



All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means- electronic, mechanical, photocopying, recording or otherwise without the prior permission of the publisher.



NEP 2020 FEATURES

The National Education Policy 2020 is determined to modify and broaden the approach of the learners so as to uproot the weaknesses whatsoever. This policy proposes the revision and revamping of all aspects of the education structure to create a new system that is aligned with the aspirational goals of the 21st century education.

Written by : Priti Aggarwal Edited by : Sunita Goel Designed by : S.S.Graphics



Disclaimer

Names of all products mentioned herein are used for identification purposes only and may be trademarks and/or registered trademarks of their respective owners. Publishers and author disclaim any affiliation, association, or connection, or sponsorship or endorsement by such owners. Any legal dispute, if, will be settled within Meerut jurisdiction.

Important Elements of NEP

- **SDGs for Qualitative Education :** Sustainable Development Goals for Qualitative Education introduces the learners to a most practical and valuable education system so as to quench their thirst of learning and career-building.
- **Cross-Cultural Learning:** It is a pedagogy that increases one's understanding of one's own culture in contrast to another's.
- The 4Cs : Core Learning `Skills : Critical Thinking, Creativity, Collaboration, and Communication are the 4Cs of the 21st Century Skills.
- Multiple Intelligence: The persons having systematized knowledge mainly consider multifarious prudence. Multiple Intelligence allows us to think about different types of mental strengths and abilities.
- Critical and Analytical Thinking: It includes four processes

 One has an experience of it, (ii) followed by one's reaction to it. Then is (iii) one's concept about it and finally
 (iv) application of this experience in onward such events.
- Adaptive Education : Adaptive learning offers students more control over their learning process, making them feel more empowered.
 - Life Skills : These enable one to be always gentle and vocational reflecting human values, dutifulness, sentiments etc. These are the basic traits a learner must possess to make his/her learning proper and creative.
- **Development of Traditional Knowledge :** Traditional knowledge is the knowledge, know-how, skills and practices that are developed, sustained and passed on from generation to generation.

REFACE 6

This series has been designed for the students of class 1 to 8.

The aim of this series is to introduce children to various facts of science. It ensures the overall development of the children.

In this series of books, correct balance between concepts and exercises has been maintained and the books are more colourful and the layout is more attractive. Step-by-step approach to topics and the simple language have made the series readable and interesting.

Key Features :

- Brush-up : Chapter is followed by an activity titled 'Brushup' that develops a bridge between the chapter and the previous knowledge of the students.
- Do you know ? : Interesting and amazing facts are also provided to support the inquistive nature of the students.
- Assess Zone : The exercise section 'Assess Zone' is given in accordance with the Bloom's taxonomy.
- Out of the Box : The 'Out of the Box' questions are added at the end of the chapters to encourage the scientific attitude of the students.
- Activity : It is an interesting way to learn through word search, crosswords, scrapbook activity, drawing and colouring activities.

We hope this series of books shall prove to be useful for the children and our efforts shall find favour both from the teachers as well as the students.

Any suggestions, with a view to make this series more useful, shall be thankfully acknowledged.

-Publishers



ONTENTS

H

9



000



Unit-I : Food CROP PRODUCTION AND MANAGEMENT

X Agriculture and Crop Plants

Stepping Up

- Crop Improvement
- 🔀 Agricultural Implements
- Nitrogen Cycle

- 🔀 Agricultural Practice
- 😵 Food from Animals

Agriculture and Crop Plants

Our food resources are derived from plants and animals. Cultivation of plants for food is called **farming** and rearing of animals to obtain milk, meat and eggs is called **animal husbandry**.

We obtain cereals, pulses, vegetables, fruits, edible oils, nuts and sugar from plants. To meet the food requirements of ever-increasing human population, new and advanced methods are practiced for growing food-yielding plants. The technology of food production from plants by sowing seed in the soil and obtaining, procuring and storing plant produce is called **agriculture**.

In brief, agriculture can be defined as the science of practicing farming. The term agriculture is derived from Latin words agar meaning field and culture meaning cultivate or grow.

History of Agriculture

The early man was a nomad and lived in caves. He wandered in small groups from place to place for food and shelter. He used to gather fruits, nuts, leaves, stems and roots. He also used stone tools for hunting animals and ate them raw. Therefore, the early man was called a **hunter-gatherer**.

Around 10,000 BC man by chance discovered that seeds can be sown to grow plants. This was the beginning of agriculture and also the beginning of settled life. Man settled close to river banks and water bodies, and thus farming communities developed. Gradually, man discovered tilling, planting and harvesting the right species of plants and rearing animals for his needs.

5 Science-8

Crop and Crop Plants



When only one type of plants are cultivated on a large scale at a vast stretch of land, it is called a **crop** and such plants as **crop plants**. For example, crop of maize means that only maize plants are grown in a field.

The crop refers to anything produced from soil. It may be grains, roots, fibres, vegetables, fruits or condiments. Some common crops and crop plants are given ahead.

Maize crop



Farming

Some Common Crop	Plants Grown in India
------------------	-----------------------

Crops	Crop plants	They provide
Cereal crops	Rice, wheat, maize, barley and ragi	Carbohydrates
Pulses (Legumes)	Peas, beans, grams, soyabean, urad, lentil	Protein-rich food
Fibre crops	Cotton, jute and hemp	Fibre for cloth
Oilseeds	Mustard, groundnut, sunflower, soyabean and coconut	Oils (plant fats)
Sugar crops	Sugarcane, beet root	Carbohydrate in the form of sugar
Plantation crops	Tea, coffee, coco and rubber	Beverages and rubber
Tubers	Potato, tapioca	Starch
Spices	Chillies, mint, garlic, ginger, turmeric	Spices and condiment

Horticulture crops

Vegetables, fruits, flowers for decoration and ornamental non-flowering plants are also grown on a large scale. These are called **horticulture crops**.



Common Horticulture Crops

n		
<i>Horticulture</i>	cro	ps

Crops	Crop plants
Vegetables	Tomato, cabbage, cauliflower, beans, radish, carrot, onion, potato, etc.
Fruits etc.	Mango, banana, papaya, apple, grapes, berries, cherries, plum, peaches
Ornamental plants	Rose, jasmine, marigold, dahlia, cacti, petunia, china rose, etc.

Crop Seasons



Rabi crop

All crops do not grow during the same season. Some grow in summer and others in winter. Depending on their growing season, crops in India fall into two categories : Rabi crops and Kharif crops.

Rabi crops are sown in October/November and harvested in March/April. Therefore, rabi crops are called winter crops. These include wheat, gram, peas, mustard, etc.

Kharif crops are grown during rainy season in June/July and harvested in September/October. They include paddy (rice), maize, jowar, bajra, groundnut, pulses, soyabean, cotton, etc.



Kharif crop



Agricultural Implements

The various agricultural practices need certain tools. Such tools are called **implements**. Thus, the various tools needed during agricultural practices are called **agricultural implements**.

Some commonly used implements are

Plough

• Khur

Seed drill

Khurpa

Cultivator

Plough

The **plough** is used for loosening and turning of the soil. Ploughs are made of wood or iron. Traditional ploughs, made of wood or iron, are driven by animals or by a tractor. The tractor driven plough is



called **cultivator**.

A plough contains a thick triangular iron strip called **ploughshare**. The main part of the plough is a long log of wood which is called **ploughshaft**.

• Hoe

There is a handle at the lower end of the shaft and a beam at the upper end. The beam is placed over the animal necks.

Cultivator driven by tractor Nowadays, ploughs made of iron are being used.

Fact Box

Plough has been a basic instrument for most of recorded history, although written

references to the plough do not appear in English until c. 1100 at which point it is referenced frequently. The plough represents one of the major agricultural inventions in human history.



Different parts of a plough

Hoe



The implement called **hoe** is used for removing weeds and for loosening the soil.

It consists of a long rod of wood or iron. A strong broad and bent plate of iron is fixed at one end of the long rod. This bent plate acts like a blade. At the other end of the rod a beam is attached. The beam is placed on the bullocks necks.

Seed-drill

A **seed-drill** is used for sowing the seeds. The seed-drill sows the seeds uniformly at proper distances and depths.

A seed-drill consists of a set of long vertical tubes with a funnel-shaped seedbowl at the top. The drill is attached to a plough. Seeds are placed in the seedbowl. As the plough moves, it makes furrows in the soil and the seeds are sown. It also covers the seed with soil after sowing. This prevents the loss of seeds.

Trowel (Khurpa) and Harrow

Trowel and harrow are used for loosening the soil and removing the weeds simultaneously.







Trowell (Khurpa) and Harrow



TESTING TIME

Fill in the blanks :

- 1. _____ can be defined as the science of practicing farming.
- 2. The _____ refers to anything produced from _____.
- 3. _____ and _____ are tubers.
- 4. _____ and _____ are the two categories of crops grown in India.
- 5. Hoe is used for _____ and for _____ the soil.

Agricultural Practices in Crop Production

You know that air, water, minerals, soil, and sunlight are essential for the growth of a plant. Their need is different for different crop plants. Thus, they must be provided properly to the crops for healthy growth and good output. The crops from must also be protected from weeds and pests and properly stored to prevent crop from damage and wastage. To meet these requirements and growing new and better varieties of crops, farmers perform a series of activities, in a particular sequence, over a period of time. These activities, known as agricultural practices, in crop production are as follows:

Levelling

Using Fertilizers

Modern Methods

Using Weedicide

Winnowing

- Soil Preparation
 - Tilling or Ploughing
- Selection of Seeds
- Sowing
 - Manual Sowing or Broadcasting
 Using Seed Drill
- Applying Fertilizers or Replenishing the Soil
 - Using Manures
- Irrigation
 - Traditional Methods
- Weeding
 - Manual Weeding
- Crop Protection
- Harvesting
 - Threshing
- Storage

Preparation of Soil

Preparation of soil involves the following three steps :

- a. Ploughing
- b. Levelling

Transplantation





c. Manuring

Weeding

a. Ploughing

The process of loosening and turning up of the soil is called **tilling** or **ploughing**. Traditional ploughs, made of wood or iron, are driven by animals. Nowadays, ploughing is done with tractor-driven cultivator.



Applying Manure and Fertilizers



Loosening of soil by ploughing has the following advantages :



Cultivator

b. Levelling

The ploughed land is levelled and pressed lightly with the help of a wooden plank or iron leveller.

This is done to

- Break or crush bigger chunks of dry soil into smaller pieces.
- Protect upper layer of the soil from erosion by wind or water.
- Prevent water logging and promote uniform irrigation.



Farmer levelling the land using wooden plank

c. Manuring

Mixing soil with manure is called manuring. Manure is a mixture of organic substances obtained from the vegetable and animal wastes decomposed by microbes. Manures are rich in nitrogen, phosphorus and potassium. Besides providing nutrients to soil, manure also improves the physical



conditions of the soil.

Some important and commonly used manures are :

Farmyard manure : This type of manure mainly consists of animal dung straw, leaves etc.

Turning and loosening of soil bring the nutrient- rich soil to the

It promotes growth of useful soil bacteria, earthworm etc. These bacteria provide nutrients to the soil. The organisms like earthworm further turn and loosen the soil and add humus to it.

top so that plants can use these nutrients.

It provides good aeration to the roots.

It permits easy and deeper penetration of the roots.

Green manure : It consists of agricultural waste, commonly from leguminous crops which is ploughed back into the soil.

Compost manure : Compost is made from the cattle-shed wastes and

Fact Box

Manures are generally added to the soil before sowing.

Activity-1

Preparation of compost.

- To make compost, dig a pit $(1 \text{ m} \times 1 \text{ m} \times 3/4 \text{ m})$ at a suitable site in the field or in your backyard.
- Spread dry leaves and kitchen waste at the bottom to form a 15 cm thick layer.

dry leaves etc.

- Spray a little water on it and then spread animal dung to form a layer of about 15 cm thickness.
- Repeat this process until the pit is filled.
- Cover the top layer with wet soil and dung.
- Keep the organic waste in the pit wet by spraying water over it from time to time.
- After about three months, compost is ready and can be used.



Selection of Seeds

Once the soil is ready, the farmers sow seeds or transplant crops. Care must be taken in the selection of seeds and planting materials. Healthy and good quality seeds or planting materials such as **corm**, cuttings, roots and tubers should be used in crop production. Diseased and low quality seeds reduce crop yield. Also, if infested seeds are sown in the crop fields, pests may emerge out of these seeds which may infest the crops and damage them completely. In India, National Seeds Corporation (NSC) is involved in the production of goodquality crop seeds. It has also helped in setting up seed-testing laboratories in different parts of the country.



Logo of NSC

Activity-2

Aim : To separate healthy seeds from unhealthy ones.

Materials required : A beaker, water, seed grains (wheat, barley, pea, rice, etc. can be used).

Procedure :

- 1. Take a beaker and fill it half with water.
- 2. Put some seed grains in the beaker and stir well.
- 3. Leave them undisturbed for some time.



Separating healthy seeds

Observation : Some seed grains float on the surface of water while some settle down at the bottom of the beaker. Inference : The grains floating on the surface of water tend to be lighter as they may have been damaged by insects. The grains settled down at the bottom tend to be heavier as they are healthy.

Sowing



Sowing by broadcasting (by hand)

Seeds are sown in the field by any of the two methods described below :

By scattering them in the field by hand : This method is called **broadcasting**. Broadcasting may also be done by using mechanical broadcasters.

By using seed-drills : Sowing by using a seed- drill saves time and labour. Seeds are placed in the seed-bowl. As the plough moves, it makes furrows in the soil and the seeds are sown.

Fact Box

The damaged seeds become hollow and are thus lighter. Such seeds float over water. Such seeds should not be used for sowing.

Transplantation

For certain crops such as rice (paddy), tomato, onion, chilli etc., seeds are not directly sown in the main field. In such cases, the seeds are first sown in a small seed-bed called **nursery**.



When the **seedlings** (new plants) have 4-5 leaves, then the healthy seedlings are transferred (or transplanted) into the main field.

Advantages of Transplantation :

Transplantation method has the following advantages :

- Transplantation enables selective cultivation of healthy seedlings. This results in better crop production.
- Transplantation permits better root penetration into the soil.
- Transplantation allows better shoot development.



Transplantation of paddy seedlings in the field by workers

Fact Box

Seeds should be sown at the right depth and at equal spacing. If the seeds are sown too deep in the soil, they may not germinate.

The process of shifting seedlings from the nursery to the main field is called transplantation.

Applying Manures and Fertilizers

Plants depend on the soil for their nutrients. Continuous farming on the land, exhausts the mineral nutrients in the soil. The soil should be enriched with manure and fertilizers. Manures and fertilizers are major sources of nutrients and hence, used in crop rotation.

Manures

Manures are organic materials which supply all the elements a plant needs in small amounts. The



Manure

manures add organic matter to the soil which increases waterholding capacity in sandy soil and drainage in clayey soil.

The important types of manures are farmyard manure (FYM), green manure, compost, sea manure and poultry manure.

Farmyard manure is the most valuable organic matter commonly applied to the soil. Even the poorest farmer can provide this manure to the soil. This usually consists of remnants of straw, leaves and other materials like the excreta of cattle.

The practice of turning or ploughing of green plants into the soil for the purpose of improving the physical structure as well as soil fertility is called **green manuring**. Leguminous crops like cluster beans, cowpea, horsegram, etc., are grown as green manure crops.

Compost consist of all the cattle shed wastes and all the available refuse. All these are properly mixed together and can be used as manure after decomposing or decaying.

Fertilizers

Fertilizers are inorganic materials that are used mainly to increase the essential elements in the soil like nitrogen, phosphate and potash fertilizers. Fertilizers are added to the soil in the form of





NPK fertilizers, i.e., nitrogen, phosphate and potash. Other fertilizers are calcium ammonium nitrate

(CAN), urea and super phosphate.

Fertilizers may be sprayed onto the crops by a machine called **spreader** or may be added to the soil. A knowledge of the nature of the soil (pH value) is essential before adding a fertilizer. Excessive use of fertilizers kills the soil organisms like earthworms, which improve the fertility of the soil.

Fact Box

Earthworms are called the best friends of farmers. They live underground in their burrows. By constantly burrowing in the soil, they loosen it and mix it up. This helps to drain and aerate it, and it ensures that the various nutrients are evenly spread out.



Earthworms in their burrows

You must have seen castings on the

surface of ground deposited by earthworms. These castings contain nitrogenous waste which makes the soil fertile.

	Manure		Fertilizer
1.	A manure is natural substance which is formed from dead, decaying organic matter and animal wastes.	1.	A fertilizer is a salt or an inorganic compound which is formed in factories with chemicals.
2.	A manure provides more than one nutrient to the soil.	2.	A fertilizer provides a specific nutrient to the soil.
3.	A manure acts very slowly on soil.	3.	A fertilizer is quick in action.
4.	If applied in large quantities, it does not harm the plants.	4.	If applied in large quantities, it may spoil the plants.

Differences between a Manure and a Fertilizer

Irrigation

Water is a key input for crop production. Supplying of water to the crop plants from the wells, canals or water reservoirs is known as **irrigation**. For the survival and proper development of crop plants, water is necessary. Each crop needs specific quantity of water at various stages of growth and fruiting. Irrigation from wells, tanks and canals was practiced throughout India in the ancient times. A new water-lifting device such as a persian wheel had been adopted and is still widely used. It consists of a leather bag with ropes pulled by bullocks to draw water from the wells for irrigation.

Traditional Methods of Irrigation

The various traditional methods of drawing water out from wells, lakes and canals were moat (pulley system) chain pump, dhekli and rahat (lever system). Cattle or human labour is used in these methods. These methods are cheaper but less efficient.

Fact Box

In the United States, irrigation accounts for the largest use of ground water. About 58 billions gallons of ground water are used daily for irrigation.











a. Moat

b. Chain pump

c. Dhekli

d. Rahat

Modern Methods of Irrigation

It is important to use water economically. Some modern methods of irrigation have been developed for this purpose.

Sprinkler system

This method is used where the soil cannot retain water for long or where sufficient water is not available. Rotating nozzles are attached to perpendicular pipes at regular intervals. Water is sprinkled on crop as if it is raining.



Sprinkler system

Drip system

This system involves providing water drop by drop at the roots of the plants. Thus water is not wasted. This system is practiced in regions where water availability is poor.

Traditional methods of irrigation

Irrigation depends on the nature of the crop plants (i.e., crop based irrigation). Water requirements



of different crops are different during the various stages of their growth and maturing. Some crop plants require more water, while others need less water. In crops such as wheat and maize, excess of water supply to the fields results in a condition called waterlogging. Water-logging reduces air in the soil, thereby damaging the roots. Even soil organisms get killed if water-logging persists for a long time. Water-logging increases the amount of salts in the soil and damages the soil fertility.

Drip system Weeding

Weeds are undesirable plants that grow naturally along with the crops. They compete with the crop plants for water, nutrients, space and light, therefore reduce crop yield. Some of them interfere even in harvesting beings. Chenopodium (bathua), Amaranthus (Chaulai), wild oat (javi), and grass are some common weeds which grow with almost every crop. They spread very fast. It is therefore,



Amaranthus



Chenopodium



Wild oat



Grass

Some common weeds



The process of removing weeds from a field is called **weeding**. The process of weeding may vary from crop to crop and place to place. It can be done manually or by using chemicals called **weedicide** or **herbicides**. Manual weeding can be done by pulling the weeds out by hand or by cutting them close to the ground with the help of implement such as trowel, hoe and harrow. The best time for the removal of weeds is before flowering and seed formation.

Weedicides or **herbicides** are chemicals that destroy the weeds but do not affect the main crop. The most common weedicides are 2, 4-D, dalapon, metachlor, and siniazine. They are diluted with water to the extent required and sprayed in the field by using hand sprayer or by an aircraft.



- 4. A fertilizer acts very slowly on soil.
- 5. Water logging damages the soil fertility.

Protection of Crops from Pests and Diseases

Organisms such as rodents and insects which attack and damage crops are called **pests**. Insects such as termites eat the roots of plants. Locusts fly in swarms, attacking the sugarcane and wheat crops. Pests can be controlled by spraying chemicals known as **pesticides**.



Farmer spraying pesticides

Fact Box

Due to its hazardous effect on the environment, DDT is now banned in most of the countries including India.

Pesticides include insecticides and rodenticides. Insecticides like **DDT** (**Dichloro Diphenyl Trichloroethane**), **BHC** (**Benzene Hexachloride or Gammaxene**) and malathion kill insects while rodenticides like zinc phosphide and warfarin kill rodents.

Microorganisms like bacteria, fungi and viruses cause numerous diseases in crops. For example wheat rust, wheat smut and potato blight are caused by fungi. Wilting of plants is caused by a bacterium which blocks xylem, the water conducting tissue in plants.

Fungi are destroyed by spraying fungicides like copper sulphate, Biological control of pests involves the use of an organism to kill the pests.









An aircraft spraying pesticide over a field

Fact Box

According to the survey of the National Cancer Institute, children are likely to suffer from Leukemia, when pesticides are used in the garden.

Pesticides increase the yield by killing pests. However, pests may become resistant to a particular pesticide. Further, pesticides may also enter the food chain and get consumed by human beings. They cause various skin and respiratory diseases. Hence, fruits and vegetables should be washed thoroughly before being consumed.

Activity-3

Visit various agricultural. Ask the farmers about the different pesticides they use for various crops. Make a list of these pesticides and find out the effects they have on plants. You can ask your teacher to help you.

Activity-4

Pluck the leaves and twigs of some plants. Keep them between folds of an old newspaper. Keep something heavy on the newspaper so that the leaves and twigs remain pressed between the newspaper. When they become dry, paste them on drawing sheets. Write the names and some important characteristics under each of the pressed specimen. In this way, you can make a herbarium (collection of preserved plant specimens) of common plants.

Collect parts of plants which have been infected by certain diseases. You can then make another herbarium of diseased plants.



Harvesting

Harvesting is yet another celebration of farmers when they harvest the crops. The harvesting season for different crops is different. The cutting and collecting of the matured crops from the fields is called **harvesting**. Even now in India harvesting with the help of the traditional method of sickle is done.

The crops are harvested and tied in bundles, and are kept ready for threshing. From the crops, the grains have to be separated from the chaff. Harvesting is associated with celebrations such as dances, singing, etc.

Threshing

Threshing is the process by which the grains are released from the chaff. This is done either by hand or by using animals such as bullocks or camels. The



Fact Box

Manures are generally added to the soil before sowing.



harvested crop is spread on the ground and the bullocks or camels are made to walk over them again and again till the grains come out of the chaff. Tractors are used for doing this job in modern times. The leaves and the stems of the crops get crushed into smaller pieces. Although, the grains come out of the chaff, they still remain mixed with the chaff and crushed leaves as well as the stems of the plants. The grains are then separated from the chaff, dried leaves and stems of the crops. Harvesting and threshing can be done simultaneously with the help of a machine called **combine**.



Manual threshing





Modern machine used for threshing

Separation of Grains from Chaff



To separate the grains from the chaff, they are sieved through the sieves made of grass or bamboo. Another method to separate the grains from the chaff is by **winnowing**. You are already familiar with this method. It is done by putting the mixture of the grains, chaff and hay in a winnowing scoop (supa) and dropping it from a height in the direction of the blowing wind. The grain drops to the ground in a vertical manner whereas the chaff and the hay being lighter fall some distance away and form a separate heap.

Separation of the grain from the chaff (winnowing)

Storage of Foodgrains

Crops are seasonal. To provide foodgrains throughout the year and at every place in the country, these are kept in storage. Harvested foodgrains contain more moisture. Moisture promotes the growth of fungi or moulds on grains and spoil the foodgrains. Therefore, the foodgrains should be dried before storage.

Fact Box

Dried neem leaves are put in the container in which food grains are stored to protect the grains from microorganisms and insects.

Before the foodgrains are stored, they are dried in the Sun to remove the excessive moisture. The dried foodgrains are then stored in a suitable storage.

- On the domestic level, foodgrains are stored in small containers made of tin coated iron or mud/clay.
- On commercial scale, foodgrains such as wheat, rice, gram etc., are stored either in gunny bags, or in grain-silos.

The gunny bags filled with the foodgrains are stacked in a large godown bout 60-70



Storage in open using bags covered with plastic sheets

cm away from the walls, and on the wooden platforms about 10-15 cm above the ground. Pathways



Grain storage in grain-silos

Cold Storage

(called alleys) for inspection or fumigation are provided in between the stacks.

When the quantity of foodgrains to be stored is very large, then it is stored in grain-silos.

Grain-silos are specially designed, tall cylindrical storage structures. These silos can store different stocks of foodgrain at different levels. The required foodgrain can be taken out from the openings provided in these silos.

Perishable food materials have very short shelf-life under ordinary conditions. These food materials can be stored safely at low temperatures. Lowering of temperature helps in increasing their shelf-life due to the following reasons.



Cold storage



- Low temperature slows down the growth of bacteria, yeast and moulds, and inhibits the action of enzymes present in the food material.
- Low temperature helps the food materials to retain their nutritive value.

At Or Sto A re

Transportation grains

At homes, the perishable food materials are stored in an **ice-box** or in a **refrigerator**.

On commercial scale, the perishable food materials are stored in either **deep freezers** or **cold storages**.

A **deep freezer** is a room-like cabinet maintained at low temperature by using the principle of refrigeration.

A **cold storage** is a godown-like large enclosure maintained at low temperature by large refrigeration machines.

Buffer Stock of Food

Crops are seasonal. The crop-yield depends upon many factors. Agriculture in our country depends heavily on rains. When the monsoon rains are good, we have a bumper crop. When the monsoon

fails, many areas in our country suffer from severe drought and the crop production is poor. Sometimes, heavy rains may cause flooding of agricultural fields and crops get destroyed or damaged. Thus, the foodgrain production may vary from year to year.

To ensure that the foodgrains are available throughout the year and at every place in the country, it was planned by the government to build a huge reserve stock of foodgrains so meet the emergency requirements. The huge reserve stock of foodgrains built by the



Storing grains to create buffer stock



government by purchasing foodgrain from the farmers is called the **buffer stock** of foodgrains. The branch of agriculture that deals with various soil and climatic conditions is called Agronomy. Our country has a very favourable buffer stock of foodgrains. Such a buffer stock also helps to maintain price-line of the foodgrains in the open market.

Crop Improvement

Fact Box

After having made improvement in various agricultural practices, it will be of no use if the quality of the grains is not improved. **Crop improvement** therefore, is a very important task. The scientists are now working on producing new varieties of crops with desirable features such as

The branch of agriculture that deals with various soil and climatic conditions is called Agronomy.

- Crops with more grains
- Crops with better quality of grains, and
- Crops which are disease resistant

This has been done by cross-breeding. Two plants with different desired features are taken as parent plants. The cross-breeding between them results in the new generation plants with desired features. With increasing population, the land available for agriculture is decreasing therefore, there is need to have high yielding crops. Scientists are now experimenting to develop new varieties of crops which are more resistant to the climatic changes such as drought, heat, cold, winds and also to various soil conditions.



High yielding varieties of crops

Genetic Modification of Crops

Some of the high yielding varieties of crops are :

- Wheat: Sonalika, Sonara-64, Kalyan Sona
- Rice : Jaya, Padma, IR-8, Pusa-205
- Maize : Ganga, Rankit, Deccan hybrid

In the 20th century, crops are being given desired features by modifying their genetic material. This results in production of crops having features which could not have been possible naturally. This is done in three steps :

- 1. Selecting the crop having desired character
- 2. Isolating the genetic component of that crop
- 3. Inserting this component into the crop and growing the crop infield

The production of insect resistant cotton crops, called Bt cotton, by this process is an example of commercial application of this technique.

Fact Box

Bt cotton is a genetically modified organism cotton variety, which produces an insecticide to ballworm. India is the largest producer of GMOo cotton.



Nitrogen Cycle

Nitrogen is an important constituent of proteins, the bodybuilding foods and the nucleic acids, the carriers of the genetic information from one generation to the next. However, though required for growth and development, most living organisms cannot utilize it directly, despite its 78% presence in air by volume. It has first to be transformed into nitrogen-rich compounds. The different ways used to fix nitrogen in gaseous state back into the atmosphere on decomposition of nitrogenous compound make up the global nitrogen cycle.



Nitrogen cycle

The nitrogen cycle involves three steps :

Nitrogen fixation, nitrification and denitrification. The nitrogen fixation involves the fixing of the atmospheric nitrogen into simple nitrogen compounds such as ammonia and oxides of nitrogen by the action of atmospheric factors such as lighting or by simple living organisms such as free-living nitrogen-fixing bacteria. During lighting,

Nitrogen combines with oxygen to form nitric oxide.

N ₂	+	02	\rightarrow	No
(Nitrogen)		(Oxygen)		(Nitric oxide)
It was a second second by the				···· · · · · · · · · · · · · · · · · ·

Nitrogen combines with hydrogen to form ammonia.

N ₂	+	3H ₂	\rightarrow	2NH ₃
(Nitrogen)		(Hydroger	n) (Am	imonia)



The root nodules of a leguminous plant contain nitrogen fixing bacteria

Nitrogen fixation also occurs in the root nodules of leguminous plants (pulses) by the bacteria living symbiotically in them.

The nitrification by bacterial action helps transform these simple nitrogenous compounds into nitrates that plants use to synthesize proteins. Animals depend on plant proteins to meet their protein requirements. When these proteins and other nitrogenous products are released as excretory products, they undergo either decomposition or denitrification. Decomposition replenishes the soil with simple nitrogen compounds whereas denitrification results in the release of nitrogen in gaseous state back into the atmosphere.

Fact Box

Apart from the Green Revolution, launched to increase crop production, a country-wide programme called 'Silver Revolution' was launched to increase egg production. The programme includes the introduction of high yielding breeds of hen and provision of better feed and health care. Also, the proper management of cattle and introduction of high-yielding varieties of cows and buffaloes have been implemented under a country-wide programme called 'White Revolution' or 'Operation Flood' that has resulted in an increase.



