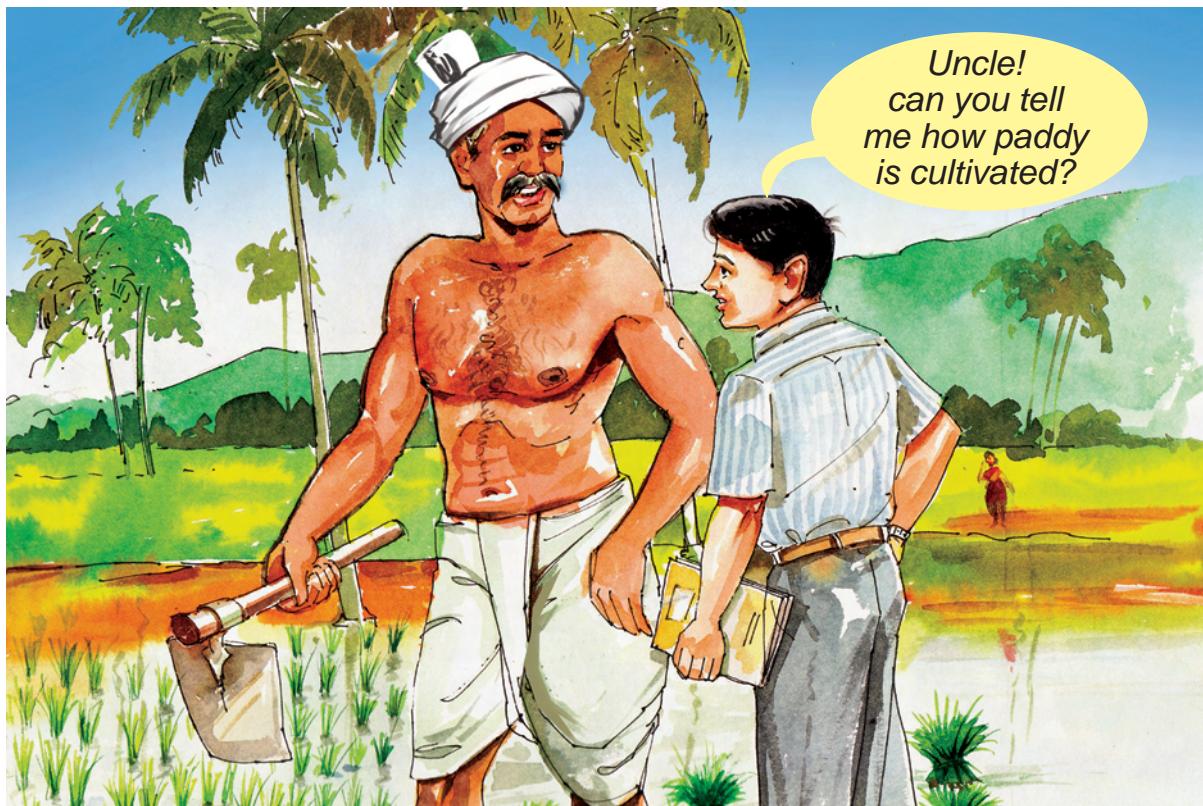


SCIENCE
STANDARD EIGHT

TERM I

1. CROP PRODUCTION AND MANAGEMENT



India is an agricultural country. We all totally depend on agriculture for our basic needs like food, clothing and shelter. Food is essential for our survival. It provides energy and materials required for the growth and maintenance of our body. Indian population had grown by 21.34% between 1991 and 2001. It is expected to exceed by 20% in 2050. How do you think food can be provided to such a large number of people? In order to provide sufficient food for a larger population, regular production, proper management, storage and application of recent technology are to be implemented in agriculture.

MORE TO KNOW

- Population of India in 2011 is around 1,21,01,93,422 (1.21 billion) people.
- It is growing faster than its ability to produce rice and wheat.

1.1. AGRICULTURAL PRACTICES

With the increase in population, the demand for food has also gone up. The available land for agriculture has been decreasing. Therefore improved, agricultural practices have to be introduced.

All the activities which are involved in the cultivation of crops from sowing to harvesting are known as **agricultural practices**.

Agriculture : Science that deals with the growing of plants and animals for human use is called agriculture.

1.2. BASIC PRACTICES OF CROP PRODUCTION

Production of crops involves several activities carried out by the farmers over a period of time. These activities are given below.

- Preparation of soil and sowing
- Adding manure and fertilizer
- Irrigation
- Protection from weeds
- Harvesting
- Storage and Marketing

1.2.1. PREPARATION OF SOIL AND SOWING

Before sowing the seeds, we have to prepare the soil. Preparation of soil is the first essential stage for cultivation of crops. Turning and loosening the soil involves,

- i) Ploughing or tilling
- ii) Levelling and
- iii) Manuring

i) Ploughing: It is the process of loosening soil. Ploughing is important because it,

- Provides good aeration to roots in order to breathe

- Retains moisture for a long period
- Promotes growth of useful micro-organisms to bring nutrient rich soil to the top
- Helps in the removal of undesirable plants (weeds)

Ploughing is done in two ways

i) Manual ploughing: It is one of the old and traditional methods of agriculture. A farmer ploughs the field with a plough pulled by a pair of bulls.



Ploughing

ii) Machinery ploughing: Nowadays ploughing is done by tractor driven cultivator. The use of cultivator saves labour and time.



Tractor and cultivator

The other ploughing tools are spade, shovel, hoe and pick-axe.

ii) Levelling: The ploughed field may have big pieces of soil crumbs, so, it is necessary to break these crumbs with the leveller. It also ensures uniform irrigation.

iii) Manuring: Sometimes manure is added before tilling. It helps in proper mixing of manure with soil.

Sowing: It is the most important step of crop production. The process of putting seeds into the soil is called **sowing**. Before sowing, the land must be watered. Seeds used for sowing should be of **good quality, healthy** and **free from infection**. Sowing is done by two methods.

i) Manual sowing: It is the traditional method of sowing where the seeds are sown manually by scattering them in the moist soil.



Manual sowing.

ii) Seed Drill: It is a method of sowing the seeds through the funnel or using two or three pipes having sharp ends.

Seed drill helps in uniform distribution of seeds, covering the seed after sowing and preventing the seeds from being damaged by birds.



Sowing by seed drill

1.2.2. ADDING MANURE AND FERTILIZERS

All the plants get their nutrients from the soil. Repeated cultivation of crops make the soil deficient in minerals. So farmers add manure and fertilizers to the soil to ensure that the crops get proper nutrients.

The substances which are added to the soil in the form of nutrients for the healthy growth of plants are called **manure or fertilizers**.

1.2.3. IRRIGATION

Plants need water for germination, drawing nutrients and preparing their food by photosynthesis.

The process of supplying water to crops in the field at different intervals is called **irrigation**. It varies from crop to crop, season to season and soil to soil.

Some of the sources of irrigation are well, tube wells, ponds, lakes, rivers, dams and canals.

Methods of irrigation

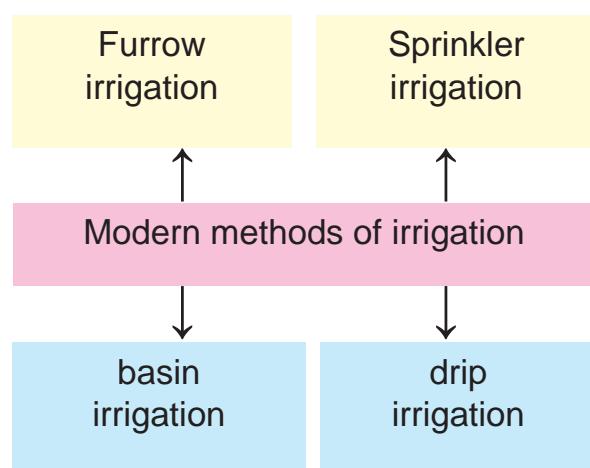
i) Traditional Method

In our country traditional systems of irrigation like,

- pulley system (moat)
- chain pump and
- lever system (rahat)

have been used for centuries to lift water from water reservoirs and supply it to the field for irrigation. These methods are cheaper but not much efficient.

ii) Modern Methods



Furrow irrigation: In this method water is allowed to enter the field through channels of furrows made between two rows of crop. e.g., sugar cane, banana, paddy, etc.



Furrow irrigation

Basin irrigation: In this method the field is just filled with water.

e.g. Paddy field.



Basin irrigation

Sprinkler irrigation: This irrigation is used where the soil cannot retain water for a long time. Here the water is sprinkled by sprinklers. e.g. Lawn



Sprinkler irrigation

Drip irrigation: In this irrigation the water falls drop by drop directly at the position of the roots, so it is called drip irrigation. It is the best method to save water. It helps to irrigate grapes, banana, brinjal, etc.



Drip irrigation

Care must be taken not to water the field excessively. Excess water on the field may cause a condition called **water logging** which may harm the crops.

ACTIVITY 1.1

Select a small place in your garden. Sow seeds and setup in such a way that it is watered drop by drop. Observe the changes.

MORE TO KNOW

- The **Karakum canal** in Turkmanisthan is the longest irrigation canal in the world. It is over 1300 km long.
- PAP – Parambikulam Aliyar Project ranks first in India in the top 10 list of the World for its massive storage capacity.
- Indira Gandhi Canal - It is one of the biggest canal project in India. Starts from Harike Barrage at Sultanpore.

1.2.4. PROTECTION FROM WEEDS (UNWANTED PLANTS)

Weeds are undesirable plants growing naturally along with the crop. Removal of these weeds is called **weeding**. Weeding should be done then and there.

The weeds must be removed because they compete with crops

for water, nutrients, space and light thereby affecting their growth.

Some weeds become poisonous.

The common types of weeds are

- Grass
- Amaranthus
- Chenopodium

Methods of weeding

i) **Manual weeding:** Weeds may be manually removed by hand by uprooting them or by using some tools like hand fork, khurpa and harrow.



Tools used for weeding

ii) **Chemical Control:** The chemical substances which destroy the weeds but do not harm the crop are called weedicides. eg. Dalapon, metachlor, 2-4- Dichlorophenoxy-acetic acid.

Excess use of chemical weedicides cause water and land pollution. Traces of these poisonous chemicals may remain in crops themselves. Therefore it is very important to use them with extreme caution.



Weedicide sprayer



*Does it affect the person who sprays it?
Yes certainly. But we can prevent by using the mask.*

MORE TO KNOW

Bio-weedicides are the mechanism of using microorganism such as fungi and bacteria used to destroy weeds.

1.2.5. HARVESTING

Once the crop gets matured, it has to be gathered. The process of cutting and gathering a matured crop is known as harvesting.

All over the world harvest season is celebrated with excitement. Pongal (Tamilnadu), Bihu (Assam), Holi (Punjab), Onam (Kerala), etc., are the harvest festivals celebrated in India.

What is your experience in harvesting? Harvesting of paddy in our country is either done manually by sickle or a machine called harvester.

In small farms crops are usually cut down using a hand held tool called



Manual Harvesting

a sickle. In big farms a large vehicle called harvester combine is used.



Harvester combine

Grains are separated from the stalks by the process of threshing. This is carried out by beating the cut stalks against hard floor or with a machine called mechanical thresher.



Manual threshing

The chaff (pieces of straw and husk after threshing) is separated from the whole grain by [winnowing](#).



MORE TO KNOW

Green Revolution: The massive step taken to augment food production by adopting modern agricultural practices in India.

1.2.6. STORAGE AND MARKETING

Grains are kept safe from moisture, insects and microorganisms. If they are not kept in a proper manner they will get spoiled and cannot be consumed.

Farmers store grains in jute bags and metallic-bins. In a large scale the grains are stored in godowns, silos, (very tall cement tanks) and granaries.

Fresh fruits and vegetables have much moisture content and thus they get spoilt soon. Therefore they are stored in cold storage.

MORE TO KNOW

Neem leaves, salt, turmeric and castor oil also prevent pests and microorganism.



Silo

MARKETING

Increase in agricultural production alone will not bring about prosperity for farmers. It is important that agricultural products fetch a remunerative price. Warehousing and marketing facilities are essential to ensure this strategy.

Government has taken more steps to assist marketing of agricultural product and to promote the status of small farmers. Tamilnadu Government has established "[Uzhavar Sandhai](#)" to satisfy the need of consumers and the small scale village farmers.



"Uzhavar Sandhai"

Regulated markets eliminate unhealthy marketing practices and exploitation of the products by middlemen. The government provides loan at a very low rate of interest to the farmers for cultivation.

MORE TO KNOW

State warehousing corporations provide storage facilities for agricultural product, fertilizers etc.

Thanjavur is said to be the Rice Bowl of Tamilnadu.

Agmark: Agmark grading and standardization is a central sector scheme to check the quality and standard for agricultural products. The grades given are Grade 1, 2, 3, 4 or Special, Good, Fair and Ordinary.

1.3. CROP ROTATION

What will happen if the same crop is grown again and again on the same land? By repeated planting of the same plant a part of minerals gets depleted in the soil. It then leads to very poor yield. One way of improving the crop yield is by crop rotation. In this method different crops are grown alternately.

The practice of growing a cereal crop and the pulse crop alternately in

ACTIVITY 1.2

Take a trowel and carefully dig up a pea plant or any leguminous plant from the garden. Wash off the mud and observe the bead like structures on the roots called nodules.

the same field in successive season is called as **crop rotation**.

Leguminous plants have root nodules associated with symbiotic bacteria which fix atmospheric nitrogen.

For example wheat and paddy (plants need nitrogen to make protein, they can't use nitrogen directly from the air) absorb more nitrogen from soil. This loss of nitrogen can be replaced naturally by leguminous plants which have symbiotic bacteria in their root nodules.e.g. pea, soya, bean are cultivated after wheat or paddy.

1.4. BIOTECHNOLOGY IN AGRICULTURE

Biotechnology is the field of applied biology that involves the use of living organisms and bioprocesses in engineering, technology, medicine and other field requiring bioproducts.

Biotechnology has also revolutionised research activities in the area of agriculture.

There are seven different techniques that are used in plant improvement.

1. Selection: It is a process of choosing a desirable crop.

2. Hybridisation: A hybrid (new variety) is produced by crossing the already existing two varieties with desirable qualities.

3. Polyploid breeding: Method to increase the chromosomal number.

- 4. Mutation breeding:** Radiations(UV and X-rays) induces mutation to develop new variety of crops.
- 5. Protoplast fusion:** Production of hybrids by the fusion of protoplasts along with nuclei of two different species.
- 6. Tissue culture:** Culturing the plant tissue in artificial, controlled, aseptic conditions (*in vitro*) to raise plantlets.
- 7. Genetic engineering:** Its objective is to identify, isolate and introduce a desirable gene/genes into a crop plant that normally do not possess them. These new plants whose genes are modified/transferred are called transgenic plants.

Genetic engineering

Genetic engineering is a part of biotechnology. It offers new hope to the farmers who are struggling hard with plant pests and diseases.

The aim of agricultural biotechnology is to give transgenic plants carrying desirable traits like

- Disease / Insect / Herbicide resistant.
- Increased photosynthetic efficiency.
- Nitrogen fixing ability.
- Increased size of storage roots, seeds, fruits and vegetables.
- Oil seeds (soya) rich in PUFA (poly unsaturatedfatty acid) recommended for heart patients.
- Potatoes with vaccines, improves starch and vitamin A is produced.

Genetically modified (GM) seeds, biofertilizers, biofuels are also produced.

1.5. BIOTECHNOLOGY IN FOOD PROCESSING

Food processing industry is the oldest and largest industry using biotechnological processes. Biotechnology in food processing is used to improve existing processes such as

- Production of additives and
- Processing aids.

Improving of microorganisms in order to improve process, control, yield, safety and quality of the processed products.

Application of biotechnology in processing of food

- Gene modification and transfer.
- Development of recombinant vaccines vitamins and proteins.
- Improving the quality, safety and consistency of fermented foods.
- Improving of microorganisms in order to improve process, control and yield of the processed products.
- Improving the processing properties eg., Development of the “flavr Savr, tomato” variety, genetically modified to reduce its ripening rate.

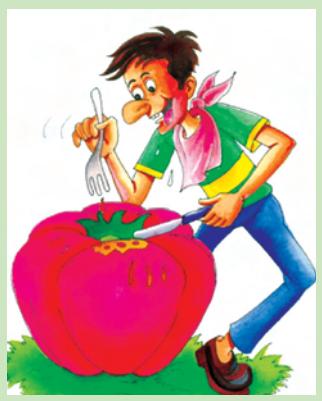
Bioethics of genetic engineering

Besides many benefits, the ethical, social and legal implications of these potent gene

technologies have led to considerable concern about the possibility of accidentally producing new pathogens responsible for fatal diseases or developing '**genetic monsters**'.

MORE TO KNOW

Biotechnology helps in promoting greater fruit and vegetable consumption for healthy nutrition.



ACTIVITY 1.3

Can we list the processed foods used in your daily life?

1. Soft drinks.
2. Chips
3. _____
4. _____
5. _____

EVALUATION

1. Choose the correct answer:

- a) Sowing is done in large scale by _____ (**manual sowing / seed drill**)
- b) We can prevent pest at home in natural way by using (**Thulsi leaves / Neem leaves**)
- c) Pick the odd one out. (**hand fork, harrow, sickle, hoe**)
- d) Government has established _____ to satisfy consumers and farmers in marketing. (**Uzhavar Sandhai / Co-operative bank / Private shops**)
- e) Choose the fermented food. (**wine / fresh juice / milk**)

2. Arrange the following steps of preparation of soil in correct order.

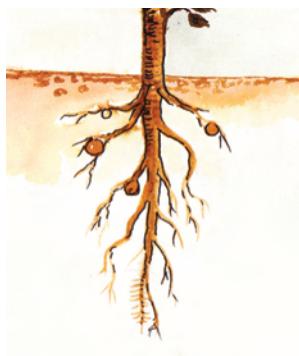
- a) Sowing
- b) Levelling
- c) Ploughing

3. Match the following

- | | | |
|-------------------------|---|-------------------------------------|
| a) Furrow irrigation | — | to irrigate grapes, banana etc., |
| b) Basin irrigation | — | used where soil can't retain water. |
| c) Sprinkler irrigation | — | between two rows of crop. |
| d) Drip irrigation | — | paddy field. |

4. Name the types of irrigation related to the following figures.

A) _____ B) _____ C) _____ D) _____

5. Label the diagram of the taproot system and write it's significance.**6. Classify the following chemicals based on the uses given below.**

(Phosphorus, 2-4-D, Pottassium, Dalapon, Nitrate, Metachlor)

Fertilizers	Weedicides
1.	1.
2.	2.
3.	3.

7. a)

- Mani is repeatedly cultivating same paddy crop in his field and getting poor yield.
- Nathan likes to go for changing the crops every season and getting good yield.
- From the above statements find out and justify the best method of agricultural practice.

7. b) Classify the following items based on the storage methods.

(Apple, Wheat, Potato, Rice, Grape, Sorghum)

Dry storage	Cold storage

8. a) Complete the circles based on applications of Genetic Engineering.

Herbicide Resistant

?

Genetic
Engineering

?

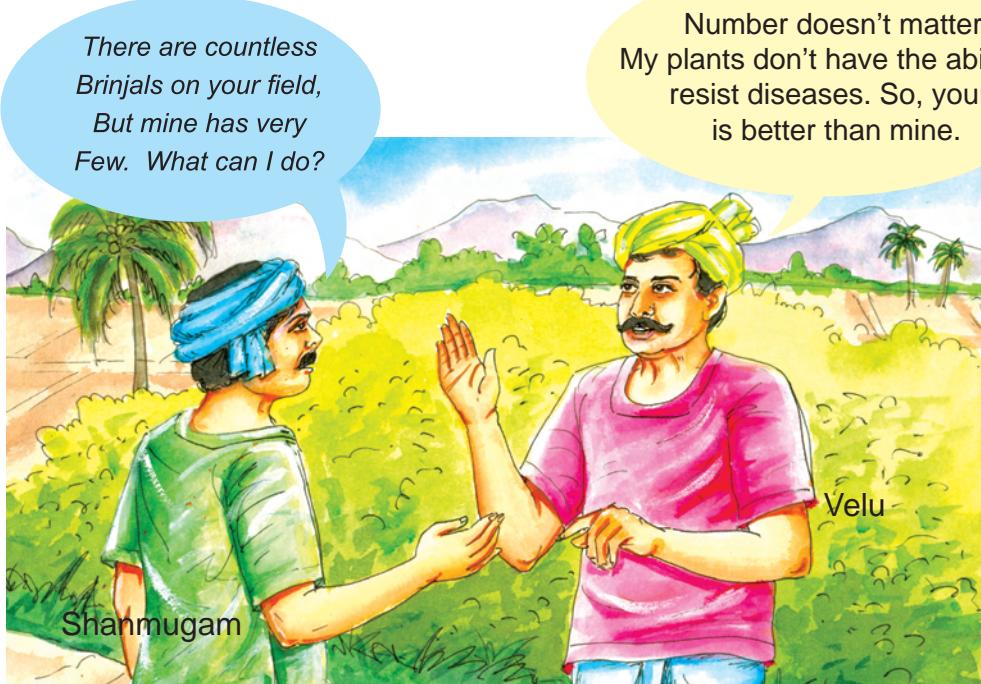
?

?

8. b)

There are countless Brinjals on your field, But mine has very Few. What can I do?

Number doesn't matter. My plants don't have the ability to resist diseases. So, yours is better than mine.



From the above statements, suggest techniques to overcome the problems of Shanmugam and Velu.

9. List some more common crop plants

Common crop plants.		
S.No	Crop group	Crops
1.	Cereals	Wheat,-----
2.	Pulses	peas,-----
3.	Vegetables	potato, -----
4.	Fruits	apple,-----
5.	Oil seeds	coconut,-----
6.	Sugar yielding crops	sugarcane-----

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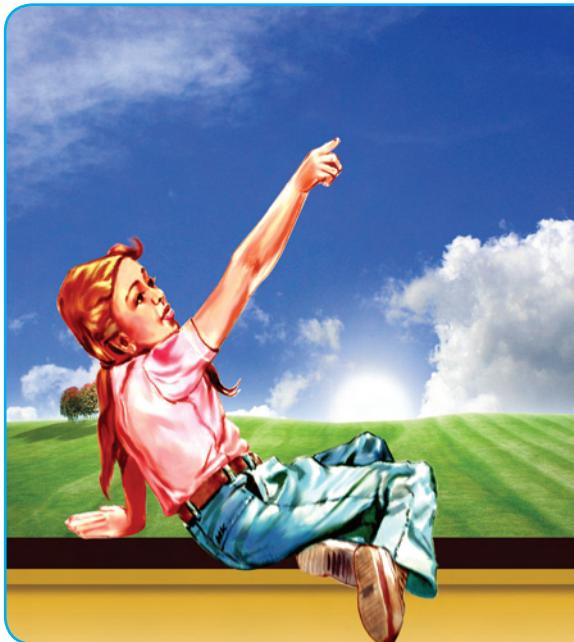
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2. REACHING THE AGE OF ADOLESCENCE



“ It is the fact that, flesh, blood and bones are hidden under a cover of skin in your body. You also have thoughts and feelings, that are not visible. But they have an important role in making you the special person that you are. ”

2.1. ADOLESCENCE AND PUBERTY

The word ‘Adolescence’ is derived from the Latin word ‘adolescere’ which means ‘to grow’. The period of transition from childhood to adulthood is called **adolescence**. The World Health Organization (WHO) defines **adolescence as the period of life between 11 and 19 years of age**. Since adolescent period covers the “teens period”, adolescents are usually called teenagers. It is a period when lots of changes take place in the body and mind. Hormonal changes result in unusual swings in emotions.

Adolescents shoot up in height and gain weight. The growth spurt begins

two years earlier for girls than for boys. But it lasts longer for boys.

The rapidly changing body proportions and the new sensations attributed to sexual development confuse and cause anxiety to the adolescents. This chapter aims at helping adolescents understand the physical, cognitive, social and emotional changes during adolescence.

Puberty

Puberty is the period in life when the body’s reproductive system gets ready to work. Generally, boys attain puberty at the age of 14 to 15 years, while girls reach puberty at a comparatively lower age of 11 to 12 years.

As you grow up, people will be quick to notice that you are getting taller but they may not see that you also change in shape. Let us see this in detail.

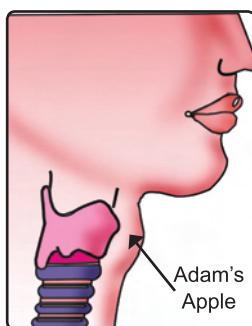
Changes at Puberty

The following changes take place in the body of boys and girls at Puberty

1. Increase in Height: There is a sudden increase in the height of both boys and girls during puberty. The rate of growth in height varies from person to person. Some may grow rapidly at the start of puberty and then slow down, while as others may grow gradually. The height of an individual depends upon the genes which are inherited from parents.

2. Change in Body Shape: The changes occurring in adolescent boys and girls are different. In girls hips become broader and the pelvic region widens. In boys, shoulders broaden and the body muscles grow more than that of the girls.

3. Change in Voice: At puberty the voice box or the larynx begins to grow. The larynx in boys is larger than that in girls. The voice box in boys can be seen as the Adam's Apple, in their throat. In boys, the voice becomes deep and harsh, whereas girls have high pitched voice.



4. Increased activity of Sweat and Sebaceous glands: The secretion of sweat and sebaceous glands (Oil glands) increases during puberty. This causes acne and pimples on the face of boys and girls at this time.

5. Development of Sex Organs

The Reproductive Organs in boys and girls become fully functional at Puberty. In boys, the male sex organs like the testes and penis develop completely. The testes start producing sperms.

In girls, the ovary enlarges and eggs begin to mature. Ovaries start releasing matured eggs.

These sex organs produce sex hormones, which play an important role in the process of reproduction and in the development of secondary sexual characteristics.

Apart from these changes that are taking place in emotional, mental and intellectual areas, they may experience various moods such as being happy, sad, angry, excited or irritated.

