Science

8

What does "Progressive Science" series consist of?

Each lesson is supported by :

- Beautiful illustrations
- Learning objectives
- Fact to know
- Let's Recall
- Word power
- Train your Brain
- Cross Curriculum Connect
- Exercises with Revision and Model tasks
- Activity time
- HOTS
- Project time

Tasks for RTP and MTP include :

- Answer the questions in short
- Fill in the blanks
- Answer the questions
- True/False
- Multiple choice questions
- Answer in one word
- Match the columns

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Aimline

Preface

Science is an attractive journey into the cause and effect, as well as the reason for all life and the world we live in. It is a subject that effects our line in a preformed manner. Thus it is vital to initiate the scientific temper into children as early as possible.

Children are naturally curious and scientific inquiry is a part of their behaviour from birth. By keeping this point in mind, the series lays stress on learning with understanding.

The series of "**Science**" for classes 1 to 8, is strictly written in accordance with the prescribed elements and guidelines issued in the **Latest National Curriculum Framework** suitable for CBSE and other **State Board Schools**.

Vital information about the series :

- Learning objectives : Recap of the chapter content.
- Fact-o-scope : Which presents snippets of interesting information to take learning beyond the syllabus.
- Let us Recapitulate : Which is given to recapitulate the important points learnt.
- Word Power : Meaning of difficult words are given in this section.
- Train your Brain : This section has been designed to develop skills of creative and critical thinking among the students.
- Model Test Paper : Measures how much a student has learnt. It is included in each chapter in the form of questions and answers and fill up the blanks.
- High order thinking Skills (HOTS) : Challenging opportunities given to develop analytical skills.

Four Formative and two Summative Assessments are given at the end to provide Continuous and Comprehensive Evaluation of knowledge, understanding and application of concepts learnt.

Every effort has been made to make the series fruitful. Any suggestions for the improvement of the series shall be gratefully acknowledged and incorporated in the forthcoming series.

– Publishers

Aim Line

DETAILED CONTENTS

S. No.	Chapter Name	Introduction	Activity and Facts to know	Let's Remember and Glossary	Summary	Exercise	HOTS (Think and Answer)	Let's Recall	Group Discussion and Activity to Do	Creative Task	Work-sheet
1.	Crop Production and Management	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
2.	Microorganisms	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Description of the difficult words	Important points of the chapter	MCQs; True/False; Fill up; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
3.	Coal and Petroleum	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
4.	Combustion and Flame	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	One Word Question; Matching; Description of the difficult words	Important points of the chapter	MCQs; True/False; Fill up; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
5.	Conservation of Plants and Animals	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Fill up; True/ False; Description of the difficult words	Important points of the chapter	MCQs; True/False; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
6.	Reproduction in Animals	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Conversion; Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; Examples; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
7.	Reaching the Age of Adolescence	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Conversion; Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; Examples; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter

S. No.	Chapter Name	Introduction	Activity and Facts to know	Let's Remember and Glossary	Summary	Exercise	HOTS (Think and Answer)	Let's Recall	Group Discussion and Activity to Do	Creative Task	Work-sheet
8.	Force and Pressure	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Matching; Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
9.	Friction	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	True/False; Description of the difficult words	Important points of the chapter	MCQs; Fill up; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
10.	Sound	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	True/False; Matching; Description of the difficult words	Important points of the chapter	MCQs; Fill up; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
11.	Chemical Effects of Electric Current	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	True/False; Matching; Description of the difficult words	Important points of the chapter	MCQs; Fill up; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
12.	Some Natural Phenomena	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Fill up; True/False; Description of the difficult words	Important points of the chapter	MCQs; Matching; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
13.	Light	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Classify; Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
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	Task for RV–2										
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CHAPTER 1

Crop Production and Management

Introduction

- Agricultural practices
- Preparation of soil
- Sowing
- Adding fertilisers / manures
- Irrigation
- Protection from weeds
- Harvest
- Storage
- Animal husbandry

We all know that food is essential for our survival. The energy we obtain from food is utilised for carrying out various functions of our body like digestion, respiration excretion, reproduction, etc. Some animals are herbivores, some carnivores and some like human beings are omnivores.

In order to provide food to a large population, food has to be produced on a large scale to meet the demands of the people. Hence proper management and distribution of food produced on a large scale is necessary.

The primitive man was a hunter and a food gatherer. He led a nomadic life and wandered from place to place in search of food, He ate whatever he found. He accidentally discovered that plants could be grown. He thus started cultivating crops. He improved irrigation facilities, and used scientific methods to grow crops. This led to the development of agriculture.

The word 'agriculture' is derived from the latin word 'ager' means 'field' and 'culture' means to 'cultivate'. Thus agriculture means producing crops and looking after them.

AGRICULTURAL PRACTICES

A variety of activities must be undertaken by the farmer to grow crops. Plants of the same kind grown at one place on a large scale are called **crop.** For example, several rice plants of grown in a field form a rice crop .

A large number of crops are grown in India depending on the climate, rainfall and humidity. Different crops are grown in different regions of our country. Crops are basically classified into two kinds based on the season.

1. **Rabi Crops :** These are grown in the winter season, sown in October-November and harvested in March-April. Examples are wheat, barley, gram, pea, mustard and linseed.
2. **Kharif Crops :** They are also called summer crops, sown during June - July and harvested in September - October. These crops need a large amount of water and are hence sown in rainy season. Examples are rice, maize, cotton, groundnut and soyabean.

Besides these, pulses and vegetables are also grown in many places.

Examples of some common crops

Type	Example
1. Cereal	wheat, rice, maize
2. Pulses	gram, lentil, urad
3. Oil seeds	mustard, groundnut
4. Tuber crops	potato, onion
5. Fibre crops	cotton, jute
6. Fruits	apple, mango, banana

Wheat crop

Paddy crop

Let us now learn about the basic practices of crop production.

For growing crops a farmer has to perform a number of activities over a period of time in a proper sequential manner. These activities or tasks are known as agricultural practices. These activities include :

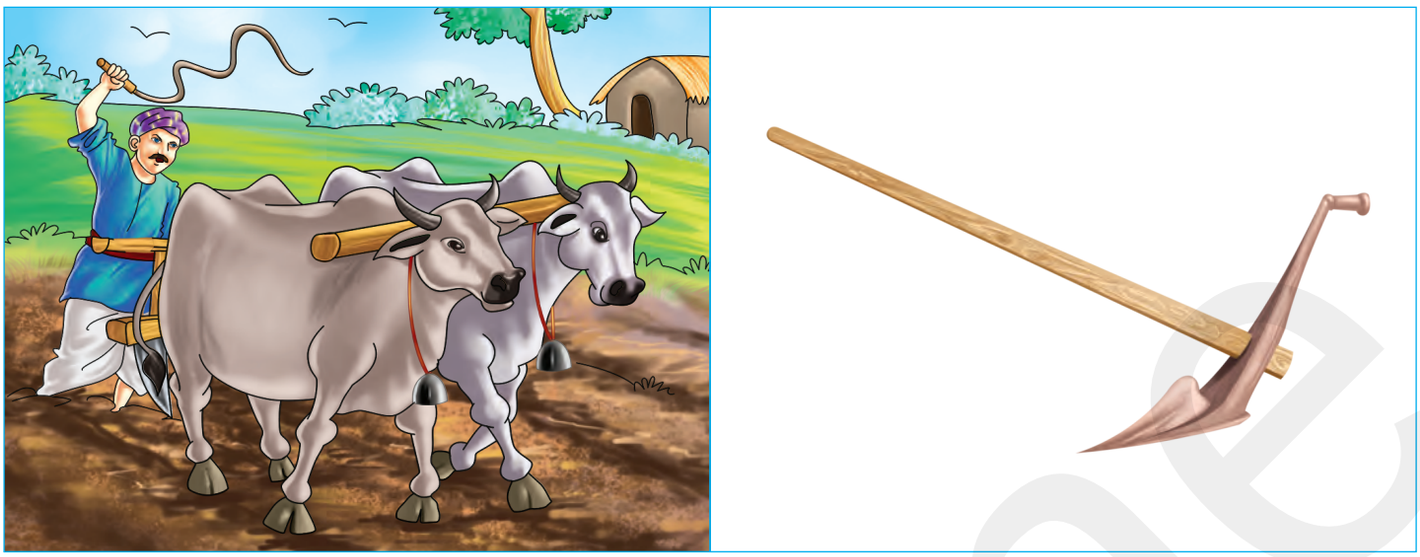
• Preparation of the soil • Selection and sowing of seeds • Adding manure and fertilisers • Irrigation • Protection from weeds • Harvesting • Threshing and storage.

PREPARATION OF THE SOIL

The first step in growing a crop is to prepare the soil i.e. to make the soil ready. It includes **tilling** or **ploughing**. This refers to loosening and turning the soil. This is an important process with many advantages.

- Loosened soil allows the roots to penetrate easily deep into the soil. This helps to fix the plant firmly to the soil.
- Helps in trapping air in the soil, which the roots use for breathing.
- Loosening of soil supports the growth of earthworms and microbes present in the soil. These organisms further turn and loosen the soil, and their, decayed bodies add humus, benefitting to the soil. These microorganisms also contribute to soil fertility by decomposing plants and animals, remains releasing nutrients back into the soil.
- The spaces between soil particles help to trap water, increasing the soil's water holding capacity.
- It brings nutrient rich soil to the top, available for use by the plant.
- Fertilisers mix easily and uniformly with loose soil.

Ploughing is done by a tool called a plough.



The Plough

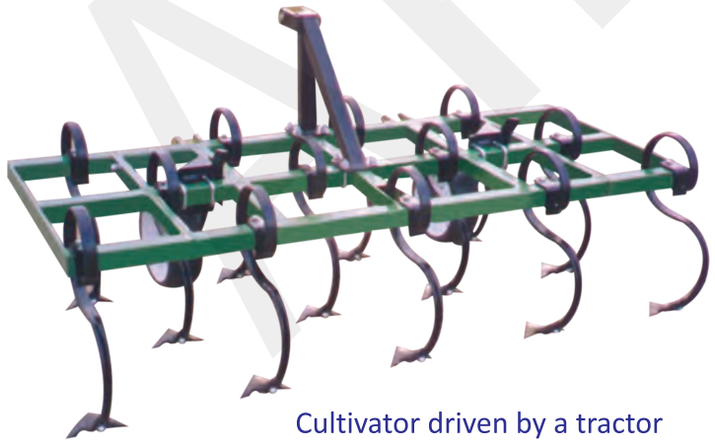
Ploughs are made of iron or wood. The wooden plough has an iron tip, which penetrates into the soil. Nowadays iron ploughs are commonly used. Ploughs are drawn either by bullocks or other animals like horses and camels or by a tractor.

Sometimes, the ploughed field may have big pieces of soil called crumbs, which need to be broken down with a plank called leveller. The process of making the soil surface even and smooth is called levelling. Levelling prevents soil erosion and aids in uniform irrigation of the field.

Agricultural Implements

The main tools used to break soil to the size of grains for better yield are ploughs, hoes and cultivators. This is done before sowing the seed.

Plough — It consist of a strong rectangular iron strip called ploughs share and a long log of wood called plough shaft. At one end of the shaft there is a handle and the other end is attached to a beam which is placed on the bull's neck.



Cultivator driven by a tractor

Hoe : It is used for removing weeds and loosening the soil.

A hoe

Cultivator

Now-a-days ploughing is done by tractor-driven cultivator.

SOWING

After preparing the soil, seeds are sown. This is the most important step in crop production. The selected seeds should be of good quality i.e. high yielding, disease resistant, clean and healthy.

Activity - 1

To separate healthy seeds from unhealthy ones.

Take a beaker filled with water. Add a handful of wheat grains or whole gram seeds to it. Stir well. Leave it for sometime.

What do you observe?

Some seeds settle down at the bottom, while others float on the surface of water.

Seeds that are damaged or eaten by insects become hollow and light. Causing them to float on water.

This is a good method for separating good, healthy seeds from the damaged ones.

- Seeds should be sown at a right depth, neither too deep nor too shallow. If planted very deep they will not germinate. If planted too near the surface they will be eaten away by birds.
- Seeds must be sown at a proper distance from each other to avoid over crowding. If the space is too little, plants will not get sufficient sunlight, nutrients and water from the soil. If the spacing is too large, precious space is wasted.

  Sowing can be done either manually or mechanically using a seed drill.

Manual Sowing

The process of sowing seeds by hand is called broadcasting. In this method seeds are sprinkled directly into the soil. However this method does not ensure uniform distribution of seeds, and it also does not ensure that all seeds are sown at an appropriate depth. Seeds of bajra, maize and wheat are sown by this method.

Using a Seed Drill

This method is better than manual sowing. It ensures the uniform distribution of seeds and sows them at a proper depth. It also ensures that seeds are covered with soil after sowing. This method is faster and more economical.

A seed drill

Sowing of Seeds by Transplantation Method

Seeds of certain plants like paddy, chilly, tomato and brinjal are not sown directly into the field. They are first sown in nurseries and then transferred into the fields manually, when the seeds are four to six weeks old. This is know as transplantation. This method has several advantages. It helps the farmers:

- To select healthy seedlings and space them properly.
- To ensure that wastage of space is avoided.

Fill in the blanks.

1. The same kind of plant grown in a large area is called _____.
2. The process of sowing seeds manually is called _____.
3. Process of loosening and turning the soil is called _____.
4. Application of artificial water to soil at desirable intervals is called _____.
5. Damaged seeds would _____ on top of water.
6. The plants which are grown by _____ method include paddy, tomato, brinjal.

Adding Manure and Fertilisers

We need to add manure to get better crops. Substances added to the soil in the form of nutrients for the healthy growth of plants are called manure and fertilisers. When crops are grown in a field, they use the nutrients present in the soil. Farmers cultivate one crop after another. The fields are not left uncultivated. The soil becomes devoid of certain nutrients. Farmers, therefore, have to add manure to the soil to replace the nutrients. This process is called manuring.

Manure is a natural substance obtained from the decomposition of plant and animal waste. It is organic in nature and increases the humus content of the soil. Manure also helps to increase the water retention ability of the soil and improving its texture by making it porous.

Fertilisers are chemicals manufactured in factories. They are rich in a specific nutrient. They provide nutrients to the soil in a concentrated form. Some examples of fertilisers are urea, ammonium sulphate, potash, NPK (Nitrogen, Phosphors, Potassium). Fertilisers are a source of water pollution. Excessive use of fertilisers is harmful as they destroy useful micro-organisms in the soil.

Activity - 2

Take three pots. Mark them as 'A' , 'B' and 'C'. Sow some gram seeds in all the three pots. To pot A add a little dung, to pot B, add a little urea. Do not add anything to pot C. Add an equal amount of water in all the pots. Keep them in sunlight and water them daily. After a week, observe them. What do you observe? Record your findings. The growth of plant was best in which pot?

Online

Therefore, we must substitute fertilisers by organic manure or leave the field uncultivated in between the crops.

Crop Rotation is another method of replenishing soil with nutrients. This is done by growing different crops alternately. Farmers often cultivate legumes and wheat alternatively in northern India. You have already studies about Rhizobium bacteria and how they fix nitrogen in the soil in the previous classes.

Manure and Fertilisers

S. No.	Manure	Fertilisers
1.	It is an organic substance. It is a natural substance obtained from plant and animal waste.	It is an inorganic salt.
2.	It can be prepared in fields.	It is prepared in factories.
3.	It increases the humus content of the soil.	Does not increase the humus content of the soil.
4.	It is not very rich in plant nutrients.	It is very rich in plant nutrients.

The organic manure is considered better than fertilisers.

IRRIGATION

Like human beings plants also needs water to live. Water is necessary for proper growth and development of flowers, fruits and seeds of plant. Plants contain 90% water. In the absence of water, germination will not take place and nfutrients dissolved in water are transported to the different parts of the plants. The crops are protected from both frost and hot air currents by water. Water has to be supplied to fields regularly so as to maintain the moisture content of the soil for healthy crop. eeeee

The supply of water to crops at regular intervals is called irrigation. Water requirement varies from crop to crop, soil to soil and season to season. Paddy needs a constant supply of water whereas wheat requires water at regular intervals. Farmers in India primarily depend on rainfall. Since the rainfall varies from time to time and also from place to place, other modes of irrigation have to be used.

Sources of Irrigation : The sources of irrigation are tube wells, canals, wells, ponds, lakes, rivers and dams.

Methods of Irrigation : Methods of irrigation are of two types- traditional and modern.

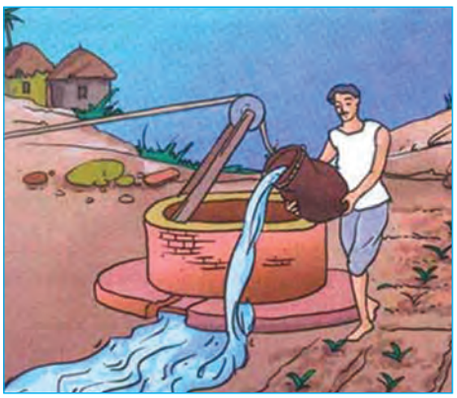
Traditional Methods :

Some of the traditional methods Include :

1. moat (pulley system)
2. chain pump
3. furrow irrigation

4. dhekli

5. rahat (lever system)



Moat

Furrow irrigation

Chain pump

Dhekli

Rahat

The water available in lakes, canals etc. is lifted up in different ways. These methods are cheap, but often lead to wastage of water.

Modern Methods

Modern methods help to save water. Sprinkler irrigation and drip irrigation are examples of modern methods.

1. Sprinkler System

This means supplying water to crops like artificial rain. It is useful in uneven land where sufficient water is not readily available, especially in areas with sandy soil. These are perpendicular pipes, having rotating nozzles on top, are joined to the main pipe line at regular intervals. This method involves pumping of water at high pressure through the main line using a pump. As water escapes from the nozzles, it sprinkles on the crop as if it is raining.

Sprinkler System

2. Drip System

In this method pipes or tubes are used with very small holes to deliver water drop by drop directly at the base of each plant. Hence it is called drip system. This method is very useful in areas facing a shortage of water and is an ideal technique for watering fruit plants, gardens and trees.

Drip System

PROTECTION FROM WEEDS

Sometimes undesirable plants called weeds naturally grow along with the main crop. These weeds need to be removed as they start competing with the crops for air, sunlight, water, space and nutrients.

The process of removing weeds from the field is known as weeding. Examples of some weeds are grass, amaranth, bathua (chenopodium) and wild oat. Farmers use different methods to remove weeds. Tilling before sowing seeds helps in uprooting and killing weeds. They dry up and mix with the soil. Manual methods of weeding involve uprooting the weeds manually, done using tools like khurpi. Weeds can also be uprooted with the help of a seed drill.

Spraying Weedicides

Weeds are also controlled with the help of chemicals called weedicides. Weedicides destroy the weeds without affecting the crops. Metolachlor 2, 4 –D, Dalapon, Butachlor are some commonly used weedicides. They are diluted with water and sprayed on the plants using water sprays. Weeding is carried out before plants produce flowers and fruits. Spraying of weedicides may adversely affect the health of the farmers if he accidentally comes in contact with these chemicals. They must be handled very carefully. Now-a-days, herbicides have replaced weedicides. They do not affect the health of the farmers and are obtained from plants.

HARVESTING

The process of cutting of crop after it matures is called harvesting. It is an important step, and the harvesting season varies for different crops. It is a time to rejoice for farmers. It comes after three to four months of hard work. Harvesting is done either manually using a sickle or with the help of a machine called harvester.

Sickle

The crops are cut close to the ground and the harvested grains are called produce. They are tied in bundles. The grains need to be separated from the chaff. This process is called threshing. Threshing is done either manually or with the help of a machine called 'combine' which is a combined harvester and a thresher.

Facts to know

In India harvesting of crops is associated with many festivals like Holy, Baisakhi, Pongal, Onam, Bihu.

Combine

After the grains are threshed, chaff is removed by winnowing. This can be done manually or with the help of a winnowing machine.

STORAGE

The harvested grains must be stored untill they are made available for human consumption. They need to be stored carefully to retain crop quality, protecting them from moisture, rodents, insects and micro-organisms. Freshly harvested grains contain a lot of moisture. So they must be properly dried in the sun before storage. Most grains spoil quickly and are also attacked by organisms thus losing their germination capacity. Dried grains are less susceptible to attack by micro-organisms and insect pests. Farmers store grains in gunny bags or metallic bins. Bulk storage of grains is done in silos or granaries. This protects them from pest attacks . At home dried neem leaves are used to store food grains. Large quantities of grains must be stored safely so as to last untill the next harvest. The humidity level is also controlled in silos and granaries to prevent the growth of microbes.

Silos for storage of grains

Storage of grains in granaries

Food from Animals : We obtain many food items from animals.

Activity - 3

Complete the table

S. No.	Food	Sources
1.	Meat	
2.	Eggs	
3.	Honey	
4.	Milk	

Animals give us milk, eggs, meat, etc. Milk in turn is used to prepare a number of products like butter, ghee, curd and cheese. Fishes are also consumed by human beings.

Rearing of animals on a large scale for food or other needs is called animal husbandry. Animals reared both at homes or in farms have to be provided with proper food, shelter and care.

Let's Remember

Give one word for each one of the following.

1. What is transplantation?
2. Name two fertilisers.
3. Name few sources of irrigation.
4. How are crops harvested?
5. What is a crop?

Glossary

Agriculture : The branch of science which deals with methods of food production is Known as agriculture

Animal Husbandry : The following of animals on a large-scale is known as animal husbandry

Apiculture : The rearing of honeybees on a large scale is called apiculture

harvesting : The cutting and gathering of mature crops is called harvesting

Pisiculture : The rearing of fish on a large-scale is called pisiculture

threshing : The separation of grain from the harvested crop is called threshing

Tilling : The process of loosening and training the soil is called tilling

SUMMARY

- Farmers have to adopt certain agricultural practices in a sequential manner, over a period of time for growing crops.
- The same kind of crop grown in a large area is called a crop.
- In India two types of crops are grown based on season - rabi and kharif.
- The first step in soil preparation involves tilling and ploughing. Ploughs and levellers are used for this purpose.

- Selecting good quality seeds and sowing them at appropriate distances and depth is another important step in crop production. The seeds are sown either by hand (broad casting) or using a seed drill .
- Soil needs replenishment of nutrients to improve its fertility. Organic manure and fertilisers are thus added.
- Crop rotation also helps to improve crop yield.
- Supply of water to crops at appropriate intervals is called irrigation.
- Modern methods like sprinkler and drip irrigation help in saving water.
- Removal of unwanted plants that grow along with the cultivated crops is called weeding.
- Crops are cut on maturity by machines or manually. This is called harvesting.
- After harvesting, grains are separated from the chaff by threshing and winnowing.
- The grains are stored in silos or granaries. Proper storage of grains is necessary to protect them from pests and micro-organisms.
- The animals also provide us food items like milk, meat, eggs, fish and honey.
- The process of rearing animals for food is called animal husbandry.

A. Multiple choice Questions (MCQS)

Tick (✓) the Right option.

1. The process of loosening soil is called _____ .

   (a) sowing ☐ (b) manuring ☐ (c) ploughing ☐ (d) Irrigation ☐

2. Which one of the following is a rabi crop_____ .

   (a) rice ☐ (b) wheat ☐ (c) maize ☐ (d) cotton ☐

3. Which is a modern method of irrigation _____ .

   (a) drip method ☐ (b) chain pump ☐ (c) moat ☐ (d) dhekli ☐

4. Which one the following is a fertiliser _____ .

   (a) NPK ☐ (b) compost ☐ (c) humus ☐ (d) cow dung ☐

5. Which tool is used for weeding _____ .

   (a) axe ☐ (b) cultivator ☐ (c) trowel ☐ (d) seed drill ☐

B. State whether True (T) or False (F) :

1. The seeds should be sown deep in the soil.
2. Fertilisers are organic in nature.
3. Rabi crops are grown in rainy season.
4. Hoe is a simple tool used for removing weeds.
5. Sprinkler system is a good technique for watering fruit plants.

C. Matching the following

Coloumn A	Coloumn B
1. Sprinklers	(a) Storage of grains
2. Silos and granaries	(b) Irrigation
3. Kharif crops	(c) Urea and super phosphate
4. Rabi crops	(d) Wheat, gram, Pea
5. Chemical fertilizers	(e) paddy and maize

D. Anwser the following Questions in short.

1. Give Two examples each of kharif crops and rabi crops.
2. What is irrigation? Name two methods of irrigation which save water.
3. What precautions should we take while sowing seeds?
4. What is transplantation? What are its advantages?
5. What are weeds? How do we control them?

E. Answer the following Questions .

1. Why is ploughing and levelling done?
2. Differentiate between manure and fertilisers .
3. What are the different ways in which seeds are sown?
4. How is soil prepared for sowing seeds?
5. How do farmers protect their crops from weeds?

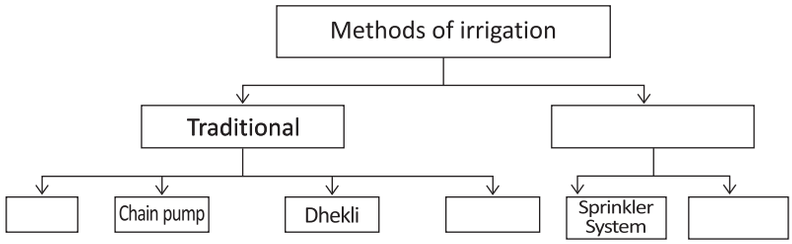
Aimline

Hots ( )

1. What do you think will happen if paddy is sown in rabi season?
2. Why do you think silos used for storing cereals should be clean and dry?

Let's Recall

Complete the following Diagram.



Group Discussion

Form a group of 4-5 students is your class. Discuss on the following topics :

1. Traditional and modern irrigation, Systems.
2. Merits and demerits of use of pesticides and weedicides.

Activity To Do

1. Prepare a Herbarium

Collect leaves and flowers from different plants. Dry them by placing between layers of newspaper and placing them under a weight for about 10-15 days. Paste the samples on your project file. Write down the name of the plants and places of collection.

Also collect different seeds in small plastic bags. Attach them in your project file. Label them and write down their uses.

2. Experiment

a) Take some moong seeds and sow them in soil, one which has been loosened and one which hasn't.

b) Sow the seeds at 3 different levels in the same kind of soil. On the surface of the soil, one inch below soil and 7-8 inches below soil. Irrigate the plants daily. Observe after 2-3 days.

Note down your observations?

What do you conclude?

Aimline

Worksheet - 1

Find out maximum words in word grid given below. All the words are related to the chapter.

R	M	K	B	X	L	E	X	Y	B	Y	B	L	V	C	R	O	P	S	T
V	K	I	I	N	F	H	U	K	I	I	Q	D	D	L	P	Y	V	N	H
L	O	V	F	G	Z	R	G	N	D	U	F	I	N	V	X	P	V	T	A
O	W	O	N	E	L	B	U	B	X	H	R	A	R	N	U	S	J	Z	Y
Y	X	P	B	B	E	E	F	I	H	I	U	Z	R	E	X	A	K	C	P
D	X	C	I	B	V	M	T	O	T	L	N	I	L	M	L	F	V	O	O
O	U	U	A	G	H	G	I	L	J	C	A	H	T	N	E	A	S	R	T
M	H	R	A	T	S	S	H	I	F	O	A	A	E	O	B	R	N	S	A
E	S	H	L	S	T	J	P	V	M	E	N	P	U	R	I	E	B	D	T
S	U	Q	Q	W	A	L	N	E	H	C	I	Y	O	R	I	M	E	Y	O
T	L	G	R	A	I	N	E	S	O	I	M	Z	D	U	X	T	Q	T	E
I	Q	S	R	F	V	N	Z	T	R	S	A	U	A	Z	L	V	U	K	S
C	I	U	P	T	D	A	N	O	S	W	L	E	I	J	P	T	U	E	Z
J	F	Q	V	C	I	M	O	C	E	M	S	X	R	P	R	L	R	R	I
R	Z	A	S	H	E	E	P	K	S	X	A	I	Y	E	A	M	I	Y	U
J	B	Q	R	F	A	R	N	N	X	X	S	R	W	D	B	L	I	T	U
J	U	I	O	M	K	X	W	S	Y	K	B	D	K	Q	L	J	M	Q	P
V	J	U	S	A	K	Z	H	P	U	P	P	F	E	E	Q	G	F	M	K
S	H	C	B	M	F	E	X	P	O	R	T	J	Z	Q	T	B	H	A	M
C	L	J	L	A	X	F	S	C	L	Y	V	S	E	G	D	G	K	N	Q

Archive

CHAPTER 2

Microorganisms

There is a large number of organisms present on our planet. They vary in size, shape and colour. Some of these organisms cannot be seen with the naked eye. They can be seen only through a microscope. That is why these are called microorganisms or microbes. The branch of Science which deals with the study of microbes is called microbiology.

Introduction

- Types of microorganisms
- Habitats of microorganisms
- Friendly microorganisms
- Harmful microorganisms
- Vaccine
- How diseases are transmitted
- Food poisoning
- Food preservation
- Nitrogen fixation and nitrogen cycle

Types of Microorganisms

A number of tiny organisms are found in soil and water.

Microorganisms are classified into four main categories: bacteria, fungus, protozoa and algae.

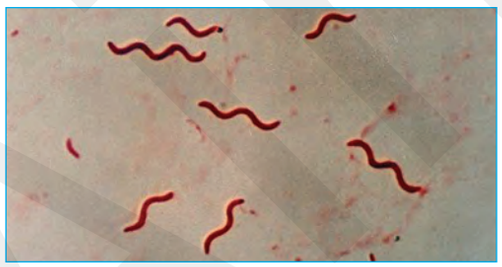
Fact to Know

Anton Van leeuwenhoek made the first simple microscope in 1668.

Activity - 1

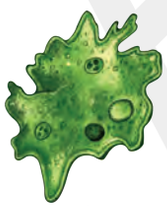
Take a few drops of water from a pond or a river. Spread on a glass slide and observe under a microscope. What do you observe?

You will see tiny organisms moving around.

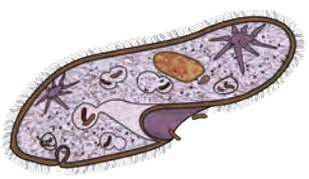


Spiral Bacteria

Rod Shaped Bacteria

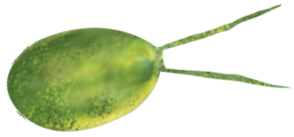


Amoeba

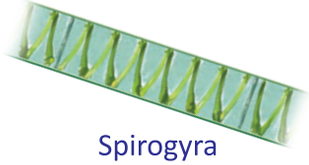


Paramecium

Protozoa



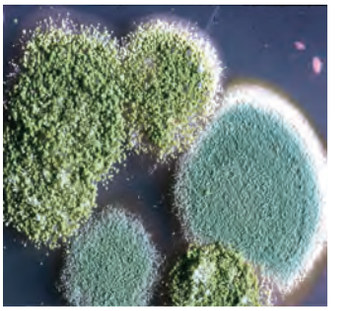
Chlamydomonas



Spirogyra

Algae

Bread mould

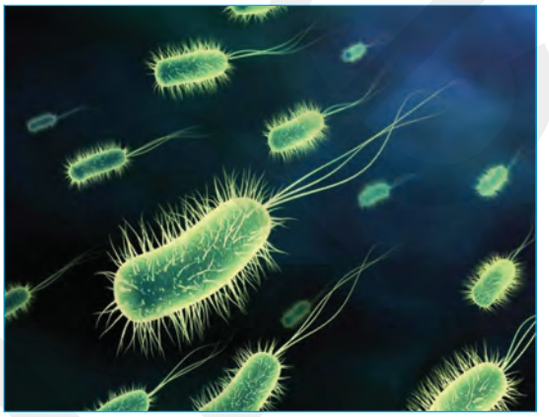


Penicillium
Fungi

Aspergillus

Viruses can also be seen only under a microscope. However, they reproduce inside the cells of organisms like plant, animals or bacteria. Common cold, influenza (flu) and cough are caused by viruses. Viruses also cause diseases like polio and chicken pox.

Protozoa cause diseases like malaria and dysentery, whereas typhoid and tuberculosis (TB) are caused by bacteria. Viruses have the characteristics of both the Living and non Living things. They are smaller than the smallest known cell.



Viruses

HABITAT OF MICROORGANISMS

Microorganisms may be single-celled like bacteria, some algae and protozoa or multicellular, such as algae and fungi. They are found every where. They can survive in all types of habitats, including ice cold water, salty water, hot springs, deserts, marshy land etc. They are also found inside the bodies of animals including humans. Some of them grow on other organisms while others exist freely. Some microorganisms like amoeba live alone, whereas fungi and bacteria live in colonies.

Microorganisms and Us

Microorganisms play an important role in our lives. Microorganisms are divided into two classes based on their behaviour :

- Friendly microorganisms
- Harmful microorganisms

FRIENDLY MICROORGANISMS

Microorganisms are useful to us in various ways. Microorganisms are used :

(a) In the preparation of curd, bread, cake, etc.

(b) In the production of alcohol.

(c) In the cleaning of the environment by decomposing organic matter into harmless and useful substances by some bacteria.

(d) In the preparation of some medicines.

(e) In agriculture, for improving the soil fertility by fixing nitrogen from the atmosphere.

Making of Curd and Bread

Curd contains a number of microorganisms. The bacterium Lactobacillus present in curd converts milk into curd. It multiplies in milk and converts it into curd. The production of cheese and paneer also make use of bacteria like lactobacillus and streptococcus.

You must have seen your mother kneading dough of bhatura with curd, or mixing curd with rawa to make idlis. Do you know why?

Activity - 2

Take a bowl of warm water. Add a teaspoon of curd to it. Stir well and cover the bowl with a plate. Leave the bowl undisturbed for 5-6 hours. What do you see? The milk has changed into curd.

Let's quickly answer orally.

1. Name two carriers of diseases.
2. Name the causative pathogen of bacteria.
3. What is 'apple scab'?
4. Name two products which use sugar as preservative.

Activity 3

Take some maida - 1 cup. Add a tea spoon of sugar and milk with water. Add a small amount of dried yeast powder. Knead with water to make a soft dough. Leave the dough covered for Two hours.

After two hours you will see that the dough has risen up and has become fluffy.

Yeast reproduces rapidly producing carbon dioxide during respiration. Bubbles of gas fill the dough, causing it to rise. This is the reason yeast is used in the baking industry for making breads, pastries and cakes.

Commercial use of microorganisms

- Certain microorganisms are used for the large scale production of alcohol, wine and acetic acid (vinegar).
- Yeast is used in the commercial production of alcohol and wine. It involves fermentation of sugar present in barley, wheat, rice, grapes, crushed fruit juices, etc.

Fermentation by yeast produces alcohol and carbon dioxide. The process of conversion of sugar into alcohol is known as fermentation.

Activity - 4

Take about 250 ml water in a beaker. Dissolve one tablespoon of sugar in it. Add a little yeast powder (1/2 t) to the solution and stir. Cover the beaker and allow it to stand for about four hours in a warm place without disturbing it.
Then smell the solution. The solution smells like alcohol.

Medicinal use of Microorganisms

Some bacteria and fungi are used in the preparation of medicines called antibiotics. These medicines kill or stop the growth of disease-causing microorganisms. Some of the commonly used antibiotics made from fungi and bacteria are penicillin (obtained from fungus penicillium), streptomycin, and tetracycline (both obtained form streptomyces bacteria). The antibiotics are manufactured by growing specific microorganisms and are used to cure a number of diseases.

Facts to know

The first antibiotic penicillin was discovered by Alexander Fleming in 1929, from the mold Penicillium notatum. It is used to cure many microbic diseases.

Antibiotics are used to treat infections even in animals. They are also mixed with livestock feed to check microbial infection in animals and used to control many plant diseases.

Remember to take antibiotics only on the advice of a qualified doctor. Do not consume antibiotics when not needed as they kill the beneficial bacteria in our bodies.

Vaccine

When a disease - causing microbe enters our body, our body produces antibodies. These antibodies fight and destroy the disease causing microbe, remaining in the body to fight future infections by the same microbe. A vaccine is a preparation of a weakened or killed disease - causing microbe needed to immunise against a particular disease. Several diseases like cholera, tuberculosis, small pox and hepatitis can be prevented by vaccination.

Children must be vaccinated against these diseases at appropriate ages. The vaccines are easily available in hospitals and health centres. Polio drops given to children are actually a vaccine.

Do you know? Edward Jenner discovered the first vaccine against small pox. Small pox has now been eradicated from most parts of the world.

Increasing Soil Fertility

Blue-green algae fix the nitrogen present in the air as nitrogen compounds in the soil, there by increasing the fertility of the soil.
The blue-green algae are commonly called biological nitrogen fixers.

The nitrogen fixing blue green algae

Cleaning the Environment

Some bacteria and fungi act on the bodies of dead plants and animals, converting them into simple substances. The nutrients released in this process are used by the plants again. Removal of dead bodies by microbial action keeps our environment clean. Anaerobic bacteria degrade animal dung into bio gas and the left over is used as manure.
Remember microbes cannot degrade polythene, glass, bottles, etc.

Let's Remember

Match of following.

Column 1	Column 2
1. Leeuwenhoek	(a) Phagocytes
2. Elie Metchnikoff	(b) Microscope
3. Louis Pasteur	(c) Penicillin
4. Alexander Fleming	(d) antiseptic
5. Edward Jenner	(e) pasteurisation

Harmful Microorganisms

Microorganisms are also harmful in many ways. They cause diseases in human beings, plants and animals. The disease causing microorganisms are called pathogenic micro organisms or pathogens.

Some Common Diseases Caused by Pathogens

Human disease	Causative Pathogen	Mode of transmission	Preventive measures
Cholera	Bacteria	Food/water	Maintain proper sanitation practices. Boil water before drinking. Avoid eating uncovered food, Vaccination.
Typhoid	Bacteria	Water	
Tuberculosis	Bacteria	Air	Vaccination. Isolate the patient. Keep the belongings of the patient separately.
Measles	Virus	Air	
Chicken pox	Virus	Air/contact	
Polio	Virus	Air/water	
Malaria	Protozoa	Mosquito	Use of mosquito repellants and nets. Control breeding of mosquitoes by spraying insecticides. Do not allow stagnant water to collect.

Pathogens enter the body of a healthy person through air, water and food. They can also spread from an infected person to a healthy one, and may be carried through an animal. Diseases that can spread from one person to another through air, water, food or physical contact are called communicable diseases. Some examples of communicable diseases are measles, common cold, chicken pox, tuberculosis, etc.

Modes of Transmission of Diseases

- **By Droplet Infection :** When an infected person suffering from the common cold or whooping cough– coughs or sneezes tiny drops of moisture carrying thousands of viruses are spread in the air. These droplets may enter another healthy person's body while breathing. This is why we should keep a handkerchief on the nose and mouth while sneezing and to maintain a safe distance from an infected person.
- There are some insects and animals which act as carriers of disease causing microbes. Housefly which feeds on garbage and human excreta can carry pathogens on its body. When the fly sits on food, these germs get transferred to the food and when a person eats these food items, the pathogens enter their body, causing diseases. Female Anopheles mosquito is another carrier of disease. It carries the parasite of malaria. Female Aedes mosquito acts as carriers of dengue virus.

Housefly

Female Anopheles Mosquito

Female Aedes Mosquito

Always keep the food covered. Do not allow dirty water to collect any where in the neighbourhood as mosquitoes breed in water.

Disease Causing Microorganisms in Animals

Several microorganisms cause diseases in animals as well. Anthrax is a dangerous disease in cattle caused by a bacterium and Foot and mouth disease is caused by a virus.

Disease Causing Microorganisms in Plants

Microorganisms also cause diseases in plants affecting crops such as wheat, rice, potato, sugarcane, orange, apple and cotton. These plant diseases reduce crops yields. These diseases can

be controlled by use of disease-resistant varieties of seeds and spraying of certain chemicals on the plants which kill the microbes. Some common plant diseases caused by microorganisms:

Plant disease	Crop	Mode of transmission	Micro organism
1. Citrus canker	Orange	Air	Bacteria
2. Rust of wheat	Wheat	Air, seeds	Fungus
3. Apple scab	Apple	Air	Fungus
4. Blast	Paddy	Air	Fungus
5. Yellow vein mosaic of okra	Okra	Insect	Virus

FOOD POISONING

Many bacteria and fungi spoil food like milk, meat, fruits and vegetables. These micro organisms sometimes produce toxic substances on the food they grow on, making it unfit for human consumption. If we eat such food we suffer from severe vomiting and diarrhoea, a condition known as food poisoning. Bacteria such as Staphylococcus, Salmonella, Clostridium botulinum can cause food poisoning.