Uses of Nitrogen

Nitrogen is one of the vital elements present in atmosphere, and is required for the normal growth and development of plants. Any deficiency of its compounds results in reduced growth and development; however, there are many commercial activities where nitrogen is used such as;

- In manufacture of chemical fertilizers such as urea, ammounium sulphate and ammonium nitrate. Of these fertilizers manufactured, urea is the best because it does not bring any change in the soil pH.
- In packaging of the food stuffs such as potato chips. This is because of the *manufacturing of chemical* inert nature of nitrogen.
- In the manufacture of explosives, such as nitroglycerine and trinitrotoluene (TNT).

Food from Animals

Though we get most of our food from crop plants, animals also provide us food. The food provided by animals consists of Milk, Eggs and Meat. The food obtained from animals is very rich in proteins. In fact, animal food provides certain proteins which are not present in plant foods. Most of the food obtained from animals also contains a good amount of fat but it contains very little of carbohydrates.

Animal food, however, contains minerals and vitamins. The food obtained from animals is more expensive than that obtained from plant sources, The animals which provide us food are mainly of two types :

- Milk yielding animals (or Milch 1. animals), and
- Meat and Egg yielding animals. 2.

The examples of milk yielding animals (or milch animals) are : Cow, Buffalo and Goat. Milk is a perfect natural diet. Milk and its products (called dairy products) like Butter, Ghee, Curd and Cheese are highly nutritious foods. The examples of meat and egg

yielding animals are : Goat, Sheep, Fish, and Poultry (Chicken, Hen and Duck). Out of these animals, goat, sheep and fish give us meat. Poultry gives us meat as well as eggs. Honey is another nutritious food obtained from animals. It is obtained from insects called 'bees' (or honeybees).

Honey

Animal Husbandry

Just as each crop has its own requirements of proper coil, irrigation, manures and fertilizers and weedicides, in the same way, each domestic animal has its own needs of food, shelter, and health care. The branch of agriculture which deals with the feeding, shelter, health and breeding of domestic animals is called animal husbandry. The various practices necessary for raising animals for food and other purposes (or the elements of animal husbandry) are :

Proper feeding of animals 1.

- Proper shelter for animals 2.
- Prevention and cure of animal diseases 20 Science-8. Proper breeding of animals 3.







Nitrogen is used in the fertilizers

Milk giving animals (milch animals or milch cattle) like cows and buffaloes are reared on small scale

in rural homes. On a large scale, they are reared in big diary farms.

Fish as Food

Fish is an important source of animal food. Many people living in the coastal areas (sea-side areas) consume fish as a major part of their diet. Fish is rich in proteins. It is a highly nutritious and easily digestible food. Fish liver oil is rich in vitamin A and vitamin D. For example Cod liver oil (or Cod fish liver oil) is rich in vitamin E and vitamin D.



Fish is an important source of ainmal food

TESTING TIME

Rewrite the given statements correctly :

- 1. Wheat rust and potato blight are caused by bacteria. _____
- 2. The harvesting season for all crops is same. _____
- 3. Low temperature paces the growth of bacteria, yeast and moulds.
- 4. Ganga, Rankit, Deccan hybrid are the high yielding varieties of wheat. _____
- 5. Goat, sheep, fish are milk yielding animals. _____

Key Words :

	•••	• • • • • • • • • • • • • • • • • • • •
Agriculture	:	The practice of farming and cultivating of crop plants.
Animal husbandry	:	The rearing and caring of animal to obtain food on large scales.
Agricultural implements	:	Tools and machinery use for agricultural practices.
Crop plants	:	The plants grown and tended in a field on large scales.
Plough	:	An instrument used for ploughing.
Levelling	:	The process of making soil surface even and smooth.
Broadcasting	:	The method of sowing seeds manually by and in the field.
Compost	:	In organic nutrients formed by the decomposition of organic matters by
		microorganisms under a covered pit.
Irrigation	:	Watering the crop plants.
Harvesting	:	Cutting and gathering of crops.

Sum Up Now :

- Same kind of plants cultivated at a large stretch of land constitute a crop.
- Growing or raising crop plants is called agriculture.
- In India, rabi and kharif are two major crop seasons.
- For obtaining good crop yield, certain basic agricultural practices are necessary. These include preparation of soil, sowing of seeds, manuring, weeding, irrigation, crop protection from pests and diseases, harvesting, threshing, winnowing and storage.
- In India, National Seeds Corporation (NSC) is involved in the production of good-quality crop seeds.



- Transplantation permits better root penetration into the soil.
- The important types of manures are farmyard manure, green manure, compost, sea manure and poultry manure.
- The various traditional methods of drawing heater out from wells, lakes and canals were moat, chain pump, dhekli and rahat
- Sprinkler system and drip system are modern methods of irrigation.
- 2, 4-D, dalapon, metachlor and siniazine are the most common weedicides.
- Microorganisms like bacteria, fungi and viruses cause numerous diseases in crops. They are destroyed by pesticides.
- Our country has a very favourable buffer stock of foodgrains.
- The process of converting atmospheric nitrogen into forms usable by plants is called nitrogen fixation.
- The food provided by animals consists of milk, eggs and meat.

			PRACTICE ZONE (Assessment Of Learning Outcome))
		0	bjective Type	
	A.	Sel (1.	ect and tick (<) the correct answer : The science of agriculture includes : a. Management of plants and animals b. Management of plants c. Management of animals d. Management of humans Transplantation is done in the case of :	
14		3. 4.	a. Wheat b. Paddy c. Maize d. Barley The bacteria that fix atmospheric nitrogen are : a. Azotobacter b. Clostrodium c. Rhizobium d. All of these a. Azotobacter b. Clostrodium c. Rhizobium d. All of these 0 Wheat rust can be prevented by using : a. A functional description d. Autocadicide 0	
	В.	Fill 1. 2. 3. 4. 5.	a. An insecticide b. A rodenticide c. A fungicide d. A weedicide in the blanks : The refers to anything produced from soil. The process of loosening and turning up of the soil is called or is the most valuable organic matter commonly applied to the soil. include insecticides and rodenticide. Fish liver oil is rich in vitamin and vitamin	
	C.	Wri 1. 2.	ite true or false : A seed-drill is used for harvesting the seeds. Plants depend on the soil for their nutrients.	

- 3. Drip irrigation system is practice in regions where water availability is poor.
- 4. In India harvesting is done with the help of machines only.
- 5. The food obtained from animals is very rich in proteins.

Subjective Type

Very short answer questions :

- 1. What is agriculture?
- 2. Name some commonly used agricultural implements.
- 3. Define broadcasting.
- 4. Why do we need to protect crops from pests and diseases?
- 5. What is nitrogen fixation?

B. Short answer questions :

- 1. Summarize the history of agriculture.
- 2. Give an account of some commonly used manures.
- 3. What are the advantages of transplantation?
- 4. Define sprinkler system and drip system.
- 5. What type of food do we get from animals?

Long answer questions :

- 1. Describe any two agricultural implements in detail.
- 2. Differentiate between manure and fertilizer.
- 3. How can we protect our crops?
- 4. Write a note on the storage of food.
- 5. Describe the nitrogen cycle.

Higher Order Thinking Skills (HOTS) :

- 1. There are various methods of irrigating the crops nowadays. What in your opinion makes the sprinkler system a preferred method of irrigation?
- 2. The table below shows the productions of crops grown by a farmer on the same size of land in five successive years from 2001 to 2005. Observe the table carefully and answer the questions that follow :

Years	Crops	Production in tonnes
2001	Rice	6.5
2002	Rice	6.1
2003	Rice	6.4
2004	Maize	4.5
2005	Rice	6.0

- a. What do you think could be the reason for reducing the yield between 2001 and 2003?
- b. What do you think could be the reason for increasing the yield in 2005 as compared to 2003?



Critical Thinking

• Complete the following diagram :



Group Discussion

- 1. Traditional and modern irrigation systems.
- 2. Merits and demerits of use of pesticides and weedicides.

Playway Learning

- 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 names 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.
- 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?

Experiential Skill

- 1. Collect pictures and information on the traditional methods of irrigation used in historic times and write their advantages and disadvantages in your scrapbook.
- 2. Collect pictures and information of the old and new agricultural machines and paste in a file with their names and uses.







Unit-I : Food MICROORGANISMS: FRIEND AND FOE

X Protozoans

X Habitat of Microorganisms

🔀 Algae Food Preservation

Microbes

🔀 Viruses

Microbes are all around us. They are in the air we breathe, in the soil and in untreated water. Microorganisms play an important role in our lives. Some of these living things are very useful to us, but others may be potentially harmful. As decomposers of organic material, they help to keep the soil fertile and recycle the living matters into valuable nutrients for plants. Some microorganisms damage and spoil food products, leather, paper and paints. In this chapter, you will study about microorganisms and their significance both as useful and harmful to us.

A number of organisms whether they are small or big, can be observed easily with naked eyes. There



Microscope

Microoganisms

are also a number of living organisms that cannot be seen with the naked eyes. They can be seen only when they are magnified. The scientists have made use of **microscopes** to observe them. Microscopes of different magnifications have been used to observe these small organisms. Such living organisms are known as microorganisms or microbes. These organisms are too small to be seen with the naked eyes and can be seen only under a microscope. Microbiology is the branch of science that deals

with the study of microorganisms.

Let us perform the following activity to understand the microbes clearly.

Activity-1

Observation of microorganisms present in water :

- Collect water from different sources, like drain, well, canal, lake, pond and river in clean glass test tubes.
- Allow these samples to settle down.
- Observe first with naked eye and then with a magnifying glass.
- Put a drop of water (from each sample one by one) on a glass slide and observe it under a microscope.
- What do you observe?
- You will observe that many small organisms may be seen under a microscope. These organisms could not be seen when observed through the naked eye.
- Write the number and type of organisms observed in different sources of water.
- What conclusion can you draw from this activity?



We conclude from this activity that the water is full of living organisms.

Habitat of Microorganism

Microorganisms are found all around us in all types of habitat such as in air, on land, under the soil, under water, in hot water springs, in snowy regions and so on. There is no place devoid of microorganisms. They can survive in extreme heat and humid conditions such as hot springs, desert soil, saline water, ice-cold water, marshy lands and bottom of sea. They are also found in dead and decaying organisms, and helps in the release of minerals to the soil after the death of living organisms by decomposing them. Some live as parasite either outside or inside

Fact Box

Louis Pasteur, a microbiologist, proved that yeasts are responsible for fermentation of grape sugar.



other organisms. Some microbes are useful to us and some cause diseases and hence are harmful to us. Microorganisms can be classified into following five groups :

Bacteria
 Viruses
 Algae
 Fungi
 Protozoans

Bacteria

Bacteria are the simplest and the most primitive organisms. Bacteria have a rigid cell wall, so they are considered as plants. Bacteria are strictly unicellular and generally occur single, but some of them are found in groups. The size of bacteria ranges from 0.2 to 100 microns.

Occurrence

Bacteria are found in all the places wherever life is possible. They are in the air you breathe, the food you eat, and the soil upon which you walk. They are on almost anything you touch. A large number of bacteria also occur in animal and human bodies. Almost all bacteria need oxygen and moisture to live, but there are some bacteria which can live both in the presence or absence of oxygen and can survive in extremely cold and hot conditions.

Types of Bacteria

- 1. On the Basis of Shapes : According to their shapes, bacteria are classified as follows :
- a. Cocci: These bacteria are oval or spherical in shape. They are generally non-mobile and the smallest.



Cocci or spherical-shaped bacteria Bacilli or rod-shaped bacteria



Spirilla or spiral-shaped bacteria



Vibrio or comma-shaped bacteria

- b. Bacilli : These bacteria are rod-shaped. This is the most common shape of bacteria.
- c. Spirilla : These bacteria are spiralshaped.
- D. Vibrio : These are incomplete, short and look like commas.



Fact Box

Within bacteria are rings of nucleic acids called plasmids. These rings can be removed from a bacterium and a desired genetic trait can be added to the ring. This process is called splicing and is carried out using enzymes. The new plasmid is then placed back in the bacterium. The microbe and its new genetic trait is then cloned.

- 2. On the Basis of Nutrition : On the basis of nutrition, bacteria are divided into two groups ; autotrophic and heterotrophic.
- a. Autotrophic bacteria : Very few bacteria synthesize their own food in the presence of light and chlorophyll.
- b. Heterotrophic bacteria : Almost all bacteria have no chlorophyll, therefore, they depend on readymade food from other sources. In this category, bacteria are mostly saprophytes (drawing nourishment from the body of their hosts).



Heterotrophic bacteria

Reproduction



Bacteria normally reproduce asexually by simple fission. Fission is the reproduction of bacteria by one cell splitting into two equal cells. Before the cell splits, the contents double up. Each new cell has equal parts. However, sexual reproduction is known to occur, when living conditions are unfavourable. A bacterium may form a protective wall around it. The organism is then inactive.

Fission of bacteria

Economic Importance

Bacteria play important roles in the economy of nature and in human economy as well.

- 1. Fixation of nitrogen : Rhizobium bacteria changes the nitrogen of air into nitrate. This process is called fixation of nitrogen. These bacteria live in the nodules of roots in leguminous plants like beans, peas and pulses etc.
- 2. Decay of plants and animals wastes : Bacteria break-down the dead bodies of animals and plants by feeding on them and produce humus which helps to maintain the fertility of soil.
- 3. Food Production : Lactobacillus bacteria help in the fermentation and production of curd and cheese. Bacteria are also used in production of coffee, tea & cocoa beans.
- Digestion in animals : Escherichia coli bacteria is present in intestines of human and herbivorous animals where they help in digestion of food.
- 5. Industries : Different kind of bacteria are used for industrial benefits. As they :

Fact Box

- Bacteria play an important role in the field of genetic engineering. Diabetes is a disease in which the pancreas of the patient produces little or no insulin. Insulin made with the help of bacteria is used to treat diabetic patients.
- Disease producing microorganism are called pathogens.



- i. Help to produce wine and vinegar.
- ii. Help in making meat tender for training of skins to produce leather.
- iii. The linen threads are obtained from flax plant by a process called **retting**. Bacteria enter the stem of plant and destroy the stem tissue and loosen the fibres which are used for making threads.
- iv. Help in production of some vitamins and antibiotics.
- v. Help in production of industrial chemicals and citric acids.

Bacteria such as Mycoderma acti convert alcohol to vinegar. Alcohol is oxidized to form acetic acid by the action of a type of bacteria. Acetic acid gives vinegar its odour.

Activity-2

Aim : To observe the preparation of curd.

Take some curd. Divide it into three parts. Mix one part thoroughly to each of the following :

a. Warm milk b. Hot milk c. Cold milk

Observe the nature of the mixture in each case after 5 to 6 hours (in summer) or 1 2 -1 4 hours (in winter). Explain the difference, if any.

Warm milk	Hot milk	Cold Milk

Harmful Bacteria

Besides useful bacteria, there are many harmful bacteria. Many bacteria are pathogenic. They cause diseases in humans, plants and other animals. Some of the most dreaded of all human diseases are caused by bacteria. Some of the harmful effects of bacteria are as follows :

- 1. Food poisoning: Numerous bacteria are found in the food preparations. Some of these excrete toxic substances and cause food poisoning. This counteracted by modern methods of canning, refrigeration and freezing.
- 2. Human diseases : Many bacteria are parasites which infect the human body and cause various diseases. These include tetanus, tuberculosis, diphtheria, anthrax, leprosy, etc.

Fact Box

A German doctor named Robert Koch helped to establish the study of bacteria as a medical science. In 1876, he discovered that the bacterium that produced anthrax, a disease of cattle and humans, could be cultured in a laboratory. He also identified the bacteria that cause tuberculosis and cholera.





Retting process

3. Plant diseases : Many plant diseases are caused by bacteria. Blight of paddy, citrus canker, soft rot, bacterial rot (tundu), etc., are some diseases caused by bacteria.

Viruses

Viruses are so small that they cannot be seen with a unaided eye. When viruses are magnified with the aid of an electron microscope, more than 100,000 times they appear to have different shapes. The size of viruses ranges from 0.015 to 0.2 microns.

Occurrence

Viruses are found inside the cells of plants, animals and human beings. They obtain their food from host.

A virus

Reproduction

Viruses have some living and some non-living properties. They carry out life activities, but only when inside a living cell. They do not grow or reproduce outside an organism. They can be crystallized and stored in bottles for many years. These crystals do not grow or reproduce more viruses until they are inside living cells again.

Viruses become attached to the outside of a cell. They then inject an acid into the cell. The acids of the virus direct the cell to make new viruses. The newly formed viruses then enter and destroy other cells.

Types

Viruses, unlike other microorganisms, do not have a well body and other structures like nucleus or mitochondria. Viruses can be classified into three groups according to the type of host :

- 1. Bacterial virus that uses bacteria as a host cell.
- 2. Plant virus that uses a plant body as a host. For example, tobacco mosaic virus (TMV) grows inside the tobacco plants.
- 3. Animal virus that uses an animal body as a host. For example foot-and-mouth disease is caused by virus.



Plant virus

Viruses and Diseases

Viruses cause diseases in organisms by changing the normal activities of cells.

Viruses cause yellow vein mosaic in ladyfinger. Tobacco mosaic viruses (TMV) cause diseases in tobacco and tomato. .

Foot and Mouth disease is a highly contagious and sometime fatal viral disease of hooved animals including cattle, sheep, pigs, buffalo, goat, etc.

Diseases like poliomyelitis, chicken-pox, AIDS, mumps, common cold, influenza and measles are caused in humans by viruses.

Fact Box

AIDS is one of the most deadly disease. There is no cure for AIDS disease. AIDS patients die easily even from simple diseases because AIDS virus weakens the immunity of their body due to which their body cannot fight disease-causing germs.



Some years ago, FMDV (Foot and Mouth Disease virus) affected the cattle that resulted in the African and European countries to ban the import and export of meat and its products.

Fact Box

- No drugs that can destroy viruses have been found yet. However, drugs can be used to treat the symptoms that
 are caused by viral diseases. For many years, scientists have been researching the common cold. They have not
 developed a cure. They have found that viruses can change their forms. The common cold is caused by hundreds
 of different forms of viruses.
- Swine flu (a type of fluenza) is a human disease. The disease was originally nicknamed swine flue because the virus that causes the disease came to human frog pigs.
- Some insects and animals act as carriers of disease-causing microbes. Houseflies and mosquitoes are such insects. When flies sit on garbage and animal excreta, pathogens stick to their bodies. These pathogens transfer to the food when they sit on uncovered food. The female mosquito Anopheles acts as carrier of dengue virus.

Algae

Algae are simple plants that have no roots, stems or leaves. The algae are classified in the plant kingdom because they have several plant-like properties. Like other plants, the algae have cells walls and chloroplasts. The size of algae ranges from 1 micron to several metres in length. They are found in different shapes.





Fucus

Chlamydomonas

Acetabularia

Blue-green algae : Oscillatoria, Anabaena, blue-green algae are single celled, colonial autotrophs.

30 Science-8





Blue algae



Diatoms have many forms

Diatoms : Diatoms are marine algae which float in water due to the presence of light storage fats along with silica. They are among the most common types of phytoplankton. Diatoms are unicellular, although they can form colonies in the shape of filaments or ribbons, fans, zigzags, or stars.

Reproduction

Algae reproduce sexually as well as asexually. They also reproduce by fragmentations, which enables them to multiply quickly.



Economic Importance

- Aquatic as well as terrestrial animals including human beings consume green algae as food.
- Brown algae specially the kelp and red algae are used as fodder.
- Many brown algae when added in land increase the fertility of the soil.
- Some blue-green algae fix the atmospheric nitrogen.
- Algae like Chlorella are used in fish cultivation.
- Iodine is produced by the marine brown algae (Laminaria).
- Algin obtained from brown algae is used in the manufacture of ice-creams and in artificial silk industry.
- Agar-agar, a gelatin-like substance, is used as a solidifying agent in the preparation of medicines and some food products.
- In sewage-treatment plants, algae are used to help break down sewage into harmless chemicals.

TESTING TIME

Write true or false :

- 1. Microorganisms can be seen only under a microscope.
- 2. Microorganisms are found only in air.
- 3. Almost all bacteria depend on readymade food from other sources.
- 4. Viruses can grow or reproduce outside an organism.
- 5. Algae reproduce sexually as well as asexually.

Fungi

Fungi are a large group of organisms. More than 1,00,000 species of fungi are known. Some familiar fungi are mildew, moulds, mushrooms, rusts, smuts and yeasts. Fungi are plants-like heterotrophs. They are like plants because they are stationary. They are heterotrophic because they do not have **chlorphyll.** They obtain their food from dead organic matter or living organisms.

Occurrence

Fungi grow best in dark, most places and at moderate temperature. Therefore, they can be seen in moist **fod** material damp clothes, damp shoes and so on.

Nutrition

Fungi are non-green plants and hence cannot make their food. They are either saprophytic or parasitic. The saprophytic fungi obtain food from dead and decaying organic matter over which they grow. The parasitic fungi live in or on the body of living organisms and derive food from them. They cause various diseases in plants and animals including humans.

Reproduction

Fungi reproduce by budding and spore formation. Alongside is the figure of yeast showing the process of adding new buds. This process is known as **budding**. The bread mould reproduces by spore formation. The spores can remain alive during unfavourable conditions and on the onset of



Ice-cream



favourable conditions they germinate to form new fungi. The fungi are useful in many ways but they also cause some diseases to the plants and human beings.



Life cycle of mushroom, a fungus : (1) and (2) spoon forms, (3) The spores germinate producing threads, (4) The threads fuse together, (5) Fruiting bodies form on the tang or threads, (6) Fruiting body grows into a mature mushroom.

Economic Importance

Fungi used as food : Dried yeasts contain about 50 per 1. cent proteins. Besides, they are rich in vitamin B-complex. Therefore, they are considered to be beneficial for diabetic and heart patients. Yeasts are eaten as a source of proteins and vitamin B. Yeast is also used in making bread products, releasing carbon dioxide and causing the dough to rise. In fermentation, yeast changes sugar into carbon dioxide gas



and alcohol. By the process of fermentation, alcohol, wine and vinegar are obtained on a large scale. Louis Pasteur discovered the process of fermentation in 1857.

Activity-3

Aim : To show that yeast produces alcohol.

- Take a flask and add about 10 ml tap water.
- Dissolve about 5 gram of sugar in it.
- Mix some yeast with the solution.
- Keep the flask for 3-4 hours.
- Now taste the solutions and feel the difference of the taste with respect to tap water.
- The solution becomes alcoholic in taste. This is because sugar has been converted into alcohol due to the presence of yeast.
- The word equation for fermentation is :

→Alcohol + Carbon dioxide + Energy Sugar -(with yeast)





Activity-4

Take a piece of bread and sprinkle water over it to moisten it. Expose the bread to air and place it on a piece of brick in a dish containing some water. Invert a well-jar over it. Observe it for a few days, and record four observations in the following table :

Date	Changes in the bread		
	colour	smell	

2. Fungi in the control of plant diseases : Many fungi are helpful in controlling plant diseases caused by insects, viruses and other fungi. These fungi compete with pathogens for essential nutrients or destroy them. Some moulds are used to produce antibiotics and other drugs. The most famous of these is penicillin.

Fact Box

important plants and minimise the yield of food considerably.

The important antibiotic penicillin was discovered By sir Alexander Fleming in 1929 from a fungus called penicillium.

Harmful Fungi

Decay of wood : Some fungi grow on timber-yielding plants 1. such as sal, teak, deodar, etc. These fungi secrete decomposing enzymes and cause heart rot.

2.

Fact Box



A fungus growing on a tree trunk

Plant diseases : Some fungi infect many economically



Potato leaves infected with potato

blight disease For example, potato blight is caused by a fungus. Rust of wheat is a fungal disease which is spread by air and seeds.

The potato crop had been destroyed by the potato late blight fungus

during 1845-1846 in Ireland.

	-	
Uses of helpful fungi	Effects of harmful fungi	
1. Some mushrooms are used as food.	1. Some mushrooms cause poisoning or some time even death in humans.	
 Some moulds are used to flavour cheese. 	 Various fungi cause plant diseases such as rust and smut. 	

Comparison between helpful and harmful fungi



3.	Some moulds are used to make useful drugs such as penicillin.	3.	Some moulds cause food spoilage such as mouldy bread.	
4.	Yeasts are used to make bread, and alcohol.	4.	Some yeasts cause animal diseases such as infection.	
5.	Yeasts and moulds are used to make soya-sauce from soyabeans.	5.	Some moulds cause human skin diseases such an ringworm.	
6.	Saprophytic fungi decompose dead organisms, and recycle organic matter.	6.	Some saprophytic fungi destroy leather fabrics.	

Protozoans

Protozoans are unicellular animals without chlorophyll. Amoeba and paramecium are examples of protozoans. The size of protozoans ranges from 2 to 200 microns.

Occurrence

Protozoans live in water, soil and on decaying organic matter. Some protozoans live in other organisms as parasites.

Types

Protozoans are classified according to the way they move. Some protozoans move by changing their shape, some move using cilia, while the others move using flagella.

An Amoeba moves by changing its shape sending out pseudopodia. Pseudopodia are finger-like projections in its body. The name means false feet. A pseudopodium forms in any direction. Thus, Amoeba moves in that direction. Amoebas also use pseudopodia to obtain food, which may be other protists or bits of dead matter. When an Amoeba locates a food particle, its pseudopodia surround and trap the food particle and some water food. Food inside the vacuole is broken down to provide energy and material for the growth.



Structure of an Amoeba

Structure of a paramecium

A paramecium is covered with short hair-like structures called cilia. It uses cilia for movement. It moves through water by beating its cilia. Along one side of a paramecium is a groove lined with cilia. Food enters the cell along the groove. The food is digested inside vacuoles.



Economic Importance

- Many free living protozoans are the primary consumers in a food chain, and they feed on producers mainly the algae. They are in turn eaten by bigger animals (secondary consumers). Thus, they form an important link in the food chain.
- Some protozoans are found living in symbiotic relationship with other animals. This relationship is beneficial to both the organisms. For example, a protozoan is found in the body of termites that can digest the wood cellulose into a soluble carbohydrate. Termites can use this carbohydrate for their growth.
- Protozoans feed on many fungi and bacteria that decompose the organic matter.



Termiter

• Thus, they make an important step in the final degradation of wastes.

Fact Box

Many protozoans cause diseases in the body of man and other animals. For example amoebic dysentery is caused by Entamoeba histolytica, malaria is caused by Plasmodium vivax, kala-azar (a fever) is caused by Leishmania sp., and diarrhoea is caused by Giardia.

Food Preservation



Refrigeration

All packed food items that we buy from the market usually have their prices written on the packets. Many of them also have the expiry date written on them. Expiry date is the time or date before which a food item is suitable to be consumed. It is not advisable to consume the food items after the period of expiry as they are likey to suffer deterioration in colour, flavour, texture or nutritive value. The period of time for which a food item can be kept before it is too old to be sold is called its **shelf life**.

In other words, the shelf life of a food item is the length of time the food item may be stored without becoming unsuitable for use or consumption. Shelf life is also known as storage life.

We need to preserve foodstuffs to increase their shelf life. This can be done by preventing the food materials from rotting and keeping them free from disease-causing microorganisms. This process is called **food preservation**. Food preservation is the process of treating food in order to slow down or stop its spoilage, thereby maintaining its nutritive value, texture and flavour.

Activity-5

Collect packets or containers of different food items like milk, curd, cooking oil, spices, etc. Look for their expiry dates. Note them down on the table given below.

Food item	Method of packaging	Shelf life or expiry date	Manufacturing Date
Milk			
Curd			
Ghee			
Cooking oil			

Spices		
Jam		
Pickles		
Noodles		

Which of the food items mentioned above has the longest and which has the shortest expiry date.

The different food preservation methods kill microbes or prevent their reproduction. The chief methods of food preservation are as follows :

Refrigeration and Freezing

Refrigeration at low temperatures is a method that slows down the activity of microorganisms. Bacteria and fungi cannot thrive at low temperatures as enzymes (any of numerous proteins produced in the cells which accelerate the metabolic processes of an organism) remain inactive at a low temperature. Therefore, food takes a longer time to decay and its nutritive value is also preserved for long. Freezing is used for preserving fresh fruits, vegetables, meat and fish.

Fact Box

Placing sugar cubes in cheese containers helps to keep the cheese mould-free.

Freezing food is a common method of food preservation. It slows down food decay and checks growth of bacteria.

Generally, refrigeration and freezing do not affect the flavour or texture of the food but often cause the fruits to become mushy.

Canning

Storing the cooked and sterilised food in air-tight containers is another method of preserving it. Since canning makes the food completely sterile, it does not decay until the can (sealed container) is opened. Jams, pickles, fish, vegetables, etc. are canned and sold in the market.



Canned food

Mango pickle



Dehydrated items

Milk, soups and sauces are dehydrates to form powders. You have read that moisture is essential for the proliferation or multiplication of microorganisms. Removal of moisture is an efficient method of food preservation. This is known as **dehydration**. Dried food items which are packed in air-tight containers last for a longer time, but this process has a drawback. It alters the flavour and texture of food.

Freeze-Drying

In freeze-drying, food is frozen and kept in vacuum (in the absence of air). In vacuum, water (ice) sublimes, i.e. changes from the solid to vapour (gaseous) state directly. This process is used to make instant coffee and store fruits such as apples.



Freeze drying


Salting and Pickling



Salt acts as a food preservative. When salt is added to a food material. It loses water. Salt has the same effect on microorganisms as well. Loss of water prevents their growth and reproduction. In cold places, salted meat lasts for years. Pickling includes the use of salt and acids like vinegar (acetic acid) to preserve vegetables for a long time.

Potato chips are cooked and salted

Pasteurisation, Fermentation and Carbonation

Pasteurisation involves heating the food to a certain temperature and then cooling it suddenly. Milk is pasteurised by slowly heat to 145° F for exactly 30 minutes then cooling for 10 minutes. Besides milk, icecream and fruit juices are also pasteurised.

Ultra high temperature (UHT) pasteurisation completely sterilises a product. In UHT pasteurisation, milk is heated to 141 for one or two



Fruit juices are pasteurised

You have already studied in the chapter that yeast helps in the fermentation process. When the fruit juices are fermented, alcohol is produced.

Carbonation is done by dissolving the carbon dioxide gas in soft drinks under high pressure. Carbonation prevents the growth of bacteria.

TESTING TIME

Encircle the correct option :

- 1. Fungi are (autotropig'heterotropic) because they do not have chlorophyll.
- 2. (Fungi/Virus) are considered to be beneficial for diabetic and heart patients.
- 3. Protozoans are (unicellular/multicellular) animals.
- 4. Bacteria and fungi can not thrive at (low/high) temperatures.
- 5. (Pepper/Salt) acts as a food preservative.

Key Words :

Microorganisms	:	Tiny organisms which can be seen only through a microscope.
Microscope	:	A device that produces magnified images of small objects.
Unicellular	:	Having or consisting of a single cell.
Nucleus	:	A large dense organelles in a cell that contains the genetic material.
Bacteriophage	:	A large and diverse group of organisms, which in terms of numbers and variety
		of habitats, includes the most successful life forms.
Virus	:	An extremely small infections agent that causes a variety of diseases in plants and
		animals, such as small pox and taobacco mosaic disease.
Diatoms	:	Marine algae which float in water due to the presence of light storage fats along
		with silica.



Shelf life

Fermentation

- The length of time for which a food item remains suitable for use or consumption.
- : The breakdown of sugar molecules with the help of microorganisms to produce an acid or alcohol.

😵 Sum Up Now :

- Microorganisms are grouped as bacteria, fungi, algae, protozoa and viruses.
- Bacteria do not have a true nucleus. They may be spherical, rod-shaped, spiral or comma-shaped.
- Bacteria can be both helpful and harmful.
- Fungi are unicellular or multicellular microorganisms.
- Yeast, mildew, mould and mushroom are the four kinds of fungi.
- Fungi are parasitic, saprophytic or symbiotic.
- Algae are simple plant-like organisms. They possess a distinct cell wall.
- Algae reproduce by fragmentation or by producing spores.
- Protozoa are unicellular microorganisms which live in water and moist soil.
- Protozoa are divided into four groups depending on the type of movement shown by them.
- Viruses are cellular microorganisms which show some characteristics of both living and nonliving things.
- Food preservation techniques must be adopted to prevent food spoilage.
- Refrigeration and freezing, canning, dehyderation, freeze-drying, salting and pickling, pasteurisation, fermentation and carbonation are some common methods of preserving food.

		PRACT	CE 7	LONE		_	(Assess	MENT	O f Learning	Outcome)	
	0	bjective Ty	ре								
Α.	Sel	ect and tick (√)	the cor	rect answer :							T
	1.	These are the sin	nplest an	d the most prir	nitive c	orga	anisms.				人人
		a. Bacteria	<mark>()</mark> b.	Viruses	\bigcirc	с.	Algae	o d	l. Fungi		
	2.	Foot and Mouth	disease i	s found in :							
		a. Tobacco	<mark>)</mark> b.	Tomato	\bigcirc	с.	Hooved animals	🔵 d	l. Humans	\bigcirc	
	3.	Algin is used in t	he manu	facture of :							
		a. Butter	<mark>)</mark> b.	Ice-creams	\bigcirc	с.	Fertilisers	🔵 d	l. Fodder	\bigcirc	
	4.	Freezing is not u	sed for p	reserving :							
		a. Fresh fruits	<mark>)</mark> b.	Vegetables	\bigcirc	с.	Meat	<u> </u>	l. Pickles		
B.	Fill	in the blanks :									
	1.	. <u></u>	_ is the b	ranch of sciend	e that	dea	als with the study	of mic	roorganisms.		
	2.	Bacilli is the mos	t commo	n shape of			·				
	3.	The size of		ranges from	m 0.01	5 to	0.2 microns.				
	4.	lodine is produce	ed by the	marine brown	algae o	alle	ed				
	5.	A paramecium is	covered	with short hair	-like st	ruct	tures called		•		

C. Write true or false :

- 1. Bacteria normally reproduce asexually by simple fission.
- 2. Acetic acid gives vinegar its odour.
- 3. Rust of wheat is a fungal disease spread by air and seeds.
- 4. Protozoans do not play any role in degradation of wastes.
- 5. Dehydration increases the flavour and texture of fod.

D. Match the micro-organisms in column A with their action in column B :

- Α
- 1. Bacteria
- 2. Rhizobium
- 3. Lactobacillus
- 4. Yeast
- 5. A protozoan
- 6. A virus
- 7. Penicillium
- Subjective Type

A. Very short answer questions :

- 1. What are microorganisms?
- 2. Microorganisms are classified into which five groups?
- 3. Name some diseases caused by viruses in humans.
- 4. Define protozoans.
- 5. What do you mean by shelf life?

B. Short answer questions :

- 1. Where can we find bacteria?
- 2. What are fungi?
- 3. State some harmful effects of fungi.
- 4. What is food preservation?
- 5. Define the process of freeze-drying.

C. Long answer questions :

- 1. With the help of an activity prove that water is full of living organisms.
- 2. Give an account of harmful effects of bacteria.
- 3. State the economic importance of algae.
- 4. Describe the types of protozoans.
- 5. Describe any two methods of food preservation.

D. Higher Order Thinking Skills (HOTS) :

- 1. How are viruses different from other microorganisms?
- 2. Why does curd set much faster in summer than in winter?
 - 39 Science-8

a. Fixing nitrogen

R

- b. Setting of curd
- c. Baking of bread
- d. Causing malaria
- e. Causing cholera
- f. Causing AIDS
- g Producing antibiotics



Group Discussion

- 1. Why can microorganisms live in any kind of environment?
- 2. Why do we need to increase the shelf life of different food items?

Playway Learning

- (i) Take an empty cold drink bottle made of plastic.
- (ii) Take 1 cup of warm water. Add 5 teaspoon 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 balloon (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 **alcoho** 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 anything? Lime water turns milky. This shows the presence of carbon dioxide.

Experiential Skill

- 1. Visit a place where water remains flowing or a place around a well which remains wet all the year round. You may find the floor covered with blackish or slippery algae growth. This is blue-green algae.
- 2. Visit old monuments in and around your place. You may find their domes covered with blackish growth. Which algae growth it can be?

Unit-II : The World of Living COAL AND PETROLEUM

Inexhaustible and Exhaustible Natural Resources
Petroleum, Natural Gas and Compressed Natural Gas

🔀 The Minerals 🛛 🛛 🔀 Coal

🔆 Conservation of Fossil Fuels

Natural Resources

We use a variety of things in our daily lives to fulfill our basic needs. Many of them such as food, wood, coal, air, water are natural, others such as clothes, household items, office gadgets, etc. are man-made. Things occurring naturally on, above and under the surface of the Earth are known as **natural resources**. They include land, water, forests, animals, minerals and sources of energy like coal, petroleum and gas.



We cannot make them rather we use and modify natural resources in ways that are beneficial to us.

Natural resources

Can you describe the ways we can use the following natural resources. Two have been done for you.

Natural Resource	The way we use it
Air	
Coal	
Oil	Electricity, fuel for cars and airplanes, plastic
Natural gas	
Animals	
Plants	
Sunlight	
Water	
Minerals	Wire, coins, cooking utensils, machinery, jewellery



Stepping Up

X Natural Resources

X Products of Coal

Inexhaustible and Exhaustible Natural Resources

Some of the resources described above can be exhausted by the use of human activities. While others cannot be exhausted as they are replenished within a reasonable period of time through natural processes. Thus on the basis of the availability of various resources in nature, natural resources can be classified into two main groups **inexhaustible and exhaustible natural resources**.

41 Science-8

Inexhaustible Natural Resources

The resources which are present in an unlimited quantity in nature and are not likely to get exhausted by human activities are called inexhaustible natural resources.

Examples : Wind, Water, Sunlight, etc. are **inexhaustible natural** resources.

Fact Box

Coal and petroleum are not only the source of energy, but also the major source of a large number of industrial chemicals used in the manufacture of fertilizers, plastics, dyes, synthetic fibres etc.

Exhaustible Natural Resources

The resources which are present in a limited quantity in nature and are likely to get exhausted over a certain period of time are called **exhaustible natural resources**.

Examples : Petroleum, Coal, Natural gas, Forests, Minerals, Wildlife etc. are exhaustible natural resources.







The Minerals

Minerals are the backbone of industry. Most minerals are obtained from lithosphere (the upper layer of the Earth). Some important minerals are,



Some minerals found in the Earth's crust





- These minerals were formed due to very slow processes taking place inside the Earth.
- These minerals are distributed in the Earth's crust differently.
- These minerals are mined from the Earth, and processed to obtain useful products.

In the last few decades, the consumption of minerals has increased rapidly. Since minerals are the non-renewable resources, these cannot be replenished easily.

Therefore, we should use minerals judiciously and economically so that these could last longer.

Coal

Coal 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. Nowadays, it is used in thermal plants to produce electricity. Many industries use coal as fuel.



Coal

How Coal was Formed

Coal was formed by the decomposition of large land plants and trees buried under the Earth about 300 million years ago. This happened as follows : About 300 million years ago, the Earth had dense forests in low-lying wet land areas. Due to natural processes like earthquakes, volcanoes and floods, etc.,



Formation of Coal

these forests were buried under the surface of Earth. As more soil deposited over them, they were compressed. The temperature also rose as they sank deeper and deeper. Due to high pressure and high temperature inside the Earth, and in the absence of air, the wood of buried forest plants and trees was slowly converted into coal. The slow process by which the dead plants buried deep under the earth have become coal is called **carbonisation**. Since coal was formed from the remains of plants, therefore, coal is called a fossil fuel.

Coal is a Source of Energy

Coal is mainly carbon. When heated in air, coal burns and produces mainly carbon dioxide gas. A lot of heat energy is also produced during the burning of coal. This can be written as :

Carbon +	Oxygen	\longrightarrow	Carbon dioxide	+	Heat
(Coal)	(From air)				

Coal is important because it can be used as a source of heat energy as such (just by burning it), or it can be converted into other forms of energy such as coal gas, coke or electricity. The leal source of energy of coal is the solar energy (or Sun's energy). This is because the plants and trees which decomposed to form coal grew on the Earth by absorbing sunlight energy during the process of photosynthesis.

Uses of Coal

(i) Coal is used as a fuel in homes and industry.



- (ii) Coal is used to make coal gas which is an important industrial fuel.
- (iii) Coal is used as a fuel at Thermal Power Plants for generating electricity.
- (iv) Coal is used to make coke.
- (v) Earlier, coal was used as a fuel to make steam to run steam engines of trains.
- (vi) Coal was used as a source of organic chemicals.

Varieties and Deposits of Coal

With the passage of time as the decomposed remains sank deeper and deeper, they got exposed to more heat and pressure. This drove the gaseous and fluid substances out from the remains. This increased their carbon content. On the basis of amount of carbon content in it, coal can be classified into four main types. The higher the carbon content of coal, the bigger is its calorific value 1.

Peat : It is the first stage in the formation of coal. Peat is soft and easily compressed. It is composed mainly of marshland vegetation and is formed by the action of bacteria on these plants. It has the lowest carbon content (50-60%). Hence its calorific value is low. It is considered an inferior type of coal.

Lignite : It tends to be relatively young coal deposit which is not subjected to extreme heat and pressure. It is also low in carbon content (60-70%) and hence produces low energy. It appears more like soil than rock and disintegrate our disintegratte when exposed to weather. It is high in moisture content. It is generally used at power plants to produce electricity. It is also called the brown coal.,

Bituminous coal : Also called the domestic coal, it is the most commonly used coal. It is formed in greater depths. The heat produced by it is nearly 2 to 3 times more than lignite. It is also an important fuel for steel and iron industries. It is soft and black. The amount of carbon content in it is 70-85%.

Anthracite : Formed very deep, it is the best quality coal. It is hard, black and lustrous coal. The carbon content in it is the highest of all the varieties of coal (85-97%).

Apart from carbon, coal contains some compounds of nitrogen and sulphur as well.



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

Products of Coal

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

Coke

Coke is a hard, dry fuel produced by heating bituminous coal to a very high temperature in the



absence of air. It is almost pure form of 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 thick, black, tarry, opaque liquid obtained as a by product of the process of the manufacturing coke. It has an unpleasant smell. It is not a single compound, but a mixture of about 200 substances.

Coal Tar



Thermal Power Plant

44 Science-8

It is 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 nowadays bitumen, a petroleum product is being used.

Coal Gas

It is a gaseous fuel obtained as a by product of the process of manufacturing coke. It consists 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 as a fuel in many industries situated near the coal processing plants.

TESTING TIME

Write true or false :

- 1. We use and modify natural resources in the ways that are beneficial to us.
- 2. Petroleum and coal are inexhaustible natural resources.
- 3. The minerals are distributed in the Earth's crust differently.
- 4. Coke is a mixture of about 200 substances.
- 5. Coal gas is used as a fuel in many industries situated near the coal processing plants.

Petroleum

Petroleum oil is found beneath the layers of rocks. It is a viscous dark coloured liquid which 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 absence of air over millions of years, transformed the dead organisms into petroleum and natural gas.

Actual composition of petroleum (or crude oil) depends upon the place of origin. Petroleum is a complex mixture of a large number of organic compounds of



Petroleum and natural gas deposit

different types mixed with saline water and silt. Petroleum is also known as black gold because of its high cost. Petroleum layer and natural gas layer is above that of water as is 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.

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







Old Refinery

Various constituents of pertoleum and their uses

S.No.	Constituents of Petroleum	Temperature Range	Uses
1.	Petroleum gas	Below 40°C	Domestic fuel
2.	Petroleum ether	40° -70°C	Solvent, dry cleaning
3.	Gasoline	40° -100°C	Motor fuel
4.	Kerosene	170° -250°C	Fuel, illuminent
5.	Diesel	250° -350°C	Fuel
6.	Lubricating oil	Above 400°C	Lubrication
7.	Paraffin wax	Above 400°C	Candles, vaseline, grease
8.	Pitch or tar	Above 400°C	Surfacing roads
9.	Petroleum coke	Above 400°C	Fuel, electrodes

In India, petroleum refineries are located in Mumbai, Cochin, Chennai, Visakhapatnam, Haldia, Barauni, Guwahati, Digbad and Mathura. These days petroleum is mined by drilling holes in the seabed.

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

Fact Box

The world first oil well was drilled in Pennsylvania, USA way back in 1859.

Natural Gas and Compressed Natural Gas

Natural gas is another fossil fuel that occurs along the crude oil. It is also formed due to the slow decomposition of fossils. It is easy to transport it through the underlined pipes. It consists of methane. It burns completely. When it burns, it releases carbon dioxide and water and a large amount of heat.

It releases more energy than any other fuel. It produces the least amount of carbon dioxide as it burns completely. It also occurs in larger amounts as compared to oil and coal. Natural gas is

stored under high pressure as compressed natural gas (CNG). It is used in heating, cooking, power generation, motor vehicles and to produce nitrogen for fertilizer, and carbon black for use in the tyre industry.

Use of natural gas is advantages as it can be supplied through pipes directly for use as fuel at households and factories. Natural gas is also used in manufacturing a number of chemicals, fabrics, stell, plastic, fertilizers and paints.



CNG-an environment-friendly fuel



A CNG-driven autorickshaw (TSR)





Conservation of Fossil Fuels

Keeping in mind the limitations of fossil fuels, the need of the hour is to conserve them to the extent possible. They cannot be renewed through a rapid cycle. We have seen that it takes millions of years for the dead organisms to get converted into fossil fuels. The reserves of petroleum, natural gas and coal will last only for 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 try to use 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 constant and moderate speed.
- Switch off engine at traffic lights or at 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 also a major cause of air pollution which in turn causes global warming. So, minimise the use of fuels.



TESTING TIME

Fill in the blanks :

- 1. Petroleum is found beneath the layers of _____?
- 2. _____ is also known as black gold.
- 3. Kerosene is used as _____ and _____.
- 4. It is easy to transport _____ through pipelines.
- 5. _____ cannot be renewed through a rapid cycle.

🔍 Key Words :		
Fossil fuels	:	The fuels derived from dead remains of living matter when buried inside the Earth for millions of years
Natural resources	:	The resources found in nature.
Man-made resources 1	:	The resources made by human.
Coal	:	A solid fuel formed by the carbonisation of prehistoric plants over millions of years ago.
Carbonisation	:	The process of conversion of plants and animals buried inside the Earth to coal
Petroleum	:	A complex mixture of hydrocarbon, also called crude oil.
Destructive distillation	:	Heating coal to high temperature (about I,000°C) in absence of air.

Sum Up Now :

- 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.



		2. The major component of CNG is :	
		a. Methane 😑 b. Hydrogen 😑 c. Carbon monoxide 🔵 d. Butane	
		3. The gas which occurs above the petroleum oil trapped under the rocks is called :	
		a. Biogas 🛛 b. Natural gas 📄 c. Coal gas 📄 d. Methane 📄	
		4. Which of the following is not obtained as a fraction during the refining of petroleum?	
		a. Kerosene 😑 b. Lubricating oil 😑 c. Bitumen 😑 d. Natural gas 😑	
ſ	B.	Fill in the blanks :	
		1. resources are not likely to get exhausted by human activities.	
		2. Most minerals are obtained from	
		3. Coal gas is an excellent fuel.	
		4. Petroleum is separated into useful substances by	
		5 releases more energy than any other fuel.	
(С.	Write true or false :	
		1. Not all natural resources can be exhausted by the use of human activities.	
		2. Most of the minerals are obtained from the seabed.	
		3. Coal is one of the earliest used fossil fuel.	
		4. Petroleum is found beneath the layers of rock.	
		5. We should use inferior quality petro and engine oil.	A
		Subjective Tupe	\bigcirc
•			
1	Α.	Very short answer questions :	S2)=
		1. What are natural resources?	\$\$\/\/
		2. Name the four varieties of coal.	N A
		 Where do we found petroleum? Define fractional distillation? 	
		4. Define fractional distillation:	
	D	Short answer questions :	Π.
	D.	1. What are inexpansible natural resources? Cive suitable examples	ЦД
		2 Give some characteristics of minerals	
		 Describe how coal was formed? What is this process called? 	
		4. What are the major products (or fractions) of petroleum refining? Give one use of any two	
		petroleum products.	
		5. What is CNG? State its one use.	
(C.	Long answer questions :	
		1. Give an account of natural resources.	
		2. Write a note on coal as a source of energy?	
		3. Describe the formation of petroleum.	
		4. How can we conserve fossil fuels?	
	D.	Higher Order Thinking Skills (HOTS) :	
		1. The fossil fuel P is formed under the Earth by the decomposition of vegetable matter lying under	

water by the action of anaerobic bacteria. The major component of fuel P is Q. The fossil fuel P is

49 Science-8

used as a source of gas R needed to manufacture nitrogenous fertilizer. When P is filled in metal cylinders and used as a fuel in motor vehicles, it is called S. What are P, Q, R and S?

2. Why do you think petroleum is known as black gold?



[(PHYSICAL MEDIA DEVELOPMENT (PMD)]

Critical Thinking

• Complete the following diagram :



Playway Learning

- Make Bees Wax Lip Balm
 - 2 Table spoon coconut oil
 - 1 Table spoon bees wax
 - 1/2 Table spoon honey
 - 1/4 Table spoon baking soda
- (i) Place coconut oil and bees wax 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.

Group Discussion

• Discuss with your mother how she uses LPG in the kitchen. If her procedure is not correct, check it, then give report to your teacher.

Experiential Skill

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



COMBUSTION AND Flame

Stepping Up

- Combustion
- 🔆 Types of Combustion

- st Conditions Necessary for Combustion
- 🔀 Flame

- ¥ Controlling Fire ¥ Fuel
- Have you ever wondered why a candle burns when a lighted matchstick is brought near it? What burns in the candle, the wick or the wax or both? Can the wax of the candle burn without the wick? A thin wooden stick burns easily whereas a thick log of wood does not catch fire easily. Coal does not burn with a flame but becomes red hot and gives heat and light both. A magnesium ribbon burns with a very bright

Pollution and Pollution – related Problems Caused by the Combustion of Fuels

burn with a flame but becomes red hot and gives heat and light both. A magnesium ribbon burns with a very bright white light whereas LPG (Liquefied Petroleum Gas) burns with a blue flame.

Commonly used fuels

In this chapter, you will study the process of burning, the kind of flame reproduced during burning and the role of different kinds of fuels in the process of burning. Fuels are used in day-to-day life for various activities like cooking, running automobiles, in the factories and for many other purposes. The commonly used fuels are coal, wood, petrol, LPG, diesel and CNG. In rural areas cow dung cakes are also used as fuel.



Combustion

С

Combustion is the process of burning of a substance in the presence of oxygen. During the process of burning, heat and light are evolved. For example charcoal burns in air to give carbon dioxide and heat.

0

Magnesium burns with bright white light

Products of Combustion

Carbonaceous fuels undergo incomplete combustion in insufficient amount of air or oxygen and form carbon monoxide, soot, water, heat and light. The fuels undergo complete combustion in adequate supply of air or oxygen and form carbon dioxide, water, heat and light.

Fact Box

The food we eat is a fuel which upon combustion produces energy for our body.

Heat

CO





Similarly, natural gas or methane burns in air and forms carbon dioxide, water vapour and heat.

 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + Heat$

When magnesium ribbon is burnt in air, it gives off a bright while light in the form of a white glow and produces a white powder of magnesium oxide.

 $2Mg + O_2 \rightarrow 2MgO$

In the above reactions, the substances that undergo combustion are called **combustible substances** or **fuels** like charcoal, natural gas, etc. Fuels may be in solid, liquid or gaseous form.

A substance burns above its ignition temperature or kindling temperature. The **ignition temperature**, therefore, is the temperature at or above which a substance starts burning. Every substance has a definite ignition temperature which may be as low as 35°C (white phosphorus) or as high as 260°C (red phosphorus). Since the ignition temperature of white phosphorus is so low that it catches fire on even slight heating, it is stored immersed in water. Red phosphorus, on the other hand, may be stored in ordinary bottles.



Burning of wood



Conditions Necessary For Combustion

The three conditions necessary for combustion are :

- (i) Presence of a combustible substance.
- (ii) Presence of a supporter of combustion.
- (iii) Attainment of ignition of kindling temperature of the combustible substance.

Conditions for combustion

Combustible and Non-Combustible Substances

It is necessary for a combustible substance to take place. All substances cannot be burnt. For example water, sand, iron nails, stones, glass etc. Such substances are called **non-combustible substances**. Water and sand are used to extinguish fire.

Substances such as paper, wood, kerosene, cloth, etc. catch fire on heating in air and are categorized as **combustible substances**.

While paper, kerosene and cloth can be burnt by slow heating, wood requires strong heating for burning. A thin piece of paper can be burnt easily whereas a thick cardboard piece requires strong prolonged heating for burning.

Presence of Supporter of Combustion

Supporter of combustion, i.e., oxygen must be present in sufficient quantity for combustion to take place. Let us perform activity to understand this.



Using water as fire extinguisher



Activity-1

Aim : To prove that air oxygen is the supporter of combustion.

Light a candle and cover it with a glass jar or beaker as shown in the figure.

What do you observe? Why does the candle stop burning after some time?

Oxygen is the supporter of combustion.

The candle burns till oxygen is present in the air inside the inverted glass jar and it extinguishes when no more oxygen is left inside.

Ignition or Kindling Temperature

Oxygen is the supporter of combustion

Does a matchstick burn on its own at room temperature? Why does it start burning when its tip is rubbed against the side of the match box? Why does a piece of paper catch fire easily whereas a log of wood requires kerosene oil to start burning?

Actually different substances burn at different temperatures.

In Activity 1, you have observed that not all substances are combustible but substances like petrol, LPG, alcohol, etc. catch fire easily. This is because their ignition temperature is low. Such substances are called **inflammable substances**.

Activity-2

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. 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.



Paper cup

Heating water in a paper cup

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.

Combustion is of two kinds

- Complete combustion
- 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



Incomplete 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 are 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





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 is put off. Water vapour formed due to the heat of the fire cuts off the supply of oxygen. The fire is extinguished.

Fire men

Do not use water over burning kerosene, petrol or diesel. This is extinguishing fire with the help of water because oil is lighter than water. They will form a light layer on water. The fuel will continue to spread to other areas, as the oil will flow along with water. Water should also not be used in electrical fires. Water is a conductor of electricity and can cause electrocution. Do you know, why a person whose clothes have caught fire, is wrapped in a thick blanket. The blanket helps in cutting off the Use Of blanket supply of oxygen.



Use of blanket



Use of Fire Extinguisher

Fire extinguishers make use of carbon dioxide gas as it is not a supporter of combustion. Carbon dioxide being heavier than oxygen envelops the fire and cuts off the supply of oxygen. The fire, thus, extinguishes in absence of the supporter of combustion. Generally, carbon dioxide also does not harm the electrical appliances.

CO₂ can be stored at high pressure as a liquid in cylinders just as LPG is stored in

Fire Extinguisher



cylinders. When CO₂ 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 CO₂ 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 four types of combustion :

1. Rapid combustion : Combustion that takes place at a very fast rate is called rapid combustion. In this type of combustion, both heat and light are released.

Examples :

- a. Burning of LPG b. Burning of petrol
- c. Burning of dry grass
- d. Burning of a matchstick
- e. Burning of a magnesium ribbon or wire.
- 2. Slow combustion : Combustion that takes

place at a slow rate with steady production of heat is called slow combustion.

Examples :

- a. Rusting of iron
- b. Bright shining surface of copper becoming dull
- 3. Spontaneous combustion : Combustion that occurs without the aid of any external heat is known as spontaneous combustion.

Examples : Sodium and white phosphorus catch fire without any external heat. These substances undergo slow oxidation by air and during this process heat is evolved. This heat accumulates in the substance till its ignition temperature is attained. At this point, it burns spontaneously.

Respiration is also a kind of combustion. Food reacts with oxygen in very large number of cells in our body and releases energy to sustain life processes.



Burning of matchstick







White Phosphorus

Fact Box

About 500 years ago, small pieces of pinewood dipped in sulphur were used as matches in ancient Egypt. About 200 years ago, a mixture of antimony trisulphide, potassium chlorate and white phosphorus with some glue and starch was applied on the head of a match made of suitable wood. When struck against a rough surface, white phosphorus got ignited due to the heat of frictions and, thus, the combustion of the match started. However, white phosphorus proved to be dangerous for both the workers working in the manufacturing and for the users.

Today, the head of safety match contains only antimony trisulphide and potassium chlorate. The rubbing surface has mixture of powdered glass and red phosphorus. When struck against the rubbing surface, some red phosphorus on



Burning of LPG



56 Science-8

reacting with potassium chlorate produces heat that is enough to ignite antimony trisulphide. Thus, the combustion starts.

Activity-3

Aim : To show that white phosphorus undergoes slow oxidation.

Take a piece of white phosphorus. Dry it with a blotting paper. Take some carbon disulphide solution in a beaker and put the piece of phosphorus into it. Stir it till the phosphorus gets dissolved completely. Now soak a filter paper with this solution of carbon disulphide and phosphorus. Hold the filter paper with a pair of tongs and wave it in the air. You will notice as the carbon disulphide gets evaporated, the filter paper bursts into flame. Why has it happened? It is because of the slow oxidation of white phosphorus.

Explosion : Sometimes, a large volume of gas is liberated in combustion besides the production of heat and light. The sudden evolution of large quantities of gas creates excessive pressure that produces a load noise. Such combustion is known as an explosion. Bursting of crackers is the best example of **explosion**. The same type of combustion is used for exploding rocks and mountains for making roads, and the explosive used is dynamite.

used is

Fact Box

Explosive are substances or devices that can produce a volume of rapidly expanding gas in an extremely brief period. For example when gunpowder burns, lots of heat is released quickly. The gases produced rapidly expand making an explosion. Fireworks contain compressed gunpowder that quickly burns.

Firework

TESTING TIME

Rewrite the given statements correctly :

- 1. During the process of burning, heat and light are absorbed.
- 2. Charcoal and natural gas are non-combustible substances.
- 3. Water and sand support fire.
- 4. All substances burn at same temperature.
- 5. Water is an insulator of electricity.

Flame

A **flame** is a region where combustion of fuel takes place. Different flames burn with different colours. A matchstick burns with a yellow flame, whereas an LPG flame burns with a blue flame. Magnesium ribbon burns with a dazzling white flame. Kerosene lamp has a yellow and smoky flame but has a blue and smokeless flame when burnt in a stove.

Flame is a region where combustion takes place. Colour of a flame depends upon the temperature, amount of available oxygen and the nature of the combustible substance. Only solid and liquid



Explosion



fuels which vapourise on heating burn with a flame. Kerosene (liquid fuel) and wax (solid fuel) both vapourise during burning and form flames. Charcoal does not vapourise and hence does not burn with a flame. However, all gaseous combustible substances burn with a flame.











Matchstick

Flame of a kitchen stove

Burning magnesium ribbon

A kerosene lamp



Hottest part

Least hot

Wax candle

Activity-4

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 vapours that burn and produce flame and not the liquid wax.

Various Zones of a Candle Flame

There are three zones of a candle flame.

- The outer zone 1.
- The middle zone 2.
- The innermost zone 3.

Middle zone of partial *combustion* (yellow)

combustion (blue)

Outer zone of complete

Innermost zone of unburnt wax vapours (black)

The Outer Zone

The outer zone of the flame is called the non-luminous zone or the zone of complete combustion. Complete combustion takes place here as the wax vapours can get sufficient oxygen from the air. Due to complete combustion, this zone is blue in colour and no residue is left on the objects that come in contact with this zone. This is the hottest zone and is faintly visible.

Activity-5

Aim : To show that the outermost zone (Non-Luminous Zone) of a Flame is the Hottest

Take a long copper wire and hold its one end with a pair of tongs. Introduce the other end of copper wire just inside a burning candle flame so that it is in the outermost zone (non-luminous zone) of flame (as shown in Figure). Keep the copper wire in this position for about 30 seconds. We will see that the part of copper wire which is in the outermost zone of the flame become red hot. This tells us that the outermost, non-luminous zone of a flame has a high temperature. In other words, the non-leguminous zone (or outermost zone) of a flame is the hottest part of a flame.





The candle flame



The Middle Zone

Luminous zone or the **zone of incomplete combustion** is the pale yellow coloured zone. It is moderately hot middle zone of flame. Here, the wax vapours do not get enough oxygen to burn completely. Carbon monoxide and some carbon particles are formed due to partial combustion. Some carbon particles are also left unburnt. These unburnt carbon particles become white and make the flame yellow in colour. This zone leaves black soot or carbon particles as residue on the objects that come in contact with this zone.

Activity-6

Take a piece of metal and hold it with a pair of tongs in the non-luminous zone and then in luminous zone of a **fame.** Observe it after a minute. No black substance is noticed in non-luminous zone and black soot is observed in case of luminous zone. This indicates that in non-luminous part, complete combustion of gaseous products takes place and incomplete combustion takes place in the luminous part.

The Innermost zone

Dark zone or the **zone of no combustion** is the area around the wick, which is black in colour due to which it is called the **dark zone**. In this zone, no combustion takes place as there is no oxygen available for burning as it is the innermost zone of the flame. It mainly consists of wax vapours.

Now, you will understand why goldsmiths 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

Most of the substances used for burning are fuels. Substances that produce heat and light energy on burning are called **fuels**. Some commonly used fuels are wood, charcoal, petrol, kerosene, etc.

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 no 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	Methanol	Biogas
Charcoal	Butanol	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.

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	Biogas	35000-40000				
Diesel	45000	Hydrogen	150000				

Calorific Values of Different Fuels

Pollution and Pollution-related Problems caused By the Combustion of Fuels



Pollution by industries

All carbon-containing fuels, such as wood, coal, petrol, diesel, kerosene, LPG, when burnt produce gases like carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur. In addition to these gases, generally in most solid fuels, smoke is also produced. These gaseous products and unburnt carbon particles cause **air-pollution**.

The solid fuels, such as wood, coal, after burning also leave behind ash. This ash, if not disposed off properly, may cause air and water pollution.

Pollutants in the air cause many diseases and reactions in human beings. Effects of the various pollutants on human beings are summarized below :

	Air pollutant	Effects	5
1.	Dust	Allergic reactions	
2.	Smoke	Respiratory problems	
3.	Carbon monoxide	Respiratory problems, may even lead to death	
4.	Carbon dioxide (excess)	Greenhouse effect : atmospheric temperature rises	
5.	Oxides of sulphur	Damage lungs, produce acid rain and cause corrosion	
6.	Oxides of nitrogen	Lung congestion, produce smog	

Greenhouse Effect

An increase in the concentration of carbon dioxide in the atmosphere leads to an increase in temperature on the Earth. This is called the **greenhouse effect**. It leads to **global warming**.

Heating up of the Earth's atmosphere due to trapping up of the infrared radiation by carbon dioxide in the atmosphere is called the **global warming**.



Global warming

- Causes changes in the pattern of crop cultivation.
- Adversely affects the monsoon rains.
- Causes excessive melting of polar ice, thereby raising the level of water in seas and ocean. This may even cause flooding and submerging of many low-lying areas.



Global Warming



Greenhouse Effect

The greenhouse effect is the rise in temperature that the Earth experiences because certain gases in the atmosphere (carbon dioxide and methane) trap energy from the Sun. Without these gases, heat would escape back into space and Earth average temperature would be about 60°C because these gases warm our world, they are referred to as greenhouse gases.

Carbon monoxide is the most dangerous air pollutant. Carbon monoxide when inhaled, combines with haemoglobin in the blood to form carboxyhemolobin. Carboxyhemoglobin cannot carry

oxygen. This cause a deficiency of oxygen in the tissues resulting into suffocation and even death.

It is due to this reason that, it is not advisable to sleep in a closed room with a coal-fired fire-place (Angithi) inside, on a cold wintry night. When the room is closed, no fresh air can enter the room. Initial burning of coal would consume whatever oxygen is available in the room. Thus, coal/wood would burn in a limited amount of oxygen producing carbon monoxide. When inhaled, carbon monoxide will cause suffocation and even death.



Angithi

Acid Rain

The rain water containing dissolved oxides of nitrogen and sulphur is called **acid rain**. The acid rain is very harmful to both living and non-living.

Some harmful effects of acid rain are given below :

- Acid rain is highly acidic and corrosive.
- Acid rain promotes corrosion of metal lie structures.
- Acid rain reacts with limestone and marble of the historical monuments. Due to such reactions, marble gets corroded and loses its shine.
- Acid rain also affects plants and aquatic (marine) life i.e., it destroys plants, fish etc. Acid rain leads to loss of soil fertility.

Fact Box

Acid rain has corroded marble structures, such as Taj Mahal.

Typically in a metro city, 250 tons of carbon monoxide, 400 tons of hydrocarbons, 600 kg of lead and 6 tons of sulphur dioxide is released into the air everyday.

The respiratory-illness average in metros is about 10-12 times the national average.



TESTING TIME

Write true or false :

- 1. Flame is a region where combustion takes place.
- 2. No combustion takes place in the innermost zone of the flame.
- 3. A good fuel is the one that burns easily in air at a moderate rate.
- 4. The lower the calorific value of a fuel, the more heat it produces when burnt. Global warming encourages the monsoon rains.

Key Words :

<i>N</i>		
Combustion	:	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 fire on exposure to air are called inflammable
		substances.
Calorific value	:	The amount of heat released on complete combustion of one kg of fuel is
		known as calorific value of a fuel.

Sum Up Now :

- Combustion is the process of burning of a substance in the presence of oxygen.
- 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, slow combustion, spontaneous combustion and explosion. A candle flame has three zones—outermost non-luminous zone, middle zone and inner zone.
- Burning fuels produce many harmful substances.
- Unburnt carbon particles in air cause respiratory problems and asthma.
- Combustion of fuels releases carbon dioxide in the air which causes global warming.
- Incomplete combustion of fuel releases carbon monoxide gas which is poisonous.

RACTICE ZONE (Assessment Of Learning Outcome) **Objective Type** Select and tick (\checkmark) the correct answer : Α. 1. Which of the following substances has the lowest ignition temperature? a. Kerosene b. Spirit c. Diesel d. Mustard oil 2. Which is required for combustion? b. Nitrogen c. Carbon dioxide d. Ozone a. Oxygen 61 Science-8

3.	The calorific value of a fuel is 4000 kJ/k	Kg. This fuel	is most likely to be
	a. Hydrogen gas	🔵 b.	Methane
	c. Liquefied petroleum gas	🔵 d.	Biogas
4.	Which causes acid rain?		
	a. Sulphur dioxide	<mark>)</mark> b.	Carbon dioxide
	c. Carbon monoxide	🔵 d.	Oxide of nitrogen
Fill	in the blanks :		
1.	is the process of bur	rning of a su	Ibstance in the presence of oxygen.
2.	Paper, wood and kerosene are categor	rized as	substances.
3.	gas is not a support	er of combu	istion.
4.	luminous zone is the	e pale	coloured zone.
5.	in the air cause man	y diseases a	nd reactions in human beings.
Mat	ch the following :		
	Column–A		Column–A
1.	Wood	a.	Incomplete combustion
2.	Ignition temperature	b.	Partial combustion
3.	Insufficient air	с.	Inflammable substances
4.	Yellow flame	d.	Fire extinguisher
5.	Compounds of sulphur	e.	Non-luminous
6.	Carbon dioxide	т.	Acid rain
	Jbjective Type		
Ver	v short answer questions :		
1.	What is combustion?		
2.	What are the three necessary condition	ns for comb	oustion to take place?
3.	Define ignition temperature.		

л Г? П

- 4. Define the calorific value of a fuel.
- 5. What type of substances on burning give a flame?

B. Short answer questions :

Β.

C.

Α.

- 1. What are combustible substances? Give examples.
- 2. Define ignition or kindling temperature.
- 3. What do you understand by explosion?
- 4. What do you mean by flame?
- 5. Differentiate between complete combustion and incomplete combustion. Give two examples of each.

C. Long answer questions :

- 1. Explain how carbon dioxide is able to control fire.
- 2. Explain the characteristics of a good fuel.
- 3. Draw a labelled diagram of a candle flame. Explain its diagram.
- 4. Explain air pollutants and their effects.
- 5. Write the types of combustion.

D. Higher Order Thinking Skills (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?

<u>Creativity</u> Zone

[(PHYSICAL MEDIA DEVELOPMENT (PMD)]

Critical Thinking

• Complete the following diagram :



Playway Learning

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 (1/4 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.

Group Discussion

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

Experiential Skill

• Visit to nearby houses in your area, find out what precautions they take in using LPG. Make a report.

Unit-III : The World of the Living CONSERVATION OF PLANTS AND ANIMALS

Stepping Up

- 🔀 Biodiversity
- st Biodiversity and Biosphere
- Flora and Fauna
- ¥ Recycling of Paper
- 🔀 Causes of Loss of Biodiversity
- X Conservation of Forests and Wildlife (Biodiversity)
- Endemic Species
- st Reforestation

- 🔀 Consequences of Deforestation
- Biosphere Reserve
- Red Data BookMigration
- 🔀 Some Conservation Programmes

A large variety of plants, animals and microorganisms are present on the planet Earth. These are living natural resources. In addition, there are other natural resources such as air, water, land or soil and Sun's energy. These constitute the non-living natural resources.

All living things depend on non-living natural resources and there needs to be a balance between them with increase in human population,

the demand for natural resources has increased tremendously. There is thus, a need for conservation of natural resources. What is meant by conservation?

The wise and judicious use of natural resources is called **conservation**. Such a use would ensure that resources are available for future generations as well. Overuse or wastage of resources must be avoided.

Conservation is broadly aimed at two aspects :

- (i) To ensure a continuous availability of useful plants, animals and materials for future generations.
- (ii) To preserve the quality of our environment.

Biodiversity

The term **biological diversity**, or **biodiversity refers** to the variety of living organisms existing on the Earth. Biodiversity includes all forms of life—plants, animals and microorganisms.

Biodiversity is not distributed uniformly across the globe. Some areas have greater biodiversity than the others. Forests are the regions where biodiversity is more.

Why Conserve Biodiversity?

Plants and animals are important to each other, to human beings as well as to the environment in which they live. All the components of our environment maintain an ecological balance. Different organisms are dependent on one other directly or indirectly.



Some of the biodiversity of the Great Barrier reef



Natural resources

Natural Resources Substances found in nature or earth that can be used by human beings.

64 Science-8

Plants are a source of food (cereals, vegetables, pulses, fruits, nuts, oils, tea, coffee and spices), medicines, fodder, fibres, timber, fertilizers, rubber, etc.

Animals provide a number of products such as meat, fish, egg, milk, honey, ivory and silk.

Biodiversity is also important in the following ways :

- Help to regulate climate, rainfall and wind
- Purify air and water
- Help in cycling of nutrients
- Help to preserve fertile soil
- Form food chains and foodwebs; thereby maintaining a balance in the availability of food to all life forms.

Fact Box

India has more than half of the world's wild tigers,65% of the Asian elephants, 85% of the great onehorned rhinoceros and 100% of the Asian lions.





Asian elephant

Tiger





One-horned rhino

Asian lion

Causes of Loss of Biodiversity

Some of the causes that threaten the existence of plants and animals on the Earth are as follows :

- Increase in population : This has led to a large scale cutting of trees (deforestation).
- Industrialization and urbanization : The land cleared by deforestation is used for erecting industries, homes and roads to fulfill the needs of the increasing population.
- Overgrazing : Overgrazing by increasing population of animals also leads to loss of biodiversity.
- Pollution of air, water and soil : Excessive discharge of solid, liquid and gaseous wastes from houses, fields and industries has caused pollution of soil, water and air. This has led to loss of biodiversity.
- Habitat destruction : Due to deforestation, industrialization, construction of dams and natural disasters such as earthquakes, floods, droughts and cyclones, a large number of habitats of living organism have been destroyed. This, thus, has resulted in loss of biodiversity.
- Hunting and killing of animals : Animals are killed for their meat, skin and other useful body parts leading to reduction in their numbers.



Deforestation

Consequences of Deforestation

Deforestation has several adverse effects which include :

- Increased air and soil pollution.
- Increase in temperature. Trees take in carbon dioxide and give out oxygen during the process of photosynthesis. Deforestation leads to increase in carbon dioxide concentration in the atmosphere which may lead to global warming.



A stable environment where a large number of different life forms, each affecting the other, live. Example : Forest, desert, soil, etc.





66 Science-8

- Lesser rainfall resulting in low ground-water level. Trees release water vapour during the process of transpiration. Destroying of trees will lead to lower the amount of water vapour in the atmosphere. This makes the atmosphere dried 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 would cause floods due to soil erosion. Increase in temperature due to 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 takes place due to wind and moving water. 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 a period of time, fertile soil gets converted into a desert. It is called desertification.
- It leads to reduction in the blinding 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 due to deforestation resulting in many species becoming extinct.

Dinasour-an extinct species

Biodiversity and Biosphere

The term **biodiversity** or biological diversity refers to the variety of organisms i.e., plants, animals and micro-organisms existing on Earth.

Biosphere refers to that part of the Earth where living organisms exist or the regions on earth which support life.

The most serious threat to biodiversity loss comes from habitat destruction (i.e., destruction takes place due to deforestation, construction of dams, cities, industries, croplands, mines and many other activities.

Extinct plants are brahmkamal and sarpgandha.

Conservation of Forests and Wildlife (Biodiversity)

Steps to Conserve Biodiversity

- Cutting of trees (deforestation) should be avoided. 1.
- Planting of trees (afforestation) should be undertaken. 2.
- Hunting of animals which is banned should be strictly enforced. 3.
- Illegal trade in animal skin and elephant tusks should be checked. 4.
- Dependence on wood as a fuel should be reduced; alternate 5. sources of energy should be encouraged.
- 6. Protected areas like national parks, wildlife sanctuaries and biosphere reserves should be established.







Biosphere



Drought

- 7. Effective system to prevent and fight forest fires should be established.
- 8. Regular surveys to monitor the population of all the species in forests should be conducted.
- 9. Laws to conserve biodiversity should be enacted and strictly enforced.
- 10. Environment awareness programmes for the masses should be conducted on a large scale.
- 11. Non-governmental organisations (NGOs) should be provided encouragement to undertake conservation work.

Fact Box

In India there are 89 national parks, 492 sanctuaries and 13 biosphere reserves.

Fact Box

India contains two of the 13 biodiversity hot spots of the world-North-East India and the Western Ghats. These two areas are very rich in biodiversity.

How can we overcome the problems of deforestation?

There is another cause of deforestation. Trees are required for manufacturing paper and therefore forests are cut.

Do you know that for making one tonne of paper, 17 full grown trees are required? So, do we stop using paper? No, we should therefore ensure that :

- (i) We do not waste paper, and write on both sides of the paper; this will reduce the consumption of paper.
- (ii) Paper is recycled; paper can be recycled five to seven times for use; recycling of paper is a good alternative. This not only saves trees but also saves energy and water needed for manufacturing paper. Another advantage is that the use of harmful chemicals in paper making is also reduced.



Recycled paper

Deforestation can be overcome by reforestation. The objective of reforestation is to regenerate the destroyed forests by planting new trees.

In India, we have the following acts aimed at (i) preservation and conservation of forests, and (ii) to meet the basic needs of the people living in and around the forest areas.

1. Forest (Conservation) Act, 1927.2. Wild (Protection) Act, 1972 (amended in 1991).

Protected Areas

The Government of India passed the Wildlife (Protection) Act in 1972, under which protected areas like national parks and wildlife sanctuaries have been created. Biosphere reserves have been created since 1986.

Protected areas include national parks, sanctuaries and biosphere reserves.



National Park

A **National Park** is an area which is strictly reserved for the protection of wildlife. National parks preserve flora, fauna, landscape and historic objects of an area. Activities like grazing and cultivation are not allowed in a national park.

In a **Sanctuary**, protection is given only to the animals (fauna). Activities such as harvesting of timber and collection of minor forest products are



allowed so long as these activities do not interfere with the well-being of animals. Killing (poaching) or capturing of animals is strictly prohibited.

Biosphere Reserves are large protected areas wherein people are in important component of the system. These are multipurpose protected areas being developed to (i) conserve biodiversity, (ii) preserve ecological balance and promote conservation, and (iii) permit tribals living in the area to exist. Biosphere reserves, thus, also help to maintain the culture of that area.

National Parks and Sanctuaries-Some Examples

- Jim Corbett National Park, Uttarakhand (tiger). 1.
- Kanha National Park, M.P. (tiger). 2.
- Bharatpur Bird Sanctuary, Rajasthan (winter home of migratory birds, most commonly Siberian 3. crane).
- Nandankanan Biological park near Bhubaneshwar (captive breeding of white tigers). 4.
- Simplipal Biosphere Reserve, Odisha (tigers). 5.
- Gir Sanctuary, Gujarat (Asiatic lion, cheetal, sambhar). 6.
- 7. Kaziranga Sanctuary, Assam (one-horned rhinoceros).
- 8. Sariska Sanctuary, Rajasthan (tiger).
- Sultanpur Bird Sanctuary, Haryana (birds). 9.
- Bandipur Sanctuary, Karnataka (Indian elephant). 10.
- Madumalai Sanctuary, Tamil Nadu (Indian elephant). 11.
- National Botanical Garden, West Bengal (rare species of plants). 12.

TESTING TIME

Fill in the blanks :

- 1. All living things depend on _____ natural resources.
- 2. _____ also leads to loss of biodiversity.
- 3. Trees help to absorb _____ from the ground.
- 4. We should not _____ paper.
- 5. _____can be overcome by reforestation.

Biosphere Reserve

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

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

- Nilgiri 1.
- 4.
- Pachmarhi 7.
- 10. Great Nicobar
- Dibru Saikhowa 5.

2. Nokrok

- 8. Kanchanjunga
 - 11. Manas

- 3. Gulf of Mannar
- 6. Debong Deband
- 9. NandaDevi
- 12. Similipal



Bandipur sanctuary

Sunderbans



Pachmarhi Biosphere Reserve

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

Fact Box

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.



Fauna

Sal

Jamun

Silver ferns

Arjun

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



Chinkara

Cheetal



Wild dog

Blue bull

Fauna

Endemic Species

An endemic species is one found naturally in an area, with notable restrictions on its overall distribution. They are not naturally found anywhere. They are unique to a particular place.

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

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





Giant panda









Wild mango

Flying squirrel

RED DATA BOOK

Red Data Book

Fact Box

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

Asiatic lion

Giant squirrel Endemic flora and fauna

Activity-1

Find out more endemic plants and animals of India.

Red Data Book

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

The nine categories in the IUCN Red List of threatened species are given below:

- Extinct
- least concern

Endangered

- Nearly threatened
- Critically endangered
- Not evaluated •

- Extinet in wild
- Data deficient
- Vulnerable

The main aims of the IUCN Red List is to focus the attention of conservationists towards species that are under threat of becoming extinct. Few of the animals listed in the IUCN Red List are blue whale, African elephant, sea turtle and Bengal tiger.

IUCN also publish a catalogue called Red Data Book, which lists rare species and those in danger of extinction.

Migration

Migration is seasonal movement of animals from one habitat to another because of climate changes.

Birds fly to warmer places to lay eggs covering a large distance. Common migratory animals are whales, fishes, turtles and birds. It is a sad story that even protected forests in wildlife sanctuaries are not safe as people living in neighbouring villages encroach upon them and destroy them. Common migrating creatures are whales, fish,

butterflies turtles and birds.



Arctic tern

Siberian Crane

The longest migration of the Arctic Tern involves a travel from North Pole to South Pole and back each year. The birds which fly from one habitat to another are called **migratory birds**. Migrating birds follow established migratory routes.

Why do Birds Migrate

Birds migrate from one place to another for the following reasons :

- To escape from the inhospitable climate.
- To enable themselves to find plenty of food throughout the year. For example, in winter when food sources are limited in northern areas, birds fly towards south where the weather is mild and food is in plenty.
- To lay their eggs in more hospitable place.

Activity-2

Aim : To prepare recycled paper from paper waste.

Material Required : Old newspaper, electric blender, large pan, wire screen, water, corn starch, stirrer, wax paper, rolling pin.

Proocedure : Follow the steps to obtain recycled paper from waste paper :

- 1. Tear a page of the newspaper into small pieces. Place it in a large pan.
- 2. Add enough water to cover the paper and soak for 1 0 minutes.
- 3. While the paper is soaking, mix 1/4 cup of water with about 1/8 cup of corn starch.
- 4. Stir until the corn starch dissolves.
- 5. Pour out the water in the pan that was not absorbed by the paper.
- 6. Put the wet paper in a blender. Add the corn starch and water mixture. Cover the blender and turn it on high for about two minutes.

Recycling of Paper

Paper is one of the important products we get from the forests. Paper is made from wood pulp that is produced from the wood of forest trees. It has been estimated that 17 full grown trees are needed to make 1 tonne of paper. So, many trees have to be cut down from the forests to make paper. Paper making is another cause of deforestation. So, we should save paper to save the forest trees. If each one of us saves just one sheet of paper in a day, we can save many trees in a year. We can save paper by writing fully on both sides of every sheet of paper in our notebook (without leaving any blank sheets). We can also save paper by using chalk and slate for doing rough work (instead of paper notebook). Reuse of paper means that, if possible, we should use the 'used paper' again. For example the 'used paper envelopes' can be reversed inside out and used again.

The term 'recycling of paper' means to process the waste paper (to make new paper) so that it can be used again. Paper can be recycled from old newspapers, magazines, books, notebooks, and packaging materials after removing ink from them. If all of us keep on collecting old newspapers, magazines, books, notebooks and paper wrappers, etc., and send them to paper mills for recycling through a junk dealer (kabadiwala), we will be able to save many forest trees from being cut down. In fact, paper can be recycled five to seven times for use. We should 'save paper', 'reuse paper' and 'recycle paper'. By doing this, we will not only save trees but also save energy and water needed for manufacturing paper. The amount of harmful chemicals used in paper making will also be reduced. From the above discussion we conclude that we should save paper, reuse paper and recycle paper :

(i) To save forest trees from being cut down (ii) To save water used in paper making

- (iii) To save energy (electricity) used in making paper
- (iv) To reduce the amount of harmful chemicals used in paper making

Not all varieties of paper can be recycled. Tissues, napkins, paper towels, candy wrapper, paper cups plates and glossy paper cannot be recycled.

During the last decade, the demand for recycled paper has increased appreciably.

Reforestation

Reforestation is a process by which a destroyed forest can be turned into a forest. Reforestation can be achieved by the following methods :

- Restocking the destroyed forest by planting new trees mostly of the same species.
- If trees have to be cut, then double the number of trees need to be planted.
- Sometimes a destroyed forest over a period of time if left undisturbed.

We have already done tremendous damage to our natural wealth—the forest. If we want to retain again the green wealth, and want the well being of all concerned, we must protect our forests.

Some Conservation Programmes

Some Non-Governmental organization (NGOs) also work with the government for conserving the environment in India. 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 : This was intimated in 1973 to protect the Royal Bengal Tiger. It is one of the largest conservation programmes. The population of tigers is slowly increasing.





Van Mahotsav: It is 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 : This was started in 1973 in a village in the Himalayas. In this people embraced trees and stopped them from being cut.

TESTING TIME

Match the following :

- 1. Deforestation
- 2. Biosphere Reserve
- 3. Flora
- 4. Endangered species
- 5. Migratory birds
- a. Conserving biodiversity
- b. Jamun tree
- c. Asiatic lion
- d. Siberian crane
- e. Lower water table


Key Words	•	
Conservation	:	The preservation and careful management of plant and animal species in order
		to prevent their extinction.
Biodiversity	:	The variability of species in different habitats, the diversity of microorganisms
		plants and animals.
Deforestation	:	The indiscriminate cutting of trees leading to destruction of forest cover.
Endemic species	:	The species restricted to a particular area or region.
Extinct species	:	Species are extinct when no individual of the species is alive and whose chances
		for further evolution are lost.
Endangered species	:	The species which are at the verge of extinction.
Flora	:	The large number of plants living in a particular area.
Fauna	:	The large number of animals living a particular area.
National park	:	A large area dedicated to conserve the environment, natural resources and the
		wildlife therein.
Wildlife sanctuary	:	A large area dedicated to conserve the wildlife therein.

😵 Sum Up Now :

- Living natural resources are a large variety of plants, animals are microorganisms present on the Earth.
- The wise and judicious use of natural resources is called conservation.
- Biodiversity includes all forms of life plants, animals and microorganisms.
- Overgrazing by increasing population of animals leads to loss of biodiversity.
- 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 ovecome unfavourable conditions is called migration.
- We should save, reuse and recycle paper to save trees, water as well as energy.
- Reforestation means planting new trees in place of destroyed trees.
- Project Tiger, Van Mahotsav programme and Chipko Movement are some famous conservation programmes in India which have gained recognition in the recent past.

	PRACTICE ZONE	(Assessment Of Learning Outcol	ME)
O	Objective Type		
Α.	Select and tick (✓) the correct answer : 1. Flora includes :		
	a. Only plantsc. Only animals2. The part of the Earth where living organis	 b. Both plants and animals d. Plants, animals and microorganisms sms exist is called : 	0
	a. Ecosystem 🥚 b. Biodiversity	😑 c. Diversity 😑 d. Fauna	0
	73	Science-8	

- 3. Giant Panda is an : a. Extinct species b. Endangered species c. Endemic species 🔵 d. Animal listed in Red Data Book 4. Species restricted to a particular geographical area are called : a. Endangered species b. Flora c. Endemic species d. Fauna Fill in the blanks : Β. 1. _____ or _____ resources must be avoided. 2. Increase in population has led to large scale cutting of 3. Dependence on ______ as a fuel should be reduced. 4. lists rare species and those in danger of extinction. 5. Chipko Movement was started in a village in the . Write true or false : С. 1. Air, water and land are non-living natural resources. 2. Deforestation has no adverse effects. 3. An area strictly reserved for the protection of animals is called a wildlife sanctuary. 4. In a national park animals can freely graze. 5. Whales, fishes, birds are migratory creatures. Subjective Type Very short answer questions : 1. Define conservation. 2. State any one importance of biodiversity. 3. What is desertification? 4. State a difference between flora and fauna. 5. What is migration? Short answer questions : 1. What are the two aims of conservation? 2. What is the difference between flora and fauna? 3. Mention the activities not permitted in Wildlife sanctuaries. 4. What are the factors responsible for habitat destruction? 5. Name the protected areas established under the Wildlife Protection Act, 1972. C. Long answer questions : 1. Why do we need to conserve forests and wildlife? 2. How does deforestation causes desertification? 3. What is Red Data Book? Write the nine categories in the IUCN Red list. 4. What is a wild life sanctuary? Name three sanctuaries and the states in which they are found. Higher Order Thinking Skills (HOTS) : D.
 - 1. The species of P and Q of wild animals are found exclusively in a 'particular area.' The species of R of wild animals is listed in Red data book of India whereas species of S of wild animals no longer exists anywhere on the Earth.



- a. What name is given to species like P and Q?
- b. What are the species like R known as?
- c. Name one species like R.
- d. What is the special name of species like S?
- e. Name one species like S.
- Consider the following animal species : Dodo, Yak, Deer, Black buck, Tiger, Crow, Kashmir stag, Dinosaur, Elephant, Lion tailed macaque, Peacock, Snow leopard. Which of these animals are :
- 1. Endemic to mountain habitats?
- 2. Endangered species?
- 3. Extinct species?

Creativity Zone

[(PHYSICAL MEDIA DEVELOPMENT (PMD)]

3.

Critical Thinking

• Complete the following diagram :

Causes of loss of biodiversity

2.

Playway Learning

Make Paper-Pulp Flower Vase

1.

- You will need : Old newspapers, Flour-Paste, Empty Jam Jar.
- 1. Tear newspaper into small pieces. 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 look as little as a jam bottle. (Fig. 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 harden about 48 hours.
- 8. Use fine sandpaper 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?

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?

Experiential Skill

- Find out about the Chipko Movement. 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.





REPRODUCTION AND LIFE CYCLE

Stepping Up

- Reproduction
- Development of Embryo

Reproductive System
 Viviparous and Oviparous animals

- Reproduction in Human Beings
 Asexual Reproduction
- ¥ Fertilization ¥ Cloning

Reproduction

Living organism may be killed by other organisms or die at old age. New organisms have to be produced to replace those that die. This is called reproduction. Thus, reproduction is a process by which a living organism is able to produce more of its own kind. Generations are maintained by reproduction. There are two methods of reproduction in living organism.

They are : asexual reproduction and sexual reproduction.

Asexual Reproduction

In this type of reproduction, only a single parent is involved. It takes place when there is plenty of food available and

conditions are good. Organisms such as Amoeba, hydra, yeasts, starfish, sponges, and worms reproduce asexually.

Sexual Reproduction

This method involves two parents, the male and the female. Most of the plants and animals including human beings reproduce sexually. In this method, male and female gametes (reproductive cells) fuse together to form a fertilized eggs called **zygote** which develops into a new individual.

Reproductive System

The organs involved in the process of reproduction constitute a system known as **reproductive system.** Human beings are able to reproduce sexually. They have gonads. Gonads produce **male gametes** or **sperms** in males and **female gametes** or **eggs** in females and accessery reproductive structures.

Reproduction in Human Beings

Human beings are the most complex animals. They have a complex mechanism of reproduction. Before we learn about the male and female reproductive organs in detail, let us understand the basic process of reproduction.



Reproduction is an essential process



The male and the female parents have permanent and separate sex organs. The male sex organ produces the male gamete called the **sperm**, and the female sex organ produces the female gamete called the **egg** or **ovum**. The sperm and the ovum fuse to form a fertilized egg called the zygote. The process of fusion of the sperm and the ovum is called **fertilization**. The zygote then goes through specific changes and finally develops into a new individual. The method of reproduction through the fusion of male and female gametes is called **sexual reproduction**.



Internal and External Fertilization

The fertilization in which fusion of male and female gametes takes place inside the female body is called **internal fertilization**. Birds, reptiles and mammals (such as cows, horses, dogs, cats) including human beings reproduce by internal fertilization.

The type of fertilization in which fusion of male and female gametes takes place outside the animal's body is called **external fertilization.** Many animals such as fish, frogs, toads and starfish reproduce by external fertilization. In these animals, usually the fertilization occurs in water.

Male Reproductive System

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.



Female Reproductive System

Male reproductive organs in humans



Female reproductive organs

The reproductive system in females 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.

77 Science-8

Fertilization

You have already studied that a fertilized ovum develops into a baby. The fusion of egg and sperm results in fertilization. In case of human beings, this fertilisation takes place in the fallopian tubes.

The male parent produces male gametes (male sex cells) called sperms in his testes each day. The female parent produces the female gametes (female sex cells) called **ova** (or **eggs**) in her ovaries. Each ovum is a round structure, of the size of a pin's head. It is many times larger than



Fertilisation

a sperm, having a lot of cytoplasm. One ovum or an egg cell is released from one of the ovaries approximately every 28 days.



Zygote



The sperms (or male gametes) in the testes of a man are introduced into the vagina to the woman through penis during copulation (or mating). In this way, millions of sperms are released into the vagina at one time. The sperms are motile, so these come up through cervix into the uterus and then pass into the oviducts. The oviduct contains an ovum or egg cell released by the ovary during ovulation. Only one sperm fuses with the ovum (or egg) in the oviduct. The sperm nucleus and the egg nucleus fuse together. This fusion of a male gamete and a female gamete is called fertilization. The fertilization results in the formation of a zygote.

Development of Embryo

The zygote divides many times to give rise to a ball of cells. The embryo moves down the fallopian tube into the uterus. It gets embedded in the wall of the uterus for further development. It continues to develop in the uterus. The embryo gradually develops body parts such as hands, legs, heads, eyes, etc. The stage of embryo in which all the body parts can be identified is called foetus. When the development of the foetus is complete, the mother gives birth to the baby. This process takes about 9 months in human beings.



This period taken by the baby to develop from the day zygote is formed till birth is called **gestation period**. The process of formation of an offspring from a zygote is known as **development**.

In case of human beings, the development starts from the fallopian tubes after the zygote is formed and in completed in the uterus when the baby has grown enough to be born.

In some animals such as butterflies and frogs, the zygote does not develop into a baby that looks like an adult but it undergoes various other stages before becoming young one that looks like an adult. The process known as **metamorphosis**, is given in brief here.



Foetus developing in the uterus

The development of this young baby to become an adult takes place outside the female body. In many animals such as silkworm, butterfly, etc., the development of a zygote to form a young one passes through a number of stages such as larva and pupa. The stages can be summarised as :



Life cycle of a frog

Fertilized ovum (zygote) \rightarrow Larva \rightarrow Pupa \rightarrow Adult like young one In case of frogs also, the zygote does not develop into an adult looking young one but hatches into a tadpole and then into a young frog with tail, which further develops into an adult looking frog.

The stages can be represented as :

Zygote \rightarrow Tadpole \rightarrow Young frog (with tail) \rightarrow Adult looking frog The process in which the zygote undergoes a number of stages before developing into a young one that looks like an adult is known as **metamorphosis**.

Fact Box

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

Test Tube Baby

In certain women oviducts are blocked. Such women cannot bear babies because sperms are not able to reach the egg for fertilization.

For such parents, the medical science has developed a technique called in vitro fertilization, or IVF (fertilization outside the body).

In this method, a freshly released egg and sperms are collected and kept together for a few hours. If fertilization of the egg by the sperm is successful, the zygote is allowed to develop for about a week. The developed zygote is then placed in the mother's uterus. The further development of zygote and the embryo takes place in the uterus of the mother. The baby is born at the appropriate time like other babies.

The babies born through the IVF are called test tube babies (although the term is misleading).



TESTING TIME

Write true or false :

- 1. A living organism is able to produce more of its own kind by the process of reproduction.
- 2. The method of reproduction through the fusion of male and female gametes is called asexual reproduction.
- 3. The sperm is very small in size.
- 4. Fertilization is the fusion of a male gamete and a female gamete.
- 5. The process of formation of an offspring from a zygote is known as gestation.

Viviparous and Oviparous Animals

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

Viviparous Animals are those animals which give birth to young ones. Examples are cows, dog, cat, horse and human



Viviparous Animals



beings, etc.

Oviparous Animals are those animals which lay eggs, that hatch into offspring. Examples are birds, lizard, butterflies, hen, crow, etc.

Oviparous Animals

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 a 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 amoeba are produced from a single Amoeba.



Budding In Hydra

Budding is an asexual method of reproduction. In budding, a small part of the body of the parent organism grows out as a 'bud' which then detaches and becomes a new organism. The asexual reproduction by budding is observed in animals like Hydra, sea anemones, sponges and corals. We will now describe the asexual reproduction in Hydra.

Hydra is a simple multicellular animal. Hydra reproduces by the process of budding. This happens as follows : in Hydra, first a small outgrowth called 'bud' is formed on the side of its body by the repeated divisions of its cells. This bud then grows gradually to form a small hydra by developing a mouth and tentacles. And finally the tiny new hydra detaches itself from the body of parent hydra



and lives as a separate organism. In this way, the parent hydra had produced (or created) a new hydra. Thus, hydra reproduces asexually by growing buds from its body. This is called budding. Please note that the bud formed in hydra is not a single cell. It is a group of cells. If we collect some pond water and observe it through a hand magnifying glass, we will see a number of hydrae with small buds attached to their body.



Hydra reproducing by the method of budding

From the above discussion we conclude that in the tiny animal called hydra, new hydrae develop from the buds. This method of asexual reproduction in hydra is called budding. Apart from binary fission and budding, there are some other methods of asexual reproduction by which a single parent produces young ones. We will study these methods in higher classes. Please note that since asexual reproduction involve only a single parent, so **fertilization is not necessary in asexual reproduction**.

Cloning

Cloning is the process of producing exact copy of a cell, a living part or a complete organism. For the first time, lan Wilmut and his colleagues at the Roslin Institute in Edinburgh, Scotland successfully cloned an animal. The technique of cloning requires two kinds of cells. One is body cell or somatic cell, which is collected from the animal to be cloned (genetic donor). The other kind of cell required for cloning is an egg cell, which is collected from a female of the same species (egg donor). The body cell contains the complete DNA, or genetic blueprint of the animal it came from. The egg cell used is devoid of the nucleus. The body cell is inserted into the egg and fuses by using electricity. The resulting fused egg is transplanted into the surrogate mother for development.

In the cloning of Dolly, the somatic cell (genetic donor) was collected from the mammary gland of a female Finnish Dorset and the egg cell was collected from a Scottish blackface ewe. The nucleus of the egg cell was discarded and the nucleus of the memory gland cell (somatic cell) was inserted into the egg of the Scottish blackface ewe, whose nucleus was discarded. The resulting egg was implanted into the uterus of the



Cloning of sheep, Dolly

surrogate mother, the Scottish blackface ewe. It developed normally into the baby sheep in the uterus and was born in the usual way. The baby sheep so born was absolutely identical to the Firm Dorsett sheep from whose memory gland the nucleus was taken. Dolly lived a healthy life for about 6 years and produced several offspring of her own through normal sexual means. It died on 14th February 2003 due to a certain lung disease.

TESTING TIME

Rewrite the given statements correctly :

- 1. Oviparous animals give birth to young ones.
- 2. Sexual reproduction occurs in microorganisms, plants and animals.
- 3. Amoeba reproduces by budding.
- 4. Hydra reproduces by binary fission.
- 5. Reproduction is the process of producing exact copy of a cell, a living part or a complete organism.

Key Words :

••• /		
Reproduction	: The process by which living organisms produce young ones or their own kind.	
Egg	: The female gamete or the ovum.	Π
Sperm	: The male gamete.	
Fertilization	: Fusion of ovum and sperm.	
Oviparous animals	: Animals which lay eggs.	1
Viviparous animals	: Animals which give birth to young ones.	
Metamorphosis	: The process by disastrous changes by which a tadpole (or a caterpillar) changes into	
	an adult.	AM

Sum Up Now :

- Reproduction is a process by which a living organism is able to produce more of its own find.
- In asexual reproduction, only a single parent is involved.
- Sexual reproduction involves two parents, the male and the female.
- The organs involved in the process of reproduction constitute a system known as reproductive system.
- Fertilization is the process of fusion of the sperm and the ovum.
- The male reproductive organs consist of a pair of testes, two sperm ducts and a penis.
- The reproductive system in females consists of a pair of ovaries, oviducts or fallopian tubes and uterus.
- The period taken by the baby to develop from the day zygote is formed till birth is called gestation period.
- The animals are divided into two categories of viviparous and oviparous on the basis of producing offspring.
- Asexual reproduction occurs in microorganisms, plants and animals.
- Amoeba reproduces by binary fission whereas hydra reproduces by budding.
- Cloning is the process of producing exact copy of a cell, a living part or a complete organism.



	PRACTICE ZONE (Aggeggment De Leadning Outcome	:)
	ASSESSMENT OF LEARNING OUTCOM	.,
 Q	Objective Type	
Α.	Select and tick (\checkmark) the correct answer :	
	1. The fusion of a male and female gamete results in the formation of :	
	a. Egg 🛛 🕞 b. Sperm 💛 c. Zoospore 💛 d. Zygote 🤇	
	2. Egg producing animals such as birds are called :	
	a. Viviparous 😑 b. Oviparous 😑 c. Hermaphrodite 😑 d. Unisexual 🦷	
	3. The offsprings of which of the following grow out of the parents body?	
	a. Hydra 🛛 😑 b. Amoeba 🚽 😑 c. Paramecium 📄 d. Human 🛁	
	4. Which of the following is involved in the sexual reproduction?	
	a. Vegetative propagation	
	b. Fertilization	
	c. Binary fission	
	d. Multiple fission	
Β.	Fill in the blanks :	
	1 develops into a new individual.	
	2. The method of reproduction through the fusion of male and female gametes is called	
	3 is the stage of embryo in which all the	
	4. The process of formation of an offspring from a zygote is known as	
	5. The technique of requires two kinds of cells.	
С.	Write true or false :	K
	1. There are two methods reproduction in living organisms.	
	2. Human beings have a simple mechanism of reproduction.	
	3. Uterus is the organ where the zygote matures and develops into a baby.	
	4. In butterflies and frogs the zygote develops into a baby that looks like an adult.	
	5. Oviparous animais lay eggs that natch into orispring.	
 Q	Subjective Type	
Α.	Very short answer questions :	
	1. What is reproduction?	
	2. Define zygote.	
	 What are the organs of the male reproductive system: State development in one sentence 	
	5. Give some examples of oviparous animals.	
B.	Short answer questions :	
	1. Why do living beings reproduce?	
	2. Explain the difference between asexual reproduction and sexual reproduction in short.	
	3. Define fertilization in your own words.	
	83 Science-8	

- 4. What do you mean by external fertilization?
- 5. How does Amoeba reproduce?

C. Long answer questions :

- 1. How do human beings reproduce?
- 2. Describe the fertilization in human beings.
- 3. Write a note an asexual reproduction in detail.

[(PHYSICAL MEDIA DEVELOPMENT (PMD)]

Critical Thinking

• Complete the following diagram :

Creativity Zone



Playway Learning

• Copy a newspaper picture :

Mix four parts of water and one part of turpentine.

Put a small piece of soap (about half a match box) and shake the mixture.

The soap will dissolve. However, turpentine and water will not separate out.

To copy a picture in a newspaper, wet it a little with the mixture.

Put a sheet of white paper on it and rub the paper firmly with a spoon.

The turpentine will dissolve the ink of the newspapers and you will get a reverse picture on your sheet of paper.

Group 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.

Experiential Skill

- 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.



REACHING THE AGE OF ADOLESCENCE

Stepping Up

- 🔀 Physical Changes in Human Beings during Growth
- ✗ Role of Hormones in Initiating Reproductive Function
- ightarrow Determination of Sex

- ⅔ Changes at Puberty
- ⅔ Reproductive Phase of Life in Humans
- Reproductive Health

Growth and **reproduction** are two important characteristics of living organisms. All living organisms become capable of reproducing only after certain age. What kind of changes occur around that age to make them capable of reproduction? In this chapter, you will learn about the changes that occur in the body of male and female to make them capable of reproduction. The importance of hormones in bringing out these changes is also described in this chapter.

🔆 Secondary Sexual Characteristics

Health



Growth



Various stages of growth in humans are

Infancy
 Childhood
 Adolescence
 Adulthood

Infancy

In the stage of growth from birth to about 2 years of age is called **infancy**. During this period, babies grow very fast.

They learn to sit, stand and recognise people and things around them.

Childhood

The stage of growth from about 2 years to 12 years of age is called **childhood.** During childhood,

- children grow in size and weight at a steady rate.
- children also grow intellectually, emotionally and socially.

Adolescence and Puberty

The stage between childhood and adulthood is called adolescence. During this period, the body attains reproductive maturity.

Thus, the period of life when the body undergoes changes leading to the reproductive maturity is called **adolescence**.

Adolescence usually parts from the age of 11 years and lasts up to the age of about 18-19 years.











Adolescents





Teenagers

Adulthood

It is very difficult to know that a person has gained the adulthood.

The end of adolescence is the beginning of adulthood. So, the state when all the body systems are fully developed, have almost reached full height, but still growing emotionally, intellectually and socially may be considered as the state of adulthood. During adulthood, one keeps growing and changing. The end of adolescence is the beginning of adulthood.





Increase in Height

Changes at Puberty

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

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.

The following chart shows the probable average rate of growth in boys and girls.

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	



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

0

upon the genes inherited from the parents. Height also depends upon the food intake during the growth period. Therefore, it is very important to eat the right kind of food during the growth period.

Change in Body Shape

In boys the muscles develop and shoulders become broad.

In girls pelvic bones grow and hips broaden. Breasts start getting enlarged.

Thus different changes take place in boys and girls.

Change in Voice Box and Voice

At puberty, the voice box or larynx begins to grow. In boys, it protrudes out in the threat region as Adam's apple. Appearance of Adam's apple marks the end of adolescence.

The larynx is smaller in girls than in boys and is hardly visible from outside because of a large larynx, boys develop high-pitched sweet voice.



Adam's apple

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 organ testes and penis develop completely. The testes start producing sperms. In girls ovaries enlarge and produce an egg or ovum. The two ovaries take turn to produce an egg. The egg is released every 28 days. This process of release 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-dependent 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 towards 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

Males and females can be differentiated on the basis of the sex organs which are present right from birth. During puberty, other differences also start developing. The characters which develop during puberty and help to distinguish a male from a female are called secondary sexual characters. Secondary sexual characters in males :

- Development of facial hair in the form of moustache and beard.
- Development of hair under the armpits, on the chest and in the public region.
- Voice becomes deeper as the voice box enlarges.



- Shoulders become broader. •
- Body becomes muscular.

Secondary sexual characters in females :

- Development of breasts.
- Development of hair under the armpits and in the pubic region.
- Development of curves in the body.
- Beginning of the menstrual cycle (discussed later in this chapter). These changes which occur at adolescence are controlled by

hormones. Testosterone and estrogen are the two sex hormones, as mentioned earlier, which bring about changes in boys and girls respectively during puberty. Testosterone is produced by testes in males, and estrogen by ovaries in females.



Development of moustache and beard

Fact Box

Estrogen is not a single hormone but a collection of related steroid hormones.

target site and acts

They stimulate

 \rightarrow changes in the body

at onest of puberty

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 which 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.

Hormone producing cell \longrightarrow Hormone secreted in the \longrightarrow Hormone reaches the 1. blood

How hormones act?

- Hormones from the 2. pituitary stimulate the testes and ovaries and
- Hormone reaches the target site through the blood stream
- ovaries to release testosterone and estrogen

How hormones bring about secondary sexual changes?

TESTING TIME

Fill in the blanks :

- 1. During _____ babies grow very fast.
- 2. The end of _____ is the beginning of adulthood.
- 3. In _____ pelvic bones grow and hips broaden.
- 4. Many _____changes take place during adolescence.
- 5. _____controlled the changes which occur at adolescence.

Myths and facts related to menstruation

Myth : Menstruation is a sin.

Fact : It is a sign that the girl's body is working in a perfect manner.

Myth : One should rest and not indulge in any sports activity during this period. Fact : Moderate activities and exercises during this period help to relieve cramps. Myth : One should not wash hair or take a bath during this period.

Fact : It is very important to maintain hygiene during this period.

Fact Box

Menstruating women should take in more iron in their diet to make up for the loss of blood during menstruation.





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 (14-15 years) and lasts till he is healthy.

When an ova is released from the ovary, the lining of the uterus becomes thicker, so as to receive the egg. If the egg is not fertilised, the lining of the uterus along with the egg

28

22

21

20

Days 26.28

The uterine lining detaches leading to menstruati

Days 18.25 If fertlization has not taken place

the corpus luteum fades away

19

and the blood vessels are shed off. Thus is known as menstruation or periods. It causes 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 26 called the **menstrual cycle**. The menstrual cycle begins 25 around puberty and is called menarche. The menstrual 24 cycle stops when the women is around 45-50 years. The stoppage of menstruation is called **menopause**. 23

The menstrual cycle includes :

Maturation of egg and its release from the ovary.

Thickening of the uterine wall.

Breakdown of uterine wall in case pregnancy does not take place.

Determination of Sex

Each cell of the human body contains a nucleus. In each nucleus there are 23 pairs of chromosomes. Whether a person is male or female is dependent on a particular pair of chromosomes. This pair of chromosomes is called 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 (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 with have a 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.

Thus, you have now seen that it is the sex chromosome of the father that determines the sex of the child. The mother is not responsible for the sex of the child and hence, should not be blamed if a girl child is born.



Days 1.7

Menstruation (3-7 days)

Days 14

Ovulation

16

Days 8.11 The lining of the womb thickens in 9

preparation for the egg

13

14



Hormones Other Than Sex Hormones

Gland	Hormone secreted	Function/Action	AL SID
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.	LUNCS
Insulin	Pancreas	Regulates the metabolism of sugar. Deficiency of insulin causes diabetes.	LIVER KIDNEYS
Adrenal	Adrenalin	Helps the body to adjust to stress when one is angry, worried or embarrassed.	LARGE INTESTINE
Pituitary	Growth Hormone	It controls the activities of the other glands. It is necessary for the normal growth of a person.	Position of endocrine glands in the human body

Some glands and their functions are as follows :

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.

HEART Pancreas STOMACH

Adrenal gland

SMALL INTESTINE

Testes

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

We know that health includes our physical, social and mental well-being. Reproductive health forms an important part of the general health. During adolescence, there is rapid physical and mental growth. Therefore, it is important to look after physical and mental health at this stage. So during adolescence, one needs to have nutritional food. One must also observe physical hygiene and undertake adequate physical exercise.

Nutritional Needs

The nutritional requirements of the body increas tremendously because of rapid physical and mental growth during adolescence. Therefore, it is very important to eat a balanced diet during these growing years. This helps the bones, muscles and other parts of the body get adequate nourishment for growth.

A **balanced diet** means a diet that contain the nutrients carbohydrates, proteins, fats vitamins and minerals in requisite proportions. Milk, green leafy vegetables, fruits, nuts and meat are good



foodstuffs for adolescents. Girls start menstruating at this stage. Therefore, it is important for them to have food rich in iron and calcium.

Fact File

Avoid eating too much junk foods such as potato chips and packed or tinned snacks. Though they are very tasty, they do not have important nutrients such as proteins, vitamins and minerals.



Personal Hygiene

A balanced diet

Since increased activity of sweat glands sometimes makes the body smelly, so personal hygiene is very important during adolescence. Adolescents should have a bath at least once every day. All parts of the body should be washed and cleaned properly every day, otherwise body odour and bacterial infection may result. Girls should take special care of cleanliness during menstruation. They should be aware of supplies such as sanitary pads and tampons and their usage.

Physical Exercise

Walking, jogging, playing outdoor games, etc., are equally important for adolescents as nutritional diet and personal hygiene. They keep the body fit and healthy.

The normal reproductive health is an important concern for all. It includes such aspects that ensure a responsible, safe and satisfying reproductive life. Both males and females must be aware regarding the fertility regulation methods, the choice of control child birth and the ability to prevent and control sexually transmitted diseases (STDs). They must also be aware about to manage disorders related to the reproductive system.

Certain infectious diseases are spread from an infected person to a healthy person by sexual contact. Such diseases are called sexually transmitted diseases (STDs).

Gonorrhoea, syphilis and trichomoniasis are common STDs. Acquired Immunodeficiency Syndrome (AIDS) is also a sexually transmitted disease which causes death. There is no definite cure of AIDS still now.

World Health Organization (WHO) has prepared guidelines and considered reproductive health as a fundamental human right. The family planning of the Indian government has taken enough steps to create awareness and provide relevant information about reproductive health.

TESTING TIME

Write true or false :

- 1. In females, the reproductive phase begins at the age of 14-15 years.
- 2. Each cell of a female has two X chromosomes.
- 3. Insulin regulates the metabolism of sugar.
- 4. During adolescence, one need to have nutritional food.
- 5. Outdoor games keep the feet and healthy.

Objective Type

Adoloscopco I It	is the transitions period between shildhood and adulthood
Addiescence : It	is the transitions period between childhood and adulthood.
Puberty : It	is the period when children begin to mature biologically, psychologically, and ocially.
Adam's apple : It	is the protruding part of the throat in the adolescent males.
Menarche : It	is the first menstrual flow that begins at puberty.
Menopause : It	is the stoppage of menstruation in females.

Sum Up Now :

- Various stages of growth in humans are :
- Infancy Childhood Adolescence Adulthood
- The period of life when the body undergoes changes leading to the reproductive maturity is called adolescence. Adolescence starts from the age of 1 1 years and lasts up to the age of about 18-19 years.
- Height of an adolescent depends upon the height of their parents.
- During adolescence, adolescents become more self dependent and self conscious.
- Secondary sexual characters develop during puberty and help to distinguish a male from a female.
- The changes which occur at adolescence are controlled by hormones.
- The endocrine system consist of several glands.
- Adolescents become capable of reproduction when their testes and ovaries begin to produce gametes.
- The gender of the child depends on the kind of sperm that fuses with the egg.
- Because of rapid physical and mental growth during adolescence, the nutritional requirements of the body increase tremendously.
- It is important for them to have food rich in iron and calcium.

PRACTICE ZONE

Objective Type

Select and tick (\checkmark) the correct answer :

- 1. Most adolescents gain their maximum height around the age of :
 - a. 11-15 years

```
b. 18-19 years
```

c. 22-25 years

92 Science-8

(Assessment Of Learning Outcome)

Ŏ O O O

	2. At puberty, the testes in boys begin to produce :	
	a. Eggs 🛛 😑 b. Hormones 😑 c. Pimples 📄 d. Sperms	\bigcirc
	3. The male sex hormone is secreted by testes is :	
	a. Progesterone 🔵 b. Oestrogen 🛛 🥚 c. Testosterone 🛛 🕘 d. Thyroxine	\bigcirc
	4. Adolescents should be careful about what they eat, because :	
	a. Proper diet develops their brains	\bigcirc
	b. Proper diet is needed for the rapid growth taking place in their body	\bigcirc
	c. Adolescents feel hungry all the time	\bigcirc
	d. Taste buds are well developed in teenagers	\bigcirc
B. F	Fill in the blanks :	
	1. During childhood, children grow, and	
	2. Appearing of marks the end of adolescence.	
	3. The stoppage of is called menopause.	
	4 is required in the production of thyroxine.	
	5. Personal is very important during adolescence.	
C. 1	Write true or false :	
	1. Adolescence lasts up to the age of about 18-19 years.	\bigcirc
	2. It is very important to eat the right kind of food during the growth period.	\bigcirc
	3. Adolescents should feel insecure during adolescence.	\bigcirc
	4. The mother should not be blamed if a girl child is born.	\bigcirc
	 The mother should not be blamed if a girl child is born. Personal hygiene holds no importance during adolescence. 	
	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. Subjective Type 	
Q A.	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. Subjective Type Very short answer questions :	0
Q A.	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. Subjective Type Very short answer questions : What is infancy? 	•
Q A.	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. Subjective Type Very short answer questions : What is infancy? Define voice box. 	
Q A.	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. Subjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? 	0
A .	 The mother should not be blamed if a girl child is born. Personal hygiene holds no importance during adolescence. Subjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. 	
A .	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. SUbjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? 	
A. 1	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. Subjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? Short answer questions : 	
A. 1	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. SUbjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? Short answer questions : Define menarche. 	
A. 1	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. SUbjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? Short answer questions : Define menarche. What changes take place in the voice of boys during adolescents? 	
A. 1	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. SUbjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? Short answer questions : Define menarche. What changes take place in the voice of boys during adolescents? What do you mean by secondary sexual characters? 	
A. 1	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. SUbjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? Short answer questions : Define menarche. What changes take place in the voice of boys during adolescents? What do you mean by secondary sexual characters? Define menstruation. 	
A. 1	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. SUbjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? Short answer questions : Define menarche. What changes take place in the voice of boys during adolescents? What do you mean by secondary sexual characters? Define menstruation. What is the genetic composition of a male child? 	
A. A	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. SUbjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? Short answer questions : Define menarche. What changes take place in the voice of boys during adolescents? What do you mean by secondary sexual characters? Define menstruation. What is the genetic composition of a male child? 	
A. A B. S	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. SUbjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? Short answer questions : Define menarche. What changes take place in the voice of boys during adolescents? What do you mean by secondary sexual characters? Define menstruation. What is the genetic composition of a male child? Long answer questions : Describe the role of hormones in initiating the reproductive function. Discuss the menstrual cycle in human beings. 	
A. A B. S	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. SUbjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? Short answer questions : Define menarche. What changes take place in the voice of boys during adolescents? What do you mean by secondary sexual characters? Define menstruation. What is the genetic composition of a male child? Long answer questions : Describe the role of hormones in initiating the reproductive function. Discuss the menstrual cycle in human beings. Mention a few secondary sexual characters in males and females. 	
A. A B. S	 4. The mother should not be blamed if a girl child is born. 5. Personal hygiene holds no importance during adolescence. Subjective Type Very short answer questions : What is infancy? Define voice box. When does adolescence begin and end? Name the hormones secreted by ovaries in females and testes in males. Which endocrine gland is referred to as the master gland? Short answer questions : Define menarche. What changes take place in the voice of boys during adolescents? What do you mean by secondary sexual characters? Define menstruation. What is the genetic composition of a male child? Long answer questions : Describe the role of hormones in initiating the reproductive function. Discuss the menstrual cycle in human beings. Mention a few secondary sexual characters in males and females. What are the nutritional requirements of adolescents? 	

D. Higher Order Thinking Skills (HOTS) :

Creativity Zone

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

[(PHYSICAL MEDIA DEVELOPMENT (PMD)]

Critical Thinking

• Complete the following diagram :



Playway Learning

• 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 to taste
- Cumin, red chilli powder

Method

- 1. Cut potato into pieces (cubes).
- 2. Chop onion, tomato and coriander leaves.
- 3. Mix all the ingredients.
- Add, salt, black salt, roasted cumin 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.

Group Discussion

- 1. Early marriage is not good for couple.
- 2. Female foeticide in India.

Experiential Skill

• Collect information about HIV/AIDS from newspapers and magazines. Write one page article on it, covering latest information.



Unit-IV : Moving Things, People and Ideas FORCE AND PRESSURE

Stepping Up

- Effects of Force
- Spring Balance
- 🔀 Forces are Due to an Interaction
- Pressure

- ⅔ Types of Forces⅔ Atmospheric Pressure
- Resultant Force

We do many jobs in our daily life like lifting things, moving things from one place to another, cutting objects, etc. To do these jobs, we have to put some effort.

During the festival of Holi, you throw small balloons filled with water at your friends. You will notice that if you just touch the balloon to your friend's body, the balloon does not burst. However, when you throw the balloon with some effort, it hits your friend, bursts and splashes the water contained in it.



Balloon burst only when it is thrown with a force



Pushing of water with force

While swimming you push the water behind with some effort.

While opening a door we have to push the door handle and at the time of closing the door, we pull the door handle with our hand. While playing football you hit the ball with some effort.

So, in our everyday life we observe that some effort is required to make a stationary object into motion or to stop a moving

object. This effort can be a push or pull. Pushes and pulls are forces. Forces are the important part of our world. We use forces while we work and play. Forces are all around us. So, in a simple way a push or pull on a body is called **force**. The direction in which a body is pushed or pulled is called the **direction of force**.

Objects cannot move by themselves. A force is needed to push or pull them before they can start or stop moving.

Effects of Force

A force cannot be seen. It can be judged only by the effects which it can produce in various bodies (or objects) around us.



A man pushing to open the door



A man pulling to close the door



A force can produce the following effects :

- Make a moving object stop : While catching a ball thrown by your friend, you apply push and the moving ball comes to a stop.
- Change the direction of a still or a moving object
 - You apply push to an almirah to make it face a different direction.
 - A football player kicks (pushes) the football to make it move in a different direction, over to another player of his team.
- Change the speed of a moving object
 - You must have made someone push your swing to increase the speed while you sat on it.
 - An elder child may stand opposite and apply a push to a tricycle being run by a younger child and slow it down.
- Change the shape of an object
 - Every day, your mother rolls down a ball of kneaded flour into a chapati (different shape) by applying a push. You might have played with moulding clay of different colours, making it



Football players kicking a football



A girl pushing the swing

into so many different shapes of fruits, animals, etc. Here also, a push is applied by you.

You might have seen labourers breaking down bricks or stones into smaller pieces, by hitting them with a hammer. Again, the shape of the bricks or stones is getting changed due to a push (hitting).



A woman making a chapati



Children playing with moulding Push changes shape of objects



A labourer breaking bricks

As described by the above examples, a force applied on an object can accomplish at least one of the following results:

- Move an object lying at rest
- Stop a moving object
- Change the speed of an object
- Change the direction of an object
- Change the shape of an object

Fact Box

A force does not necessarily cause motion. There are times when we push or pull an object with all our might but it does not move. This does not mean that we are not applying a force, but there the force we are applying is not sufficient to move the object.



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



A woman standing behind the stationary car

A man pushing the car





A boy kicked a ball

A cart being pulled

Now if you push the car, i.e., force is applied, car will begin to move in the direction of applied force. When we kick a fall or pull a cart, interaction of two objects is required.

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

In most cases like kicking a ball, pushing a cart, pulling a drawer, the force and the object come in direct contact with each other. Such forces are called **contact forces**.

However, interaction may not always involve a direct physical contact. Such forces are called **non**–**contact** forces. For example, magnet attracts iron objects without coming in direct contact. Thus, forces are of two kinds.

Types of Forces

There are two kinds of forces :

Contact Force • Non-contact Force

Contact Force

Forces that action 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.** For example when we lift a bucket of water or push a cart, kick a ball, walk or run we use muscular force. Digestion of food, bending of our body, breathing; are all carried out due to the force exerted by the muscles.

Fact Box

Bodybuilding is an art of making your muscles stronger and well-shaped.









Examples of muscular forces

Similarly, animals like bullocks, horses, donkeys and camels also use muscular force to do heavy work such as pulling a cart or a tonga, ploughing, carrying 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 peddling, because of the friction between the road and the cycle.



Non-contact Force (or Action at a distance Force)

There are some kind of forces which can be exerted from a distance without touching the object.

For example, a magnet can exert a pull (attraction) or a push (repulsion) on another magnet even when the two magnets are at a distance from each other.

The force which can act even without any actual contact between the two objects is called a non– contact force (or action at a distance force).

Examples : Gravitational force, Electrostatic force, and Magnetic force are **non-contact forces** (or **action at a distance forces**).

Some typical non-contact forces are described below :

- 1. Magnetic Force
- A magnet attracts nails and pins made from iron even from some distance.
- A magnet attracts another magnet when the unlike-poles are brought nearer.
- A magnet repels another magnet when the like-poles are brought nearer.

These examples show that a magnet exerts some force on the objects made of iron as well as other magnets when brought nearer to them.

The force exerted by a magnet is called **magnetic force.** The magnetic force acts from a distance.

Like-poles repel each other

Attraction magnets move away from each other



Repulsion magnets move towards each other





2. Electrostatic Force

The force exerted by an electrified body is called electrostatic force.

Activity-1

Rub a plastic pen or comb into your dry hair and then hold it near some tiny pieces of paper. What happens? The tiny pieces of paper get attracted towards the plastic pen or comb.

The tiny pieces of paper get attracted due to the force exerted by the electrostatic charge on the pen or comb.



3. Gravitational Force



The force of attraction between any two objects possessing mass is called **force of gravitation** or gravitational force.

For example : The force acting between any two books, between a book and a table, between you and your friend, between The Earth and the moon etc., is gravitational force. Gravitational force exists everywhere in the universe. Earth has a huge mass. So it attracts every object towards it. That is why a ball thrown upwards ultimately

Force of gravity

comes down, a ripened fruit falling from a tree falls down to the earth.

Fact Box

The weight of quantities lying in two pans of weighing balance are said to be equal when the gravitational forces acting on both pans become equal.

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-2

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

(b)

to do so? (a)





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 much faster than when you alone had to do it.



In the second case, table will move in the direction in which 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 at times move in any direction. This is because the resultant force (net force) acting on it is zero.

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

TESTING TIME



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

Fill in the blanks :

- 1. A _____ or _____ on a body is called force.
- 2. Force can change the direction of a _____ or a _____ object.
- 3. _____ forces act on objects of direct as indirect physical contact.
- 4. Direction of friction is always _____ to the direction of motion.
- 5. The ______force acts from a distance.

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 not be able to move a wall, irrespective of the amount of force you apply.

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

Activity-3

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

Spring Balance

Spring balance is a device which is used to measure the weight of a body.

The object to be weighed is attached to the hook of spring balance which is held vertically either from a hook or with a hand. The spring gets stretched due to the gravitational pull and hence, the pointer slides downward on the engraved scale. The weight of the object is read from the position of the pointer on the scale.



Spring balance



Activity-4

Aim : To make a spring balance and measuring the different weights.

Material required : Rubber band, paper clip, pin, some identical coins, match box tray, paper scale, a wooden panel.

Procedure : Take a wooden panel. Cut a rubber band, tie it on a nail and fix the nail on the upper corner of wooden panel. Tie a paper clip to the other end of the rubber band and to this clip tie a matchbox tray as shown in the figure. Use a pin or matchstick as a pointer to move along the paper scale. Use 50 paise coins as weight. Use a small stone to stretch the rubber band first and mark zero on scale. Each number is the weight of the coin. Using identical coins, mark divisions on your scale. Use your balance to weight light objects.



Constructing a spring balance

Fact Box

There are many natural forces whose effects you can see. Strong winds, storms and hurricanes can exert much force and cause damage to houses, people and other living things. Running water can exert a force. In villages this force is used to turn a wheel which grinds grains. In power houses, falling water is used to turn the blades of a giant wheel in a machine called turbine. This machine is used to make electricity. Electricity obtained from water power is called hydroelectric power.

Pressure

You would have noticed that it is easy to pierce a bunch of papers with a sharp pin, but try doing the same with a blunt pin. Did you succeed? Try pushing a nail into a wooden plank by its head and the



Pushing a nail into a wooden plank

pointed end. Which is easier? You have to exert more force to pierce the paper with a blunt pin. It is easier to push the nail into the wooden plank with the pointed end.

You would have also noticed that the tip of the sharp pin is smaller than that of the blunt pin. Similarly, the tip of the pointed end of the nail is smaller than its head. From this we deduce that the area over which the force is applied plays a role in making these tasks easier.

The force acting on a unit area of a surface is known as **pressure**.

The lesser the area on which a given force acts, the more the pressure will be and vice versa.

Pressure = Force/Area on which it acts

The SI unit of pressure is N/m_2 (Newton paper square metre). It is called Pascal. One pascal is the Pressure exerted on a surface of one metre square by a force of one Newton.

When you stand on the floor, you exert a force against the floor. The pressure you exert is your body weight in pounds divided by the surface area under your feet or shoes. In countries where there is snowfall, you can see people wearing snow shoes. They do this to avoid sinking in the snow. This

Fact Box

High heels concentrate a large amount of face into a small area. The great pressure transmitted through such a heel can make you uncomfortable while walking on soft ground.



trick spreads a person's body weight over a larger area. The constant body weight and larger area produce a low pressure on the snow surface. This is another reason why large vehicles have big tyres. The heavy mass must be distributed over larger area or else the higher pressure on the road surface would practically break down the road.

Activity-5

Aim : The demonstrate the effect of pressure exerted by solids on surfaces in contact.

Material required : Heavy house brick and mud.

Procedure :

- 1. Put a heavy house brick on mud standing on biggest area.
- 2. Now stand it on the long area and the second biggest area.
- 3. Now stand it on the short side, the smallest area.
- 4. Record your observations.



Observation : The brick sinks deepest when the area of the brick touching the mud is least.

Inference : The weight of the brick remains the same but the pressure, the brick exerts on the mud changes as the area of contact changes.

Unit of Pressure

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

 $1 \text{ pa} = 1 \text{ N/m}^2$

Pressure Exerted by Liquids and Gases

Both liquids and gases exert pressure.

Activity-6

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 some depth.



Activity-7

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 that pressure increases with the depth of water.

Activity-8

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 see that the balloon inflates with the pressure of water.



Pressure Exerted By Air

Gases also exert pressure.

Activity-9

- 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? The answer is No.

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

Atmospheric Pressure

Scientists discovered atmospheric pressure in the seventeenth century. This discovery uncovered an interesting fact that air actually has weight! That weight of the atmosphere presses down on the Earth's surface and creates a pressure on it. The pressure at any point exerted by the weight of the air above it is called **atmospheric pressure**.

Atmospheric pressure on the Earth's surface at sea level is about one hundred thousand pascal, i.e., 100 kPa. If such an enormous amount of pressure is acting on us, why do we not feel it? This is because the pressure of the blood in our blood vessels and that of the other fluids present in the body balances out the atmospheric pressure. Atmospheric pressure is measured using an instrument called barometer.

Fact Box

The weight of the atmosphere on the top of your head is 250 kg wt, which is equivalent to the weight of about two baby elephants!

Otto von Guericke's Experiment

We have just learnt that the pressure of the atmosphere is enormous. A very spectacular demonstration of this was





done by the German physicist and engineer Otto von Guericke in the 1600s. In this demonstration, he took two semicircular bowls made of copper, fitted them together to form a hollow sphere, and removed the air inside this sphere using the suction pump he had invented. These two semicircular bowls were held together only by the pressure of the atmosphere. He then got two teams of eight horses each to pull the bowls apart. Guess what? The bowls held tightly together, demonstrating the enormous force of atmospheric pressure.

Variation of Atmospheric Pressure With Altitude

The altitude of a place is its height above sea level. The atmospheric pressure at a place depends on its altitude and decreases as we go up. We know that atmospheric pressure at a place is the force

exerted by the weight of the air column above that place. As we go up, the length of the air column above us decreases. This means its weight decreases, and therefore, the atmospheric pressure is smaller at higher places (than at sea level).

If the pressure of atmosphere is changed suddenly, the blood vessels in our body will burst due to the pressure of the blood and other fluids in side. This is why astronauts have to wear special pressurized suits there is no air and therefore, no air pressure in space.



Astronauts wear special suits

Activity-10

Aim : To show the presence of atmospheric pressure.

Materials needed : A glass tumbler (with a smooth edge at the mouth, and without a rim), a piece of stiff cardboard (a little bigger than the mouth of the tumbler), and water. (It would be convenient to perform this activity over a wash basin or the kitchen sink.)

Method :

- 1. Fill the tumbler with water to the brim.
- 2. Cover the tumbler with the cardboard piece (figure A).
- 3. Place the palm of your hand over the piece of cardboard, and quickly invert the tumbler (figure B).
- 4. Slowly remove your hand supporting the piece of cardboard (figure C).



Observation : You will observe that the cardboard piece will not fall. Conclusion : Atmospheric pressure provides enough force to support a full glass of water.

Activity-11

Aim : To study atmospheric pressure using rubber suckers.

Materials required : Rubber suckers.

Method : Take a rubber sucker and press it firmly to a smooth surface like a kitchen tile or a plain glass window. Try to pull it out.

Observation : You will see that it is really difficult to pull the rubber sucker off the smooth surface.

Conclusion : By pushing the rubber sucker against the smooth surface, you have created a partial vacuum, and the pressure of the air pressing on the outer surface of the sucker holds it in place.

Extension : Take a smooth stainless steel or ceramic plate and stick the rubber sucker on it. You can now hold me the plate at any angle (horizontal, vertical, upside down, etc.) and try to pull the rubber sucker off the plate. You will find that the rubber sucker remains stuck to the plate regardless of the angle at which you hold the plate. This shows that air exerts pressure in all directions.

🔍 Key Words :

	:	Any push or pull which moves a thing.
tic Force	:	The force of the magnet which attracts some metals like iron etc. towards itself.
nical force	:	Force generated by a machine is called mechanical force.
ar force	:	Force produced by the muscles of any living organism.
leter	:	Device to measure the pressure exerted by liquids.
e	:	The force per unit area.
	ic Force lical force ar force leter e	ic Force : nical force : ar force : eter : e :

Sum Up Now :

- 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.
- 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.

(Assessment Of Learning Outcome)

- Atmospheric pressure decreases with altitude.
- Atmospheric pressure is measured by an instrument called barometer.

PRACTICE ZONE

Objective Type

A. Select and tick (\checkmark) the correct answer :

- 1. Which of the following is a non-contact force?
 - a. Muscular force 🔵 b. Frictional force 😑 c. Magnetic force 🥚 d. Mechanical force

	2.	The SI unit of force is :
		a. Metre/second 🔵 b. Newton 🛛 😑 c. Metre/second ² 🕘 d. Gram-weight
	3.	If a given force is applied on a smaller area of contact the pressure exerted by it :
		a. Decreases O b. Increases O c. Does not change O d. None of these
	4.	Pressure is defined as :
		a. Force () b. Force x distance () c. Force x area () d. Force per unit area
	B. Fill	in the blanks :
	1.	The direction in which a body is pushed or called the
	2.	Force can change the of an object.
	3.	force exists everywhere in the universe.
	4.	The force acting on a unit area of a surface is known as
	5.	is defined as the pressure exerted on an object by the weight of the air above.
	C. Wri	te true or false :
	1.	A force can change the direction of motion of a moving object.
	2.	Force of fraction is due to smoothness on the surface of the bodies in contact.
A a	3.	The SI unit of pressure is newton per square metre.
	4.	When two forces act in the same direction along the same line, the resultant
		force is equal to the sum of the forces.
	5.	Liquids exert equal pressure in all directions at the same depth.
-(9)/=	Su	ubjective Type
A Am	A Ver	v short answer questions •
	1.	Define force, 2. Write two effects of force.
	3.	What is the SI unit of force? 4. Give one example of an elastic force.
nT	5.	The things that are attached towards a magnet are made of which attract some metals.
	B. Sho	rt answer questions :
	1.	Give any two examples, where objects move by applying force with hands.
	2.	State key four effects a force can produce.
	3.	Define : a. Contact force b. Non-contact force?
	4.	What happens when a rubber band is stretched?
	5.	Give two examples, where friction is helpful.
1	C. Lon	g answer questions :
	1.	What are the different effects of force? Give suitable examples?
	2.	Describe an experiment to demonstrate that liquids exert equal in all the directions at the same
		time.
	3.	Give the examples of each of the following :
		a. Muscular force b. Gravitational force c. Friction force d. Electrostatic force

D. Higher Order Thinking Skills (HOTS) :

- 1. Why do you think a dam is thicker at the base than at the top?
- 2. What hurt you 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?
- **Creativity** Zone

[(Physical Media Development (PMD)]

Critical Thinking

• Complete the following diagram :



Playway Learning

- You will need a card board piece, a spoon of thread (empty), paper, pencil, glue, balloon :
- 1. Take a cardboard square (4x4 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 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 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?

Group Discussion

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

Experiential Skill

• Make a chart depicting the items available in your house/school, which makes use of various forces to perform various functions.



Stepping Up

- Friction
- Friction : A Necessary Evil
- st Factors Affecting the Force of Friction
- Ways to Increase or Reduce Friction
- Types of Friction

When you roll a ball on the ground, it stops after going some distance. Why is it so? You applied force on it to make it move, but still it comes to stop.

Consider another situation. A man pushes (applies force on) a heavy almirah but it does not move. What happened to the force the man applied? How could a force act on an object without showing any effect? The answer to these questions is friction.



A man pushing an almirah

Friction

Friction is a natural force that resists the relative motion of two surface in contact. It is always exerted in a direction that opposes motion.

The ball stops due to the friction (frictional force) acting between the ball and the ground. Similarly, the friction acting between the base of almirah and the floor prevented it from moving. In this case, the friction is large and in order to overcome it and make the almirah move, either a large force is to be applied or some other means are to be used.

Friction is an evil for all motions. No matter which direction something moves in, friction always pulls it in the opposite direction. It is a force that slows down motion and dampens the energy. It can transform the energy of a moving body into heat energy and sound energy.

Consider the following examples :

- You rub your hands against each other to warm them up in chilled winter mornings.
- To light a matchstick, you rub its head on the rough side of the matchbox. By doing this, some heat is generated and the combustible material on the head of the matchstick starts burning.



• When wind blows through a tree, the tree impedes the flow of the wind. This causes the wind to slow down. Friction takes away some energy from the wind and transforms it into noise of leaves and branches as the wind blows, through them.

Fact Box

Friction between two solid objects is often referred to as dry friction.

Lighting a matchstick


Causes of Friction

Friction force comes into play only when two surfaces are in physical contact and is therefore, a contact force.

• No solid surface is perfectly smooth. There are a large number of irregularities present on the two surfaces in contact. Some are rougher than others. In other words, all solid surfaces are rough, only the degree varies. When an object moves over another surface, the irregularities in the two surfaces interact with each other and oppose the relative motion between the two objects. Since a rough surface has more irregularities, the force of friction is greater if the surface is rough. Thus, friction is caused due to interlocking of irregularities in the two surfaces.

Fact Box

- The roughless of the surfaces is often referred to as sandpaper effect.
- The microscopic projections or irregularities on the surface of an object are known as asperities.



• 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 objects, this gives rise to frictional force.

Factors Affecting the Force of Friction

The force of friction is dependent on :

The smoothness or roughness of the surface in contact.

Activity-1

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 stack of books after wrapping them in (a) Polythene piece (b) Jute cloth. Do you notice any variation in the readings?



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-2

Make an inclined plane on a table by placing books and a plyboard piece as shown in the figure given the next page. Put 6 mark on the plyboard 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 object which moves on a horizontal surface.

Activity-3

- 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 these 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 increases.

Types of Friction

The friction between two surfaces may be divided into three categories :

- Static friction
- Limiting friction
- Sliding friction
- Rolling friction

Static Friction

When a body is in contact with a surface at rest and no external force is applied, the force of friction is zero. When a small force is applied on the body, the force of friction starts acting on the body in a direction opposite to the tendency of motion of the body. As long as the body remains at rest, the force of friction is equal to the applied force and is called the static friction.

When a body is at rest, the force of friction is called the static friction and is always equal and opposite to the applied force.

Activity-4

Measuring frictional force

Take a wooden block provided with a hook.



Place this wooden block on a table.

Attach a sensitive spring balance to its hook.

Pull the spring balance gently by applying a little force.

You will notice that a little force does not move the block. That is, it is not sufficient to overcome the force of friction.

Gradually increase in the force on the block until it starts moving.

Note that a certain, minimum force is required to get the block moving.

Limiting Friction

When the external force is increased slowly, the value of static frictional force also increases and a stage comes when the body is just about to move. As external force is slightly increased from this value, then the body starts sliding over the surface. The force of friction which acts when the body is just at the verge of sliding on the surface is called the **limiting frictional force** or **limiting friction.** Let us perform the following activity to know more.

Block Spring Balance Frictional Pull

Spring Balance

The force acting on an object can be measured with the help of a spring balance. It consists of a coiled spring which gets stretched when a force is applied to it. It also consists of a pointer and a graduated scale. The reading on the scale gives the magnitude of the force.

Activity-5

- Take a wooden block provided with a hook.
- Place this wooden block on the table.
- Attach a sensitive spring balance to its hook and pull the spring balance gently.
- Gradually increase the pull (force) on the spring balance until it just starts moving.
- Record the force shown by the spring balance. This force is equal and opposite to the limiting friction between the surface of the wooden block and the table.
- Now, sprinkle some talcum powder on the table and place the wooden block over it.
- Repeat the activity and record the force of limiting friction.
- Now, take a sand paper and place it flat on the table.
- Place the wooden block over this paper.
- Repeat the activity and record the force of limiting friction.
- You will observe that the limiting friction is least in case of talcum powder, of middle order in case of table top and maximum in the case of sand paper.

Thus, it is clear that limiting friction depends upon the nature of surfaces in contact with each other.



Spring balance

111 Science-8

Sliding Friction

When external force exceeds the limiting friction, the body begins to move on the surface. This force of friction is called **sliding friction**. When an external force is applied to start a relative motion, the interlocking of surfaces gets off thus, causing less frictional force. That is why once the motion starts the frictional force acting between the surfaces in contact decreases, so that a smaller force is required to maintain a uniform motion. That is why sliding friction is less than the static friction. The sliding friction is constant whatever the velocity of body may be and is always less than the limiting friction.

The amount of sliding friction present depends on two factors the weight of the object that is moving and the types of surfaces that the object slides across. There is more friction when a stack of cartons is pushed than when just one carton is pushed, but there is less friction opposing the motion if the cartons are pushed across a smooth floor rather than across a carpeted one.

Fact Box

The rolling friction is much smaller (100 to 1000 times) than the static and sliding friction.

Rolling Friction



Rolling reduces friction

If a symmetrical body (a spherical ball, a cylinder, a ring, etc.) rolls on a surface without slipping, it will not experience any friction. The reason is that in this situation there is just a point of contact between the body and the plane at all instant of time and there is no motion of this point relative to plane. Hence, in this situation there is no question of existence of static and sliding friction and so in this ideal situation the body must roll on the surface with constant velocity, but in practice this does not happen and the body suffers a hindrance in its motion. This hindrance is called the **rolling friction**.

The origin of rolling friction is also the intermolecular force of body and the plane in contact and may be understood as follows.

A body while rolling has a small area of contact with the surface, hence smaller number of molecules of both surfaces in contact exert intermolecular force, this causes rolling friction to be small. During rolling, the surfaces in contact get deformed a little instantaneously, this causes intermolecular forces to appear in the picture. The resultant of these intermolecular forces has a component parallel to surfaces, which opposes motion.

Activity-6

To show that rolling friction is less then sliding friction. Take a heavy book and a few round pencils. Place the book on a plane surface. Give it a push. See how fat it moves. Now place the same book over the round pencils and give it a gentle push. You will find that it is easier to move the book when it is placed on pencil. The book goes much further. Here we see that pencils act as solvers and reduce the friction between the book and the surface.

Thus, we can say that rolling friction is less than the sliding friction.



The discovery of wheels, ball bearings in vehicles due to small rolling friction is a born to human society. The friction force that exists between two surfaces when a body rolls over the other is called **rolling friction**.

You will find that it is easier to move the block now. The force required is always less than the sliding friction for the same body. This explains why wheels and rollers are used in machines. Thus, it is easier to roll than to slide a body over another. Now you can understand why luggage fitted with rollers is convenient to pull.

TESTING TIME

Rewrite the following statements correctly :

- 1. Friction is always exerted in a direction that supports motion. _____
- 2. Rough surfaces offer lesser friction than smooth surfaces. ____
- 3. Static friction is always greater than and similar to the applied force. _____
- 4. Sliding friction is more than the static friction.
- 5. Static friction exists between two surfaces when a body rolls over the other. ____

Friction : 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 mixer 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 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 footwears. This is the reason why patterns or grooves are made on the soles of shoes to increase friction. This prevents the person



Sole of a shoe



Nail fixed on a wall due to friction

from slipping.

- Can you now guess why it is easier to write on a plain paper than on a glazed/waxed paper explaint it?
- Other situation 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.
- 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 fill of oil on it, it is difficult to hold it.
- Therefore, we can conclude that friction is a necessary evil.



Ways to Increase or 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.



Treaded Tyre

- 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.

The friction between two surfaces can be reduced by the following methods.

1. By polishing the surfaces : Rough surfaces can be made smooth by polishing. Polishing removes 'hills' and 'valleys' from the surfaces. Therefore, polishing of the surfaces reduces the friction.



View of two rough surfaces in contact (a) without oil/grease (b) with oil/grease.

By applying oil or grease on the surfaces (or by lubrication)

 Oil/grease forms a thin layer between the two surfaces.
 Thus, a lubricant (oil/grease) separates the two surfaces.
 This reduces the chances of interlocking of the two surfaces and thus reduces the friction.

Soap solution also acts as a lubricant. That is why we tend to slip on the floor if it is covered with soap solution.

• By sprinkling a soft, slippery fine powder on the surfaces : Small quantity of fine powder on a wooden surface or floor etc., reduces friction. That is why a small quantity of talcum powder is applied on carrom board. Graphite powder is used in machines to reduce friction.



By using wheels, ball-bearings or roller-bearings : When a body rolls over a surface, the force of friction is much lesser than that on a flat surface. That is why, friction is being reduced by using wheels, ball-bearings or roller-bearings in machines.



Powder is sprinkled on the carrom board to reduce friction.

By streamlining the body of an object : Properly shaped bodies (called streamlined) experience less friction from air or water. Bodies of aeroplanes, rockets, ships, etc., are streamlined. Birds and fish also have streamlined bodies.



Streamlined body of a ship



TESTING TIME

Encircle the correct option :

- 1. Heating results in (wastage/production) of energy.
- 2. Friction is a/an (necessary/unnecessary) evil.
- 3. Soles of the shoes have (grooves/treads) to reduce friction. Streamlined bodies experience (more/less) friction from air or water.

Key Words :

Friction	:	Friction is the force which opposes the motion.
Static friction	:	Force of friction between two surfaces which balances the force applied on the
		object to push it.
Sliding friction	:	Sliding friction refers to the resistance created by two objects sliding against each
		other.
Streamlined	:	It is the shape of the body which is narrow in front and sloping from sides.

🕈 Sum Up Now :

- 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, the less is the force of friction between the two.
- Friction depends on how hard the two surfaces press against each other.
- There are four types of friction-static friction, limiting 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 friction resistance to objects travelling through them. It is called fluid friction.
- We can increase friction by making the surface rough like soles of the shoes and treaded tyres.
- 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.

PRACTICE ZONE

Objective Type

A. Select and tick (\checkmark) the correct answer :

- 1. Frictional forces between two surfaces come into play only when the two surfaces.
 - a. Are far away from each other
 - c. Are in physical contact

- b. Are close to each other
- d. Do not touch each other

(Assessment Of Learning Outcome)



Science-8

D. Higher Order Thinking Skills (HOTS) :

- 1. When a pencil cell is released from a certain point on an inclined wooden board, it travels a distance of 35 cm on floor A before it comes to rest. When the same pencil cell is released from the same point on the same inclined board, it travels a distance of 20 cm on floor B before coming to rest. Which floor, A or B, offers greater friction? Give reason for your answer.
- 2. What kind of friction comes into play:
- a. When a block of wood kept on table moves slowly?
- b. When a block of wood kept on table just tends to move (or slip)?
- c. When a block of wood kept on cylindrical iron rods moves?

(PHYSICAL MEDIA DEVELOPMENT (PMD)]

Critical Thinking

• Complete the following diagram :



Playway Learning

- 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.

Groups Discussion

• Divide yourself into groups of 3. Discuss at least five situations yourselves on the importance of friction in our daily life.

Project Work

• Take three similar wooden surfaces. Apply oil, grease and water on each of these surfaces. Place a similar steel box on each of these surfaces and push each of them with equal force. Find out which box comes to rest first and the one which comes to rest last. What do you conclude from this activity?

SOUND

Stepping Up

- Sound is Produced by a Vibrating Body
 Sound Needs a Medium for Propagation
- Characteristics of Sound
- X Audible and Inaudible sound
- 🔀 Sounds Produced by Human Beings
- Musical Sounds and Noises
- X Noise Pollution

Sound is something that produces the sensation of hearing in our ears. Everyday we hear different types of sounds produced by living beings as well as non-living things. We can recognize some of

them even without seeing them.

For example, a teacher teaching in class, the barking of dogs, the roaring of lions and the mooing of cows. Non-living things also make a variety of sounds.

For example the horns of vehicles, the sound produced by generators, various machines, aeroplanes and various musical instruments.



A bird chirping A dog barking Sounds produced by living things

Sound is Produced by a Vibrating Body

Play a transistor or a radio at a louder volume. Hold your palm against the speaker of transistor or radio. Can you feel its vibrations? Blow across the mouth of a bottle which is half filled with water. Repeat with different amounts of water in the bottle. Do you feel the same vibrations?

Sound can be produced by making the objects move to and fro or back and forth. The to and fro or back and forth motion of an object is called vibration. When a tightly stretched band is plucked, it vibrates and produces sound. Vibration in some cases can be easily visible to us, but in most cases it is so small that we can not see it.

Fact Box

Thomas Alva Edison invented the phonograph, a device that played recorded sound in 1877.

Let us perform some activities to learn more about vibrations.

Activity-1

Aim : To demonstrate that sound is produced by vibration.

Material required : A cassette player/television.

- Method : 1. Hold your throat with your finger tips. Now speak or sing for about 5-10 seconds. What do you feel?
 - 2. Turn on the cassette player/television. Place your palm on its speaker. What do you feel?

Observation : In the first case, you should be able to feel the vibrations in your throat. In the second case, you should be able to feel the vibrations in the speaker.

Conclusion : Sound is produced by vibration.



Activity-2

Aim : To show that the frequency of vibrations can be changed.

- Attach one end of a rubber band to a fixed support like a hook on the wall. Hold the other end with your finger.
- Stretch the rubber band and pluck from the middle.

You can pluck at different parts to change the frequency of vibrations of the sound.

Activity-3

Aim : To show that vibrations carry energy.

- Strike a tuning fork on a rubber pad and bring it close to your ear. You will hear the sound produced by it.
- Strike it again on the rubber pad and touch the surface of water kept in a glass. What happens to the water?

You will observe movement in the water caused by the energy carried by vibrations of the fork.

Characteristics of Sound

Sound travels in the form of a wave. Waves are characterized by three basic quantities.

They are frequency, speed, and amplitude. Two of the main characteristics of sound are pitch and loudness, which is in turn are determined by the frequency and amplitude of the wave, respectively. Therefore, to understand what pitch and loudness mean, we will first need to study the characteristics of waves.

We will use the example of oscillations of a simple pendulum to explain the terms **amplitude** and **frequency**. Although a simple pendulum does not produce sound waves that we can hear, this example will help us observe oscillations and understand the terms involved. The diagram of a simple pendulum is given in the figure below it consists of a small ball (called the bob) attached to a

string, which is fixed at one end.

Amplitude : If we pull the bob sideways and leave it, it will oscillate back and forth for some time and then come to a stop. The position where it comes to a stop is called the **mean position** (position A in the figure.)

The maximum displacement of the bob from the mean position during oscillation is called the **amplitude** of the oscillation. In the figure, the maximum displacement occurs when the bob is at positions B and C.

Time period : When the bob moves from one position and comes back to the same position (moving in the same

direction), it is said to complete one oscillation. For example in the figure above if the bob starts from A, goes to C, then to B, and then back to A, we say one oscillation is complete (look at the





Vibrations carry energy



arrows the figure above). The time taken to complete one oscillation is called the **time period** of the oscillation. It is measured in seconds.

Frequency : The number of oscillations per second is called the **frequency of oscillation**. For example if the bob of the pendulum in the given moves five times through point B in a second, its frequency is 5 per second. The SI unit of frequency 'per second' is called hertz (Hz) in honour of the German physicist, Heinrich R. Hertz. When we say that a vibrating body has a time period 'T', we mean that it

completes one oscillation in 'T' seconds. Thus, in 1 second it will complete 1/t oscillations, which is its frequency.

Frequency and pitch : Sound waves are produced due to the to and fro oscillation of particles in a medium. If an object oscillates 80 times per second, it is said to have a frequency of 80 Hz. Frequency is considered an important characteristic of a sound wave because different frequencies sound different to us. You might have noticed the difference between the shrill voice of a child and the deep voice of a man. The shrillness of the sound produced is determined by the frequency of the vibrating body. Shrillness is also explained using a term called pitch.

Fact Box

Sound waves of frequencies above 20,000 Hz are called ultrasonic waves. While we cannot hear ultrasonic waves, we apply them in technologies like Sonar. Sonar stands for Sound Navigation Ranging. It is used in navigation of ships, to map sea beds, and in submarines.

Higher the frequency of the vibrating body, the higher will be its pitch. A high-pitched sound appears shrill, and a low-pitched sound appears deep or gruff to our ears.

Amplitude and loudness : The amplitude of the vibrating body producing the sound determines the loudness of the sound. If the amplitude is higher, the sound produced is louder.



Pictorial representations of sound waves

TESTING TIME

Fill in the blanks :

- 1. _____ produces the sensation of hearing in our ears.
- 2. The to and fro or back and forth motion of an object is called _____
- 3. Sound travels in the form of a _____
- 4. _____ is measured in seconds.
- 5. If the _____ is higher, the sound produced is louder.

Sounds Produced by Humans Beings

In human beings 'larynx', also known as voice box, the source of sound, we have already performed an activity on the vibration of vocal cord producing sound.



These vocal cords are the ligaments that stretch across the larynx leaving a narrow slit between them for passage of air. When the air is forced through the slit of the vocal cords, they vibrate producing sound. When the vocal cords are tight and thin the voice is of high frequency. When the vocal cords are loose and thick the voice is of low frequency.











How do we Hear?



The ear

Vocal cord

Our ears help us to hear. Sound waves enter the ears and travel down a canal at the end of which is a thin, tightly stretched membrane called eardrum. As the sound wave strikes the eardrum, it vibrates and the vibrations reach the inner ear which sends signals to the brain. The brain interprets the signals and we hear or recognise the sound.

Remember never put sharp objects like matchstick, hairpins, etc. in the ear; the ear drum can get damage in this way.

Sound Needs a Medium for Propagation

How is it that you are able to hear your mummy even from a distance? How does sound travel?

Activity-4

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-5

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-6

Take a clean dry glass tumbler. Place a cell phone in it. Ask someone 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 cell phone 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-7

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.

Loudness of sound is expressed in decibels (dB). The sound above 80 dB is not pleasant. The following table gives an idea of loudness of sound coming from various sources.

Rustling of leaves	10dB	Heavy traffic	90 dB
Whisper	30dB	Loud music	90dB
Normal breathing	10dB	Aircraft engine	100-200 dB
Normal conversation	60 dB		

Activity-8

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 ampitude of the vibration.



Activity-9

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?

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 differnce in the size of the vocal cords. They are longest in men and shortest in children.

Activity-10

Aim : Tin can model of the eardrum

- Take a tin and cut its ends.
- Stretch a rubber balloon on one end of the can and fasten it with a rubber band.
- From the open end, put a few grains (4 to 5) of dry cereal on the stretched rubber.
- Shout "Hurray! Hurray!" from the open end and ask your friend to see how the grains jump up and down.
- This is the way your eardrum reacts to sound .

Audible and Inaudible Sound

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 – 20 Hz to 20,000 Hz – Above 20,000 Hz –

subsonic sound sonic sound

000 Hz – ultrasonic sound

sound onic sound

Fact Box

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

Musical Sounds and Noises

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 10 dB to 30 dB. 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 :





Noise



- 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

Noise pollution is the unwanted and displeasing human created sound that disrupts the environment. The word noise is derived from a Latin word noxia, which means, "I do harm", originally referring to nuisance.

Sources of Noise

Due to day by day increase in noise level it has become out of the foremost priority to curb this menace. In big cities noise pollution is equally harmful as air or water pollution.

Sources

- 1. Industrial Sectors : Machinery a basic unit of factories is the main cause of noise pollution in commercial sectors. As the machineries become old their noise pollution also increases.
- 2. Noise from Vehicles : In addition to air pollution vehicles also cause noise pollution. Moreover when old vehicles are not maintained properly their contribution to the noise level increases manifolds. Transport vehicles like truck, bus, rail, car, scooters, aeroplanes etc. all cause **sound pollution**. Aeroplanes flying at lower altitudes cause noise pollution.



- 3. Noise in surroundings : In our surrounding noise is produced by loud speakers used in different functions and rallies organised by various political parties. Loud music played in cars, shouting of street hawkers, noise produced during the construction of buildings also add to the noise pollution.
- 4. Fire Crackers : Fire crackers explode with a sharp and loud sound. These high intensity crackers are the sources of sound pollution.
- 5. Gadgets for entertainment : Radio, tape, recorders, transistors, television etc. when played on high volumes contribute to sound pollution.
- 6. Domestic appliances : Coolers, air conditioners, washing machines, mixer cause sound pollution.





Noise Hazards

Noise can lead to many health hazards.

- It may cause partial or permanent hearing loss.
- It increases nervous tension, irritation and high blood pressure.
- It may also cause lack of concentration in work or studies.
- Loud noise during night time disturbs our sleep.

Controlling Noise Pollution

In view of the dangers of noise, it is necessary to control the increasing noise level due to noise pollution. Some of the measures to reduce noise pollution are as follows :

- We should not play the radio, television and stereo system very loudly.
- The horns of motor vehicles should not be blown unnecessarily.
- Automobiles should be fitted with silencers and soft horns.
- Ear plugs should be used by mechanics and workers in a factory.
- Airports and noise making factories should be shifted away from the residential area of the city.
- Trees must be planted along the roads and around buildings playing a stereo system very to cut down on the sounds reaching the residents.

TESTING TIME

Tick (\checkmark) the correct word :

- 1. Our (eyes/ears) help us to hear.
- 2. Sound having frequencies above 20,000 Hz are (inaudible/audible).
- 3. (Pleasant/Unpleasant) sound is called noise.
- 4. Drum, tabla and dholak are (percussion/stringed) instruments.
- 5. Automobiles should be fitted with (silencers/horns) to reduce noise pollution.

Key Words :

Vibration	:	A 'to and fro' or 'back and forth' motion of an object about a central position.
Amplitude	:	The maximum displacement of the vibrating object on either side of its mean
		position.
Frequency	:	The total number of complete vibrations by an object in one second.
Oscillation	:	Another name for vibration.
Time period	:	The time taken by the vibrating object to complete one vibration.
Sound	:	A disturbance produced by vibrating objects.
Audible sound	:	Sound that can be heard by human.
Sound propagation	n :	The travel of a sound from one place to another.
Music	:	A sound that appears pleasant to our ears.
Noise	:	Any unpleasant sound that causes discomfort.



Playing a stereo system very loudly can cause hearing impaired



Sum Up Now :

- Sound is produced by vibrating objects.
- The number of oscillations or vibrations per second is called frequency of oscillation.
- It is expressed in hertz (Hz).
- Loudness of sound is expressed in decibel (dB).
- Higher the frequency of vibration, higher is the pitch and shriller is the sound.
- Sound needs a medium to travel. It can travel in solids, liquids or gases.
- In human being sound is produced due to vibration of vocal cord.
- Sound travels faster in solids and liquids than in gases.

PRACTICE ZONE

Objective Type

Select and tick (\checkmark) the correct answer : 1. The substance through which a wave travels is called a : d. Disturbance a. Source 🛛 b. Trough C. Medium 2. Through which of the following does sound travel the fastest? a. Air b. Water c. Ice d. Wood

(Assessment Of Learning Outcome)

d. Oscillation

- 3. Rapid back and forth motion is called :
- a. Translation 😑 b. Rotation c. Vibration
- 4. An object produces a round of 15 Hz. Which of the following statements is correct?
 - a. This sound can be heard by us b. This sound cannot be heard by us d. This sound can be heard only through solids
 - c. It cannot produce sound
- Fill in the blanks :
 - 1. things also make a variety of sounds.
 - 2. The SI unit of frequency of sound is ______.
 - 3. Unpleasant sound is called ______.
 - 4. Sound cannot travel through .

Write true or false : С.

- 1. Unwanted or unpleasant sound is termed as music.
- 2. Sound can travel through solids, liquid and vacum.
- 3. Sound is produced by vibrating objects.
- 4. The unit of frequency is hertz.

Subjective Tupe

Very short answer questions : Α.

- 1. What is frequency?
- 2. How is sound produced?
- 3. Name the human organ that produces sound.
- 4. What is the range of audible frequency for humans?
- 5. In what unit is the loudness of sound measured?

B. Short answer questions :

- 1. List the factors on which the velocity or speed of a sound wave depends.
- 2. What is sound pollution?
- 3. What are stringed musical instruments?
- 4. State four ill effects caused by noise pollution.
- 5. Why are the voices of men, women and children different?

C. Long answer questions :

- 1. What are the characteristics of sound?
- 2. How do we perceive the amplitude of a sound wave?
- 3. What are the various sources of noise pollution? State four ill effects caused by noise pollution.
- 4. Describe as experiment to demonstrate that sound cannot travel in vacuum.
- 5. Draw a well labelled figure of human ear.

D. Higher Order Thinking Skills (HOTS) :

- 1. If you are sitting in a boat, a sound coming from the shore will sound louder than the same sound heard by a person on land. Give reason.
- 2. Explain why, if strike a steel tumbler with a metal spoon lightly, we hear a feeble sound but if we hit the tumbler hard, a loud sound is heard.

Creativity Zone [(Physical Media Development (PMD)]

Critical Thinking

• Complete the following diagram :



Playway Learning

- Music from a coat hanger
- Have you ever thought that you can hear musical noises from a coat hanger.
- 1. Take a metal coat hanger.
- 2. Take a piece of rope about 11½ metre long in the centre of the hanger.
- 3. Tie one end of the rope 3-4 times round your left finger.
- 4. Tie the other end in the same way around your right finger.
- 5. Put your finger ends into your ears.
- 6. Now stand near a chair and allow the hanger to strike it.
- 7. 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.

Group Discussion

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

Project Work

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

Unit-V : How Thinks Work CHEMICAL EFFECTS OF ELECTRIC CURRENT

Stepping Up

- X Conduction in Liquids
- ightarrow Good/Bad Conducting Liquids
- st Detectors to be used for Detecting the flow of current
- 🔀 Chemical Effects of Electric Current
- ➢ Electroplating

Electricity is an essential part of modern living. It is one of the most important of all forms of energy. It provides us with light and heat, and operates a variety of machinery-motor cars, refrigerators,

television sets, ovens, pumps, heaters, etc. Moreover it can power the huge engines of a high speed electric train and turn a piece of iron into a magnet. This is not all. In this chapter we will learn more about the effects of electricity.

Look at these pictures and find out what mistakes these people are making. All of them are dealing with electricity and must take care to protect themselves from electric shocks.





Have you ever tried to think that why your elders always warn you not to touch electric wires and switches with wet hands? It is so because they want to prevent you from getting an electric shock. Water being a good conductor of electricity makes a connection between the electric switches and your body resulting in flow of current and giving you an electric shock.

We have studied in earlier classes that the materials, which allow electric current to pass through them, are **conductors of electricity**.

While materials which do not allow electric current to pass through them easily, are **insulators**. We can find with the help of a tester whether the electric current passes through a particular material or not.

Let us perform an activity to know about conductors and insulators.



Activity-1

Aim : To study about conductors and insulators.

Materials required : A torch bulb (1.5 volt) fixed in a holder, a dry cell and things like copper wire, iron wire, aluminium wire, cotton thread, rubber string, strips of paper and plastic.

Procedure : Connect the positive and negative terminals of the cell to the two terminals of the bulb holder with the help of copper wire as shown (figure a). What do you observe?

You will find that the bulb glows.



Now, remove the copper wires. Again connect the cell to the terminals of the bulb holder with the help of cotton thread (figure b). Does the bulb glow now?

Next, make the connections between the bulb and cell with the help of some other materials like rubber string. Strips of paper and plastic, iron wire, aluminium wire, etc. Observe in which case the bulb glows.

Observation : You will observe that the bulb glows when it is connected to the cell with the help of materials like copper wire, iron wire and aluminium wire. The bulb does not glow when it is connected to the cell with the help of materials like cotton thread, cubber strings, strips of paper and plastic.

Conclusion : It can be concluded from the above activity that materials like copper wire, iron wire, aluminium wire allow electric current to pass through them. On the other hand materials like cotton thread, a rubber strings, strips of paper and plastic do not allow electric current to pass through them.

We observe an electrician working at the electric poles. He generally wears rubber gloves in his hands or uses tools which have rubber coating on their handles. Similarly in our homes, copper wires and aluminium wires covered with thin layer of insulating materials like rubber, PVC are used for electric wiring.

Conduction in Liquids

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

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.

Activity-2

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 wire in at as shown in the figure. Ensure that the two free ends of the not touch each other and are 1 cm apart. Does the bulb grow?

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?





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

Detectors to be Used for Detecting the Flow of Current

Some conductors allow the current to flow through them easily. Such conductors are commonly called **good conductors**. There are some others which do not allow the current to flow through them so easily. Such conductors are called **bad conductors**.

When a good conductor is placed in any electrical circuit, a strong current flows through it. For such cases, a battery bulb can be used as a detector.

- If the bulb glows, the material placed in the circuit is a good conductor.
- If the bulb glows dimly, the material placed in the circuit is a bad conductor.

When the current flowing through the circuit is too weak then the bulb may not glow at all. In such cases, a more sensitive detector such as an LED or a magnetic compass can be used.

Detector Based on Magnetic Compass

LED (Light Emitting Diode)

An **LED** is an electronic device. It starts emitting light even when a very weak current flows through it. It has two leads. The longer lead is the positive (+) and the smaller one is negative (-) end. LEDs are available in different colours.

Place the test sample in the gap AB LED as a current detector

LED

This detector is based on the magnetic effect of current. When current passes through a circuit, a magnetic compass placed near it gets deflected. The detector based on magnetic compass can detect even weak currents. The detector based on magnetic compass can be made as follows :

- Place a small magnetic compass in an empty match box tray.
- Wrap an electric wire around the tray a number of times.
- The two free ends of the wire then can be used for connecting it to the other components of the circuit.

Activity-3

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 1 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?



Place the test sample in the gap AB Current detector based on the magnetic effect of current



Good/Poor Conducting Liquids

Fill in the following table and observe.

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		

You can see that 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, but 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 a conductors and insulators. Let us now see whether distilled water and salt solutions are good conductors or not. Tap water, as a 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.

Fact Box

Unlike the dry cell you are familiar with, an electrolytic cell does not use chemical reactions to generate electric current. In fact, it does the opposite. An electrolytic cell uses electric current to produce chemical reaction.

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

Activity-4

Take a plastic cup full of distilled water. Use a tester to test whether distilled water conducts electricity or not.

Now, dissolve 1/2 teaspoon of salt in a little distilled water and again test. What do you conclude? The bulb does not glow when distilled water is used showing that distilled water does not conduct

used, showing that distilled water does not conduct electricity. However, salt solution is a conductor of 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 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-5

Carry out the activity under the supervision of an adult.

Repeat activity 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?

TESTING TIME

Write true or false :

- 1. Electricity is one of the most important of all forms of energy.
- 2. Rubber and PVC are conducting materials.
- 3. Not all liquids are good conductors.
- 4. If the bulb glows dimly, the material placed in the circuit is good conductor.
- 5. LEDs are available in different colours.

Chemical Effects of Electric Current

Activity-6

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 cm 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 current.

Electrolysis is defined as the chemical decomposition of constituents of solution on passage of electric current. Electrolytes are substances which when dissolved in water break up into contains (positively charged) and anions (negatively charged). The cations move to the negative electrode (cathode) and the anions to the positive electrode (anode). To observe the chemical change in water when electricity passes through it. Perform the following activity.

Fact Box

William Nicholson, a British chemist, had shown that if electrodes were immersed in water and a current was passed, bubbles of O2 and H2 were produced.



 $\mathbf{0}$



Activity-7

- Take a plastic vessel. Drill two holes at its bottom and set rubber stoppers in these holes.
- Insert carbon electrodes in these rubber stoppers and connect these electrodes to a 6 volt battery and a switch.
- Fill the vessel with water such that the electrodes are immersed. Add a few drops of dilute sulphuric acid to the water in the vessel.
- Take two graduated test tubes filled with water and invert them over the two carbon electrodes.
- Switch on the current.
- After sometime you will observe the formation of bubbles at both the electrodes. These bubbles displace water in the graduated tubes.
- Once the test tubes are filled with the respective gases, remove them carefully.
- Test these gases one by one by bringing a burning splinter of wood close to the mouth of test tubes.
- What happens in each case? When gas is present in each test tube?
- What do you think has happened?
- The electricity has a chemical effect on the water and has split it into oxygen and hydrogen. The volume of hydrogen gas is twice that of oxygen and so the formula for water is H2O.
- Electrolysis of water Hydrogen burns with a pop Oxygen will relight a glowing splinter of wood



Electroplating

The process of depositing a thin layer of one metal on top of another metal with the help of electric current is called **electroplating.**

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.

Fact Box

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

Activity- 8

Aim : To demonstrate electroplating

Material required : Two small copper plates, copper sulphate, beaker, battery, distilled water, sulphuric acid, and copper wire.

Procedure :

1. Take two copper plates and clean them with sand paper and connect them with the copper wire to connect to the terminals of a battery.



- 2. Take a beaker and half-fill it with distilled water.
- Add two teaspoon full of copper sulphate in it. 3.
- 4. Add few drops of dilute sulphuric acid to copper sulphate solution to make it more conducting.
- 5. Now immerse the copper plate in copper sulphate solution.
- 6. Allow the electric current to pass for about 15 minutes.
- 7. Now remove the electrodes from the solution and record your observations.

Observation : A coating appears on the plate.

Inference : The copper sulphate solution dissociates into copper and sulphate when a current is passed through it. The free copper moves to the negative terminal of the battery and gets deposited on it.

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.

Applications of Electroplating

- It is widely used for coating metal objects with a thin layer of different metals. For example chromium plating is done on many objects such as kitchen gas burners, bath taps, etc.
- Electroplating is widely used to prevent corrosion. For example, chromium has a shiny appearance and it does not corrode.
- Jewellers electroplate silver and gold on less expensive metals.
- Tin cans used for storing food are made by electroplating tin on iron.
- Iron is coated with zinc to protect it from corrosion and prevent formation of rust.



Set-up to demonstrate electroplating

Copper plate

> Copper sulphate

Some electroplated objects







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.

TESTING TIME

Give one word for the following :

- 1. The electrolyte used in the extraction of aluminium from its ore by electrolysis. _
- 2. The metal electroplated on kitchen gas burners, bath taps, etc. _____
- 3. A metal refined by the process of electrolysis. __





🔍 Key Words :

Electrodes	:	The rods of a conducting material connected to the two terminals of the battery and immersed in the electrolyte.
Good conducto	r:	The material which allows a large amount of current to pass through it easily.
LED	:	A semiconductor based light source (Light Emitting Diode).
Electrolyte	:	A conducting liquid solution.
Electrolysis	:	A processes of producing chemical reactions in liquids by passage of electric current.
Electroplating	:	The complete process of coating a metal on another material by electrolysis process.

🕈 Sum Up Now :

- 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.

PRACTICE ZONE

(Assessment Of Learning Outcome)

Q	Objective Type				
Α.	Select and tick (\checkmark) the correct answer :				
	1. Materials which do not allow electric current to pass through them are called :				
	a. Insulators 😑 b. Conductors 😑 c. Reflectors 😑 d. Mirrors 🥏				
	2. A positively charged ion is called :				
	a. Atom 😑 b. Anion 🦳 c. Cation 😑 d. Neutral ion 🦲				
	3. The process in which any electrolytic gets decomposed when electricity is passed through it, is				
	called :				
	a. Electrolysis b. Decomposition 🕘 c. Dissociation 💛 d. Splitting 🦳				
	4. The process of depositing a thin layer of any superior metal over an object of a cheaper metal with				
	the help of electricity is called :				
	a. Electro refining 🔵 b. Electro metallurgy 🔵 c. Electroplating 🛛 🔵 d. Electro winning 🔵				
Β.	Fill in the blanks :				
	1 of electricity allow electric current to pass through them.				

2. An ______ starts emitting light even when a very weak current flows through it.

_____.

- 3. Distilled water does not conduct _____
- 4. Cations are ______ charged and anions are ______ charged.
- 5. ______ is widely used to prevent corrosion.

C. Write true or false :

- 1. Electrical conductivity is the measure of the ability of a substance to allow the flow of an electric current.
- 2. The longer lead of the LED is the negative.
- 3. Two type of water can conduct electricity.
- 4. Electroplating is a common application of chemical effects of electric current.
- 5. Jewellers electroplate silver and gold on less expensive metals.

Subjective Type

A. Very short answer questions :

- 1. What are conductors and insulators?
- 2. Define an LED.
- 3. Does distilled water conduct electricity?
- 4. What is electrolysis?
- 5. Define electroplating.

B. Short answer questions :

- Which of the following liquids conduct electricity and which do not conduct electricity? Lemon juice, Milk, Vinegar, Common salt solution, Sulphuric acid solution, Sugar solution, Distilled water, Honey, Sea water, Rainwater.
- 2. Why is it dangerous to touch a working electrical appliance with wet hands?
- 3. What is the advantage of using LED in testing the electrical conductivity of liquids?
- 4. What happens to the needle of a compass kept nearby when electric current is switched on in a wire? Why does this happen?
- 5. Explain, why distilled water does not conduct electricity but tap water conducts some electricity.

C. Long answer questions :

- 1. Describe an experiment to demonstrative that liquids conduct electricity.
- 2. Explain the process of electrolysis.
- 3. Give an activity to show deflection in magnetic compass when brought near an electric wire.
- 4. What is electroplating? How it is done?
- 5. State applications of electroplating in our day to day life.

D. Higher Order Thinking Skills (HOTS) :

- 1. Why do you think a fireman shuts off the electrical supply to the area before putting out the fire with a water house?
- 2. Why do you think electroplating is hazardous to the environment?



Critical Thinking

• Complete the following diagram :



Playway Learning

- Ask your friend to put the cork in the centre :
- 1. Take a glass tumbler. 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 that it is easily feasible.
- 4. Pour more water in the tumbler till it is over the rim.
- 4. The cork will immediately move to the centre, as the water level is the highest here.

Group Discussion

• Discuss why water is not used for extinguishing fires caused due to electrical faults.

Experiential Skill

- 1. Make a list of objects around you which can be electroplated.
- 2. Take half potato and make a circuit using two iron nails, torch cell and LED.

SOME NATURAL Phenomena

Stepping Up

- Kectric Changes
- Earthing
- 🔀 Causes of Earthquake
- Charging a Body
- Lightning and Thunder
- 🔆 🔆 Damaging Effects of Earthquakes

On a stormy night, we often hear a loud noise of thunder and see a bluish-white flash of light in the sky. Have you ever wondered what these are and how they are caused? These are some natural phenomena that occur in nature. Some other natural phenomenon are earthquakes, tsunami, etc. You have already learnt about some of them in the previous class.

- 🔆 Transfer of Charge
- 🔆 Earthquake
- 🔀 Protection against Earthquakes



Lightning

Electric Charges

We already know that atoms are made of protons, neutrons and electrons. Protons are positively charged, neutrons have no charge and electrons are negatively charged. In the normal stage, an atom has an equal number of electrons and protons and it carries no charge.

Hence, it is electrically neutral. However, any disbalance in the number of protons and electrons creates an electric charge. The charge on the body is positive if the number of protons exceeds the number of electrons. If the number of proton is lesser than the number of electrons, the charge on the body is negative.



Protons and neutrons together form the nucleus of an atom as they are present in the centre. While the electrons remove around the nucleus in orbits or shells.





Bengamin Franklin

Fact Box Charges were discovered by Greeks in around 600 BC. **Benjamin Franklin,** an American scientist in 1752 conducted an experiment using a silk kite. 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.

Charging a Body

An electrically neutral object can be charged by various methods. Let us perform Activity 1 to understand this better.

138 Science-8

Activity-1

Aim : To observe whether a neutral body can be charged or not.

- Take a balloon, an eraser, a plastic scale, an ebonite rod, a glass rod and a metal rod. You can add more items to the list.
- Now rub these objects with different materials like a woollen sweater, a silk cloth, a polythene bag, dry hair, etc. and bring them close to small pieces of paper.

Note your observations below :

Object	Rubbed with	Attracts/does not attract pieces of paper	Charged/neutral
Balloon	Polythene bag, dry hair,		
	silk cloth, sweater		
Eraser	Sweater		
Plastic scale	Dry hair, sweater		
Ebonite rod	Sweater		
Glass rod	Silk cloth		
Metal rod	Polythene bag, sweater		

Nature of charge induced in a neutral body

(i) Charging by friction : There is friction between two bodies when they are rubbed against each other. This produces in equal and opposite charge in both the bodies. Thus, we can say that friction is one method of charging a body. Let us perform Activity 2 to understand this method of charging.

Fact Box The S.I. unit of charge is Coulomb.

Activity-2

To show charging of a body by friction.

- Take a plastic comb and rub it with a woollen cloth or with your dry hair.
- Bring this comb near small pieces of paper or some dry leaves.
- You will notice that the comb attracts paper or dry leaves.

This happens because the comb acquired a charge.



A charged comb attracts paper and dry leaves

You have seen in Activity 2 that the comb attracts small pieces of paper and dry leaves after it was rubbed with a woollen cloth. This happens because on rubbing friction was produced between the plastic comb and woollen cloth which charged them electrically. You can perform a similar

Fact Box

An electron has a negative charge of 1.6 10-19 Coulomb. This is the minimum charge that exists in nature.

activity by rubbing on inflated balloon with a woollen cloth and taking it close to the wall.

(ii) Charging by conduction: If we touch a charged object to an uncharged one, the electric charge will flow from the charged object to the uncharged one. This method of charging a body is called charging by conduction. The body being charged will acquire the same charge as the body charging it.



(iii) Charging by induction : We can also charge a body by bringing a charged body near it, but not touching it. The charged body induces the same charge that it has on the uncharged body. This method of transfer of charge is called **induction**.

Transfer of Charge

Electric charge can be transferred 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.

At the start, the aluminium strip were not charged and 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.

Activity-3

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 X 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.

TESTING TIME

Fill in the blanks :

- 1. In the normal stage, an atom is _____ neutral.
- 2. _____is one method of charging a body.
- 3. _____is used to detect and measure electric charge.
- 4. A body can be charged either by _____ or _____

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 and Thunder

In class VII, you have learnt that during the development of a thunderstorm, there is upward and downward movements of air currents. When you watch dark thundercloud rising rapidly through

Fact Box

Electrical appliances and the mains of the house are earthed to protect just from an electric shock.

A simple Electroscope



the sky, you can almost sense the huge amount of energy inside it. Water droplets, ice and other particles swirl and rub together inside the cloud. As a result, the top of the thundercloud may become positively charged and bottom part negatively charged. By a complex process, positive charges accumulate near ground.



Lightning



Accumulation of charges leading to lightning



Clouds bearing unlike charges are attracted towards each other and cause lightning flash.

During a storm, suddenly the negative charges in the thundercloud jump down. They are attracted by the positive charges on the ground. The air becomes hot and glows in a brilliant flash.

Thunder is caused by heated air expanding and producing the loud sound of a thunderstorm. This is what we see as lightning and the process is called **electric discharge**.

The process of electric discharge can occur between two clouds, between clouds and the Earth or even between clouds and human body. Such lightning strokes cloud be fatal. Lives were lost due to thunder and lightning. Today scientists are trying hard to improve their understanding about this natural phenomenon. Today we should not get frightened by lightning like the ancient people did.

The Lightning Conductor

High-rise buildings can be protected from lightning by providing a lightning conductor at its highest point.

A lightning conductor consists of long, thick metal rod/strip having sharp spikes at its upper end. The spikes towards the sky are fixed at the highest point of the building. The lower end of the metal rod/ strip is connected to a large copper (or aluminium) plate which is buried deep inside the Earth. This is called Earthing.

When a highly charged cloud passes over a tall building, it induces an opposite charge on the spikes. This charge quickly flows to the Earth through the copper rod/strip. Thus, the lightning discharge is prevented and the building is saved from damage.

Protection from Lightning

Lightning can strike not only on objects, people, other living beings in open areas but also inside the so called safe homes and buildings. One should carefully follow the safety measures during lightning and thunderstorm, while being outdoors or indoors. Some important ones are as follows :

Inside

- Stay away from doors and windows.
- Avoid being near electrical outlets, appliances or equipments.
- If the thunderstorm is present do not plug or unplug TVs, telephones, stereos or other electrical appliances.



A lightning conductor



- Stay away from plumbing, avoid running water and do not take a shower or bath.
- Do not use corded telephone except for emergency purposes.

Outside

- If caught outdoors, seek cover indoors as quickly as possible.
- Do not stand under a tree for cover because taller and moist objects are more prone to lightning strike.
- Seek shelter in a vehicle with closed windows.
- Do not use an umbrella, lawn mower, bicycle or similar objects.
- Avoid metal objects like fences, benches or tall poles.
- If swimming or boating, seek shelter on land as quickly as possible.
- If caught in an open field, crouch low, with your head bent in between your arms and legs close together.



Earthquake

It 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?



Destruction caused by 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.

Causes of 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 small plates.

Most earthquakes take place at the boundaries where the plates meet, though they may also occur within the plates.

The plates brush against one another or at times a plate may go under another plate due to collision. This causes disturbance in the Earth's crust. This disturbance shows up as an earthquake on the surface of the Earth.



142 Science-8



Movements of earth's plates

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.

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 Kashmir, Western and Central Himalayas, whole of North-East, Rajsthan, Indo-Gangetic 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 4-6 is considered moderate and that above 7 is destructive. Do you know, that an earthquake of magnitude 5.0 is ten times more severe than that of magnitude 4.0.

Activity-4

With the help of your parents, find out about 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 seismic waves are recorded by the pen on a paper (like graph) which moves underneath it.

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**.



A Seismograph

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**.

Damaging Effects of Earthquakes

The destructive (or damaging) effect of an earthquake depends upon the following factors : Magnitude of the earthquake

- Local geological conditions Focal depth.
- Distance from the epicentre.
- Design of buildings and other structures.
- Density of constructions and population in the affected area.

Fact Box

- The earthquakes of large magnitude do not necessarily cause more damage on the Earth.
- The most threatened areas are Kashmir, Western and Central Himalayas, North-East, Rann of Kutch, Rajasthan and Indo-Gangetic plane and a small part in the southern India.



Earthquakes may,

- (i) cause damage to the buildings, railway tracks, bridges, roads etc. As a result, people may get trapped inside the collapsed structures and many may die.
- (ii) cause landslides. The rubble may block rivers and cause flooding.
- (iii) change the course of rivers and cause floods.
- (iv) damage underground water and gas pipelines. This may lead to fire breakout and large scale burning.

Protection Against Earthquakes

The occurrence of an earthquake cannot be predicted. Therefore we should be ready to face such a situation anytime.

Before the Occurrence of Earthquake

- While getting your house constructed, ensure that it is earthquake safe the fire lighting equipment should be in ready-to-use condition.
- In highly seismic areas, one should avoid the use of heavy construction materials such as stones, marble, iron girders etc. Keep the roofs as light as possible.
- This will minimise the damage in case of building collapse.
- Cupboards and shelves must be fixed to the walls.
- Minimise the hanging items. Even if these are to be used keep them away from the most commonly used area.

When the Earthquake Strikes At Home

- Take shelter under a table and be there until the vibrations stop.
- Stand under the doorframe.
- If in bed, be there. Cover your head with a pillow.
- Stay away from tall and heavy objects.

When Outdoors

- If in a car or bus, do not come out. Drive slowly to a clear area.
- Be away from tall buildings, large trees, and overhead transmission lines.
- Sit on the ground.

TESTING TIME

Write true or false :

- 1. During a thunderstorm, there is upward and downward movements of air currents.
- 2. A lightning conductors is used to protect high-rise buildings from lightning.
- 3. One should always take a bath during lightning.
- 4. An earthquake can last for a day or two.
- 5. We use seismograph to measure seismic waves.




Key Words :

Lightning	:	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.
Electroscope	:	A device used to find whether on object is charged or uncharged.
Lightning	:	A bright flash of electricity produced by the rubbing of clouds with each other.
Farthquake	•	A violet movement of part of the Earth's surface

😵 Sum Up Now :

- Atoms are made of protons, neutrons and electrons.
- Protons are positively changed, neutrons have no change and electrons are negatively changed.
- An electrically neutral body can be changed by various methods. These are :
 - Charging by friction
 - Charging by conduction
 - Charging by induction
- Electric charge can be transferred from a charged object to another through a metal conductor.
- The loud noise heard during lightning is called thunder.
- Lightning strike cloud destroy life and property.
- Earthquake is sudden movement or trembling of the Earth.
- Earthquake are caused due to disturbances deep inside the Earth crust.
- Earthquakes mostly occur at the boundaries of the Earth plates. These boundaries are known as fault or seismic zones.

(Assessment Of Learning Outcome)

PRACTICE ZONE

Objective Type

Α.	Sel	ect and tick (√)	the co	rect answer	:						
	1.	Charging can be	done by	:							
		a. Radiation	<mark>)</mark> b.	Conduction	\bigcirc	с.	Convection) d.	Insulation	\bigcirc
	2.	Which of the foll	owing ca	n be charged	with sta	atic	electricity?				
		a. Metal	<mark>)</mark> b.	Alloy	\bigcirc	с.	Insulator) d.	Semi conductor	\bigcirc
	3.	The point from w	here the	e shock wave o	of an ea	rtho	quake originate i	is cal	led :		
		a. Seismic focus	<mark>)</mark> b.	Focal depth	\bigcirc	с.	Epicentre	C) d.	Surface point	\bigcirc

4. Lightning occurs because of : b. Electrolysis a. Electric magnification d. Electric discharge c. Electromagnetism Fill in the blanks : Β. 1. _____ are made of protons, neutrons and electrons. 2. An electrically object can be charged by various methods. 3. The process of transferring charge from a charged object to the Earth is called 4. During a thunderstorm seek shelter in a vehicle with windows. 5. are also caused due to volcanic eruptions. Write true or false : С. 1. The charge of the body is negative if the number of protons exceeds the number of electrons. 2. Earthing is done so that we do not get an electric shock. 3. During lightning we should stay away from doors and windows. 4. The outermost layer of the Earth is one continuous piece of land. 5. The vibrations caused by an earthquake travel in the form of waves on the surface of the Earth. Subjective Type Very short answer questions : 1. What the nature of force between like charges? 2. Name the device used for protecting human beings and property from the hazards of lightning. 3. Name the method of charging when an object is charged by touching it to a charged body. 4. How is the intensity of an earthquake measured? Short answer questions : 1. What are electrical charges? 2. How can we charge a body by friction? 3. What is the best shelter to be adopted during lighting? 4. What do you mean by charging by induction? 5. Define earthquake. Long answer questions : С. 1. How does a charged body attract an uncharged body? 2. What is the difference between the nature of charges when charged by conduction and induction? 3. Describe an activity to show that a neutral body can be charged. 4. What precautions can one take against the hazards of lightning? D. Higher Order Thinking Skills (HOTS) : 1. Why do you think a cracking sound is heard while taking off nylon clothes? 2. Why do you think we should not carry an umbrella when a thunderstorm is predicted?



Critical Thinking

- Complete the following diagram :
 - Solve the crossword puzzle given below with the help of the given clues : **Across**
- 1. Used to detect and measure electric charge. (12)
- 3. Particles having no charge on them. (8)
- 5. Transferring charge from a charged object to the Earth. (8)



Down

- 1. The point vertically above the seismic focus. (9)
- 2. A method of charging a neutral body. (10)
- 4. The scale used to measure the intensity of earthquake. (7)
- 6. The layer just below the crust. (6)
- 7. The graph paper which is used to record the readings of seismograph. (10)

Playway Learning

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.

Group Discussion

• Discuss the various guidelines framed to construct earthquake proof buildings.

Experiential Skill

- 1. Visit a tall building and examine the lightning conductor provided.
- 2. Make posters to create awareness among people for safety against earthquakes and lightning.

LIGHT

Stepping Up

- Nature of Light
- st Regular and Diffused Reflection
- Dispersion of Light
- Care of the Eyes

- Reflection of Light
- Image Formed by a Plane Mirror
- 🔀 Human Eye
- st Visually Impared and Braillle system
- X Laws of Reflection
- 🔀 Multiple Images
- st Defects of vision and their correction
- 😵 Some Animals Facts

Light is essential to us in our day-to-day routine. We see things around us because of light. We need light to read, play, jump, swim, eat, etc. In fact, almost for everything except when we sleep, we need light. Things that are not visible in the dark become visible because of light. Light like air and water, is essential to sustain life of human beings, animals and plants. Oxygen, in the air so necessary for us to live, is produced by plants in the presence of sunlight.



We see things beacuse of light

Nature of Light

Light is that form of energy which produces the sensation of sight in our eyes.

For thousands of years, people tried to understand the true nature of light. The ancient Greeks thought that light was rays of matter given out by whatever object was being looked out. Later it was proved that light is a form of energy. It spreads out from any source in which it is produced.

Reflection of Light

When a ray of light falls on a mirror or a polished surface, it bounces off the surface. This is called **reflection of light**. Reflection is the phenomenon of bouncing back of light into the same medium. The amount of light that is reflected depends on the material and nature of the surface on which the light falls.

Incident ray : A ray of light falling on a reflecting surface such as the mirror is called the **incident ray**. PO is the incident ray in. Point of Incidence : The point at which the incident ray strikes the reflecting surface is called the **point of incidence**. O shows the point of incidence in.

Reflected ray : The ray of light that is reflected from the reflecting surface and starts from the point of incidence is ^P called the **reflected ray.** RO is the reflected ray in.





Normal: The line drawn perpendicular to the surface at the point of incidence is called the normal. OX shows the normal in the figure above.

Angle of incidence : The angle between the incident ray and the normal is called the angle of **incidence.** x, shows the angle of incidence for the incident ray PO.

Angle of reflection : The angle between the reflected ray and the normal is the **angle of reflection**. x, shows the angle of reflection for the reflected ray RO.

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 observe now? After the light ray falls on the mirror it is reflected in another direction.

Laws of Reflection

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 say, the reflected ray and the normal at the point of incidence, all lie in the same plane.

Thus, the two laws of reflection are :

First law : The incident ray, the reflected ray, and the normal at the point of incidence lie on the same plane.

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.

Angle of incidence and angle of reflection











Arrangement for showing reflection



Second law : The angle of incidence is equal to the angle of reflection.

Regular and Diffused Reflection

We know that light bounces of all kinds of surfaces, but we can see images of objects only from highly polished surfaces like mirrors. Reflection of light from a smooth surface is called **regular reflection**. The image formed is clear and sharp in this case.





Regular reflection

When light rays fall on a rough, irregular surface, 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 **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.



Luminous objects

Image Formed by a Plane Mirror

Let us perform Activity 3 to see the nature of image formed by a plane mirror.

Activity-3

Aim : To see the nature of image formed by a plane mirror.

- Take a flower vase and keep it in front of a plane mirror. You will find that its image is formed behind the mirror.
- Place an opaque object like a chart paper vertically behind the mirror. The image of the object will still be seen behind the mirror.
- Now place the same chart paper in front of the mirror. You will not be able to see the image now.

Note your observations in the table below by marking a tick in the correct column.

Characteristics of the image	Tick in front of the right alternative				
1. Location	Behind the mirror	In front of the mirror			
2. Nature	(a) Real	(a) Virtual			

Nature of image formed by a plane mirror

150 Science-8

3. Size	(b) Erect	 (b) Inverted	
4. Distance	Enlarged	 Same	
5. Laterally inverted	Equal	 Unequal	
	No	 Yes	

Thus, from the above Activity we can summarize the characteristics of image formed by a plane mirror as follows :

- (i) The image is formed behind the mirror.
- (ii) It is a virtual image which cannot be taken on the screen.
- (iii) The size of the image and the object is the same.
- (iv) The image formed by the plane mirror is erect and not inverted. That is why you see yourself upright in plane mirror and not inverted.
- (v) The image will be formed as far behind the mirror as the object is in front of it. That is why you find that when you move closer to the mirror your image also seems to move closer. Similarly,



Image formed in a plane mirror

when you move away from the mirror, your image also seems to move away.

(vi) The image formed by a plane mirror is laterally inverted. Lateral inversion means that the right side of the object appears as left and the left side of the object appears right.

Let us perform activity 4 to show the characteristics of lateral inversion.

Activity-4

Aim : To show the characteristics of lateral inversion.

- Draw any four objects at the four corners of a sheet of paper.
- Hold the sheet in front of the mirror and observe its image.
- The virtual image looks almost the same, but the objects on the right side appear to be on the left and vice-versa. This is because of lateral inversion.

TESTING TIME

Rewrite the statements correctly :

- 1. Light produces the sensation of herring in our eyes.
- 2. A ray of light falling on a reflecting surface is called normal.
- 3. The image formed by a place mirror is a real one.
- 4. A clear image is formed in an irregular reflection.
- 5. Illuminated objects absorb the light of others.

Use of Plane Mirrors

The following are the uses of plane mirrors in our day-to-day life.

1. Wall Reflectors : Plane mirrors are fixed on walls for different purposes, for example as a decoration or for detecting thieves in shops.

Also note that mirrors make the room appear bigger.



152 Science-8

- Seeing around the Corner : Plane mirrors are often placed before a curve on the highway to allow the approaching vehicle to see around the curve.
- 3. Dressing Mirror : Plane mirrors are used as dressing mirrors. They enable us to check our appearance and how we have dressed.
- 4. Periscope : Periscopes are instruments that allow the viewing of objects that are not in the direct line of vision.

A periscope consists of a rectangular long tube with mirrors fitted at an angle of 45 degrees within the tube. The mirrored surfaces are arranged parallel to each other. Light from the objects is incident on the mirror on the top part of the cube. This mirror then reflects the light to the mirror on the bottom part of the tube. The objects can be clearly seen by placing the eye in line with the bottom mirror.

Multiple Images

Have you been to a hall of mirrors or Sheesh Mahal? When you stand in the middle of the hall, you see multiple images of yourself. How does this happen? This trick can be achieved by arranging equal-sized mirrors at various angles. The shiny faces of the mirrors must face each other.

Activity-5

Reflection of Light with two plane mirror, double mirrors placed at a number of angles.

- Place two plane mirrors at an angle, with an object between them.
- Look past the object. How many images can you see?
- How can you arrange to place the mirrors accurately at a specific angle to each other?
- Try angle of 90° at first. Which other angles are "good angles"?
- A full circle is 360° Can you deduce a formula for the connection between the angle and the number of images?
- What is the name of the toy that uses this ideal? Can you make one?
- What is the best number of mirrors to use?

When you place two plane mirrors at 90 angle, the image of the first mirror is reflected in the second mirror so that the reversed mirror image is reversed again and you see a true image. The placement of images in the mirror will vary with the distance of the person or object in front of the mirrors.

You will see whole images at 60°, 90° and 180° angles. The number of images is equal to 360 divided by the angle between the mirrors.

Thus,

The number of images = <u>360</u> Angle between the mirrors









The number of observed images and the computed images should be equal but the observed images may be one or two less because of the crude equipment used.

Now set the two mirrors parallel to each other and place a candle between them. You will observe an infinite number of images of the candle. Theoretically, an infinite number of images are formed but we can see only few images. This is because the light get absorbed after every successive reflection. Therefore, far off images are faint as compared to nearer images. The concept of number of images formed by mirrors placed at an angle to one another is used in making a kaleidoscope.

Kaleidoscope

The term kaleidoscope has a Greek origin. It means see a beautiful image. It was invented more than 250 years ago. This is based on the principle of the reflection of light by mirrors. Sir David Brewster refined it in 1816 to help carpet makers invent new designs. Magicians also use the property to reflection of light by mirrors to create their magic.



Activity-6

Making a kaleidoscope

- Collect :
 - three flat rectangular mirrors of equal size,
 - rubber bands,
 - tracing paper,
 - thin cardboard, and
 - broken pieces of coloured glass or coloured bangles.
- Place the three mirrors with their shiny surfaces facing inside (using the long side of each mirror as shown.)
- Put two of the rubber bands around them to hold them securely together.
- Make a cylindrical tube with the thin cardboard so that the rubber banded mirrors fit into it.
- Cover both ends with tracing paper.
- At one of the ends, place pieces of broken glass or bangle pieces over the tracing paper and fix another piece of tracing paper to hold the glass pieces (or bangle pieces) in place.
- Put this into a cylindrical tube and fix it in place. You can paste coloured paper over the cylindrical tube to make your kaleidoscope more attractive.
- Your kaleidoscope is ready.
- Hold it to light and slowly rotate the tube and enjoy the magical patterns that emerge.
- When three rectangular mirrors of same size are arranged in an equilateral triangle, rays of light from an object from multiple images due to reflection from the mirrors. The equilateral triangle formed by the mirrors has three equal angles of 60 degrees, and the sides have equal lengths.

Dispersion of Light

We know that white sunlight consists of seven colours and a prism can be used to see. The constituents of light 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**.



Making a kaleidoscope

153 Science-8

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.



Activity-7

Take a bowl of water. Place a small plane mirror in the bowl, so that it rests at an angle of about 4 5° 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.

Human Eye



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

Eyes are a very important part of our body. Eyes are very delicate. Let us first study the structure of the eye. It is spherical in shape.

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 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 increased 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.

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 lining 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 or darkness or dim light.

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 8

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 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.

Activity-9

Cut a square piece from a cardboard 4×4cm. 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 1/1 6th of a second.

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.

Defects of Vision and their Correction

In a healthy eye, the muscles surrounding the lens automatically adjust the curvature of the lens to enable it to form a sharp image of an object on the retina, whether the object is near or at a distance from the eyes. Thus, the object can be seen clearly.

Sometimes, the curvature of the lens cannot be adjusted as required for the formation of sharp images. This is known as **defect of vision.**

There are two types of defects of vision of the human eye :

- 1. Myopia or Short-sightedness
- 2. Hypermetropia or Long-sightedness
- Short-sightedness : The eye lens of the eye cannot become thinner when required and cannot see distant objects clearly. Such a defect is called myopia or short-sightedness. Such a defect is seen in young persons. In such cases, the image of the distant object falls in front of the retina. A person suffering from myopia cannot see far of objects clearly.

Short-sightedness is caused when the eyeball has elongated or the focal length of the eye lens has shortened.

The defect of short-sightedness can be corrected by using spectacles with concave (diverging) lenses of appropriate focal length. The rays are diverged by the concave lens and

so the rays coming from a distant object can be focused on the retina.



a. The light rays are brought to a focus before they reach the retina.



b. A concave lens bends the light rays outwards before they reach they eye own lens to form the focus on the retina.

Ray diagrams of short-sightedness and the use of lens to get it corrected



2. Long-sightedness : When the eye lens cannot become thicker to observe the nearby objects, we cannot see them clearly. This defect is called hypermetropia or long-sightedness. Usually, old persons suffer from this defect. Persons suffering from long-sightedness have difficulty in reading. In this case, the image of the object falls behind the retina.

Long-sightedness is caused when the eyeball has shortened or the focal length of the eye lens has increased.

The defect of long-sightedness can be corrected by using spectacles with convex lenses of appropriate focal length. The rays are converged by the convex lens, and so the rays coming from a nearby object can be focused on the retina.



a. The eyes lens cannot bend light rays from a nearby object strongly enough. So, the rays has not been brought to a focus when they reach the retina



b. A convex lens bends the light rays inwards they reach the eye own lens. So, the rays are brought to a focus on the retina.

Ray diagrams of long-sightendess and its correction using a lens

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 television for long hours.
- Always read at the normal distance for vision (25-30 cm). Do not read by keeping the book too close or too far from yours eyes.

Cataract

Cataract is a very common disease of eye that causes blurred and dimmed vision. It is a generally occured at the old age. In a person suffering from this disease, the eye-lens becomes cloudy and opaque leading to the loss of vision.

This defect of eye can be rectified by laser rays or removing eye-lens through surgical operation and placing in its place an artificial lens. Millions of people all over the world are affected by this disease of eye.

• 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 carrots, broccoli, green vegetables (spinach).



- Milk and milk products like curd, cheese, butter.
- Eggs
- Fruits such as mangoes and papayas.
- Cod liver oil

Visually Imparied and Braille System

Visually impaired are the persons who cannot see through their eyes. There can be various reasons for this. Such persons try to identify the things either by touching or listening to the voices. Such persons use braille for reading and writing. It is a reliable method of literacy for blind persons because it enables them to read and write and can actually be substituted for print in most circumstances.

Blind persons of all ages and in all walks of life use Braille in the same ways as sighted persons use print.



A	В	С	D	E	F	G
H	!	J	ĸ	Ŀ	м	N
•••	•••	•••	•••	::	•:	•••
0	P 	Q	R	S	Ţ	U

The code of Braille system

Braille is a code, which enables blind persons to read and write. A blind Frenchman, Louis Braille invented it in 1829 and adopted in 1932.

There is a Braille code for common languages, mathematics and scientific notations. Braille is comprised of a rectangular six-dot cell on its end, with up to 63 possible combinations using one or more of the six dots. Braille is embossed by hand (or with a machine) onto thick paper and read with the fingers moving across on top of the dots. Combinations of the Braille dots within a cell represent contractions of two or more print letters and Braille characters take up three times as much space as print. This method is based upon recognition of characters by touching which are them memorised.

Fact Box

Vitamins play an important role in the safety of the eye. Vitamin A and Vitamin B complex are essential for its maintenance. Vitamin A improves night vision. Food source for vitamin A is dark green leafy vegetables, carrots, spinach, broccoli, eggs, cheese and butter. Deficiency of vitamin A causes night blindness.

Vitamin B complex is good to reduce redness in eyes and can help eyes that are sensitive to light. Food sources for vitamin B complex are pastas, breads, milk, dark green vegetables, mushrooms, tuna, nuts, avocados, bananas, liver, etc.

Some Animals Facts

- 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.
- 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.
- A chameleon can look in different directions at the same time.









TESTING TIME

Encircle the correct option :

- 1. The term kaleidoscope has a (Greek/Chinese) origin.
- 2. (Retina/Cornea) is a very thin transparent membrane.
- 3. Eye lens is a (concave/convex) lens made up of transparent jelly-like material.
- 4. Short-sightedness is also called (myopia/hypermetropia).
- 5. Braille system was invented by (Alfred Nobel/Louis Braille).

Key Words :

N		
Reflection	:	Bouncing back of 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 colours.
VIBGYOR	:	Stands for violet, indigo, blue, green, yellow, orange and red.

Sum Up Now :

- Light is reflected from all surfaces.
- 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. Kaleidoscope is based on the formation of multiple images by inclined mirrors.
- The splitting of white light into its constituent colours is called dispersion.
- 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.

PRACTICE ZONE

Objective Type

A. Select and tick (\checkmark) the correct answer :

- 1. The angle of incidence is the angle between :
 - a. The incident ray and the surface of the mirror.
 - b. The reflected ray over the surface of the mirror.
 - c. The normal to the surface and the incident ray.
 - d. The normal to the surface and the reflected ray.
- 2. The nature of image formed by a plane mirror is :
 - a. Laterally inverted
 - c. Of the same size as the object
- b. Virtual and erect
- d. All these are correct

(Assessment Of Learning Outcome)

	3.	The screen behind the eye lens is called the :	
		a. Retina 😑 b. Ciliary muscle 😑 c. Iris 😔 d. Pupil	
Β.	Fill	in the blanks :	
	1.	is the phenomenon of bouncing back of light into the same medium.	
	2.	The angle between the incident ray and the normal is called the	
	3.	In a plane mirror, the image is formed the mirror.	
	4.	sunlight consists of seven colours.	
	5.	Deficiency of vitamin causes	
C.	Wri	te true or false :	
	1.	Light spreads out from any source in which it is produced.	
	2.	The angle of incidence is equal to the angle of reflection.	
	3.	The image formed by the plane mirror is always erect.	
	4.	Luminous objects do not have light of their own.	
	5.	Violet light travels the slowest and bends the most.	
 Q		Jbjective Type	
Α.	Ver	y short answer questions :	
	1.	Give any one law of reflection.	
	2.	What do we call the angle formed between the reflected ray and the normal?	
	3.	Name the image formed when light rays reflected actually meet on a screen.	$-(c_2) =$
	4.	What is window of the eye?	
	5.	What provides structure, strength and protection to the eye?	
Β.	Sho	rt answer questions :	
	1.	Define lateral inversion.	
	2.	What are the two kinds of reflections?	T
	3.	State the role of Iris in seeing the objects by the eye.	人人
	4.	Give any two differences between myopia and hypermetropia.	
	5.	How is virtual image formed?	
C.	Lon	g answer questions :	
	1.	What are the two types of reflections? Distinguish between them.	
	2.	Define the angle of reflection and angle of incidence. How are the two related?	
	3.	State the laws of reflection.	
	4.	What are the characteristics of the image formed by a plane mirror?	
	5.	What is Braille? How is it help the visually impaired persons?	
D.	Hig	her Order Thinking Skills (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?	



[(PHYSICAL MEDIA DEVELOPMENT (PMD)]

Critical Thinking

• Complete the following diagram :



Playway Learning

• In a dark room, place a mirror in front of burning candle. You will see more bright light.

Group Discussion

• Discuss about some common examples in your surroundings where dispersion of light can be observed.

Project Work

- 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.

		Model Tes	st Pa	per-I			
		(Based on Cr	napler	1 10 7)			
A.	Sel (ect and tick (✓) the correct answer : The science of agriculture includes :					
		 a. Management of plants and animals b. Management of plants c. Management of animals d. Management of hymnes 					
	2.	These are the simplest and the most primit	ive org	anisms.			
	3.	a. Bacteriab. VirusesWhich of the following is a natural fabric?	— с.	Algae	💛 d.	Fungi	\bigcirc
		a. Wool 😑 b. Nylon	🔵 с.	PVC	🔵 d.	Polythene	\bigcirc
	4.	Which of the following pairs can not under	go disp	lacement reactior	1?		
		a. Iron sulphate solution and magnesium	b .	Zinc sulphate sol	ution ar	nd iron	\bigcirc
		c. Zinc sulphate solution and calcium	🔵 d.	Silver nitrate sol	ution an	d copper	\bigcirc
	5.	Which of the following is not obtained as a	frictior	n during the refini	ng of pe	troleum?	
		a. Kerosene 🥚 b. Lubricating oil	🔵 с.	Bitumen	💛 d.	Natural gas	\bigcirc
	6.	Species restricted to a particular geograph	ical area	a are called :			
		a. Endangered species	• b.	Flora			
		c. Endemic species	<u> </u>	Fauna			\bigcirc
В.	Fill	in the blanks :					
	1.	The refers to anything p	roduce	d from soil.			
	2.	Synthetic clothes should not be worn in the	e	·			
	3.	Magnesium burns in air to form					
	4.	A reactive metal cannot	replace	a reactive metal.			
	5.	Coal gas is an excellentf	fuel.				
	6.	lists rare species and the	ose in da	anger of extinctio	n.		
C.	Wri	te true or false :					
	1.	A seed-drill is used for harvesting the seeds	5.				\bigcirc
	2.	Acetic acid gives vinegar its odour.					\bigcirc
	3.	The synthetic fibres are also known as mar	n-made	fibres.			\bigcirc
	4.	Metals are used for making electrical cable	s and w	vires.			\bigcirc

161 Science-8

- 5. Coal is one of the earliest used fossil fuel.
- 6. Air, water and land are non-living natural resources.

D. Match the following :

Column A

- 1. Wood
- 2. Ignition temperature
- 3. Insufficient air
- 4. Yellow flame
- 5. Compounds of sulphur
- 6. Carbon dioxide

E. Very short answer questions :

- 1. What is agriculture?
- 2. What are microorganisms?
- 3. What are called the man-made fibres?
- 4. How can we obtain sulphur and chlorine gas?
- 5. Where do we found petroleum?
- 6. Mention the function of golgi bodies.

Short answer questions :

F.

- 1. Summarize the history of agriculture.
- 2. Where can we find bacteria?
- 3. State the uses of nylon.
- 4. How do metals react with bases?
- 5. Give some characteristics of minerals.
- 6. How cell was discovered?

G. Long answer questions :

- 1. Describe any two agricultural implements in detail.
- 2. Give an account of harmful effects of bacteria.
- 3. State the features of polyester.
- 4. Give an account of occurrence of non-metals.
- 5. Give an account of natural resources.
- 6. With the help of examples show how cells vary in size, shape and number.

Column B

- a. Incomplete combustion
- b. Partial combustion
- c. Inflammable substances
- d. Fire extinguisher
- e. Non-luminous
- f. Acid rain

	M. J. J. T. + D. J. TT							
	Model Iesi Paper-ll							
	(Based on Chapter 8 to 13)							
Δ	Select and tick $(/)$ the correct answer \cdot							
л.	1. Which of the following is involved in the sexual reproduction?							
	a. Vegetative propagation							
	b. Fertilization							
	c. Binary fission							
	d. Multiple fission							
	2. Adolescents should be careful about what they eat, because :							
	a. Proper diet develops their brains	\bigcirc						
	b. Proper diet is needed for the rapid growth taking place in their body	\bigcirc						
	c. Adolescents feel hungry all the time							
	d. Taste buds are well developed in teenagers	\bigcirc						
	\sim Metre/second \sim b Newton \sim C Metre/second ² \sim d Gram-weight							
	4. Friction between two flat surfaces can be reduced by :	\bigcirc						
	a. Greasing b. Painting	\bigcirc						
	c. Using ball bearing d. Decreasing the area	ŏ						
	5. Through which of the following does sound travel the fastest?	Ū						
	a. Air 😑 b. Water 😑 c. Ice 😔 d. Wood	\bigcirc						
	6. The process in which any electrolytic gets decomposed when electricity is passed through	n it, is						
	called :							
_	a. Electrolysis \bigcirc b. Decomposition \bigcirc c. Dissociation \bigcirc d. Splitting	\bigcirc						
Β.	Fill in the blanks :							
	2 Appearing of marks the end of adolescence							
	3. Force can change the of an object.							
	4. Friction is caused due to in the two surfaces.							
	5. Unpleasant sound is called							
	6 is widely used to prevent corrosion.							
C.	Write true or false :							
	1. There are two methods reproduction in living organisms.	\bigcirc						
	2. It is very important to eat the right kind of food during the growth period.	\bigcirc						
	3. A force can change the direction of motion of a moving object.	\bigcirc						
	4. Friction slows down motion and dampens the energy.	\bigcirc						

- 5. Unwanted or unpleasant sound is termed as music.
- 6. The longer lead of the LED is the negative.

D. Match the microrganisms in column A with their action in column B :

Column A

- 1. Bacteria
- 2. Rhizobium
- 3. Lactobacillus
- 4. Yeast
- 5. A protozoan
- 6. A virus

Ε.

7. Penicillium

- a. Fixing nitrogen
- b. Setting of curd
- c. Baking of bread
- d. Causing malaria
- e. Causing cholera
- f. Causing AIDS
- g. Producing antibiotics

Very short answer questions :

- 1. What is reproduction?
- 2. Define voice box.
- 3. Define force. Write two effects of force.
- 4. Give an example to show that friction can produce heat energy.
- 5. How is sound produced?
- 6. What the nature of force between like charges?

F. Short answer questions :

- 1. Why do living beings reproduce?
- 2. Define menarche.
- 3. State key four effects a force can produce.
- 4. Why is sliding friction less than static friction?
- 5. What are stringed musical instruments?
- 6. What are electrical charges?

G. Long answer questions :

- 1. How do human beings reproduce?
- 2. Discuss the menstrual cycle in human beings.
- 3. What are the different effects of force? Give suitable examples?
- 4. Give some examples of friction from our day to day life.
- 5. What are the characteristics of sound?
- 6. How does a charged body attract an uncharged body?