2.2. SECONDARY SEXUAL CHARACTERS

Certain characters help to distinguish the male from the female. They are called secondary sexual characters. Some of the secondary sexual characters that develop in girls and boys are as follows:

Boys

1. Facial hairs such as beard and moustaches develop.
2. Hair develops under the armpit, under chest and in the pubic regions.
3. Voice becomes deeper.
4. Muscles develop, and shoulder becomes broad.
5. Increase in weight.

Girls

1. Development and enlargement of breasts.
2. Hair develops under the armpit and in the pubic regions.
3. Hips broaden and pelvic region widens
4. Initiation of menstrual cycle.
5. Deposition of fat around hips, these changes which occur at adolescence are controlled by hormones.

2.3. DUCTLESS GLANDS

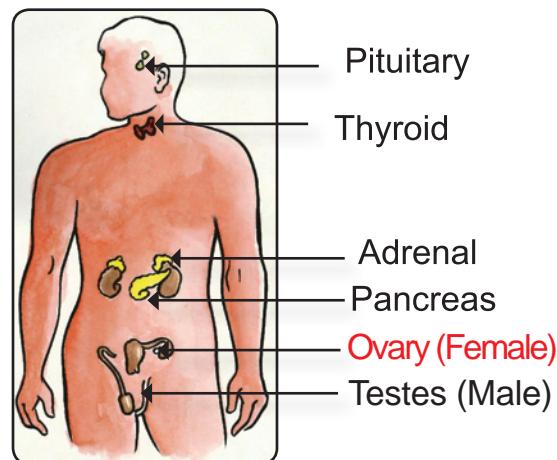
Introduction

The word gland means having some secretions. There are two types of glands.

1. Exocrine gland – gland with duct
2. Endocrine gland – gland without duct.

The exocrine gland secretes enzymes which are important for digestion. The ductless or endocrine glands secrete hormones. They are special chemical substances that make wonders in our body.

The following are the important Endocrine Glands (Ductless) present in our body.



1. Pituitary
2. Thyroid
3. Pancreas
4. Adrenal
5. Testes (Male) **Ovaries** (Female)

Pimple:

A small papule or pustule. Pimples are sebaceous glands that are infected by bacteria, become inflamed and filled with pus.



The secretions of the ductless glands (hormones) are carried away by the blood stream.

Let us see the functions of these glands.

1. Pituitary gland: It is located just below the brain. It is called as the master gland because it controls the functioning of all other endocrine glands. Your growth depends on the secretion of the pituitary gland. It secretes growth hormone. A person having less growth hormone remains very short (**Dwarfism**) ; on the other hand, a person having much growth hormone becomes very tall (**Gigantism**). In adults, excess secretion leads to a condition called **acromegaly**.



2. Thyroid gland: It is located in the throat region. It secretes a



hormone called **thyroxine**. The function of thyroxine is to control the rate of **Metabolism**, growth and respiration.

The deficiency of thyroxine hormone in children is known as **cretinism**. It slows down growth and mental development. Sometimes the gland may enlarge causing a disease called **Goitre**.

3. Pancreas: Pancreas is located just below the stomach in the body. Pancreas is both exocrine and endocrine in nature. The endocrine part is called **Islets of langerhans**. It has alpha and beta cells, which secretes **glucagon** and **insulin**. Both control sugar metabolism in the body.

Deficiency of insulin in the body causes a disease known as **diabetes mellitus**.

4. Adrenal gland: These are also known as supra renal glands, as they are located just on the top of the kidneys. It secretes **adrenalin** hormone. This hormone is produced during stress or emergency situations. It regulates heart beat, breathing rate, blood pressure etc.

5. Testes and ovaries: Testes and ovaries secrete sex hormones. Testes produce **testosterone** and ovaries produce **oestrogen** hormones. We have already learnt that these hormones are responsible for male and female secondary sexual characters.

2.4. ROLE OF HORMONES IN REPRODUCTION

Most hormones are at work from the moment you are born. Sex hormones are different because they start to work later on. They gradually prepare the body for reproduction.

The sex hormones are responsible for the fundamental change in growth and development and stimulate the developments of secondary sexual characters.

The testes and the ovaries are the reproductive Organs; both are stimulated by the pituitary hormone during puberty.

IN BOYS

In male, the testes produces the male sex hormone **testosterone**. This hormone helps in the development and maintenance of the primary and secondary sexual characters and functions of sperms.

In female, the ovaries secrete **estrogen** and **progesterone** responsible for the primary and secondary sexual characters.

Apart from testes and ovaries the Adrenal Cortex also secretes steroid hormones in both the sexes. These hormones are responsible for adolescent growth spurt.

2.5. REPRODUCTIVE PHASE OF LIFE IN HUMANS

What is Reproductive Phase? How long does it last in males and females?

The phase in an individual's life during which there is production of gametes is called Reproductive Phase. In females it is normally between 13 to 50 years, and in males, it is from the age of 13 to life long. The reproductive age may vary from person to person.



The following are the various reproductive phases in the life of a female.

1. Ovulation: Release of an ovum from the ovary - usually one egg is released every month.

2. Menstruation or the period: This is the outward sign of the routine cycle of egg production and hormone change in a woman's body. It takes about 3 – 5 days.

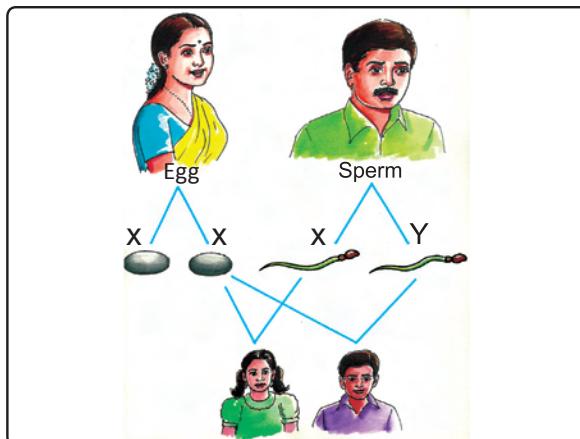
3. Pregnancy: When the egg gets fertilized by the sperm, the zygote is implanted in the uterus for further development this results in pregnancy.



4. Menopause: The menopause marks the end of the reproductive phase of a woman's life, the chief outward sign is the cessation (stop) of the monthly flow of menstrual blood. The usual age is around 50.

2.6. SEX DETERMINATION

Do you know which is responsible for the determination of sex? What makes the fertilized egg to develop either into a boy or a girl?



If you want to know about that, you should know about the chromosomes. Chromosomes are thread like structures present in the nucleus of the cell. All the cells contain 23 pairs of chromosomes. The last pair of chromosome is different in males and females. The last pair determines the sex, so it is called as **sex chromosome**.

Sex chromosomes are of two types, These are named as X. and Y chromosomes. Usually a woman has two 'X' chromosomes (XX) and male has one 'X' and one Y chromosome (XY), in their cells. During gamete (reproductive cell) formation the number of chromosomes are reduced into half. (46 chromosomes are reduced into 23).

When a sperm containing 'X' chromosome fertilizes the egg, the zygote will have two 'X' (XX) chromosomes. The zygote will develop into a female child.

Similarly, when a sperm containing 'Y' chromosome fertilizes the egg,

the fertilized egg will have one 'X' chromosome and one 'Y' chromosome (XY), and it will develop into a male child.

Now you know that the sex chromosomes of the father determine the sex of a child. The belief that the mother is responsible for the sex of her baby is completely wrong.

2.7. REPRODUCTIVE HEALTH

During adolescence growing children need special attention towards diet, exercise and personal hygiene. The personal hygiene includes female and male reproductive health.

The following are some of the measures that girls and boys need to take to maintain personal hygiene.

- Take bath atleast once a day, paying special attention to underarms, groins and genitals.
- Change the underwear daily. The underclothes should be made of cotton.

Menstrual hygienics:

Menstruation in females is as natural as our regular physiological activities like breathing, drinking, eating, urinating and defecation etc., It is a cyclical process that is present in all the mammalian females.

- So It is a natural phenomena, that is neither to be worried nor to be ashamed. Sanitary napkins (pads)

or a pad made of clean soft cloth which can absorb moisture should be used for absorbing menstrual flow.

- Sanitary napkins or cloth should be changed frequently depending upon the menstrual flow. If a cloth is being used repeatedly, it should be cleaned with soap and hot water and dried in sunlight for reuse.
- Wash with soap and water before using a fresh napkin.

2.7.1. Nutritional Needs

The adolescents need more calories and other nutrients due to spurt in growth and increase in physical activity.

The nutritional deficiencies during this period not only retard the physical growth, but also impair the intellectual development and delays sexual maturation. The diet of adolescents should meet the demands of physical and intellectual growth, provide adequate reserves for illness / pregnancy and prevent onset of adulthood diseases related to nutrition. e.g., Hypotension and osteoporosis. (Bones become brittle)

A very good amount of proteins and carbohydrate is necessary during this growth period. Apart from that, adolescents need to keep in mind the following dietary consideration:

Minerals: Since there is an increase in skeletal mass and blood volume, the body needs calcium, phosphorous and iron.

Calcium: Calcium intake needs to be increased to prevent osteoporosis in later life. It is present in milk and milk products.

Iodine: It helps to prevent thyroid gland related diseases.

Iron: Lack of iron in the diet results in anemia. To make up for the loss, have a diet rich in iron. In boys, iron deficiency occurs due to muscle spurt if it is not adequately supplemented. In girls, iron deficiency occurs due to menstruation in addition to the spurt in muscular growth if it is not adequately supplemented.

Green leafy vegetables, jaggery and whole pulses are rich sources of iron.

During adolescent period, take hygienic balanced diet.

2.7.2. Personal Hygiene



Personal hygiene is a clear indicator of man's personality. Personal hygiene

should start from the hair tip and ends down at the toes.

Remember and practise the following 10 tips for your personal hygiene

1. Shower or bath daily.
2. Always wash your hands before and after meals.
3. Keep fingernails clean, and avoid wearing nail polishes or jewellery.



GERM FARM

4. Wash your teeth and mouth before and after each meal.
5. Avoid touching your face, nose, or mouth, while preparing food.
6. Avoid coughing or sneezing around food.
7. If you want to taste the food, use a clean spoon.
8. Change your clothes, especially undergarments, everyday.

9. Do not defecate in open field. Use clean toilets for defecation
10. If you are not well, do not take self medication. Consult a doctor.

2.7.3. Prevention and protection from sexual and other abuses

Preventing childhood sexual abuse

Taking steps to prevent childhood sexual abuse is an ongoing parental responsibility. In 80% of cases the abuser is someone the child knows as a trusted or loved adult or older child who may use threats, bribery or tricks to take advantage of the child's innocence.

There are three stages in the Prevention of sexual abuse. They are

1. Primary Prevention
2. Secondary Prevention
3. Tertiary Prevention

Primary Prevention: It involves preventing the abuse from happening in the first place. Avoid being alone in company of suspected person. Don't wear provocative dresses. Do not let anyone to hug, pet or kiss you. Take care of the way you sit. When you are going to school by auto, bus or by train keep distance from the other sex.

Secondary Prevention: It includes early detection and reporting of perpetrators for the purpose of stopping the perpetrators and minimizing the negative effect on the child.

Tertiary prevention: It focuses on the treatment of abused children and adults who have developed signs and symptoms of distress.

Warning signs of sexual abuse:

Children who have been sexually abused often show the following signs:

- A sudden dramatic change in behaviour or personality.
- Recurring nightmares.
- Regression to early behaviour patterns such as bed wetting.
- Withdrawal from friends and family members.
- Imitating adult sexual behaviour.
- Hostile, aggressive behaviour.

Substance abuse: To pre-teens and teens, alcohol, tobacco and drugs may seem like a quick way to move into the adult world. These substances cause serious problems, and their use leads to **addiction**. Alcohol is the most abused substance among teenagers. Consumption of alcohol leads to frequent memory loss and hepatitis (liver damage).

Drug: (Fr. drogue – a dry herb) is a chemical which is taken for some illness and is withdrawn when the desired effect is achieved.

Illegal Drugs: Illegal drugs are drugs used for recreation, but it is against the law to take them, because it is extremely dangerous. The side effects are serious and the drugs are highly

addictive, ruining people's lives. The effects of the drug on the addict's life style can lead to a very unpleasant death. These drugs slowly reduce the functioning of nervous system and heart functions. Opium, Heroine, Marijuana and Cocaine are some of the illegal drugs.

These drugs slowly change the behaviour of the users:

some of the behavioural changes are as follows:

1. Rejection of old friends and the acquiring of new ones.
 2. Sudden lack of interest in hobbies or extracurricular activities.
 3. Staying away from home after school.
 4. Drop in grades and disinterest in school work.
 5. Less concern with personal appearance.
 6. Mood swings or extreme irritability.
- So, please say a big 'No' to drugs if you come across any temptation in your life.

Prevention of drug abuse

1. Children should avoid the company of drug addicts.
2. Advertisements of drugs on public media should be banned
3. Doctor's advice and prescriptions should be strictly followed.

2.7.4. Smoking hazards

Cigarettes have been deemed one of the greatest health hazards of the 20th century and are now widely regarded as the chief preventable cause of death. Tobacco products such as cigarettes, cigars, smokeless tobacco (like snuff and chewing tobacco) are more dangerous. When a cigarette is burned, it is broken down into its chemical elements from which lethal chemical compounds are created.

The period between puffs allows time for nicotine, ammonia, acetone, formaldehyde, hydrogen cyanide and some 4000 other chemical constituents to become irritants, poisons, mutagens and more than 40 types of carcinogens.

Some of the evil effects of smoking are

- Raising bad cholesterol (Low Density Lipid), decreasing good cholesterol (High Density Lipid)
- Blood vessels are constricted, damages the lining of the arteries making the blood more sticky. This increases the risk of blood clots and dramatically raises the risk of a heart attack or stroke.
- 80% of cancerous deaths are linked to it. Smoking aggravates asthma, bronchitis, pneumonia and emphysema.

- Also the causative agent for peptic ulcers, cataracts.
- Cigarettes increase the risk of infertility in both men and women.
- Children of smokers are also far more susceptible to asthma and ear infections.



Healthy food

Dear children please avoid junk food.
Take healthy foods like bean sprouts.
Let us know about bean sprouts.

2.7.5. SPROUTING

Why should we sprout?

Sprouts are a living, enzyme-rich food, natural and low in calories. Their vitamin A content will usually double, various B group vitamins will be 5 - 10 times higher, and vitamin C will increase by a similar order. Their protein content becomes easily digestible and rich new nutrients such as enzymes are created. They contain significant amounts of calcium, iron and zinc.



When a dormant seed sprouts, its starch is converted into simple sugars and long chain proteins are split into smaller, easily digestible molecules. **Sprouted beans and seeds are like a predigested food, one of the most enzyme-rich and nutritious foods known.**

What can we sprout?

Most seeds sprout easily, as do many legumes. Nuts are more difficult to sprout. It is recommended that soaking all the nuts, legumes and grains that we consume, which then become a wonderful, highly nutritious and essential component of a living food diet.

Best sprouting results in sunflower seeds and mung beans. This may be a reflection of the local conditions and suppliers.

Mung beans make an excellent sprout, used widely in cooking. However, they primarily use the

sprouts and not the beans, and the sprouts are often stir-fried.

Soya and kidney bean sprouts are toxic and may be avoided. .

An easy method to prepare bean sprouts at home.

1. First remove the damaged bean seeds.
2. Soak them in a clean water overnight or for about 12 hours.
3. Drain, rinse and place them in a wide mouthed bottle. Allowing room for the sprouts to grow.
4. Cover the jar with cotton cloth.
5. Keep it in the dark area of your house as sunlight makes them taste bitter.



As soon as the bean germinate, all the starches, oil and other nutrients packed into it – to nourish the tiny plant begin to turn into vitamins, enzymes and other forms of proteins mineral and sugars. The Vitamin C content of the bean increases, when it starts sprouting. Rinse the bean sprouts two to four times a day. They will be pale green fresh and ready for eating in two to six days.

2.7.6 Cancer and its prevention

Normally body cells grow and reproduce in an orderly way. In contrast cancerous cells multiply rapidly. This is due to damaged genetic material of the cell. This stage is known as **initiation**. It can be influenced by external factors like radiation, viral infections and

certain chemicals. These cancerous cells create lots of problem in our metabolism and invade to the other areas through blood streams, where they cause secondary tumours. This stage is called **metastasis**.

What causes cancer?

Cancer is ultimately the result of cells that uncontrollably grow and do not die. Normal cells in the body follow an orderly path of growth, division and death. Programmed cell death is called **apoptosis**, and when this process breaks down, cancer begins to form. Unlike regular cells, cancer cells do not experience programmatic death and instead continue to grow and divide. This leads to a mass of abnormal cells that grows out of control.

What are the symptoms of cancer?

Cancer symptoms are quite varied and depend on where the cancer is located, where it has spread, and how big the tumour is. Some cancers can be felt or seen through the skin - a lump on the breast or testicle can be an indicator of cancer in those locations. Skin cancer (melanoma) is often noted by a change in a wart or mole on the skin. Some oral cancers present white patches inside the mouth or white spots on the tongue.

Other cancers have symptoms that are less physically apparent. Some brain tumours tend to present symptoms early in the disease as they affect important cognitive functions.

Pancreas cancers are usually too small to cause symptoms until they cause pain by pushing against nearby nerves or interfere with liver function to cause a yellowing of the skin and eyes called jaundice. Symptoms also can be created as a tumour grows and pushes against organs and blood vessels. For example, colon cancers lead to symptoms such as constipation, diarrhoea, and changes in stool size. Bladder or prostate cancers cause changes in bladder function such as more frequent or infrequent urination.

How is cancer classified?

There are five broad groups that are used to classify cancer.

1. **Carcinomas** are characterized by cells that cover internal and external parts of the body such as lung, breast, and colon cancer.
2. **Sarcomas** are characterized by cells that are located in bone, cartilage, fat, connective tissue, muscle, and other supportive tissues.
3. **Lymphomas** are cancers that begin in the lymph nodes and immune system tissues.
4. **Leukaemia** are cancers that begin in the bone marrow and often accumulate in the bloodstream.
5. **Adenomas** are cancers that arise in the thyroid, the pituitary gland, the adrenal gland, and other glandular tissues.

Prevention

The following are some of the ways to prevent diseases like heart attack, cancer, diabetes and hypertension. Smoking causes lung cancer. It also affects mouth, throat, oesophagus, pharynx, larynx liver etc. Smoking should be totally avoided.

◆ High intake of fruits and vegetables are protective against many forms of diseases like heart attack, cancer, diabetes and hypertension. A vegetarian diet is typically high in fibre, low in saturated fat compared to meat eaters.

- ◆ High intake of beta carotene, vitamin C and other vitamin containing food should be taken. Apart from citrus variety of fruits, bean sprouts is also an excellent source of vitamin C.
- ◆ Try to reduce your weight, if you are obese.
- ◆ Avoid pickles and salty foods.
- ◆ Treatment involves surgery, chemotherapy, radiotherapy and hormonal therapy.

EVALUATION

1. Adolescents sometimes experience various mood swings such as being happy, sad, angry, excited or irritated. What makes them behave so?
2. The deficiency of thyroxine hormone in children is cretinism. It slows down growth. Apart from this, write one more disorder.
3. Note the endocrine glands given in column A with their respective hormones in column B.

A	B
Pituitary	Oestrogen
Thyroid	Adrenalin
Pancreas	Growth hormone
Adrenal	Thyroxine
Ovary	Insulin

4. Give reasons for the following.
 - i) Smoking increases the risk of blood clots.
 - ii) Smoking aggravates asthma.
 - iii) Bean sprout is good for health.
 - iv) cancerous cells multiply rapidly
5. Pituitary, thyroid, adrenal, pancreas, testes and ovary. From the glands listed above one gland acts both as exocrine and endocrine. Name it
6. The human sperm consist of head, middle piece and tail. What purpose does the tail in a sperm serve?
7. Babu heard his mother and aunty talking about his cousin who is going to have a baby, they were discussing whether she would give birth to a boy or girl,
 - a. Will it be possible to judge the sex of the child by them?
 - b. What makes the fertilized egg develop either into a boy or a girl?

Project work

1. How many of your classmates are doing exercises regularly and who do not exercise regularly? Did you notice any difference in their fitness and health? Prepare a chart on their benefits of regular exercise and fix it in your classroom.
2. Collect information from newspapers, magazines and from the local health centre about the evil effects of cigarettes and alcohol. Prepare a chart and display it permanently in your classroom.
3. Prepare a colourful poster on the theme, 'Say No to Drugs'.

FURTHER REFERENCE

Books:

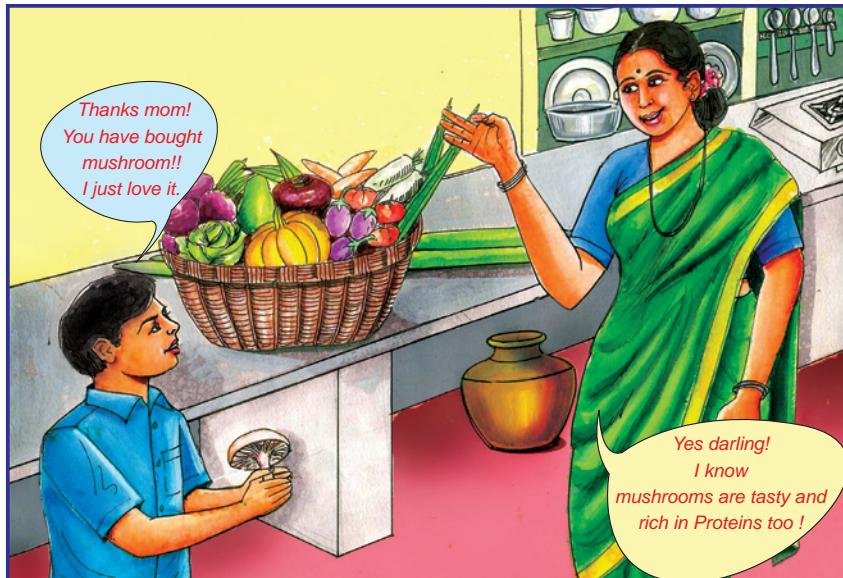
Biological science by Taylor, Green an Stout – Cambridge University Press

The complete family health book- Donna Shelly, Sharyn Ann Lenhart and Roslyn E. Epps - St.Martin's Press

Webliography:

<http://en.wikipedia.org/wiki/smokinghazards>

3. PICTORIAL FEATURE OF PLANT KINGDOM



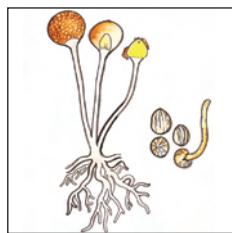
Robert Harding Whittaker, American plant ecologist classified the plants and animals into five kingdoms, which you already studied in the class seven. Let us know in detail about the kingdom fungi and plantae in this chapter.

3.1. FUNGI

Fungi do not have chlorophyll and cannot prepare their own food.

All of us would have noticed the sudden growth of mushrooms soon after the rain in humus soil. They belong to the kingdom of fungi.

Fungi is a third kingdom of Whittaker which includes moulds, mushrooms, toadstools, puff balls and bracket fungi.



Mould



Mushroom



Bracket fungi



Puff balls

Features of fungi

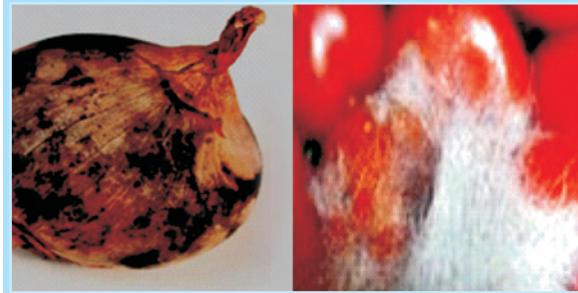
1. They may be unicellular (e.g., Yeast) or multicellular (Rhizopus, Agaricus and Aspergillus)
2. They are non-green organisms as they lack chlorophyll.
3. Their body is made up of hyphae called mycelium and is covered by cell wall made up of chitin.
4. It reproduces by sexual or asexual reproduction.
5. Based on nutrition, fungi are classified into three types.
 - **Parasites**- Fungi living on other living organisms. e.g., Puccinia.
 - **Saprophytes**- Fungi living on dead and decaying matter. e.g., Agaricus, Rhizopus.
 - **Symbionts**- Fungi (living associated with algae (lichens) or on the roots of higher plants (Mycorrhizae).

ACTIVITY 3.1

Let us list out few eatables affected by the growth of fungi, which you have observed.

1.....2.....

3.....4.....



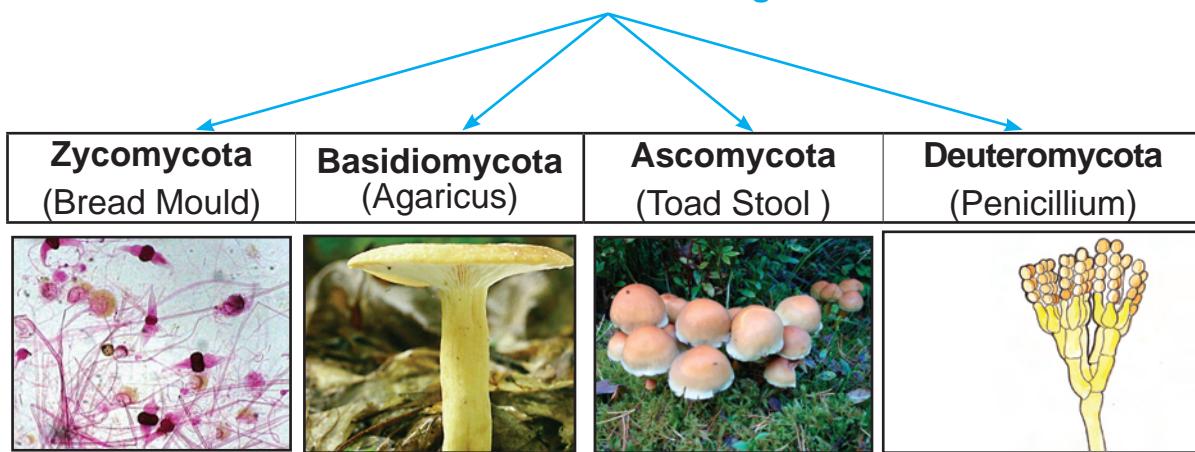
Fungus affected Onion and tomato

MORE TO KNOW

- There are about 1,00,000 different species of fungi that have been named.
- Lichens are bio indicators of environmental contamination.

