?

All objects on the earth move along with it. This can be understood only if we view from outer space.

What a speed!



The earth rotates about its axis at an approximate speed of 1667 kilometre per hour at the equatorial region. It revolves around the sun with a speed of 1,06,000 kilometre per hour. How wonderful it is to realise that we are moving at a great speed even while sitting still at a place.



See 'Prapanchathile ella vasthukkalum chalikkunnu' in *School Resources in IT@School, Edubuntu.*

Motion within the body

Place your ears close to your friend's chest. What do you experience? What is the reason behind the sound you hear? What are the movements that occur within your body?

- blood circulation
-
-

Motion around us

Wave a piece of paper. Don't you feel the motion of air?

What are the other instances when you have experienced the motion of air?

- while sitting on a sea shore
-
-



What are the other types of motion that take place around you? Enlist.

-
-

Now you might have realised that different types of motion take place around you always.

Force and Motion

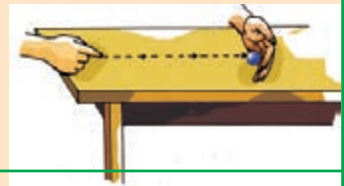
When does a body start moving? You might have seen different types of motion, either fast or slow. What is the reason for the difference?

Conduct the following activities.

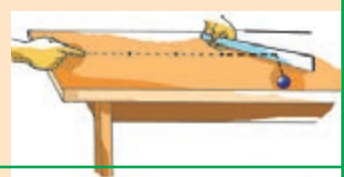
1. Place a marble (*goli*) at one end of a desk and strike it using a finger.



2. Allow the marble to roll slowly on the desk. Gently place your hand blocking its path.



3. Allow the marble to roll with a considerable speed on the desk. Hold a scale in a slightly inclined position in its path.



4. Roll the marble slowly on the desk. Roll another marble in the same direction at a greater speed so that it collides with the first one.



- When did the marble, which was at rest, start moving?
- When did it come to rest?
- When did it change its direction of motion?
- When did the speed of the rolling marble increase?

What change in motion was brought about by applying force in each situation? Write them down in the science diary.

- The marble which was at rest was set into motion.
-
-
-

We watch and play games with a ball. What are the purposes for which players apply force on a ball.

- to move the ball at rest.
-
-
-



Force and Motion

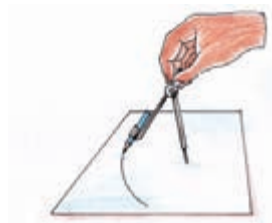
We can move objects at rest by applying force. We can also change the state of motion of a body to a state of rest by applying force. We apply force to change the direction of motion or to increase or decrease the speed of motion.



See 'Balavum chalanavum' in *School Resources in IT@School, Edubuntu.*

Different types of motion

Try doing these activities.



- Sharpen a pencil with a sharpener.
- Draw a circle with a pencil fixed in a compass.
- Draw a straight line using a pencil and a scale.

How was the motion of the pencil in each case?

1. -----
2. -----
3. -----

Observe the following motions. Which of them resemble the different motions of the pencil?



Swirling a stone tied to a rope.



A rotating top.



A ripe mango falling down.



The wheel of a vehicle rotating.



Lift going up.



Toy train running along a circular path.

Group the similar ones. Add more examples to each group and write them down in the science diary.

Those resembling the action of sharpening the pencil using a sharpener	Those resembling the action of drawing a circle using pencil fitted in a compass	Those resembling the action of drawing a straight line using pencil and scale
<ul style="list-style-type: none"> • Rotation of a top • • 	<ul style="list-style-type: none"> • Swirling a stone tied to a rope. • • 	<ul style="list-style-type: none"> • Ripe mango falling down • •

- What is the common feature of the motion in each group?
 - 1
 - 2
 - 3
- How do groups one and two differ?

The motion of a body along a straight line is linear motion. The movement of a body about its own axis is rotation. The motion along a circular path is circular motion.

Motion like this too!

You may be familiar with the following type of motions.

- motion of the pendulum of a clock.
- motion of a swing.
- motion of a hanging lamp.



What are the peculiarities of these movements?

Find out similar examples of motions.

The to and fro motion of a body about a mean position is called oscillation.



Is the motion of the wiper of vehicles an oscillation?



What is your response to Haseeb's query?

Discuss using the indicators given below.

- Is it a motion about a mean position?
- Does it move to both sides?

Oscillations like this too!

Do the following activities.

- Beat one of the prongs of a tuning fork with a rubber hammer.
- Tap on a stretched rubber band using a finger.
- Place a metal scale on a table in such a way that one of its ends projects out, and tap this end using your fingers.



Did you notice that these oscillations are at a greater speed?

Fast oscillations are referred to as vibrations.



See 'Vividhatharam chalanangal' in
School Resources in IT@School, Edubuntu.