Food Preservation

We need to preserve food to prevent spoilage. The process of preventing the spoilage of food items by the action of microbes using physical or chemical methods is called food preservation.

Some common methods of food preservation are:

Heat and Cold Treatments : Boiling kills many microorganisms. Milk and water are thus boiled to kill harmful microbes that may be present in them. We also keep food in the refrigerator as microbes cannot thrive at low temperatures.

Pasteurisation: Pasteurisation is a technique of preserving milk, whereby milk is heated to about 70°C for 15-30 seconds and then suddenly chilled and stored. This process kills the microorganisms in the milk and prevent the bacteria from growing. Thus pasteurised milk can be directly consumed without boiling.

This technique was discovered by a French scientist named Louis Pasteur in the 19th century.

Dehydration: The removal of water from fruits and vegetables is called dehydration. Removing water slows down the growth of microorganisms. Hence food items like pulses and cereals are dried in the sun to remove moisture before storage.

By Using Salt and Sugar: Jam, Jellies and squashes are preserved by sugar. High concentration of sugar slows down the bacterial growth and prevents food spoilage. Meat, pickles and fish are preserved with the help of common salt.

High salt concentration (15-18%) removes water from the food materials. This checks the growth of bacteria. Amla, raw mangoes and tamarind are preserved by salting.

By Using Oil and Vinegar : Oil and vinegar are used to preserve pickles as bacteria cannot thrive in such an environment. Vegetables, fruits, meat and fish are preserved by this method.

By Using Chemical Preservatives : Food is also preserved with the help of chemicals which check the growth of food-spoiling microorganisms. Substances which help preserve food or any other item are called preservatives. This method of food preservation is called chemical preservation. Sodium benzoate and potassium metabisulphite are used to preserve ketchup, squashes, fruit juices, jams, jellies, etc.

By Vacuum Packaging : Snack packets like wafers and kurkure often came in sealed airtight packaging. The air from these packets has been removed by evacuation and flushed with oxygen - free nitrogen.

Nitrogen Fixation

The process of converting free atmospheric nitrogen into useful nitrogenous compounds is called nitrogen fixation. Rhizobium, which resides in the root nodules of leguminous plants, aids in nitrogen fixation.

Nitrogen fixation also occurs during lightning? When lightning strikes, nitrogen and oxygen react to form nitric acid. The nitric acid is washed down with rain and reacts with limestone present in the soil to form nitrates.

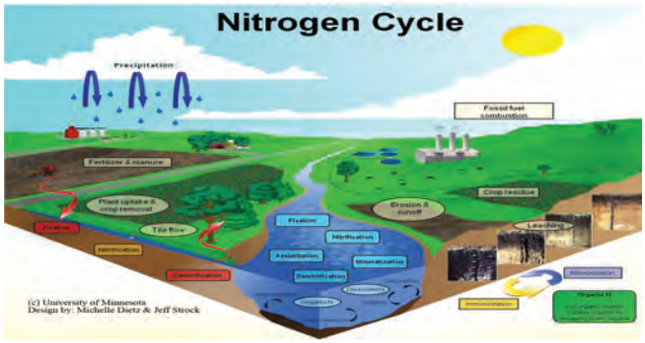
Roots of leguminous plants with root nodules

Nitrogen Cycle

Nitrogen as you know comprises about 78% of the atmosphere and is required by all living organisms. It is an important constituent of proteins, chlorophyll, nucleic acid and vitamins. The atomospheric nitrogen has to be first converted into nitrogenous components before it can be utilised by plants and animals. This is done by certain bacteria and blue green algae present in the soil.

Nitrogen compounds are then taken up by roots of plants and used for the synthesis of plant proteins. Animals obtain nitrogen by feeding on plants. When plants and animals die the

bacteria and fungi present in the soil convert the nitrogenous waste into nitrogeous compounds. Some denitrifying bacteria convert part of them into free nitrogen gas. This nitrogen escapes into the atmosphere. Thus the atomospheric nitrogen gets cycled in nature and its level remains more or less



Nitrogen Cycle

Glossary

Germ : Any life form that is too small to be seen with the naked eye is called a germ
Microbiology : The study of microbs or microoganisms is called a microbiology
Microbiologist : The scientist who studies about microganisms is called microbiologist
preservative : A chemical used to pressure food by inhibiting microbial growth is called a preservative
Denitrification : The conversation of nitrates into free nitrogen gas is called denitrification.
Protozone : A single called animal

SUMMERY

- Microorganisms or microbes are so tiny that they cannot be seen with the naked eye.
- Microorganisms are found in air, water, soil, in deserts and marshy lands and also inside the bodies of other living beings.
- Microorganisms are of four main types - bacteria, protozoa, fungi and algae.
- Viruses are also microbes but they differ from others as they reproduce only inside the host organism which may be bacteria, plant or animals cell.
- Based on behaviour, microorganisms are of two types - friendly microorganisms and harmful microorganisms.
- Friendly microorganisms help in the preparation of curd, cakes, breads, in the preparation of alcohol and in the commercial preparation of medicines.
- They also help to cleanse the environment by decomposing organic waste and dead animals and plants into simple substances.
- Harmful microorganisms cause diseases in humans, animals and plants. Some microorganisms also causes spoilage of food which leads to food poisoning.
- Spoilage of food can be prevented by food preservation.
- Food preservation increases the shelf life of perishable food materials.
- The atomospheric nitrogen is converted into useful nitrogenous compounds by some bacteria and blue green algae. This process is called nitrogen fixation.
- Rhizobium bacterium present in the nodules of leguminous plants can fix nitrogen of air into nitrates directly thereby increasing the fertility of the soil.
- Certain bacteria convert nitrogenous compounds present in the soil into nitrogen gas which escapes into the atmosphere.
- The nitrogen cycle helps to keep the concentration of nitrogen in the atmosphere constant.

Exercise

A. Multiple choice Questions (MCQS)
Tick (✓) the Right option.

1. Amoeba is a form of
   (a) algae ☐ (b) protozoa ☐ (c) fungi ☐ (d) virus ☐
2. Yeast is used in the production
   (a) sugar ☐ (b) alcohol ☐ (c) oxygen ☐ (d) none of these ☐
3. Who discovered the microscope?
   (a) Louis Pasteur ☐ (b) Edward Jenner ☐
   (c) Anton Van Leeuwenhoek ☐ (d) Charles Darwin ☐
4. The following is an antibiotic
   (a) tetracycline ☐ (b) alcohol ☐
   (c) sodium benzoate ☐ (d) renin ☐
5. The dough of bhatura rises because of
   (a) heat ☐ (b) kneading ☐ (c) grinding ☐ (d) fermentation ☐

B. Fill in the blanks :

1. Microorganisms can be seen with the help of a ..... .
2. ..... is used in the preparation of bakery products.
3. ..... algae can fix nitrogen.
4. Cholera is caused by ..... .
5. Common cold and cough is caused by ..... .
6. The process of conversion of sugar to alcohol is called ..... .

C. Write 'T' for true and 'F' for false statements.

1. All microorganisms are harmful. ☐
2. Malaria is caused by a protozoa. ☐
3. Microbes are delicate organisms. ☐
4. Antibiotics can be taken without consulting a doctor. ☐
5. Vaccine helps to fight disease. ☐

D. Anwser the following Questions in short.

1. What are the major groups of microorganisms?
2. Name two harmful effects of microorganisms.
3. What are antibiotics?
4. Explain how do a blue green algae help in increasing the fertility of soil.
5. What are the causes of food poisoning?

Aimline

E. Answer the following question :

1. How are microorganisms useful to us? Explain in 10 lines.
2. How does a vaccine produce immunity against a disease?
3. How can we prepare curd at home?
4. What is food preservation? Describe any four methods of food preservation.
5. How is the level of nitrogen maintained in the atmosphere?

(Hots)

1. Why do you think antibiotics are not effective against cold and flu?
2. Why do you think sealed packets of biscuits and namkeen do not spoil fast?

CREATIVE TASK

1. Visit a place where water remains following or a place around a well which remains wet all the year round. you may find the floor covered with slippery algae growth. this is blue - green algo.
2. Visit old monuments and around your place. you many find their domes covered with blackish growth. which algal growth it can be ?

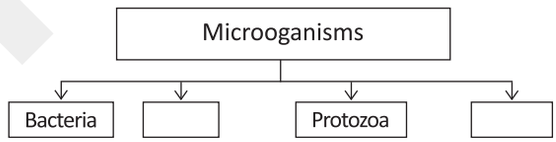
Group Discussions

Discuss the following will your classmates "

1. Why can microoganisms live in any kind of environment ?
2. How can we prevent communicable diseases?

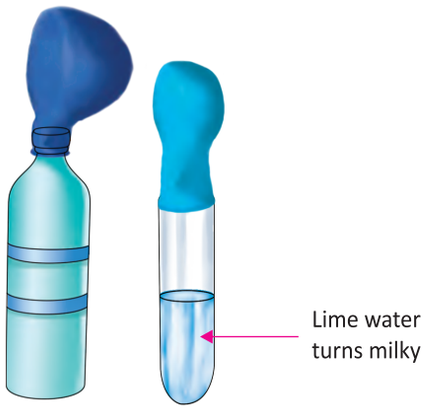
Let's Recall

Complete the following Diagram.



Activity to do

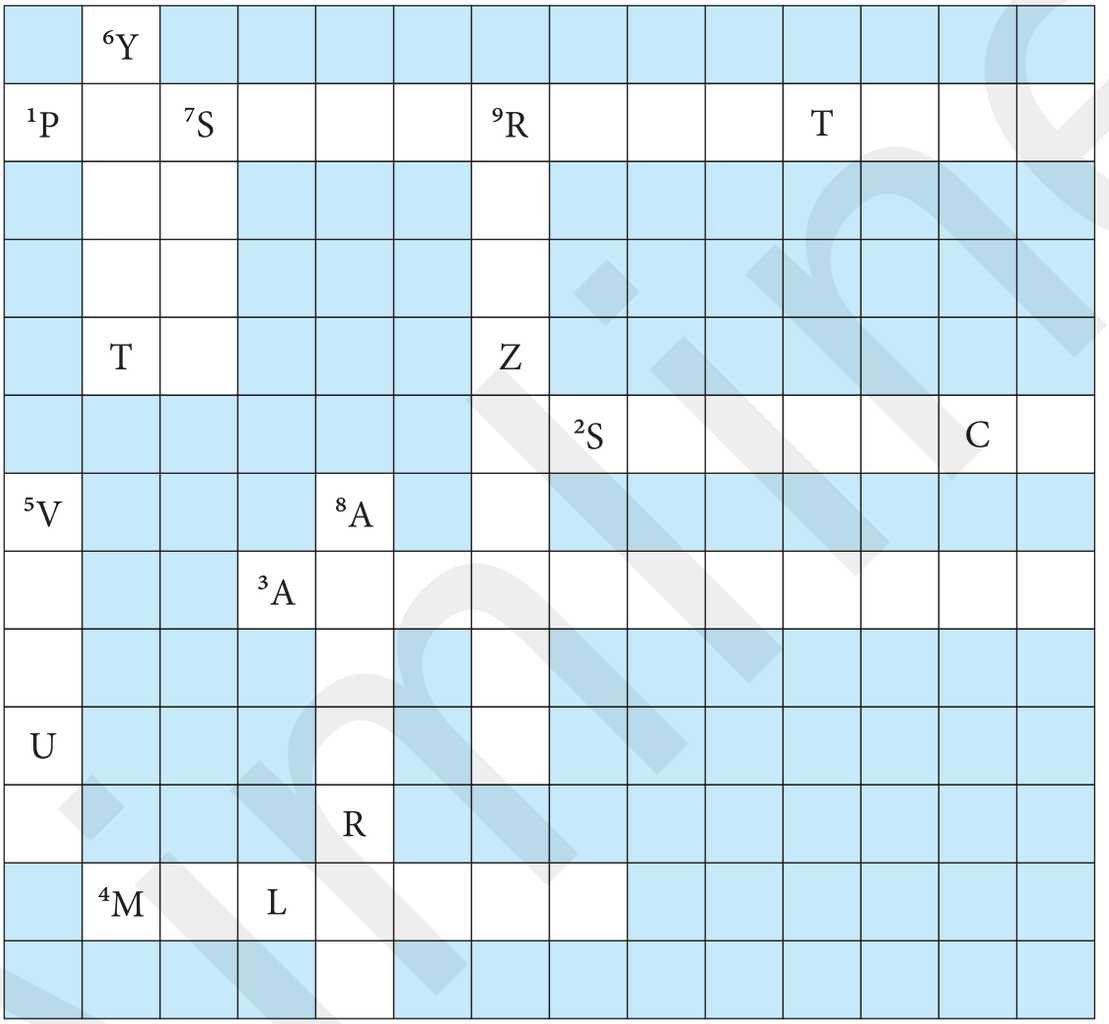
(i). Take an empty cold drink bottle made of plastic.
(ii). Take 1 cup of warm water. Add 5 tea spoon of sugar and 1 teaspoon of dried yeast powder. Mix well. Fill this mixture in the bottle.
(iii). Attach a balloon to the mouth of the bottle (stretch the balloon by blowing and deflating it few times before using it).
(iv). Leave the bottle undisturbed for some time.
What do you observe? The balloon inflates. You can also smell alcohol inside the bottle.
Remove the balloon so that the gas inside it does not escape. Fit the balloon on a test tube containing lime water. Shake well .
Do you notice any thing? Lime water turns milky.
This shows the presence of carbon dioxide.
Write down the conclusion.



Worksheet - 2

Solve the crossword puzzle with the help of the clues given.

1. Heating and cooling treatment given to milk.
2. A vegetable which can be preserved by dehydration.
3. Produced by the body to fight the disease causing microbe.
4. A communicable disease caused by female Anopheles mosquito.



Down

5. Having characteristics of both the living and nonliving.
6. Causes fermentation.
7. A disease of wheat caused by fungi.
8. A disease of animals and human caused by bacteria.
9. The nitrogen-fixing bacteria present in the nodules on the roots of leguminous plants.

Anime

CHAPTER 3

Coal and Petroleum

Introduction

- Natural resources – Two types
- Exhaustible
- Inexhaustible
- Exhaustible natural resources
- Coal–coke, coal tar, coal gas
- Petroleum
- Various fractions obtained during refining of petroleum
- Natural gas
- Conservation of fossil fuels

We use a number of materials in our daily lives. Some of them like air, water, soil and minerals are found in nature and are called natural resources. Others like cars, furniture, food grains, fruits, etc. have been made by human efforts and are called man-made resources.

Do you think we can use the natural resources forever or there will be a time when they will be exhausted?

Depending upon the availability of various natural resources in nature; the natural resources are broadly classified into :

- Inexhaustible natural resources
- Exhaustible natural resources

(i) Inexhaustible Natural Resources

Examples are sunlight and air.

These resources are present in an unlimited quantity on earth and are not likely to be exhausted by human activities.

(ii) Exhaustible natural resources

These resources are likely to be exhausted over time as they are present in a limited quantity on earth. Examples are minerals, forests, wildlife, coal, petroleum and natural gas. Their over use should be avoided.

In this chapter let us learn about some exhaustible natural resources like coal, petroleum and natural gas. These are the most commonly used concentrated sources of energy and are also known as fossil fuels. They were formed from the dead remains of living organisms.

COAL

You must have all seen coal. It is generally black or brownish-black in colour and as hard as a stone. It is one of the most earliest used fossil fuel. It is a mixture of compounds of carbon, hydrogen, oxygen and free carbon. Coal is formed from the remains of trees. Coal is used as a fuel to cook food. It was used in railway engines to produce steam. Now a days it is used in thermal plants to produce electricity. Many industries use coal as fuel.

Origin of Coal

The process of formation of coal (as coal contains carbon) is called carbonisation. About 300 millions of years ago during the carboniferous age, there were dense forests in the low lying wetland areas. Due to various natural processes, the trees died and were burried under the soil. They were covered with more soil and were compressed. They got burried deeper and deeper into the soil. Anaerobic thermal degradation of the cellulosic material of trees/big plants took place due to high temperature and pressure and they were slowly converted to coal.

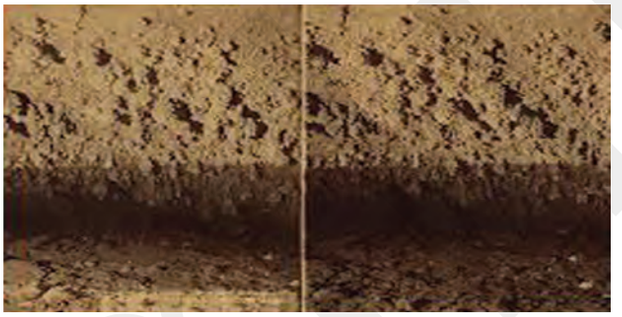
Since coal is formed from living organisms such as plants and trees it is called a fossil fuel. There are four varieties of coal depending on its age and carbon content. They are –

(a) Peat : Contains 60% carbon

(b) Lignite : 70% carbon

(c) Bituminous : 82% carbon

(d) Anthracite : 95% carbon



Formation of Coal

In India coal deposits are found in Odisha, Madhya Pradesh, West Bengal and Jharkhand.

Coal is processed further in industries to get some useful products like coke, coal tar and coal gas.

Coke

It is a hard, porous, and black fuel. It is produced by heating bituminous coal to a very high temperature under anaerobic conditions. It is almost pure carbon. It is used as a fuel and in the manufacture of steel. It is also used in the extraction of many substances.

Coal Tar

It is a black, tarry, thick liquid obtained as a by-product during the manufacture of coal. It has an unpleasant smell. It is not a single compound, but a mixture of about 200 substances. It is used as a raw material for the manufacture of various substances like synthetic dyes, drugs, explosives, perfumes, plastics, paints, photographic material, soaps, anti dandruff

shampoos and many other useful compounds. Naphthalene balls and moth repellants are also obtained from coal tar.

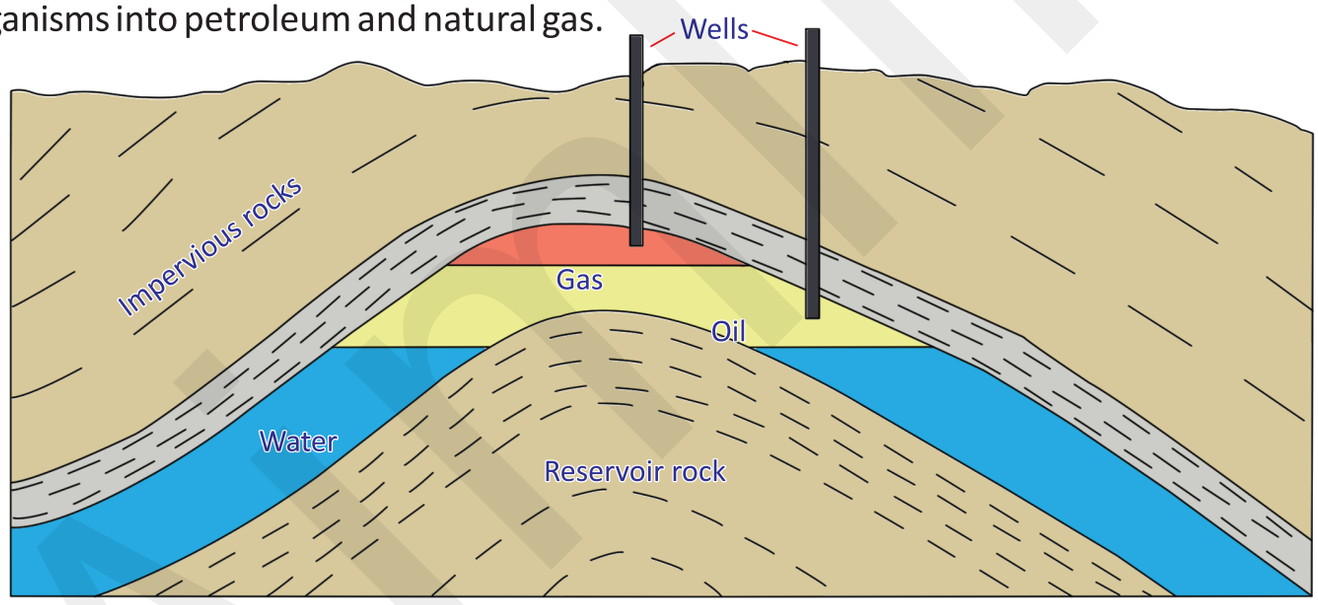
Earlier it was used for metalling roads, but now-a-days bitumen, a petroleum product is being used.

Coal Gas

It is a gaseous product obtained during the manufacture of coke. It consist mainly of hydrogen, methane and carbon monoxide. All three gases are combustible. It is an excellent gaseous fuel. Earlier it was used as an illuminant for domestic and street lighting. It is these days used by industries situated near the coal processing plants.

PETROLEUM

Petroleum or mineral oil is found beneath the layers of rocks. It is a viscous, dark coloured liquid that occurs deep inside the earth. It is formed from the remains of tiny organisms living in the sea, that died millions of years ago. The marine organisms died and their bodies sank to the bottom of the sea. Gradually they got covered with sand and clay. Enormous heat and pressure and the absence of air over million of years, transformed the dead organisms into petroleum and natural gas.

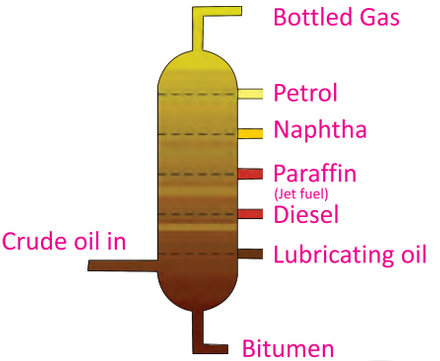


Petroleum and natural gas deposit

Actual composition of petroleum (or crude oil) depends on the place of origin. Petroleum is a complex mixture of a large number of organic compounds of different types mixed with saline water and silt. Petroleum is also known as black gold because of its high cost. The petroleum layer and natural gas layer are above that of water as seen from the above diagram. This is because they are lighter than water and immiscible.

Petroleum is separated into useful substances through a process called refining of petroleum, which is done in oil refineries by a process called fractional distillation.

Oil refinery



Distillation of petroleum

Petroleum is refined to get useful products such as petrol, diesel, kerosene, fuel oil, gases, etc.

Various fractions obtained during refining of petroleum and their uses.

S. No.	Constituent	Uses
1.	Liquified Petroleum Gas (LPG)	Used as domestic gas in its liquified form
2.	Petrol	Fuel in automobiles, aviation fuel, dry cleaning
3.	Kerosene	Fuel for lamps, stoves and air jets
4.	Diesel	Fuel in heavy motor vehicles and generators
5.	Fuel oil	In power stations and ships
6.	Lubricating oil	In lubrication
7.	Paraffin wax	Used in candles and ointments, vaseline etc
8.	Asphalt	Making roads

Let's Remember

Fill in the blanks :

1. ....., ... and ..... are fossil fuels.
2. ..... is the purest form of coal.
3. These days vehicles are being run on ..... .
4. These days ..... is used for metalling roads.

In India petroleum refineries are located in Mumbai, Cochin, Chennai, Visakhapatnam. Haldia, Basauni, Guwahati, Digboi and Mathura. These days petroleum is extracted by drilling holes in the seabed. The world's first oil well was drilled in Pennsylvania, U.S.A. way back in 1859.

The useful substances obtained from petroleum and natural gas are called petro chemicals. They are used in the manufacture of detergents, polyester, nylon, acrylic, polythene, plastics, etc.

NATURAL GAS

The volatile components of petroleum form a gaseous layer over petroleum. This is natural gas. It also occurs deep inside the earth. It consists mainly of methane. It has a number of uses.

- It is used for the generation of electricity.
- Natural gas is stored under high pressure as compressed natural gas (CNG), which is used as a fuel for transport vehicles. It is less polluting. Delhi buses run on CNG.
- LPG can be supplied through pipes and can be used as a fuel directly in homes and factories. LPG is being supplied though pipes in Vadodara and some parts of Delhi also.
- It is used to produce hydrogen and ammonia. Ammonia in turn is used to manufacture urea.
- As a raw material for manufacturing a number of chemicals and fertilisers.

Facts to know

LPG is odourless, so a small amount of ethyl mercaptan a smelling agent is added to detect leakage.

Natural gas is found in the states of Tripura, Rajasthan, Maharashtra and also in the Krishna-Godavari delta. CNG is an environment friendly gas as it leaves no ash when burning. It neither produces smoke. Nor harmful by products only carbon dioxide and water are produced.

CONSERVATION OF FOSSIL FUELS

Fossil fuels are natural fuels which are exhaustible and cannot be rapidly renewed It takes millions of years for the dead organisms to convert into fossil fuels. The reserves of petroleum, natural gas and coal will last for only a few hundred years. Coal might last for another 150-200 years. Therefore we must take proper steps to conserve these natural resources. We must use existing resources judiciously and promoting renewable energy sources like wind, solar energy and bio fuels. The Petroleum Conservation Research Association (PCRA) have given certain tips on how to conserve petrol/diesel :

- Drive at a constant and moderate speed.
- Switch off the engine at traffic lights or other places, where you have to wait.
- Maintain correct air pressure in the tyres.
- Get your vehicle serviced regularly.
- Use good quality petrol and engine oil.

Remember that the burning of fuels is a major cause of air pollution which contributes toglobal warming. So, minimise the use of fuels.

Let's Remember

Crime one word for each one of the following.

1. Give Two fuels formed from the dead remains of living organisms.
2. What are petrochemicals?
3. Name the chemical substance added to LPG to help detect leakage.
4. Name Two inexhaustible natural resources.

Glossary

fossil : the remains or impression of prehistoric plant or animal embedded in rock and preserved in petrified form.
renewable sources of energy : the source of energy which can supply energy repeatedly.
non-renewable sources of energy : the source of energy which ones finished cannot be obtained again
carbonisation : the process of conversion of plants and animals buried inside the earth to coal
petroleum : complex mixture of hydrocarbon, also called crude oil
destructive distillation : heating coal to high temperature (about 1000°C) in absence of air
refining : the process of removal of undersirable impurities
lpg : Liquified petroleum gas
cng : Compressed natural gas
ongc : Oil and natural gas
oil : Oil India limited

SUMMARY

- Coal, petroleum and natural gas are fossil fuels.
- Fossil fuels are exhaustible natural resources.
- Fossil fuels are formed from the decay of dead remains of living organisms millions of years ago.
- Coal is processed to form useful materials like coke, coal tar and coal gas.
- Petroleum is separated into useful petroleum substances like gas, petrol, diesel, kerosene, paraffin wax, lubricating oil by the refining of petroleum.
- The useful substances obtained from petroleum and natural gas are called petrochemicals.
- Since fossil fuels are exhaustible they must be used judiciously.
- The two main limitations of fossil fuels are their limited availability in nature and the air pollution caused due to their use.

Exercise

A. Multiple choice Question (MCQS)
Tick (✓) the Right options.

1. Which one is not an exhaustible natural resource?
   (a) Coal ☐ (b) Petroleum ☐
   (c) Sunlight ☐ (d) Forests ☐
2. Which one contains least carbon?
   (a) Peat ☐ (b) Lignite ☐
   (c) Bituminous ☐ (d) Anthracite ☐
3. Which petroleum product is used in making road surface?
   (a) Coal tar ☐ (b) Paraffin wax ☐
   (c) Peat ☐ (d) CNG ☐
4. Which product is used in dry cleaning?
   (a) Petrol ☐ (b) Diesel ☐
   (c) Kerosene ☐ (d) Fuel oil ☐

B. Write 'T' for True and 'F' for false

1. Coal tar is a mixture of many substances. ☐
2. Minerals are inexhaustible natural resources. ☐
3. We can prepare fossil fuels in the laboratory. ☐
4. Coal gas contains two combustible gases. ☐
5. Petroleum is formed due to decomposition of trees. ☐

C. Anwser the following questions in short.

1. What do you mean by carbonisation?
2. Give two examples each of exhaustible and non exhaustible natural resources.
3. Name the different varieties of coal found in nature.
4. What is coal gas? Name its constituents.
5. Name two constituents of petroleum which are not used as fuel.

D. Answer the following questions.

1. Explain the process of formation of coal.
2. Name two harmful effects of burning fuels. How can we save petrol for future generations?
3. What are the advantages of using LPG and CNG as a fuel?
4. Explain the process of petroleum formation.
5. Name the consequences of excessive use of fossil fuels.

CREATIVE TASK

1. Go to some cool shop in your area. collect samples of different types of coal and make a report.
2. Go to petrol station. Ask workers about the type of petrol they have and how the petrol is of different type ? make a report about their types and cost per litre.

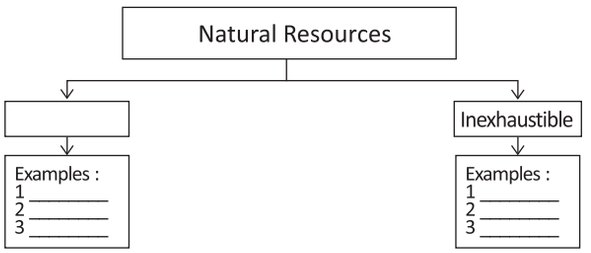
GROUP DISCUSSION

Discuss to your matter how she uses LPG in the kitchen. if her procedure is not correct, check it, then give report to your teacher.

Aimline

Let's Recall

Complete the following Diagram.



Hots ( )

1. Why do you think CNG is considered as a green fuel?
2. Why do you think petroleum is known as black gold?

Activity to do

Make Bees Wax Lip Balm

2 Tsp coconut oil

I Tsp bees wax

½ Tsp honey

¼ Tsp baking soda

(i). Place coconut oil and beeswax in a bowl.

(ii). Heat a pan of water.

(iii). Place the bowl inside the pan, taking care that water does not enter the pan. Keep stirring the mixture and continue heating the pan on a low flame, till the mixture melts.

(iv). Take out the bowl. Add honey and baking soda to it. Whisk with a fork briskly for a few minutes.

(v). When the mixture is uniform pour into a small glass bottle. Place the bottle in the refrigerator. Let it cool or leave it in a cool place so that it hardens.

(vi). Close the jar with the lid.

Aimline

Worksheet - 3

Complete the crossword puzzle with the help of the clues given.

ACROSS

1. Rise in temperature on the earth.
2. Noncombustible substance with very high melting point.
3. A gaseous substance with highest calorific value.
4. A slow and spontaneous combustion in which no light is produced and temperature remains almost constant.

DOWN

5. liquid fuel used as domestic fuel.
6. the supporter of combustion.
7. The gaseous fuel obtained from petroleum.
8. A metallic element that burns with a dazzling whitelight.
9. Depletion of nonrenewable source of energy.

							[8]M				[9]E	
[1]G		[6]O			[7]L							
[5]K							G					
		Y									G	
R							[2]S					
		[3]H			R							
[4]D				S								

CHAPTER 4

Combustion and Flame

Introduction

- Combustion — combustible and non-combustible substances.
- Conditions necessary for combustion.
- Ignition temperature
- Controlling fire — water / fire extinguisher
- Types of combustion
- Flame
- Zones of a flame
- Fuel – ideal fuel
- Fuel efficiency
- Hazards of burning fuel

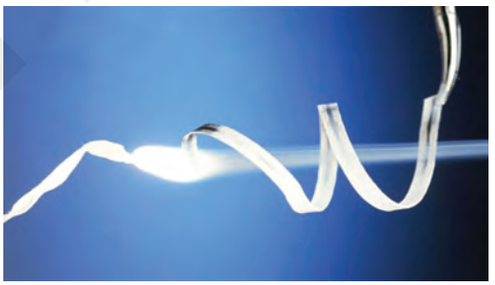
We use different kinds of fuels at home, for running automobiles and in industries. Fuel is a substance that burns in the air to produce energy in the form of heat and light. We use fuels like cowdung, kerosene and LPG at homes; CNG, diesel, petrol for running automobiles and coal to produce electricity in thermal power plants.

You must have seen that some substances burn with a flame like a candle whereas others like coal do not. Let us now study the process of burning in detail.

COMBUSTION

Combustion is a chemical process in which a substance reacts with oxygen and gives off heat and light. When you heat a piece of charcoal by bringing it near a bunsen burner, it burns in air producing carbon dioxide, heat and light.

Burning of charcoal



Burning of magnesium ribbon

Substances can be classified as combustible or non-combustible depending on whether they burn or not.

Combustible Substances :

Substances that can burn easily are called combustible substances. A combustible substance can be solid, liquid or gas. Charcoal, magnesium ribbon, kerosene, diesel, petrol, LPG, wax, paper, cloth, wood, etc. are some examples of combustible substances. You will be surprised to know that food is a fuel for our bodies.

Online

Non-combustible Substances :

Substances that do not burn in air are called non-combustible substances. Some examples are sand, water, glass, cement, etc.

Activity - 1

- Collect a small sample of the following materials : matchstick, paper, straw, cloth, sand, cement, aluminium foil.
- Hold each one of them turn by turn with a pair of tongs and heat them in a candle flame. Do this under the supervision of an adult.
- Note down your observations in the given table.

S. No.	Substance	Burns	Does not burn
1.	Match stick	✓	×
2.	Paper	✓	×
3.	Straw	✓	×
4.	Sand	×	✓
5.	Cement	×	✓
6.	Cloth	✓	×
7.	Foil	×	✓

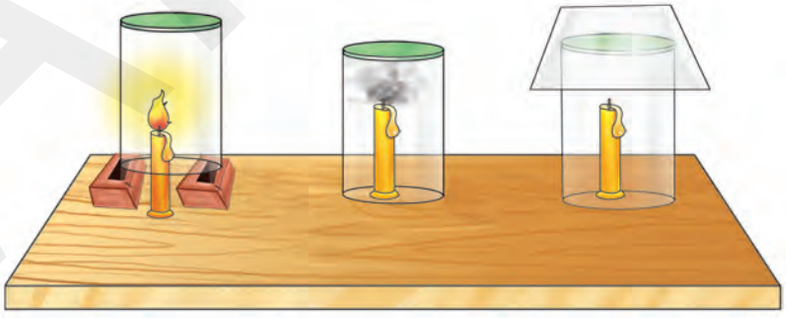
Match stick, paper, straw and cloth are combustible substances whereas sand, cement and foil are non-combustible substances.

CONDITIONS NECESSARY FOR COMBUSTION

Activity - 2

Be careful while lighting a candle.

- Fix a lighted candle on a table.
- Cover it with a chimney. Rest it on a few bricks so that air can enter the chimney. Observe the flame.



(a) (b) (c)

- Now remove the bricks, so that the chimney rests on the table, leaving no space for air to enter from below. Observe the flame.
- Now cover the top of the chimney with a glass plate. Again watch the flame.

Note down your observations :

Candle in (a) : Candle burns freely as air enters the chimney from below.

Candle in (b) : Flame flickers and produces smoke as no air enters the chimney from below.

Candle in (c) : Flame extinguishes as no air is available.

This activity clearly shows that air is necessary for combustion.

Activity - 3

Take some spirit in a glass bowl. Place a cotton wick in it and ignite. It will burn. Now cover the bowl with a lid. Does the wick stops burning after sometime? Can you guess the reason? Carry out this activity under supervision of an adult.

Paper and wood do not burn by themselves. You need to burn paper with a burning match stick. Matchstick will not burn wood. You have to use paper or kerosene oil to start fire in wood or coal. This shows that different substances catch fire at different temperatures.

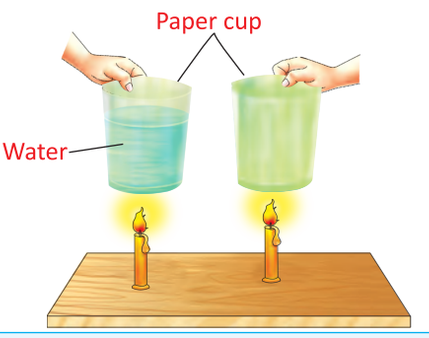
A substance starts burning only after it has attained a certain minimum temperature. The lowest temperature at which a substance catches fire is called Ignition Temperature. Different substances have different ignition temperatures. A matchstick does not catch fire on its own. It immediately catches fire when rubbed against a rough surface. Various substances like coal, wood, LPG, kerosene do not catch fire on their own. These substances need a spark or match stick to burn them.

Substances like alcohol, petrol, LPG and synthetic fibres catch fire easily. This is because these substances have low ignition temperatures. They are said to be inflammable substances.

Activity - 4

This activity will show that a substance does not catch fire at a temperature below its ignition temperature.

- Take two paper cups. In case you do not have paper cups, fold a sheet of paper to form cups.
- Pour about 50 ml of water in one of the cups.
- Hold the two cups separately over two candle flames as shown in the diagram.



Heating water in a paper cup

- What do you observe?
- The empty paper cup catches fire and starts burning.
- The cup containing water does not catch fire. The water in it becomes hot. You can even boil water in it, if heating is continued.

Note : Do it under the strict supervision of an adult.

The candle flame raises the temperature of the empty cup above ignition temperature, hence it catches fire.

The heat supplied to the paper cup gets transferred to water by conduction. As a result the paper cup does not reach its ignition temperature. This is the reason why it does not burn.

Thus, we see that the necessary conditions for combustion are :

1. Presence of a combustible substance.
2. Presence of a supporter of combustion : An dequate supply of a supporter of combustion (e.g. oxygen) is necessary.
3. Attainment of ignition temperature.

Combustion is of two types :

- Complete combustion and
- Incomplete combustion

Complete Combustion

When the supply of oxygen is sufficient the substance will burn completely.

Incomplete Combustion

When the supply of oxygen is inadequate the substance does not burn completely and combustion is said to be incomplete. This combustion results in the formation of carbon monoxide, soot, water, heat and light. Thus we see that a number of pollutants are produced. Complete combustion is less polluting.

Combustion is an irreversible, chemical reaction. All combustible reactions produce heat. Most of them also produce light. It also produces carbon dioxide and water.

CONTROLLING FIRE

As we have seen that for a fire three conditions are necessary. The fire can be extinguished if any one of the three conditions is not fulfilled.

- By cutting supply of oxygen.
- By removing the combustible substance.
- By lowering the temperature below ignition point.

Fire is extinguished by the following methods :

Fire brigade

By Spraying Water

When water is sprayed over a burning substance, it brings its temperature down below the ignition point and the fire is put off. Water vapour formed due to the heat of the fire cuts off the supply of oxygen, is extinguishing the fire.

Fire men extinguishing fire with the help of water

Do not use water over burning kerosene, petrol or diesel. This is because oil is lighter than water. They will form a light layer on water and the fuel will continue to spread to other areas, as the oil will flow along with the water. Water should also not be used in electrical fires as water is a conductor of electricity and can cause electrocution.

Do you now know, why a person whose clothes have caught fire, is wrapped in a thick blanket ? The blanket helps in cutting off the supply of oxygen.

USE OF FIRE EXTINGUISHER

The best way to douse fire involving electrical equipments or inflammable substances is by spraying carbon dioxide (CO_2). Carbon dioxide being heavier than oxygen envelops the fire and cuts off the supply of oxygen, extinguishing the fire. Generally, carbon dioxide also does not harm the electrical appliances.

Fire Extinguisher

CO_2 can be stored at high pressure as a liquid in cylinders just as LPG is stored in cylinders. When CO_2 is released from the cylinders, it expands a lot and envelops the fire besides also bringing down the temperature of the fire. This is the reason CO_2 is widely used as a fire extinguisher.

Another type of extinguisher is soda-acid fire extinguisher. In this type, sodium hydrogen carbonate and sulphuric acid are present in two compartments in the fire extinguisher. When the extinguisher is used, the two come in contact with each other producing carbon dioxide.

TYPES OF COMBUSTION

There are three types of combustion :

- Rapid combustion
- Spontaneous combustion
- Explosion

Rapid Combustion

In this type of combustion, large amount of heat and light are produced in a very short span of time.

Examples are combustion of LPG, kerosene, petrol.

Spontaneous Combustion

In this type of combustion, substances suddenly burst into flame on their own, without application of any apparent cause, An example is white phosphorous which burns in air at room temperature.

At times spontaneous forest fires are caused by the heat of the sun or due to lightning striking. This mainly occurs due to extreme heat of summer. Forest fires are very difficult to control. Many forest fires take place due to carelessness of human beings, like not extinguishing a camp fire completely before leaving a forest after a visit.

Spontaneous fires in coal mines can take place due to spontaneous combustion of coal dust.

Explosion

In this type of combustion heat, light and sound are produced accompanied by the liberation of a large amount of gas. Bursting of fireworks is an example of explosion. Explosions can also take place if pressure is applied on the cracker.

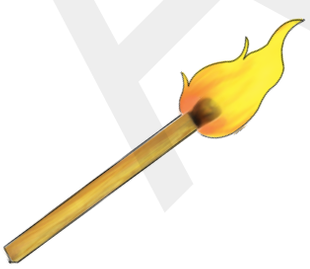
Let's Remember

Give one word for each one of the following

1. Name the products of incomplete combustion.
2. Why is a person whose clothes have caught fire wrapped in a thick blanket?
3. Name any two types of combustion.

FLAME

Different flames burn with different colours. A matchstick burns with a yellow flame,



Matchstick

Flame of a kitchen stove

Burning magnesium ribbon

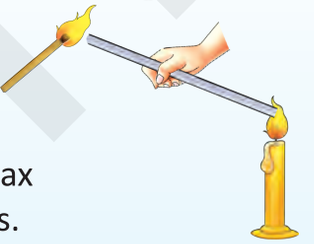
A kerosene lamp

A candle flame

Activity - 5

Note : Carry out this activity under the supervision of an adult.

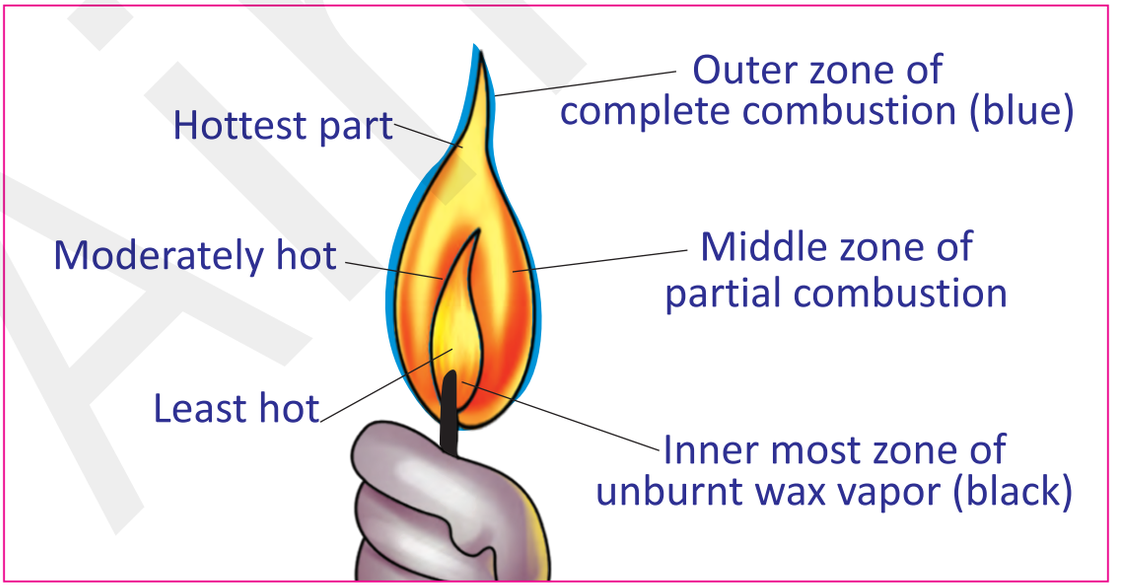
- Fix a lighted candle on a table. Hold a glass tube with a pair of tongs and bring one end of it into the dark zone of a well lighted candle.
- Bring a lighted matchstick near the other end of the glass tube.
- What do you observe?



It is seen that wax near the heated wick melts quickly. The molten wax rises through the wick and is vapourised during burning and form flames.

This shows that when a candle is lit, it is the wax vapors that burn and produce flame and not the liquid wax.

ZONES OF A CANDLE FLAME



Different zones of a Candle

◈ **The Inner Zone :** This is the dark zone, it is the coolest part of the flame. Since oxygen is not available in this zone, no combustion takes place here. The zone is dark and emits no light.

Now, you will understand why goldsmith use the outermost part of the zone. They use a metallic blow-pipe for melting gold and silver in the outermost zone of a flame.

FUEL

In the previous chapter we have studied about what is a fuel? Now let us learn some qualities about a good fuel. Substances that produce heat and light on burning like wood, charcoal, petrol, kerosene, etc. are called fuel.

A good fuel is one :

- That is easily available and cheap.
- That burns easily in air at a moderate rate.
- That produces a large amount of heat.
- That does not produce any poisonous and irritating fumes during burning.
- That leaves no ash on burning.
- Whose ignition temperature is above room temperature.

Remember : There is no fuel which can be considered an ideal fuel.

Types of Fuel

Solid	Liquid	Gaseous Fuel
Coal	Kerosene	Natural gas
Coke	Petrol	LPG
Cow dung	Diesel	Coal gas
Wood		Biogas
Charcoal		Petroleum gas

FUEL EFFICIENCY

The amount of heat energy produced on complete combustion of a kilogram of fuel is called its calorific value. The standard unit of representing calorific value is kilojoule (kJ) per gram (g) or per kilogram (kJ/g) or (kJ/kg). The higher the calorific value of a fuel the more heat it produces when burnt.

Calorific Values of Different Fuels

Fuel	Calorific Value (KJ/Kg)	Fuel	Calorific Value KJ/Kg)
Wood	17000 –22000	Methane	50000
Coal	25000 – 33000	CNG	50000
Petrol	45000	LPG	55000
Kerosene	45000	Bio gas	35000 – 40000
Diesel	45000	Hydrogen	150000

HAZARDS OF BURNING FUELS

Burning fuel produces harmful products. With the increase in population, the fuel consumption has also riseu, resulting in harmful effects on the environment.

1. Carbon containing fuels like wood, coal and petroleum when burnt release unburnt carbon particles. These fine pollutants cause air pollution leading to respiratory diseases and asthma.
2. Solid fuels also leave behind ash, which if not disposed off properly can cause air and water pollution.
3. Incomplete combustion of fuels give carbon monoxide gas. Exposure to it can lead to headache, dizziness and can even cause coma and death. This is why we should not burn coal in a closed room or sleep in a room with a burning coal fire in it.
4. Combustion of fuel releases carbon dioxide in the environment, leading to an increase in the earth's. This causes global warming, adversely affecting monsoons, causing excessive melting of polar glaciers, resulting in a rise in the sea and ocean levels– this is turn can cause floods in coastal areas and the submerging of low-lying areas.

- Burning coal and fossil fuels releases sulphur dioxide gas and nitrogen oxides. These gases react with water and oxygen producing acids, that on the earth as acid rain. Acid rain is harmful to the plants, buildings, soil and aquatic life. It is highly acidic and corrosive and due to acid rain marble structure of Taj Mahal has corroded.

Let's Remember

Fill in the blanks :

1. Petrol and kerosene are ..... .
2. The lowest temperature at which a substance catches fuel is called ..... .
3. The most common supporter of combustion is ..... .
4. The ..... zone of the candle is the hottest.
5. Taj Mahal has been corroded by ..... .
6. Burning of coal and wood causes ..... .

Key words

Combustion : Combustion is a chemical reaction which involves the burning of fuel in the presence of air or oxygen that is accompanied by the production of heat or both heat and light.

Ignition : the lowest temperature at which a substance spontaneously ignites in a normal atmosphere is called the ignition temperature or kindling point

Inflammable substances : substances which catch five on exposure to air are called inflammable substances

Colorific value : the amount of heat released on complete combustion of one kg of fuel is known as calorific value of a fuel

SUMMARY

- Fuel is a substance which burns in air to produce heat and light.
- Substances which burn in air are called combustible substances.
- Water is most commonly used to extinguish fires.
- However, water cannot be used to extinguish electrical or oil fires.
- There are different types of combustion – rapid combustion, spontaneous combustion and explosion.
- A candle flame has three zones– non luminous zone, luminous zone and dark zone.
- Burning fuels produce many harmful substances.
- Unburnt carbon particles in air cause respiratory problems and asthma.
- Combustion of fuels release carbon dioxide in the air which causes global warming.
- Incomplete combustion of fuel releases carbon monoxide gas which is poisonous.
- Acid rain is harmful for crops, buildings, statues and soil.

Exercise

A. A Multiple choice Questions (MCQS)

Tick (✓) the correct option :

1. This is a non combustible substance
   - (a) Wood ☐ (b) Paper ☐
   - (c) Cement ☐ (d) Kerosene ☐
2. This is required for combustion
   - (a) Oxygen ☐ (b) Nitrogen ☐
   - (c) Carbon dioxide ☐ (d) Ozone ☐

3. The substance having the highest calorific value is

   (a) LPG (b) CNG

   (c) Oxygen (d) Coal gas

4. This causes acid rain

   (a) Sulphur dioxide (b) Carbon dioxide

   (c) Carbon monoxide (d) Oxide of nitrogen

5. The standard unit of calorific value is

   (a) kJ/cm (b) Jh/g

   (c) kJ/kg (d) Calories

B. Write 'T' for True and 'F' for false statments

1. Combustion always produces heat.
2. Burning of LPG is a slow combustion.
3. The higher the ignition temperature, more inflammable is the substance.
4. Combustion is a reversible reaction.
5. An example of spontaneous reaction is burning of white phosphorous.

C. Match the following

Column A		Column B
1. Ignition temperature	(a)	17kg/g
2. Blue frame	(b)	green house effect
3. Wood	(c)	Incomplete combustion
4. Compounds of sulphur	(d)	non-luminous
5. carbon dioxide	(e)	acid rain
6. Insufficient air	(f)	kindling temperature

D. Anwser the following questions in short.

1. Which will catch fire first coal or kerosene? Why?
2. State any two conditions necessary for combustion.
3. What do you understand by explosion?
4. Why should water not be used for extinguishing electrical fires?
5. Differentiate between combustible and non-combustible substances. Give Two examples of each.

E. Answer the following questions.

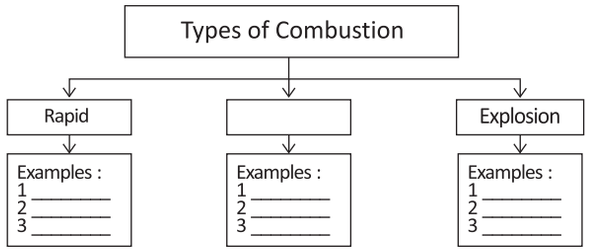
1. Explain how carbon dioxide is able to control fire.
2. Explain the characteristics of an ideal fuel.
3. Draw a labelled diagram of a candle flame. Explain it.
4. Explain Three hazards of burning fuels.
5. How is it possible to boil water in a paper cup without the paper catching fire?

Group Discussion

Discuss ways to save non-renewable sources of energy. write a report and present it to your teacher.

Let's Recall

Complete the following Diagram.



Creative task

Visit 10 nearby houses in your area. find out what precautions they take in while using LPG and make a report.

(Hots)

1. Why do you think carbon monoxide is more dangerous than carbon dioxide?
2. Why do you think dried grass catches fire more easily compared to green and fresh grass?

Activity to do

Make Silver Polish at Home

You will need

1. A tarnished piece of silver.
2. A pan to immerse the silver.
3. Aluminium foil to cover the bottom of the pan.
4. Baking Soda.

Method Place the aluminium foil on the bottom of the pan. Place the silver object on top of it. The silver object should come in full contact with the foil.

Fill the pan with hot water so as to immerse the silver object.

To the hot water add (¼ cup of baking soda for a 1 litre water.)

Almost immediately the tarnish will start disappearing. In case the silver is badly tarnished, you will have to reheat the soda water mixture several times to remove all tarnish.

Worksheet - 4

Define the following terms.

1. Ignition Temperature

_____

_____

_____

2. Complete Combustion

_____

_____

_____

3. Luminous flame

_____

_____

_____

4. Fuels

_____

_____

_____

5. Characteristics of an ideal fuel

_____

_____

_____

Aimline

CHAPTER 5

Conservation of Plants and Animals

Introduction

A large variety of plants and animals exist on our planet. They are essential for our survival. The number and variety of plants, animals and other organisms, their interrelationships and their relation with the environment that exist is known as biodiversity. Every component of biodiversity from microorganism to the huge elephant serves an important function in nature.

Some of these species of plants as well as animals have become extinct or are on the verge of becoming extinct. One of the most serious environmental problem faced by us is loss of biodiversity. There are number of causes for this.

- Biodiversity
- Deforestation and it causes
- Consequences of deforestation
- Conservation of wild life
- Biosphere reserve
- Flora and fauna
- Endangered species
- Wild life sanctuary
- Red Data Book
- Migration
- Reforestation
- Recycling of paper

DEFORESTATION AND IT CAUSES

One of the major threats to the survival of the organisms is deforestation. You have already studied that deforestation is the large scale cutting of trees and clearing of forests. The reasons of deforestation are :

- Increased requirement of land for agriculture, for the construction of roads, houses, factories and dams. This is happening because of increase in population.
- Increased requirement of wood for making furniture, in construction and in making paper, etc. Wood is being used as a fuel.
- Overgrazing by cattle.
- Increased mining activity.
- Some natural causes of deforestation include forest fires and lowering of water-table caused by droughts.

CONSEQUENCES OF DEFORESTATION

Deforestation has many adverse effects which include :

- Increased air and soil pollution.
- Increase in temperature. Trees take in carbon dioxide photosynthesis, reducing the carbon dioxide concentration in the atmosphere which may lead to global warming.

Deforestation

- Lesser rainfall results in low ground-water level. Trees release water vapour during the process of transpiration. Destroying of trees will lead to a lower amount of water vapour in the atmosphere. This makes the atmosphere drier and leads to reduced rainfall.
- Increased chances of natural calamities such as floods and droughts. Trees help to absorb rain water from the ground. Excess water could cause floods due to soil erosion. The increase in temperature due to the felling of trees will disturb the water cycle and lead to less rainfall causing droughts.
- Roots of trees bind the soil particles together. Due to deforestation soil erosion can take place due to wind and moving water. The Loss of top soil will reduce the fertility of the soil as it is rich in humus and nutrients. Removal of top layer of the soil exposes the lower hard and rocky layers and over time, fertile soil gets converted into a desert. This is called desertification.
- It leads to reduction in the binding capacity of the soil particles. Land slides are a consequence of this reduction in binding capacity.
- Soil texture and nutrient content are adversely affected.
- Cutting down trees destroy the homes of many species of animals.
- Many species of animals and plants are not able to adjust to the changing climate caused by deforestation resulting in many species become extinct.

CONSERVATION OF FOREST AND WILDLIFE

We need to conserve forest and wildlife as they are a valuable treasure. The preservation and careful management of plant and animal species are called conservation. Our life depends on forests in several ways. The Biosphere is that part of the earth in which living organisms exist or which supports life. Several steps have been taken by the government to preserve biodiversity.

Biosphere : Various protected areas have been established to protect the flora and fauna and their natural habits. These protected areas are called sanctuaries, national parks and biosphere reserves. They were established under the Wild Life Protection Act (1972).

These protected sites are natural areas that allow native organisms to flourish and all kinds of human intervention leading to the destruction of habitats are removed from this area. Hence, cultivation, grazing, felling of trees, hunting and poaching are strictly prohibited in these areas. The government has laid down strict rules and polices which are implemented in these areas.

Let's Remember

Give one word for each of the following :

1. What is meant by bio-diversity?
2. How does deforestation lead to reduced rainfall?
3. Why has government established various protected areas?

BIOSPHERE RESERVE

It is an area meant for conservation of biodiversity. It is a large area of protected land developed to conserve wild life, plants resources and traditional life of the tribal living in that area.

Some of the biosphere reserves which have been set up in India are :

1. Nilgiri
2. Nokrok
3. Gulf of Mannar
4. Sunderbans
5. Dibru Saikhowa
6. Debong Deband
7. Pachmarhi
8. Kanchajunga
9. Nanda Devi
10. Great Nicobar
11. Manas
12. Similipal

A biosphere reserve may contain other protective areas in it. Example Pachmarhi Biosphere Reserve consists of one national park, named Satpura and two wild life sanctuaries named Bori and Panchmari.

Pachmarhi Biosphere Reserve

Facts to know

Zoos are places where animals are protected, but it is an artificial setting and not a natural habitat.

FLORA AND FAUNA

The large number of plants living in a particular area are called the flora of a place.

The large number of animals living in a particular area are called the fauna of a place.

Examples :

The flora of Pachmarhi are Sal, Teak, Mango, Jamun, Silver ferns, Arjun, etc.

Sal | Jamun | Silver ferns | Arjun

Flora

The fauna include Chinkara, Blue bull, Cheetal, Wild Dog, Barking Deer, Leopard.

Chinkara | Cheetal | Wild dog | Blue bull

Fauna

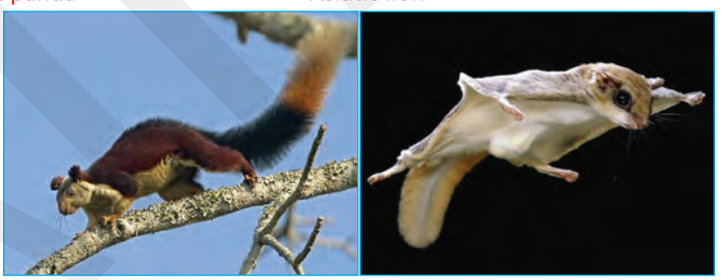
ENDEMIC SPECIES

Plant and animal species confined to a particular geographic area are called endemic species. They are not naturally found anywhere else and are unique to a particular space.

Species : It is a group or a class of animals or plants that share common characteristics such as similar body parts and functions, same eating habits, same habitat, the ability to interbreed and reproduce fertile offspring only with members of their own species and not with other species.

Examples of Endemic species : The Giant Panda is endemic to the mountains of Sichuan, Gansu and Shanxi Provinces in China. The Asiatic Lion is endemic to Gir National Park in Gujarat. The endemic flora of Pachmarhi Biosphere Reserve includes sal, wild mango and species such as Bison, Indian giant squirrel and Flying squirrel.

Giant panda | Asiatic lion | Wild mango



Giant squirrel | Flying squirrel

Endemic flora and fauna

Activity

Find out more endemic plants and animals of India.

Facts to know

North-East India and Western Ghats are two hot biodiversity spots of the world.

WILDLIFE SANCTUARY

Wildlife sanctuaries are protected areas established to prevent the extinction of animals. They provide protection and suitable living conditions for wild animals. Killing of animals (poaching) or capturing of animals is strictly prohibited in these areas.

There are more than 400 wildlife sanctuaries in India. Indian sanctuaries have broad based level forests, mountain forests and bush land in the deltas of major rivers like Ganga.

Some wildlife sanctuaries have been specifically named as bird sanctuaries.

Some famous wildlife sanctuaries in India are :

1. Gir in Gujarat (Asiatic Lion, Sambhar, Chital)
2. Kaziranga in Assam (Indian rhinoceros)
3. Sariska in Rajasthan (Tiger)
4. Periyar in Kerala (Asian elephant)
5. Bandhavgarh in Madhya Pradesh (Tiger)
6. Bharatpur Bird Sanctuary in Rajasthan (Siberian crane)

Facts to know

Ecosystem consists of all the plants, animals, micro-organisms in an area and anaerobic components such as soil, climate, river, deltas etc.

Some endangered species of wild animals like black buck, white-eyed buck, elephant, golden cat, pin headed duck, gharial, lion, tiger, rhinoceros etc. are protected and preserved in our wild life sanctuaries.

National Park

These are special areas reserved for wild life where they can freely move about in their natural habitat. The wild animals, natural vegetation and landscapes are preserved together in the National Park.

Examples are

- Corbett National Park in Uttaranchal. This was the first National Park set up in India.
- Kanha National Park (M.P)

There are more than 80 national parks in our country.

The finest teak is found in the Satpura National Park. Rock shelters are also found here. Rock paintings indicate the existence of lions, elephants, wild buffaloes during the prehistoric period.

Tiger

Satpura Tiger Reserve : This was developed to ensure the survival and maintenance of the tiger population in our country.

Species that are at a high risk of getting extinct are called endangered species.

Examples are Indian rhinoceros, Asiatic lion, crocodile, blue whale.

Species which are likely to become endangered due to destruction of forest, over exploitation and other environmental disturbances are called vulnerable species.

Examples : golden langur, chinkara, deer.

Rhinoceros

Chinkara deer

Golden langur

Endangered and vulnerable species together are known as threatened species.

Facts to know

Dinosaurs have became extinct billion of years ago.

RED DATA BOOK

The first Red Data Book on animals was published in 1991. the international Union for conservation of Natural and Natural Resources (IUCN) works towards assessing the global conservation status of plants and animal species. IUNC maintains a comprehensive list known as the IUCN Red list of Threatened species. Here, species are classified into nine categories based on criteria like the rate of decline, population size, and area of geographical distribution.

The nine categories in the IUCN Red List of Threatened species are given below.

- Extinct
- Near threatened
- Extinct in the wild
- Least concern
- Critically endangered
- Data deficient
- Endangered
- Not evaluated
- Vulnerable

The main aims of the IUCN Red List are to focus the attention of conservationists on species that are under threat of becoming extinct. Some of the animal listed on the IUCN Red List include blue whale, African elephant, sea turtle, and Bengal tiger.

IUCN also publishes a catalog, called a Red Data Book which lists rare species and those in danger of extinction

MIGRATION

Seasonal movement of animals from one habitat to another due to of climate changes is called migration. Birds fly to warmer places to lay eggs covering a large distance. Common migratory animals include whales, fish, turtles and birds.

It is a sad story that even protected forests in wild life sanctuaries are not safe as people living in neighbouring villages encroach upon them and destroy them.

RECYCLING OF PAPER

Do you know paper is the most throw away material? Paper as you know is made from trees. It takes 17 full grown trees to make a tonne of paper. We can recycle paper 5-7 times. We should use paper with care. This will help us in saving many trees each year. This way the amount of harmful chemicals used in paper making will also be reduced. The demand for recycled paper is increasing these days as people have started realising its importance.

REFORESTATION

Reforestation means planting trees in place of the trees destroyed. The trees planted should be as far as possible of the same species as found in that forest. Reforestation can take place naturally also if the deforested area is left undisturbed, it redevelops itself.

SOME CONSERVATION PROGRAMMES

In India some non-governmental organisations (NGOs) also work with the government for conserving the environment. Some help in spreading awareness amongst people whereas some work towards the implementation of rules set up by the government.

Some famous conservation programmes include:

- **Project Tiger :** Initated in 1973 to protect the Royal Bengal Tiger. It is one of the largest conservation programmes. The population of tigers is slowly decreasing.
- **Van Mahotsava :** Celebrated in the first week of July all over the country. It was started by the government to revive lost forest cover. During this week lakhs of plants are planted.
- **Chipko movement :** Started in 1973 in a village in the Himalaya. In this people embraced trees and stopped them from being cut.

Let's Remember

Match the following

Column A		Column B
1.	Deforestation	(a) Conserving
2.	Biosphere Reserve	(b) Jamun tree
3.	Flora	(c) Asiafic Lion
4.	Endangered species	(d) Siberian Crane
5.	Migratory birds	(e) Lower water taste

Glossary

biodivercity : the variability of the species in different habitats, the diversity of microorganisms, plants and animals is called biodiversity

botanical garden : a botanical garden consists chiefly of a collection of living plants, of doors or under glass in greenhouses and conservatories

deforestation : the indiscriminate cutting of trees leading to destruction of forest cover is known as deforestation

endemic species : a species is extinct when no individual of the species is alive and whose chances for further evaluation are lost

endangered species : the species which are at the verge of extinction are called endangered species

In situ conservation : conservation of living resources within the natural habitat is called in situ conservation

ex situ conservation : conservation of living resources outside the habitat is called ex situ conservation

migration : the periodic movement of animals from one place to another for food, reproduction or survival is called migration

National park : a large area dedicated to conserve the environment, natural resources and the wildlife therein is called a national park

wildlife sanctuary : a large area dedicated to conserve the wildlife therein is called a wildlife sanctuary

zoological park : a place where wild animals are kept in protection for public display is called a zoological park

SUMMARY

- Biodiversely refers to the large variety of plants, animals and other organisms in a specific area.
- Deforestation is one of the major reasons for the loss of biodiversity.
- Wild life sanctuaries, national parks, biosphere reserves are special areas for conservation and preservation of forest and wild animals.
- Plants and animals living in an area are called the flora and fauna of that area.
- Plants and animal species confined to a particular geographical area are called endemic species.
- Endangered species are those which are facing the danger of extinction.
- Endangered and vulnerable species are together described as threatened species.
- Red Data Book contains a record of endangered species.
- Movement of a species from one place to another for a particular time period every year to overcome unfavourable conditions is called migration.

Exercise

A. Tick (✓) the correct answer :

1. The species which have been lost forever are called.
   (a) Endangered species ☐ (b) Vulnerable species ☐
   (c) Rare species ☐ (d) Extinct species ☐
2. Different animals are collectively called
   (a) Flora ☐ (b) Fauna ☐
   (c) Biodiversity ☐ (d) None of these ☐
3. This is a famous Biosphere Reserve
   (a) Pachmarhi ☐ (b) Gir ☐
   (c) Corbett ☐ (d) Sariska ☐
4. This is endemic to Gir National Park in Gujarat
   (a) Panda ☐ (b) Asiafic lion ☐
   (c) Bison ☐ (d) Flying squirrel ☐
5. The Red Data Book gives an account of
   (a) Endangered plants ☐ (b) Extinct animals ☐
   (c) Threatened species ☐ (d) Endangered plants and animals ☐
6. Indian rhinoceros are found in this wild life sanctuary
   (a) Sariska ☐ (b) Kaziranga ☐
   (c) Periyar ☐ (d) Bharatpur ☐

B. State (T) for True and (F) for false statements.

1. A National Park is bigger than a Biosphere Reserve. ☐
2. Sal, teak and mango are fauna of Pachmarhi Biosphere Reserve. ☐
3. An area strictly reserved for the protection of animals is called a wild life sanctuary. ☐
4. In a national park animals can freely graze. ☐
5. Whales, fish, birds are migratory creatures. ☐
6. Reforestation can also take place naturally. ☐

C. Fill in the blanks with the correct words

flora 400 plant 80 biosphere

1. A large variety of plants and animals exist on our _____.
2. A _____ reserve may contain other protective areas in it.
3. The large number of the plant living in a particular area are called the _____of a place.
4. There are more than _____wild life sanctuaries in india.
5. These are more than _____ national parks in our country.

D. Anwser the following question short.

1. Why should we conserve biodiversity ?
2. What is the difference between flora and fauna?
3. Mention the activities not permitted in wild life sanctuaries.
4. Mention two causes of deforestation.
5. Name the protected areas established under the Wild Life Protection Act (1972).

E. Answer the following questions.

1. Explain how deforestation leads to reduced rain?
2. Why do we need to conserve forests and wild life?
3. How does deforestation causes desertification?
4. Why should we save paper? Prepare a list of ways by which you can save paper.
5. What is a wild life sanctuary? Name three sanctuaries and the states in which they are found

RED DATA BOOK

Find out about the movement and make a powerpoint presentation on it. Plant at least five different plants in your locality during this academic year and ensure their maintenance till they grow

GROUP DISCUSSION

Form a group of 5-6 students and discuss on the following points :

1. Habitat destruction and loss of biodiversity
2. How can we use forest products as well as conserve them for future ?

Let's Recall

Causes of loss of biodiversity

1.
2.
3.

(Hots)

1. Why do you think wild life sanctuaries are a better way of conserving animals than zoos?
2. What do you think will happen in an hilly area because of deforestation?

Aimline

Worksheet - 5

Find out maximum words in word grid given below. All the words are related to the chapter.

R	P	R	W	T	L	L	Y	G	N	A	I	T	P	N	L	V	A	A	E
E	C	P	H	N	A	S	P	L	E	F	X	B	G	C	M	G	W	W	A
U	A	E	R	V	H	O	E	O	K	G	J	K	A	C	C	O	Q	Q	R
S	R	O	B	Y	D	I	N	B	Y	H	L	G	A	E	U	M	D	D	T
E	B	P	V	F	T	L	E	A	P	O	B	N	J	F	L	V	L	L	H
N	O	L	J	T	V	M	R	L	E	R	G	F	T	O	W	S	C	C	E
Z	N	E	K	H	L	F	G	C	V	O	X	Y	G	E	N	Q	O	O	N
K	D	I	X	R	Y	E	Y	C	G	F	K	W	M	F	P	W	N	N	V
X	I	D	G	A	P	V	O	Z	O	N	E	O	O	S	Q	A	S	S	I
P	O	F	R	G	H	J	D	E	Q	C	L	I	M	A	T	E	E	E	R
W	X	L	E	J	M	P	I	S	Q	K	W	O	D	D	S	H	R	R	O
L	I	B	D	O	V	A	C	Y	O	F	L	E	U	E	E	U	V	V	M
A	D	F	U	Q	R	N	X	W	P	L	A	M	T	S	E	B	A	A	E
H	E	B	C	F	E	I	G	D	U	Y	Y	A	L	S	D	X	T	T	N
X	Q	Q	E	I	C	M	K	I	L	T	V	D	S	E	S	D	I	I	T
Z	I	U	Y	L	Y	A	A	I	R	O	D	T	R	E	E	S	O	O	C
S	I	S	N	A	C	L	O	U	O	L	E	A	J	Y	Y	Z	N	N	Z
U	W	O	G	Q	L	U	X	Z	L	Q	G	C	L	P	H	B	S	S	W
N	B	V	E	X	E	T	M	F	C	A	I	Q	B	X	I	M	C	C	A
C	E	X	K	U	O	N	C	G	V	X	Y	P	R	K	V	J	Z	Z	G

Define the following terms:

(a). Endemic Species

_____

_____

_____

(b) Red Data Book

_____

_____

_____

(c) Recycling

_____

_____

_____

Fun Time

Make Paper - Pulp Flower Vase

You will need Old newspapers
Flour - Paste
Empty Jam Jar

1. Tear newspaper into small places. Soak them in water overnight.
2. Next day squeeze the paper and pour out surplus water.
3. Mix a solution of flour-paste into the pulp, till a stiff plaster is formed.
4. Take the empty jar. First cover the bottom of the jar with half -inch layer of paper mache. Then work upwards along the sides of the jar. Carefully spread the pulp into position with an old kitchen knife.
5. Do not follow the exact shape of the jar while applying pulp. Try to make the vase look as little as a jam bottle. (Fig a & b)

(a) (b)

6. Make the surface of the bottle smooth with the help of a flat bladed knife.
7. Keep it in a warm, dry place till the paper mache shell hardens - about 48 hours.
8. Use fine sand - paper to smoothen the rough surface of the vase.
9. Decorate with bright, glass paint, using different colours.

Isn't it easy to make pulp pottery?

Anime

CHAPTER 6

Reproduction in Animals

All organisms reproduce to produce more of their kind. It is one of the most important characteristics of living organisms. It is essential for the continuation of a species. If we do not produce young ones of our kind the living world would come to an end. Reproduction allows an organism to continue to live on earth, generation after generation. Different living organisms reproduce in different ways.

Introduction

- Reproduction
- Modes of reproduction
- Male reproductive system
- Female reproductive system
- Fertilization
- Development of embryo
- Viviparous and oviparous animals
- Metamorphosis
- Asexual reproduction
- Budding
- Binary fission

MODES OF REPRODUCTION

Reproduction is the process by which living beings produce young ones of their own kind. Just as plants reproduce, animals also reproduce by two modes:

- Sexual reproduction and
- Asexual reproduction

Fish, frog, cow, horse, cat, dog, human beings, etc, reproduce by sexual reproduction. Let us now study about sexual reproduction in detail.

Complete the table by naming the young ones.

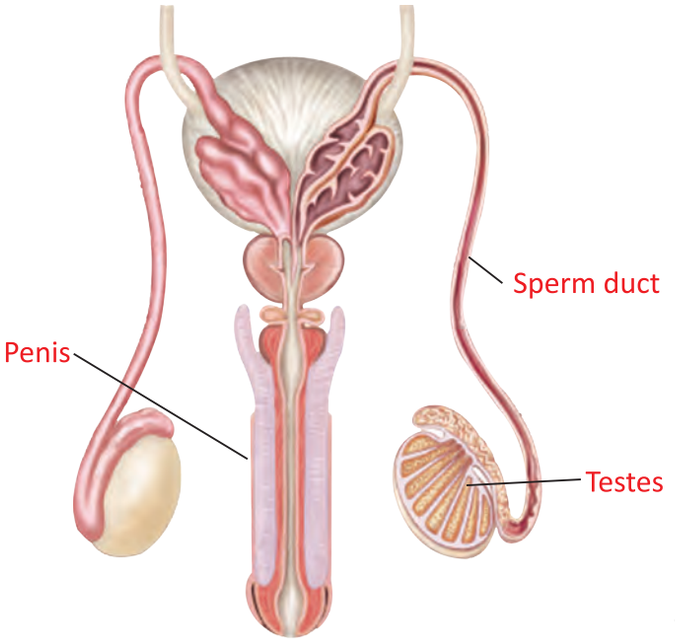
S. No.	Animal	Young one
1.	Human	Baby
2.	Cat	—
3.	Dog	Puppy
4.	Cow	—
5.	Horse	—
6.	Hen	—
7.	Frog	—
8.	Sheep	—

Sexual Reproduction

In this method two parents are required to produce a new organism. Most plants and mammals reproduce sexually. The reproductive parts of animals also produce gametes, that fuse to form a zygote. The zygote develops into a new individual. The process of fusion of male gamete with a female gamete is called fertilisation of egg. This type of reproduction beginning with the fusion of male and female gamete is called sexual reproduction.

Let us now study reproduction in humans.

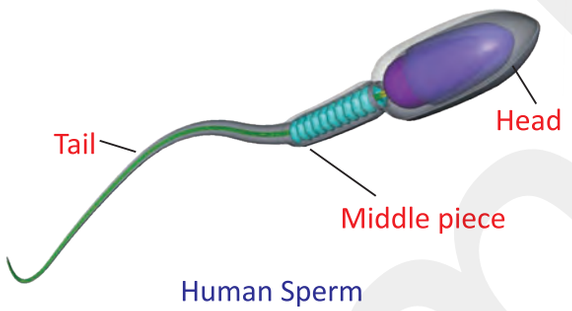
THE MALE REPRODUCTIVE SYSTEM



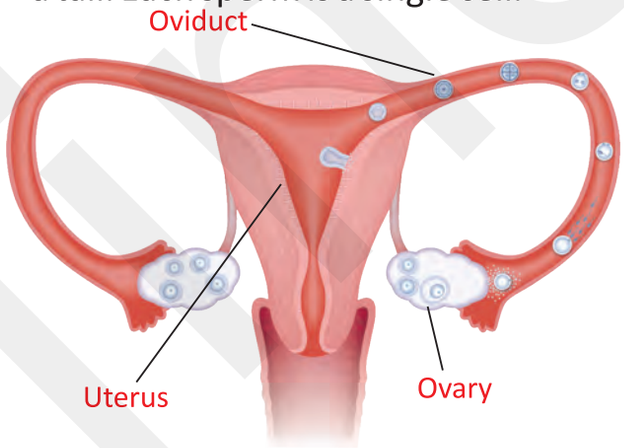
Male reproductive organs in humans

The male reproductive organs consist of a pair of testes (singular testis), two sperm ducts and a penis.

The testis is made up of numerous coiled tubes that produce sperms which are the male gametes. The testes produce millions of sperms. The sperm is very small in size. Each sperm consists of three parts – head, middle piece and a tail. Each sperm is a single cell.



Human Sperm



Female reproductive organs

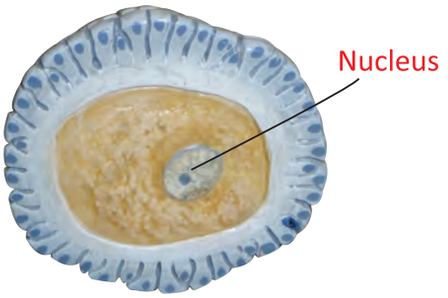
FEMALE REPRODUCTIVE SYSTEM

The female reproductive system consists of a pair of ovaries (each ovary is of the shape and size of an almond), oviducts or fallopian tubes and uterus. The ovary produces female gamete called ova (egg). When a girl reaches puberty a single matured egg is released into the fallopian tube by one of the ovaries every month. Like the sperms, egg is also a single cell. Uterus is the organ where the zygote matures and develops into a baby.

You have already studied in the previous chapter that the size of the egg varies from animal to animal.

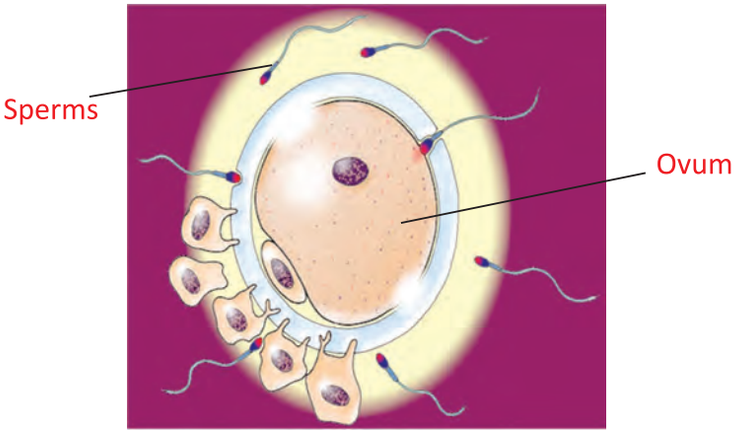
FERTILIZATION

The first step in the process of reproduction is fertilisation. The fusion of the male and the female gamete to produce a new organism is called fertilization. This takes place when the sperm comes in contact with

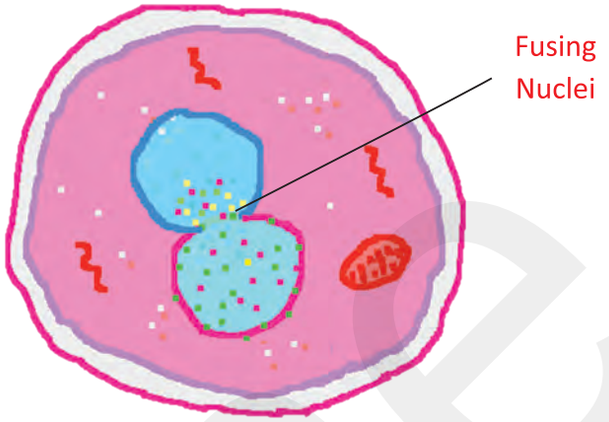


Human Ovum

an egg and, one of the sperms may fuse with the egg. In humans, fertilization takes place in the body of the female. During fertilization, the nucleus of the sperm and the egg fuse to form a single nucleus. The fertilized egg so formed is called a zygote.



Fertilization



Zygote

The new individual inherits characteristics of both mother and father as the zygote is formed due to the meeting of an egg cell from the mother and a sperm cell from the father. This is the reason why children have some characteristics similar to those of the mother and father.

There are two types of fertilization :

- Internal fertilization
- External fertilization

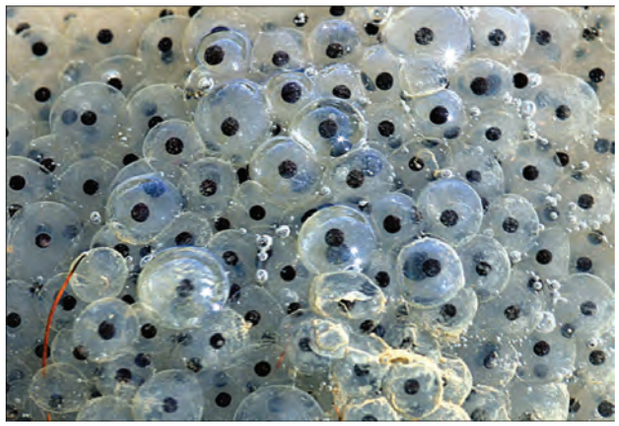
Internal fertilization

In this type of fertilization, the fusion of male and female gamete takes place inside the body of the female. This process happers in many animals including mammals like cats, dogs, cows, horses and humans.

External fertilization

In many animals fertilization takes place outside the body of the female. In these animals fertilization takes place in water. Examples are fish, frog, starfish.

Aquatic animals like frogs and toads move to ponds and rivers during spring or rainy season. Female lays hundreds of eggs in water. If you visit a pond during rainy season, you might be able to see clusters of frog eggs floating in water. The egg of a frog is very delicate and is not covered by a shell. The eggs are held together by a layer of jelly which provides protection to the eggs.


Eggs of frogs

The male releases sperms in to the water and the Eggs swim randomly with the help of their long tail. Fertilization takes place when the sperm comes in contact with an egg. Since fertilization takes place

outside the body of the female, it is called external fertilization. Though hundreds of eggs are laid, only a few of them get fertilized. This is because the eggs and sperms are exposed to wind, water movement and rainfall. Other animals present in the pond also feed upon the eggs .

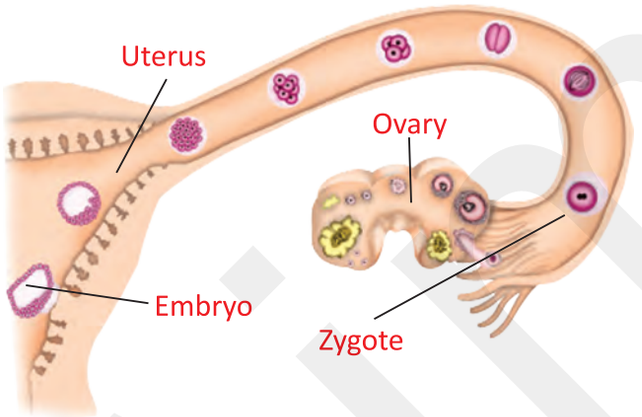
In Vitro Fertilization

Some women are unable to bear babies as their oviducts are blocked. In these women sperms cannot reach the egg for fertilization. In such cases doctors use a technique called in vitro fertilization or IVF (fertilization outside the body).

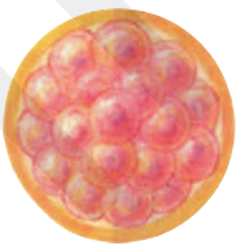
In this freshly released eggs and sperms, keeping them together for a few hours in a laboratory dish. If fertilization is successful, the zygote is allowed to develop for a week and then transferred into the woman's uterus . The embryo grows and develops in the uterus, just like other babies. The babies born through this technique are called test-tube babies.

DEVELOPMENT OF EMBRYO

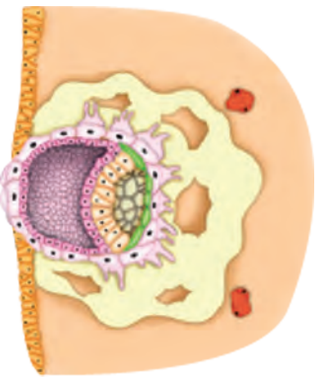
The zygote formed as a result of fertilization divides repeatedly to give rise to a ball of cells which moves towards the uterus. Upon reaching the uterus, it gets embedded in the wall for further development. The developing zygote is now called an embryo. The cells form groups that develop into different tissues and organs of the body.



Zygote formation and development of an embryo from zygote



Ball of cells enlarged



Embedding of the embryo in the uterus (enlarged)

From eight weeks after fertilization till birth, the developing baby is called a Fetus. The embryo develops body parts such as hands, legs, head, eyes, ears etc. When the development of the Fetus is complete, the mother gives birth to the baby.

It takes about 36-40 weeks for a human child to fully develop in the uterus.

Fetus developing in the uterus

Let's Remember

Give one word for each one of the following.

1. Name the female and the male gamete.
2. What is a zygote?
3. Name the male reproductive organs.
4. In humans, where does the zygote gets embedded?

Facts to know

The developement of the chick takes place inside the egg shell.

VIVIPAROUS AND OVIPAROUS ANIMALS

The animals are divided into two categories depending on how they produce offspring.

Viviparous Animals are those animals that give birth to young ones.
Example include: Cows, dog, cat, horse and human beings are viviparous animals.

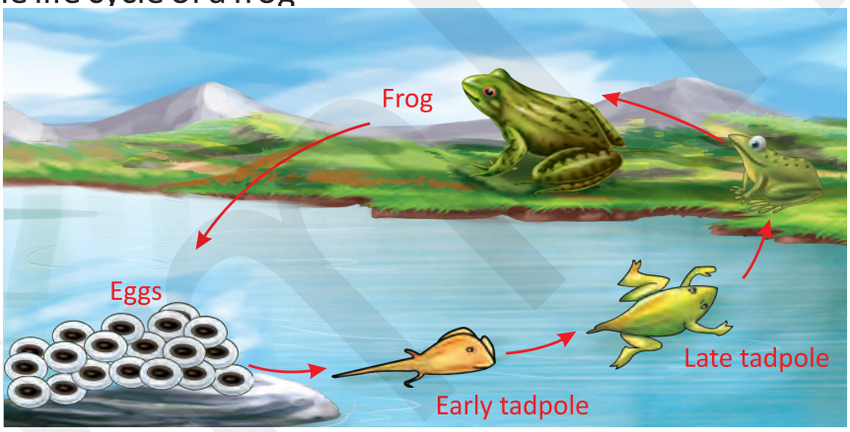
Oviparous Animals are those animals that lay eggs, which hatch into offspring.

Examples include birds, lizard, butterflies, hen, crow, etc.

Young Ones to Adults

The young ones which are either born or hatched from eggs continue to grow till they become adults. In some, the young ones look very different from the adults. You have already studied the life cycle of the silk worm in your previous class (egg → larva → pupa → adult).

Let us now study the life cycle of a frog —

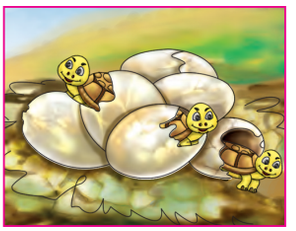


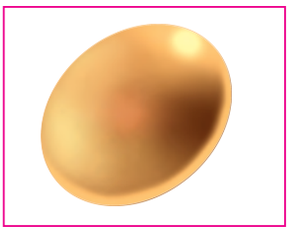
Life cycle of a frog

There are three distinct stages in the life cycle of a frog.
egg → larva (tadpole) → Pupa → adult
The tadpoles looks completely different from the adult frog.
The transformation of a larva into an adult through drastic changes is called metamorphosis.
Human beings do not under go metamorphosis as body parts similar to those present in the

Insects, Reptiles and Birds

These animals lay eggs. The fertilised egg laid by the female develops into a new individual. The fertilised egg is covered with a shell to protect it from the environment. The baby animal hatches out of the egg when the development is complete.





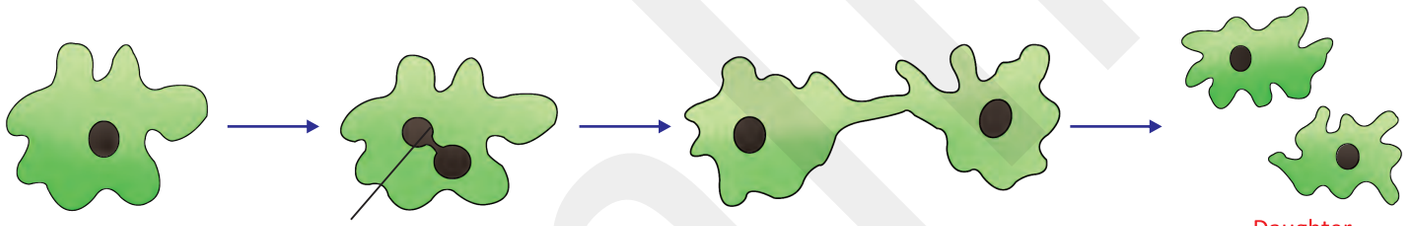
Young ones of insects, reptiles, birds hatch from eggs.

ASEXUAL REPRODUCTION

Asexual reproduction occurs in microorganisms, plants and animals. In this type of reproduction, a new individual is formed from cell(s) of a single parent. Amoeba, hydra, yeast, starfish, sponges and worms reproduce by asexual reproduction. The offspring is exactly identical to the parent.

Amoeba Reproduces by Binary Fission

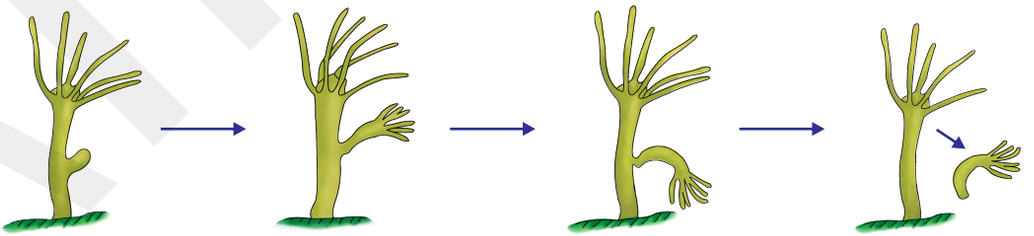
You have already learnt that amoeba is an unicellular organism. In amoeba the nucleus divides into two nuclei. The body then divides into two parts, each part receiving a nucleus. Further stretching of the body leads to the formation of two daughter cells. Thus two amoebae are produced from a single amoeba.



Binary fission in Amoeba

BUDDING IN HYDRA

First a bulge is formed on the body of the organism known as the bud. The bud grows to form a baby hydra. The nucleus of the parent body divides and one of it goes into the bud. The baby hydra then separates from the parent. Since in this case new individuals develop from the buds in hydra, this type of asexual reproduction is called budding.



Budding in Hydra

Let's quickly answer orally.

Fill in the blanks :

1. The young one of a frog is called ..... .
2. Fertilised egg is called ..... .
3. The organ which produces ova is called ..... .
4. ..... reproduces by budding.
5. The embryo is embedded in the ..... .
6. Babies born through in vitro fertilisation are called ..... .

SUMMARY

- Reproduction is a process through which living organisms produce offsprings like themselves.
- There are two modes of reproduction - (i) sexual reproduction and (ii) asexual reproduction.
- Sexual reproduction involves fusion of the male gamete and the female gamete.
- The male reproductive organs includes testes, sperms, ducts and penis.
- The female reproductive organs include ovaries, oviduct and uterus.
- The ovary produces female gametes called ova, whereas the testes produce the male gametes called sperms.
- The fusion of male and female gamete is called fertilisation and the fertilised egg is called a zygote.
- Fertilisation that takes place inside a female body is called internal fertilisation.
- In external fertilisation the fertilisation takes place outside the female body. This is observed in frogs, fish, star fish etc.
- The zygotes repeatedly divides to form a ball of cells, which develops to form an embryo.
- The embryo gets embedded in the walls of the uterus for further development.
- The stage when the body parts of an embryo can be identified is called a foetus.
- Animals which give rise to young ones are called viviparous animals like human beings, cows, horses, cats etc.
- Animals which lays eggs outside the body are called oviparous animals includes fish, frog, butterflies, lizards, snakes, hen etc.

Glossary

egg : the female gamete or the ovum
sperm : the male gamete
fertilization : fusion of ovum and sperm is called fertilization
embryo : the young one. zygote divides and redivides to form an embryo
viviparous animals : give birth to young one
metamorphosis : an embryo developing through different stages from egg to adult
hermaphrodite : organism bearing both, male and female sex organs on the some body
spawn : mass of zyotes in a jelly
spawning : the process of laying eggs in large numbers is called spawning
wriggler : larva of a mosquito

Exercise

A. A Multiple Choice Questions (MCQS)

Tick (✓) the correct answer :

1. The number of sperms needed to fertilise an egg _____.
   (a) One ☐ (b) Two ☐ (c) More than two ☐ (d) Millions ☐
2. Sperms are produced in _____.
   (a) Penis ☐ (b) Ovary ☐ (c) Testis ☐ (d) Uterus ☐
3. External fertilisation takes place in _____.
   (a) Humans ☐ (b) Cows ☐ (c) Monkeys ☐ (d) Frogs ☐
4. Which one is not an oviparous animal ?
   (a) Hen ☐ (b) Fish ☐ (c) Lizard ☐ (d) Cat ☐
5. The number of nuclei present in the zygote _____.
   (a) One ☐ (b) Two ☐ (c) Three ☐ (d) Four ☐

B. Write 'T' for true and 'F' for false statements.

1. Each sperm is a single cell. ☐
2. External fertilisation takes place in starfish. ☐
3. In asexual reproductions two parents are required. ☐
4. Sperm ducts are also called fallopian tubes. ☐
5. The developing baby is called an embryo, 8 weeks after fertilisation . ☐

C. Match the following

Column A	Column B
1. Pituitary gland	(a) oestrogen
2. Thyroid gland	(b) Insulin
3. Pancreas	(c) Testosterone
4. Ovaries	(d) Thyroxine
5. Testes	(e) Master gland

D. Answer the following questions in short.

1. Why is reproduction necessary in organisms?
2. Differentiate between sexual and asexual reproduction.
3. What is metamorphosis?
4. What are oviparous animals? Give three examples.
5. List the male and female reproductive organs.

Aimline

E. Answer the following questions :

1. With the help of diagrams explain how amoeba and hydra multiply.
2. Describe the process of fertilisation in human beings with the help of a diagram.
3. What is a zygote and a foetus? Give two differences between them.
4. Differentiate between external and internal fertilisation.

(Hots)

1. Why do you think it is possible to collect eggs of lizard, butterfly and frogs and not of cows or humans.
2. Why do you think fish lays hundreds of eggs?

CREATIVE TASK

1. Find out about the 'in vitro fertilisation' technique. What are its merits and demerits ?
2. Make a project of "How a single cell become such a big individual ?"
3. Collect information about some animals which reproduce asexually.

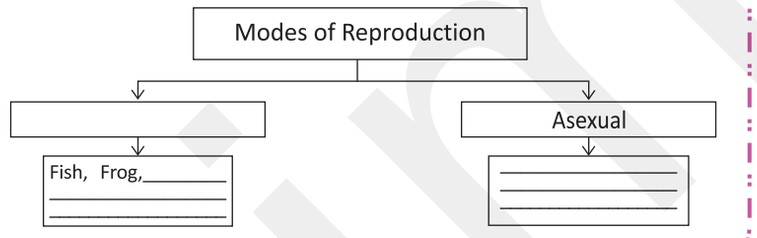
DISCUSSION

Discuss in the classroom with your friends on following topics:

1. Reproduction – A necessity for the continuity of life on earth.
2. Differences between asexual and sexual mode of reproduction.

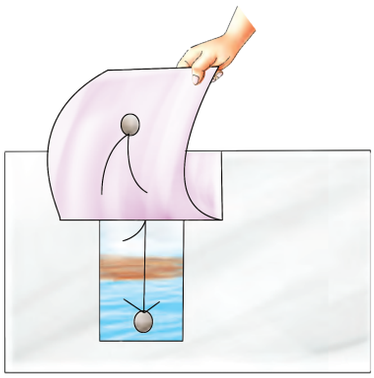
Let's Recall

Complete the following Diagram.



Activity to do

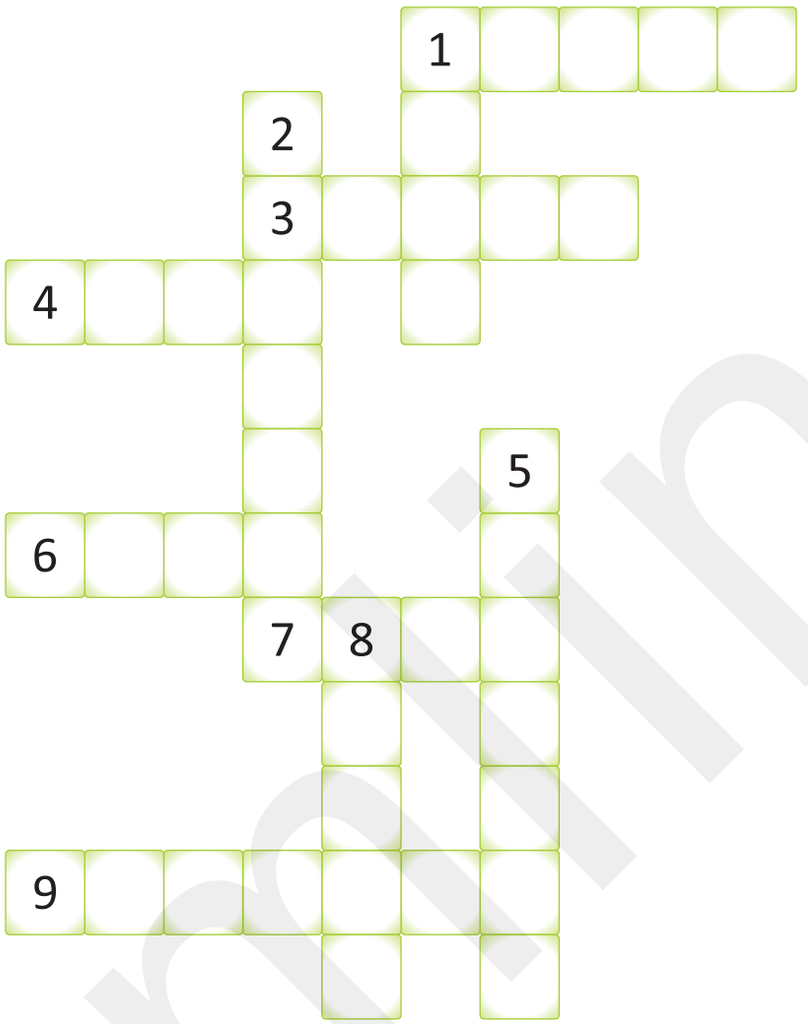
Copy a newspaper picture.



(i). Mix four parts of water and one part of turpentine.
(ii). Put a small piece of soap (about half a match box) and shake the mixture.
(iii). The soap will dissolve. However, turpentine and water will not separate out.
(iv). To copy a picture in a newspaper, wet it a little with the mixture.
(v). Put a sheet of white paper on it and rub the paper firmly with a spoon.
(vi). The turpentine will dissolve the ink of the newspapers and you will get a reverse picture on your sheet of paper.

Worksheet - 6

A Crossword puzzle related to this lesson is given below. Take help of the clues and fill the box



Across clues

1. What do frog use to breathe ?
3. What do tedpoles eat ?
4. A place where a mother frog might lay eggs.
6. What do tedpoles use to swim ?
7. What do mother frog lay
9. A young frog with a tail still attached.

Down Clues

1. Adult frogs use these to move around instead of a tail.
2. A baby frog.
3. What do adult frog eat?
4. What do tadpoles use to breathe ?

Anime

CHAPTER 7

Reaching the Age of Adolescence

In the previous chapter we have studied how animals reproduce. You must have also seen that it is only after a certain age that human beings and most animals can reproduce. There must be a number of changes that occur around that age in body of both female and male to make them capable of reproduction. Let us study about them.

Introduction

- Adolescence
- Changes at puberty
- Secondary sexual characterestics
- Role of hormones in initiating reproductive function
- Reproductive phase of life in humans
- Determination of sex
- Hormones other than sex hormones
- Reproductive health
- Drug abuse

Adolescence and Puberty

There are various stages in the growth of human beings. They are :

◈ Infancy ◈ Childhood ◈ Adolescence ◈ Adulthood

Infancy : It lasts from birth to about 2 years.

Childhood : It is the period of growth from 2–10 years.

Adolescence : The period between childhood and adulthood is called adolescence. During this period of life, the body undergoes changes, leading to reproductive maturity. Although growth take place right from the day a child is born, but there is a spurt of growth around the age of 10–11 years. The adolescence begins around the age of 10–11 years and lasts upto 18 or 19 years. The boys and girls passing through this age are called adolescents or teenagers. The period of adolescence usually begins a year or two earlier in girls.

During the adolescent period there is rapid growth and a number of visible changes are seen in the body of both girls and boys. These changes mark the onset of puberty. At puberty the boys and girls become capable of reproduction.

CHANGES AT PUBERTY

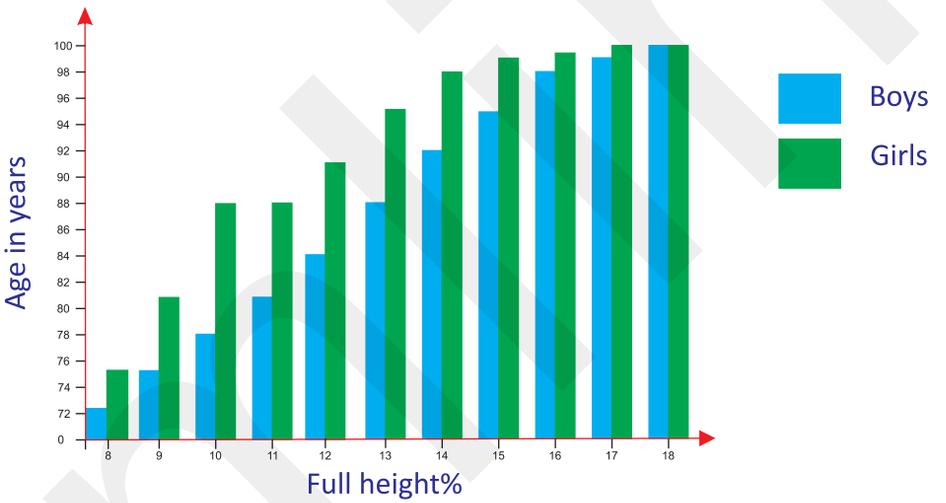
Increase in height

There is a growth spurt during puberty, meaning a rapid increase in height. This occurs due to the elongation of bones in the arms and legs of both girls and boys.

The following chart shows the probable average

Age in years	Full height %	
	Boys	Girls
8	72	75
9	75	81
10	78	84
11	81	88
12	84	91
13	88	95
14	92	98
15	95	99
16	98	99.5
17	99	100
18	100	100

The rate of increase in height varies from adolescent to adolescent. Some may show a sudden growth spurt at puberty and then slow down, while some may grow gradually.



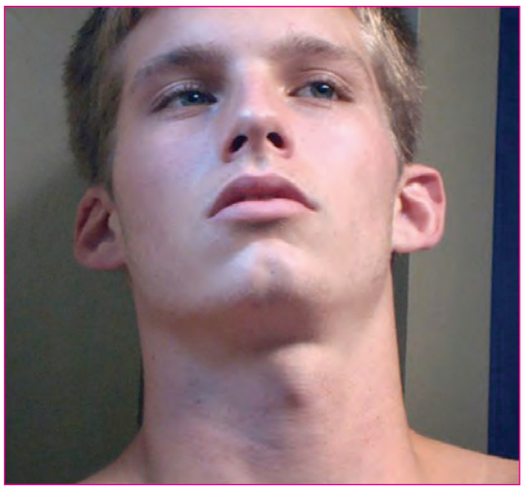
From the above graph it can be concluded that:

- Girls grow faster than boys during the initial period.
- Both girls and boys reach their maximum height at 18 years.

Height of an adolescent depends upon the height of their parents. This is because height depends upon the genes inherited from the parents. Height also depends upon the food intake during the growth period. It is therefore very important to eat the right kind of food during the growth period.

CHANGES IN BODY SHAPE

- In boys the muscles develop and shoulders become broad.
- In girls pelvic bones grow and hips broaden. Breasts start getting enlarged.



Adam's apple

Voice Change

The voice box or larynx increases in size during puberty resulting in a change in voice. The increase in size of larynx is usually more in boys compared to girls–the enlarged box can be seen as a prominent lump in the throat called Adam's apple. The voice box in the girls is hardly visible. Due to the increased size, boys have a deep voice whereas girls have a shrill or high pitched voice. In adolescent boys, at times, the boy's voice may crack or break, as at times the muscles of the voice box can go out of control. But the voice becomes normal after a few days or a few weeks. This change is only temporary.

Increased Activity of Sweat and Sebaceous Glands

During puberty the secretion of sweat glands and sebaceous glands (oil gland) increases leading to increased sweating. Due to the increased activity of these glands, adolescents may get acne and pimples on their face.

Development of Sex Organs

In boys, the male reproductive organs– testes and penis develop completely. The testes start producing sperms. In girls ovaries enlarge and produce an egg or ovum. The two ovaries take turns to produce an egg. The egg is released every 28 days. This process of releasing of an ovum by the ovary is called ovulation.

Emotional Changes

Many emotional changes take place during adolescence. During this period adolescents become more self-independent and self-conscious. Intellectual development takes place and one has a great capacity to learn. They tend to spend a lot of time in thinking. Due to increase in hormonal levels mood swings may occur. During this period one may be attracted to the opposite sex. At times adolescents may feel insecure while trying to adjust to the changes in both the body and the mind. All these changes are natural and a part of growing up. Adolescents should therefore try to cope with the changes and not feel insecure.

SECONDARY SEXUAL CHARACTERISTICS

The physical characteristics that help distinguish male from females are called secondary sexual characteristics.

- During puberty hair develops under the armpits and in the pubic region or above the thighs in both boys and girls. Boys also develop facial hair i.e. moustache and beard and hair on the chest.

These changes that occur at adolescence are controlled by hormones. Hormones are chemical substances secreted by the endocrine glands or ductless glands.

1. The testes secrete the male hormone called testosterone. This hormone helps in the development of secondary sexual characteristics in boys.
2. The ovaries secrete the female hormone estrogen which causes the enlargement of the breasts. Mammary glands or milk secreting glands develop inside the breasts.

The production of these hormones is under the control of another hormone secreted by the pituitary gland situated at the base of the brain.

ROLE OF HORMONES IN INITIATING REPRODUCTIVE FUNCTION

The endocrine system consist of several glands. These glands are located at specific places inside our body. These glands release hormones that travel inside our body and reach a particular body part such as a cell, tissue or organ through the blood stream. The particular body part is called the target site. The target site then responds to the hormone.

The sex hormones are under the control of hormones from the pituitary gland.

1. Hormone producing cell → hormone secreted in the blood → Hormone reaches the target site and acts.

How hormones act ?

2. Hormones from the pituitary stimulate the tests and ovaries to release testosterone and estrogen → Hormone reach the target site through the blood stream → They stimulate changes in the body at onset of puberty

Let's Remember

Give one word for each one of the following

1. Define adolescence.
2. Why does the voice change during puberty?
3. Name the hormones secreted by the testes and the ovary.

Aimline

REPRODUCTIVE PHASE OF LIFE IN HUMANS

Adolescents become capable of reproduction when their testes and ovaries begin to produce gametes.

In females the reproductive phase begins at puberty (10–12 years) and lasts till 45–50 years, whereas in male it begins at puberty (14–15years) and lasts till he is healthy.

When an ovam is released from the ovary, the lining of the uterus becomes thicker, to receive the egg. If the egg is not fertilised, the lining of the uterus along with the egg and the blood vessels are shed off. This is known as menstruation or periods, causing bleeding in women. Menstruation occurs once in about 28 days and the menstrual flow lasts for 4–7 days. The period from one menstruation to another is called the menstrual cycle, which begins around puberty and is called menarche. The menstrual cycle stops when the women is around 45–50 years old and the stoppage of menstruation is called menopause.

The menstrual cycle includes :

- Maturation of the egg and its release from the ovary.
- Thickening of the uterine wall.
- Breakdown of uterine wall if pregnancy does not take place.

DETERMINATION OF SEX

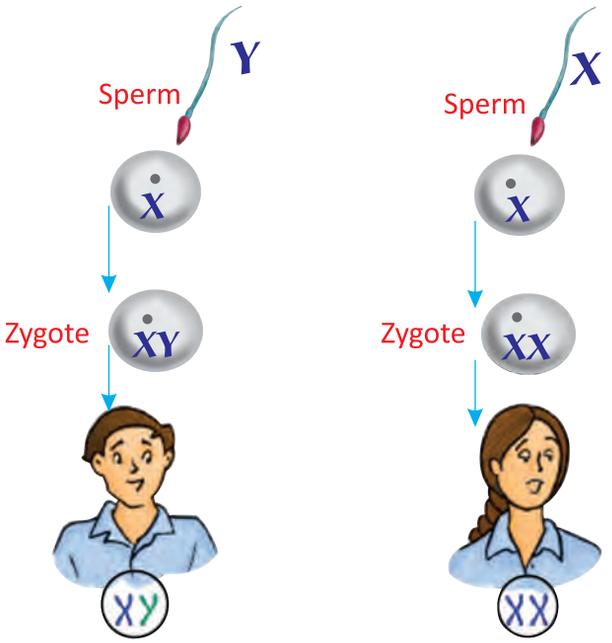
Each cell of the human body contains a nucleus and in each nucleus there are 23 pairs of chromosomes. Whether a person is male or female depends on a particular pair of chromosomes knows as the sex chromosomes. There are two types of sex chromosomes X and Y.

Every cell of a male has one X and one Y chromosome, whereas that of a female has two X chromosomes. The gametes i.e the sperm and egg have only one set of chromosomes. The unfertilised egg always has one X chromosome, while a sperm can have either a X chromosome or a Y chromosome. When a sperm (X chromosome) fuses with an egg (X chromosome) during fertilisation, the zygote will have X, X chromosomes and the offspring will be a female.

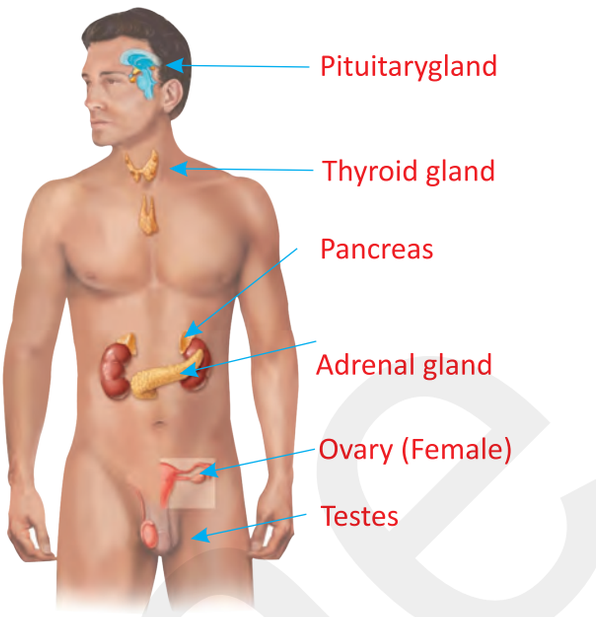
If the sperm has a Y chromosome and fuses with an egg (X chromosome), the zygote will have an X and a Y chromosome and the offspring will be a male.

Thus the gender of the child depends on the kind of sperm that fuses with the egg.

It is the sex chromosome of the father that determines the sex of the child and the mother is not responsible for the sex of the child.



Sex determination in humans



Position of endocrine glands in the human body

HORMONES OTHER THAN SEX HORMONES

Some glands and their functions are as follows:

Gland	Hormone secreted	Function /Action
Thyroid	Thyroxine	Regulates the metabolic rate and growth, stimulates respiration. A disease called goitre is caused (bulging in the throat) if the thyroid gland does not produce thyroid.
Insulin	Pancreas	Regulates the metabolism of sugar. Deficiency of insulin causes diabetes.
Adrenal	Adrenalin	helps the body to adjust to stress when one is angry, worried or embarrassed.
Pituitary	Growth Hormone	It controls the activities of the other glands. It is necessary for the normal growth of a person.

Role of Hormones in Completing the Life History of Insects and Frogs

Metamorphosis in insects is controlled by insect hormones. In frogs it is controlled by thyroxine which is produced by the thyroid gland.

Iodine is required in the production of thyroxine. Hence, if iodine is not present in the water in sufficient quantity in which tadpoles are growing, they will not be able to become adults.

REPRODUCTIVE HEALTH

Health is defined as the physical, mental and social well being of an individual. To keep healthy one must eat a balanced diet. One must observe personal hygiene and must do regular physical exercise.

The importance of the above factors is even the more crucial during adolescence as the body is growing.

NUTRITIONAL NEEDS OF AN ADOLOSCENT

An adolescent must have a balanced diet consisting of proteins, carbohydrates, fats, vitamins and minerals in proper proportions. This is a period of rapid growth and development, so due attention should be paid in planning a diet. The traditional Indian meal consisting of dal, roti /rice and vegetables is a balanced meal. Growing adolescents should have a protein rich diet as proteins act as building blocks of the body.

Adolescent girls should consume iron rich foods as iron builds blood. These foods includes leafy vegetables, jaggery,meat, citrus fruits and amla. Carbohydrates and fat provide energy. Adolescents need more energy for various activities. Milk is a complete foodand Fruits also provide nourishment. Consuming too much junk food should be avoided as it is deficient in important nutrients like proteins, minerals and vitamins. Junk food should never replace regular meals.

Personal Hygiene

Personal hygiene is very important during adolescence. The activity of the sweat glands increases during adolescence and hence teenagers sweat a lot and the body may become smelly. One must therefore take a bath daily and wear clean clothes. All parts of the body must be washed and cleaned daily. Chances of getting bacterial infections are very high if cleanliness is not observed. Girls should take special care of their hygiene during their menstrual cycle. They must change their undergarments regularly and keep a record of their menstrual cycle.

Adolescents must wash their face with a mild soap to keep it clean as they are affected by acne and pimples.

Physical Exercise

Regular physical exercise like walking, cycling, swimming, skipping must be done. You must play outdoor games in fresh air.

Drug Abuse

Drug abuse is a common problem among adolescents world-wide. Adolescents undergo a lot of changes both mentally and physical. At times they feel confused and insecure due to stress. To relief from this, adolescents my start taking drugs. If someone suggests that you take drugs, just say 'No'. Once a person takes drugs, it becomes a habit and they becomes a drug addict. Therefore one must avoid them at all costs. They harm the body in the long run, ruining health and happiness.

AIDS is another dangerous disease caused by HIV virus. It destroys the defence-mechanism of the body. It is spread by sharing syringes used for

Let's Remember

Write 'T' for true and 'F' for false statements.

1. The period of adolescence begins earlier in boys compared to girls.
2. The sweat glands become more active during puberty.
3. Both the ovaries produce a mature egg every four weeks.
4. The sex hormones in females consist of one X and one Y chromosome.
5. Endocrine glands do not have ducts.

Glossary

adolescence : the period of transition from childhood to adulthood is called adolescence
ovulation : the process of release of an as, by an ovary is called ovulation
menstrual cycle : the cycle of producing and releasing mature eggs is called the menstrual cycle
drugs : chemical substances that produce physical, mental, behavioral, or emotional charges in the user are called drugs.
drug abuse : use of a drug for purpose other than medicinal use is called drug abuse

LET US RECALL

- The period between childhood and adulthood is called adolescence. It is between the ages of 11 to 19 years.
- The onset of puberty brings about growth in the reproductive organs.
- There is an increase in height during adolescence.
- In boys muscles develop and shoulders become broad. The voice box enlarges and the voice becomes hoarse. Moustache and beard appears in boys.
- In girls breasts develop. The pelvic bones grow and hips broaden. Hair grows at various places in the body.
- The onset of puberty and maturity of reproductive parts are controlled by hormones.
- Hormones are secreted by endocrine glands which are released into the blood stream.
- The testes release the male hormone testosterone and the ovaries produce the female hormone (estrogen) on reaching puberty.
- The production of these hormones is under the control of an endocrine gland called the pituitary gland.

Exercise

A. Multiple Choice Questions (MCQS)

Tick (✓)the right option :

1. Adams Apple is an enlarged_____.
   (a) bone ☐ (b) muscle ☐ (c) gland ☐ (d) tissue ☐
2. Most adolescents gain maximum height around the age of _____.
   (a) 11–15 years ☐ (b) 18–19 years ☐ (c) 22–25 years ☐ (d) 13–15 years ☐
3. The release of egg from the ovary is called_____.
   (a) fertilisation ☐ (b) ovulation ☐ (c) menstruation ☐ (d) menopause ☐
4. This is a female sex hormone_____.
   (a) estrogen ☐ (b) testosterone ☐ (c) thyroxine ☐ (d) insulin ☐
5. Menstruating girls need to have food rich in_____.
   (a) carbohydrates ☐ (b) fats ☐ (c) iron ☐ (d) vitamins ☐

B. Match the following.

Column A	Column B
1. XX	(a) hormones
2. Pancreas	(b) adolescence age
3. Endocrine glands	(c) female
4. High–Pitched Voice	(d) girls
5. Puberty	(e) insulin

C. Fill in the blank with the correct option.

hardly nucleus harmone adolescence emotional

1. The period between childhood is called _____.
2. The voice box in the girls is _____ visible.
3. Many _____ changes take place during adolescence.
4. the target site then responds to the _____.
5. Each cell of the human body contains a _____.

D. Answer the following questions in shorts :

1. Define adolescence.
2. Why does the height increases during puberty?
3. Why do some adolescents get pimples on their face?
4. What is the difference between menarche and menopause?
5. Which type of a zygote will develop into a male and which type into a female child?

Aim line

E. Answer the following questions .

1. List the changes that take place in the body during puberty.
2. Make a list of endocrine glands and the hormones secreted by them.
3. What health measures should be taken to maintain good reproductive health?
4. What is a menstrual cycle? Explain the changes that occur during the menstrual cycle in an adolescent girl.
5. Write short notes on • Adam's apple •Sex determination

(Hots)

1. Why do you think adolescent girls should have an iron rich diet?
2. Why should adolescents not eat too much of junk food?

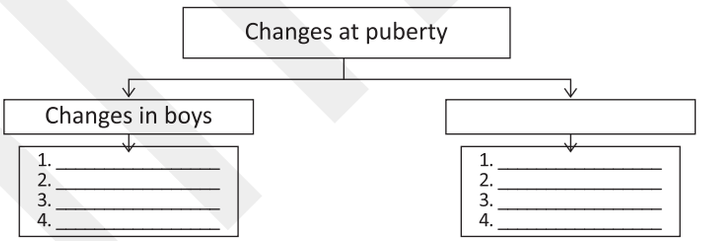
GROUP DISCUSSION

Discuss with your classmates and elders about :

1. Female faecticide in india.

Let's Recall

Complete the following Diagram.



Activity to do

Make a HEALTHY SALAD

Ingredients

Boiled kabuli chana	1 cup
Boiled potato	1 medium
Tomato	1 medium
Onion	1 small
Coriander leaves	few
Lemon juice	2 teaspoon
Salt, black salt, roasted zeeera, red chilli power	to taste

Method

1. Cut potato into pieces (cubes).
2. Chop onion, tomato and coriander leaves.
3. Mix all the ingredients.
4. Add salt, black salt, roasted zeera and red chilli powder according to taste.

Note : Instead of kabuli chana, you can use sprouted moong dal.
If you like, you may also add 1 cup of thick curd.

CREATIVE TASK

Collect information about HIV/AIDS from newspaper and magazines. write one page article on it, covering latest information.

Worksheet - 7

Define the following terms.

1. Secondary sexual characteristics

_____

_____

_____

2. Hormones

_____

_____

_____

3. Ovulation

_____

_____

_____

4. Reproductive health

_____

_____

_____

5. Thyroid and parathyroid glands

_____

_____

_____

Aimline

CHAPTER 8

Force and Pressure

If you look around you will see many things moving. Some move slowly and some move fast. A rolling ball may suddenly change its direction. Have you ever wondered what causes these changes? A body cannot start moving or stop moving, change its direction or shape on its own. This happens because force is applied to the body. Let us learn what force is.

Introduction

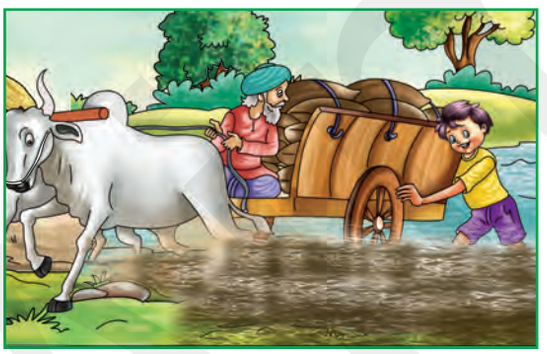
- Force – pull or push
- Types of Forces
- Contact force
- Noncontact force
- Resultant force
- Effects of force
- Pressure
- Unit of pressure
- Pressure exerted by liquids and gases
- Atmospheric pressure

FORCE – A PULL OR A PUSH

We use force to perform various day-to-day activities. When we pull or push an object it moves. We need force to move them.

Pull and Push are Forces

A pull or push acting on an object is called force. Force is usually denoted by the letter F. The standard unit of force is called newton, denoted by N. Force does not always move an object, For example, you can push a wall without displacing it from its position.



Push and pull are forces that make things move

Let us understand force with examples.

Force as a push (when an object is moving away by applying force)

- Pushing a door to open it
- A lady pushing a pram
- A vegetable vendor pushing a vegetable cart
- A boy kicking a foot ball

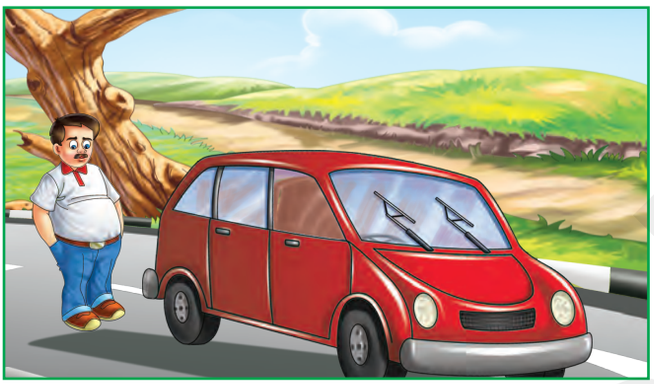
Force as a pull (when an object is moving towards the applied force)

- A horse exerts a pull to move a tonga
- Pulling a door to open it
- Drawing a bucket of water from a well
- Opening a drawer of a table

Forces are Due to an Interaction

We have seen that when force is applied (either push or pull), there is some kind of change in the state of motion of the object. Let us see when does force come into play?

Suppose there is car which is not starting. Now if you stand behind the stationary car, it will certainly not move.



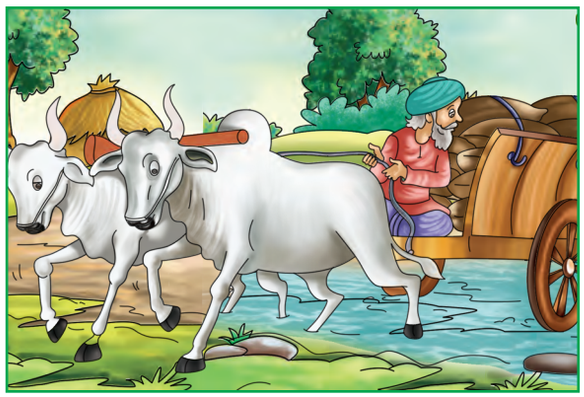
A man standing behind the stationary car

A man pushing the car

Now if you push the car, that is force is applied, car will begin to move in the direction of applied force.

When we kick a ball or pull a cart, interaction of two objects is required.

A boy kicked a ball



A cart being pulled

Thus we can infer that at least two objects must interact for a force to come into play. We can therefore say that forces are due to interaction of one object with another.

However, interaction may not always involve a direct physical contact. Such forces are called non contact forces. For example magnets attract iron objects without coming in direct contact.

TYPES OF FORCES

There are thus two kinds of forces:

- Contact Force
- Noncontact Force

Contact Force :

Forces that act on objects by direct or indirect physical contact are called contact forces.

The following are some kinds of contact forces.

1. Muscular Force

The force exerted by the action of muscles in our body is called muscular force. Examples include lifting a bucket of water, or pushing a cart, kicking a ball or walk and runway. muscular force. Digestion of food, bending of our body and breathing are all carried out due to the force exerted by the muscles.

Examples of muscular forces

Similarly animals like bullocks, horses, donkeys and camels also use muscular force to perform heavy work such as pulling a cart or a tonga, ploughing, carrying a heavy load, etc.

2. Friction

Friction is also a type of contact force. The force acting between two surfaces in contact with each other which opposes the motion of one body over the other, is called friction or force of friction. The force of friction always acts on all moving objects and its direction is always opposite to the direction of motion.

Example : A rolling ball comes to rest after some time due to the friction between the ground and the surface of the ball. A cycle stops after some time, if you stop pedalling because of the friction between the road and the cycle.

Noncontact forces

Forces that do not require physical contact with the object on which they are acting are called non-contact forces. Magnetic force, electro-static force and gravitational force are examples of non-contact forces.

1. Magnetic force

Activity 1

- Bring a magnet near iron nails. What happens?
- Bring two magnets with like poles near each other. What do you observe?
- Now bring two magnets with unlike poles near each other, what happens?

You will observe that a magnet attracts nails even though it is not in direct contact with the nails. A magnet attracts another magnet when unlike poles are brought near and repels another magnet when like poles are brought together.

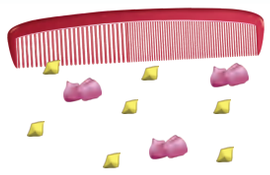
This activity shows that a magnet exerts force on another magnet without being in contact with it. The force exerted by the magnet is called magnetic force.

2. Electrostatic force

The comb acquires an electrostatic charge after it has been rubbed on the hair. The force exerted by a charged body on another body is called electrostatic force. This force also comes into play when the two bodies are not in contact with each other.

Activity 2

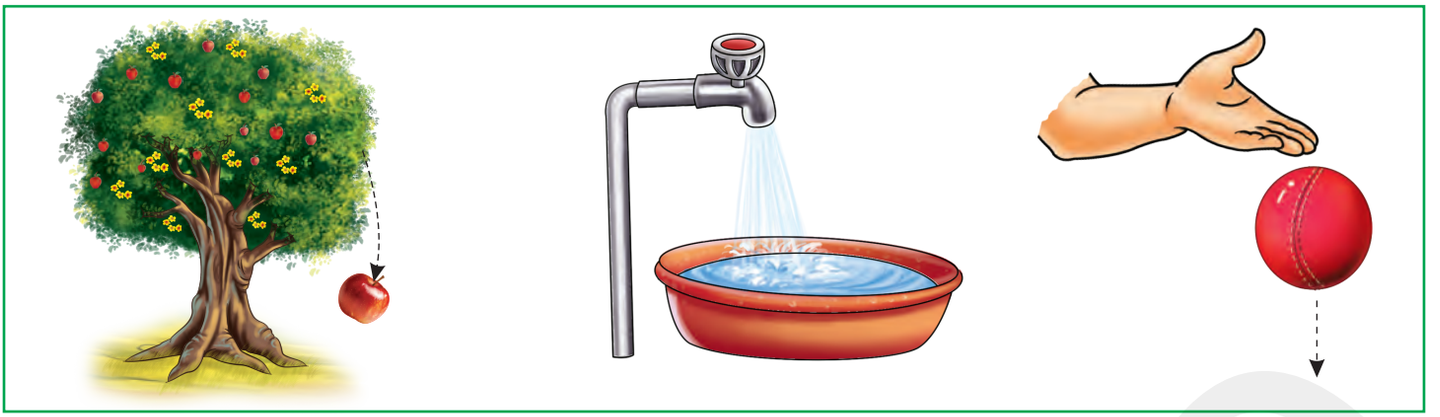
Take a plastic comb. Rub it on your dry hair several times. Bring it near small pieces of paper. What happens? The pieces of paper will be attracted towards the comb.



3. Gravitational Force

Every object in the universe, irrespective of its size exerts a force on every other object. This force is known as the gravitational force.

Examples : When a balls slips from your hand it falls down. Fruits and leaves fall on the ground, water in river flows down, all objects fall down towards the earth. This is due to the force of gravity.



Force of gravity

Let's Remember

1. Define pressure.
2. Does the pressure increase or decrease as we go deeper beneath the surface of a liquid?
3. State Pascals law.
4. Does pressure of a liquid depends on the size and shape of the container?
5. Name the instrument used to measure air pressure. Why does it show lower reading on a mountain than in the plains.

Resultant Force

At times more than one force acts on a body at the same time. In such a case, the effect on the object is due to the net force acting on it.

Activity 3

Take a heavy object like a table. First try to push it alone. Then ask one of your friends to help you push it. Is it easier to do so?

(a)

(b)

Now if your friend pushes the table from the opposite end, does it move and if so, in which direction?

When both you and your friend move the table in the same direction, it can easily be done and more faster than when you alone had to do it.

In the second case table will move in the direction where more force is applied

Thus, we can conclude that

- When two forces act in the same direction along the same line, the resultant force is equal to the sum of the two forces.
- When two forces act on an object in opposite directions, the net force acting on it is the difference between the two forces.

You must have seen a game of tug-of -war. When the two sides pull the rope hard, it does not move in any direction at time. This is because the resultant force (net force) acting on it is zero.

The rope does not move if the two teams pull at it with equal force.

If the direction or the magnitude of the applied force changes, its effect also changes.

EFFECT OF FORCE

1. A force can change the state of motion or rest

When you kick a ball at rest it moves. In other words force can make a stationary body move.

Suppose a ball is moving on the ground slowly. If you push the ball while it is still rolling, what do you observe? It's speed increases. This shows that a force can increase the speed of a moving object.

If you catch the ball, it stops moving. Therefore, we can say that force can stop a moving body. A bicycle can be slowed down or stopped by applying brakes. Force can decrease the speed of a moving object.

We can conclude from the above two examples that if the force applied on the object is in the direction of its motion, the speed of the object increases. If the force is applied in the direction opposite to the direction of motion, it results in a decrease in speed.

2. A force can change the direction of motion of a moving object

Let us understand this with the help of examples

Examples :
1. A foot ball player kicks the ball in a different direction.
2. A batsman hits the ball bowled at him.
3. A badminton player hits the shuttle cock either softly or smashes it on the other side of the court.

Thus, a force may bring a change in state of motion of an object. State of motion means the speed and direction of motion. The two states of motion are rest and in motion.

At times you may apply force but it does not result in a change in the state of motion. You will do not be able to move a wall, irrespective of the amount of force you apply.

Activity 4

1. Take plasticine or dough. Press it down with your hand.
2. Take a rubber band and stretch it.
3. Squeese tooth paste out of a tube.
4. Press an inflated air pillow.
5. Pull a spring

   What do you observe? It there any change in size and shape or both? Note down your observation.

Description of activity	Change in size/shape
1. Pressing plasticine or dough.	Yes
2. Stretching a rubber band.	Yes
3. Squeesing tooth paste out of the tube.	Yes
4. Pressing an inflated air pillow.	Yes
5. Pulling a spring.	Yes

Can you add some more examples to the list?

3. A force can change the size and shape of an object

In all the above examples we see that when force is applied on an object, its size and shape changes.

We can thus conclude that –

- Force can move a body at rest.
- Force can make a moving object move faster.
- Force can slow down a moving object.
- Force can stop a moving object.
- Force can change the direction of a moving object.
- Force can change the shape of the body.

Let's Remember

Fill in the blanks.

1. To draw water from a well we have to ..... at the rope.
2. A push or pull on an object is called ..... .
3. A force acting on a body can change its ..... .
4. The force with which the earth pulls us is ..... .
5. The atmospheric pressure ..... as we go up.
6. To move a pram we have to ..... it.

PRESSURE

The force acting on a unit area of surface is called pressure.

$$\text{Pressure} = \frac{\text{Force}}{\text{area on which it acts}}$$

$$= \frac{\text{Force (in N)}}{\text{Area (in m}^2\text{)}}$$

You must have experienced that cutting a fruit with a sharp knife is easier than cutting it with a blunt knife. When you apply pressure to the broader end of the drawing pin, it pierces into the cardboard. All these are due to effect of force in respect to the area it acts on. In other words it is pressure. This shows that:

Pressure exerted is inversely proportional to the area of contact i.e. the pressure produced is less if the area over which force is exerted is large. Decreasing the area over which a particular force acts increases the pressure produced.

The area of the pointed end of a drawing pin is much smaller than its head, therefore when we apply force on the head, the needle is inserted into the card board. Similary it is easier to cut fruits with a sharp knife because the area of contact of sharp knife is much less than that of a blunt knife.

This also explains why a camel is able to walk easily on sand as it has flat broad feet or why do porters or persons lifting heavy loads place a turban (round piece of cloth) on their head before placing heavy loads. The turban increases the surface area of contact of the load with their head. This is turn reduces the pressure on the head.

UNIT OF PRESSURE

The unit of pressure is pascal (pa). It is named after the French scientist Blaise Pascal.

$$1\ pa = 1N/m^2$$

PRESSURE EXERTED BY LIQUIDS AND GASES

Both liquids and gases exert pressure.

Activity 5

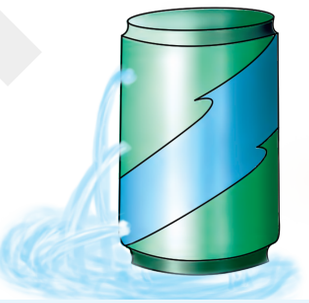
Take a tin can or a plastic bottle. Drill a few holes all around it near the bottom. The holes must be at the same height from the bottom. Fill the bottle with water. What do you observe? Water rushes out from all the holes and falls at the same distance from the can.

Liquids exert equal pressure at the same depth

This shows that liquids exert equal pressure in all directions at the same depth.

Activity 6

Take a tall can (empty talcum powder can). Make 3 holes in it on one side at different heights. Fill the can with water and observe what happens? Water from the lowest hole comes out with greatest pressure and hence it travels maximum distance, whereas water coming out from the highest hole falls nearest due to least pressure of water. Water from middle hole falls in between.

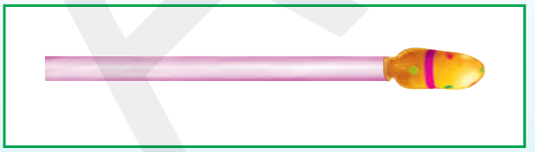


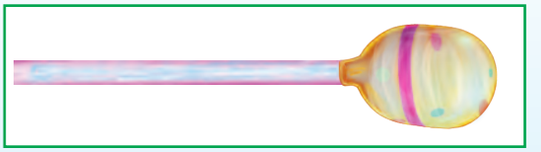
Pressure in a liquid increases with depth

This activity shows water pressure increases with the depth of water.

Activity 7

Take a rubber pipe and fit a balloon tightly on one of its end. Fill water from the other end. What do you observe.? You will see that the balloon inflates with the pressure of water.





This activity shows that liquids exert equal pressure in all directions. This is called Pascal's law.

PRESSURE EXERTED BY AIR

Gases like liquids also exert pressure.

Activity 8

- Take a balloon. Inflate it. Leave the mouth open. What happens? The air moves out and the balloon deflates.
- Take a balloon, prick it with a needle to make holes. Can you fill air in it? No.

The above activity shows that air exerts pressure in all directions and also on the walls of the container.

ATMOSPHERIC PRESSURE

We have already studied that earth is surrounded by air. This envelope of air is called atmosphere. Air is a mixture of gases. Like gases, air also exerts pressure on earth due to its weight. Atmospheric pressure is defined as the pressure exerted on an object by the weight of the air above it.

Air pressure is maximum at sea level. It is about one hundred thousand pascal. Air always exerts pressure on the human body because of the tall column of air above us. Do you feel this pressure? No. This is because the pressure of the blood and that of fluids in our body balances out this atmospheric pressure.

Otto Van Guericke, a German physicist in the 1600's demonstrated air pressure. He joined two hollow semicircular bowls made of copper with a diameter of 51cm and removed the air inside with the help of suction pump. He got a team of eight horses each to pull each hemisphere apart. The two bowls held together and they could not be pulled apart, showing the enormous force of atmospheric pressure.

Horses pulling the hemisphere

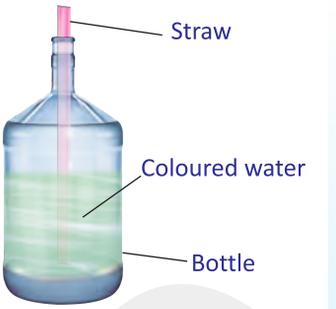
Air pressure is measured by an instrument called the barometer. It was discovered by an Italian Scientist - Torricelli.

Atmospheric pressure decreases as we go up in the atmosphere. This is because as we go up the length of the air column decreases and hence atmospheric pressure also decreases.

Mountaineers at high attitudes at times, experience bleeding through their nose. This is due to rupturing of blood vessel in the body due to sudden decrease in air pressure.

Activity 9

Mix some food colour in water and fill this water in a glass bottle. Close the mouth with the lid. Make a hole in the centre of the lid and insert a drinking straw through it in such a way so that one end of the straw dips in water. Seal the lid by pouring melted wax around it. You will notice that higher the level of water in the straw, lower is the air pressure.



Activity 10

Take a rubber sucker and fit on a glazed tile. Now try pulling it out. What do you observe ?

You need a lot of force to remove it. When we press the rubber sucker on the tile, most of the air between the cup and the surface escapes and a partial vaccum is created. The sucker sticks to the tile because of atmospheric pressure. You need to apply a force larger than the atmospheric pressure to remove the sucker away. This activity will give you an idea of the magnitude of air pressure.

Facts to know

The weight of atmosphere on top of your head is about 225 kg.

Let's Remember

Give one word for each one of the following

1. Name the standard unit of force.
2. Name the two types of forces.
3. Give an example each of the two forces.
4. Which force acts on the fruit by which it drops on the ground on ripening?

Glossary

Force – any push or pull which moves a thing is called force
magnetic force – the force of the magnet which attracts some metals like iron etc. towards itself
mechanical force – force generated by a machine is called mechanical force
muscular force – force produced by the muscles of any living organism
manometer – device to measure the pressure exerted by liquids
pressure – the force per unit area

SUMMARY

- Force is either pull or push.
- The standard unit of force is newton.
- Force is due to an interaction between two objects.
- Force has both direction and magnitude.
- Forces are of two types- contact force and non contact force.
- Contact force is the force which acts when two objects are in physical contact.
- The noncontact force interacts from a distance like magnetic force, electrostatic force or gravitational force.
- A change in the speed of an object or the direction of its motion or both implies a change in its state of motion.
- A force acting on a body can change its state of motion, or change its size and shape; can change the direction of a moving object.
- Force per unit area is called pressure. The standard unit of pressure is N/ m^2 or pascal.
- Liquids and gases exert pressure on the walls of their container.
- Pressure in liquids increases with depth.
- Pascal's law states that when pressure is applied to a liquid, it gets transmitted equally in all directions.
- The pressure exerted by air around us is called atmospheric pressure.
- Atmospheric pressure decreases with altitude.
- Atomeric pressure is measured by an instrument called barometer.

A. A Multiple Choice Question (MCQS)

Tick (✓) the right option:

1. Which one is a noncontact force ?
   (a) muscular force ☐ (b) frictional force ☐
   (c) electro static force ☐ (d) mechanical force ☐
2. With increase in depth water pressure _____.
   (a) increases ☐ (b) decreases ☐
   (c) remains same ☐ (d) can increase or decrease ☐
3. A sharp knife cuts better because _____.
   (a) the force is small ☐ (b) pressure is small ☐
   (c) the edges have small area ☐ (d) the edges have large area ☐

4. The standard unit of pressure
   (a) newton (b) pascal
   (c) mm mercury (d) atmosphere
5. Atmospheric pressure is measured by
   (a) thermometer (b) voltmeter
   (c) gauze meter (d) barometer

B. Write (T) for True and (F) for false statement.

1. Electrostatic force is a contact force.
2. Force can make a moving object move faster.
3. Atmospheric pressure is due to weight of water.
4. Force can change the size and shape of an object.
5. Force of gravity acts all the time.
6. Liquids exert equal pressure at the same depth.

C. Match the Following.

Column A	Column B
1. Frictional force	(a) no change is the state of motion
2. Zero resultant force	(b) pascal's law
3. Pressure	(c) barometer
4. Hydraulic carjack	(d) force area
5. Atmospheric pressure	(e) contact force

D. Answer the following questions in short.

1. Name 3 forces which can act from a distance.
2. Give two examples of situations in which by exerting force you can change the shape of the object.
3. Members of two teams, playing a game of tug-of-war, pull the rope in their direction and the rope does not move. What does it indicate?
4. Name the force acting on :
   (a) Lifting a bucket
   (b) apple falling to the ground
   (c) Squeesing a lemon
5. How does liquid pressure vary with depth?

E. Answer the following questions

1. Name the four effects of force.
2. State pascal's law. Demonstrate this law with the help of an experiment.
3. What is atmospheric pressure? Why do we not feel this pressure?
4. Give reasons.
   (a) needle pierces a piece of cloth easily.
   (b) mountaineers at times suffer from nose bleeding at high altitudes.
   (c) it is easier to cut fruit with a sharp knife than with a blunt knife.
   (d) Porters place a turban /round pieces of cloth on their heads when they have to carry heavy loads.
5. Give 2 examples to show that air exerts pressure on the walls of the container.

Airline

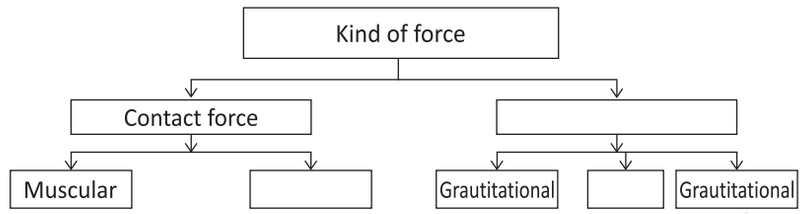
GROUP DISCUSSION

Divide the students into group of two. they should make a project on the essentiality of content and non-contact forces.

CREATIVE TASK

Make a chart depicting the items available in your house/school, which makes you of various forces to perform various functions. an example is seen give below.

Let's Recall



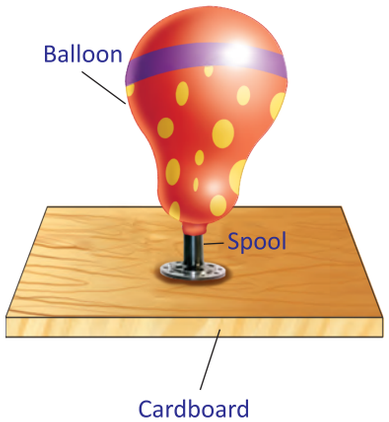
Hots ( )

1. Why do you think a dam is thicker at the base than at the top?
2. Would you hurt your self more - if a person wearing a pointed heel stepped on your foot or one wearing a flat soled shoe? Why?
3. Why do you think shoulder bags having broader straps are more comfortable than those having thin straps?

Fun Time

Make a Hover Craft

You will need - a card board piece, a spool of thread (empty), paper, pencil, glue, balloon :



1. Take a cardboard square (4 × 4 inches)
2. Punch a hole exactly in the centre of the square. The hole should be of the same size as the hole of the spool.
3. Glue the spool to the cardboard on top of the hole, in such a way so that no air escapes between the spool and the cardboard with a piece of circular paper and glue. Let the glue dry.
4. Punch a hole in the paper where the hole of the spool is. Your hole will run through the paper, spool and cardboard.
5. Blow up a large balloon twist its end and immediately stretch it over the spool.
6. Place the set up on a flat table and let go off the balloon and tap the side of the square to make the hovercraft glide.

   As air flows out of the balloon, air pressure builds up over the piece of cardboard and this will lift the hovercraft off the flat surface. It flows on a cushion of air.

Worksheet - 8

Solve the crossword puzzle with the help of the clues given.

ACROSS

1. A contact force.
2. The standard unit of force.
3. Force acting on a body is considered.
4. Pressure due to air with altitude.
5. Force per unit area.
6. The instrument that measures the atmospheric pressure.

DOWN

7. A noncontact force.
8. Pressure due to a liquid with depth.
9. The law, whose statement is related to the transmission of pressure in liquids.

1 M 7					L			F				
												9 P
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Online

CHAPTER 9

Friction

You must have seen that a ball rolling on the ground stops after sometime. Why does this happen? You must have wondered why is it that we find it difficult to walk on a highly polished surface or why is it that a vehicle slows down when brakes are applied?
The stopping of ball or slowing down of a vehicle must be due to some force acting on the objects that is opposing their motion. This is the force of friction.

Introduction

- Force of friction
- Causes of friction
- Factors affecting the force of friction
- Kinds of friction–static, sliding and rolling
- Fluid friction
- Friction–a necessary evil
- Ways to increase or reduce friction

FORCE OF FRICTION

Activity - 1

Push a pencil box from one end of a table. What do you observe? It stops after moving a little distance. Repeat the activity from the opposite end of the table. The box again stops after moving a little distance. This shows that there is some force acting on the box that opposes its motion.

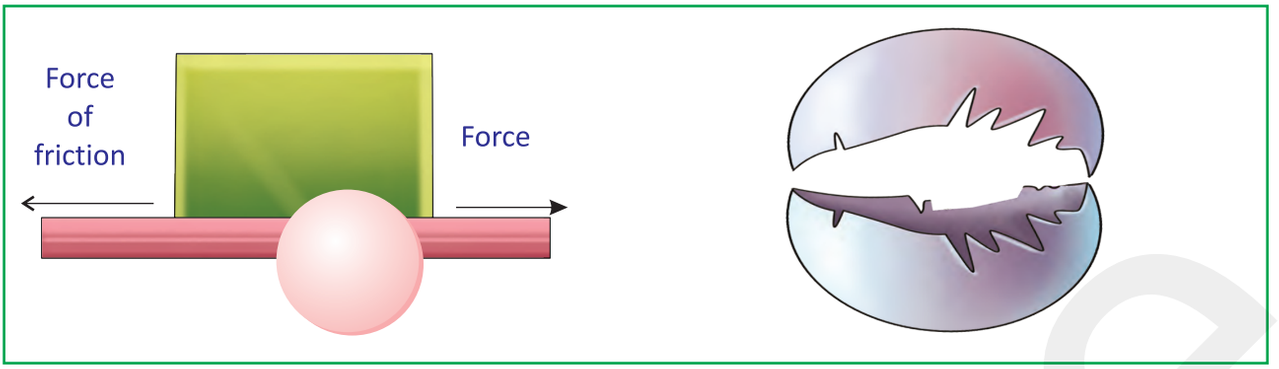
The force acting along two surfaces in contact which opposes the motion of one body over the other, is called frictional force. It always opposes the relative motion between the two surfaces. Friction always acts in a direction opposite to the direction of motion. If force is applied along the left, friction acts along the right and vice versa. In both cases friction opposes the motion.

CAUSES OF FRICTION

Friction between any two surfaces is caused due to :

- No solid surface is perfectly smooth– There are a large number of irregularities present on the two surfaces in contact. Some are more rough than others. In other words all solid surfaces are rough, only the degree varies. When a body moves over another surface, the irregularities in the two surfaces interact with each other and oppose the relative motion between the two bodies. Since a rough surface has more irregularities

the force of friction is greater if the surface is rough.
Thus friction is caused due to inter locking of



Surface irregularities (magnified view)

irregularities in the two surfaces.

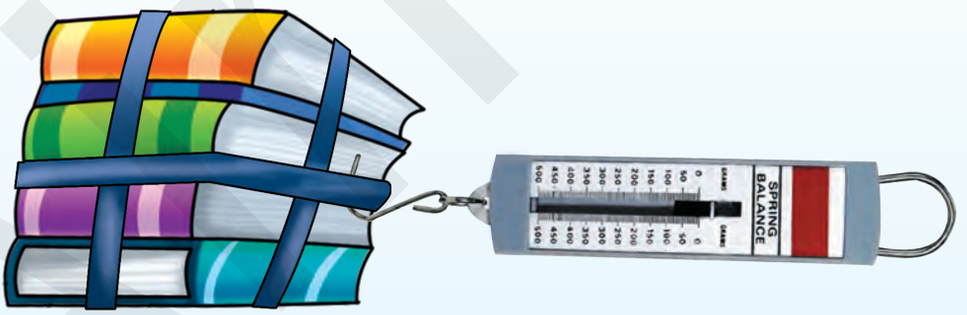
- When two rough surfaces come in contact with each other, there are few places where the two surfaces meet. The atoms or molecules present at the contact point attract each other due to electrostatic forces. It is this force of adhesion which opposes the motion of the two bodies, this gives rise to frictional force.

FACTORS AFFECTING THE FORCE OF FRICTION

The force of friction is dependent on :

Activity - 2

Take a big heavy book or make a stack of 3-4 books (with the help of a string). Pull it with the help of a spring balance as shown in the figure.
Note down the reading in the spring balance when the bundle moves.



Now try pulling the same books or stacks of books after wrapping them in a (a) Polythene piece (b) Jute cloth. Do you notice any variation in the readings?

- The smoothness or roughness of the surface in contact

The above activity shows that smooth surfaces offer lesser friction than rough surfaces. You will notice that the reading will be higher for rough surfaces. Thus we can easily conclude that the force of friction depends on the nature of the surfaces in contact.

Activity - 3

Make an inclined plane on a table by placing books and a plyboard piece as shown in the figure. Put a mark on the ply board piece. Now roll a penlight cell from this point. Note down the distance it moves before coming to rest. Now place a tablecloth on the table and repeat the activity. You can experiment with different surfaces. Remember to maintain the same inclination in all the activities.

In which case did the cell travel maximum distance. Why did it travel the most? Can you guess?

From the above activity it is seen that the distance travelled by the cell is more on a smooth surface than on a rough surface.

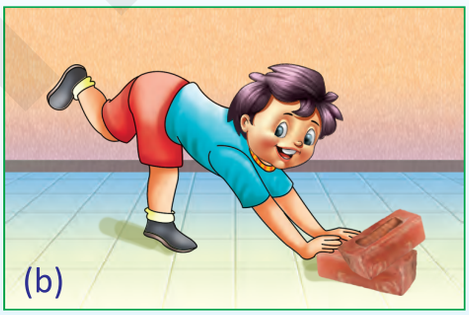
We can thus conclude that rough surfaces exert greater frictional force than smooth surfaces.

- The force of friction is directly proportional to the weight of the body which moves on a horizontal surface.

Activity - 4

- Take a brick. Place it on the floor and push it.
- Now take two bricks placed one on top of the other and push them.
- Repeat with three bricks.

What do you observe? Can you push all three bricks by applying the same force as in case of one brick? Note down your observations.



From the above activity it is seen that as the mass of the object increases, the force of friction also increase.

KINDS OF FRICTION

There are three kinds of friction. They are :

- Static friction
- Sliding friction
- Rolling friction

Static Friction

Static friction comes into action when we try to move an object which is at rest. In other words, when we increase the applied force, the force of friction also increases and the body remains stationary. Thus the static friction is a measure of the force required to overcome friction to start moving an object at rest.

Sliding Friction

The force required to keep an object moving with the same speed is a measure of sliding friction.

Sliding friction is slightly less than static friction.

This is the reason why it is easier to move a box which is in motion than to move one which is at rest.

Rolling Friction

The force of friction offered when rolling an object on the surface of another object is called rolling friction. Rolling friction is smaller than sliding friction. The friction offered by a rolling marble is an example of rolling friction. Do you know why it is easier to pull a suitcase having wheels? This property is used in the making of ball bearings.

Wheels makes it easier to pull a suitcase

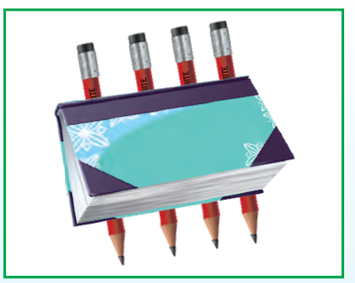
Ball bearings reduce friction. They are used in machines where rotatory motion is required. Small metal balls are placed between moving surfaces to reduce friction. Examples–use of ball bearings between hubs and axles of ceiling fans and bicycles.

Ball bearings reduce friction

Activity - 5

Let us now with the help of this activity see that rolling friction is less than sliding friction.

Take 4 cyclindrical pencils and place them on the edge of the table, parallel to one another. Place a book over the pencils as shown in the figure.



The pencils act as rollers. Now push the book. What do you observe? The book moves easily. You can see the pencils rolling as the book moves. Now remove the pencils and slide the book ? Do you have to use more force?

From the above activity it can be easily concluded that
rolling friction is less than sliding friction.

Air exerts frictional force on objects moving through it. Similarly water and other liquids also exert force of friction on objects moving through it. The frictional force exerted by fluids (liquids and gases) is also called drag. The force of friction between a solid and a fluid is less than that between two solids. The frictional force on an object in a fluid depends on :

- its speed in comparison to that of the fluid
- shape of the object
- nature of the liquid

You have studied in the previous classes that fishes and birds have streamlined bodies. This shape offers least resistance to friction and thereby birds and fish lose less energy. Taking a clue from this the scientists have also streamlined the bodies of aeroplanes, ships and boats.

Similarity in the shape of an aeroplane and a bird

Let's Remember

Match the following

Column A	Column B
1. Friction	(a) fish
2. Ball – bearing	(b) interloking
3. Streamlined shape	(c) self adjusting force
4. Brake – living	(d) decrease friction
5. Hills and valleys on	(c) increase friction

FRACTION : A NECESSARY EVIL

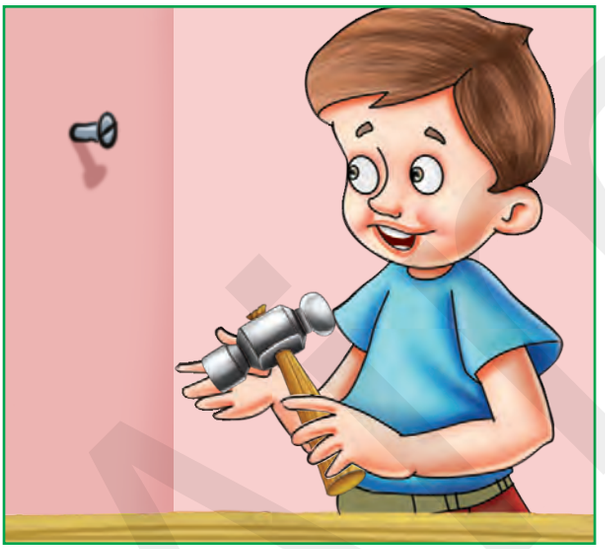
Friction causes a lot of energy to be wasted. It is due to friction that moving parts of machines and automobiles heat up. When you rub your palms vigorously together you must have seen heat being produced. This is due to friction.

Can you give a few examples where friction produces heat? When mixie is run, the jar become hot.

Heating results in wastage of energy as well as fuel. Friction also causes wear and tear of moving parts of a machine. But on the other hand, has a lot of advantages.

- We are able to walk, run, play etc. due to friction between the ground and the soles of our footwear. This is the reason why patterns or grooves are made on the soles of shoes to increase friction. This prevents the person from slipping.
- Can you now guess why it is easier to write on a plain paper than on a glazed / waxed paper?
- It is due to friction between the road and the surface of tyre that you are able to drive safely. If there was no friction, automobiles could not be started or stopped or turned to change direction of motion.
- You are able to tie a knot or fix a nail on the wall due to friction.

Sole of a shoe



Nail fixed on a wall due to friction

- Without friction you will not be able to sit on a chair or write, or construct a building.
- You will also not be able to hold on to things. If a vessel is greasy or has a film of oil on it, it is difficult to hold it.

Therefore, we can conclude that friction is a necessary evil.

WAYS TO INCREASE AND REDUCE FRICTION

As you have just seen that friction is useful in some situations.

Ways to increase friction

- Soles of the shoes have grooves so as to provide shoes better grip on the ground.
- Tyres of automobiles have treads which provide a better grip with the ground.

- The break pads/lining in automobiles are made rough . These break pads do not touch the wheel when you ride a bicycle. But when brakes are applied they arrest the motion of the rim due to friction.
- Wrestlers and kabaddi players apply soil on their hands for better grip of their opposition due to friction.
- Similarly gymnasts also apply a coarse powder before performing.

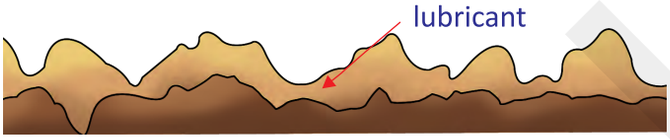
Treaded Tyre

Ways to reduce friction

- By applying oil or grease on the surface :

  When you apply oil or grease between the moving parts of a machine a thin layer is formed between the two surfaces and as such the two surfaces do not directly rub against each other. The movement becomes smooth as interlocking of the two surfaces is avoided to a large extent. The substances which reduce friction are called lubricants.

  Examples : applying oil on the hinges of the door or oiling a sewing machine, applying grease on the moving part of a motor or a bicycle.



Action of lubricant

Do you know why we tend to slip on a floor if oil or soap solution has been spilt on it?

- By using wheels, ball bearings :

  Ball bearings change sliding friction to rolling friction. The force of friction when a body is rolled on a surface is much less than that when pushed on a flat surface. Small metal balls made of stainless steel, brass or ceramic are placed between moving parts to reduce friction.

- By sprinkling a soft, fine powder on the surface :

  This is the reason why talcum powder is sprinkled on carrom boards and graphite power is applied to the moving parts of a machine.

- By polishing the surface :

  Polishing the surface helps to smoothen rough surfaces thereby reducing friction.

  Remember one thing – Friction can only be minimized but not entirely eliminated i.e. it can to never be reduced to zero.

Let's Remember

Write 'T' for true and 'F' for false statements.

1. The smoother the surface more the friction.
2. Ball bearings reduce friction.
3. Wrestlers rub soil on their hands to reduce friction.
4. Sliding friction is less than rolling friction.
5. Smooth surfaces offer less friction than rough surfaces.

Key words

friction : Friction is the force which apposes the motion
static friction : force of friction between two surfaces and it balances the force applied on the object to push it
sliding friction : sliding comes into play when one body slides over the other
streamlined : it is the shape of the body which is narrow in front and sloping from sides. fish and birds' bodies one streamlined.

SUMMARY

- Friction opposes the relative motion between two surfaces in contact. It acts on both the surfaces.
- Frictions always acts in the direction opposite to the direction of motion.
- Friction depends on the nature of the two surfaces in contact and the mass of the objects.
- The smoother the two surfaces in contact, less is the force of friction between the two.
- Friction depends on how hard the two surfaces press against each other.
- There are three types of friction– static friction, sliding friction and rolling friction.
- Static friction comes into action when we move an object which is at rest.
- Sliding friction is the friction when a body slides over another surface.
- Sliding friction is less than static friction.
- Rolling friction comes into action when an object rolls over another object. Rolling friction is less than sliding friction.
- Liquids and air also offer frictional resistance to objects travelling through them. It is called fluid friction.
- Friction is useful to us in many of our activities.
- We can increase friction by making the surface rough like soles of the shoes and tyres are treaded to increase friction
- Friction is at times undesirable as it produces heat and causes a lot of energy and fuel to be wasted.
- We can reduce friction by use of lubricants, ball bearings, polishing the surfaces, use of fine powder between two surfaces.
- Fluid friction can be minimized by giving a streamlined shape to bodies moving in fluids.
- Fluid friction is also called drag friction.

Exercise

A. Multiple Choice Questions (MCQS)

Tick (✓) the right option.

1. Which friction is the least ?
   (a) static friction ☐ (b) sliding friction ☐
   (c) rolling friction ☐ (d) dynamic friction ☐

2. It is difficult to walk on a polished surface because
   (a) friction is low ☐ (b) friction is high ☐
   (c) pressure is high ☐ (d) none of these ☐
3. Friction is a kind of
   (a) pressure ☐ (b) heat ☐
   (c) force ☐ (d) energy ☐
4. Oil and grease are common
   (a) lubricants ☐ (b) ball bearing ☐
   (c) paints ☐ (d) anti lubricants ☐
5. This is an application of friction
   (a) writing ☐ (b) walking ☐
   (c) lighting a match stick ☐ (d) all of these ☐
6. Disadvantages of friction are
   (a) it produces heat ☐ (b) causes wear and tear of machines ☐
   (c) wastage of fuel ☐ (d) all of these ☐

B. Fill in the blanks :

Sliding	Rolling	Wasted	Motion	Friction

1. Friction always acts in a direction opposite to the direction of _____.
2. _____ Friction is a slightly less than static friction.
3. _____ Friction is smaller than sliding friction.
4. Ball bearing reduce _____.
5. Friction causes a lot of energy to be _____.

C. Give one word for each one of the following.

1. Force that acts along the surface of contact between two moving bodies. _____
2. The property which oposes the relative motion between two bodies in contact. _____
3. The property on the surface in contact that give rice to friction. _____
4. The frictional force exerted by fluets. _____
5. The substances applied in between the surfaces of contact to reduce friction. _____

D. Write short answers :

1. What is sliding friction?
2. What is the direction of frictional force?
3. What do you mean by 'drag'?
4. Why do athletes use shoes with spikes?
5. Why are wet surfaces more slippery?

E. Answer the following questions.

1. How can you minimize friction between two surfaces? Mention Three ways.
2. What are the causes of friction.
3. Describe the various kinds of friction.
4. Give examples to show that friction is both a friend and a foe.
5. Why do objects moving in fluids have special shapes ?

CREATIVE TASK

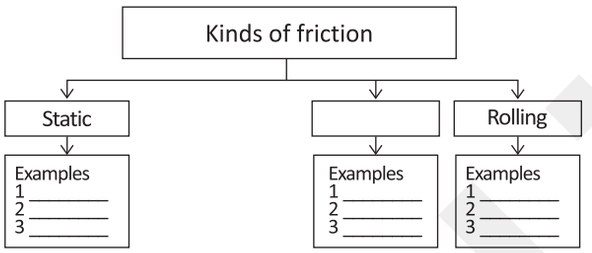
Take three similar wooden surfaces. apply or, grease and water on each of these surfaces. places a similar steel box on each of these surfaces and push each of them with equal force. find out which box comes to rest the first and the one which comes to rest last. what do you conclude from this activity?

GROUP DISCUSSION

Divide yourself into groups of 3. Discuss at last five situations your daily on the importance of Friction in our daily life.

Let's Recall

Complete the follo wing Diagram.



Hots ( )

1. While walking, your mother saw a banana peel in the middle of the pavement. Why do you think she stopped and threw the peel on the side? (Hint : slippery)
2. Why do you think people rub their palms in winter when they feel cold?

Activity to do

Lift a bottle of jam filled with rice with a pencil :

1. Take an empty clean jam bottle -Fill it with rice upto the top. Hold the jar firmly with one hand and push a pencil to the bottom with its tip pointing down.
2. Pull the pencil up slowly but do not remove it completely. Push it back again.
3. If the level of rice drops, push some more into it
4. You will slowly feel it harder to push the pencil down.
5. There will come a time when you see the jar lifting as you pull the pencil up.

This will require little practice – like with how much speed you have to push the pencil or how deeply you need to push or whether with tapping of jar you will be able to fill more rice.

As the jar fills more compactly, the pockets of air in the jar reduce. This result in more friction between each grain of rice and also between rice grains and pencil. It also increases friction between rice and the sides of the jar. Once the combined force of friction becomes more than the weight of rice and the jar, jar can be lifted.

Worksheet - 9

Define the following terms.

1. Causes of friction

_____

_____

_____

2. Ways to reduce friction

_____

_____

_____

3. Ways to increase friction

_____

_____

_____

4. Use of ball-bearing

_____

_____

_____

5. Streamlined shape

_____

_____

_____

Aimline

CHAPTER 10

Sound

Introduction

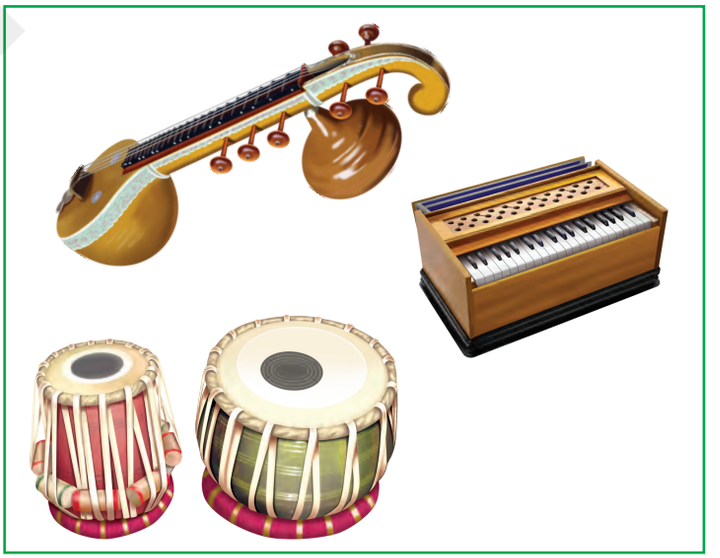
We hear a number of sounds in our daily lives. Sound plays an important role in our lives. It helps in communicating with each other. Some sounds are mild, some are loud, some are pleasant and some unpleasant. You know that someone is coming just by hearing the foot steps. When the cooker whistle blows you know that food is being cooked, or when the door bell rings you come to know that someone has come to your house. We hear sounds of birds, animals, cars, vehicles, crackers, etc most of the time.

Make a list of 10 sounds which you hear regularly in your surroundings.

You also know that different musical instruments produce different sounds.

- Sound is produced by vibrations
- How sound is produced in humans
- sound needs a medium for propagation
- Working of the human ear
- Amplitude, time period and frequency of vibration
- Loudness and pitch
- Audible and inaudible sound
- Noise and music
- Musical instruments
- Noise pollution, its harmful effects and control

Let us find out what produces sound? How does it travel from one place to another? How do we distinguish one sound from another and many more things in this chapter.



Different kinds of sounds

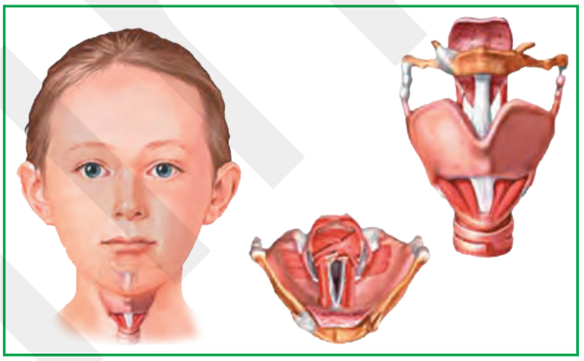
Activity - 4

Take about 8 bowls or tumblers. Fill them with increasing level of water. Ensure that the increase is gradual from one end to another. With the help of a pencil strike each bowl / tumbler gently in quick succession. You will hear sounds that of a jaltarang.

Jaltarang

SOUNDS PRODUCED BY HUMANS

In humans sound is produced by the voice box or the larynx. It is situated in the neck at the upper end of the wind pipe.



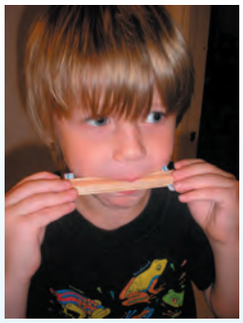
Voice box in human

If you place your fingertips on the throat you will find a hard bump which moves when you make noise or swallow. This is the voice box. The sound produced is controlled by vocal cords. They are stretched across the voice box in such a way that they leave a narrow slit between them for passage of air. Muscles attached to the vocal cords can make the vocal cords loose or tight. When air from the lungs is forced out through the slit, the vocal cords vibrate to produce sound. The quality of voice varies depending upon whether the muscles are tight and thin or loose and thick.

Activity - 5

With the help of this activity let us study how the vocal cords work.

- Take two small rubber strips of the same size.
- Place the two strips on top of each other and stretch them tightly.
- Blow air through the gap between the two strips.

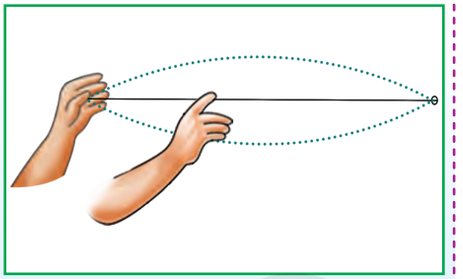


Do you notice a sound?

Sound is produced as air passes through the two strips. Now repeat the activity without stretching the rubber strip. Do you observe any change in the quality of sound produced?

Activity - 1

Take a rubber band. Fix one end on a nail or a hook and hold the other end in your hand. Keep it stretched. Now pluck the rubber band in the centre with your finger. What do you observe? Do you hear any sound.You will hear a sound and will see the rubber band moving rapidly to and fro.

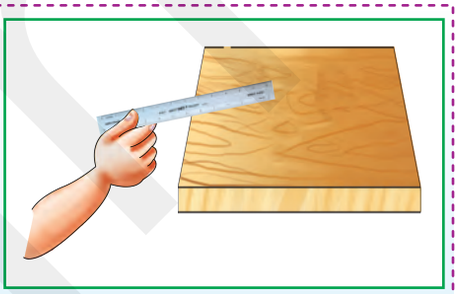


When the tightly stretched rubber band is plucked, it vibrates and produces sound. The sound becomes louder when you stretch the rubber more. The sound is not produced when it stops vibrating.

Activity - 2

Take a ruler and hold one end of it firmly on a table. Flick the other free end.

You will notice the free end vibrating and producing a sound. Once it stops vibrating no sound is produced.



Vibration is to and fro or back and forth motion of an object.

Activity - 3

Take a stainless steel glass. Fill it with water. With the help of a metal spoon strike the glass on the rim. Do you hear a sound? Again strike it and touch the glass and also observe the water in the glass.

You will hear a sound and also see ripples in the water. When you strike the metal spoon on the stainless steel glass both vibrate and produce sound. The vibrations are seen as ripples in the water.

These activities show that vibrating bodies produce sound. At times the vibrations cannot be seen because their amplitude is very small, but they can be felt.

We can thus conclude that all vibrating bodies produce sound.

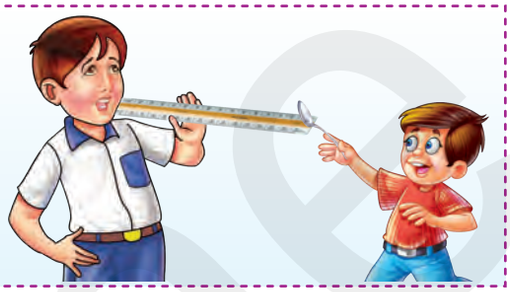
The vocal cords work in the same manner. Can you guess why the voices of men, women and children are different? This is due to the difference in the size of the vocal cords. They are longest in men and shortest in children.

SOUND NEEDS A MEDIUM FOR PROPAGATION

Activity - 6

Take a metre scale. Hold it near your ear. Let your friend tap it gently with a plastic spoon at the other end. Can you hear the sound?

You will be able to hear the sound clearly. This shows that sound can travel through solids.



Activity - 7

Take a balloon fill it with water. Hold it near your ear. Now shake a small bell gently on the other side of the balloon to produce a sound. Do you hear the sound?

This shows that sound can travel through liquids.

Activity - 8

Take a tub filled with water. Shake the bell inside the water taking care that the bell does not touch the body of tub. Can you hear the sound of the bell? This shows that sound can travel through liquids.

Activity - 9

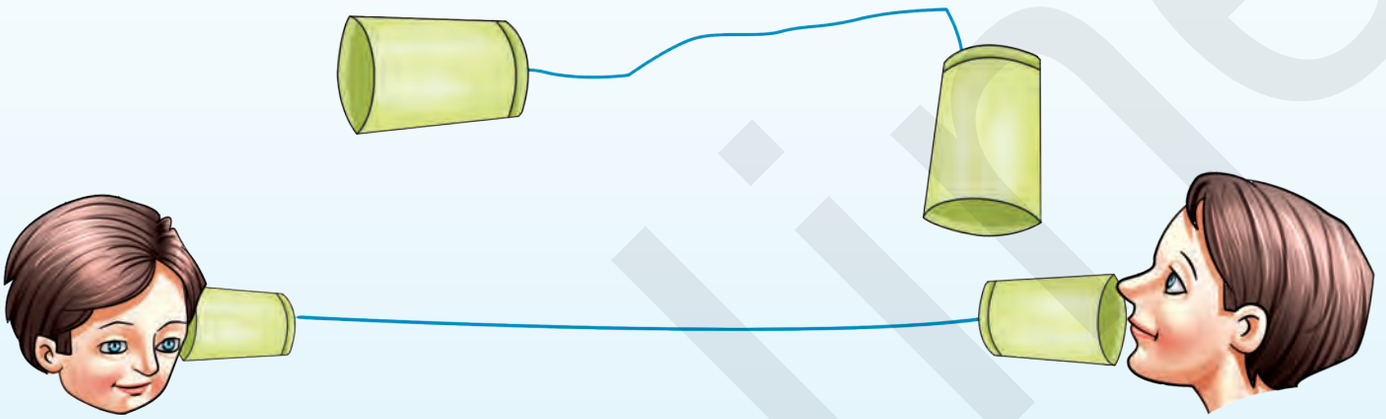
Take a clean dry glass tumbler. Place a cell phone in it. Ask some one to call on the phone. Listen to the ring carefully. Surround the rim of the tumbler with your hands. Put your mouth on the opening between your hands. Ask your friend to call you on the cellphone again. Listen to the ring, while you suck air from the glass tumbler. Is there any difference in the volume of sound as you suck air? What happens to the sound when you remove your mouth from the tumbler?

The sound becomes fainter as you suck air. You would not hear any sound if all the air in the tumbler could be sucked. The sound needs a medium to travel. It cannot travel in vaccum. Vaccum means complete removal of air from a vessel.

Let us make a toy telephone.

Activity - 10

Take 2 paper cups or 2 small tin cans. Make a hole in the centre and connect them with the help of a long piece of string. Hold one can /cup and ask your friend to hold another. The string must be tightly stretched. Ask your friend to whisper into the cup while you listen through the other cup. Can you hear your friend?



The above activity with the toy phone shows that sound can travel even through a string.

We can thus conclude that :

- Sound cannot travel in vaccum.
- Sound needs a medium to travel. It can be solid, liquid or gas. Sound can travel through any solid → metal, wood, string, glass, etc. Sound travels faster in solids and liquids than in gases.
- Vibrating objects produce sound which is carried in all directions in a medium.

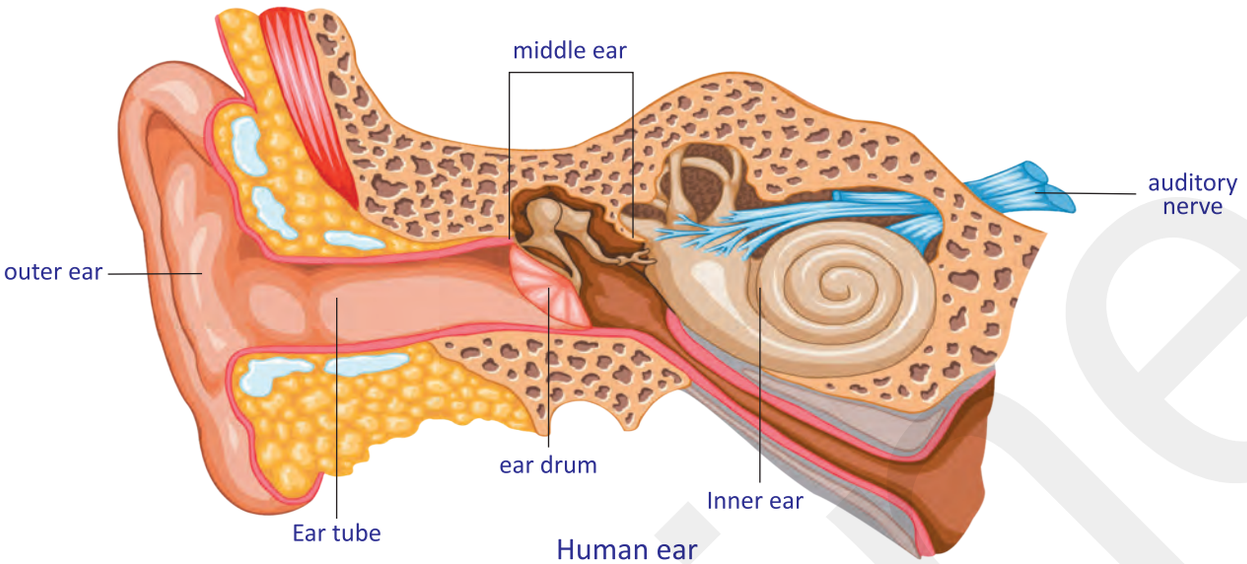
Let's quickly answer orally.

B. Fill in the blanks :

1. Loudness is determined by the ..... of vibration.
2. In humans sound is produced by the ..... of the vocal cords.
3. Sound needs a ..... to travel.
4. Pitch depends upon ..... of the sound.
5. Sound travels faster in ..... than in gases.

WE HEAR SOUND THROUGH OUR EARS

The human ear is made up of three parts - the outer ear, the middle ear and the inner ear.



Human ear

The outer ear is funnel shaped. Sound waves collected by the outer ear reach the ear drum through a canal. Eardrum is a thin membrane which is stretched tightly.

Activity - 11

Let us make a plastic can model of an eardrum. Take a plastic or tin can. Cut both its ends. Stretch a piece of rubber balloon over one end of the tin and hold it in place with a rubber band. Place 4-5 grains of rice on the rubber. Speak through the open end of the can. What happens to the grains? They start jumping up and down.
This is because of vibrations.

Tin can eardrum

The ear drum is like a stretched rubber sheet which vibrates when sound waves strike it and transmits the sound to the middle ear. The middle ear has three bones which move when the eardrum vibrates. They magnify the force of the vibrations and transmit it to the inner ear. From here the signal goes to the brain. This is how we hear.

Note : Ear is a very delicate and important organ. We must take proper care of it. Never put a sharp pointed object into the ear. It can damage the ear drum and make a person deaf.

AMPLITUDE, TIME PERIOD AND FREQUENCY OF A VIBRATION

You have already learnt in the previous class that to and fro motion of an object is called oscillating motion. It is also known as vibration. The number of oscillations per second is known as the frequency of oscillation. The frequency is expressed in hertz (Hz). It is named after the German physicist, Heinrich R. Hertz. If an object completes one oscillation in one second, its frequency is 1Hz. If the frequency of an object is 15 Hz, how many oscillations will the object complete in one second?

Frequency and amplitude are two important properties of sound that determine the two main characteristics of sound – pitch and loudness. We are able to recognise different types of sound without actually seeing the object. We can differentiate sounds on the basis of frequency and amplitude.

LOUDNESS AND PITCH

The amplitude of the vibrating body producing sound determines how loud the sound is. Higher the amplitude, louder the voice. The distance covered by a vibrating particle in any direction is called its amplitude.

Loudness of sound is proportional to the square of the amplitude. You must have seen that as you move away from the source of sound, the sound becomes weaker. When the amplitude of vibration is large, the sound produced is loud. When the amplitude is small the voice is feeble.

Loudness of sound is expressed in decibels (dB). The sound above 80 d B is not pleasant.

The following table gives an idea of loudness of sound coming from various sources.

Rustling of leaves	10dB	Heavy traffic	90dB
Whisper	30dB	Loud music	90dB
Normal breathing	10dB	aircraft engine	100–200dB

Activity - 12

Place a ping pong ball on a drum. Beat the drum gently with a drum stick. Do you see the ball hopping up and down? Next beat the drum harder with the drumstick. Do you notice any difference in the jumping pattern of the ball?

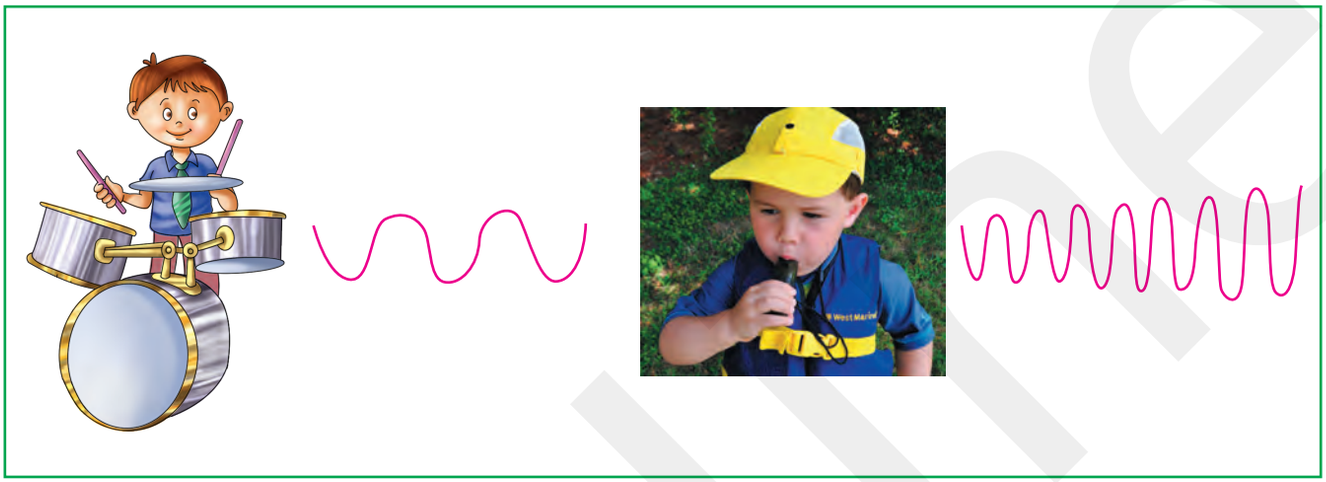
When the drum produces louder sound, the ball jumps higher due to increased amplitude of the vibration.

Drum when hit harder produces louder sound

Online

PITCH

The shrillness of voice is called its pitch. It is determined by frequency. If the frequency of vibrations is high, the sound is shrill and has a higher pitch. Lower the frequency of a sound, lower is its pitch. Girls generally have a high pitched voice and men low pitched voice. A low pitched voice produces a deep tone. A drum vibrates with low frequency whereas a whistle has a high frequency. Therefore a whistle produces a sound of higher pitch compared to a drum.



Frequency determines the pitch of sounds

AUDIBLE AND INAUDIBLE SOUNDS

The human ear can detect sounds having frequencies between 20 Hz to 20,000 Hz. This is the audible range. We cannot hear sounds of frequencies less than 20 Hz. Such sounds are called inaudible. Sounds having frequencies above 20,000 Hz are also inaudible.

less than 20 Hz – subsonic sound

20 Hz to 20,000 Hz – sonic sound

Above 20,000 Hz – ultrasonic sound

Dogs can hear ultrasonic sounds. Humans cannot hear many sounds of animals because they are outside our audible range.

NOISE AND MUSIC

Sound which is pleasing to the ear is called musical sound. Sound produced by musical instruments like harmonium, piano, violin, flute and guitar is musical. It is in the range of 10dB to 30dB. Unpleasant sound is called noise. It is usually above 80 dB. Examples : blowing of horns, machines in a factory, noise at construction site, children yelling, etc.

MUSICAL INSTRUMENTS

Musical instruments are designed to produce pleasant sounds. There are Three main types of musical instruments :

1. Stringed instruments : Violin, guitar and sitar. In these instruments sound is produced by the vibrating string.
2. Wind instruments : Trumpet and flute. In these instruments sound is produced by vibrating column of air.
3. Percussion instruments : Drum, tabla and dholak. In these instruments sound is produced by vibration of the stretched membrane.

NOISE POLLUTION

Just like air and water pollution, noise pollution is also harmful. Major causes of noise pollution are sound of vehicles, bursting of crackers, machines, T.V's , radio, music system played at high volume, loud speakers, etc. Can you add same more to the list?

HARMFUL EFFECTS OF NOISE POLLUTION

Prolonged exposure to loud noise can lead to temporary or permanent impairment of hearing. Lack of sleep, hypertension, anxiety, etc. are some other health problems caused due to noise pollution.

How to limit noise pollution?

- Noise producing industries should be set away from residential areas.
- Do not play loud music.
- Avoid use of loud speakers.
- Use horn minimally.
- Installation of silencing devices in aircraft engines, automobiles, industrial machines and home appliances.
- Plant trees along roads and buildings as they act as noise absorbers and cut down on sounds reaching the residents.

Let's Remember

Give one word for each one of the following.

1. Which part of the ear is funnel shaped?
2. What determines the loudness and pitch of a sound?
3. Which is a louder sound 20 dB or 50dB?
4. Name two wind instruments.

Anime

Key words

vibration : a 'to and fro' or 'back and forth' motion of an object about a central poison is called vibration
Amplitude : the maximum displacement of the vibrating object on either side of its mean position is called amplitude
frequency : the total number of complete vibrations by a object in one second is called frequency
Oscillation : Oscillation is another name for vibration
time period : the time taken by the vibrating object to complete one vibration is called time period
sound : sound is a disturbance produced by vibrating objects
audible sound : sound that can be heard by human is called audible sound
sound propagation : sound propagation is the travel of a sound from one place to another
music : a sound that appears pleasant to our ears is called music
noise : any unpleasant and unwelcome sound that cause discomfort is called noise

SUMMARY

- Sound is produced by vibrating objects.
- In human beings sound is produced due to vibration of vocal cord.
- Sound cannot travel in vaccum.
- Sound needs a medium to travel. It can travel in solid, liquid or gas.
- Sound travels faster in solids and liquids than in gases.
- The eardrum senses the vibration of sound. It sends signals to the brain. This is called hearing.
- The number of oscillations or vibrations per second is called frequency of oscillation. It is expressed in hertz (Hz).
- The amplitude of the vibrating body determines the loudness of sound. Higher the amplitude, louder the sound.
- Loudness of sound is expressed in decibel (dB).
- Higher the frequency of vibration, higher is the pitch and shriller is the sound.
- A human ear can hear sounds having frequencies between 20 Hz and 20,000 Hz. This is called the audible range.
- Loud and unpleasant sound is called noise.
- Musical instruments are of three types.
- Noise pollution causes a number of harmful effects. Noise pollution occurs due to excessive or unwanted sounds.
- We must take steps to control noise pollution.
- We can reduce noise pollution by planting trees on the road side and in other places.

Exercise

A. Multiple Choice Questions (MCQS)

Tick (✓) the right option :

1. Sound cannot travel in _____.
   (a) air ☐ (b) solid ☐ (c) liquid ☐ (d) vaccum ☐

2. Frequency of sound is measured in

(a) decibel (b) hertz (c) amperes (d) seconds

3. The audible range of frequency in man is :

(a) 200-2000Hz (b) 20-10,000 Hz (c) 20-5000Hz (d) 20-20,000 Hz

4. The voice of this will have the minimum frequency

(a) baby girl (b) baby boy (c) man (d) woman

5. Sitar is a

(a) string instrument (b) wind instrument

(c) percussion instrument (d) none of these.

B. Write (T) for true and (F) for false statements.

1. Sound travels faster in gases than in liquids.
2. Flute produces sound due to vibration of stretched string.
3. If the amplitude becomes twice, the loudness increases 5 times.
4. Higher the frequency, higher the pitch.
5. Sounds having frequency above 20,000 Hz is subsonic sound.

C. Match the following

Column A	Column B
1. Loudness	(a) produces sound
2. Audible Sound	(b) a pleasant sound
3. Music	(c) amplitude
4. Auditory nerve	(d) $20H_2$ to $20KH_3$
5. Ringing bell	(e) transmits sound signals to brain

D. Answer the following questions in short.

1. How is sound produced?
2. Write one difference between musical sound and noise.
3. A pendulum oscillates 25 times in 5 seconds. Find its frequency.
4. Mention the part which vibrates to produce sound in the following instruments.

(a) drum (b) flute (c) violin

5. Name the sources at home which lead to noise pollution.

E. Answer the following questions .

1. Explain how sound is produced in a larynx.
2. What do mean by noise pollution? What are its harmful effects?
3. Explain the working of the ear in brief .

4. Give reasons
   (a) Trees are planted along road side.
   (b) Voice of man, women and children are different.
   (c) Lightning is seen earlier than thunder is heard though both take place at the same time and at the same distance from us.
5. How can you control noise pollution ?

CREATIVE TASK

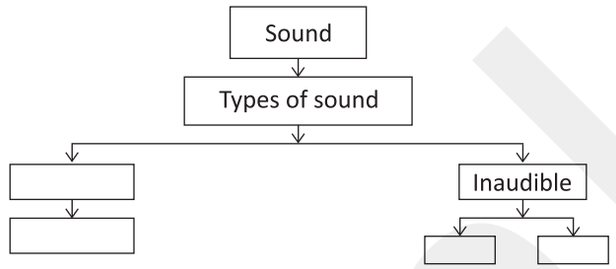
Make your own musical bond by collecting disposed off items like steel rim of a wheel, broken metallic plats, unused spoons, ghungroo, forceps, string of a bow, etc.

GROUP DISCUSSION

Make too groups and discuss on noise pollution how can we contribute to reduce it ?

Let's Recall

Complete the follo wing Diagram.



Hots ( )

1. Why do you think humans cannot hear the sound of the whistle used in dog training?
2. Why do you think we are not able to hear all sounds produced by animals?

Activity to do

Music from a coat Hanger

Have you ever thought that you can hear musical noises from a coat hanger.

(i). Take a metal coat hanger.
(ii). Tie a piece of rope about 11½ metre long in the centre of the hanger.
(iii). Tie one end of the rope 3-4 times round your left finger.
(iv). Tie the other end in the same way around your right finger.
(v). Put your finger ends into your ears.
(vi). Now stand near a chair and allow the hanger to strike it.
(vii). You will be able to hear a pleasant music like that of a bell or a clock.

This is because the hanger vibrates and the finger tips bring the sound waves to your ears.

Worksheet - 13

Complete the crossword puzzle with the help of the clues given.

ACROSS

1. The voice box.
2. Repaid to-and-fro movement of a body.
3. Number of oscillations made per second.
4. Unit for describing loudness.
5. Displeasing and discordant sound.
6. The characteristic of sound that depends on the amplitude of vibration.

DOWN

7. The quality of sound.

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CHAPTER 11

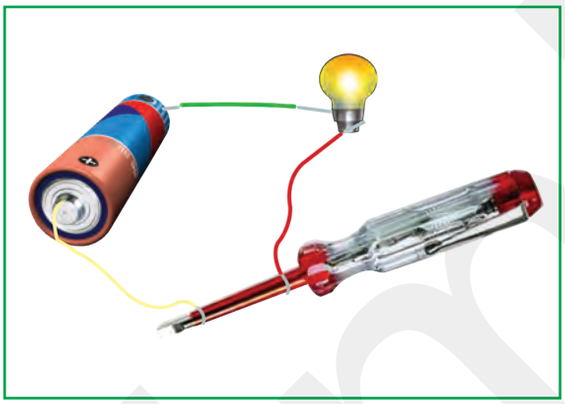
Chemical Effects of Electric Current

Introduction

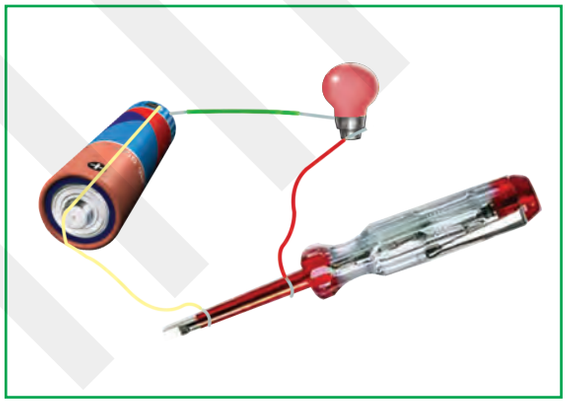
- Conduction in liquids
- Detectors
- Chemical effects of electric current
- Electrolysis
- Electroplating
- Uses of electroplating

You have already learnt in the previous class that the materials which allow electric current to pass through them easily are good conductors of electricity and those that do not allow electric current to pass through them easily are poor conductors of electricity. Can you give a few examples of good conductors of electricity and poor conductors of electricity? Is water a conductor of electricity or not?

We use a tester to determine whether electric current flows through a material or not. We have already leant how to use a tester in case of solid material.



Good conductor



Poor conductor

A Tester

Let us now learn whether liquids also allow electric current to flow through them and what chemical effects that are produced when electric current flows through a liquid.

DO LIQUIDS CONDUCT ELECTRICITY

Some liquids conduct electricity, but not all liquids are good conductors.

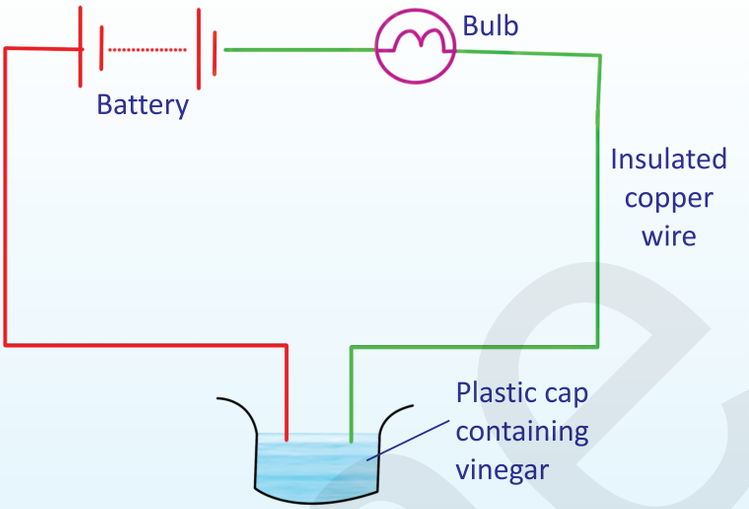
The measure of the ability of a substance to allow the flow of an electric current is called electrical conductivity.

Let us test electrical conductivity in some liquids.

When the liquid between the two ends of the tester allows electric current to pass, the circuit is completed and the bulb glows. When the liquid does not conduct electricity, bulb will not glow.

Activity - 1

Carry out the activity under the supervision of an adult. Take a small amount of vinegar in a plastic bottle cap and dip the two copper wires in it as shown in the figure. Ensure that the two free ends of the wire do not touch each other and are 1 cm apart. Does the bulb glow?



The bulb glows. This indicates that vinegar is a good conductor of electricity.

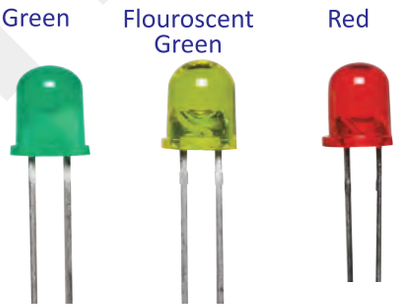
Repeat the above activity using lemon juice. Is lemon juice also a good conductor of electricity or not?

At times you will see that the bulb does not glow though the liquid that conducts electricity. This may happen if the current flowing through the circuit is too weak and the filament of the bulb does not get heated sufficiently. In such cases, we need to use a more sensitive detector such as LED in place of an electric bulb or a magnetic compass.

LED (Light Emitting Diode)

It emits light even when a weak current flows through it. It has two leads (wire),one slightly longer than the other.

The longer lead is always connected to the negative terminal of the battery. LEDs are available in different colours.



DETECTOR BASED ON MAGNETIC COMPASS

This type of detector is based on the magnetic effect of current. You have already studied that electric current produces a magnetic effect. When current is passed through a circuit, the needle of the magnetic compass will get deflected, even if the current is very weak.

Activity - 2

Carry out the activity under the supervision of an adult. Place a magnetic compass in an empty match box tray. Wrap an electric wire round the tray a number of times. The two free ends of the wire are used to connect the other components. One end is connected to the battery. Connect the other end of the terminal of the battery to another piece of wire. Now join the two ends of the wire for a very brief period. What do you observe?

The compass needle will deflect. Now repeat activity I using this detector in place of the bulb.

You may repeat the activity using different liquids like tap water, milk, oil, honey, etc.

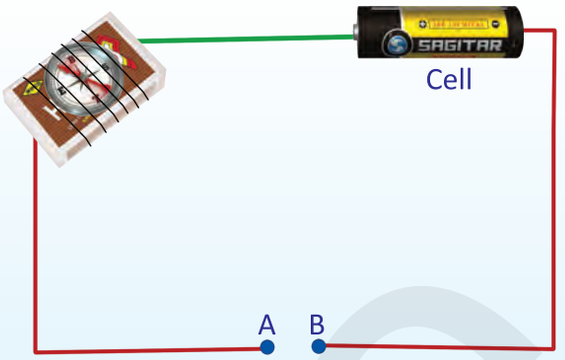
Note : Always wash and dry the ends of the tester after testing a liquid.

Note down your observations — whether there is a deflection in the compass needle or not?

The compass needle will deflect. Now repeat activity I using this detector in place of the bulb. You may repeat the activity using different liquids like tap water, milk, oil, honey, etc.

Note : Always wash and dry the ends of the tester after testing a liquid.

Note down your observations — whether there is a deflection in the compass needle or not?



Good /poor conducting liquids

S. No.	Material	Compass needle deflects Yes/No	Good/poor conduction
1.	Lemon juice		
2.	Vinegar		
3.	Tap water		
4.	Milk		
5.	Vegetable oil		
6.	Honey		

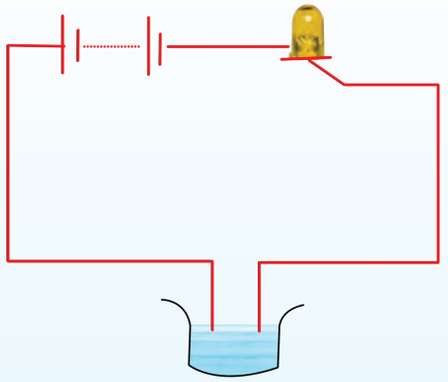
Some liquids conduct electricity while others do not. Under certain conditions most materials can conduct electricity. Though we all know that air is a bad conductor of electricity, during lightning an electric current passes through it. This is the reason why it is preferable to classify materials as good conductors and poor conductors instead of classifying them as conductors and insulators. Let us now see whether distilled water and salt solutions are good conductors or not.

Tap water, as well as water from hand pumps, wells, ponds and rivers is not pure. It contains many dissolved salts. Some mineral salts are naturally present in it. Thus water conducts electricity.

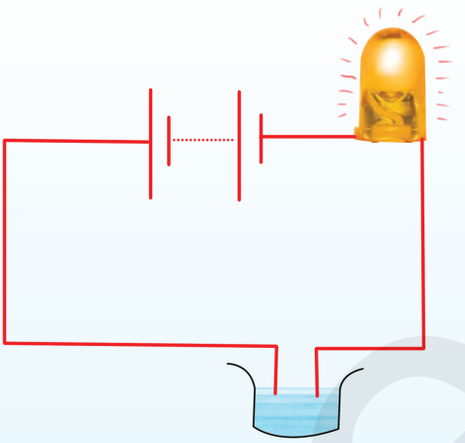
Activity - 3

- Take a plastic capfull of distilled water. Use a tester to test whether distilled water conducts electricity or not.
- Now dissolve 1/2 a teaspoon of salt in a little distilled water and again test.

What do you conclude?



Distilled water



Salt solution

The bulb does not glow when distilled water is used, showing that distilled water does not conduct electricity. However, salt solution is a conductor of electricity.

Distilled water is pure water, free of salts and thus does not conduct electricity.

A person experiences an electric shock when electric current flows through his body. This is the reason why we should not touch electrical appliances with wet hands or while standing on a wet floor as water allows current to flow through it.

It is due to this effect that bubbles of gas may be formed on the electrodes. You may also see deposits of metal on the electrodes. The colour of the solution may also change. The type of reaction depends on the solution being used and the type of electrodes being used.

Activity - 4

Carry out the activity under the supervision of an adult.

Repeat activity 3 by adding a few drops of dilute sulphuric acid, dilute hydrochloric acid, caustic soda and potassium iodide to distilled water.

Observe which solutions conduct and which do not. What do you conclude?

This activity shows solutions of acids, bases and salts conduct electricity.

Let's Remember

Write 'T' for True and 'F' for false statements.

1. All liquids conduct electricity. ☐
2. In the tester we must preferably use LED bulb in place of normal bulb when testing liquids. ☐
3. Acidic solutions conduct electricity. ☐
4. Tap water does not conduct electricity. ☐

CHEMICAL EFFECTS OF ELECTRIC CURRENT

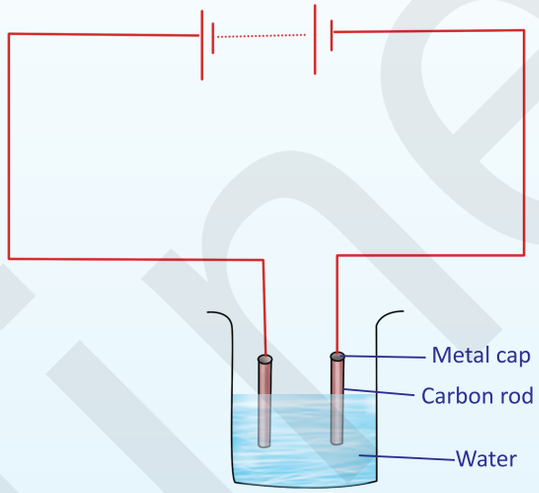
Activity - 5

Take two discarded cells and take out the carbon rods from them carefully. Clean the metal caps with sand paper. Take two copper wires and wrap them around the carbon rods and join them to a battery. These are our two electrodes. You can substitute iron nails (6 cms long) for carbon rods.

Take water in a beaker. Add a teaspoon of salt or few drops of lemon juice to make the water more conducting. Position both the electrodes in the beaker in such a way that the metal caps or the carbon rods are outside the water. Wait for 3–4 minutes. Observe the electrodes carefully. What do you observe?

You will see tiny gas bubbles near the electrodes connected to the negative terminal of the cell due to the formation of hydrogen gas. Chlorine gas will be produced at the electrode connected to the positive terminal of the cell but since the reaction is extremely slow it is not visible.

The passage of an electric current through a conducting liquid causes chemical reactions. The resulting effects are called chemical effects of currents.



Passing current through water.

ELECTROLYSIS

The chemical change induced by the passage of electric current through an electrolyte is known as electrolysis**.** Electrolytes are substances which when dissolved in water break up into cations (positively charged) and anions (negatively charged). The cations move to the negative electrode (cathode) and the anions to the positive electrode (anode).

ELECTROPLATING

Electroplating is the process of depositing a thin layer of one metal on top of another metal with the help of electric current.

Facts to know

Electrolysis of water produces hydrogen at the cathode and oxygen at the anode.

When an electric current is passed through a copper sulphate solution, copper sulphate dissociates into copper and sulphate. Free copper gets deposited on the cathode. To make up for this loss of copper in the solution, an equal amount of copper from the anode gets dissolved in the solution, and this process continues. In other words copper gets transferred from the anode to the cathode.

Activity - 6

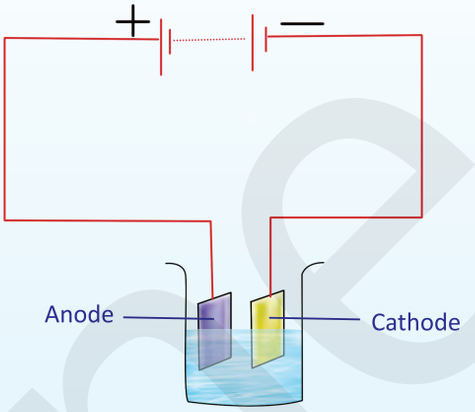
Note : Carry our the activity under the supervision of an adult.

Take a beaker filled with distilled water. Dissolve two teaspoonfuls of copper sulphate in it. Acidify the solution by adding few drops of dilute sulphuric acid to it so as to make it more conducting. Take two copper plates (about 10 cm × 4 cm) and clean them with sand paper. Wash with water and dry. Now, connect the two plates to the terminals of a battery and immerse them in copper sulphate solution. Pass the current for about 12–15 minutes. Remove the electrodes from the solution and observe them carefully.

The cathode i.e the electrode connected to the negative terminal of the battery gets coated.

Now interchange the electrodes and repeat the activity.

What do you observe?



In electroplating the object to be coated is made the cathode and the metal to be deposited on the object is made the anode. The solution contains dissolved salts of the metal to be deposited.

Electroplating is a common application of chemical effects of electric current.

USES OF ELECTROPLATING

Electroplating is done for many purposes :

- Electroplating is used to coat a metal with some special property such as wear resistance, corrosion protection, aesthetic qualities that the base metal does not possess.

  For example chromium is coated on iron to protect it from rust, to give it a good finish and make it attractive. Chromium plating is done on many automobile parts, bath taps kitchen gas burners, bicycle handle bars, towelrails, etc. Chromium is an expensive metal and hence it is not practical to make the whole object with it. So the object is made from a cheaper metal and is electroplated with chromium. Nickle is another metal which is widely used in electroplating in the automobile industry.

- Silver and gold are used in electroplating jewellery made of cheaper metals, cutlery and statues to give them good appearance at a much lower cost.
- Zinc coating is used to protect iron from rust and corrosion.
- Iron is electroplated with tin in the making of tin cans used in storing food, as tin reacts less with food compared to iron.

Online

Electroplated items

Disposal of waste from electroplating factories is a major problem as it is highly polluting. It must be disposed off in accordance to the laid down guidelines.

Let's Remember

Match the following.

Column A	Column B
1. Electrolyte	(a) positive charge
2. Wood	(b) negative charge
3. Proton	(c) anode mud
4. cathode	(d) bad conductor
5. Electrolyte refining	(e) good conductor
6. Iron	(f) Irons

Glossary

electrodes : the rods of a conducting material connected to the two terminals of the battery and immersed in the electrolyte are called electrodes

good conductor : the material which allows a large amount of current to pass through it easily is called good conductor

poor conductor : the material which do not allows only a current to pass through it, is called bad conductor

LED : LED is a semiconductor based light source (Light Emitting Diode)

electrolyte : electrolyte is a conducting liquid solution

electrolysis : electrolysis is a process of producing chemical reactions in liquids by passage of electric current

electroplating : the complete process of coating a metal on another by electrolysis process is called electroplating

SUMMARY

- Some liquids are good conductors of electricity and some are poor conductors.
- Pure water is a poor conductor of electricity. Most acids, bases and salts dissolved in water are good conductors.
- The process of causing chemical changes on passing electricity through some conducting liquid is called chemical effects of current.
- The process of decomposition of an electrolyte on passing of electric current is called electrolysis.
- The process of depositing a desirable metal on another material by means of electricity is called electroplating.
- Electroplating is done to prevent corrosion or for decorative purposes.
- During electroplating the material to be electroplated is made the cathode and anode is made of the metal to be deposited.

A. A Multiple Choice Questions (MSQS)

Tick (✓) the right option.

1. Cations are attracted to the _____.
   (a) anode ☐ (b) cathode ☐
   (c) electrolyte ☐ (d) walls of the container ☐
2. The object to be electroplated is made the _____.
   (a) cathode ☐ (b) anode ☐
   (c) electrolyte ☐ (d) aqueous solution ☐
3. Which is not a good conductor of electricity ?
   (a) pure water ☐ (b) tap water ☐
   (c) vinegar ☐ (d) lemon juice ☐
4. Most acids and bases dissolved in water are _____.
   (a) good conducts ☐ (b) poor conductors of electricity ☐
   (c) insulators ☐ (d) none of these ☐
5. An electrolyte is a _____.
   (a) solid that conducts electricity ☐ (b) liquid that conducts electricity ☐
   (c) both (a) and (b) ☐ (d) none of these ☐

B. Fill in the blanks with the correct words.

Electroplating	Electrolysis	negative	distilled	rust

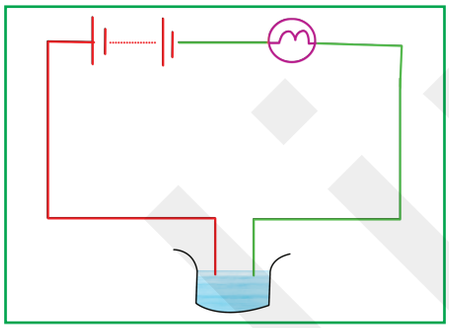
1. The longer lead is always connected to the _____ terminal of the battery.
2. _____ water is pure a water, true of salts and thud does not conduct electricity.
3. _____ is a common application of chemical effects of electric current.
4. Zinc coating is used to protect iron from _____and corrosion.
5. The process of decomposition of an electrolyte on passing of electric current is called. _____

C. Give on word of each one of the following.

1. Name one semiconductor . _____
2. Where are electrons present in an atom ? _____
3. Write full name of LED. _____
4. A metal used to electroplate containers of iron in which food is stored. _____
5. A solid where conductivity is between that of an insulator and a conductor. _____

D. Answer the following question in short.

1. Give two liquids which are good conductors of electricity.
2. Why does a magnetic needle show deflection when the free ends of a tester are dipped into a solution.
3. An electric bulb does not glow in the set up given below. What steps can you take to make it glow?



4. How can you make distilled water conduct electricity?
5. Name two metals that are widely used in the automobile industry for protection from corrosion.

E. Answer the following questions :

1. Define electrolysis, electrolyte and chemical effects of electric current. What changes take place due to this effect?
2. Explain why a compass needle deflects more in sea water, than in tap water when tested with a conductor.
3. Prepare a list of objects around you which are electroplated.
4. Draw a diagram showing electroplating of copper on an iron spoon. Explain.
5. What is electroplating ? How will you carry out electroplating of copper in laboratory?

GROUP DISCUSSION

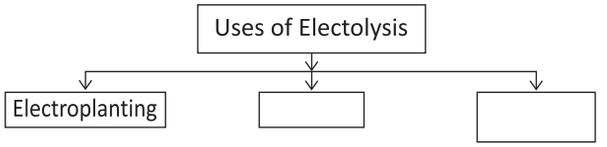
Discuss why water is not used for extinguishing fires caused due to electrical faults.

CREATIVE TASK

1. Make a light of objects around you which one electroplated.
2. Take half potato and make a circuit using two iron nails, torch cell and LED.

Let's Recall

Complete the following Diagram.



Hots ( )

1. Why do you think a fireman shuts off the electrical supply to the area before putting out the fire with a water hose.
2. Why do you think electroplating is hazardous to the environment?

Activity to do

Ask your friend to put the cork in the centre :

1. Take a glass tumber. Fill it almost full with water.
2. Put a small cork in it. Ask your friend to make the cork stay in the centre and not touch the sides.
3. When your friends give up, you demonstrate to them it is easily feasible.
4. Pour more water in the tumbler till it is over the rim.
5. The cork will immediately move to the centre, as the water level is the highest here.

Aimline

Worksheet - 11

Define the following terms.

1. Electrolytes and non–electrolytes

_____

_____

_____

2. Chemical effects of current

_____

_____

_____

3. Electrolysis

_____

_____

_____

4. Electroplating

_____

_____

_____

5. Electrolytic refining of metals

_____

_____

_____

Aimline

CHAPTER 12

Some Natural Phenomena

Rain, storm, lightning, thunder, volcanic eruptions, earthquakes, cyclones, etc are examples of natural phenomenon. Some of them are beautiful and fascinating, whereas others are destructive.

In class VII you have studied about winds, storms and cyclones, the destruction caused and the measures to be taken by us to protect life and property. In this chapter we will study about two more natural phenomena – lightning and earthquake. We will also study what steps we can take to minimise the destruction caused by them.

Introduction

- Lightning and static electricity
- Transfer of charge
- Earthing
- Lightning safety
- Do's and don'ts during a thunderstorm
- The lightning conductor
- Earthquakes
- Causes of earthquakes
- Protection against earthquakes

LIGHTNING AND STATIC ELECTRICITY

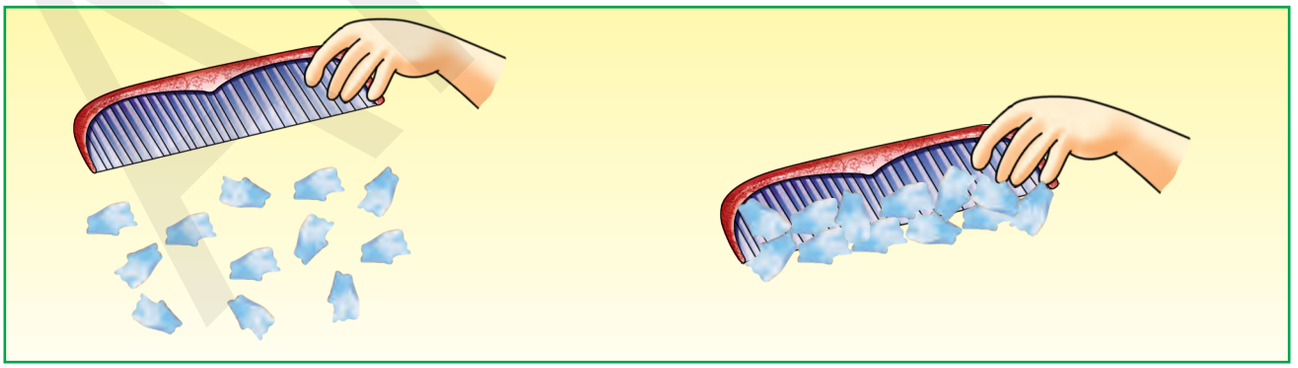
In ancient times people thought lightning was due to the wrath of Gods. But now we have the answer as to what causes lightening. It is due to the accumulation of charges in the clouds. Lightning is also a spark but on a massive scale.

Way back in 600 B.C of Thales a Greek found that when a piece of amber was rubbed with fur, small pieces of hair, feathers, straw, etc were attracted.

You must have observed that when you take off your nylon and polyester clothes in the dark, tiny sparks of electricity are seen and a crackling sound is heard. Your hair also stands up.

You must have seen that when you rub a plastic scale or comb on your head and then hold it near some tiny pieces of paper they get attracted towards the scale or comb.

Benjamin Franklin, an American scientist in 1752 conducted an experiment using a silk kite.



Pieces of paper getting attracted

He tied a small metal key to the string held in the hand. When the kite flew into the clouds lightning struck and the key turned hot. The key became electrically charged. He concluded that lightning and spark from our clothes are essentially the same phenomenon. It took more than 2000 years for this discovery.

Activity - 1

Take a plastic refill and rub it vigorously with a piece of polythene. Now bring the refill near small pieces of paper. Repeat this activity using dried leaves, husk, straw, mustard seeds.

Note : Do not touch the rubbed end of the refill with your hand or with a metallic object.

What do you observe?

You will notice that things get attracted to the charged refill.

Charging by Rubbing

When the plastic refill is rubbed with a polythene piece, it acquires a small electric charge by friction. The object which acquires the charge is called the charged object. The Static electricity produced by this method is called charging by friction.

Activity - 2

- Let us charge various materials using the method of rubbing.
- Rub a balloon with a piece of woollen cloth or polythene.
- Bring the balloon near pieces of small paper. What do you observe?

Similarly repeat the activity with more items :

Object rubbed	Material used for rubbing	Effect on paper pieces	Charged/Notcharged
Balloon	Woollen cloth/polythene	Attracted	Charged
Glass rod	Silk cloth	Attracted	Charged
Eraser	Woollen cloth	Attracted	Charged
Ebonite rod (hard rubber)	Fur	Attracted	Charged
Steel rod	Fur	No effect	Notcharged

When a glass rod is rubbed with silk, negative charges of the glass are transferred to silk. The glass rod acquires a positive charge and the silk cloth acquires a negative charge. When ebonite rod is rubbed with wool, wool gets positively charged and ebonite rod negatively charged. Objects made of rubber, polythene, glass and ebonite can be charged. Metals like steel cannot be charged by rubbing.

Types of Charges and Their Interaction

Activity - 3

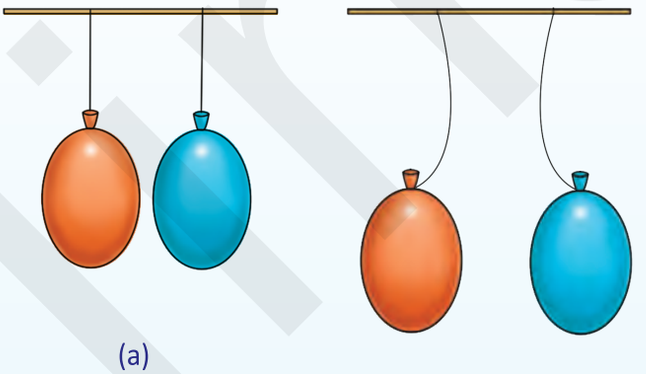
Take two balloons and inflate them. Hang them on a string in such a way so that they do not touch each other. Rub both the balloons with a woollen cloth. What do you observe?

Facts to know

Static electricity consists of electric charges which do not flow.

The two balloons move away from each other. Now repeat the experiment using plastic refills and rubbing them with polythene.

Place one refill in a glass tumbler after rubbing it. Bring the second charged refill close to this one, what do you observe?



(a) (b)

Are they attracted or do they repel each other?

Now repeat the activity with objects made of two different materials like a balloon and a plastic refill. What do you now notice?

We can conclude that :

- A charged balloon repelled a charged balloon.
- Similarly a charged refill repelled a charged refill.
- However, a charged balloon attracted a charged refill.

From the above activity it is clear that like-charges repel each other and charges of different kind attract each other.

Do you know it was Benjamin Franklin who also discovered that there are two kinds of electrical charges – positive and negative charges, represented as (+) or (–)?

Facts to know

A charged body attracts an uncharged body.

Note : The glass rod acquires a positive charge when rubbed with silk as a convention.

The electric charges produced by rubbing are static that is they do not move by themselves. When the charge moves it constitutes electric current.

Do you know that you can only charge insulators with static electricity.

Let's Remember

B. Fill in the blanks :

1. The process of transferring of charge from a charged object to earth is called ..... .
2. ..... is produced when oppositely charged clouds come close to each other.
3. The electric charges produced due to rubbing are ..... charges.

TRANSFER OF CHARGE

It is possible to transfer electric charge from a charged object to another through a metal conductor. Electroscope is the device working on this principle.

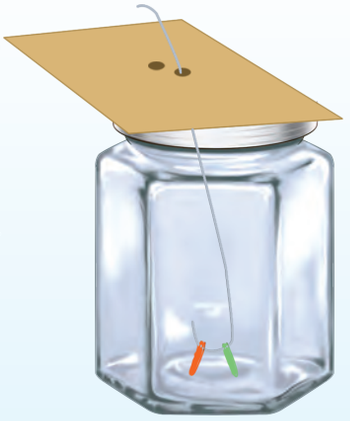
It is used to detect and measure electric charge.

Activity - 4

Take an empty jam jar. Cut a piece of cardboard slightly bigger than the mouth of the bottle. Make a hole in the centre of the cardboard. Take a paper clip and open it completely as shown in the figure. Now take two strips of aluminium foil about 1 ×1.5 cm each. Hang them on the paper clip as show in the figure. Charge a refill by rubbing on your hair and bring it near the end of the paper clip. What do you observe?

The two foil strips repel each other.

You can repeat the activity using different charged bodies like a refill, balloon, ebonite rod.



A Simple Electroscope

At the start, the aluminium strip were not charged when they hung freely. When a charged refill was brought to touch the paper clip, the charge from the refill flows down to the foil strips (metal is a good conductor of electricity) and the two strips repel each other as they now carry the same charge.

An electroscope can thus be used to test whether an object is carrying charge or not.

If you gently touch the paper clip with hand, the strips come back to their original places. This is because the foil strips lose charge to the earth through our body. The foil is set to be discharged.

EARTHING

The process of transferring charge from a charged object to the earth is called earthing. You must have often heard the word 'earthing". Most electrical appliances and the mains of the house are 'earthed'.

This is done so that we do not a get an electric shock.

LIGHTNING

Lightning

Accumulation of charges leading to lightning

Lightning is a spectacular sight in nature. You have studied in the previous class, that air currents move upwards and water droplets move downwards during a thunderstorm. Due to this movement, the charges in the water molecules of the cloud separate in such a way that the positive charges concentrate near the upper edges of the clouds and the negative charges near the lower edges. These charges keep building up. Air, as we know is an insulator, but when the magnitude of accumulated charges builds up, the insulating property of air breaks up and it is no longer able to resist their flow. The negative and positive charges meet resulting in the production of streaks of bright light and sound. The process is called electric discharge**.** The process of electric discharge can occur between cloud and the ground or between two or more neighbouring clouds. A large amount of electric current is produced during a lightning strike. This causes the air to heat up enormously (the temperature even higher than even the surface of the sun) and flashes of lightning are seen. The increase in temperature expands the air violently. This creates a sound, which we call thunder. Lightning can cause loss of life and property. Lightning can damage buildings, burn trees, cause forest fires and kill living things. We must therefore take safety measures to protect ourselves.

Lightning safety

- Rush to a safer place on hearing thunder.
- Wait before coming out of the safe place for sometime after hearing the last thunder.

Safe Place : It could be a low rise building or a house. If in a bus or in a car, close the windows/doors and you are safe inside.

DO'S AND DON'TS DURING A THUNDERSTORM

Outside the House

- Do not take shelter under a tree. In case they get struck by lightning there is a danger of getting burnt.
- Do not carry an umbrella during thunderstorms.
- If in a forest take shelter under shorter trees.
- Stay away from tall trees, high-rise buildings, metallic objects and poles.
- Open vehicles like cycles scooters, motobikes, tractors are not safe. Open places, shelters in parks are also not safe. Do not run across large open field or high ground.
- Do not lie down on the ground. It is better to squat low on the ground with your hands on you knees and head between them.

If Inside the House

- Unplug all electrical appliances like T.Vs, computers, etc.
- Do not use wire phones. It is better to use cordless phones or mobile phones. Try not to call a person who is receiving your phone through a wired phone.
- Avoid contact with running water and hence do not take a bath.
- Do not touch metallic objects like metal pipes, railing or electric wires.

THE LIGHTNING CONDUCTORS

Lightning conductors are used to protect buildings from the damaging effects of lightning. It is a device which consists of a long copper rod with sharp spikes at its upper end. The lower end of the rod is connected to a large copper or aluminium piece buried deep inside the earth. The rod is taller than the building and is installed during the construction of the building.

In case lightning strikes, the rod provides an easy path for the charge to pass through to the ground and the building is protected.

EARTHQUAKE

Earthquake is another destructive phenomenon. Scientists are still not able to predict them accurately. It causes great destruction to human life and property.

What is an earthquake ?

An earthquake is a sudden movement or trembling of the earth which lasts for a brief period. It is caused due to disturbance deep down inside the crust. Earthquakes occur all over the earth all the time. They may range from mild tremors that are not noticed to massive ones causing wide spread destruction and damage to buildings, bridges, dams and life. Earthquakes can also cause floods, landslides and tsunamis. You must have heard about the tsunami which occurred in the Indian Ocean in December 2004.

Destruction caused by earthquake

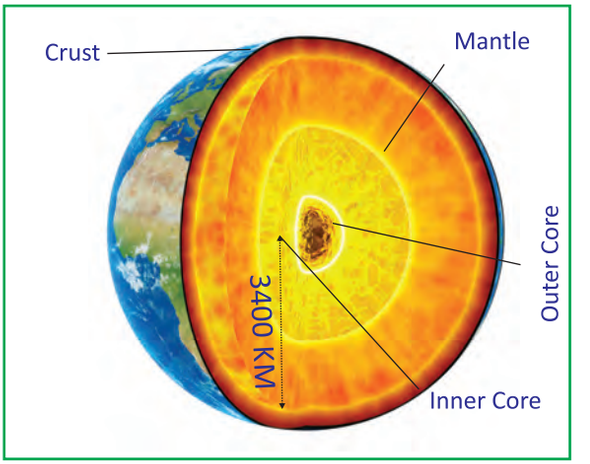
What causes an earthquake?

As seen from the diagram, earth is made of up of the crust, mantle, outer core and the inner core.

The outermost layer of the earth is not one continuous piece but is made up of many pieces called plates. Due to the slow movements inside the earth, these plates move with respect to one another.

The earth is divided into seven large plates and several smalls place.

Most earthquakes take place at the boundaries where the plates meet, though they may also occur within the plates.

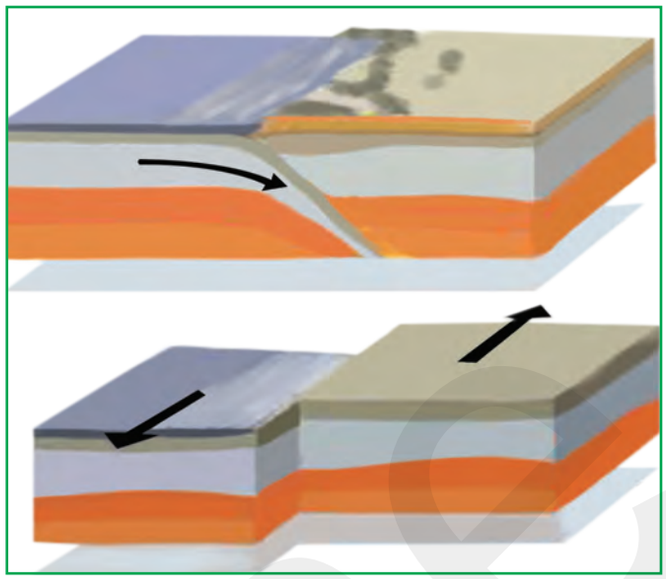


The inner structure of
the earth (not to the scale)

The plates brush against one another or at times a plate may go under another plate due to collision. This causes disturbance in the earths crust. This disturbance shows up as an earthquake on the surface of the earth.

Earthquakes are also caused due to volcanic eruptions. The energy released during a volcano causes vibrations in the crust, which in turn causes earthquakes.

Earthquakes may also occur when a meteor hits the earth or due to underground nuclear explosions.



Movements of earth's plates

Most common cause of earthquakes is the movement of earth's plates.

The boundaries of the plates are weak zones where earthquakes mostly occur. These weak zones are called seismic or fault zones.

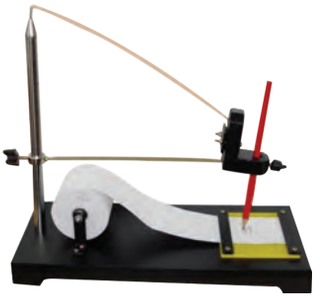
In India the seismic zones are in Kashmir, Western and Central Himalyas, whole of North - East, Rajsthan, Indo-Gangatic plane and Rann of Kutch.

The magnitude of the earthquake is measured by the Richter scale. An earthquake having a magnitude of 2–4 on the Richter scale is not damaging. Magnitude between 4–8 is considered moderate and above 7 is destructive. Do you know that an earthquake of magnitude 5 is ten times more severe than that of magnitude 4.0.

Activity - 5

With the help of your parents find out two earthquakes which occurred in India having magnitude of more than 7.5.

The vibrations caused by an earthquake travel in the form of waves on the surface of the earth. These waves are called seismic waves. Seismograph is the instrument used to measure seismic waves. Seismograph consists of vibrating rod or pendulum with a string to which a pen is attached. The rod starts vibrating when tremors occur. The siesmic waves are recorded by the pen on a paper (like graph) which moves underneath it.



A Seismograph

The point of origin of the earthquake is called focus. The point on the surface of the earth vertically above the focus is called the epicentre.

The branch of science which deals with the study of earthquakes is called seismology. The scientists who study the behaviour of earthquakes are called seismologists.

PROTECTION AGAINST EARTHQUAKES

As we know that occurence of an earthquake cannot be predicted. Therefore we must be ready to protect ourselves all the time. People living in the seismic zone need to be specially prepared. Buildings should be designed to be earth quake proof. For this consult qualified architects and engineers.

The building must be made earthquake resistant as most of the damage is caused building collapsing. One should avoid using materials like stones, marble, iron girdles etc in seismic areas. Instead use of mud and timber is better. Keep roofs as light as possible. This will minimise the damage due to building collapse.

- Cupboards and shelves must be fixed to the wall.
- Ceiling fans, air conditioners, coolers must be secured firmly. They can cause a lot of damage if they fall down.
- Wall hangings, wall clocks, photo frames must be hanged carefully so that they do not fall on people in case of an earthquake.
- All buildings must have fire fighting equipment in working order as there are chances of buildings catching fire during an earthquake.

In case of an earthquake, following steps should be taken :

At Home

- Take shelter under a sturdy object like a table or a cot. Stay there till shaking stops.
- Stay away from the tall heavy objects that might fall.
- If in bed, stay there. Protect your head with a pillow.

When Outdoors

- Move away from buildings, electric poles and trees which might fall down. Stand away from over head power lines.
- Drop to the ground.

- If you are in a vehicle, stay inside till tremors stop. Drive slowly to a clear area, away from bridges, tunnels, trees, power lines, electric poles or sign boards etc.

Let's Remember

Match the following

Column A	Column B
1. Fault Zone	(a) measures intensity of earthquakes
2. Richter scale	(b) sanes building from lighting damage
3. Discharge	(c) areas prone to earth quakes

Glossary

lighting : visible electric discharge between clouds or between cloud and the ground
thunder : loud noise followed by a flash of lightning
thunder bolt : flash of lightning followed by a heavy sound as if some rock has come to fall a high electrical charge
electron : a particle negatively charged and orbiting about the nucleus in an atom
electric charge : a charge developed from friction on a body
static electricity : a charge which does not flow through a conductor
amber : resinous stone
ebonite : dark wood from a plant in which cells are filled with rubber–like gum
electroscope : an apparatus to learn about the nature of charge
lightning conductor : a metallic device, a strip of metal running from under the ground (earth) to the top of the high–rise building for discharging the charge from clouds
siesmology : science dealing with earthquakes

SUMMARY

- Certain materials can be charged by rubbing. Examples glass, fur, plastic, ebonite.
- The electrical charges produced by rubbing are called static charges.
- Static electricity consist of charges which do not flow.
- When charges move, they constitute an electric current.
- Charges are of two types - positive charge and negative charge.
- Like charges repel each other and unlike charges attract each other.
- The process of transfer of charge from a charged body to the earth is called earthing.
- A rapid flow of electric discharge between clouds and the earth or between neighbouring clouds causes lightning.

- The loud noise heard during lightning is called thunder.
- Lightning strike could destroy life and property.
- Lightning conductors are used to protect buildings from the damaging effect of lightning.
- Earthquake is sudden shaking or trembling of the earth.
- Earthquakes are caused due to disturbances deep inside the earth's crust.
- Earthquakes mostly occur at the boundaries of the earth's plates. These boundaries are known as fault or seismic zones.
- It is not easy to predict an earthquake.
- The magnitude of an earthquake is expressed on a richter scale.
- An earthquake of magnitude seven or more is destructive.
- We must take precautions to protect ourselves.

A. Multiple Choice Questions (MCQS)

Tick (✓) the right option.

1. Which of the following cannot be charged with static electricity ?
   (a) metal ☐ (b) conductor ☐
   (c) alloy ☐ (d) semiconductor ☐
2. Which one of the following cannot be charged with friction ?
   (a) plastic scale ☐ (b) woollen cloth ☐
   (c) inflated balloon ☐ (d) metal rod ☐
3. A faulty zone in the earth's crust is also called _____.
   (a) seismic zone ☐ (b) seismograph ☐
   (c) mantle zone ☐ (d) none of these ☐
4. When a glass rod is rubbed with silk, then _____.
   (a) both glass and silk acquire a positive charge ☐
   (b) both acquire a negative charge ☐
   (c) glass rod acquires a positive charge, silk cloth a negative charge ☐
   (d) glass rod acquires a negative charge and silk cloth a positive charge ☐
5. Which is used to protect tall buildings against lightning ?
   (a) seismogram ☐ (b) electroscope ☐
   (c) lightning conductor ☐ (d) plates ☐

B. Write (T) for True and (F) for False statements.

1. A charged object always attracts another charged object.
2. Lightning conductor consits of a tall plastic rod.
3. It is easy to predict an earthquake.
4. The outermost layer of the earth is fragmented.
5. The uppermost layer of the earth's crust is called the core.

C. Give one word for each one of the following.

1. Which kind of material can be charged with static electricity ?
2. What is the rapid flow of change between the two oppositely –charged clouds called ?
3. What are the zone of weakness in the earth crust due to abrupt release of strain called ?
4. Name the instrument on which the regmic waves due to on earthquake are recorded .

D. Answer the following questions in short ?

1. Explain why a charged body loses its charge if we touch it by hand.
2. What do you understand by charging by friction?
3. What is a lightning conductor?
4. Name three areas in India which are earthquake prone ?
5. Mention two causes of earthquakes other than movement of tectonic plates.

E. Answer the following questions.

1. Describe with the help of a diagram, an instrument which can be used to detect a charged body.
2. Explain briefly why lightning occurs?
3. Suggest four measures to protect ourselves from lightning.
4. Suppose you are outside the house and an earthquake strikes. What precautions would you take to protect yourself?
5. What special precautions should people living in earthquake prone areas take?

(Hots)

1. Why do you think a crackling sound is heard while taking off nylon clothes?
2. Why do you think we should not carry an umbrella when a thunderstorm is predicted?

Aimline

GROUP DISCUSSION

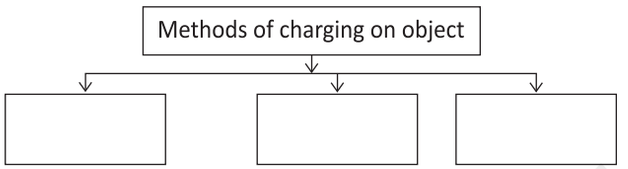
Discuss the various guidelines framed to construct earthquake proof buildings.

CREATIVE TASK

1. Visit a tall building and examine the lightning conductor provided.
2. Make posters to create awareness among people for safety against earthquakes and lightening

Let's Recall

Complete the following Diagram.



Activity to do

Magic or Fun

1. Put a rupee coin (small sized) on its side and put a small piece of paper on it and cover it with a glass tumbler.
2. Ask your friend to throw the piece of paper from the coin without touching the glass. Your friend must also ensure that the coin does not fall off.
3. Let them try for sometime.
4. Then rub your hair which must be dry with a comb and place it near the glass. The piece of paper will fall down immediately.

Can you guess the reason?

It is the charge on the comb which makes the piece of paper to fall down.

Aimline

Worksheet - 12

Solve the crossword puzzle with the help of the clues given.

ACROSS

1. The relative movement of different parts to the lithosphere producing high intensity shock waves.
2. Dislocation of the crust.
3. the load sound produced during lightening.
4. charge developed on glass rod when rubbed with silk.
5. Method by which static electricity is produced.
6. Charge developed on ebonite rod when rubbed with cat skin.

DOWN

7. Caused by electric discharge between two clouds alongwith the rain.
8. Burying the lower end of the lightning conductor deep inside the earth.
9. Sea waves caused by earthquake under the sea bed.
10. Earthquakes measuring or more on Ritcher scale.
11. The point on the surface of the earth, vertically above the seismic focus.

^{2}T		^{1}E^{8}			^{9}T		Q				^{11}E
		T			N						C
D						^{10}M					
		N				J	^{2}F				T
^{2}T			N								
		^{4}P				T					
^{5}R			B								
				^{6}N			T				

CHAPTER 13

Light

We cannot see objects in the clark. Light enables us to see things. We are indeed very lucky to be blessed with the sense of sight. We are able to see so many wonderful things around us.

In this chapter we shall study about reflection of light, and how we see with our eyes.

Introduction

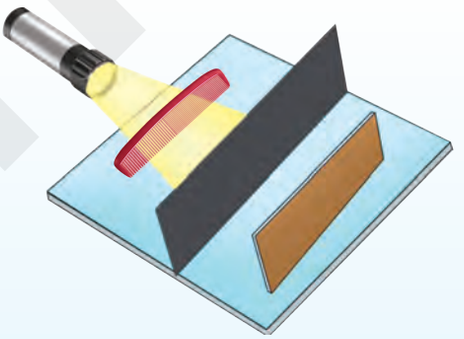
- Reflection of light
- Laws of reflection
- Image formed by a plane mirror
- Multiple reflections
- Kaleidoscope
- Dispersion of light
- Human eye
- Defects of vision
- Care of the eyes
- Visually challenged
- Animal eyes

REFLECTION

We have already seen in the previous class that when light falls on a highly polished surface the light rays bounce back. This is called reflection of light.

Activity - 1

Take a white sheet of photocopier paper, and fix it on a drawing board. Take a comb and close all its opening except in the centre with the help of a black chart paper. Hold the comb perpendicular to the sheet of paper. With the help of a torch throw light through the slit of the comb from one side. With a little bit of adjustment of the torch and comb, a ray of light along the paper on the other side of the comb can be seen. Now place a mirror in the path of light ray. What do you now observe?



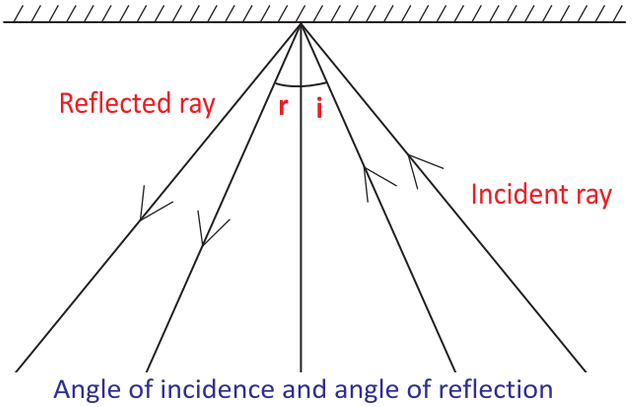
Arrangement for showing reflection

After the light ray falls on the mirror it is reflected in another direction.

The ray of light which falls on the reflecting surface is called the incident ray.

The ray of light which bounces back or is reflected from the surface of an object is called the reflected ray.

Draw lines showing the position of the mirror, incident ray and reflected ray. Remove the mirror and then, draw a line perpendicular to the mirror



Angle of incidence and angle of reflection

at the point where the incident ray strikes. This is know as the normal. The angle between the normal and the incidence ray is called the angle of incidence (∠i). The angle between the normal and the reflected ray is called the angle of reflection (∠r).

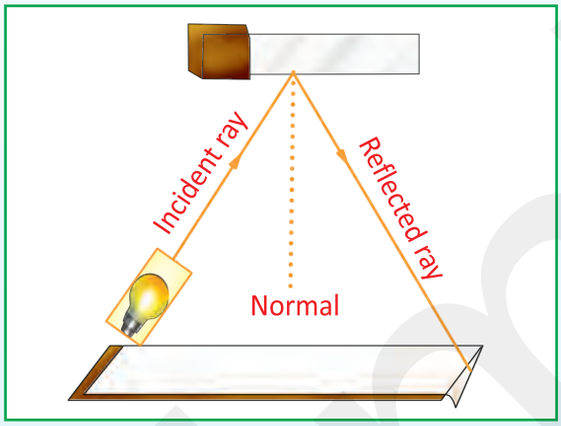
Measure the angle of incidence and angle of reflection.

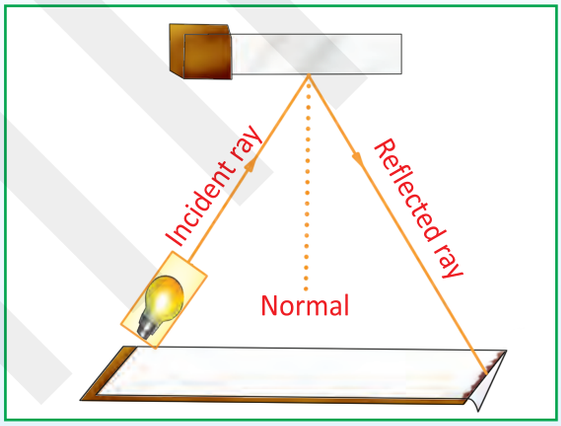
Repeat the activity by changing the angle of incidence. What happens to the angle of reflection? Does it also change? Is there any relationship between the two?

You will notice that the angle of incidence is equal to the angle of reflection.

Activity - 2

Take a white sheet of stiff paper like art paper. Fix it on a drawing board in such a way that it projects slightly beyond the edges of the drawing board. Place a plane mirror strip on the paper holding it vertically with a mirror stand. Throw a ray of light on the mirror. Look at the reflected ray. You will notice that it extends to the projected portion of the paper. Bend the part of the projected portion on which the reflected ray falls. Do you still see the reflected light on the bent portion of the paper. Now, bring the paper back to the original shape. Can you see the reflected ray again? Yes the reflected light is again seen on the paper.





The entire sheet of paper spread on the table represents one plane. The incident ray, the normal at the point of incidence, and the reflected ray lie in the plane of the paper. When the paper is bent, a plane different from the plane in which the incident ray, reflected ray and normal lie is created. The reflected ray of light does not lie in the new plane formed due to the bent sheet.

Can you tell what this indicates?

This suggests that the incident ray, the reflected ray and the normal ray at the point of incidence, all lie in the same plane.

Thus the two laws of reflection are :

- The angle of incidence is always equal to the angle of reflection.
- The incident ray, the normal and the reflected ray at the point of incidence , all lie in the same plane.

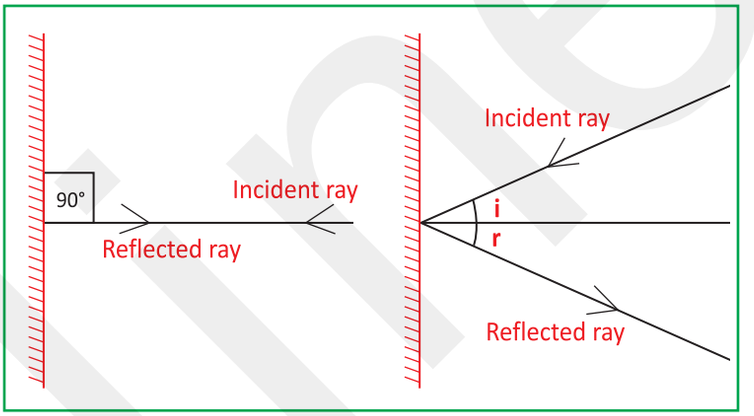
IMAGES FORMED BY A PLANE MIRROR

You have already learnt about some of the features of the image of an object formed by a plane mirror. Let us revise some of them.

- A plane mirror forms an erect image.
- Image size and the object size are the same.
- The distance of the image from the mirror equals the distance of the object from the mirror.
- The image formed is virtual i.e it cannot be obtained on a screen.
- The image shows lateral inversion, meaning that the left of the object appears on the right and the right appears on the left.

Ray diagram for the formation of image by a plane mirror.

- A ray of light falling on a plane mirror gets reflected in such a manner that the angle of incidence is equal to the angle of reflection.
- A ray of light falling on a plane mirror at 90° gets reflected back from the mirror at the same path.



Reflection of rays from a plane mirror

Activity - 3

List the diagram. Two rays OA and OB are incident on the mirror from the source of light O placed in front of the plane mirror.

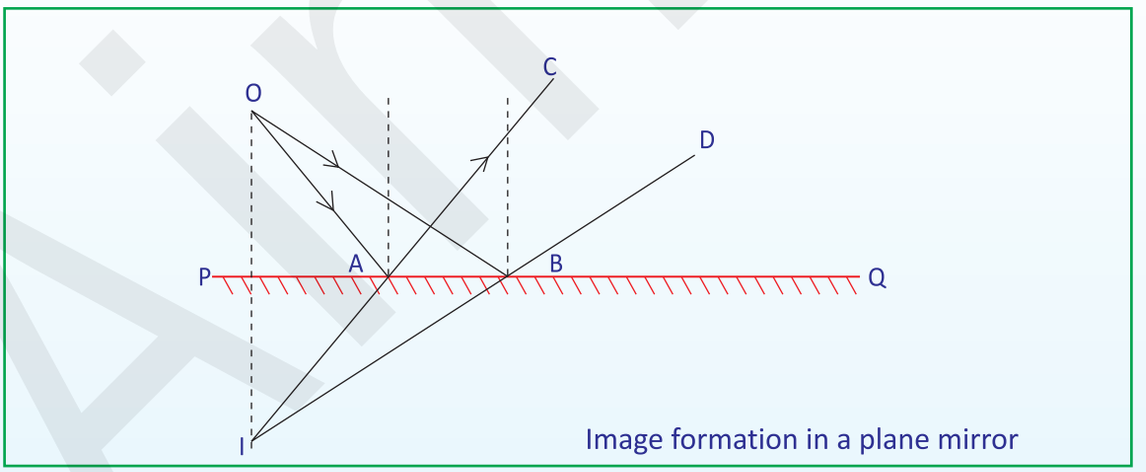


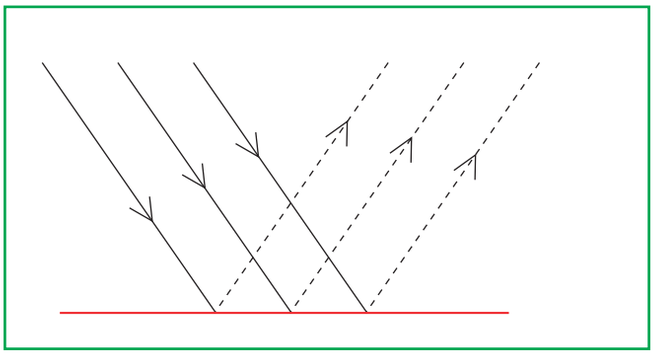
Image formation in a plane mirror

The reflected rays are AC and BD respectively. Extend the 2 rays backwards. You will notice that they meet at a point, call it I. Point I is the image of the point object O. The reflected rays do not actually come from I, but only appear do so, we thus say that the virtual image of the object O is formed at I.

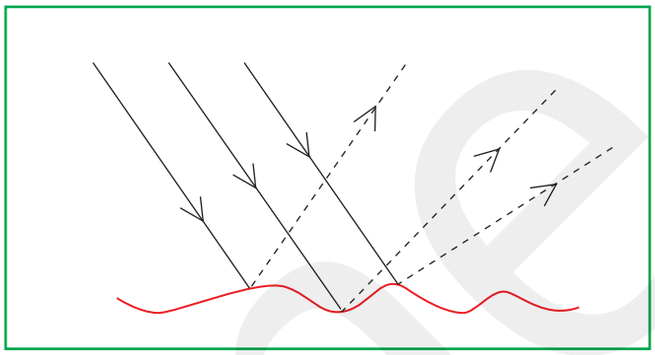
Aimline

REGULAR AND DIFFUSED REFLECTION

When a ray of light falls on a smooth surface like that of a mirror then the light is reflected along a particular direction. Reflection of light from a smooth surface is called regular reflection. The image formed is clear and sharp in this case.



Regular reflection



Diffused reflection

When light rays fall on a rough, irregular surface then the reflected rays are not parallel, but are reflected in different directions. The image formed is not clear and sharp.
This is called irregular or diffused reflection.
Reflection of light from old stainless steel utensils, paper and wall are examples of diffused or irregular reflection.

What make things visible?

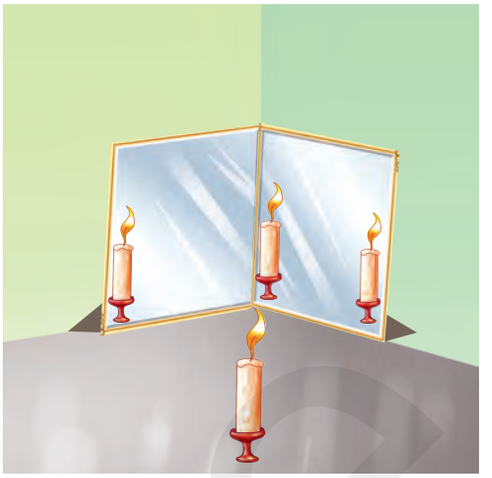
Some objects like the sun, fire, electric lamp, light bulb etc. give light of their own and are called as luminous objects. There are some objects which do not have light of their own and shine in the light of other objects. They are called illuminated objects. Example moon shines due to the reflected light of the sun.

MULTIPLE REFLECTIONS

What do you think will happen if we use two mirrors? What kind of images will we get?
By varying the angle between the two mirrors, a number of images can be obtained.
This happens because the image in one mirror acts as an object for the other mirror.

Mirror at a hair dresser shop

- When the two mirrors are placed at right angles to each other, three images are formed.
- As the angle between the two mirrors is decreased the number of images are increased.
- When the mirrors are placed parallel to each other, we get an infinite number of images.



Now you will be able to understand why the hair dresser holds a mirror behind you while you sit in front of a mirror to show you how your hair has been cut.

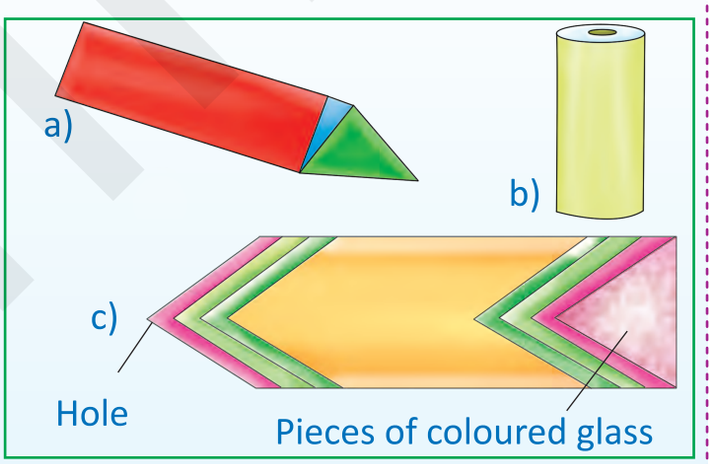
Can you name the device which you studied about in your previous class made by using two plane mirrors?

It is used in submarines, tanks and by soldiers in bunkers to see things outside.

Let us make a kaleidoscope. It is based on the fact that a number of images are formed by mirrors placed at an angle to one another. i-e on the principle of multiple reflection.

Activity - 4

Take three rectangular mirror strips about 15cm×4cm in size. Join them to form a prism. (a) Make a tube slighty longer than the glass strips from a thick chart paper. (b) Fix the prism inside the tube. Cut a circular disc, make a hole in the centre through which you can see and cover one end of the tube with it.



At the other end, touching the mirror, fix a circular plane glass plate. Put several pieces of broken glass bangles on this glass plate. Close this end of the tube with a ground glass plate. There should be sufficient space for the glass pieces to move.

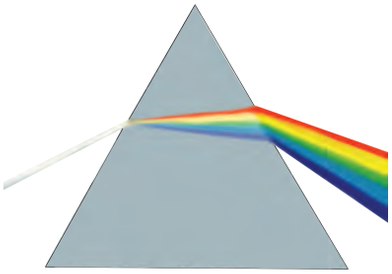
When you look through the hole, you will be able to see a variety of patterns. Do the patterns repeat? You will never see the same pattern again.

DISPERSION OF LIGHT

When a ray of light passes through a glass prism it splits up into a band of colours – red, orange, yellow, green, blue, indigo and violet. The process of splitting up of white light into

many colours is called dispersion. The band of colours produced when white light is split up is called a spectrum.

The dispersion of light into seven colours occurs because light of different colours bends differently while passing through a glass prism. The red light travels fastest and bends the least, whereas violet light travels slowest and bends the most.



Dispersion

Activity - 5

Take a bowl of water. Place a small plane mirror in the bowl, so that it rests at an angle of about 45°on the wall of the bowl. Place the bowl, near a window so that the mirror faces the sun. Adjust the position of the bowl, so that mirror reflects the sunlight on a wall. In case the wall is not white, fix a sheet of white paper. What do you observe?

You will see a wonderful spectrum on the wall as the mirror and water form a prism.

RAINBOW

Rainbow is an example of dispersion of light. The drops of water which remain in the air just after the rain act as small prisms. They split sunlight which falls on them into the seven colours. The dispersed light from a large number of drops appears as a band called the rainbow.

The rainbow

Let's Remember

Give one word for each one of the following.

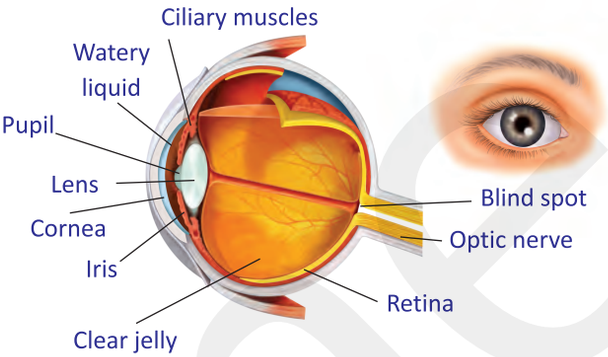
THE HUMAN EYE

Human eye is the most important sense organ. It is very delicate. Let us first study the structure of the eye. It is spherical in shape.

The main parts of the eye are as follows :

Cornea : It is a very thin transparent membrane which covers the front of the eye.

Iris and pupil : Behind the cornea is a dark coloured muscular structure is called iris. The central circular opening in the iris is called the pupil. The pupil appears black in colour because no light is reflected from it. The size of the pupil is controlled by the iris. The iris increases and decreases the size of the pupil to regulate the amount of light that enters the pupil. The iris gives the distinctive colour to the eye.



Human Eye

Eye lens : Behind the pupil is the eye lens. It is a convex lens made up of a transparent jelly like material.

Retina : In the back of the eyeball is a layer called the retina. The eye lens focusses the image of the object on the retina. The retina contains several nerve cells. The retina has two types of cells called rods and cones.

The rod shaped cells are sensitive to brightness, darkness or dim light.

The cone shaped cells are sensitive to colours. Cones sense colour.

Blind Spot : There are no rods and cones at the point where the optic nerves leaves the eye, so no vision is possible at this spot. This is called the blind spot.

Activity - 6

Take a sheet of white paper and mark a circle and a + sign on the two sides of the paper. Close your left eye and hold the paper in your hand looking at the circle continuously, move the paper towards yourself. You will notice that a point the + sign will disappear. Next close your right eye. Look at the + sign and again repeat the activity. This time the black circle mark will disappear.

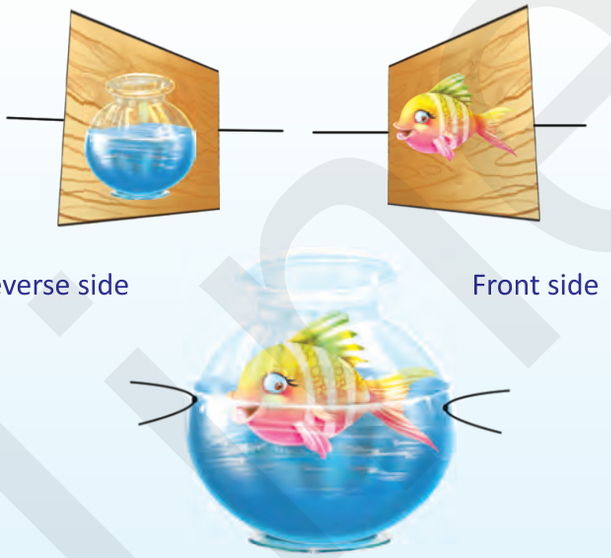
This activity shows that there is a point on the retina (blind spot) which is unable to send message to the brain when light falls on it and hence the image is not seen.

PERSISTENCE OF VISION

The image formed on the retina does not disappear immediately.
It persists for 1/16th of a second after we stop looking at the object. This phenomenon is called persistence of vision. This is used in cinematography.

Activity - 7

Cut a square piece from a cardboard 4cm × 4cm. Make two holes and tie short pieces of string.
Draw a fish on one side of the square and a glass bowl on the other side. Hold the pieces of string in your fingers. Turn the squares very rapidly with your fingers. What do you see? You will see the picture of the fish in the bowl .
We see a moving picture because the two pictures are made to move at a very fast rate– faster than 1/16th of a second.



DEFECTS OF VISION

Short-sightendness

Some people can see nearby objects clearly but cannot see distant objects clearly. They are said to be suffering from short-sightedness or myopia.

Long-sightedness

Some people can see distant objects very well but not close objects. They are said to be suffering from long-sightedness or hypermetropia.

Cataract

In old age, the eyesight becomes foggy. This is because the lens becomes cloudy. This is called cataract. The opaque lens is removed by a simple minor surgery and a new artificial lens is inserted.

COLOUR BLINDNESS

Some people are colour blind. They are unable to distinguish between certain colours. It is an inherited defect.

CARE OF THE EYES

Since eye is a delicate and extremely valuable organ it is necessary to take proper care of your eyes. Have a regular eye-check-up from an eye specialist.

- Use spectacles if advised.
- Protect eyes from the glare of the sun and also from dust.
- Do not look at the sun or powerful light directly. It can injure the retina.
- Do not read in dim light or in moving vehicle or while lying down. This causes strain on your eyes.
- Wash your eyes frequently by splashing clean and cold water whenever your eyes feel strained.
- Do not rub your eyes.
- Do not watch televison for long hours.
- Always read at the normal distance for vision (25–30cm). Do not read by keeping the book too close or too far from yours eyes.
- Take a diet rich in vitamin A. Deficiency of vitamin A causes night blindness. The person suffering from night blindness cannot see properly in dim light or in the night.

Foods rich in vitamin A are :

- Vegetable such as raw carrot, broccoli, green vegetables (spinach) .
- Milk and milk products like curd, cheese, butter.
- Eggs
- Fruits such as mangoes and papayas
- Cod liver oil

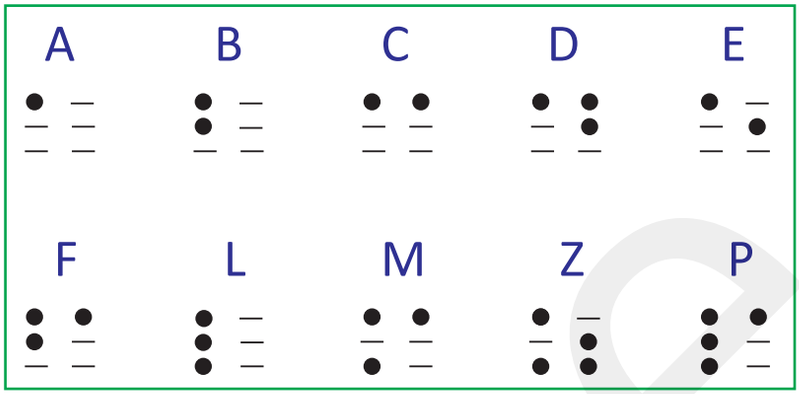
VISUALLY CHALLENGED CAN ALSO READ AND WRITE

Visually challenged people cannot see. Such people try to identify things by feeling and listening to sounds carefully. A special system called Braille is used by these people for reading and writing. The Braille System was invented by Louis Braille who himself was a visually challenged person. This system was adopted in 1932. The Braille system uses patterns of raised dots to represent letters and numerals. Each Braille cell is made of 6

Aimline

dots arranged in a rectangle of 2 columns of 3 dots. Braille system has 63 dot patterns or characters. We can read many Indian languages using the Braille system.

Louis Braille



Some examples of dot patterns used in Braille

A visually challenged person recognises each letter by its position of dots in each cell. Braille printing is done in special presses. These days computers are used in these presses.
Nowadays special key boards based on the Braille system, with embossed characters, are available. Special scanners and printers are also available.
Devices like talking calculators, audio dictionary, dictaphone, audio measuring devices are very useful to the blind.

SOME ANIMALS FACT

- Day birds like eagles and kites have more cones and fewer rods compared to night birds like owl, which has a large number of rods and only a few cones. Hence owl has a large pupil. Owl can see well during the night and not in the day.
- The crab can look all around.
- Rabbit and parrot can look behind them without turning their head.
- Owls are the only birds which can see blue colour.
- Butterflies have compound eyes - (having many lenses). They can see in different directions at the same time.
- Crocodiles are blind in water but can see on land.
- A chameleon can look in different directions at the same time.

Let's Remember

Write (T) for True and (F) for False Statements.

1. Eye lens is a concave lens.
2. The image formed by a plane mirror is of the same size as the object.
3. Visually impaired people read with the help of Braille.
4. Colour blindness is caused due to deficiency of vitamin A.
5. The blind spot contains only cone cells.

Glossary

reflection : bouncing back to light
scattering : irregular reflection of light
incident ray : ray of light falling upon a surface
reflected ray : the ray of light bounced from a smooth surface
dispersion : splitting of light
spectrum of light : splitting of light in seven colour
VIBGYOR : stands for violet, indigo, green, yellow, orange and red
stereoscopic : three–dimensional vision
myopic eye : short sightedness
hypermetropic eye : long sightedness
braille : language for the blind

SUMMARY

- Light is reflected from all surfaces.
- There two laws of reflection :
  (i) The angle of incidence is equal to the angle of reflection.
  (ii) The incident ray, reflected ray and the normal at the point of incidence lie in the same plane.
- When light falls on a smooth, polished surface regular reflection takes place.
- Diffused irregular reflection takes place from rough surfaces.
- Images formed in a plane mirror are erect and virtual and of the same size of the object. They undergo lateral inversion.
- Two mirrors placed at an angle to each other, form multiple images. If the mirrors are placed at an angle of 90°, 3 images are formed.
- Kaleidoscope is based on the formation of multiple images by inclined mirrors.
- The splitting of white light into its constituent colours is called disperson.
- Rainbow is a natural phenomenon based on dispersion of light.
- Important parts of the eye are cornea, iris, pupil, lens, retina and optic nerve.
- A normal eye can see distant and nearby objects clearly.
- Cataract, myopia and hypermetropia are common eye defects.
- Visually challenged persons can read and write using the Braille system. They identify things by touching and hearing. Such people develop their other senses more sharply to interact with their environment.

Exercise

A. Tick the (✓) correct option :

1. The image formed by a plane mirror is always.
   (a) laterally inverted ☐ (b) erect ☐ (c) virtual ☐ (d) all of these ☐
2. Diffused reflection will not take place through
   (a) wall ☐ (b) cardboard ☐ (c) sand paper ☐ (d) marble ☐
3. The colour which bends the least when white light passes through a prism.
   (a) red ☐ (b) yellow ☐ (c) blue ☐ (d)violet ☐
4. A person can see distant objects but has difficulty in seeing near ones. This defect is called.
   (a) myopia ☐ (b) hypertrophia ☐
   (c) cataract ☐ (d) night blindness ☐
5. Rods and cones are present in the
   (a) cornea ☐ (b) retina ☐ (c) iris ☐ (d)pupil ☐

B. Fill in the blanks with the correct word.

reflection regular rainbow same incident ray

1. The ray of light which falls on the reflecting surface is called the _____
2. Measure the angle of incidence and angle of _____
3. Image size and the object size are the _____
4. of light from a smooth surface is called _____ reflection
5. _____ is an example of dispersion of light.

C. Match the following.

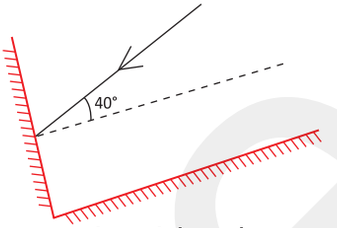
Column A	Column B
1. Cornea	(a) shows multiple reflections
2. Myopia	(b) external covering of eyes
3. Refraction	(c) imaginary line perpendicular
4. Normal	(d) corrected through lens
5. Kaleidoscope	(e) bonding of pen in water

D. Write short answers :

1. If an object is placed at distance of 5cm in front of a plane mirror, how far would it form its image?
2. How many images of a coin will be formed if it is placed between two parallel mirrors separated by a distance of 10cm?
3. What is a blind spot?
4. State the laws of reflection.
5. What are the characteristics of the images formed by a plane mirror?

E. Answer the following

1. Differentiate between regular and irregular reflection with the help of a diagram.
2. Show that the incident ray, the reflected ray and the normal at the point of incidence lie in the same plane.
3. Draw a labelled diagram of the eye.
4. Two mirrors are placed at night angles to each other. A ray of light is incident on one at an angle of 40° as shown in the figure. Draw the reflected ray from the sound mirrors.
5. Why and how can we take care of our eyes ?



CREATIVE TASK

1. Collect the pictures of various optical devices and make a project on it, with a short description of each of these devices.
2. Make a prism of your own and demonstrate the dispersion of light using the prism

Group Discussion

Discussion about some examples in your surroundings where dispersion of light can be observed.

(Hots)

1. Why do you think we get a clear image from new stainless steel utensils and not from old stainless steel utensils?
2. Your friend sits on the last bench in the class. He is all the time complaining that he cannot see the board clearly and has a headache? Can you think why?

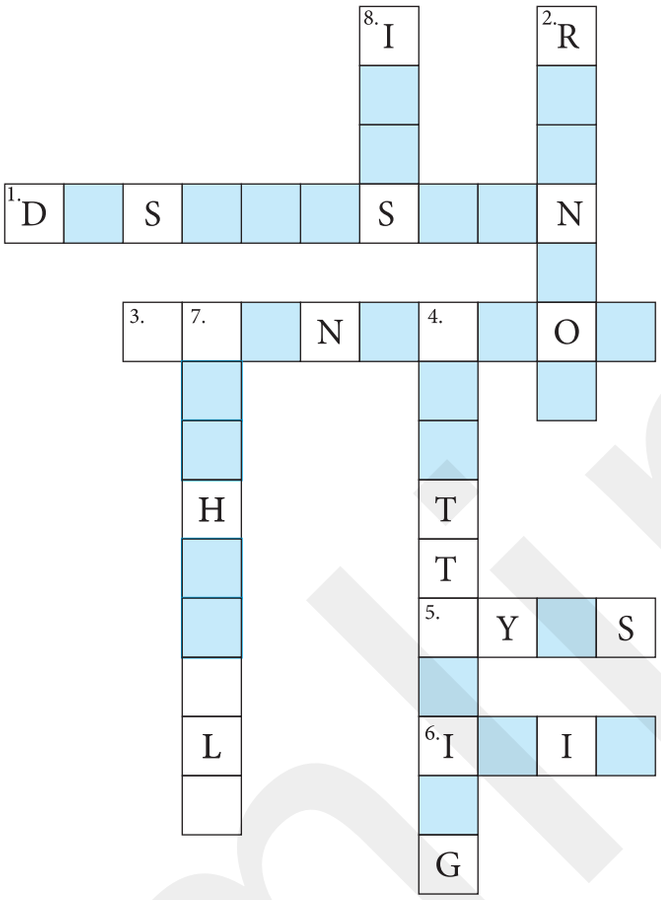
Activity to do

Solve the riddles :

1. I am black in colour.
   I always follow you.
   However hard you try,
   You cannot catch me.
   Guess who am I? .....
2. I am bow shaped and colourful.
   You see me in the sky after
   the rains.
   Guess who am I? .....
3. I am a vegetable, good for your eyes.
   My first is in sun and not in nun.
   My second is in pen as well as in play.
   My third is in ink as well as in ice.
   My fifth is neither in eye nor in nose
   My sixth is in chair and my
   last letter is in both hair and hear.
   Guess who am I? .....

Worksheet - 13

A crossword puzzle related to this lesson is given below. Take help of the clues and fill the box.



Across clues

1. Splitting of light.
3. Point of no vision
5. Sensitive and delicate
6. Dark coloured muscular structure.

Down clues

2. An example of dispersion of light.
4. Irregular reflection of light.
7. A luminous object.
8. Dark coloured muscular structure.

Aimline

Revision Test paper-I

(Based on chapters 1 to 5)

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. Which one of the following is a rabicrop ?
   - (a) Rice ☐ (b) Wheat ☐
   - (c) Maize ☐ (d) Cotton ☐
2. Who discovered the microscope ?
   - (a) Louis Posteur ☐ (b) Edward Jenner ☐
   - (c) Anton Van Lee Uwenhack ☐ (d) Charles Darutin ☐
3. Which is a thermosetting plastic ?
   - (a) Bakelite ☐ (b) Telton ☐
   - (c) PVR ☐ (d) Polythene ☐
4. Pencil lead is made of _____ .
   - (a) Graphite ☐ (b) Gallium ☐
   - (c) Copper ☐ (d) Coal ☐
5. Which product is used in day cleaning ?
   - (a) Petrol ☐ (b) Diesel ☐
   - (c) Kerosene ☐ (d) Fuel oil ☐

B. Write 'T' for true and 'F' for false statements.

1. The seeds should be sown deep in the soil. ☐
2. Rabi crop are grown in rainy season. ☐
3. All microorganisms are harmful. ☐
4. Polyester was the first man-made fibre ☐
5. Coal for is a mixture of many substances ☐

C. Give one word for each one of the following.

1. What is Transplantation ?
2. Name the Causah' ve Pathogen of bacteria.
3. Name the wonder material.
4. Name the metal which reouls most vigorously with water
5. What are petro – Chemicals ?

Revision Test paper-2

(Based on chapters 6 to10)

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. Which is required for combustion?
   (a) Oxygen ☐ (b) Nitrogen ☐
   (c) Carbon dioxide ☐ (d) Ozone ☐
2. Indian rhinoceros are found in this wild life sanctuary _____
   (a) Sariska ☐ (b) Khazirango ☐
   (c) Periyor ☐ (d) Bharatpur ☐
3. The Egg of a hen is _____
   (a) Cell ☐ (b) Tissue ☐
   (c) Organ ☐ (d) Orgun System ☐
4. Which one is not an oviparous animal ?
   (a) Hen ☐ (b) Fish ☐
   (c) Lizard ☐ (d) Cat ☐
5. Adams Apple is an enlarged _____.
   (a) Bone ☐ (b) Muscle ☐
   (c) Gland ☐ (d) Tissue ☐

B. Write 'T' for true and 'F' for false statements.

1. Combustion always product heat. ☐
2. A National park is bigger than a biosphere reserve. ☐
3. Amoeba has a fixed shape. ☐
4. Each sperm is a single cell. ☐
5. The sweat glands become more activity during puberty. ☐

C. Give one word for each one of the following.

1. Name the product of incomplete combustion ?
2. What is meant by bio-divercity ?
3. Give two example of unicellular organisms.
4. What is a Zygote ?
5. Name the hormones secreted the testes and the ovary.

Amine

Revision Test paper-3

(Based on chapters 11to14)

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. Which one is a non–contact force ?
   (a) Muscular Force ☐ (b) Frictional Force ☐
   (c) Electro Static Force ☐ (d) Mechanical Force ☐
2. Friction is a kind of _____
   (a) Pressure ☐ (b) Heat ☐
   (c) Force ☐ (d) Energy ☐
3. Sound cannot travel in _____
   (a) Air ☐ (b) Solid ☐
   (c) Liquid ☐ (d) Vaccum ☐
4. Cations are attracted to the _____.
   (a) Anode ☐ (b) Cathode ☐
   (c) electrolyte ☐ (d) Walls of the container ☐
5. Which is not a good conductor of electricity ?
   (a) Pure water ☐ (b) Tap water ☐
   (c) Vinegar ☐ (d) Lemon Juice ☐

B. Match the following.

Column A	Column B
1. Frictional Force	(a) No change in the stage of motion
2. Zero Resultant Force	(b) Pascal's law
3. Pressure	(c) Barometer
4. Hydraulic Carajck	(d) Force/Area
5. Atmospheric Pressure	(e) Contact Force

C. Give one word for each one of the following.

1. Name the standard unit of force
2. The substance applied in between the surfaces of contact to reduce friction
3. Which part of the car is funnel shopped ?
4. Write full name of LED.
5. Name one semi conductor.

Aimine

Revision Test paper-4

(Based on chapters 15to18)

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. Which of the following cannot be charged with static electricity ?
   (a) Metal ☐ (b) Conducter ☐
   (c) Alloy ☐ (d) Semi Conductor ☐
2. The image formed by a plane mirror is always_____.
   (a) Laterally inverted ☐ (b) Erect ☐
   (c) Virtual ☐ (d) All of these ☐
3. This is not part of the solar system _____.
   (a) Asteroid ☐ (b) Comet ☐
   (c) Mars ☐ (d) Sirius ☐
4. This gas decrease the Oxygen carrying capacity of blood _____.
   (a) Carbon dioxide ☐ (b) Carbon monoxide ☐
   (c) Nitrogen oxide ☐ (d) Sulphur dioxide ☐
5. Which one is not a green house gas ?
   (a) Carbon dioxide ☐ (b) Methane ☐
   (c) Nitrogen ☐ (d) Sulphur dioxide ☐

B. Match the following.

1.	Constellation	(a)	Jupiter
2.	Jovin plant	(b)	Ceres
3.	Largest asteroid	(c)	Great bear
4.	Arya bhata	(d)	36000 Km above the earth's surface
5.	Geostationary satelite	(e)	First Indian satellite

C. Give one word for each one of the following.

1. Which kind of material can be charged with static electricity
2. Name the seven colour in order as seen the spectrum ?
3. What is a constellation ?
4. Which gas is produced due to incomplete combustion ?
5. What is the process of splitting of white light into colours called ?

Model Test paper-I

(Based on chapters 1to10)

A. Answer the following questions in short.

1. Give two examples each of Kharif crops and Rabi crops .
2. What are weeds ? How do we control them ?
3. What are the majors group of microorganisms ?
4. What are antibiotics ?
5. What are synthetic fibres ? Give three examples ?
6. What is a polymer ?
7. Why are sodium and potassium stored in kerosene ?
8. What is coal gas ? Name is constituents.
9. What do you mean by carbonisation ?
10. What do you understand by explosion ?

B. Fill in the blanks.

1. The some kind of plant grown in a large area is called _____.
2. Microorganisms can be seen with the help of a _____.
3. The tiny chain like molecules are called _____.
4. _____ is the purest from of coal
5. Petrol and kerosene are _____.
6. A large variety of plants and animals exist on our _____.
7. _____and_____ are unicellular organisms.
8. The young one of a frog is called _____.
9. _____ reproduces by budding
10. The period between childhood and adulthood is called _____.

Aimline

C. Match the following

Column A	Column B
1. Bronze	(a) liquid
2. Platinum	(b) untensils
3. Copper	(c) good packaging
4. Mercury	(d) noble metal
5. Aluminium	(e) statues

D. Answer the following questions .

1. Why is plougning and levelling done ?
2. How are microorganisms useful to us ? Explain in 10 lines.
3. Why is it said 'No to plastics ' ?
4. Explain the process of formation of coal.
5. Explain three hazards of burning fuels.
6. Why do we need to conserve forests and wild life ?
7. Why is the nucleus is most important part of the cell ?
8. What do you mean by invitro fertilisation ?
9. List the changes that take place in the body during puberty.
10. What health measures should be taken to maintain good reproductive health ?

Aimline

Model Test paper-2

(Based on chapters 11to18)

A. Answer the following questions in short.

1. Electrostatic force is a contact force.
2. What is sliding friction ?
3. Write one difference between musical sound and noise.
4. Give two liquids which are good conductors of electricity.
5. What is a lightning conductor ?

B. Fill in the blanks.

1. To draw water from a well we have to _____ at the rope.
2. Friction always acts in a direction opposite to the direction of_____
3. Sounds need a _____ to travel.
4. The process of decomposition of an electrolyte on passing of electric current is called _____
5. Toemors are caused by _____ waves

C. Match the following

Column A	Column B
1. Electrolyte	(a) Positive charge
2. Wood	(b) negative charge
3. proton	(c) anode mud
4. cathode	(d) bad conductor
5. Electrolytic refining	(e) good conductor
6. Iron	(f) iron

Aimline

Test Paper-1

(Based on lessons 1-9)

Maximum Time : 2 hours **Maximum Marks : 50**

A. Tick (✓) the correct answer : **(10 Marks)**

1. The process of cutting and gathering of crops is called
   (a) transplantation ☐ (b) irrigation ☐
   (c) harvesting ☐ (d) crop rotation ☐
2. The process of conversion of sugar into alcohol by action of micro-organisms is called
   (a) fermentation ☐ (b) preservation ☐
   (c) pasteurisation ☐ (d) food poisoning ☐
3. The first fully synthetic fibril
   (a) rayon ☐ (b) nylon ☐
   (c) polyester ☐ (d) acrylic ☐
4. Which of the following can be beaten into thin sheets ?
   (a) zinc ☐ (b) phosphorous ☐
   (c) sulphur ☐ (d) oxygen ☐
5. This is not a product of coal
   (a) coke ☐ (b) coal tar ☐
   (c) coal gas ☐ (d) diesel ☐
6. Non metal that is liquid at room temperature
   (a) bromine ☐ (b) chlorine ☐
   (c) oxygen ☐ (d) iodine ☐
7. Dinosaur is an example of
   (a) threatened species ☐ (b) endangered species ☐
   (c) extinct species ☐ (d) vulnerable species ☐
8. This cell is branched
   (a) red blood cell ☐ (b) muscle cell ☐
   (c) white blood cell ☐ (d) nerve cell ☐

Aimine

9. Endocrine glands secrete chemicals called

(a) enzymes (b) hormones

(c) digestive juices (d) none of these

10. A tadpole develops into an adult frog by the proces of.

(a) fertilisation (b) budding

(c) metamorphosis (d) embedding

B. Fill in the blanks (1 × 5 = 5 Marks)

1. Paddy and maize are examples of ..... crops.
2. ..... is used for making non-stick cook ware.
3. ..... is a synthetic fibre which resembles silk.
4. ..... and ..... are stored in kerosene.
5. ..... is the only non metal that conducts electricity.

C. State whether True (T) or False (F) : (1 × 5 = 5 Marks)

1. The period of transition from childhood to adulthood is called puberty.
2. Viviparous animals lay eggs.
3. Biodiversity refers to the variety of both living and non living organisms in a specific area.
4. Petrol and alcohol are inflammable substances.
5. Plastics do not react with air and water.

D. Write short answers : (2 × 5 = 10 Marks)

1. What are the conditions essential for combustion?
2. What do you understand by malleability? Give two examples.
3. What is the function of nucleus in a cell?
4. What are endangered species? Give two examples.
5. List out the basic practices of crop production.

E. Answer the following questions : (4 × 5 = 20 marks)

1. What is irrigation? Explain two modern methods of irrigation used in India.
2. Draw a labelled diagram of a plant cell. How is it different from an animal cell?
3. Why is conservation of forest and wild life sanctuary necesary?
4. Write a short note on human endocrine system.

Aimline

Test Paper-2

(Based on lessons 10-18)

Maximum Time : 2 hours **Maximum Marks : 50**

A. Tick (✓) the correct answer : **(10 Marks)**

1. Audible range of frequency is
   (a) 20-200 Hz ☐ (b) 200-2000 Hz ☐
   (c) 20-20,000 Hz ☐ (d) above 20, 000 Hz ☐
2. The positively charged ions are called
   (a) anions ☐ (b) cations ☐
   (c) anode ☐ (d) cathode ☐
3. Which planet has rings around it
   (a) Mercury ☐ (b) Venus ☐
   (c) Mars ☐ (d) Saturn ☐
4. The white part of the eye is called
   (a) cornea ☐ (b) pupil ☐
   (c) Iris ☐ (b) sclera ☐
5. The instrument used to measure air pressure is called
   (a) manometer ☐ (b) barometer ☐
   (c) anemometer ☐ (d) volmeter ☐
6. Sound can travel through
   (a) sounds only ☐ (b) liquids ☐
   (c) gases only ☐ (c) solids, liquids and gases ☐
7. This cannot be charged easily by friction
   (a) a plastic comb ☐ (b) an inflated balloon ☐
   (c) a silk cloth ☐ (d) a copper rod ☐
8. Acid rain is caused due to oxides of
   (a) hydrogen ☐ (b) carbon ☐
   (c) sulphur ☐ (d) ammonia ☐

Anime

9. The nearest star to the earth is

(a) Sun (b) Alpha centauri

(c) North star (d) Pole star

10. The standard unit of force is

(a) Pascal (b) Joule

(c) Newton (d) atmosphere

B. Fill in the blanks : **(1 × 5 = 5 Marks)**

1. The planet which appears reddish in colour is ..... .
2. The moon moves round the earth due to ..... .
3. The distance travelled by light in one year is called ..... .
4. Sound is produced due to a ..... body.
5. Most solutions that conduct electricity are solutions of ..... and ..... .

C. State whether True (T) or False (F) : **(1 × 5 = 5 Marks)**

1. We use gravitational force to draw water from a well.
2. The force of friction acting on a car on a rough road will be more than on a smooth road .
3. If amplitude of vibration is large sound is feeble.
4. Pure water does not conduct electricity.
5. Lightning conductor cannot protect a building from lightning.

D. Write short answers : **(2 × 5 = 10 Marks)**

1. What determines the pitch of the sound?
2. Name two artificial satellites launched by India.
3. What is a Braille system?
4. Why is a crackling sound sometimes produced while taking off a sweater during winter?
5. What is meant by persistence of vision?

E. Answer the following : **(4 × 5 = 20 marks)**

1. Explain the process of lightning.
2. With the help of a diagram, explain the different parts of our eye.
3. What is acid rain? Write its effect?
4. Describe the green house effect.
5. What precautions would you take to protect yourself from an earthquake if you are outside the house?