SCIENCE

Classification of Fungi



We and fungi

1. Food

The Mushrooms are rich in protein and minerals. The most commonly eaten mushroom is button mushroom i.e., Agaricus. All the mushrooms are not edible. There are 2,000 species of edible mushrooms.

Edible mushroom: e.g., *Agaricus campestris*, *Agaricus bisporus* etc.

Poisonous mushrooms
(Toadstools) *Amanita muscaria*,
Amanita phalloides (death cup)etc.



Agaricus campestris



Amanita Phalloides



*How can I
differentiate
the edible
mushrooms
from the
poisonous ones?*

Poisonous mushrooms are usually brightly coloured.

2. Antibiotics

It is a chemical substance extracted from one living organism to kill or stop the growth of the other living organism.

Such antibiotic, like Penicillin, is extracted from fungi, Penicilium and other common antibiotics are Streptomycin, Neomycin, Kanamycin, Gentamycin and Erythromycin.

3. Vitamins

Fungi *Ashbya gossypii* and *Erymotheicum ashbyii* are used in the synthesis of Vitamin B-riboflavin

Fungal diseases

Human- Mycoses (growing on skin, nails, hair, organs), athletes foot, and ringworm.

Animals - Ergot, athletes foot.

Plants - Rust, black rot, black spot, canker.

ACTIVITY 3.2

- Observe the mushrooms that grow after the rain in your area. Note down their colour, shape and various parts.
- Visit a nearby mushroom cultivation centre and learn the process of cultivation.

MORE TO KNOW

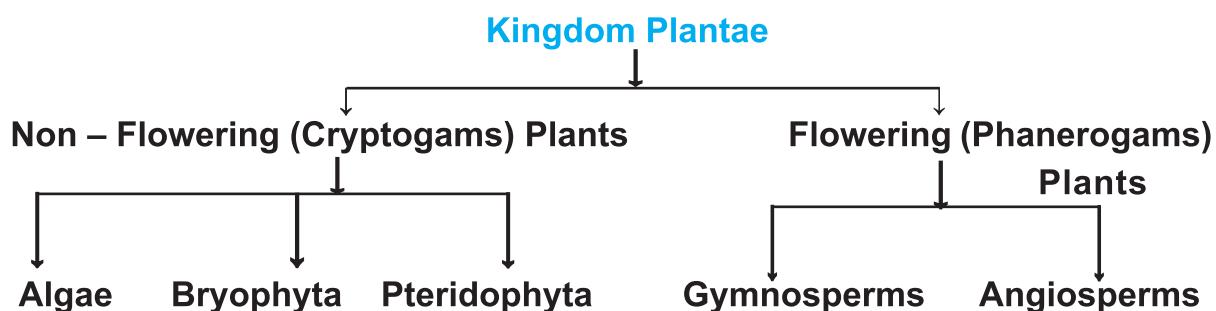
Claviceps purpuria - Hallucinogenic fungi cause the greatest damage to the frustrated youth by giving unreal, extra ordinary lightness and hovering sensation.

Aspergillus cause allergy to children while ***Cladosporium*** protects against allergy.

3.2. FLOWERING AND NON- FLOWERING PLANTS



The plants are classified into flowering and non-flowering plants. The classification of kingdom plantae is given below



Non-flowering plants(cryptogams)

3.3. ALGAE

- They are green water plants called algae. They are lowest and simplest primitive plants. Their body is not differentiated into root, stem or leaf.
- They may be unicellular, multicellular, filamentous or branched and tree like.

3. They possess chlorophyll and can prepare their own food.

4. Their cell wall is made up of cellulose.

5. Algae reproduce by

- **vegetative reproduction**
(fragmentation) e.g. *spirogyra*
- **Asexual reproduction**(Spores)

- Sexual reproduction
- Scalariform conjugation and Lateral conjugation e.g., *Spirogyra*
- By producing sex organs Antheridia and archegonia e.g., *Chara*.

Classification of Algae

Algae have photosynthetic pigments which may be green, brown, red or blue green according to the dominant pigment present in them. They are classified on the basis of their colour as given below.

S.No.	1	2	3	4
Colour	Blue-green	Green	Brown	Red
Pigment	Phycocyanin	Chlorophyll	Fucoxanthin	Phycoerythrin
Class	Cyanophyta	Chlorophyta	Phaeophyta	Rhodophyta
Reserve Food	Cyanophycean Starch	Starch	Laminarian Starch	Floridean Starch
Example	Oscillatoria 	Chlamydomonas 	Sargassum 	Polysiphonia 

Uses of Algae

1. Food

- The following algae are used as food by human being, domestic animals and fishes. e.g., *Ulva*, *Laminaria*, *Sargassum*, *Chlorella*

2. Agar Agar

- This substance is obtained from the red algae e.g., *Gelidium* and *Gracilaria*.
- It is used to make ice creams.

ACTIVITY 3.3
Collect some pond water along with algae and observe under the microscope.

MORE TO KNOW
The California giant kelp (brown marine algae) is the fastest-growing sea weed (15 cm/day & 160ft/year).

- It is used as culture medium for growing plants in test tubes. (Tissue culture)

3. Iodine

- It is obtained from *Laminaria* a brown algae.

4. Algae in space travel

- *Chlorella pyrenoidosa* is used in space travel to get rid of CO₂ and other body waste and it also decomposes human urine.

3.4. BRYOPHYTES

The trees and rocks of hilly areas are covered by thick green carpet of tiny plants. They are the first plants to come out of water to get adapted to live on the land. But can reproduce only in the presence of water.

- The mosses has root like stem like and leaf like structure.

- They have alternation of generation. (Sporophytic phase alternates with the Gametophytic phase)
- They reproduce sexually by gametes and asexually by spores, gemma and fragmentation.
- They live both on land and water so they are called amphibious cryptogams.

Classification of Bryophyta

Class – Hepaticae	Class – Anthocerotae	Class – Musci
Class – Hepaticae <ul style="list-style-type: none"> • Undifferentiated thallus • Protonemal stage absent e.g., Riccia 	Class – Anthocerotae <ul style="list-style-type: none"> • Sporophyte is differentiated in to seta and capsule • Protonemal stage absent e.g. Anthoceros 	Class – Musci <ul style="list-style-type: none"> • Differentiated into root like stem like leaf like organs. e.g. Funaria 

Uses of Bryophytes

- Peat moss or sphagnum in dried condition is used as fuel.
- Sphagnum is also used as antiseptic and absorbent bandage in the hospitals.
- Sphagnum is also used as seed bed in green houses.
- Bryophytes control soil erosion as they form a carpet over the soil.

MORE TO KNOW

Sphagnum moss was once used in disposable diapers because it soaks liquid well.

ACTIVITY 3.4

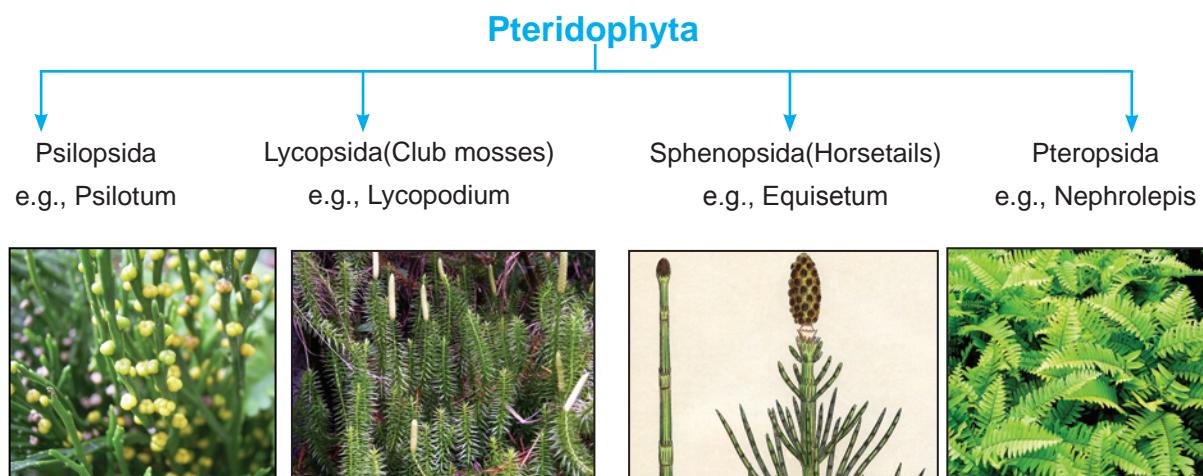
Let us visit a nearby nursery of plants and observe the horticultural methods, where they use Sphagnum.

3.5. PTERIDOPHYTE

The first successful group of cryptogames to live on the land with a vascular system are pteridophytes. They are called vascular cryptogams (xylem and phloem are present in order to conduct water and food). These plants are living since the Jurassic period.

- Leaves are called as fronds (sporophylls) They bear sporangia on the ventral [lower] side

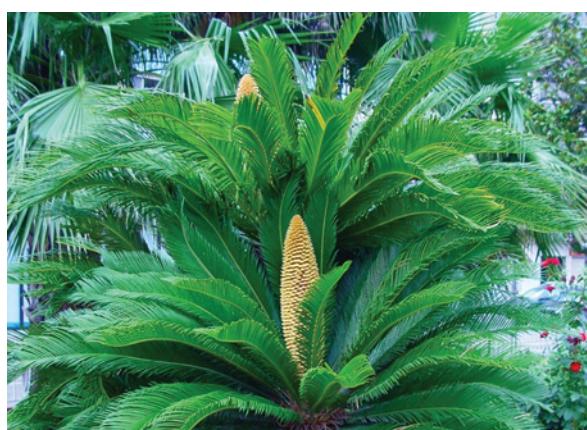
- The leaves are dimorphic [two types of leaves] in selaginella
- Stem is a rhizome. They are seedless true land plants
- They reproduce by means of spores
- Spores may be homosporous or heterosporous.
- Sporophyte alternates with the gametophyte.



Uses of Pteridophytes

- Grown as ornamental plants for their beautiful fronds.
- Marselia is used as food
- Dryopteris is used as vermifuge.
- Lycopodium powder is used as medicine.

- Leaves vary in nature
- Gymnosperms undergo secondary thickening



Gymnosperms

3.6. GYMNOSPERMS

- Plant body is differentiated in to root ,stem and leaf.
- Well developed tap root system

- They have two phases in its life cycle. Sporophytic and Gametophytic phase
- Most of the Gymnosperms produce male and female cones

Classification of Gymnosperms

1. Cycadales:- e.g., cycas

- Palm like small plants (erect and unbranched)
- Leaves are pinnately compound forming a crown
- Taproot system have coraloid roots



Cycas tree

2. Ginkgoales:- e.g., Ginkgo biloba



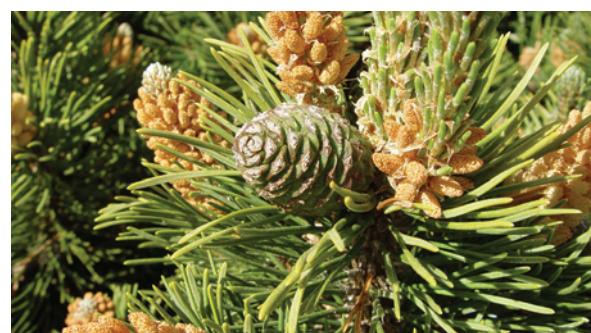
Ginkgo biloba

- It is the only living species of the group

- It is a large tree with fan shaped leaves.
- They produce offensive smell.

3. Coniferales:- e.g., Pinus

- Evergreen trees with cone like appearance
- Needle like leaves or scale leaves
- Seeds are winged



Pinus tree

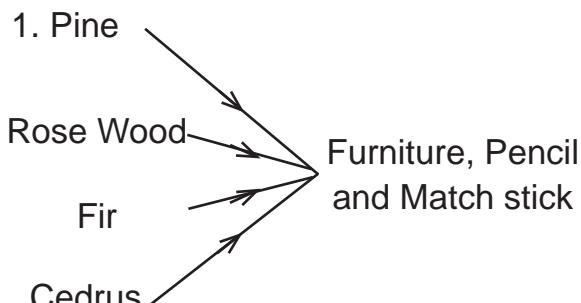
4. Gnetales:- e.g., Gnetum

- Small group of plants with advanced characters
- Ovules are naked present on flower like shoot



Gnetum

Uses of gymnosperms



2. Timber, oils and resins are produced from *Pinus*. Resins are used in the manufacturing of paints, ointments and varnishes.
3. *Ephedra* → Ephedrine (Alkaloid) → cures Asthma
4. *Gnetum* → cures rheumatism.
Agathis → paper pulp → paper.
5. *Araucaria* (Monkey's puzzle) → evergreen ornamental plant.

3.7. ANGIOSPERMS

1. Angiosperms are flowering plants which forms one of the major groups of seed plants with atleast 2,60,000 living species.
2. They occupy every habitat on earth except extreme environments. They can be small herbs, shrubs, lianes or giant trees.
3. Conducting tissues (xylem and phloem) are present.
4. Secondary growth is observed (formation of bark).



Angiosperms

5. Ovules are enclosed within the carpels of ovary which later gets modified into fruit. Ovules become seeds and seeds have cotyledons.

Angiosperms are crucial for human existence. They are the sources for food, clothing fibres, medicine and timber.

Classification of angiosperms

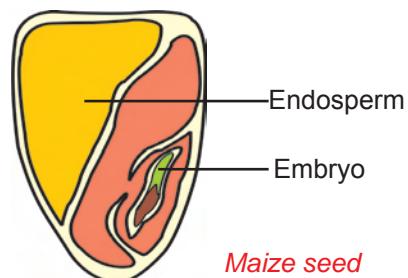


ACTIVITY 3.5

Take few gram seeds and maize, soak them in water. After sometime dissect and observe.

3.8. MONOCOTYLEDONS

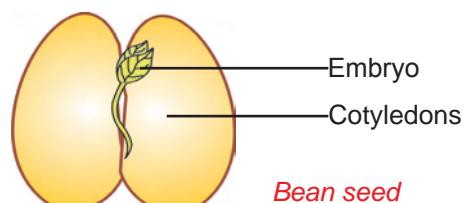
The plants which have seeds with only one cotyledon are called as monocotyledons. e.g., Grass, Paddy, Maize and Wheat



Maize seed

3.9. DICOTYLEDONS.

The plants which have the seeds with two cotyledons are called as dicotyledons. e.g., Bean, Pea, Mango.



Bean seed

Morphology of dicot and monocot plant

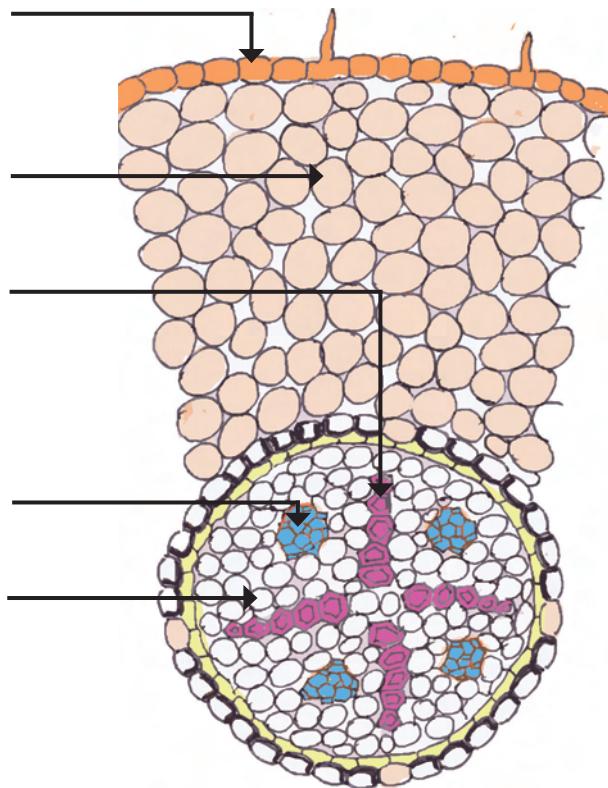
Parts of the plant	Dicot	Monocot
Root	Tap root system	Fibrous root system
Leaf	Reticulate veination	Parallel veination
Flower	Calyx and corolla are differentiated eg. Mango, Neem. Floral parts are in the sets of 4 or 5.	Calyx and corolla not differentiated but fused to form perianth. Floral parts are in the sets of 3.

ACTIVITY 3.6

Pull out a grass plant and a small Acalypha plant. Observe the morphological difference between dicot and monocot.

3.10. STRUCTURE OF ROOT

- The outer most layer of the root is **rhizodermis**. It gives rise to unicellular root hairs.
- The next layer is **cortex**, helps in conduction and storage.
- The **xylem** vessels transport water from roots to various parts of the plant.
- The **phloem** tissues translocates food from leaves to other parts of the plant.
- There is a **conjunctive tissue** between xylem and phloem.
- Pith is the centre part of the root. It is present in monocot and absent in dicot it helps in storage.



T.S. of Dicot root

Many xylem bundles in monocot (Polyarch)
Four xylem bundles in dicot (Tetrarch)

3.11. STRUCTURE OF A STEM

- **Cuticle** - waxy coating
- **Epidermis** - barrel shaped cells, gives protection and produces multi cellular epidermal hairs
- **Cortex**- it is divided into three layers.

Collenchyma – thick walled, gives mechanical support.

Chlorenchyma - thin walled, filled with chlorophyll and helps in photosynthesis.

Parenchyma - thin walled, helps in storage and ventilation.

- **Endodermis** (Starch Sheath) – barrel shaped, helps in protection and conduction.

- **Pericycle**- parenchyma alternates with sclerenchyma

- **Vascular bundle**

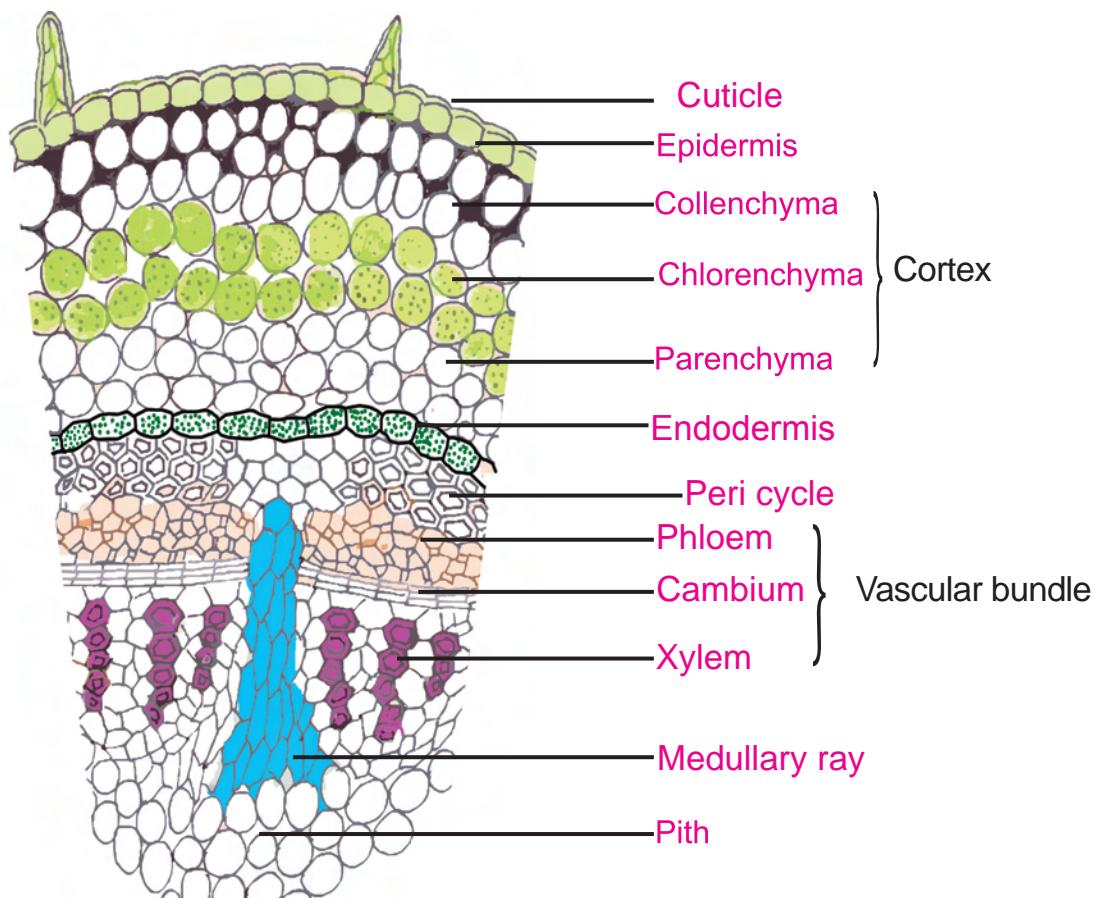
Phloem - Translocates food

Cambium - secondary growth

Xylem - conducts water

- **Medullary ray**- extends between vascular bundles

- **Pith**- helps in conduction



T.S of Dicot stem (Sunflower)

3.12. STRUCTURE OF LEAF

- **Cuticle** – Outermost layer.
- **Upper epidermis** – Barrel shaped cells. Helps in protection.
- **Vascular bundle** - **xylem** conducts water, **phloem** translocates food.
- **Lower epidermis** – barrel shape, have stomata, helps in exchange of gases and transpiration.

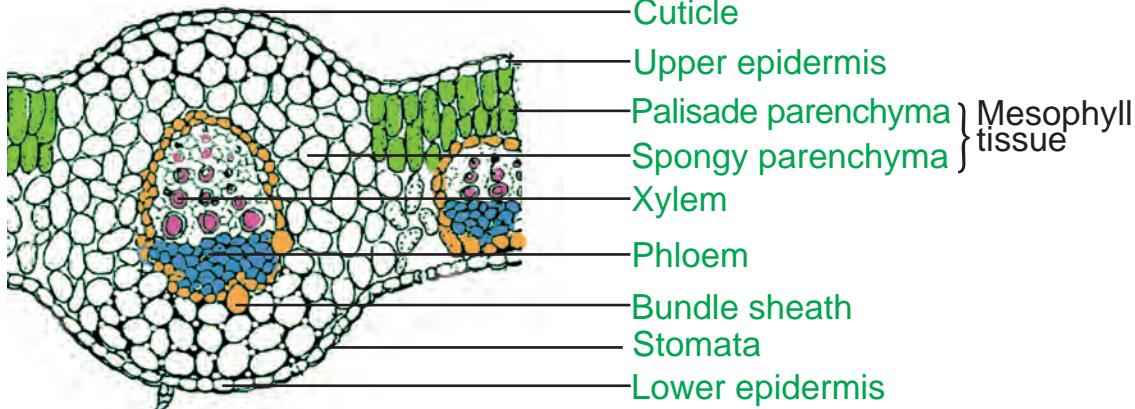
- **Mesophyll tissue**

Palisade parenchyma – cylindrical cells have more chlorophyll and helps in photosynthesis.

Spongy parenchyma – oval or round shaped with less chlorophyll helps in storage and conduction.

Isobilateral – (either spongy or palisade parenchyma are present) in monocot.

Dorsiventral – (both palisade and spongy parenchyma are present) in dicot.



T.S of Dicot leaf (Sunflower)

EVALUATION

1. Choose the correct answer

- An example of saprophyte. (Puccinia / Agaricus) _____
- Agar-agar is obtained from (Gelidium / Chlorella) _____
- _____ is a palm like Gymnosperm. (Cyca / Pinus)
- _____ are called as amphibious cryptogams(Bryophytes/Pteridophytes)
- The algae which decomposes human urine is _____
[spirullina/chlorella]

Pictorial Feature on Plant Kingdom

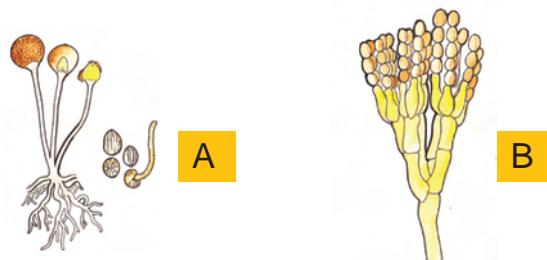
2. a) Pteridophytes are vascular cryptogams. Reason out in short.
b) Antibiotics are extracted from bacteria and fungi. They stop the growth of microorganisms and cure diseases.

Give any two antibiotics obtained from fungi.

3. How are the following organisms called?

- a) Algae that prepare their own food.
b) Fungi that either depend on living organisms or non-living things for their food.
c) An organism having both algal and fungal characters

4. Name the Fungi.



5. a) Match the following

- | | | |
|-------------------|---|---------------|
| i) Algae | — | Nephrolepis |
| ii) Bryophyta | — | Chlamydomonas |
| iii) Pteridophyta | — | Riccia |

6. I am a true terrestrial plant. I have root, stem, leaf. I reproduce through spores but I don't have flowers. Who am I? Explain

FURTHER REFERENCE

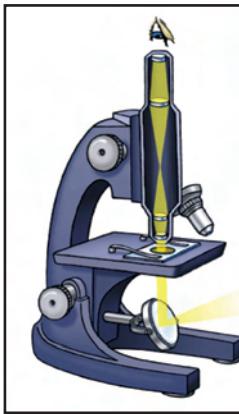
Books: Outline of Botany- R.V. Narayanasamy, K.N.Rao. and Dr. A. Raman - S.Viswanathan Printers and Publishers

Webliography:

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4. MICROORGANISMS

Vijay brings his microscope in to the class room. He shows an empty glass slide and another micro slide specimen and he permits his friends to observe.