Vibrations

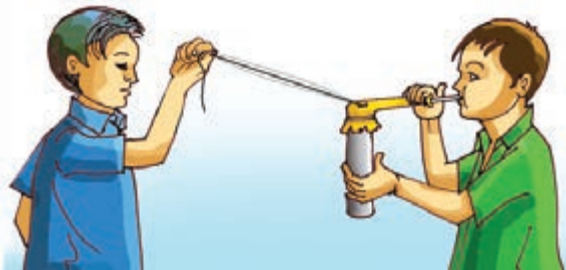
Let's make a blow pipe 'peepi' which helps us to observe vibrations.

Materials required:

10 cm long pipe of one inch diameter, a balloon, the empty case of a pen, rubber band, 2 m long thread and cello tape.

Method:

Cut open the closed end of the balloon. Insert the pipe at one end of the balloon and the empty case of a pen at the other. Tie them strongly using a rubber band. Hold the pipe vertically and stretch the empty pen horizontally. Now the balloon will appear like a stretched membrane. In the middle of this stretched portion fix one end of the thread using cello tape. The 'peepi' is now ready for use.



Method of operation:

Let your friend pull the free end of the thread. Pull the case of the pen and blow through it. Don't you hear a sound like the trumpet of an elephant? Observe the movement of the thread as well. What type of motion is it?

Motion in application

Observe a tailor stitching clothes using a sewing machine. Of the different types of motion you have already come across, which are the ones you can see in a sewing machine ?

-
-



Complete the table adding the types of motion and the uses of the instruments mentioned below.

Body in motion	Type of motion	Use
The membrane of a 'chenda' (drumhead)	oscillation	produces sound
A rotating chair		
The tip of a clock's hand		
The smaller wheel of a sewing machine		
A lift		
A swing		
The string of a veena		
Wheels of a flourmill		

Did you complete the table? What do you infer from this? Write it down in your science diary.



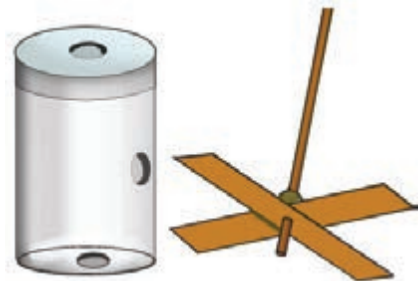
See 'Chalanam prayogathil' in *School Resources in IT@School, Edubuntu.*

Let's make a toy fan

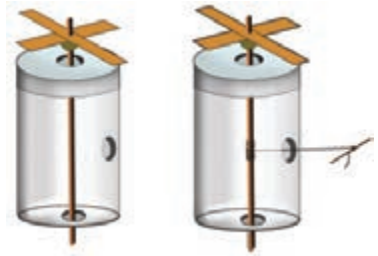
Materials required: A small plastic bottle, rib of a coconut tree leaf (eerkil), thread, cardboard piece, a bead and glue

Different stages of construction:

- Make a hole each on the lid, bottom and sides of the bottle as shown in the figure.
- Cut out the leaves of a fan from cardboard.
- Fix the bead at the top of the rib. Fix the leaves of the fan on the bead using glue. Tie the thread at the middle of the rib.



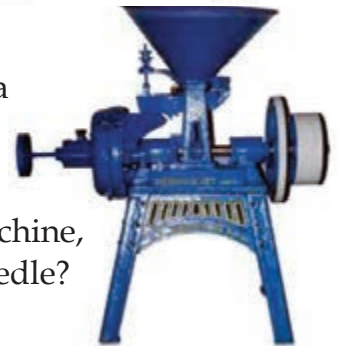
- Pass the rib through the top and bottom holes in the plastic bottle, such that the rib moves freely.
- Pull out the free end of the thread through the hole on the side of the bottle and tie it to another piece of rib.



Let's rotate the fan

Turn the rib to completely wind the thread around it. Now pull out the free end of the thread. Don't you see it rotating?

- How did the motion of the thread pass to the leaf of the fan?
- What are the devices you have seen, in which the force applied on one part is transferred to another part and used for motion?
- What are the arrangements made in such devices?
- Where do we apply force while cycling?
- How does this force reach the wheel?
- Which part is set to motion first while working a flour mill?
- How is this rotation transferred to other parts?
- What arrangements are made use of in a sewing machine, to transfer the force applied on the pedal to the needle?



Write down your findings in the science diary.

The force applied on a machine can be transferred to other parts of the machine or to other machines thus setting them into motion. We make use of the chain, wheel and axle, belt, etc., for this purpose.

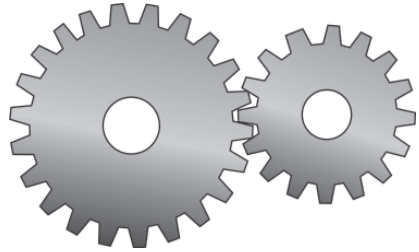
Gears



As shown in the picture, fix two corrugated plastic lids of different sizes on a wooden plank in such a way that they touch each other closely. Now turn each lid. What do you observe?

- When the small lid is turned to the left, in which direction does the big lid turn? what happens when it is turned to the right?
- Does the big lid also complete one rotation when the small lid completes one?
- How many times does the small lid rotate When the big lid is rotated once?

It is the interlocking of corrugations on the lids that enables one to rotate with the other. Such wheels are called gears.



Where have you seen gears?



- in toys
-
-

Try rotating the gears in hand drills and toys. Observe and find out the changes gears can bring about in motion, on the basis of the indicators given below and write them down in the science diary.

- Do they bring about change in the direction of motion?
- Do they bring about change in the speed of motion?

By making use of the rotation of one part of a machine, gears help us to set in motion more than one part of a machine at different speeds and in different directions. When a big wheel is turned using a small wheel, the speed of rotation decreases. When it is reversed, the speed increases. The use of gears can bring about changes in speed and direction of motion. We make use of this advantage in a number of machines.



See 'Chalanam yanthrangalil' in *School Resources in IT@School, Edubuntu.*



Significant learning outcomes

The learner can:

- explain that all objects on the earth are in motion.
- explain the changes that force can bring about in the states of rest and motion.
- give examples by classifying the types of motion on the basis of their characteristics.
- explain and cite examples for the ways in which different types of motions are used in different devices.
- make different devices related to motion.



Let us assess

1. A man pulling a hand cart applies force on it in the following situations. What is the purpose in each case?
 - i. when he starts pulling the hand cart.
 - ii. when it goes on a down hill

What are the changes force can bring about in the motion?
2. Which type of motion is dominant in the following situations?
 - i. An aeroplane gaining speed on the runway before takeoff.
 - ii. The motion of a valve tube in the rotating wheel of a bicycle.

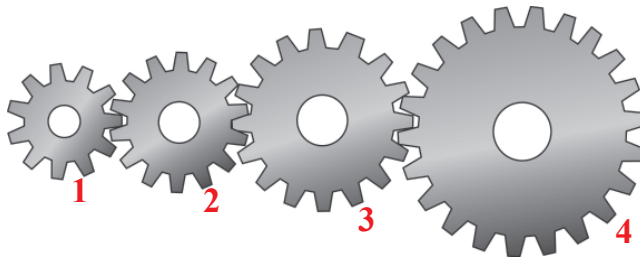
Find one example each for other kinds of motion as well.
3. The table on oscillation prepared by Lathika, Iqbal and Sonu is given below.

Lathika	Iqbal	Sonu
<ul style="list-style-type: none"> • The motion of the membrane across the drum head of a chenda, on beating it. • The motion of a swinging cot. • The motion of a giant wheel. 	<ul style="list-style-type: none"> • The motion of the membrane across the drum head of a chenda, on beating it. • The motion of the string while playing veena • The motion of the prongs of an excited tuning fork 	<ul style="list-style-type: none"> • The motion of an arrow, shot from a bow. • The motion of the prongs of an excited tuning fork. • The motion of a stretched metal wire on strumming it.

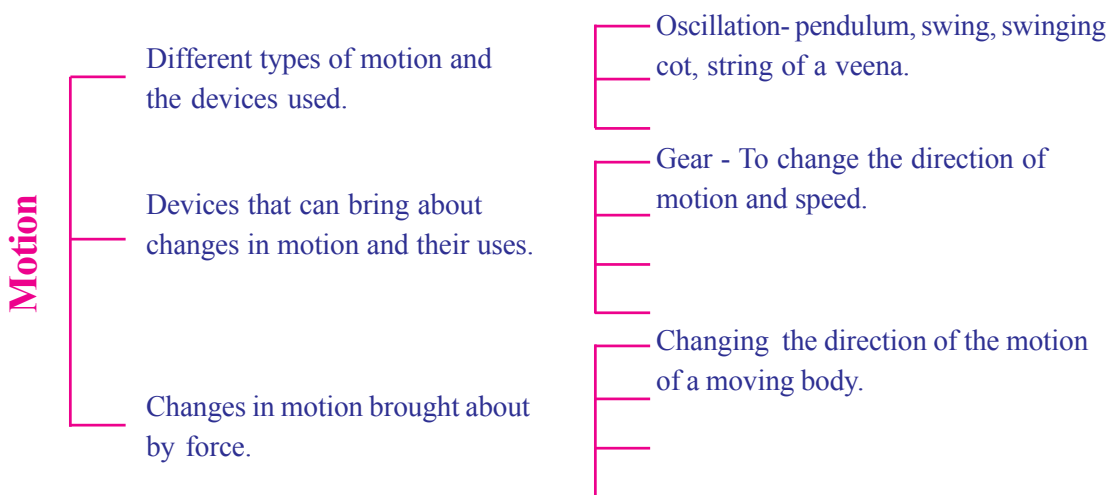
- i. Whose findings are correct?
- ii. Which are the ones that cannot be considered as examples of oscillation?
- iii. What is the difference between vibration and oscillation?

4. Observe the arrangement of gears in the figure.

- i. When the first gear is rotated, which other gear would also rotate in the same direction?
- ii. Which gear would be the slowest?



2. Complete the following concept map suitably.



Extended activities

1. Take a 50 cm long string and let it pass through a 25 cm long PVC pipe. Tie to one end of the string an iron nut and to the other end a bottle filled with water. Holding the pipe tightly, swirl the nut. What are the motions that you observe in the nut, the rope and the bottle?
2. Conduct a study tour to a science and technology museum. Try out the available activities related to motion there.
3. Dismantle a damaged clock, toys etc. Examine the arrangements in them for producing different types of motion.



Food for Health

5



What I like very much is noodles, fried rice, fried chicken and ice cream but my mother mostly prepares sambar and avial and sometimes fish curry too.



The case is the same in my home too. We mostly prepare dishes with yam, amaranthus and moringa leaves!

Now what is the case in your house?

Categorize food items into those you like and those you don't like. Do you think that we need to eat only food items we like?

In our food

We feel tired and weak if we don't have food even once.

Why do we have food?

- to acquire immunity



What is the problem if we take only one type of food?

Let us find out the things that our body receives from the food we take.

Let us see what these have to say.



Include us in your diet. We have plenty of carbohydrates.

We are full of proteins.



We have a lot of fat.

We provide mineral salts and vitamins.



Which nutrients are available from food? Examine the illustration and complete the table.

Food items	Nutrients
Rice	
Fish	
Oil	
Fruits and vegetables	



See 'Bhakshanathile poshakakhadakangaal' in *School Resources in IT@School, Edubuntu.*

What is the need of including carbohydrates in our diet? Which food items contain carbohydrate in plenty?

1. Carbohydrate

Carbohydrate is made up of carbon, hydrogen and oxygen. Its chief function is to provide energy for physiological activities. Starch, sugar, glucose and cellulose are different forms of carbohydrate. Carbohydrate is present in plenty in cereals and tubers in the form of starch.



See 'Dhanyakangal' in School Resources in IT@School, Edubuntu.

The energy we need to do work comes mainly from carbohydrate. Do we perform the activities that are shown in the picture? What are the other activities that we engage ourselves in? Don't we need a lot of energy to do all these activities? Which is the food item that constitutes the major part of your diet? Why do you include this item in higher quantity? Write down your findings in your science diary.

Which among the following food items will you include in your diet if you avoid rice for a day. Why?

Egg, Banana, Tapioca, Milk

How can we detect the presence of starch in food?

Detecting starch

Materials required: Test tube, rice gruel (*Kanjivellam*), diluted iodine solution.

Procedure: Take some rice gruel in a test tube. Add 2-3 drops of iodine solution to it. Observe the colour.

Have you now understood how to detect the presence of starch in food items? Test egg, banana, tapioca and milk in the same way.

What are your findings?

Conduct this experiment on more food items and record the inferences in your science diary.

Iodine test

A deep blue colour is formed when starch reacts with iodine solution.

Food items	Colour formed on adding iodine	Inference
<ul style="list-style-type: none"> • Ash gourd • Wheat flour • Potato • 		

2. Protein

Look at these pictures.

What is your observation about the growth of these two children?

What may be the reason for this difference?



Behind growth

Protein is a major food constituent that helps the development and growth of the body. Protein is essential for the formation of cells, hair, digestive juice etc., in the body. Protein produces energy in the absence of carbohydrates. Protein contains hydrogen, carbon, oxygen, nitrogen and sulphur. In accordance with the body weight, one should obtain protein from diet at the rate of 1 gram per kilogram.

- Do you know your body weight?
- How many gram of protein do you need a day?

Deficiency of protein leads to retardation of growth.

Kwashiorkar

Kwashiorkar is a disease caused by the deficiency of protein. The body of the affected will be weak and with a protruded belly.



From which food items do we get plenty of protein?

Examine the quantity of protein contained in different food items.

- Do you get the required amount of protein from your daily diet?
- What is the advantage of supplying green gram as part of the midday meal in schools?

We can detect the presence of protein in a few food items by the following experiment.

Materials required: *Copper sulphate, water, sodium hydroxide, dropper, beaker, egg white, test tube.*

Procedure: Add water to egg white and stir it well. Take it upto a quarter of a test tube. Add 8-10 drops of 1% concentrated sodium hydroxide to it. Stir it and add 2 drops of 1% concentrated copper sulphate solution to it. The appearance of violet colour indicates the presence of protein.

Do the experiment and write down the observation note in your science diary.

Repeat the experiment using green gram powder instead of egg. Present your findings in the class.



See 'Aahaaravum Valarchayum' in *School Resources in IT@School, Edubuntu.*

3. Fat



Here are the pictures of some food items we use everyday. We do not eat any of these directly. Then how do they get into our body?

Food item (100 g)	Protein (g)
Rice	6.8
Wheat	11.8
Cashew nut	21.2
Sardine	19.6
Duck	21.6
Duck's egg	13.5
Hen's egg	13.3
Mutton	21.4
Cow's milk	3.2
Green gram	24.0
Ground nut	17.1





Which type of food, enables the body to get oil and ghee?

If there is no fat

Fat is one of the food constituents required by our body in small quantities. Meat, fish, milk, milk products, egg, different kinds of peas etc., contain fat. Different kinds of oils and ghee are fats extracted from many food items. Fat also provides energy like carbohydrates. Certain vitamins dissolve only in fat. To get these vitamins, it is essential to include fat in our diet.

How slimy it is when the lady's finger is chopped! There is a lot of fat in it, isn't it?



Now scrub lady's finger to a paper and examine.

Examine different food items in this way and write your inferences in the science diary.

Listen to Reefa's doubt.

What is your opinion about it? How can we detect the presence of fat in food items?

Pour a few drops of oil on a white paper. Let it dry in the sun and observe. Do you see any difference on the area where oil is applied?

Detect fat

Rub any food item on a paper. If the paper is oily even after it is dried we may conclude that the food contain fat.

If in excess...



I got my blood tested yesterday. The cholesterol is high.

Lab Report		
Test	Value	Normal
Blood sugar	80	70 - 110 mg/dl
Cholesterol	230	Up to 200 mg/dl

Look at the lab report. What is the normal level of cholesterol?

Fat and cholesterol

Cholesterol is one form of fat. Besides obtaining from food, the body also produces cholesterol. If the level of cholesterol becomes high, it adheres to the inner walls of the blood vessels and prevents the flow of blood. This leads to cardiac diseases. Hence taking excessive fatty food is not advisable.

Don't you like fried food items very much? What will be the difference in the level of cholesterol if such food is taken in excess?

What are the changes to be adopted in your diet to control the level of cholesterol? Discuss and write them in your science diary.



See 'Aarogyam sambath - Abhimukham' in *School Resources in IT@School, Edubuntu.*

4. Vitamins

Examine a study report related to our food habit.

Name the vegetables and fruits that you take a day. In what quantities do you take them? Tabulate it in your science diary.

What is the significance of having fruits and vegetables?

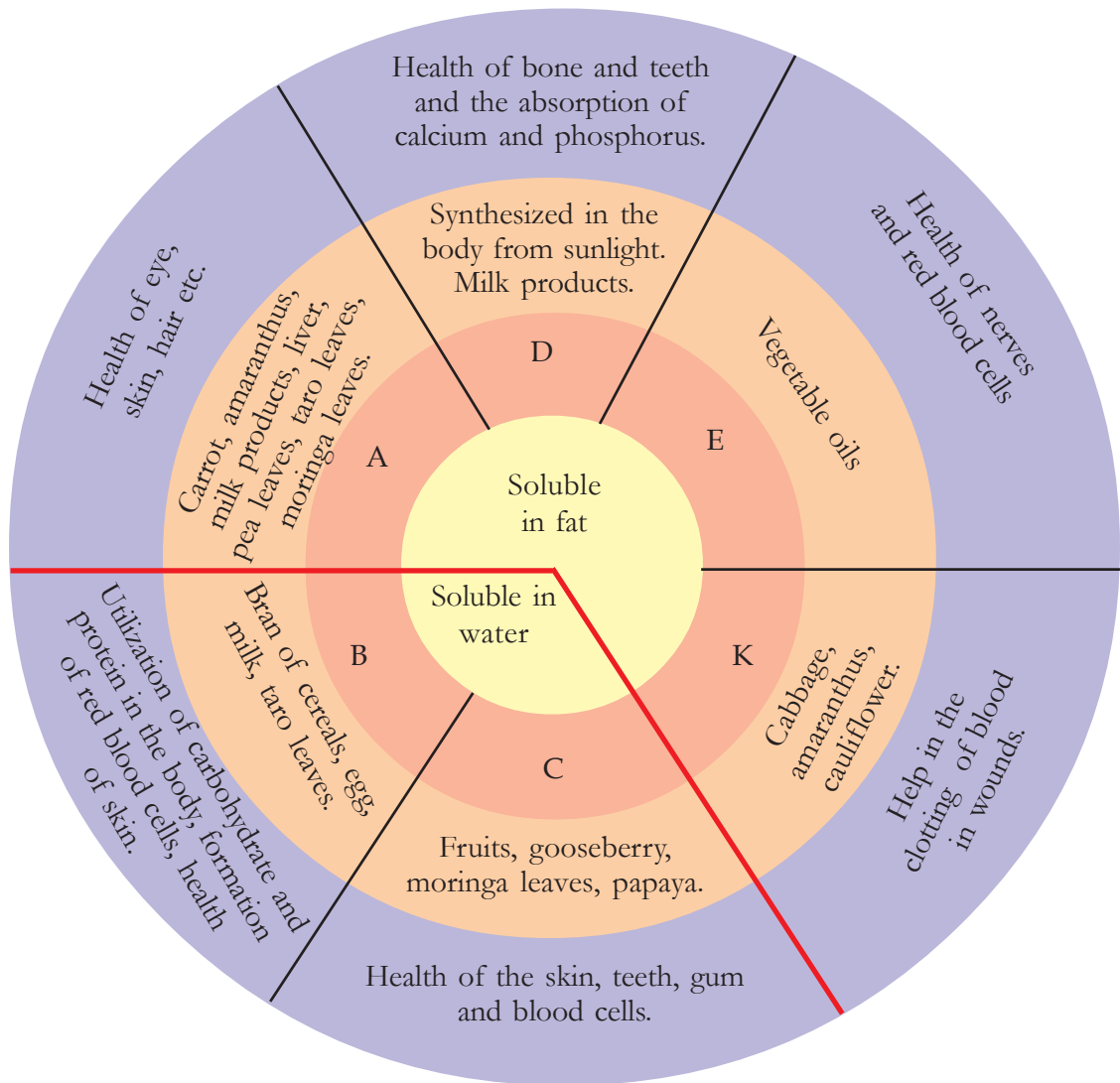
From a Study Report

The Indian Medical Research Council recommends that an adult Indian should consume 295 g of vegetables per day. But in India, an average of only 135 g vegetable is included in diet generally. In Kerala, an individual consumes an average of 50 g vegetables per day.

Health

Vitamins and minerals are nutrient factors that are inevitable for proper health and the smooth functioning of physiological activities. They are required only in small quantities. Fruits, vegetables, milk, egg, etc., are the store houses of vitamins and minerals.

There are many kinds of vitamins. Examine the illustration.



- What are the health hazards caused by the deficiency of vitamin A?
- What are the food items to be included in the diet of a person suffering from ill health of the gums?
- What happens if the intake of fat in the food is very low?
- What are the vitamins that dissolve in water?
- Infants who have not started taking food items are exposed to mild sunlight for a short time. Why?

Analyse the illustration and prepare notes. Record them in your science diary.



See 'Jeevakangal' in *School Resources in IT@School, Edubuntu.*



I wash the vegetables thoroughly after chopping, and then drain out the water.

If not kept covered

When fruits and vegetables are cooked, the vitamin C in them dissolves in steam. It goes out of the vessel with the steam. So it is better to cover the vessel while cooking them.

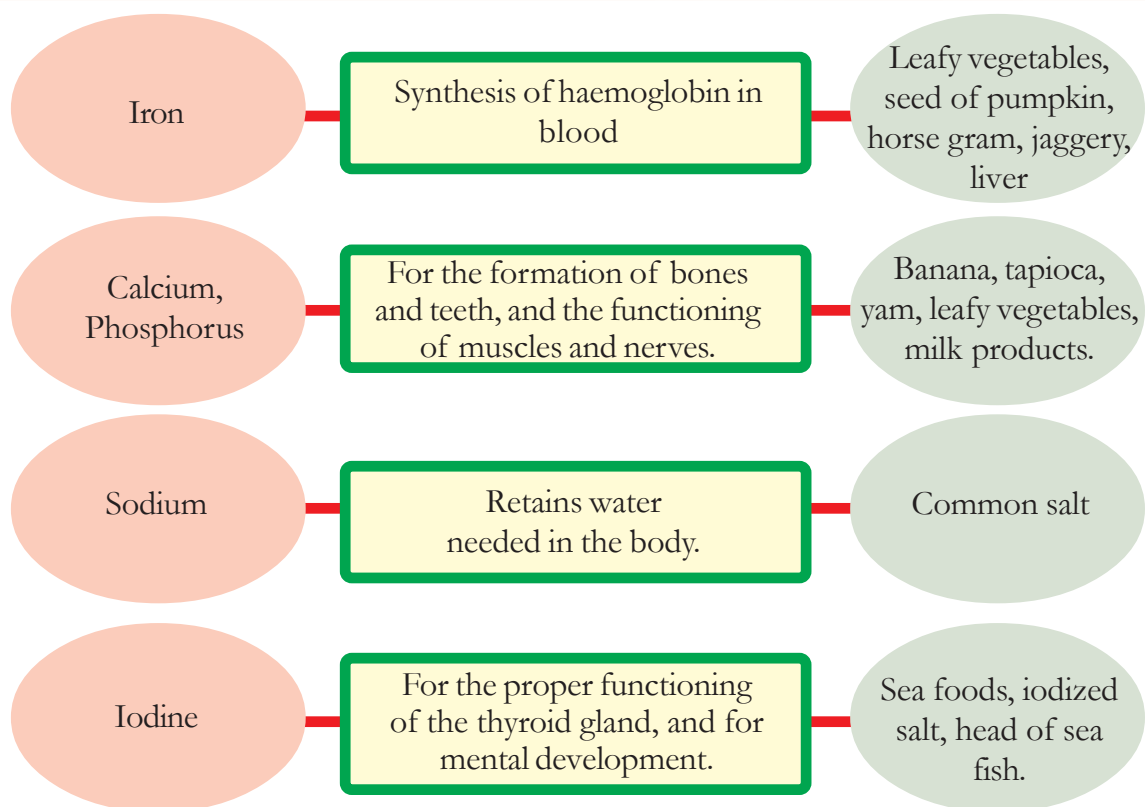
Have you paid attention to the words of this housewife?

Do you think it is advisable to wash vegetables after chopping them? Why?

5. Minerals



How is anaemia cured by taking leafy vegetables?
Go through the following information.



- The deficiency of which element causes anaemia in a child?
- What are the health hazards caused by the lack of leafy vegetables in the diet?

Haven't you now understood the importance of minerals even though they are required in small quantities? Prepare notes and record them in your science diary.



See 'Doctor classroomil' in *School Resources in IT@School, Edubuntu*.

Nutrient Deficiency Diseases

The deficiency of nutrients causes retardation of growth and many other diseases. Such diseases are called nutrient deficiency diseases.

Didn't you earlier learn about certain diseases caused by the deficiency of protein? Take note of a few diseases caused by the deficiency of vitamins and minerals.

Nutrient factor	Deficiency Disease	Symptom
Vitamin A	Night Blindness	Difficulty to see in dim light
Vitamin B	Mouth sores	Lesions in the mouth
Vitamin C	Scurvy	Pus and bleeding of gums
Vitamin D	Rickets	Bones become brittle and bend
Iron	Anaemia	Lack of blood, paleness
Iodine	Goitre	Swelling in the throat

Analyse the table and write your inferences in the science diary.

Non-nutrient factors

Non-nutrient factors like water and fibre are also to be included in the diet besides nutrient factors. Examine their importance.

Water

Water constitutes two-third of our body weight; 85% of brain, 90% of blood and 25% of bones. Water acts as the medium for many physiological activities including digestion. About 2.5 litres of water is lost from our body through urine, sweat etc. So a large quantity of pure water has to be drunk.

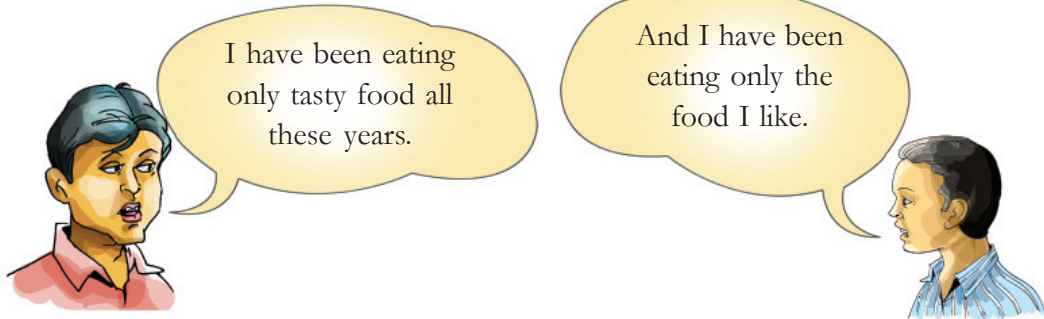
Fibres

Fibres are a kind of carbohydrate which are available in vegetarian food and cannot be digested by the body. They are mainly composed of cellulose. Though they provide no nutrients to the body, they help in the movement of excretory materials in the large intestine. Cereals containing bran, leafy vegetables, vegetables, stem and bud of the plantain, etc., are very rich sources of fibre.

- How much water do you drink everyday?
- What are the food items that provide water to your body?
- What are the problems caused by the excessive intake of food made of maida flour which contains very little fibre?

Haven't you now understood the different nutrient factors and their importance?

While selecting food

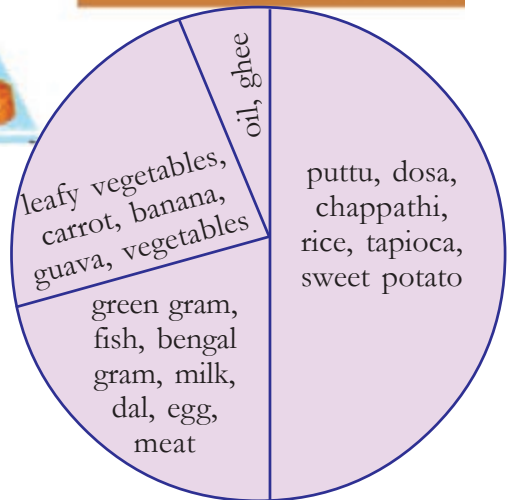


Did you notice the conversation? Do you get all the nutrients by eating only the food you like? What is your opinion? Notice the illustration given below.

Do you think that we have to take all types of food in equal quantity?



Balanced diet
Food that contains all nutrients in required quantities is termed as balanced diet.



What are the things to be considered while preparing a routine menu chart?

Examine the food charts prepared by three students.

Time	Anil	Mini	Sinan
Morning	Idli Sambar Milk	Parotta Egg Curry Milk	Idli Chutney
Noon	Rice Peas Curry Amaranthus Fish	Rice Chicken Curry Sambar	Rice Fish Curry
Night	Banana Chappathi Vegetable Kuruma	Chappathi Potato Curry	Chappathi Egg Curry

Whose food chart is more balanced? Why?

Can you prepare diverse, balanced food charts?

Make use of the following tables and the matters discussed so far for data collection.



Tubers and Leafy vegetables

Food Item 100 g	Vitamin (mg)				Minerals (mg)		
	A	B1	B2	C	Calcium	Phosphorus	Iron
Tapioca	0	0.05	0.10	25	50	0	0.9
Yam	260	0.06	0.07	0	50	38	0.6
Taro	24	0.09	0.03	0	40	88	1.7
Baby yam	10	0.10	0.01	15	12	53	0.8
Curry leaves	7560	0.08	0.01	4	813	57	7.0
Taro leaf stalk	104	0.07	0.07	3	60	20	0.05
Taro leaf	10278	0.22	0.26	12	227	82	10.0
Pea leaf	6072	0.05	0.18	4	290	58	20.1
Moringa leaves	6780	0.06	0.05	220	440	80	7.0
Plantain bud	27	0.05	0.02	16	32	0	1.6

Fruits



Fruits (100 g)	Carbohydrate (mg)	Protein (mg)	Fat (mg)	Calcium (mg)	Iron (mg)
Banana	10	200	400	50	153
Small plantain	24700	1100	100	10	0.5
Cashew apple	11600	200	100	10	48
Grapes	10000	1000	100	10	0.2
Guava	14500	1500	200	10	1.0
Jackfruit	18900	1900	100	20	0.5
Mango	11800	1500	100	10	0.3
Papaya	9500	50	100	10	0.4
Pineapple	12000	600	100	20	0.9

Recipe



Avial



Ingredients: Cucumber, drumstick, carrot, yam, papaya, tender plantain, coccinea (*Kovaikka*), pea, curd ($\frac{1}{2}$ cup each), ground coconut and green chili – 2 cups, coconut oil – 3 table spoons, curry leaves, salt and turmeric powder.

Method of preparation: Cut vegetables into long and narrow slices. Add one teaspoon of turmeric powder and salt for taste. Cook it in a flat vessel. Add the ground coconut and green chilly to the scraps. After taking it out from the stove, add curd and stir. Then add coconut oil and curry leaves, stir gently and close the vessel.

Is *Avial* included in the food chart you prepared?

What all nutrients do you get when *Avial* is included in your food? You might have understood the nutrients present in various food materials. Is it necessary to change your food habit in order to get all the nutrients in required quantity?

Record your inferences in the science diary. Discuss the findings at home and try to implement it.



Significant learning outcomes

The learner can

- recognize and tabulate nutritious food and the nutrients in them.
- recognize the concept of balanced diet and prepare food charts.
- find out causes of deficiency diseases and suggest remedies.
- bring about required changes in the food habit.



Let us assess

1. Arrange the nutrients given below based on the quantity in which they are required (from higher amount to lower).

[Protein, Minerals, Carbohydrate, Fat.]



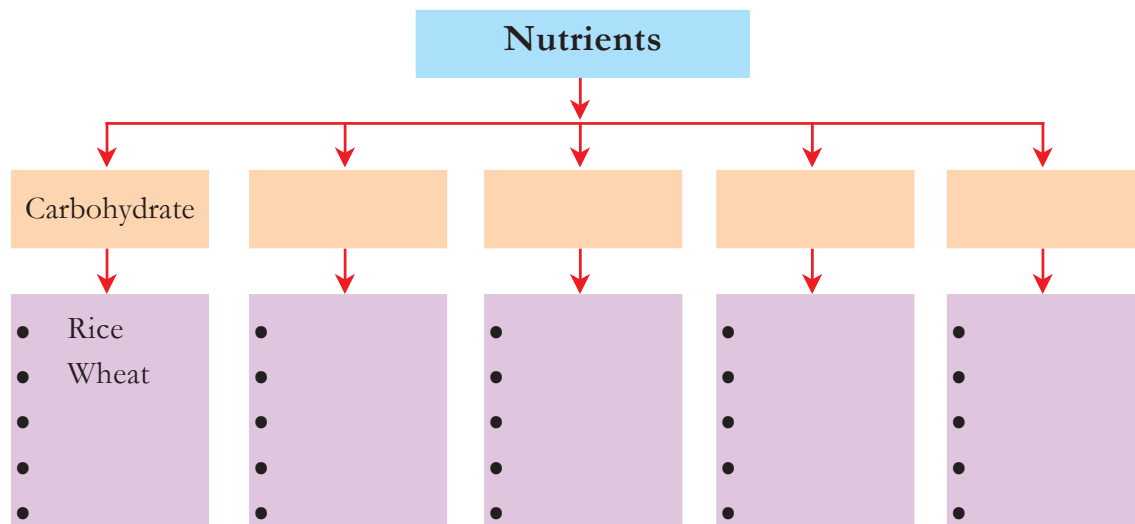
- 2.

Minerals and vitamins are needed only in small quantity. Then isn't it enough that we eat very little fruits and vegetables?

We get vitamins and minerals in required quantities only by having plenty of fruits and vegetables.

Analyse the two statements. What is your inference?

3. Complete the illustration adding more information.



4. Prepare a questionnaire to conduct an interview with a doctor to get more information about deficiency diseases.



Extended activities

1. The approximate height and weight required, in relation to the age, is indicated in the table. Find out your height and weight. Compare it with the information given in the table.

Age	Boy		Girl	
	Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
11	140	32.2	142	33.7
12	147	37	148	38.7
13	153	40.9	150	44
14	160	47	155	48
15	166	52.6	161	51.5



2. Collect recipes of various food items and prepare a special booklet.
3. Prepare suggestions to make the midday meal at school more balanced and submit it to your Headmaster.