Compound Microscope

Vijay:- Do you see any thing in the micro-slide?

Sheelan:- Yes, it is an Amoeba on the slide.

Vijay:- Today, we shall learn more things about microorganisms through the internet.

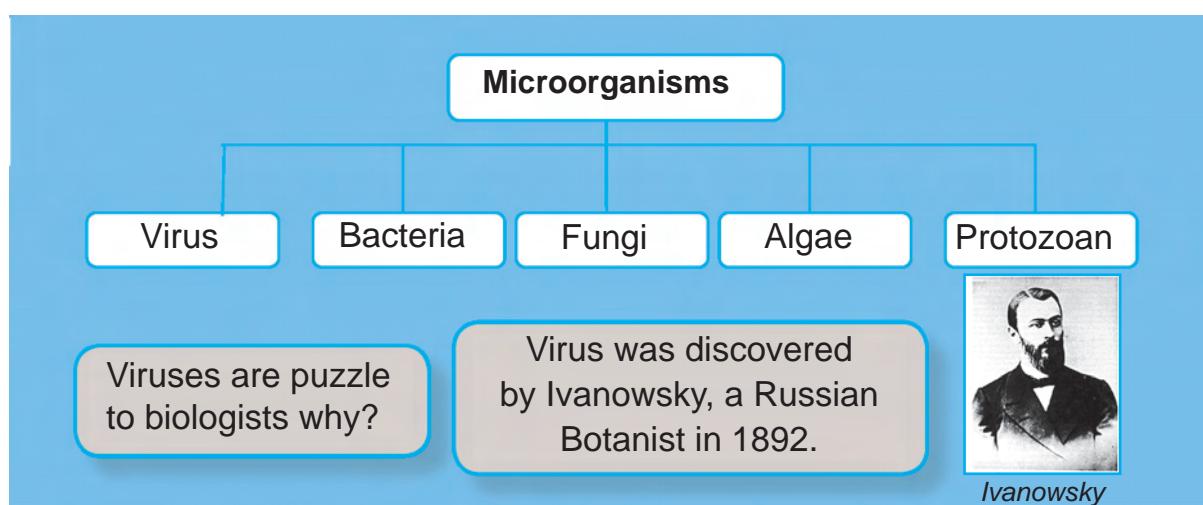
As both of them started browsing the internet about microorganisms, they started getting information about microorganisms.

Living organisms show a great degree of diversity in their size. A considerable number of species are not visible to the naked eye. They can be seen only with the help of a microscope. Such organisms which can be seen through a microscope are called microorganisms.

They are measured in microns and millimicrons. Example: Virus, bacteria, algae, fungi and protozoan like **Amoeba, Plasmodium**.

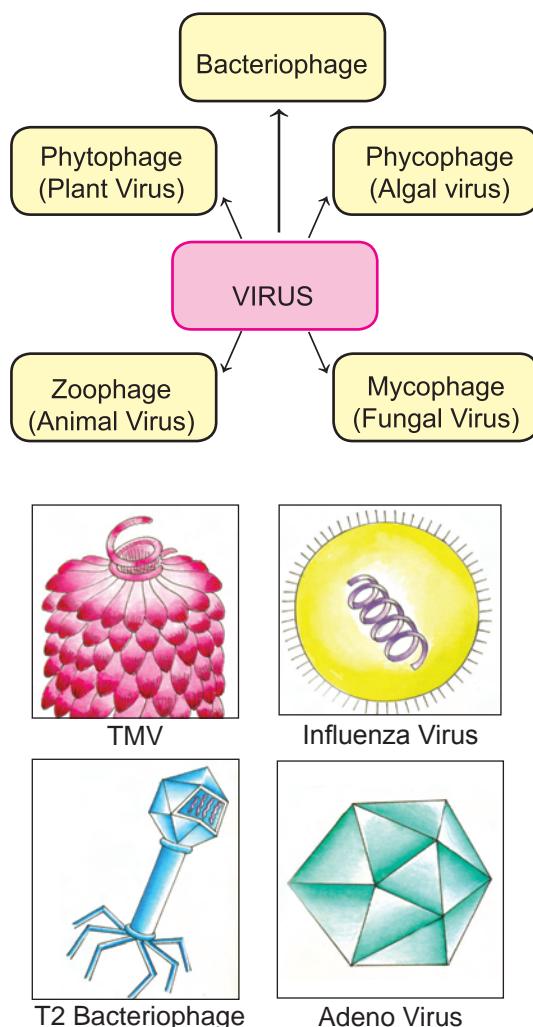
4.1. VIRUS

Virus is a Latin word which means **poison**. Viruses are the smallest and simplest of all living organisms. The study of viruses is called **Virology**. Viruses show both living and non-living characteristics. They are considered as being on the border line between living and non-living organisms.



The living cell inside which the virus grows and multiplies is known as host cell. Outside the host cell, viruses do not show any of the characteristics of living organisms.

Based on their host, viruses are classified into five types.



BACTERIA

The curd contains *Lacto bacillus* bacteria which helps to change the milk into curd. Let us now study about bacteria. Bacteria are unicellular and

ACTIVITY 4.1

Have you seen your mother adding a little curd to warm milk to set the curd for the next day? Why?

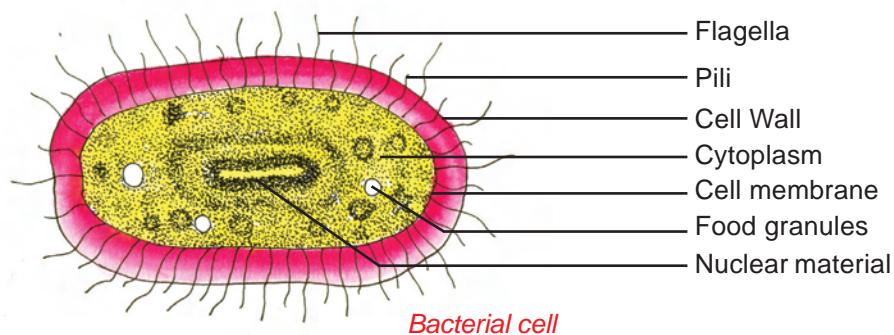
microscopic, belonging to the world of microbes. The study of bacteria is called **Bacteriology**. Bacteria were first observed under a microscope by the Dutch Scientist Anton Von Leeuwenhoek in 1675. Later, Louis Pasteur, Robert Koch and Lord Lister carried out detailed studies on bacteria.

The structure of bacteria can be studied with the help of an electron microscope. The bacterial cell is a prokaryotic cell. It has a rigid cell wall protecting the cell and giving a definite shape to it. The living material inner the cell wall is called protoplasm. It is differentiated into cell membrane,



Anton Von Leeuwenhoek

nuclear material and cytoplasm. Membrane bound organelles like golgi bodies, mitochondria, endoplasmic reticulum, lysosomes are absent. It contains bacteriochlorophyll



pigments. The nuclear material of a bacterial cell is made of a circular, DNA molecule. It is not bound by nuclear membrane. There are thread like appendages which are called flagella, the organs of motility. Pili are minute, straight, hair like appendages and are considered to be organs of attachment.

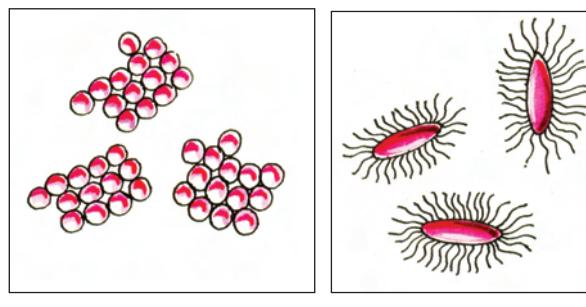
Bacteria are measured in microns.
1 micron = 1/1000 millimetre.

Four types of bacteria are recognised based on shape. They are

1. Cocc (Spherical shaped)
2. Bacilli (Rod shaped)
3. Spirillum (Spiral or cork screw)
4. Vibrio (Comma Shaped)

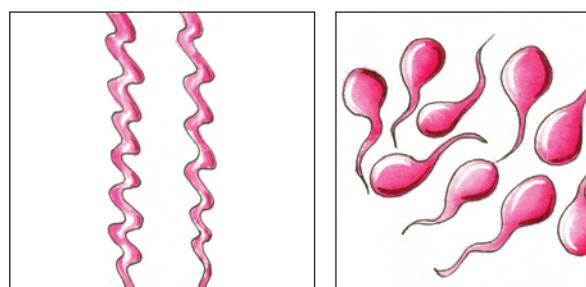
On the basis of the number and arrangement of the flagella, bacteria are classified as

1. Monotrichous (Single flagellum at one end)



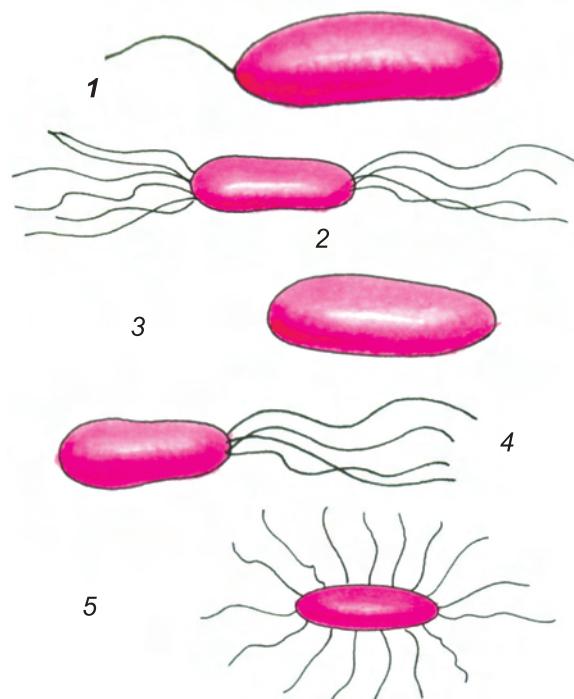
1. Cocc (Spherical shaped)

2. Bacilli (Rod shaped)



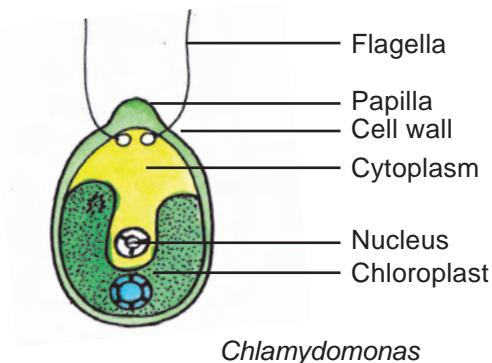
3. Spirillum (Spiral or cork screw)

4. Vibrio (Comma Shaped)



2. Amphitrichous (Tuft of flagella arising at both ends).
3. Atrichous (Without any flagella).
4. Lophotrichous (Tuft of flagella at one end).
5. Peritrichous (Flagella all around).

ALGAE



Chlamydomonas is a unicellular green algae. It is spherical or oval in shape. The protoplasm is surrounded by a cellulose cell wall. The cell wall may have a pectic sheath around it. There is a single large cup-shaped chloroplast. Inside the chloroplast a pyrenoid which contains starch may be present. There are two flagellae at the narrow end of the cell which helps in locomotion. There may be a vacuole at the base of the flagella. An eye spot is located at the anterior end. Based on the presence of other



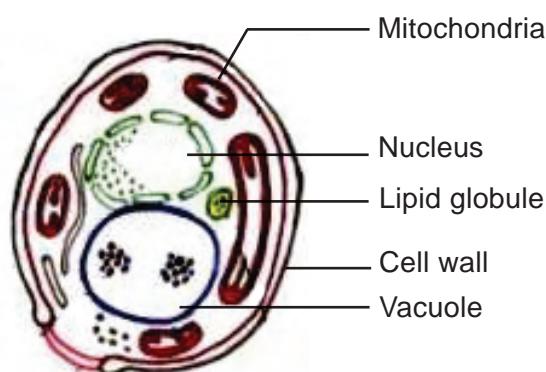
pigments, algae are classified into four classes. The study of algae is called **Phycology** which you have studied in the previous chapter.

ACTIVITY 4.2

Take a 250 ml beaker filled up to $\frac{3}{4}$ with water. Dissolve 2 table spoon of sugar in it. Add a pinch of yeast powder to the sugar solution. Keep it covered in a warm place for 4–5 hours. Now take and smell the solution.

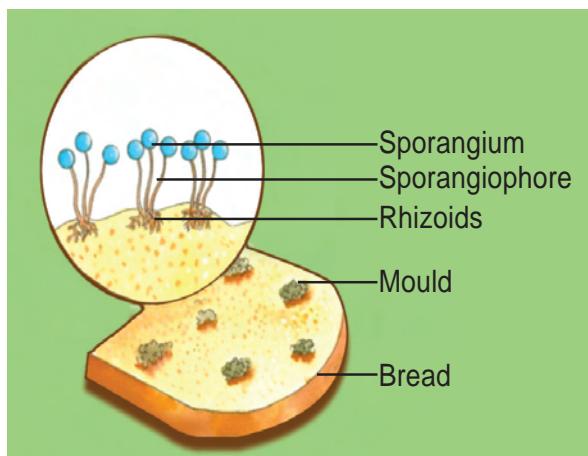
FUNGI

The conversion of sugar solution into alcohol and liberation of carbon dioxide is known as **fermentation**. Here the sugar solution is fermented and gives a smell. Wine, alcohols are prepared from the molasses by the fermentation activity of the yeast. etc.



Yeast cell

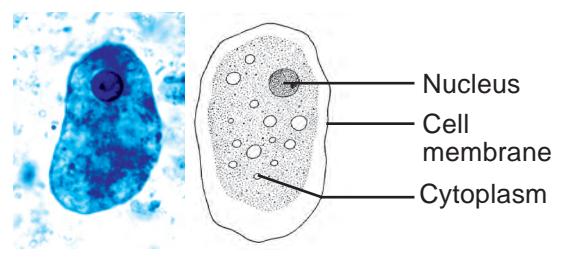
Keep a bread slice in a moist place. Observe if there is any change in colour. Why?

*Bread mould*

Yeast is a unicellular, saprophytic fungus. The cell is oval shaped. The nucleus is seen at one end of the vacuole. The cytoplasm shows the presence of organelles like endoplasmic reticulum, ribosome, mitochondria, etc., Fungi do not possess chlorophyll. Hence they are incapable of photosynthesis. The study of fungi is called **Mycology**. They lead a parasitic or saprophytic mode of life.

A black powdery spot with a network of thread like filaments, called hyphae

Entamoeba histolytica - Amoebic dysentery	}
Plasmodium vivax	
Plasmodium falciparum	
Trypanosoma gambiense - African sleeping sickness	

*Entamoeba histolytica*

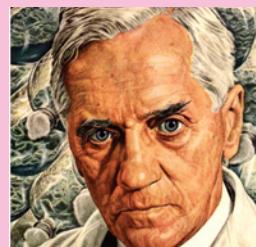
is called mycelium (bread mould) which changes the colour of the bread.

PROTOZOA

Protozoans are unicellular organisms. Metabolic activities are done by organelles. Protozoans show mainly two modes of life, free living and parasitic. Free living organisms inhabit fresh and salt water. Parasitic forms live as ectoparasites or endoparasites. They cause diseases.

MORE TO KNOW

When a cut or wound occurs in your body, you will be treated by the doctor. Your body temperature is recorded. If you have fever, doctor will give you some **antibiotic**.



**Alexander Fleming of Britain
in 1928 discovered the 'Wonder
Drug 'Penicillin'.**

Alexander Fleming

Have you observed dead plants, small dead animals in your surroundings? What happens to them? Do they emit smell? Why?

4.2. USES OF MICROORGANISMS IN MEDICINE, AGRICULTURE, INDUSTRY AND DAILY LIVING.

Microorganisms are used in the manufacture of antibiotics, linen, bread, wine, beer and the other

Name of the Species		Antibiotic
Bacteria	Streptomyces griseus Bacillus subtilis	Streptomycin Bacitracin



Penicillium notatum

Fungi	<i>Penicillium notatum</i> <i>Penicillium chrysogenum</i>	Penicillin
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Penicillin

industries. Microorganisms are used to enrich the soil fertility.

What is antibiotic?

Antimicrobial agents which are useful medicines or drugs and are extracted from the microorganisms. are called **antibiotics**. Bacteria, Fungi are used to make antibiotics, vaccines, etc.

AGRICULTURE

Agriculture :- The science that deals with the growth of plants and animals for human use is called agriculture.

It may be defined as the science or practice of farming. Agriculture depends on soil fertility. Micro-organisms like bacteria, fungi, few algae enrich the soil fertility. Nitrogen is essential for all life.

Bacteria convert complex proteins in the dead bodies of plants and animals into ammonia, nitrites and nitrates. Bacteria play a major role in the cycling of elements like carbon, oxygen, nitrogen and sulphur as biological scavengers. They oxidize the organic compounds and set free the locked up carbon as



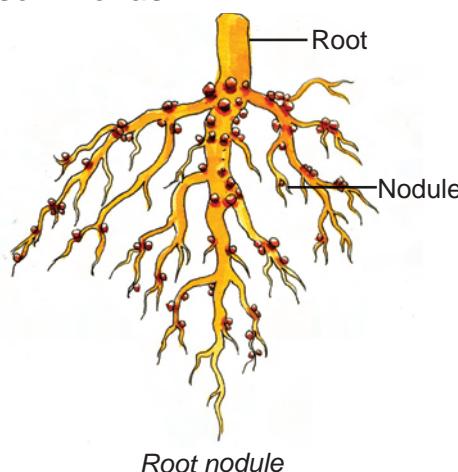
Farming

carbon dioxide due to which we smell the foul odour.

The following bacteria are involved in enriching soil fertility:

Ammonifying bacteria:- e.g., *Bacillus ramosus*

Nitrifying bacteria:- e.g., *Nitrobacter Nitrosomonas*.



Nitrogen-fixing bacteria:- e.g., *Azotobacter*, *Clostridium*, *Rhizobium* (Root nodules bacteria). Various blue green algae like *Oscillatoria*, *Anabaena* and *Nostoc* increase the soil fertility by fixing atmospheric nitrogen.

Role of microorganisms in industry and daily living.

1. Curing of tea/Coffee: The leaves of tea, tobacco, the beans of coffee and cocoa are fermented by the activity of *Bacillus megaterium* to impart the characteristic flavour. This is called **curing**.

Let us know how we get a good flavour when we drink coffee or tea?

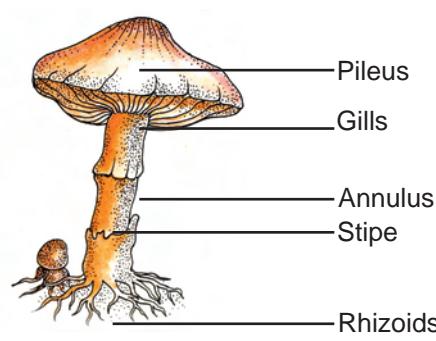
In the world today many industries totally depend upon the microbial activities of microorganisms such as Lactic acid bacteria.

2. Production of Vinegar: *Lactobacillus lactis* (lactic acid bacteria) converts milk protein into curd. Vinegar is manufactured from sugar solution employing *Acetobacter aceti* by the fermentation process.

Vinegar is a good preservative. Pickles do not get spoilt. How do we get vinegar?

3. Production of Alcohol: Butyl alcohol, methyl alcohols are prepared from molasses by the fermentation activity of *Clostridium acetobutylicum*. Alginic acid is obtained from brown algae.

4. Production of Oxalic acid: Oxalic acid is the fermentation product of fungi *Aspergillus niger*. Yeast is the best source of vitamin B complex and vitamin Riboflavin. Mushroom is also an edible (e.g.) *Agaricus*, *Morchella* are edible and are cultivated.



Edible mushroom

Chlorella and *Spirulina* are used as protein sources. Hence they are known as **single cell protein**.

4.3. HARMFUL MICROORGANISMS

Microorganisms cause damage to the plants and food materials. They contaminate food, which leads to food poisoning. Influence of microorganism on plants and animals reduce the

- Fruits. Vegetables, fish, meat, milk, etc., are perishable foods.
- Wheat, rice, maize, pulses, sugar are non-perishable foods. Some times food is unfit for our consumption. Why?

market value of their product. The various harmful activities of bacteria, fungi and virus are given in the table.

The diseases caused by Microorganisms in Plants

S. No	Micro-organisms	Name of the Species	Diseases
1	BACTERIA	<i>Xanthomonas citri</i> <i>Pseudomonas solanacearum</i> <i>Xanthomonas oryzae</i>	Citrus Canker Wilt of Potato Bacterial blight in Rice
2	FUNGI	<i>Cercospora personata</i> <i>Cercospora arachidicola</i> <i>Pyricularia oryzae</i>	Tikka disease of groundnut Blast disease of rice
3	VIRUS	Bunchy Top Virus Tobacco Mosaic Virus Cucumber Mosaic Virus	Bunchy top of Banana Tobacco Mosaic disease Cucumber Mosaic disease.

PLANT DISEASES



Citrus Canker



Blast disease of rice



Cucumber Mosaic disease

Microbes affect human lives and pose a challenge to human health." Health is wealth" is just a saying. But today we hear of **Rat fever, Malaria, Swine Flu. Birds Flu**, etc., How do we get infected?

Viruses, bacteria, fungi, protozoa and certain worms are the main organisms causing diseases.

To cause disease, they must first gain entry into the body. Such entry must be either through the skin or through the nose into the respiratory system or through the mouth to the alimentary canal.

The method of carrying these disease organisms to the body is varied. The carriers of disease organisms are called vectors. They are said to transmit diseases.

Some organisms pass directly through the surface of the skin. Such is the case with the spores of the fungus

which causes ring worm. Bacteria frequently enter the skin through a wound, causing inflammation of the wound.

Many microorganisms enter through the nose or mouth and penetrate the delicate membranes of the respiratory system. Virus causing colds and influenza enter this way.

Parasitic bacteria, protozoans, viruses, etc., cause various communicable diseases in man.

Communicable diseases are pathogenic diseases which spread from, person to person, either directly or indirectly. The following table shows some of the common communicable diseases in man.

The diseases caused by Microorganisms in Human beings and animals

PATHOGEN	DISEASES	MODE OF TRANSMISSION
VIRUS	Common cold, Polio. Hepatitis, Influenza, Jaundice.	Air water, direct contact
	AIDS	Sexual Contact
BACTERIA	Cholera, typhoid	Contaminated water.
	Tetanus	Cuts and wounds
	Leptospirosis	Contact of animal's urine. (Rat and Squirrel)
	Leprosy	Contact (vector)
FUNGI	Athlete's feet	Spores in water and in ground.
PROTOZOAN	Malaria	Vector example mosquito



ACTIVITY 4.3

1. Collect the pictures of viral diseases in man.
2. Collect the pictures of fungal diseases in man.
3. Collect the pictures of bacterial diseases in man.
4. Collect the pictures of protozoan diseases in man.

Pneumonia	Tuberculosis	Cholerae or Cholera	Dysentry	Diphtheria

Disease causing microbes

Harmful microorganisms in food and drink can be taken in through the alimentary canal unless high standards of hygiene are followed. The food may be contaminated in a variety of ways. Bacteria may enter the food causing it to go bad, if food is not properly stored. The bacteria causing cholera and typhoid and the protozoan causing

amoebic dysentery are easily picked up from the infected food and water.

Disease causing microbes

Due to chemical reaction, butter milk gets spoilt if kept in a brass vessel. The starchy foods get spoilt due to change of starch into sugars by the enzymes present in the food articles.

4.4. MICROBES IN FOOD PRESERVATION

Food preservation is the process of treating and handling food to stop or greatly slow down spoilage (loss of quality, edibility or nutritive value) caused or accelerated by micro-organisms. Canning, Pasteurization, refrigeration, dehydration, the use of preservatives, heating, boiling and drying are the effective methods of controlling microorganisms.

Bottling and Canning

The right types of containers have to be chosen. They are then sterilized. Preservatives such as vinegar, sodium benzoate, oil, citric acid are added to the food stuff, which is then packed and sealed properly.



Milk pouch

Aavin milk etc., that comes in packets does not get spoilt soon. Why? This milk is **pasteurised**.

What is Pasteurisation?

Pasteurisation is used to preserve milk. Milk is heated to 72°C for 30 minutes and then suddenly cooled to 12°C. Microbes

are killed without causing damage to the taste, quality of milk for a longer time and packed in polythene pouches.

Why do we keep fish, meat and vegetables with salt in the hot sun?

Dehydration: Fish, meat and vegetables with salt can be dried in the sun to reduce the moisture content and the growth of microorganisms. These are dehydrated under controlled conditions.

4.5. RELATIONSHIP BETWEEN MAN AND MICROBES

Balances, imbalances and uses

All existing things in the world and the universe around it made up of five basic elements, the earth, water, fire, air and space.

Human life and the knowledge of science as growing concern, have come into being almost simultaneously. In the past, man found that living in large groups was to his advantage. In this way, he had much better protection from his enemies. Man involved himself in many group activities, as a result ended up with many problems. The greatest problems of today are disease, population growth and pollution. Today in our present time, it is too late for any preventive measures because the diseases are already with us, and therefore, good medical services, conservation methods,

and socio biological approaches are required.

Social Biology

Social biology is the study of how man lives with other men, with animals and plants and how he affects each of these.

Man of course has developed his knowledge and understanding about microbes to a greater extent and made use for its benefits in agriculture, soil fertility, medicine, industry and in genetic engineering.

Microbes are used as biological control. How?

Certain *Bacillus* species such as *B.thuringiensis* infect and kill the caterpillars of some butterflies and related insects. Since the bacteria do not infect other animals or plants they provide an ideal means of controlling many serious crop pests. This control measures is called as Biological control.

The role of microbes in genetic engineering

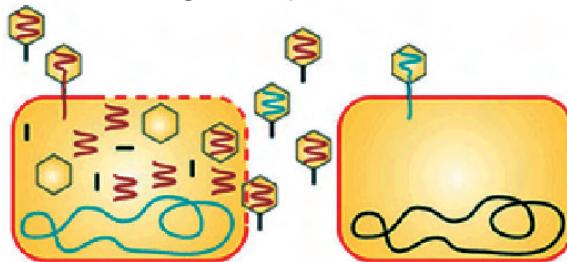
Gene transfer by virus and bacteria

Viruses are useful in genetic engineering. Their ability to move genetic information from one cell to another makes them useful for cloning DNA and could provide a way to deliver gene therapy (transformation).

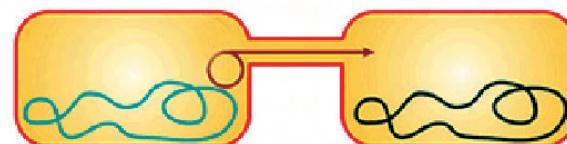
Viruses are very much used as biological research tools due to their simplicity of structure and rapid multiplication.

In order to attain the desirable character such as insulin gene, nif gene the bacterial host such as *E.coli*, *Bacillus subtilis* and *streptomyces* are introduced.

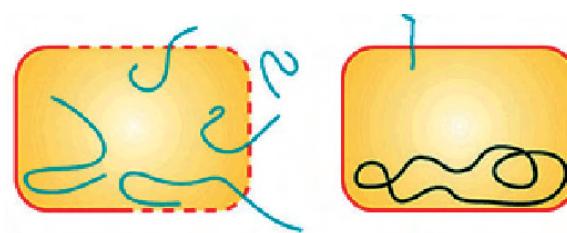
By conjugation method, the fertility factor, undergoes replication.



Transduction in Bacteria



Conjugation in Bacteria



Transformation in Bacteria

Bacteria and nature:

Saprophytic bacteria and fungi cause decay and decomposition of dead bodies of plants and animals. They release gases and salts to the atmosphere and soil. Hence, the microorganisms like bacteria and fungi are known as **Nature's scavengers**.

ACTIVITY 4.4

Take two glass bottles and mark it A and B. Keep the vegetable waste, food wastes, in bottle A and cover the mouth of the bottle. Keep the damaged, plastic toys, metal toys in bottle B and close the mouth of the bottle with a lid. Observe the two bottles A and B after a week. Write your observation.

Many bacteria like *Rhizobium*, *Acetobacter* and *Clostridium* can fix atmospheric nitrogen. This phenomenon is called **biological nitrogen fixation**.

The cyclic movements of chemicals of Biosphere between the organisms and the environment are referred as **Bio - geo cycle**.

Algal bloom: Under certain conditions, algae produce "blooms" i.e. dense masses of materials that cover the water surface, thereby decrease the oxygen content of water. This is followed by the death of aquatic

organisms. Algal bloom leads to loss of species diversity which is known as **Eutrophication**.

Death of the coral reef in the ocean produces new pathogenic bacteria. Any septic operation theatre (Surgical arena) produces number of disease causing pathogens (disease causing microbes). Surgical wastes, medical wastes are dumped in catchment areas such as lakes, ponds and river banks causing communicable diseases.

Pathology is a science which deals with diseases of plants, animals and human beings caused by viruses, bacteria and fungi.

Man and microbes are in the biosphere. Man's interference with nature has caused imbalance in the biosphere. Man has to bring certain healthy changes in the field of agriculture and in industry in order to make a better habitat for his happy living with micro organisms. Let us start to create an eco-friendly nature for our better future.



Algal bloom

Earth provides enough to satisfy everyman's need, but not every man's greed.- MAHATMA GANDHI

- Butter milk gets spoilt if kept in a brass vessel. Why?
- The starchy foods get spoilt at room temperature if kept more than a day. Why?

EXTENDED ACTIVITY

Two loaves of same kind of bread were purchased for a family. One loaf was set out in a basket for breakfast. The other loaf was refrigerated at once. Some of the bread in the basket was not eaten and was later refrigerated. The family went away on vacation for ten days. When they returned one of the loaves was covered with mould. The other was mould free. Which loaf do you think was mouldy?

Account for the differences in the loaves.

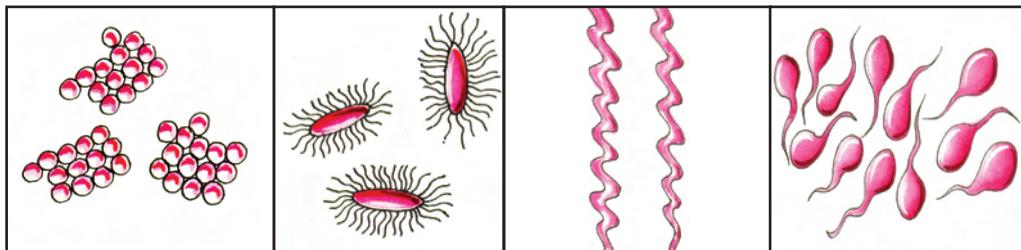
EVALUATION

1. Choose the best answer :

- Algal bloom leads to loss of species diversity which is known as _____. (Eutrophication, Pasteurisation)
 - Which one of the following cause amoebic dysentery? (*Entamoeba histolytica*, *Plasmodium vivax*, *Plasmodium falciparum*)
 - Milk is heated to 72° C for 30 minutes and then suddenly cooled to 12° C. Microbes are killed without causing damage to the taste and quality of milk. Name this process (dehydration, pasteurisation)
 - Nodules are responsible for nitrogen fixation. Name the bacteria present inside the root nodules. (*Acetobacter*, *Rhizobium*, *Clostridium*)
2. Living organisms show a great degree of diversity in their size. A considerable number of species are not visible to naked eye. They can only be seen with the help of a microscope. How will you measure the size of micro organisms?
3. Fungi do not possess chlorophyll. Hence they are incapable of photosynthesis. So, they depend on either living organisms or non-living things. Name the two types of modes of nutrition in fungi.

Microorganisms

4. Communicable diseases are pathogenic diseases which are spread from person to person either directly or indirectly. Write the mode of transmission of the following diseases.
- Cholera, typhoid
 - Malaria
5. The conversion of sugar solution into alcohol and liberation of carbon dioxide is known as fermentation. Which microorganism is responsible for this process?
6. i) Identify the following bacteria based on its shape.
ii) Draw and label the following parts of the bacteria.
a) Flagella b) pili c) cell wall cytoplasm cell membrane



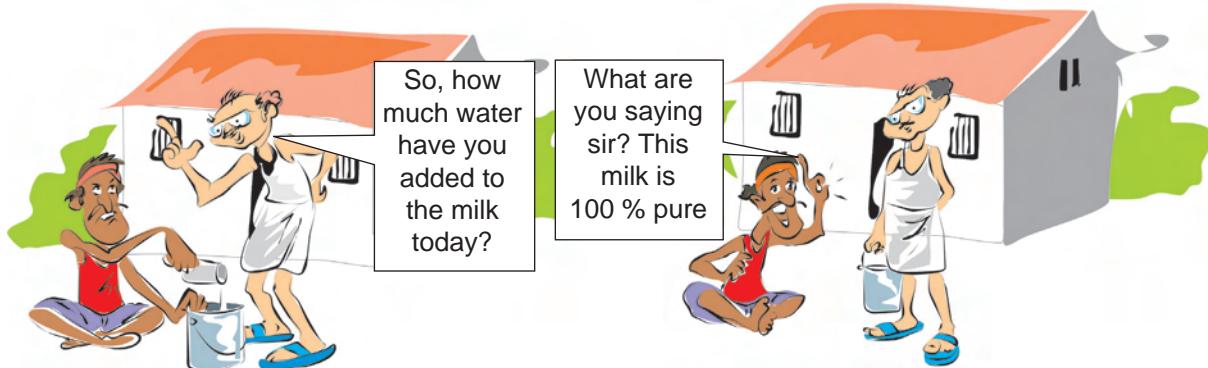
7. In the world today many industries totally depend upon the microbial activities. For example, oxalic acid is the fermented product of fungi *Aspergillus niger*. Name any two bacteria used in industry with their product.
8. Farmers consider microorganisms such as bacteria, fungi and virus a menace on their fields and gardens because they cause disease to their crops. Name any one of the bacterial disease, viral disease and fungal disease.

FURTHER REFERENCE

Books: Biology – Oxford – A modern introduction, B.S. Beckett - Oxford university press second Edition.
Biology- Wallace, Sanders and Ferl - Harper collins college publishers.

Webliography: [www.en.wikipedia.org/wiki/micro organism](http://www.en.wikipedia.org/wiki/micro%20organism).

5. ELEMENTS AND COMPOUNDS AROUND US



5.1. TYPES OF PURE SUBSTANCE

Read the above conversation. How often do we use words such as 'pure milk' and 'pure water'? Have you ever wondered what 'pure' really means?

For an ordinary person, "a pure substance" means that it is free from adulteration. In that sense, the air we breathe and the milk we drink are not pure. However, there are a few cases where the matter that we encounter in ordinary experience is 'pure' that is, they consist of only a single substance. Distilled water, sugar, baking soda etc. are pure substances like the copper used in electric wiring.

How to recognise a pure substance?

MORE TO KNOW

Air we breathe is not a pure substance but a mixture of gases

Milk is a mixture that contains liquid fat, protein and water.

One can recognise a pure substance by its properties such as density, melting point, refractive index, electrical conductivity and viscosity. Then, how can we define a pure substance?

A pure substance has fixed composition and fixed properties which cannot be easily separated by physical methods.

For example, pure water boils at 100°C at one atmospheric pressure and ice freezes at 0°C . These are the properties of all samples of pure water, regardless of their origin. Pure water contains only two hydrogen atoms and an oxygen atom which cannot be separated by physical methods.

In science, a pure substance is either an element (e.g., iron) or a compound (e.g., Sodium chloride).

ACTIVITY 5.1

List any 5 substances you consider pure:

1. _____
2. _____
3. _____
4. _____
5. _____



Fig: 1

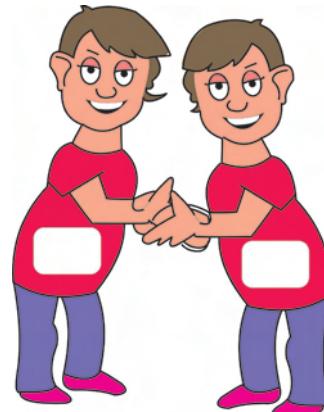


Fig: 2

ACTIVITY 5.2

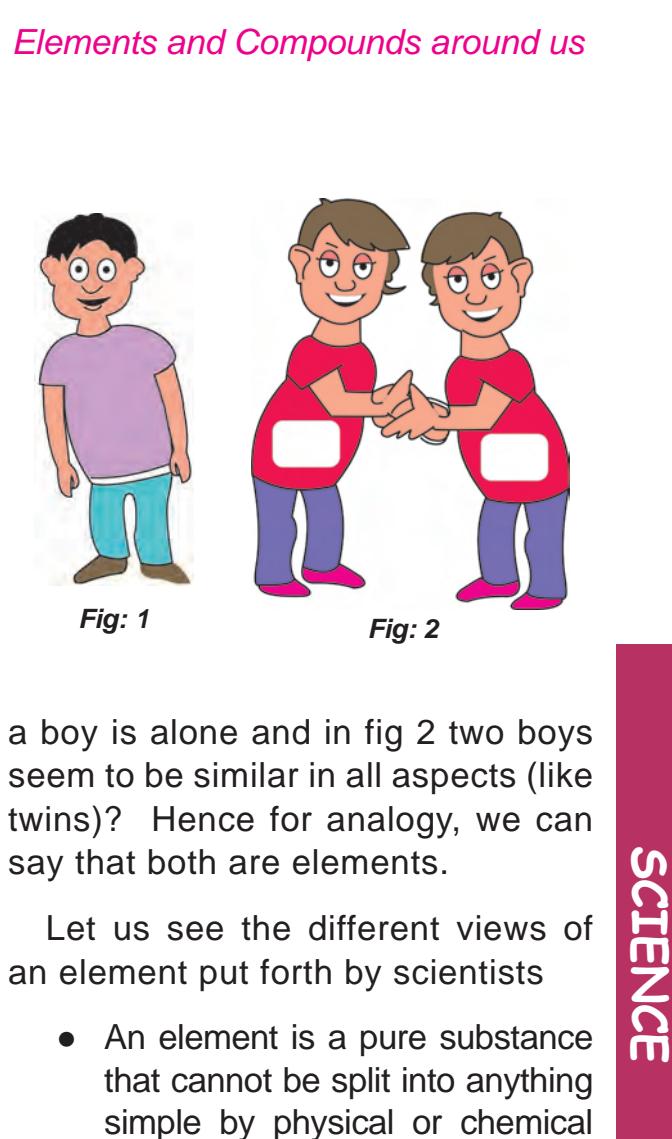
You have to unscramble the following words given in bracket:

1. Water conveying pipes are made of _____ (ONIR)
2. Electric wire contains _____ (PPERCO)
3. Ornaments are made of _____ (LDGO)
4. The air we breathe consist of _____ (YGENOX)
5. Coal contains _____ (RBONCA)

5.2. WHAT IS AN ELEMENT?

The unscrambled words such as iron, copper, gold, oxygen and carbon that we come across in our daily life are said to be elements.

Look at the pictures. What do you notice? Did you notice this. In fig.1,



a boy is alone and in fig 2 two boys seem to be similar in all aspects (like twins)? Hence for analogy, we can say that both are elements.

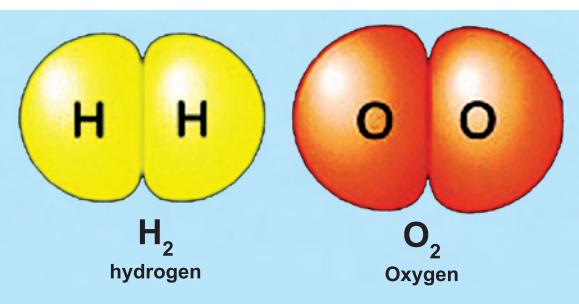
Let us see the different views of an element put forth by scientists

- An element is a pure substance that cannot be split into anything simple by physical or chemical methods. (BOYLE)
- An element is the basic form of matter that cannot be broken into a simpler substance. (LAVOISIER)
- An element is made of same kind of atoms. (Modern atomic theory)

MORE TO KNOW

An atom is the smallest particle of an element.

A molecule is made up of the same kind of atoms or different kinds of atoms



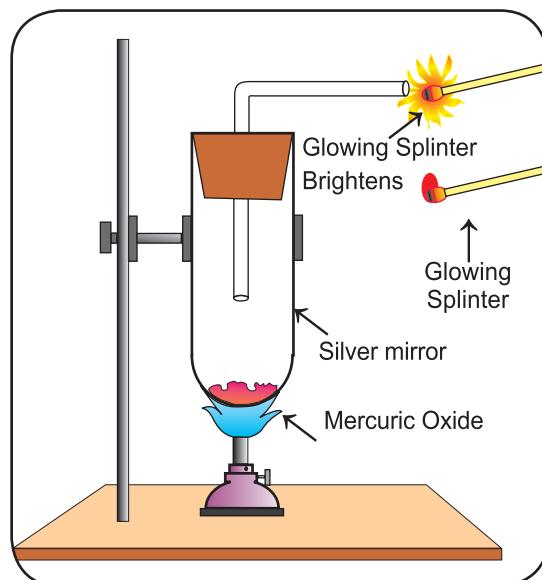
Examples of elements are hydrogen, nitrogen, oxygen, carbon, aluminium, gold, silver etc. A lump of sulphur contains sulphur atoms only. Nitrogen contains atoms of nitrogen only. Copper wires contain only copper atoms.

Thus, all elements are made up of one kind of atom only. However, atoms of different elements are not identical. For example, if we compare atoms of copper and silver, we find that they differ from each other in size and internal structure.

ACTIVITY 5.3

Take a little amount of mercuric oxide in a test tube. Heat it first gently, and then strongly in a bunsen flame. Observe the test tube. You will notice a silver mirror gradually appearing on upper part of the test tube and later, globules of mercury will be seen. Insert a glowing splinter into the test tube. The flame of splinter brightens showing the presence of oxygen. What does this tell you?

A complex substance like mercuric oxide is broken down into simpler substances, mercury and



oxygen. It is not possible to split these substances any further by any other chemical method. Thus, mercury and oxygen are elements.

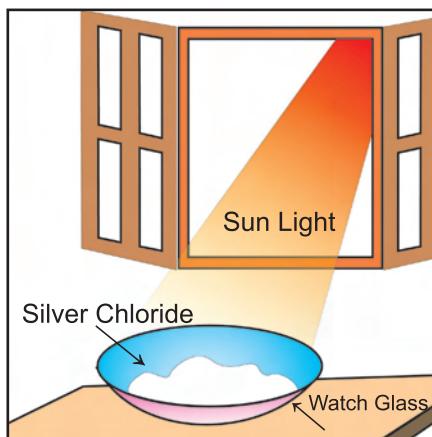


ACTIVITY 5.4

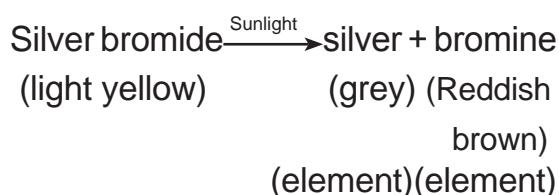
Take a small amount of crystals of silver chloride which are white in colour on a watch glass. Place the watch glass under sunlight for some time. What do you notice?

The crystal will slowly acquire grey colour. On analysis, it is found that sunlight has decomposed silver chloride into silver and chlorine(element)





you can repeat the same activity with silver bromide.

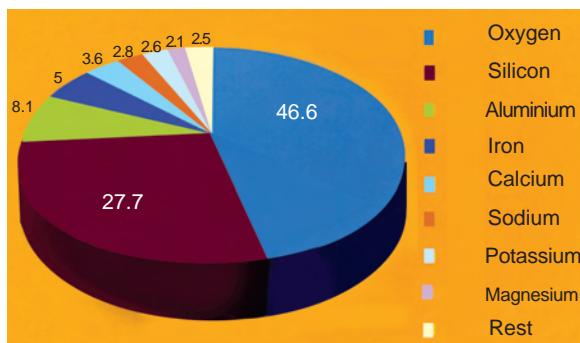


5.2.1. Do you know how many elements exist in nature?

There are **118** elements known at present, out of which **92** elements occur in nature and the remaining **26** have been prepared in laboratory by artificial methods. However, only 112 elements have been authenticated by IUPAC (International Union of Pure and Applied Chemistry), and are allotted symbols.

Let us see the relative abundance of various elements in earth's crust, either in free state or in the combined state.

In earth's crust, oxygen is the most abundant element followed by silicon. Together, these make up three quarters of the earth's crust.



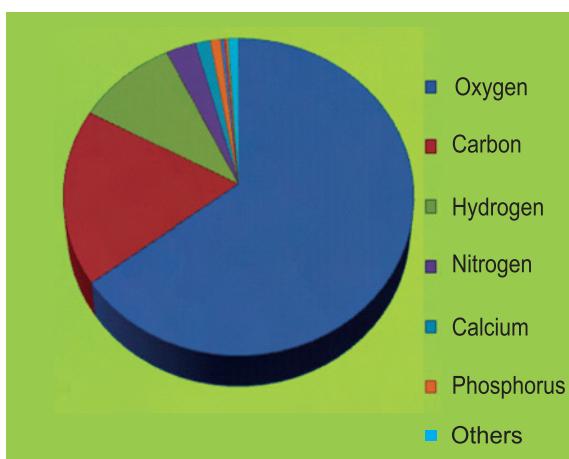
Pie Diagram - Elements present in the earth's crust

ACTIVITY 5.5

Can you find the most abundant element from the above pie diagram?

5.2.2. Have you ever thought about the elements found in our body?

About 99% of the mass of human body is made up of six elements (oxygen, carbon, hydrogen, nitrogen, calcium and phosphorus) and the rest 1% by other elements.



Pie Diagram - Elements present in the human body

Elements and Compounds around us

All the living things, both plants and animals, are made from a few elements only. They are,

Oxygen (65%), Carbon (18%), Hydrogen (10%), Nitrogen (3%), Calcium (2%) along with some other elements.

Hydrogen and helium are the main elements in the universe and stars.

5.2.3. Classification of elements based on their physical state

Let us classify the known elements on the basis of their state of subdivision as solids, liquids and gases.

Liquids: Mercury, bromine, (at room temperature) cesium and gallium can exist in liquids around 30° C.

Gases: Hydrogen, nitrogen, oxygen, chlorine, fluorine, helium, neon, argon, krypton, radon and xenon.

Solids: Remaining elements are solids. e.g. Carbon, silicon, copper, gold etc.

5.2.4. Classification of elements based on properties

Now we classify the known elements on the basis of their properties as **metals**, **non-metals** and **metalloids**.

Metals: Of the 92 natural elements 70 elements are metals. Metals are hard lustrous (shining in appearance),

malleable(can be beaten into very thin sheet) ductile(drawn into wire), good conductors of heat and electricity, and sonorous (producing sound)

e.g. Copper, gold, silver, iron etc.,

Non-metals: Only about 16-17 elements are soft, non lustrous, non-malleable, non-ductile, bad conductors of heat and electricity, and non-sonorous.

e.g. Hydrogen, oxygen, sulphur, carbon etc.,

Metalloids: Very few semi-metals are known as metalloids which shows properties of metals as well as non metals.

e.g. Boron, silicon, germanium etc.

MORE TO KNOW

- 20 % of the Earth's oxygen produced by the Amazon forest.
- An ounce of gold can be stretched into a wire of 80 kms (50 miles) long.
- The amount of carbon in the human body is enough to fill 9000 'lead' pencils.
- The noble gas xenon lasers can cut through materials that even diamond tipped blades will not cut.
- An average adult body contains 250g of salt .
- The metal with the highest melting point is tungsten. (3410° C)

Elements and Compounds around us

How elements are used in day-to-day life - Periodic table

Color Key

- Metals**: Represented by green boxes.
- Nonmetals**: Represented by blue boxes.
- Metalloids**: Represented by purple boxes.
- Poor Metals**: Represented by light blue boxes.
- Normerals**: Represented by yellow boxes.
- Noble Gases**: Represented by pink boxes.
- Halogens**: Represented by orange boxes.
- Alkali Earth Metals**: Represented by light green boxes.
- Alkali Metals**: Represented by light blue boxes.
- Transition Metals**: Represented by teal boxes.
- Superheavy Elements**: Represented by light teal boxes.
- Rare Earth Metals**: Represented by light blue boxes.
- Actinide Metals**: Represented by light blue boxes.

Properties and Symbols

Property	Symbol	Description
Solid	S	Element is solid at room temperature
Liquid	L	Element is liquid at room temperature
Gas	G	Element is gas at room temperature
Human Body	H	Top ten elements by weight
Earth's Crusts	E	Top fifteen elements by weight
Magnetic	M	Magnetic at room temperature
Noble Metals	N	Corrosion-resistant
Radioactive	R	Radioactive

Atomic Number and Symbols

Atomic Number: Number of protons

Atomic Symbol: Symbol for element

Symbol: Abbreviation for element

Name: Name of element

Periodum: A hexagonal grid representing the periodic table.

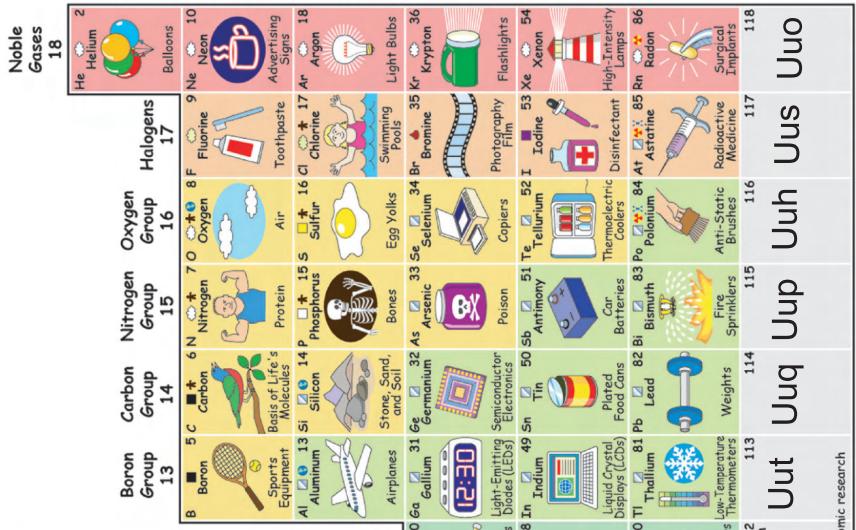
Widgets: Placeholder for the hexagonal grid.

Periodic Trends

How it is (or was) used or where it occurs in nature

Groups and Periods

Group	Period	Element	Symbol	Atomic Number	Properties
Alkali Metals	Group 1	Hydrogen	H	1	Sun and Stars
Alkali Earth Metals	Group 2	Beryllium	Be	4	Batteries
Post-transition Metals	Group 12	Magnesium	Mg	12	Emeralds



SCIENCE

ACTIVITY 5.6

Learn about uses of gases with the help of the periodic table:

Fill the blanks:

1. The gas that can be used to fill party balloons is _____.
2. The gas that is used to make flash light is _____.
3. The gas widely used in advertisement signs is _____.
4. The gas present in tungsten bulb is _____.
5. The gas present in the universe is _____.
6. The gas used in high intensity lamp is _____.
7. The gas which is used in tooth pastes to keep the teeth strong is _____.
8. The gas which helps to keep swimming pool clean is _____.
9. The radioactive gas used to cure cancer is _____.
10. About 21% of earth's atmosphere consists of_____.



5.3. WHY SYMBOLS?

Every chemical change can be conveniently represented in the form of chemical equation. This is because describing a chemical change with the names of substances becomes difficult. So, we need symbol for an element.

What is symbol?

You are familiar with the use of shortened forms of names of people, countries etc. we refer to United Kingdom as U.K., United States of America as U.S.A. and so on. It is more convenient to use the shortened forms instead of writing down long names. Similarly, in chemistry, symbols are used to represent names of elements.

A symbol is a shortened form of the name of an element.

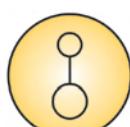
Let us learn the brief history of symbols of elements.

Greek symbols

Some earliest symbols in form of geometrical shapes were those used by the ancient Greeks to represent the four elements earth, air, fire and water.

Alchemist symbols

In the days of alchemists, the different materials that they used were represented by pictorial symbols.



Nickel



Arsenic



Antimony

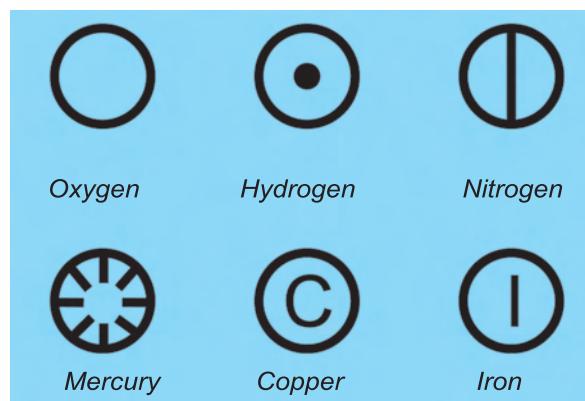


Water

The work of trying to change less valuable metal into gold was called **alchemy**, and the men who did this work were **alchemists**.

Dalton's symbol

In 1808, **John Dalton**, English scientist tried to name the various elements based on these pictorial symbols.



The uses of the above symbols are difficult to draw and inconvenient to use. Hence, Dalton, symbols are not used; it is only of historical importance.

Berzelius symbols

In 1813, **Jon Jakob Berzelius**, Swedish chemist devised a system using letters of alphabet. He argued that letters should be used because they could be written more easily than other signs. The modified version of Berzelius system follows under the heading

'System for Determining Symbols of the Elements'

1. The symbols of the most common elements, mainly non-metals, use the first letter of their English name

Element	Symbol
Boron	B
Carbon	C
Fluorine	F
Hydrogen	H
Iodine	I
Nitrogen	N
Oxygen	O
Phosphorus	P
Sulphur	S
Vanadium	V
Uranium	U

2. If the name of the element has the same initial letter as another element, then symbol uses the first and second letters of their English name.

Element	Symbol
Aluminium	Al
Barium	Ba
Beryllium	Be
Bismuth	Bi
Bromine	Br
Cobalt	Co
Gallium	Ga
Helium	He
Lithium	Li
Neon	Ne
Silicon	Si

3. If the first two letters of the names of elements are the same, then the symbol consists of first letter and second or third letter of English name that they do not have in common.

Elements and Compounds around us

Element	Symbol	Name of element	Latin name	Symbol
Argon	Ar	Sodium	Natrium	Na
Arsenic	As	Potassium	Kalium	K
Chlorine	Cl	Iron	Ferrum	Fe
Chromium	Cr	Copper	Cupurum	Cu
Calcium	Ca	Silver	Argentum	Ag
Cadmium	Cd	Gold	Aurum	Au
Magnesium	Mg	Mercury	Hydrargyrum	Hg
Manganese	Mn	Lead	Plumbum	Pb
		Tin	Stannum	Sn
		Antimony	Stibium	Sb
		Tungsten	Wolfram	W

4. Some symbols are based on the old names or Latin name of the element. There are eleven elements.

MORE TO KNOW

Names of some elements are derived from important country/scientist/colour/mythological character/planet. Examples

Name	Symbol	Name derived from
Americium	Am	America (Country)
Europium	Eu	Europe(Country)
Nobelium	No	Alfred Nobel(scientist)
Iodine	I	Violet (colour, greek)
Mercury	Hg	God mercury (mythologic character)
Plutonium	Pu	Pluto (planet)
Neptunium	Np	Neptune (planet)
Uranium	U	Uranus (planet)

How to write a symbol?

While writing a symbol for an element, one has to follow the method given below.

1. If the element has a single English letter as a symbol, it should be written in capital letter.
2. For elements having two letter symbols, the first letter should be in capital followed by small letter.

Significance of the symbol of an element

Symbol of an element signifies

- Name of the element
- One atom of the element

For example,

- The symbol N stands for the element of nitrogen
- One atom of nitrogen

GROUP ACTIVITY 5.7

Here is an interesting game which helps you to remember the symbols and their names. Make cards as instructed and then form a small group with your class mates to play.

INSTRUCTIONS:

Prepare 15 cards with the name of elements written on them and 15 cards with their corresponding symbols. Here is a list of names of elements (you have a freedom to choose the name of the elements)

Hydrogen	Calcium	Arsenic	Sodium	Mercury
Oxygen	Argon	Chlorine	Gold	Magnesium
Copper	Helium	Chromium	Iron	Manganese

How to play?

1. Shuffle the 30 cards and place the cards face down on the table .
2. Start the game. Each player will get a chance of taking 2 cards at a time to see. If a player does not get the correct pair, then he/she should keep the cards at the original position. If the name and symbol of the cards match correctly, then he/she can show to all the players and can keep the correct pairs of cards with him/her. If correct pairs are shown, players will get another chance until the player makes wrong match. Game will continue till all the cards are taken up. The winner is the one having maximum number of cards.

Elements and Compounds around us

ACTIVITY 5.8

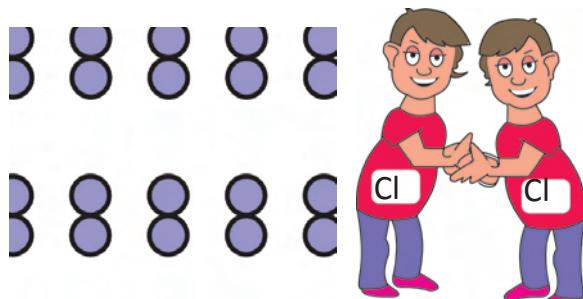
Analyse the number of elements, if any present in your name.

Here are few examples

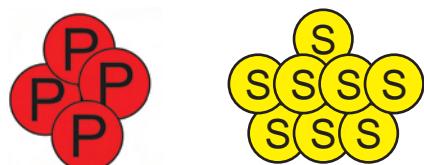
1. Name : Gautam
Written as : GaUtAm
Elements : Ga-Gallium
 U-Uranium
 Am-Americium
2. Name : ARUN
Written as : ArUN
Elements : Ar-Argon
 U-Uranium
 N-Nitrogen

5.4. MOLECULE OF AN ELEMENT

The molecule of an element contains two or more similar atoms. For example, a molecule of chlorine contains two atoms of chlorine; it is therefore written as Cl_2 (Chlorine). Similarly, a molecule of nitrogen contains two atoms of nitrogen; it is therefore written as N_2 (Nitrogen). Molecules like chlorine and nitrogen which consist of two atoms of the same kind, are called

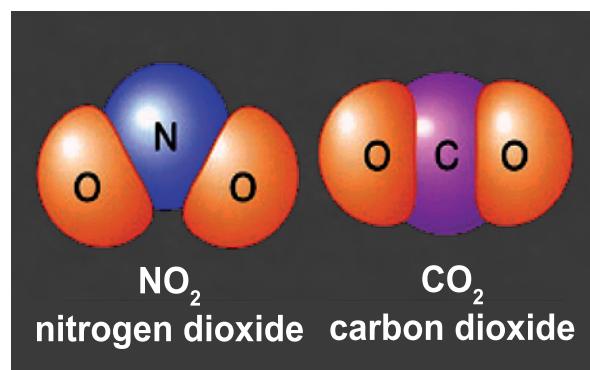
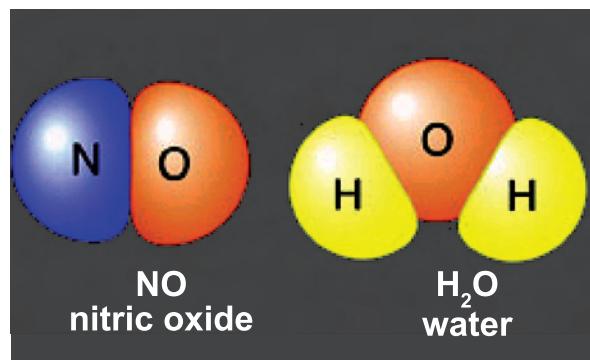


diatomic molecules. A molecule of ozone consists of three atoms of oxygen and is represented as O_3 . Similarly, some molecules, like phosphorus (P_4) and sulphur (S_8), consists of more than two similar atoms.



5.5. WHAT IS A COMPOUND?

Do you know that common salt, water, sugar, sand etc., which we use daily are said to be compounds? Similarly, our body is composed of hundreds of compounds. We have learnt that there is limited number of elements (<120), but number of compounds is unlimited.

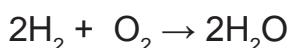
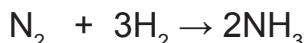


From the picture, can you define a compound?

When two or more elements combine in a fixed ratio by mass, they form compound.

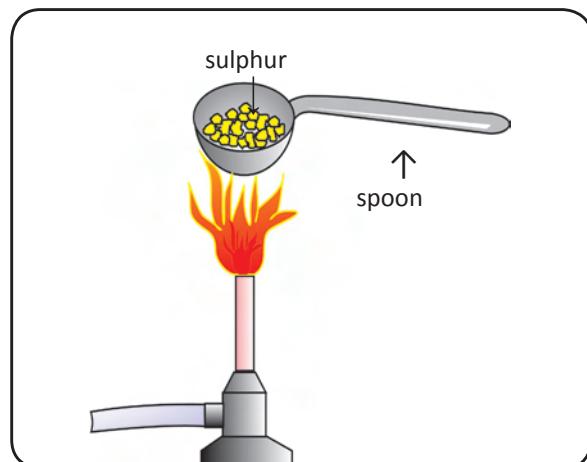
For example, water is a compound made of two hydrogen atoms and one oxygen atom in the ratio 2 : 1 by volume or 1 : 8 by mass.

A compound is a pure substance composed of two or more elements combined together chemically in a fixed ratio by mass.

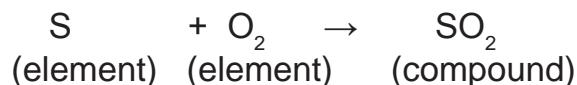


ACTIVITY 5.9

Take a little sulphur in a spoon. Heat it. It burns with a blue flame which slowly disappears. You can smell a pungent odour. what is it due to?

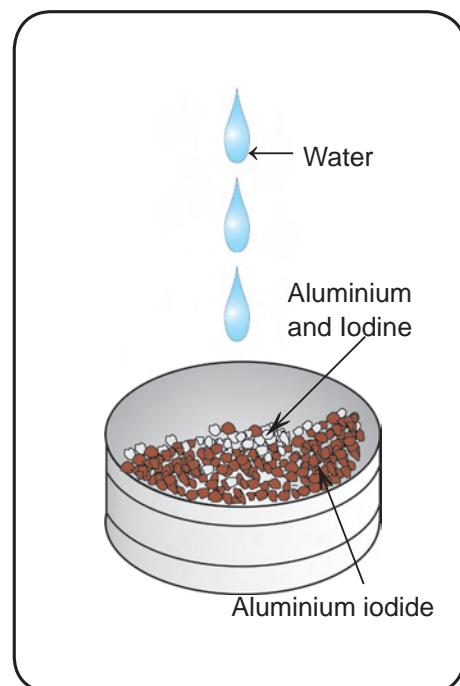


Sulphur combines with oxygen to form a colourless gas sulphur dioxide.



ACTIVITY 5.10

Take powdered iodine and aluminium in a bottle lid. Add 2 to 3 drops of water to this mixture. You can see a greyish black compound formed. What is it? (Perform the experiment in outdoor).



The greyish black compound formed is aluminium iodide.



ACTIVITY 5.11

Take 7g of iron powder and 4g of sulphur. Mix the two thoroughly. Take the mixture in a test tube and heat it over a flame. Remove the burner and observe. Then heat it to red hot and let it cool. What do you notice? You can see a grey brittle compound formed. What is it?

The grey brittle compound is iron sulphide



5.5.1. Characteristics of a compound

Now let us take iron sulphide and study the characteristics of a compound by performing simple experiments.

1. Iron sulphide contains iron and sulphur in the ratio 7 : 4. by mass. Hence, we can say that a chemical compound is formed by the **chemical reaction between two or more elements in a fixed proportion by mass.**

2. Iron in iron sulphide cannot be pulled away by using a magnet. Similarly sulphur present in iron sulphide cannot be separated by dissolving it in carbon disulphide because sulphur present in it does not dissolve in carbon disulphide. Hence we can conclude that the **components of the compound cannot be separated by simple physical methods.**
3. When a mixture of iron powder and sulphur is heated it glows red hot, and the glow stays for a while even when bunsen flame is removed. This shows that heat is given out. This reveals that **formation of a compound is associated with evolution or absorption of heat.**
4. Pure iron sulphide melts at a definite temperature. Hence a **compound has a fixed melting and boiling point.**
5. Iron sulphide is not attracted by magnet. When dilute sulphuric acid is added to iron sulphide, a colourless gas with rotten egg smell is produced due to hydrogen sulphide but not hydrogen. Thus iron present in the compound does not show its property. When carbon disulphide is added to Iron sulphide, it does not dissolve in it. This shows that sulphur is also not able to show its characteristic property. Hence we can say **the properties of a compound are different from those of its component elements.**

6. When a sample of iron sulphide is viewed by magnifying lens, it is found to be homogenous throughout its mass. No individual particle of iron and sulphur can be seen in iron sulphide. Hence **compound is homogenous.**

Now can you to list out the characteristics of compounds?

ACTIVITY 5.12

List the characteristics of compounds

- 1.....
- 2.....
- 3.....
- 4.....
- 5.....
- 6.....

5.5.2. Classification of compound

Let us learn to classify the compounds based on the origin or chemical components as

1. Inorganic compounds

Compounds obtained from non living sources such as rock, minerals, etc., are called inorganic compounds. eg. Chalk, marble, baking powder, etc.

2. Organic compounds

Compounds obtained from living sources such as plants, animals etc., are called organic compound.eg. Protein, waxes, oil, carbohydrates, etc.

ACTIVITY 5.13

Check whether sugar is a compound or not.

- Take some sugar in a test tube.
 - Heat the test tube on a flame.
 - The sugar will melt and turn brown.
 - On further heating it starts charring and turning black.
 - Look near the rim of the test tube. You will find small droplets of water.
 - Since the water droplets have formed upon heating these cannot possibly be result of condensation from air. This shows that water has formed by decomposition of sugar.
 - Black residue is carbon.
 - So, sugar decomposed into carbon and water.
 - We know that water is made up of elements of hydrogen and oxygen.
- This shows that sugar is a compound.

MORE TO KNOW

- Talc is the softest known substance.(talcum powder)
- Water expands by about 10% as it freezes.
- It is estimated that plastic containers can resist decomposition for 50,000 years.
- Hydrofluoric acid will dissolve glass.

Elements and Compounds around us

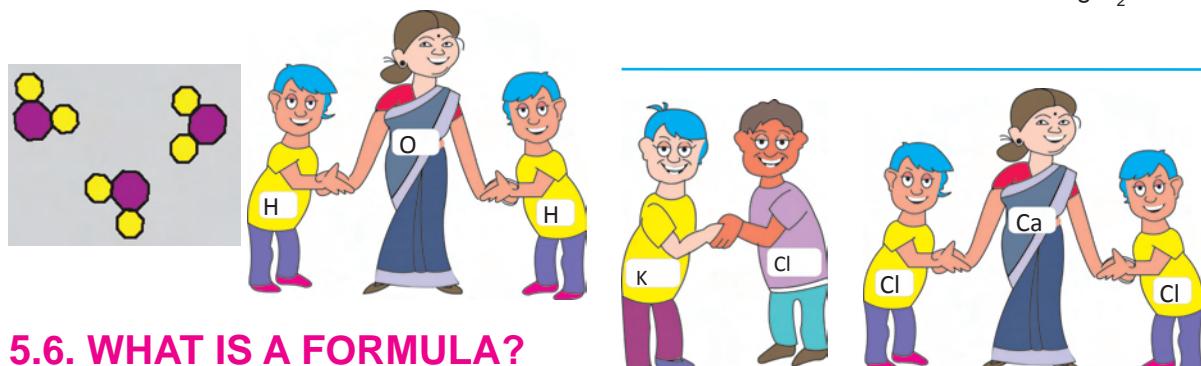
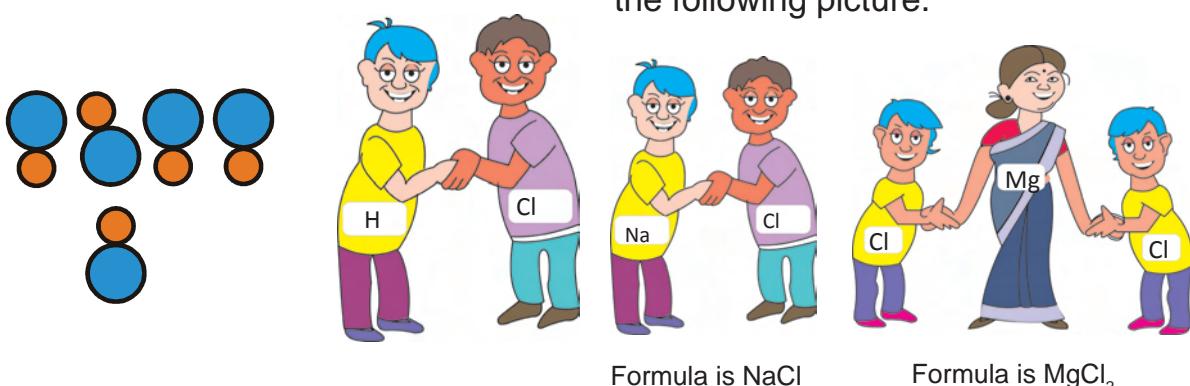
5.5.3. Uses of Compounds

Let us tabulate the some compounds and their components that we use in our daily life.

COMMON NAME	CHEMICAL NAME	COMPONENTS	USES
Water	Hydrogen Oxide	Hydrogen and oxygen	For drinking and as solvent
Table salt	Sodium chloride	Sodium and chlorine	Essential component of our daily diet, preservative for meat and fish.
Sugar	Sucrose	Carbon, hydrogen and oxygen	Preparation of sweets, toffees and fruit juices.
Baking soda	Sodium bicarbonate	Sodium, hydrogen , carbon and oxygen	Fire extinguisher, preparation of baking powder and preparation of cakes and bread.
Washing soda	Sodium carbonate	Sodium,carbon and oxygen	As cleaning agent in soap and softening of hard water.
Bleaching powder	Calcium oxy chloride	Calcium, oxygen and chlorine	As bleaching agent, disinfectant and sterilisation of drinking water.
Quick lime	Calcium oxide	Calcium and oxygen	Manufacture of cement and glass.
Slaked lime	Calcium hydroxide	Calcium , oxygen and hydrogen	White washing of walls.
Lime stone	Calcium carbonate	Calcium ,carbon and oxygen	Preparation of chalk pieces.

5.5.4. Molecule of compound

The molecule of a compound contains two or more different types of atoms. For example, the molecule of hydrogen chloride contains one atom of hydrogen and one atom of chlorine. Similarly, one molecule of water contains two hydrogen atoms and one atom of oxygen.



5.6. WHAT IS A FORMULA?

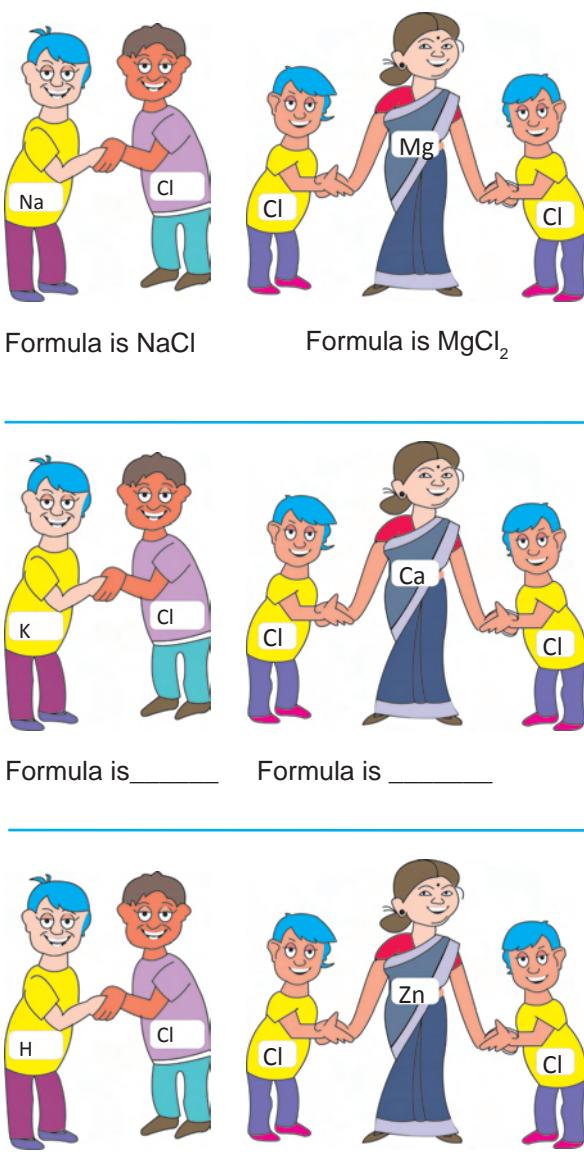
Just as an atom is represented by its symbol, a molecule of element or a compound is represented by means of a formula.

The formula represents the number of atoms of each element in the molecule. For example H_2 represents one molecule of hydrogen formed when two atoms of hydrogen combine.

The formula of water is H_2O . This indicates that two atoms of

hydrogen chemically combined with one atom of oxygen to form water. The subscript “2” below H indicates the number of atoms of hydrogen present in one molecule of water. Notice that when only one atom is present the subscript “1” is not written.

Let us learn to write formula from the following picture.



Elements and Compounds around us

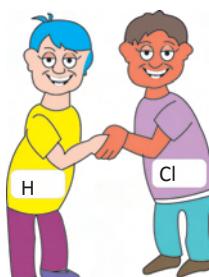
5.7. WHAT IS VALENCY?

Two atoms of hydrogen combine with one atom of oxygen to form a molecule of water. While one atom of hydrogen combines with one atom of chlorine to form a molecule of hydrogen chloride. You could say that oxygen atom has a greater capacity to combine with hydrogen than the chlorine atom. This is somewhat like some people being friendly with many people, while others are satisfied with just one friend.

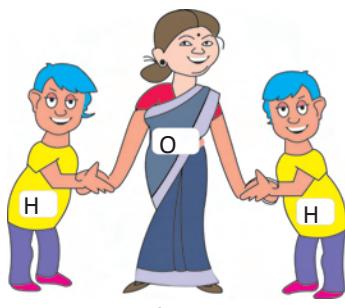
The compounds are formed by combination of atoms of different elements. During the formation of molecules of the compounds, atoms combined in a fixed proportion. This is due to the fact that different atoms have different combining capacities.

Valency can be defined as the combining capacity of an element.

Valency with respect to hydrogen: The valency of hydrogen atom is taken as one and it is selected as the standard. Valency of other elements is expressed in terms of hydrogen. Valency of an element can also be



Valency of chlorine is 1



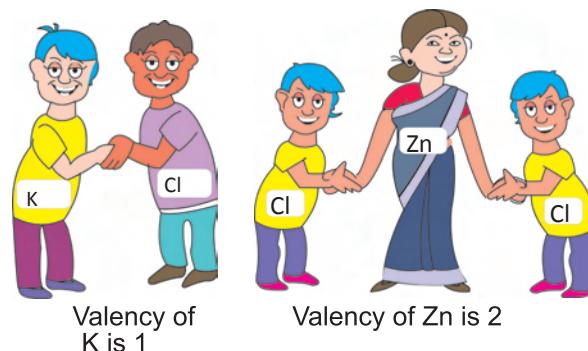
Valency of oxygen is 2

defined as the number of hydrogen atoms which combine with one atom of the element.

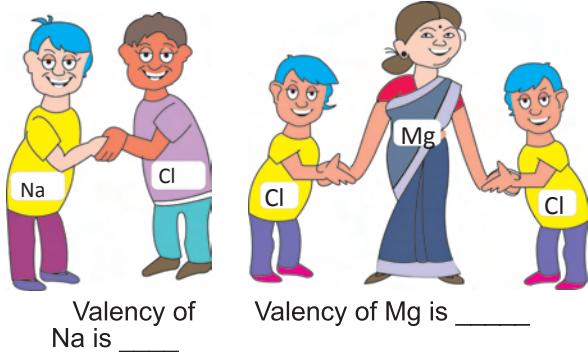
Since most of the elements do not combine with hydrogen, the valency or the combining capacity of the element is also defined in terms of chlorine or oxygen.

Valency With Respect to Chlorine:

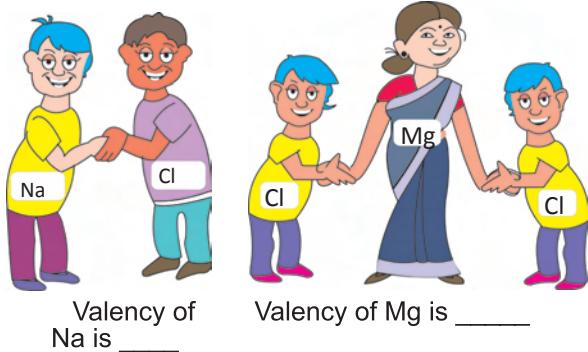
Since valency of chlorine is one, the number of chlorine atom with which



Valency of K is 1



Valency of Zn is ____

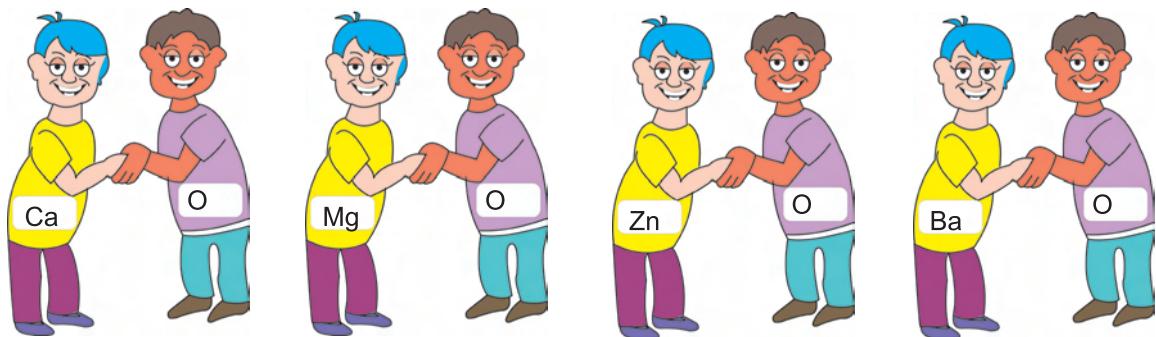


Valency of Na is ____

one atom of an element can combine is called its valency.

Valency with respect to Oxygen:

We know that the valency of oxygen is 2. Double the number of oxygen atoms with which one atom of an element can combine is also called **valency**.



Valency of Ca is 2

Valency of Mg is 2

Valency of Zn is _____

Valency of Ba is _____

Certain elements that exhibit more than one valency, are said to be variable valence elements.

For example,

Valency of Fe in FeCl_2 is 2

Valency of Fe in FeCl_3 is 3

Some elements, especially rare gases like helium and neon, do not combine with other elements. They have **zero valency**.

ACTIVITY 5.14

List out the zero valency elements from the periodic table.

SCIENCE

EXTENDED LEARNING

New elements, till they are given permanent name, or those elements with disputed claims for discovery/synthesis, are named using three letters based on the Latin for their atomic number.

Number	0	1	2	3	4	5	6	7	8	9
symbol	n	u	b	t	q	p	h	s	o	e
Name	nil	un	bi	tri	quad	pent	hex	sept	oct	enn

The “entire symbol” name of elements must end with the suffix –ium.

To illustrate this system,

Let us assign to an element with atomic number

1 1 2

Name

Un un bium

Symbol

Uub

GROUP ACTIVITY 5.15

Here is an interesting game which will help you remember the symbols and valencies of the elements you have learnt in this lesson. Make the cards as instructed and then form small groups with your classmates to play?

Instruction:

1. Prepare 3 cards each for every element given in the list.
($3 \times 13 = 39$)

Hydrogen	copper	magnesium	oxygen
Sodium	zinc	iron	sulphur
Potassium	lead	calcium	chlorine
Mercury			

2. Then prepare 3 cards each for the same elements. This time use their symbol instead of their names ($3 \times 13 = 39$)

H Cu Mg O Na Zn Fe S K Pb Ca Cl Hg

3. Prepare 30 cards with '2' written on them and 12 cards with '1' written on them. The '2' and '1' cards represent the valency.

4. There should be a total 120 cards.

How to Play:

Eight players can play at a time. All the cards are distributed among the players. Each player gets 15 cards. At each turn, a player can do one of the following:

1. Make a set of three cards. One set is made of a card which has the name of an element on it, a card with its symbol and a card with its valency.
2. Draw a card from the person sitting on the left. Check if this card helps to make a set as explained above. If yes, place the set face up on the table.

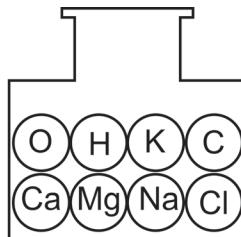
A person who makes a set with a wrong symbol or valency card will have to skip next turn as a penalty. The round ends when one of the players has used up all the cards. The player who has used up all the cards or has the lowest number of cards left in hand is the winner.

EVALUATION

1. Water is made up of two elements, hydrogen and oxygen. Water is a liquid, whereas hydrogen and oxygen are gases. Hydrogen catches fire easily. Oxygen helps in burning. Water is used to put off the fire.

From the above information, answer the following questions.

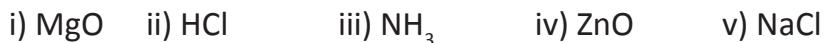
- What are the elements present in water?
 - In which state do these elements exist?
 - Write the property of hydrogen.
 - Write the property of oxygen.
 - Do the properties of water differ from hydrogen and oxygen?
2. Using the elements enclosed in the bottle, frame formulae for some compounds.



3. Find the valency of the underlined element in the given formulae.



4. write the chemical name of the given formulae.



5. Write the names of the planets(Greek God) after which these elements are named.

- a) Plutonium b) Neptunium c) Uranium

Project Ideas

- Obtain samples of the following materials.
Sugar, Common salt, Water, Copper wire, Pencil lead, eraser, Iron
- Observe each material and mention its state or appearance.
- Classify the samples into element or compound.

Elements and Compounds around us

2. List several items that are made of common elements like iron, copper and aluminium, which you find in your home or around your home. **Indicate the name of the elements they are made up of and their symbols.**
3. Using clay, water colour, tooth pick (small bamboo stick), make models of elements and compounds of your choice.

Experiment

Take three samples namely, iron pieces, copper wire and charcoal. Perform the following tests and tick appropriate observations. Based on the observation classify the samples into metal and non-metal.

Test	Observation		
	Iron	Copperwire	Charcoal
Addition of water	Soluble/insoluble	Soluble/insoluble	Soluble/insoluble
Drop it down	Sonorous/ nonsonorous	Sonorous/ nonsonorous	Sonorous/ nonsonorous
Conductor of electricity(using copper wire, cell and bulb)	Good/bad	Good/bad	Good/bad

Result:

The sample :

Iron is a _____. Copper wire is a _____. Charcoal is a _____

FURTHER REFERENCE

Book

Inorganic chemistry - Puri and Sharma - Vishal publications.

Websites

www.freshney.org

www.authorstream.com

6. MEASUREMENTS

In a warm summer vacation, Aruna is eagerly waiting for her friend Swathi. Finally, Swathi came to Aruna's home with an umbrella.

Aruna: Is it raining, Swathi?

Swathi: No Aruna, but my mother asked me to take this, as it is very hot outside.

Aruna: Of course, I heard in the TV news that the temperature was 42°C yesterday and it seems to be more than that today.

Swathi: I am confused about the unit that we use for temperature. We see people using celsius but my brother said this morning that kelvin is the unit for temperature.

Aruna: We will clear this doubt with my father (who is a teacher). (They go to Aruna's father for clarification. Aruna's father explained them clearly about units).

You know that measurement is nothing but comparing an unknown quantity with a standard quantity. The standard quantity is called unit. For example, if you say a distance as 300km, here 300 is its magnitude and km is its unit. We can't measure anything without a unit.

We have been following many system of units to measure physical quantities. For example kilometre, mile, foot, centimetre etc., are all units of length. Similarly kilogram, gram, pound etc., are units of mass.

Le Systeme International d' Unites (SI system of units)

To bring uniformity, the general conference on Weights and Measures in 1971, decided to have a uniform system of measurement called SI system of units. In SI system, the units for all physical quantities are fixed and derived. This is logically far superior to all the other systems. It has certain features, they are based on the properties of atom. So, they do not vary with time. SI system is more convenient to practice.

There are seven fundamental quantities and many derived quantities in this system of units.

We learnt about the units of length, mass and time in SI system. Let us learn more about other basic units.

Temperature

We know that temperature is a measure of degree of hotness or coldness of a body. Different scales like celsius, fahrenheit, etc. are used to measure temperature.

Types of scales	Lower fixed point (Melting point of pure ice)	Upper fixed point (Boiling point of water)
Celsius	0°C	100°C
Fahrenheit	32°F	212°F

There is also another type of scale called the Kelvin Scale with which we can measure the temperature. **Kelvin is the primary unit of temperature in SI system.**

The freezing point of water is 0°C. in Celsius scale but at 0°C, water molecules do not come to rest. Only at -273°C, all the molecular movement comes to rest. Hence **-273°C**, has been fixed as the lower fixed point in Kelvin Scale and is called as **absolute zero**.

Hence,

$$-273°C = 0 K$$

$$0°C = 273 K$$

The usage of negative values in Celsius scale can be avoided by using Kelvin scale.

Conversion of scales of Temperature

Fahrenheit to Celsius

The number of divisions between upper and lower fixed points in celsius scale is 100 and in Fahrenheit scale is 180.

$$\frac{C}{100} = \frac{F - 32}{180}$$

$$C = (F-32) \times \frac{100}{180}$$

$$C = (F-32) \times \frac{5}{9}$$

Using this we can convert a Fahrenheit temperature to a Celsius temperature. Similarly to convert Celsius to Fahrenheit

$$(F-32) = \frac{C}{100} \times 180$$

$$(F-32) = \frac{9 C}{5}$$

$$F = \frac{9 C}{5} + 32$$

Converting Kelvin into Celsius scale

$$-273°C = 0 K$$

$$0°C = 273 K$$

$$100°C = 373 K$$

Worked out problems

1. Convert 37°C to Fahrenheit scale

$$F = \frac{9 C}{5} + 32$$

$$F = \frac{9 \times 37}{5} + 32$$

$$F = 98.6°F$$

Measurements

2. Convert 100°F to Celsius scale

$$\text{C} = (\text{F}-32) \times \frac{5}{9}$$

$$\text{C} = (100-32) \times \frac{5}{9}$$

$$\text{C} = 37.7$$

$$100^{\circ}\text{F} = 37.7^{\circ}\text{C}$$

3. Convert 40°C to Kelvin scale

$$-273^{\circ}\text{C} = 0 \text{ K}$$

$$0^{\circ}\text{C} = 273 \text{ K}$$

$$40^{\circ}\text{C} = 273+40$$

$$40^{\circ}\text{C} = 313 \text{ K}$$

Try yourself:

1. Convert 98°F to Celsius scale
2. Convert -40°C to Fahrenheit scale
3. Convert 32°C to Kelvin scale

Electric current

SI unit for electric current is ampere.

Amount of Substance

SI unit for amount of substance is mole.

Luminous intensity

Candela is the SI unit for luminous intensity.

A candle emits light with a luminous intensity roughly equal to one candela.

Quantity	SI Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Temperature	kelvin	K
Electric Current	ampere	A
Amount of substance	mole	mol
Luminous Intensity	candela	cd



Conventions to be followed in writing the units in SI system

- The symbols for units should be written with a small letter
For example: m for metre, kg for kilogram
- Units which are named after scientists should always be written with small letter.
For example: newton, joule
- The symbols of the units named after scientist should be written by capital letter
For example: N for newton, W for watt
- Symbols should not be written in plurals but in words, plurals are used.
For example: 30 kg or 30 kilograms
- There should be no full stop at the end of a symbol for units

For example: Symbol for unit of length is m(it is not m)

MORE TO KNOW

- The intensity of sound is measured in a unit called decibel (dB).
- Intensity of earthquakes are measured in Richter scale.

Note : The following conversions are only for information. Need not be asked in evaluation.

Units of Length

10 millimetres (mm)	= 1 centimetre (cm)
10 centimetres	= 1 decimetre (dm) = 100 millimetres
10 decimetres	= 1 meter (m) = 1000 millimetres
10 metres	= 1 decametre (dam)
10 decametres	= 1 hectometre (hm) = 100 metres
10 hectometres	= 1 kilometre (km) = 1000 metres

Units of Area

100 square millimetres (mm^2)	= 1 square centimetre (cm^2)
100 square centimetres	= 1 square decimetre (dm^2)
100 square decimetres	= 1 square metre (m^2)
100 square metres	= 1 square decametre (dam^2) = 1 are

Measurements

100 square decametres	= 1 square hectometre (hm^2) = 1 hectare (ha)
100 square hectometres	= 1 square kilometre (km^2)

Units of Liquid Volume

10 millilitres (ml)	= 1 centilitre (cl)
10 centilitres	= 1 decilitre (dl) = 100 millilitres
10 decilitres	= 1 litre = 1000 millilitres
10 litres	= 1 decalitre (dal)
10 decalitres	= 1 hectolitre (hl) = 100 litres
10 hectolitres	= 1 kilolitre (kl) = 1000 litres

Units of Mass

10 milligrams (mg)	= 1 centigram (cg)
10 centigrams	= 1 decigram (dg) = 100 milligrams
10 decigrams	= 1 gram (g) = 1000 milligrams
10 grams	= 1 decagram (dag)
10 decagrams	= 1 hectogram (hg) = 100 grams
10 hectograms	= 1 kilogram (kg) = 1000 grams
1000 kilograms	= 1 megagram (Mg) or 1 metric ton(t)

MORE TO KNOW

Some Common measurements used in our daily life.

1 Feet	=	30.48 cm
1 Sq.feet	=	$30.48 \text{ cm} \times 30.48 \text{ cm} = 929.0304 \text{ sq.cm}$
1 Ground	=	2400 sq.feet
1 Kuzhi	=	145.2 sq.feet
1 Cent	=	435. 60 sq.feet
1 Acre	=	43560 sq.feet = 300 Kuzhi = 100 Cent

In practice, we use only rounded off values of the above measurements.

ACTIVITY 6.1

Collect some other measurements that are used in your locality.

EVALUATION

1. Ramu and Madhu are friends. They wanted to measure the length of a room. Ramu wanted to measure it in foot. But Madhu wanted to measure it in metres. Who is right in measuring the room in the internationally accepted system. Why?
2. Match the following

S.No	Quantities	SI Unit
1	Temperature	candela
2	Amount of Substance	kelvin
3	Luminous Intensity	kilogram
4	Mass	second
5	Time	mole

3. Which of the following statement is correct?
 - a. The unit of force is Newton
 - b. The unit of force is newton
4. Murugan measured the electric current. What unit should he use?
5. Say true or false.
 - a. The symbol for units should be written with a small letter.
 - b. There should be a full stop at the end of a symbol for units.
 - c. We should not use plurals when we write the unit in words.
 - d. The SI unit for mass is KG.

Project : Collect pictures of various measuring instruments and prepare an album.

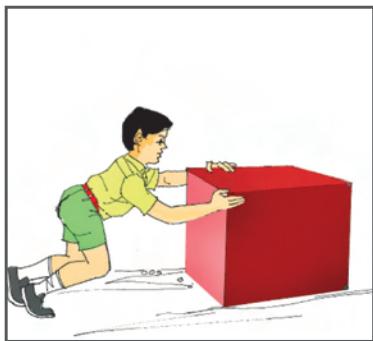
FURTHER REFERENCE

- Books:**
1. Physics vol (1) and(2) - Satya Prakash - Rahul Jain V K (India) Enterprises, New Delhi-2
 2. The Physics Quick reference guide - E.Richard Cohen 1996 - American Institute of Physics.

- Webliography:** www.metrication.com
www.surfnet.org/wiki/A-level-physics
www.physics.nist.gov/cuu/unit

7. FORCE AND PRESSURE

Murugan and Nila are students of 8th standard. In their day-to-day life the following activities take place.



Actions like opening the door, lifting a bag, kicking a ball, pulling a drawer, pushing a box are some of the tasks we do every day. All these actions result in the change of position of an object.

Do you notice that each of these activities involve a push or a pull? From this we infer that to move any object, effort is needed (push or pull). This effort is called a force.

Force is a push or a pull acting on an object which changes or tends to change the state of the object.

UNIT OF FORCE

In the International system of units (SI System), the unit of **force** is **newton** (N).



Sir Issac Newton (1642 - 1727)

One of the greatest scientists the world has ever seen. He was an English mathematician, physicist and astronomer. The SI unit of force is named after him.

MORE TO KNOW

There are also other units that are used to measure force. They are dyne, kilogram weight and pound weight.

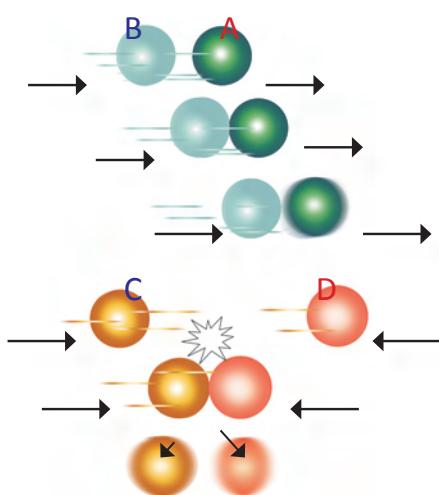
7.1. STATE OF MOTION

Let us play a game with marbles to understand what happens when force acts on an object.

Set a marble A in motion. Hit it from behind with another marble B. What do you notice?

The marble A moves faster. It is because the marble B exerted a force on A.

Take two more marbles C and D. Let them move in the opposite direction and collide with each other. After the collision, the marbles C and D change their directions of motion as shown in the figure. This is due to the exertion of force between them.



Hence a force changes either the speed of an object or its direction of motion.

A change in either the speed of an object or its direction of motion or both is described as a change in its state of motion. Thus, a force may bring a change in the state of motion of an object.

A force does not always result in a change in the state of the object. For example, the wall of a room may not move at all even if we apply the maximum force that we can exert. This does not mean that we are not applying force, but the force that we are applying is not sufficient to move the wall.

ACTIVITY 7.1

Ask your friend to bowl a cricket ball towards you. Hit the ball with a cricket bat. What happens to the state of motion of the ball?



7.2. ACTION OF FORCE AND ITS EFFECTS

ACTIVITY 7.2

Some situations have been given in the column 1 of the table; column 2 shows diagrams of some actions. Match the situation in column 1 with suitable diagram in column 2.

Table

Column 1	Column 2
Moving an object which is at rest	
Changing the speed of an already moving object.	
Changing the direction of motion of an object	
Changing the shape of an object	

From the above activity, you would have realised that a force

- can change the state of an object (rest to motion/ motion to rest)
- may change the speed of an object if it is already moving.
- may change the direction of motion of an object.
- may bring about a change in the shape of an object.
- may cause some or all of these effects.

It is important to note that none of these actions is possible without the action of a force.

7.3. CONTACT FORCES

Can you lift a pot of water without holding it? Can you push this table without touching it?

Generally, to apply force on an object, we need to come in contact



Force and Pressure

with that object. A force that can cause or change the motion of an object by touching it is called **Contact Force**.

In the above activities, the force is caused by the action of muscles. Hence this force is known as **muscular force**. Do you agree that muscular force is a contact force?

Are there other types of contact forces? Come, let us find out.

A ball rolling on the play ground gradually slows down and comes to rest. If the ground is made smooth, the distance covered by the ball would be more than that what was covered earlier. Why?

The ball slows down due to the force acting between the ball and the ground. It is the force of friction which causes the ball to rest. The **frictional force** is always in a direction opposite to the direction of motion of the object.

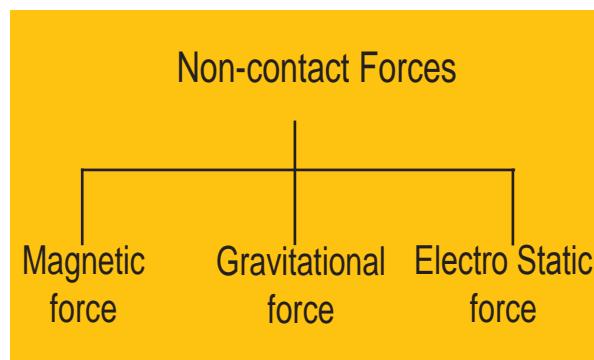
The force of friction arises due to contact between the ball and ground. It acts between any two bodies when both are in contact with each other and either any one or both are moving. Is friction also a contact force? Yes.

7.4. NON-CONTACT FORCES

A **non-contact force** is any force applied to an object by another body without any contact.

7.4.1. Magnetic Forces

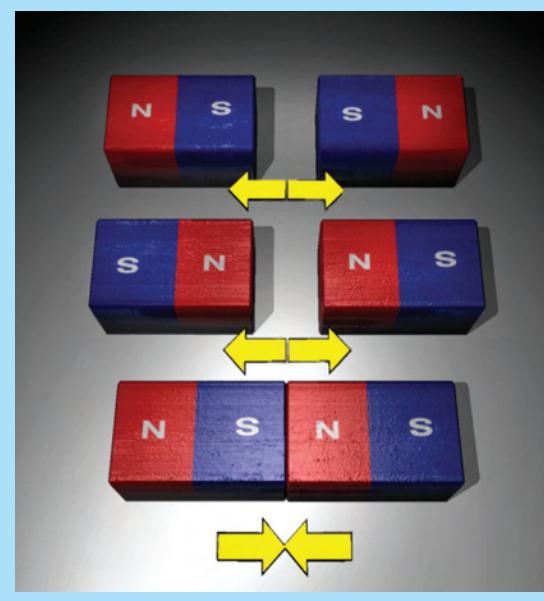
Is it necessary to bring the two magnets in contact to observe the



ACTIVITY 7.3

Take a pair of bar magnets. Place one of the magnets on a smooth surface such as a table. Now bring one end of the other magnet to one end of the magnet on the table and observe what happens.

Next, separate the two magnets, and bring the other end of the magnet you are holding to the same end of the magnet on the table. Again, watch what happens.



force between them? No. A magnet can exert a force on another magnet

without touching it. **Magnetic force** is a non contact force.

7.4.2. Gravitational Force

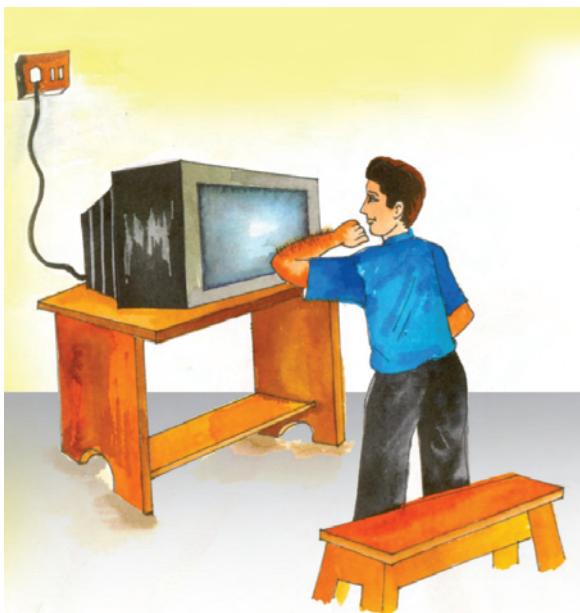
Have you wondered why the cricket ball hit high by a batsman falls back to the ground? Or why a mango or an apple falls to the ground? Why are objects fall towards the earth? It is because the earth pulls them down. This force is called the **force of gravity**. This is an attractive force. This is an example for non-contact force.



MORE TO KNOW

Gravity is not a property of the earth alone. In fact, every object in the universe whether small or large, exerts a force on every other object. This force is also known as the gravitational force.

7.4.3. Electrostatic Force



ACTIVITY 7.4

When you switch off the Television in your house after watching for some time, you can notice that hairs in your hands are getting attracted towards the screen. Why?

The television screen becomes electrically charged and it exerts an electrostatic force on the hair of your hand. This force is a non-contact force because, there is no contact between the screen and the hair.

The force exerted by a charged body on another charged or uncharged body is known as electrostatic force. This force acts when the bodies are not in contact. The **electrostatic force** is another example of non contact force.

7.5. PRESSURE

ACTIVITY 7.5



Take two bags of the same size. Let the strap of one bag be narrow and that of the other broad.

Place your books in the bag with broad strap. Hang the bag on your shoulder and walk for some time. How do you feel?

Transfer the books to the other bag with narrow strap. Hang it again on your shoulder and walk for some time. How do you feel?

It is comfortable to carry the bag with broad strap. Isn't it? Why?

When you hang a bag with broad strap, the weight of the books is distributed over a larger area of the shoulders and hence the pressure on your shoulders is less.

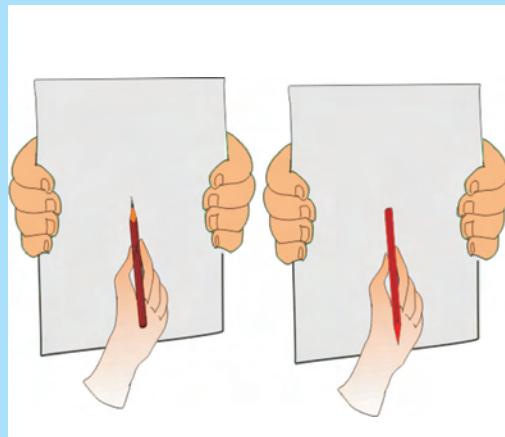
ACTIVITY 7.6

Let us take a pencil and a paper. Try to make a hole in the paper by pressing the blunt end of the pencil on the paper.

Now try to make a hole in the paper by pressing the sharp end of the pencil.

Which was easier why?

Although the force applied on the pencil is almost the same in both the cases, the sharp end of the pencil is able to make a hole. In this case the area over which the force acts on the paper is very small and its effect on the paper is much greater (it makes a hole in the paper).



From these activities we understand that the effectiveness of the force applied depends on the area on which it is acting.

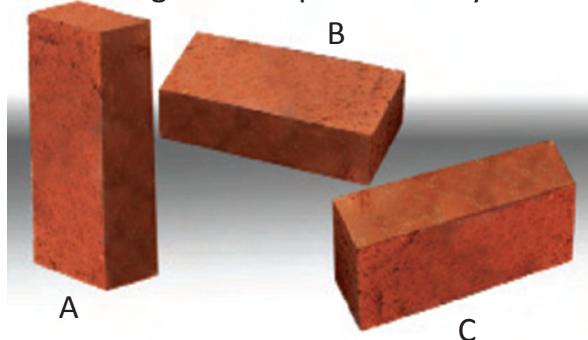
Now we will define a new physical quantity, pressure.

Pressure is defined as the force acting on a unit area

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

The SI unit of pressure is N/m². It is also called pascal (Pa) .

Can you say which brick will give more pressure why?



Solved Problem 1:

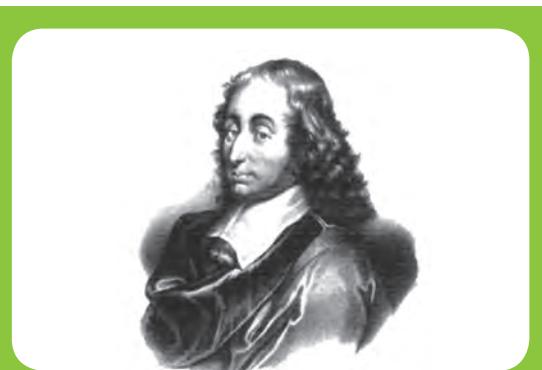
A liquid gives force of 100N over an area of 2m². What is the pressure?

$$\text{Force} = 100\text{N}$$

$$\text{Area} = 2\text{m}^2$$

$$\text{Pressure} = ?$$

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



Blaise Pascal (1623-1662)

One of the greatest scientists of the 17th century. He was a child prodigy. A French mathematician, physicist, inventor, writer and philosopher. The SI unit of pressure is named after him.

Substituting the values

$$\begin{aligned}\text{Pressure} &= 100\text{N} / 2\text{m}^2 \\ &= 50 \text{ N/m}^2\end{aligned}$$

$$\text{Pressure} = 50 \text{ N/m}^2$$

TRY YOURSELF

A liquid's force is acting over an area of 4m². If the pressure is 25 N/m², what is the force?

7.6. PRESSURE EXERTED BY LIQUIDS AND GASES

You know that liquids and gases are called fluids. Solids always exert pressure downwards. But the fluids exert pressure in all directions.

Force and Pressure

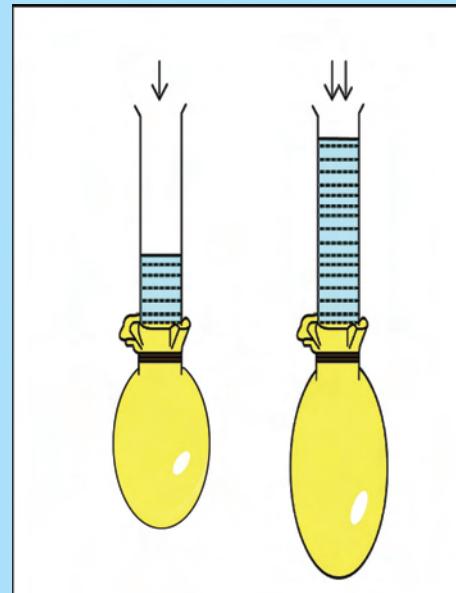
Fluids exert pressure on all bodies immersed in them and also on the walls of the container that holds them.

Pressure exerted by Liquids

ACTIVITY 7.7

Take a transparent glass tube or a plastic pipe. Also take a piece of thin good quality of rubber (Piece of a rubber balloon). Stretch the rubber sheet tightly over one end of the pipe. Hold the pipe vertically. Ask one of your friends to pour some water in the pipe. Does the rubber balloon bulge out? Notice the height of the water column in the pipe. Pour some more water. Observe again the bulging in the rubber balloon and the height of the water column in the pipe.

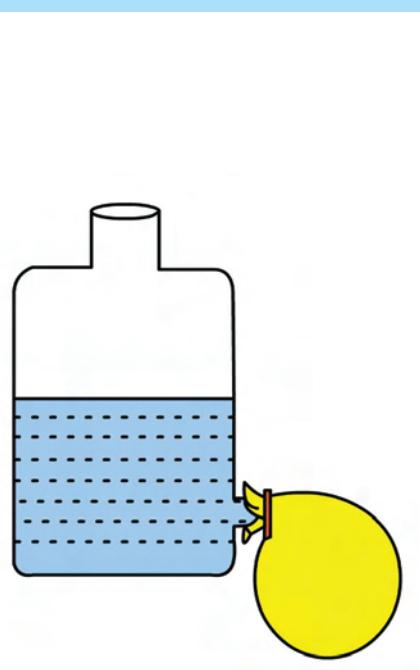
This shows that the pressure exerted by liquids at the bottom depends on the height of the liquid column.



ACTIVITY 7.8

Take a discarded plastic water bottle, fit a glass tube near the bottom of the bottle. You can do so by slightly heating one end of the glass tube and then quickly inserting it. Make sure that the water does not leak from the joint. Cover the mouth of the glass tube with thin rubber balloon as you did in Activity 1. Now fill the bottle with water up to half of the bottle. What do you observe? Why does the rubber sheet bulge this time? Now pour more water and watch, what happens to the rubber sheet?

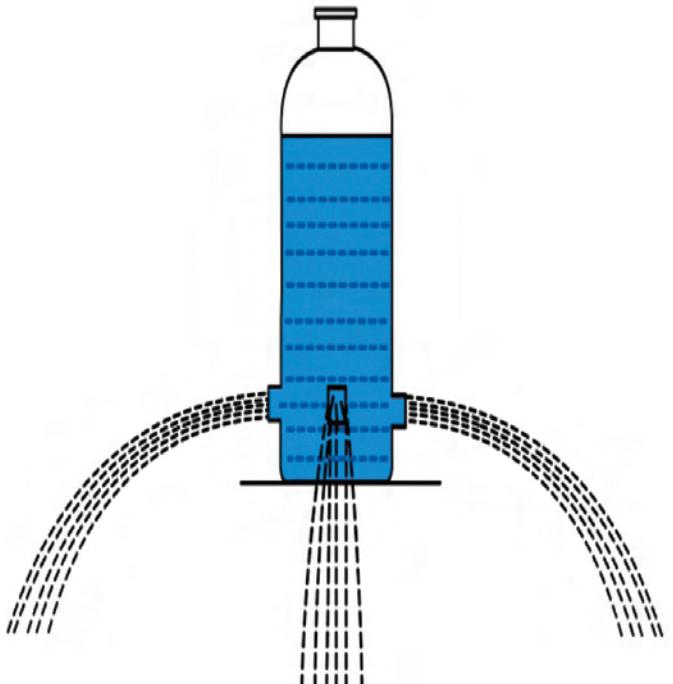
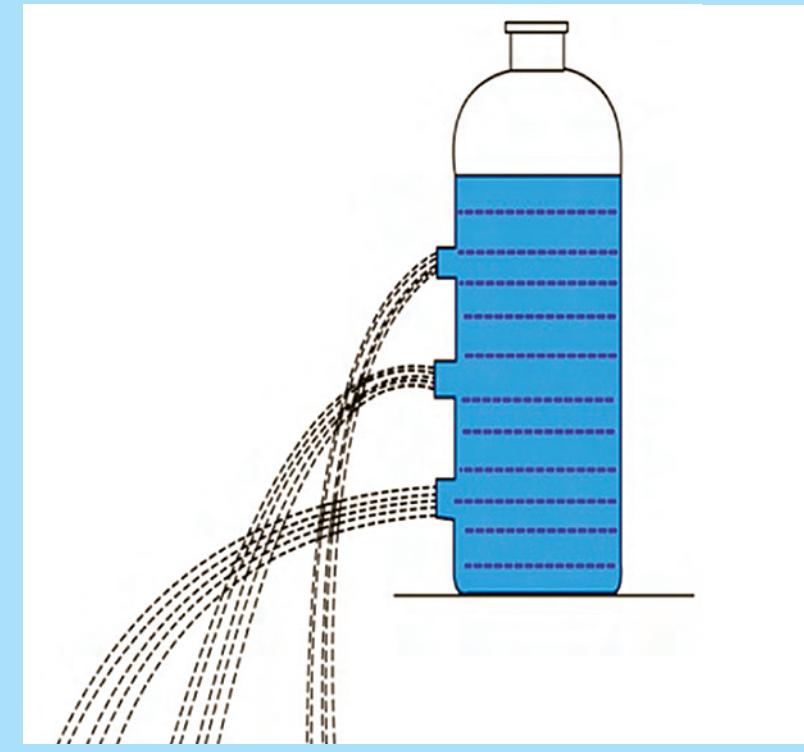
This shows that liquid exerts pressure on the walls of the container.



ACTIVITY 7.9

Take a plastic bottle and drill four holes all around near the bottom of the bottle. Make sure that the holes are at the same height from the bottom. Now fill the bottle with water. What do you notice? Do the different streams of water coming out of the holes fall at the same distance from the bottle?

Inference: Liquid exerts equal pressure at the same depth.

**ACTIVITY 7.10**

Take a plastic bottle, drill three holes at different heights from the bottom. Now fill the bottle with water. What do you observe? You can see that three different streams of water fall at different distances from the bottle.

Inference: The pressure of the liquid increases with the increase in depth.

ACTIVITY 7.11

Let us take two identical glass beakers. Take some water in one beaker and an equal amount of mercury or caster oil in other beaker.

Let us approximately find out which beaker is heavier by keeping both the beakers on our palms.

Is the pressure exerted by both the beakers same?

No, the pressure is different. The pressure exerted by the beaker containing mercury or caster oil is more than that of the beaker containing water. This is because mercury or caster oil has more density than water.

Hence we can infer that pressure depends on density of a liquid.

Is the pressure exerted by a glass of water the same on the earth and the moon?

No, on the earth we have more gravitational force and hence the pressure exerted by the glass of water will be more.

On the moon, the gravitational force is less compared to our earth. Hence the pressure exerted by a glass of water is less on the moon.

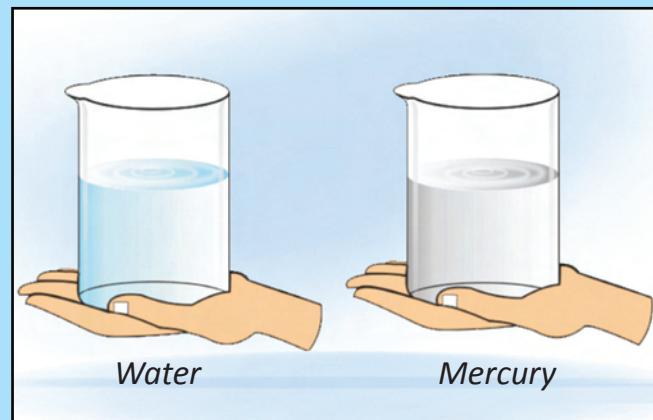
So, pressure of a liquid depends on gravitational force.

The pressure of a liquid can also be calculated by using a formula

$$p = hdg$$

p = pressure of a liquid

h = height of the liquid column



d = density of the liquid

g = acceleration due to gravity

MORE TO KNOW

- Deep sea divers wear specially designed suits to protect them from the huge pressure of the water underneath.
- The walls of the dams are made stronger and thicker at the bottom than at the top of the dam to withstand the huge lateral pressure of water at the bottom

7.7. PASCAL'S LAW

The pressure applied to an enclosed liquid gets transmitted equally to every part of the liquid. This property was first demonstrated by Pascal and is called Pascal's law.

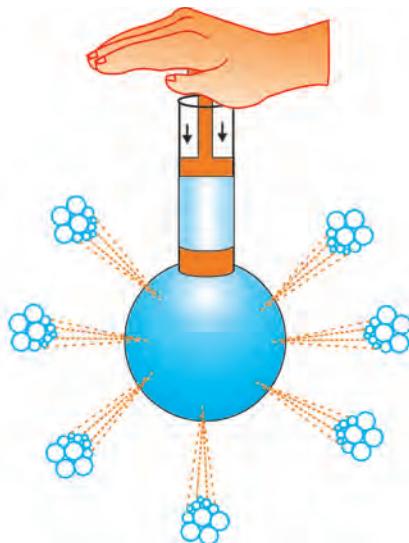
ACTIVITY 7.12

Take a rubber ball and make many holes in it with a needle. Fill the ball with water. Squeeze the ball with your hand. What do you see?

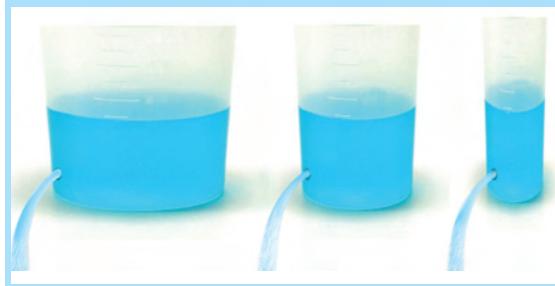
Water rushes out through the holes with equal forces. What do you infer from this?

Hydraulic devices, like earth excavators (JCB) and car brakes work on the above principle.

Take a stout flask with holes of equal size at different places as shown in the figure. Fit a piston which can be moved up and down along the neck of the flask. When a force is applied on the piston, the piston moves down and the water flows out equally in all directions through holes. This shows pressure exerted on water is transmitted equally throughout the water. So that water comes out of all holes with equal force.

**Try yourself**

Take three kinds of vessels as shown in figure. Make holes in them at the same height from the bottom. Pour water into the vessels so that the height of the water level is same in all the vessels. In which case the pressure is more. Give reason?

**7.8. PRESSURE EXERTED BY AIR**

We must have walked on the road while there is a strong wind. How did we feel? Did we feel any force while walking against the wind?

What happens to the bicycle tube when it has a puncture?

Force and Pressure

From the above observations you can say that air also exerts pressure on the walls of their container.



7.9. ATMOSPHERIC PRESSURE

The earth is surrounded by air all around. This thick envelope of air is called the **atmosphere**. The atmospheric air extends up to many kilometers above the surface of the earth. The pressure exerted by this air column is known as the **atmospheric pressure**.

We know pressure is force per unit area, and if we imagine a unit area and a very long cylinder standing on it filled with air, up to the height of atmosphere, then the weight of the air in this cylinder is atmospheric pressure.

The atmospheric pressure at sea level is approximately $1,00,000 \text{ N/m}^2$ (or 10^5 N/m^2). As we go higher and higher above the earth surface, the atmospheric pressure decreases.

Measurement of atmospheric pressure

The atmospheric pressure is not the same at all places. It decreases as we go above the earth's surface. The instrument used to measure the atmospheric pressure is called **Barometer**.

In 1643, an Italian scientist named Torricelli invented the first barometer. It was a mercury barometer. Aneroid barometer and Fortin's barometer are other instruments used to measure the atmospheric pressure.

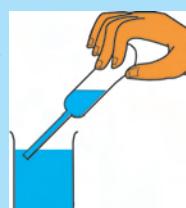
ACTIVITY 7.13

Take a glass of water. Suck a little water through a straw. Hold your finger above the straw. Pull the straw out of the water. What do you observe? Now remove your finger from the top of the straw. what happens?



ACTIVITY 7.14

Take an ink-filler. Press its bulb with your finger to pump air out of it. Now keep its open end in water or ink and release your finger. What happens now?



MORE TO KNOW

Why do astronauts wear a special dress to go into the space? The blood pressure inside our body would need air pressure outside to keep us safe.

When we go above the earth's atmosphere, the pressure outside is very less. But, the pressure inside our body is very high. Due to this our body will burst. So, to avoid this astronauts wear a special dress.

7.10. FRICTION

We must have seen children skating. These children wear shoes with wheels. Is it possible to skate on bare feet?



The force which opposes the action of sliding your foot on the floor is called 'friction'.

We saw earlier that the frictional force is a contact force.

Friction is the force created whenever two surfaces move or try to move over each other.

Friction is caused by the irregularities on the two surfaces in contact. Even those surfaces which appear very smooth have a large number of irregularities on them. Irregularities on the two surfaces lock into one another. When we attempt to move any surface, we have to apply a force to overcome the interlocking. On rough surfaces there are larger number of irregularities. So the force of friction is greater if a rough surface is involved.

7.10.1. Factors affecting friction

The force of friction depends on two main factors

1. Mass of the body
2. Nature of the surfaces in contact

As the mass of the body increases, the force of friction also increases. A football when kicked goes farther than a cricket cork ball since the mass of the cricket ball is more than that of the foot ball.

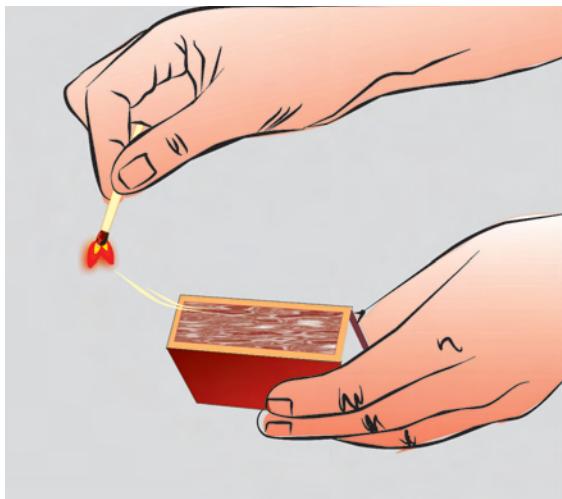
Friction is less when the surface is smooth. This you can understand by rolling a stone on a tar road(rough surface) and a house floor(smooth surface).

7.10.2. Friction

Friction plays, an important role in our daily life. Friction opposes motion and it has both advantages and disadvantages.

Advantages of Friction

1. We are able to walk or run properly on the floor because of friction. If there is less or no friction we will slip and fall down.
2. It would not be possible to light a match stick without friction between its head and the side of the matchbox.
3. Cars and buses are able to run on the roads because of the friction between the wheels and the road.
4. We cannot write on paper without friction between the tip of a pen or a pencil and the paper.



Disadvantages of Friction

1. Friction produces heat. This heat causes wear and tear of the machinery parts.
2. Vehicle tyres and soles of footwear wear out because of friction.

7.10.3. Increasing and reducing friction

We have seen in the earlier section that friction is desirable in some situations. Can we increase this friction?

You may have seen that the sole of shoes and footwear are grooved. Why is it so? Have you ever thought of it?

It is done to provide them better grip on the floor, so that you can move safely. This means you have increased the friction.

The treaded tyres of cars, trucks and bulldozers provide better grip with the ground.

Sand and gravel are strewn on the slippery ground during rainy season to increase the friction.

Just as we can increase the friction, we can also reduce the friction.



Friction can be reduced

1. By using suitable lubricants, friction can be reduced. eg. oil (for light machinery), grease (for heavy machinery) ,



2. If the surfaces are polished, they become smooth and in turn, reduce friction between them.
3. By the use of wheels .



4. By the use of ball bearings.

Ball bearings have small balls of steel between metal surfaces. They are placed between hubs and the axles of ceiling fans, bicycles, motor cycles etc. to reduce friction.

Ball bearing



Ball
bearing.

MORE TO KNOW

Friction can never be entirely eliminated. No surface is perfectly smooth. There are always some irregularities.

EVALUATION

1. Choose the correct answer.

- a) The SI unit of pressure is N/m^2 . This unit is otherwise called _____ (pascal, newton, joule)
- b) Atmospheric pressure at sea level is approximately equal to _____ (10^5 N/m^2 , 10^7 N/m^2 , 10^3 N/m^2)

2. Fill in the blanks

Friction is a _____ force (contact / non-contact)

3. Match the following

- | | |
|------------------------------------|-----------------------|
| i) wheels and ball bearings | non-contact force |
| ii) grooves | based on Pascal's law |
| iii) earth excavators | increases friction |
| iv) fall of an apple from the tree | decreases friction |

4. Correct the given statement.

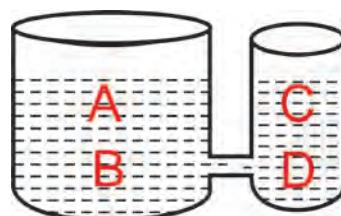
The gravitational force of moon is equal to the gravitational force of earth.

5. List out the following actions on the basis of contact force and non contact force

- a) lifting a chair
- b) the falling of a coconut from the tree
- c) friction between the road and the tyre of a car
- d) a comb attracts bits of paper
- e) attraction between two magnets

6. By observing the diagram, answer the following.

- a) How does the pressure at A differ from the pressure at B?
- b) The pressure at B is greater than the pressure at D. Is it true? Justify your answer.
- c) Compare the pressure at A and C.
- d) If the water is replaced with mercury, how would this affect the pressure at A and D?



7. We know Pressure = $\frac{\text{Force}}{\text{Area}}$

If 50 N force is applied on a liquid and it experiences 25 N/m^2 pressure.
Find out the area on which the force is applied?

8. Aswin and Anwar were playing with four bricks each. Aswin arranged his four bricks as shown in figure A. Anwar arranged his bricks as shown in figure B, in order to be a taller one.

Now let us complete the following sentences by choosing the right option below

(equal to, less than, more than)

- a) The force of A on the ground is _____ the force of B on the ground.
- b) The area that A occupies is _____ B on the ground.
- c) The pressure exerted by A is _____ the pressure exerted by B.

9. We know that pressure can also be calculated by using the formula $p=hdg$

A rectangular storage tank is filled with paraffin. The height of the tank is 2m. Density of paraffin is 800 kg/m^3 , the value of g is 10 m/s^2

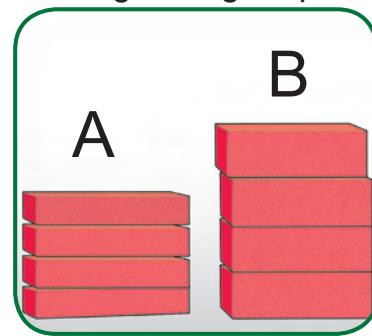
Calculate

- a) the pressure at the bottom of the tank
b) the pressure at a depth of 1 m.

10. Swetha is wearing a sharp edged high heeled footwear. Madhu is wearing a flat footwear. If both the girls are having same weight and both are stepping over your foot, whose footwear will cause more pain to your foot? Why?

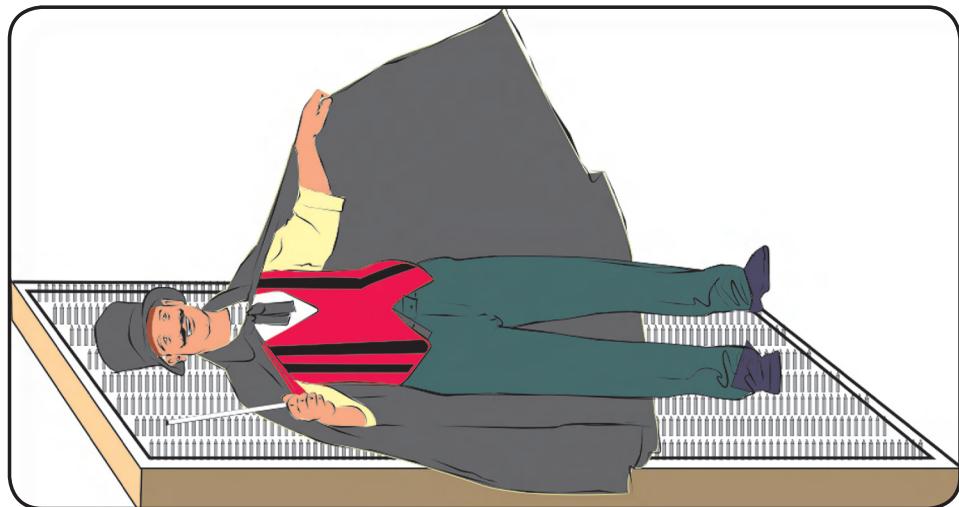
11. Swathi went by car to Ooty last week, when the car was climbing the mountain, her ears popped. She felt uneasy but after sometime she felt better. Why did her ears pop when she climbed the mountain?

12. As we go higher and higher atmospheric pressure _____ (increases / decreases)



Force and Pressure

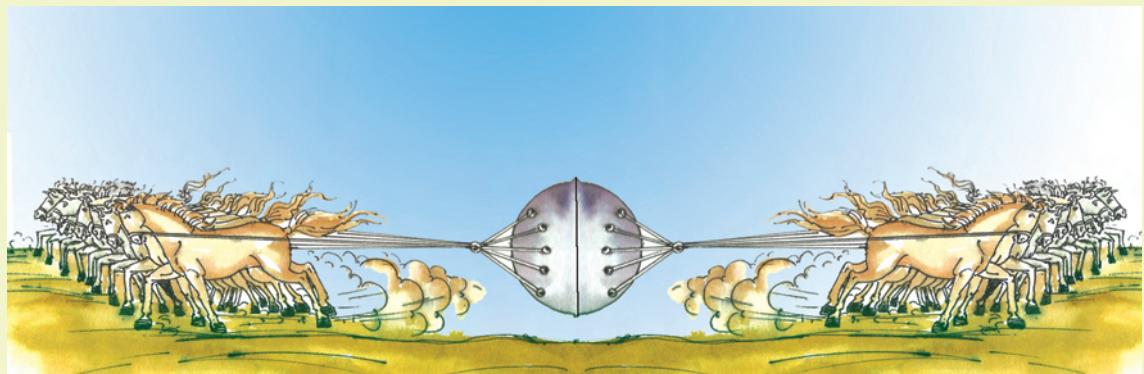
13. Kumaran went to a shop near his house on a bicycle. The bicycle made a lot of noise when he pedalled it. After coming home, he applied some oil on some parts of the bicycle. Then there was no noise, why?
14. We know that friction depends upon mass of the body when we roll down an iron ball and a football on the ground, which ball will travel more distance? Why?
15. When we “suck” using a straw, the liquid travels up into it. Explain why?
16. In a car, friction is essential in some parts but needs to be reduced in some parts. Give two examples of where friction is a) Essential and b) Needs to be reduced in a car.
17. Arasu went to an exhibition. There he saw a magician lying on a bed of nails. To his wonder, the magician was not hurt at all. Help Arasu to understand the phenomenon.

**Project Work**

Take a brick. Measure its length, breadth and height. Weigh the brick on a balance and note its weight. Now keep the brick on a table in various positions in turn. Find its area of contact with the table. The weight of the brick is the force applied by the brick. Now calculate the pressure applied by the brick on the table in various positions. Prepare a chart showing your observations. Similarly find the pressure exerted by a book, a wooden block, etc., and note your observations in the chart.

Magdeburg Hemispheres

Otto von Guericke, a German scientist of the 17th century, invented a pump to extract air out of a vessel. With the help of this pump, he demonstrated dramatically the force of the air pressure. He joined two hollow metallic hemispheres of 51cm diameter each and pumped air out of them. Then he employed eight horses on each hemisphere to pull them apart. So great was the force of air pressure that the hemispheres could not be pulled apart.



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'I can, I did'

Student's Activity Record

Subject: