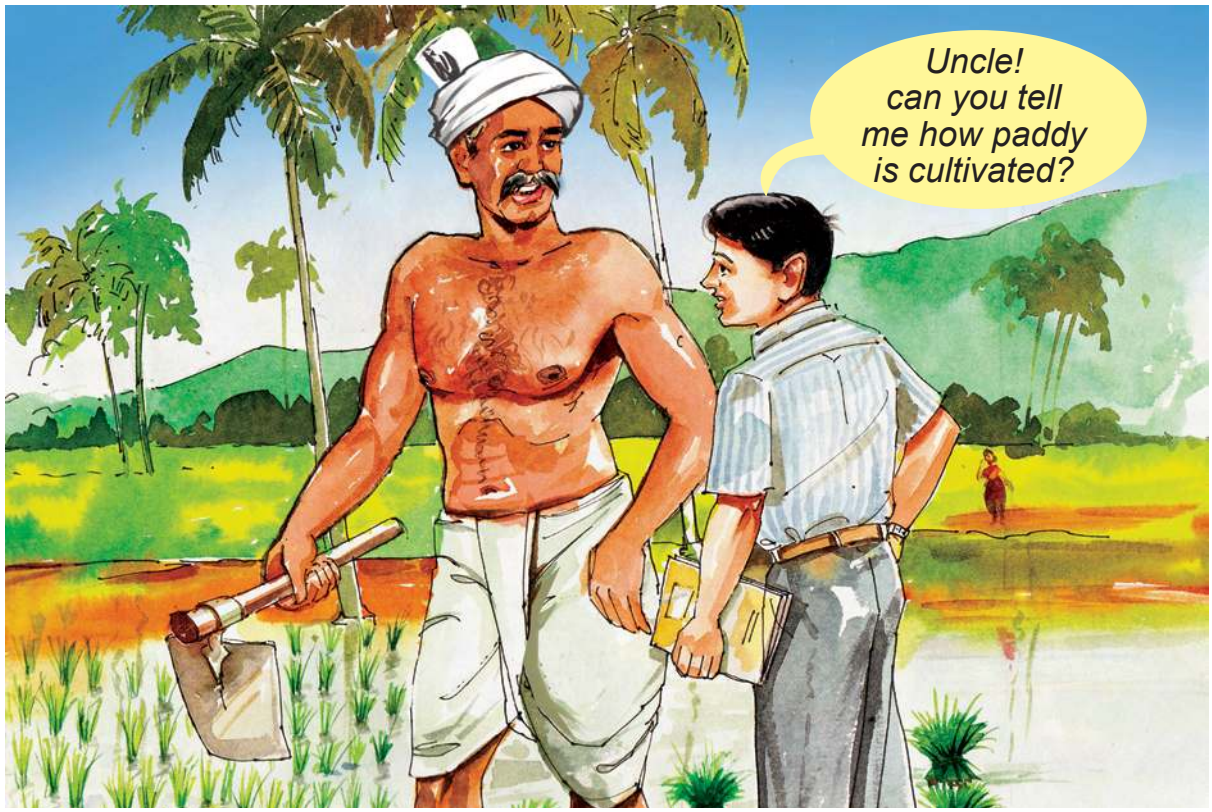
SCIENCE

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: Now a days ploughing is done by tractor driven cultivator. The use of cultivator saves labour and time.

Tractor and cultivator

SCIENCE

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

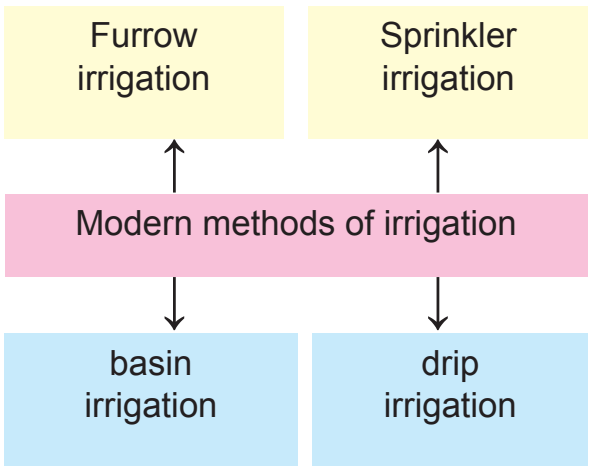
i) Traditional Method

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

SCIENCE

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

SCIENCE

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

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

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.

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.eg. 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 varities with desirable qualities.
3. **Polyploid breeding:** Method to increase the chromosomal number.

SCIENCE

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 virto) 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 unsaturated fatty 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

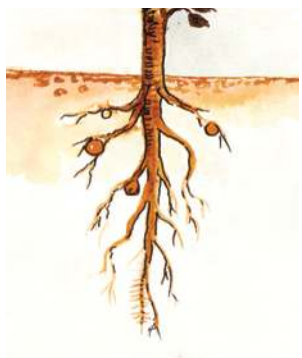
a) Furrow irrigation	—	to irrigate grapes, banana etc.,
b) Basin irrigation	—	used where soil can't retain water.
c) Sprinkler irrigation	—	between two rows of crop.
d) Drip irrigation	—	paddy field.

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)

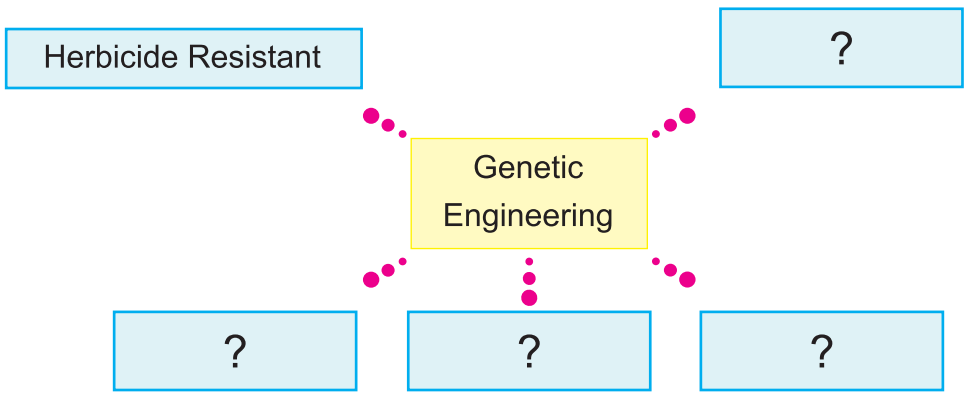
- Mani is repeatedly cultivating same paddy crop in his field and getting poor yield.
- Nathan likes to go for changing the crops every season and getting good yield.
- From the above statements find out and justify the best method of agricultural practice.

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

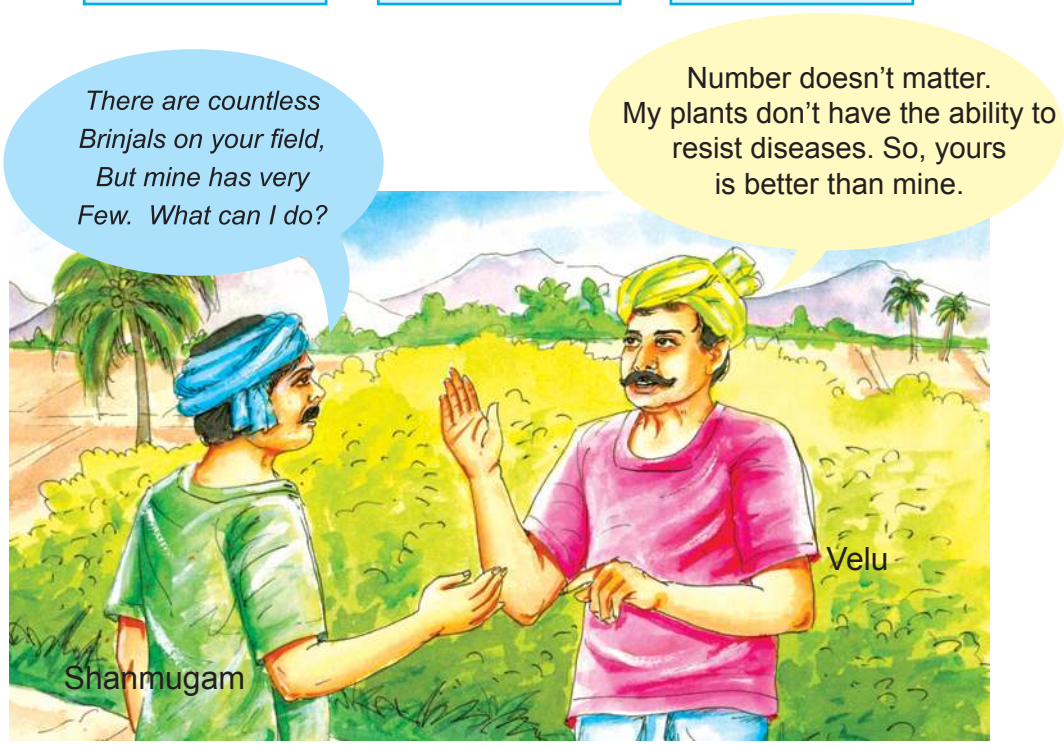
(Apple, Wheat, Potato, Rice, Grape, Sorghum)

Dry storage	Cold storage

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



8. b)

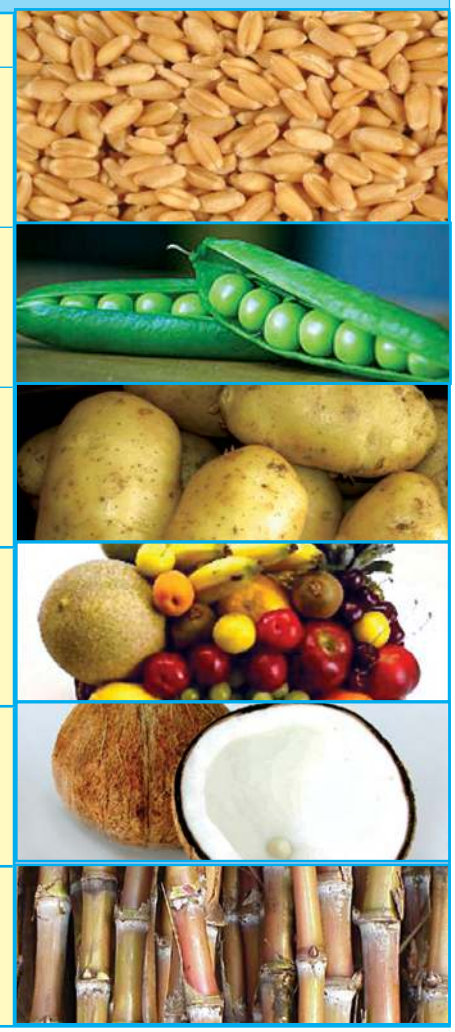


From the above statements, suggest techniques to overcome the problems of Shanmugam and Velu.

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----------



FURTHER REFERENCE

Books:

Bio technology - A.K.Panday - CBS publication

Biology - Understanding life IV the edition, Wallace, Sanders - Ferlcollins College publishers Science encyclopedia - Mathew Coles

Webliography:

www.msswaminathan.com

www.biotechnology.com

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.

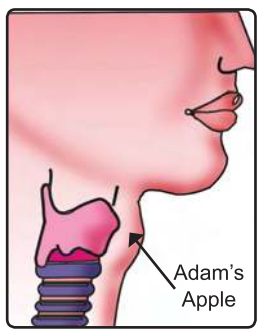
Changes at Puberty

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, where as 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

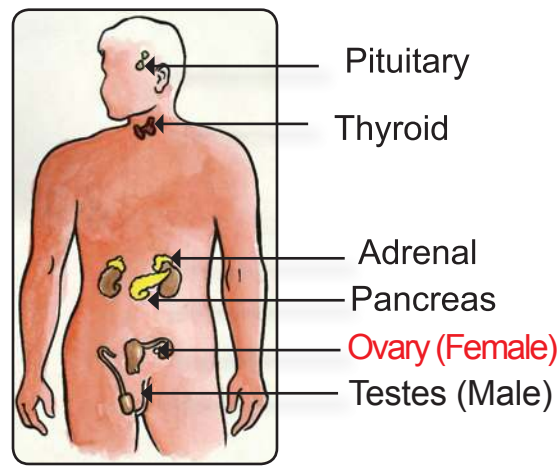
Introduction

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 GIRLS

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.

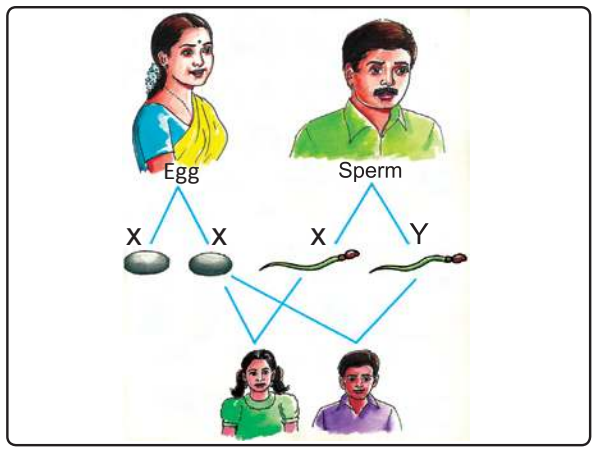
2. Menstruation or the period: This is the outward sign of the routine cycle of egg production and hormone change in a woman's body. It takes about 3 – 5 days.

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 defecatio
10. If you are not well, do no 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 allow 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

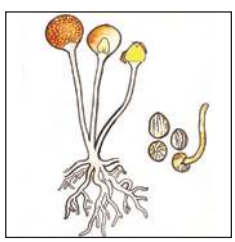
Robert.Harding Whittaker, American plant ecologist classified the plants and animals into five kingdoms, which you already studied in the class seven. Let us know in detail about the kingdom fungi and plantae in this chapter.

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

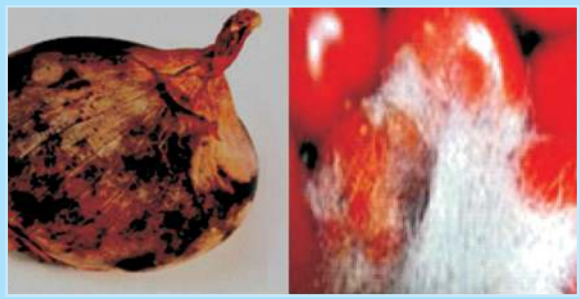
1. They may be unicellular (e.g., Yeast) or multicellular (Rhizopus, Agaricus and Aspergillus)
2. They are non- green organisms as they lack chlorophyll.
3. Their body is made up of hyphae called mycelium and is covered by cell wall made up of chitin.
4. It reproduces by sexual or asexual reproduction.
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.....



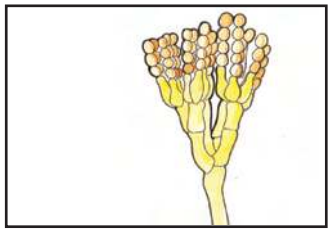
Fungus affected Onion and tomato

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

Zycomycota (Bread Mould)	Basidiomycota (Agaricus)	Ascomycota (Toad Stool)	Deuteromycota (Penicillium)
			

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 anitbiotics are Streptomycin, Neomycin, Kanamycin, Gentamycin and Erythromycin.

3.Vitamins

Fungi *Ashbya gospii* and *Erymothecium 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, athlets 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 near by mushroom cultivation centre and learn the process of cultivation.

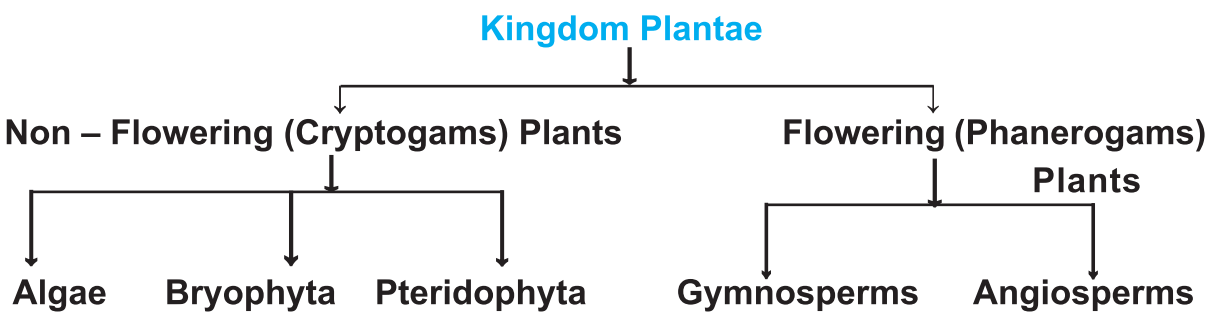
MORE TO KNOW

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

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

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).

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 *Gracillaria.*
- It is used to make ice creams.
- 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

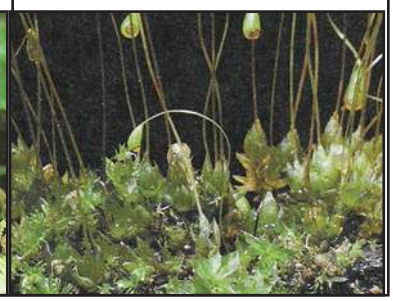
- *Chlorella pyrenoidosa* is used in space travel to get rid of CO_2 and other body waste and it also decomposes human urine.

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
• Undifferentiated thallus • Protonemal stage absent e.g.,Riccia	• Sporophyte is differentiated in to seta and capsule • Protonemal stage absent e.g. Anthroceros	• 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.

SCIENCE

3.5. PTERIDOPHYTES

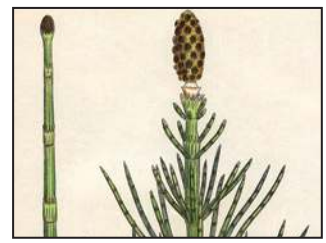
The first successful group of cryptogames to live on the land with a vascular system are pteridophytes. They are called vascular cryptogams (xylem and phloem are present in order to conduct water and food). These plants are living since the Jurassic period.

- 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.

Pteridophyta

Psilopsida	Lycopsida(Club mosses)	Sphenopsida(Horsetails)	Pteropsida
e.g., Psilotum	e.g., Lycopodium	e.g., Equisetum	e.g., Nephrolepis






Uses of Pteridophytes

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

3 .6. GYMNOSPERMS

- Plant body is differentiated in to root ,stem and leaf.
- Well developed tap root system
- Leaves vary in nature
- Gymnosperms undergo secondary thickening

Gymnosperms

- 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 coralloid 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

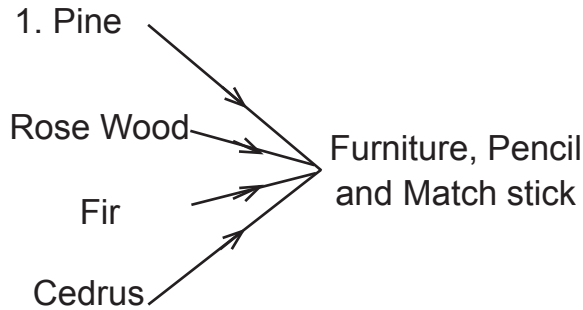
Pinus tree

4. Gnetales:- e.g., Gnetum

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

Gnetum

Uses of gymnosperms



SCIENCE

2. Timber, oils and resins are produced from Pinus. Resins are used in the manufacturing of paints, oinments and varnishes.

3.Ephedra → Ephedrine (Alkaloide) → 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).
5. Ovules are enclosed within the carpels of ovary which later gets modified into fruit. Ovules become seeds and seeds have cotyledons.

Angiosperms

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

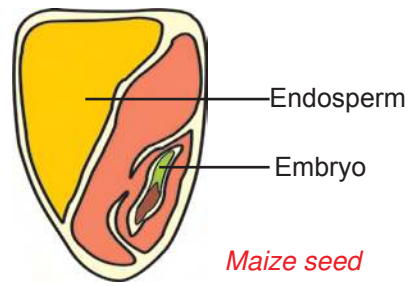
Classification of angiosperms

ACTIVITY 3.5

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

3.8. MONOCOTYLEDONS

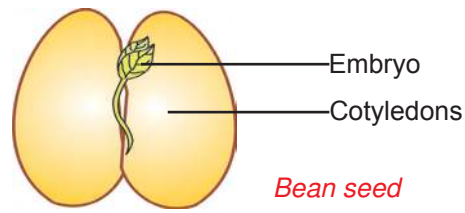
The plants which have seeds with only one cotyledon are called as monocotyledons. e.g., Grass, Paddy, Maize and Wheat



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

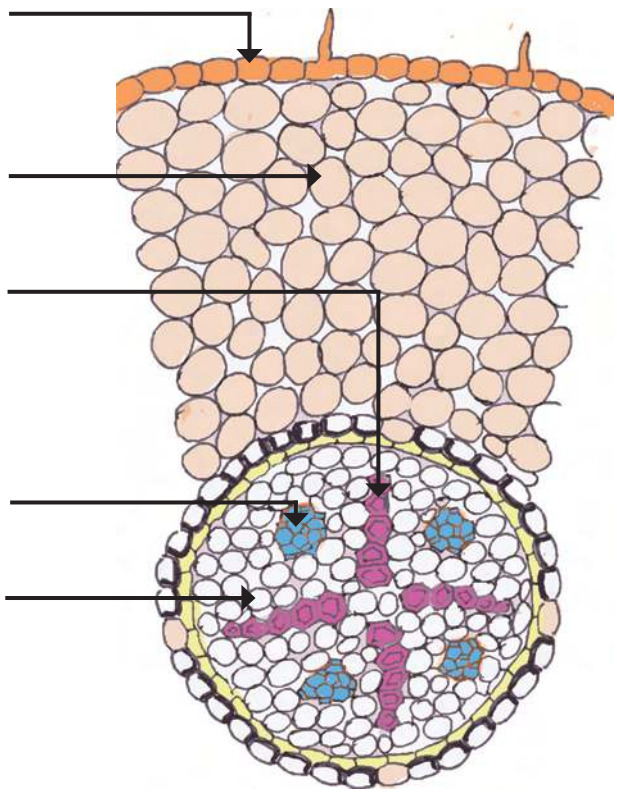
Parts of the plant	Dicot	Monocot
Root	Tap root system	Fibrous root system
Leaf	Reticulate veination	Parallel veination
Flower	Calyx and corolla are differentiated eg. Mango, Neem. Floral parts are in the sets of 4 or 5.	Calyx and corolla not differentiated but fused to form perianth. Floral parts are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

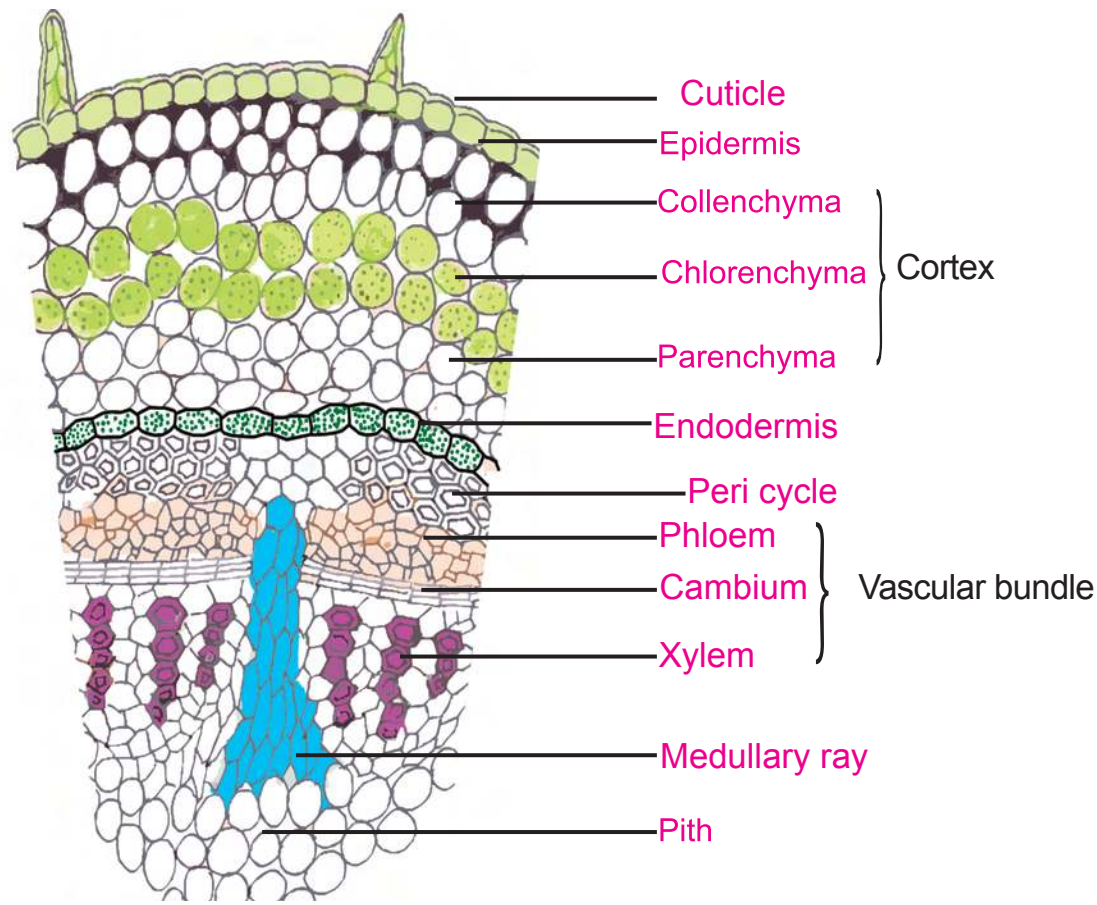
- Endodermis (Starch Sheath) – barrell shaped, helps in protection and conduction.
- Pericycle - parenchyma alternates with sclerenchyma
- Vascular bundle

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

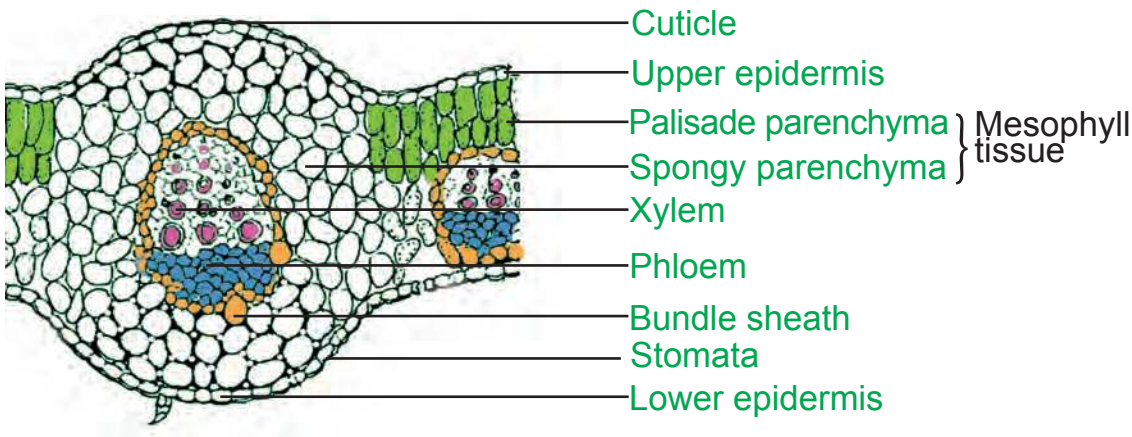
- Cuticle – Outermost layer.
- Upper epidermis – Barrel shaped cells. Helps in protection.
- Vascular bundle - xylem conducts water, phloem translocates food.
- Lower epidermis – barrell shape , have stomata,helps in exchange of gases and transpiration.
- Mesophyll tissue

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

Spongy parenchyma – oval or round shaphed 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)

SCIENCE

EVALUATION

1. Choose the correct answer

a) An example of saprophyte. (Puccinia / Agaricus) _____

b) Agar-agar is obtained from (Gelidium / Chlorella) _____

c) _____ is a palm like Gymnosperm. (Cyca / Pinus)

d) _____ are called as amphibious cryptogams(Bryophytes/Pteridophytes)

e) The algae which decomposes human urine is _____ _____[spirullina/chlorella]

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.

A

B

5.

a) Match the following

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

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

FURTHER REFERENCE

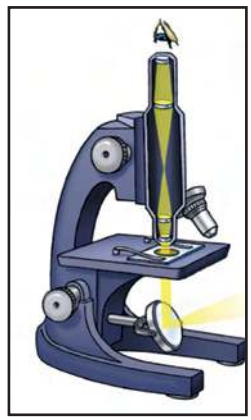
Books: Outline of Botany- R.V. Narayanasamy, K.N.Rao. and Dr. A. Raman - S.Viswanathan Printers and Publishers

Webliography:

www.fivekingdomclssification.com
www.wikipedia.org/wiki/plants

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.

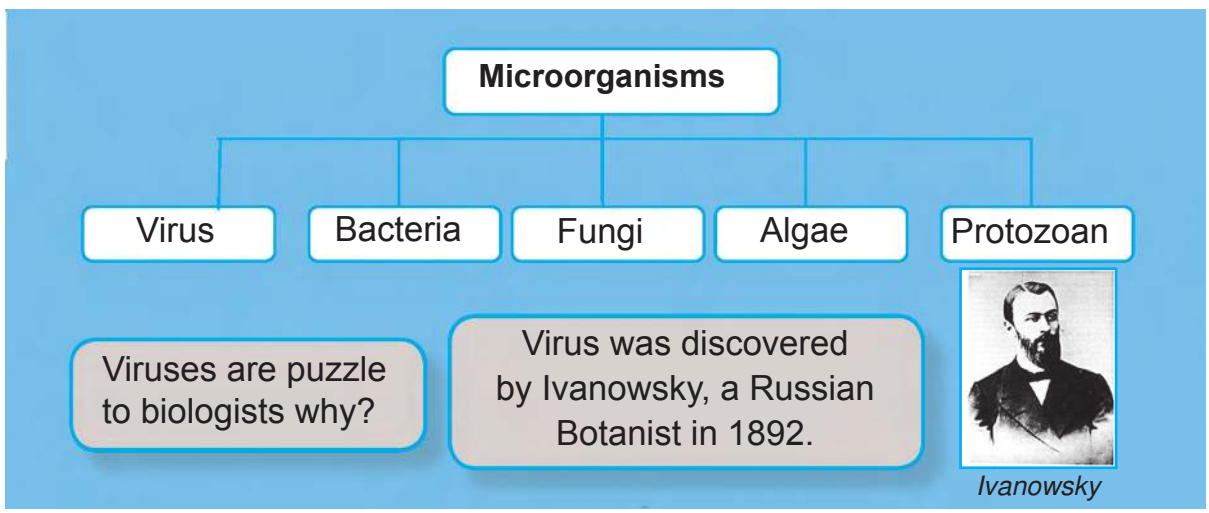
As both of them started browsing the internet about microorganisms, they started getting information about microorganisms.

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.***

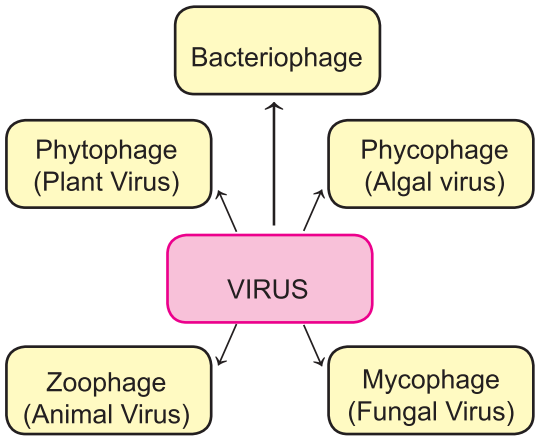
4.1. VIRUS

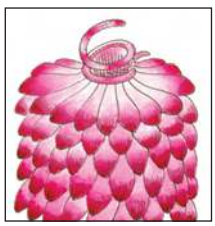
Virus is a Latin word which means **poison.** Viruses are the smallest and simplest of all living organisms. The study of viruses is called **Virology.** Viruses show both living and non-living characteristics. They are considered as being on the border line between living and non-living organisms.

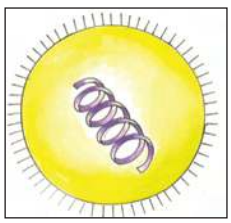


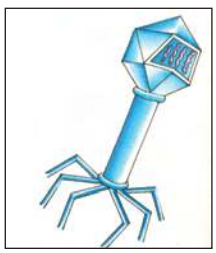
The living cell inside which the virus grows and multiplies is known as host cell. Outside the host cell, viruses do not show any of the characteristics of living organisms.

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




TMV


Influenza Virus


T2 Bacteriophage


Adeno Virus

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?

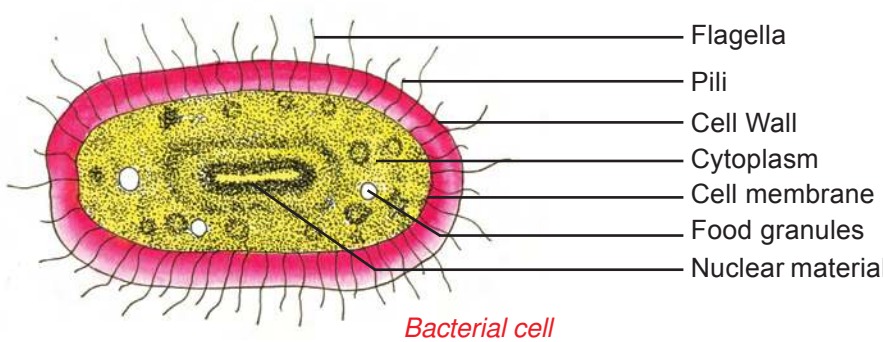
microscopic, belonging to the world of microbes. The study of bacteria is called **Bacteriology.** Bacteria were first observed under a microscope by the Dutch Scientist Anton Von Leeuwenhoek in 1675. Later, Louis Pasteur, Robert Koch and Lord Lister carried out detailed studies on bacteria.

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

SCIENCE



Bacterial cell

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.

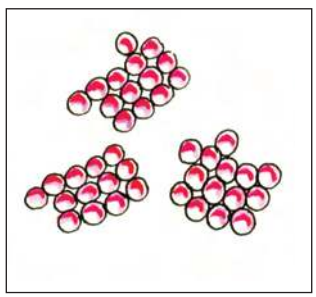
Bacteria are measured in microns. 1 micron = 1/1000 millimetre.

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

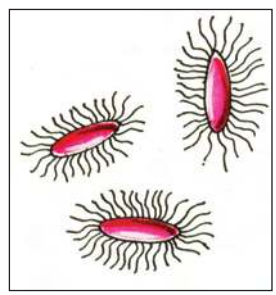
1. Cocci (Spherical shaped)
2. Bacilli (Rod shaped)
3. Spirillum (Spiral or cork screw)
4. Vibrio (Comma Shaped)

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

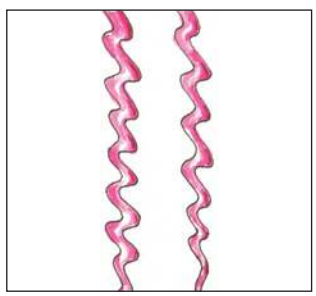
1. Monotrichous (Single flagellum at one end)



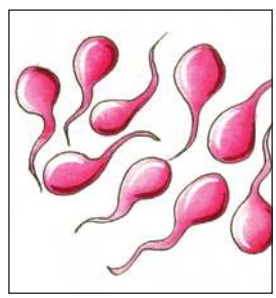
1. Cocci (Spherical shaped)



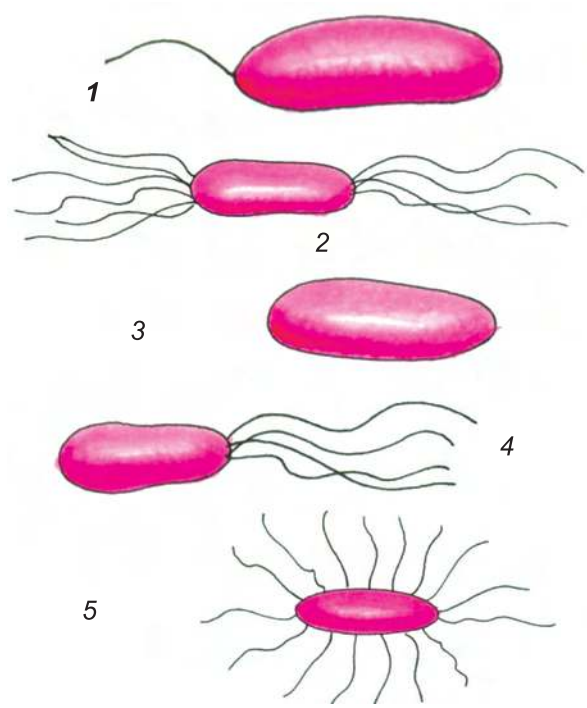
2.Bacilli (Rod shaped)



3. Spirillum (Spiral or cork screw)

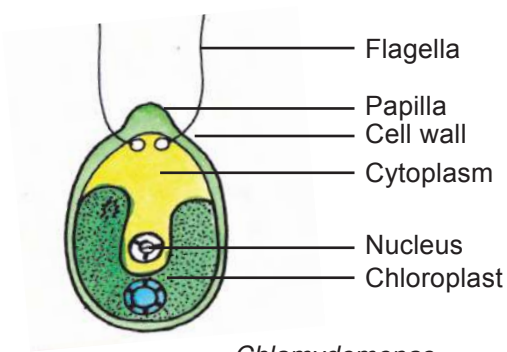


4.Vibrio (Comma Shaped)



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

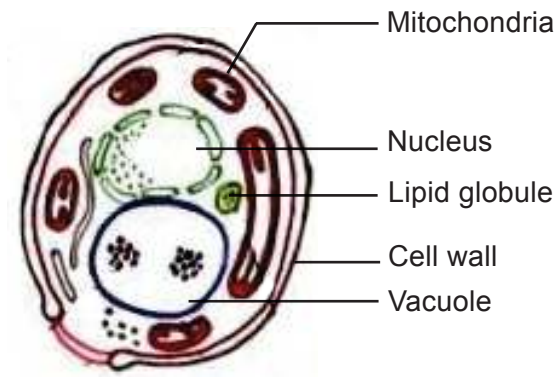
Chlamydomonas is a unicellular green algae. It is spherical or oval in shape. The protoplasm is surrounded by a cellulose cell wall. The cell wall may have a pectic sheath around it. There is a single large cup-shaped chloroplast. Inside the chloroplast a pyrenoid which contains starch may be present. 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 ¾ 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

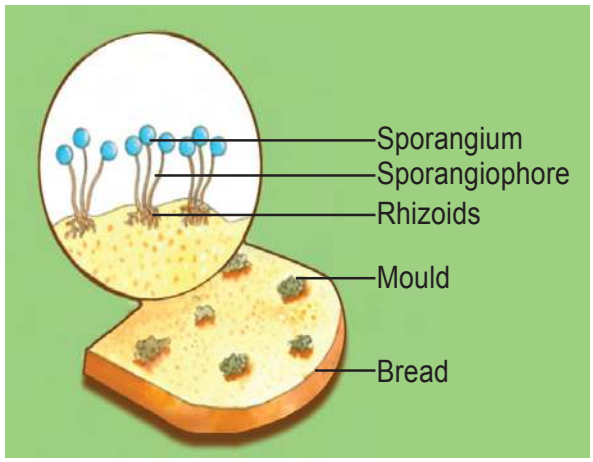
The conversion of sugar solution into alcohol and liberation of carbon dioxide is known as **fermentation**. Here the sugar solution is fermented and gives a smell. Wine, alcohols are prepared from the molasses by the fermentation activity of the yeast. etc.



Yeast cell

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

SCIENCE



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

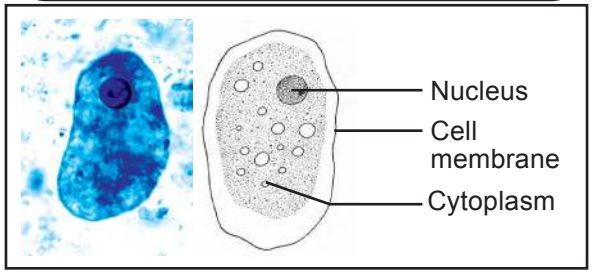
PROTOZOA

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.

Entamoeba histolytica - Amoebic dysentery

Plasmodium vivax, Plasmodium falciparum } Malaria

Trypanosoma gambiense - African sleeping sickness



Entamoeba histolyitica

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'.

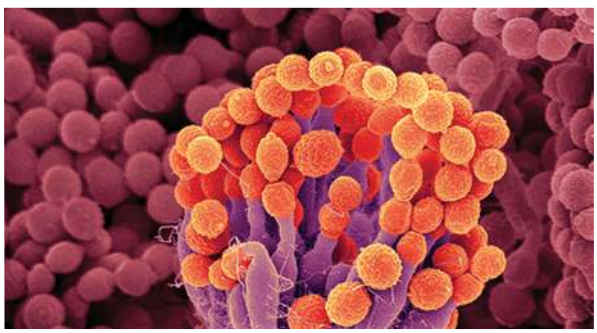
Alexander Fleming

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 industries. Microorganisms are used to enrich the soil fertility.

Name of the Species		Antibiotic
Bacteria	Streptomyces griseus Bacillus subtilis	Streptomycin Bacitracin
Fungi	*Penicillium notatum* *Penicillium chrysogenum*	Penicillin



Penicillium notatum

Penicillin

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

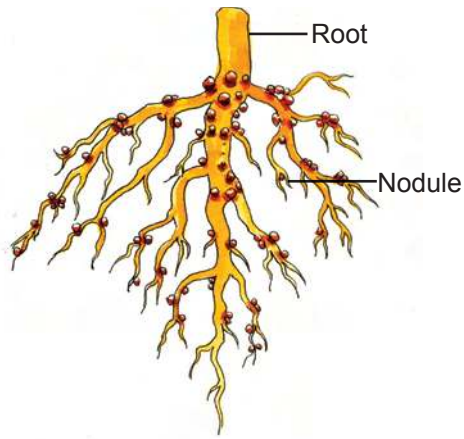
SCIENCE

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 Nitrosommonas.*



Root nodule

Nitrogen-fixing bacteria:- e.g., *Azatobactor, 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?

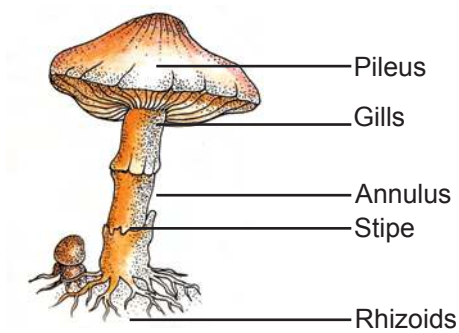
In the world today many industries totally depend upon the microbial activities of microorganisms such as Lactic acid bacteria.

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

- 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?

The diseases caused by Microorganisms in Plants

S. No	Micro-organisms	Name of the Species	Diseases
1	BACTERIA	*Xanthomonas citri* *Pseudomonas solanacearum* *Xanthomonas oryzae*	Citrus Canker Wilt of Potato Bacterial blight in Rice
2	FUNGI	*Cercospora personata* *Cercospora arachidicola* *Pyricularia oryzae*	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.

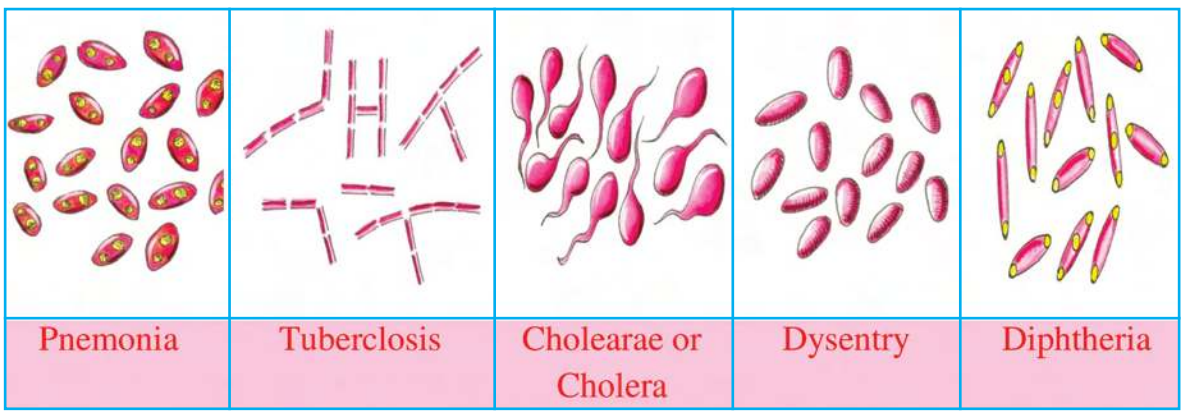
Communicable diseases are pathogenic diseases which spread from, person to person, either directly or indirectly. The following table shows some of the common communicable diseases in man.

The diseases caused by Microorganisms in Human beings and animals

PATHOGEN	DISEASES	MODE OF TRANSMISSION
VIRUS	Common cold, Polio. Hepatitis, Influenza, Jaundice. AIDS	Air water, direct contact Sexual Contact
BACTERIA	Cholera, typhoid	Contaminated water.
	Tetanus	Cuts and wounds
	Leptospirosis	Contact of animal's urine. (Rat and Squrriel)
	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.



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?

Pasteurisaton 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

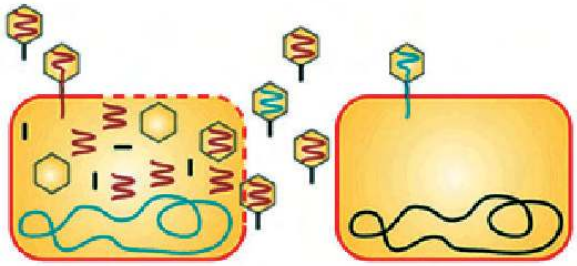
Gene transfer by virus and bacteria

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).

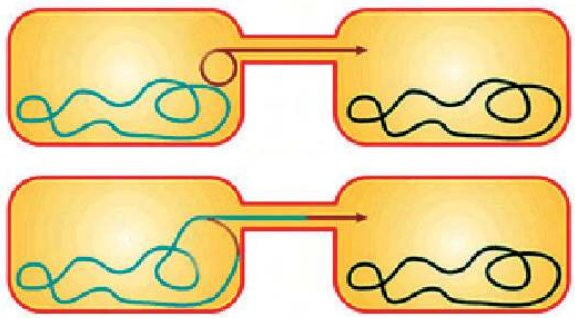
Viruses are very much used as biological research tools due to their simplicity of structure and rapid multiplication.

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.

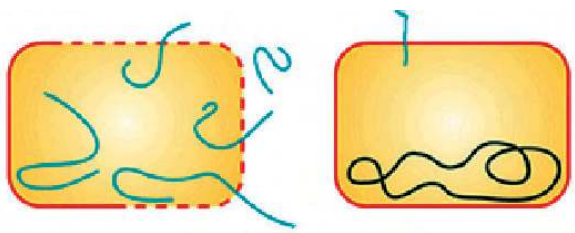
By conjugation method, the fertility factor, undergoes replication.



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 ACITIVITY

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 :

   a) Algal bloom leads to loss of species diversity which is known as _____. (Eutrophication, Pasteurisation)

   b) Which one of the following cause amoebic dysentery? (Entamoeba histolytica, Plasmodium vivax, Plasmodium falciparum)

   c) Milk is heated to 72^{o} C for 30 minutes and then suddenly cooled to12^{o} C. Microbes are killed without causing damage to the taste and quality of milk. Name this process (dehydration, pasteurisation)

   d) Nodules are responsilble for nitrogen fixation. Name the bacteria present inside the root nodules. (*Acetobactor, 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.

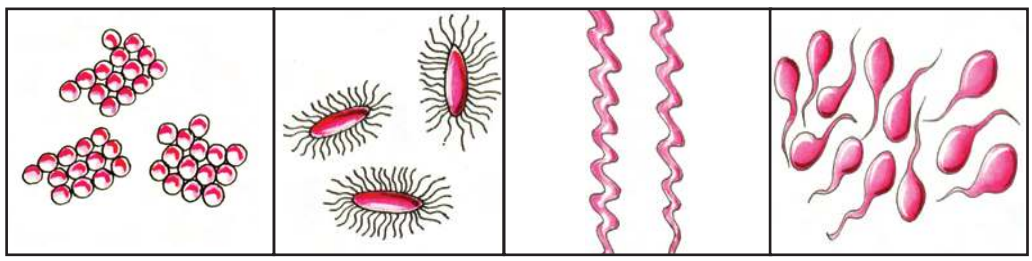
4. Communicable diseases are pathogenic diseases which are spread from person to person either directly or indirectly. Write the mode of transmission of the following diseases.
   i) Cholera, typhoid
   ii) Malaria

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.

SCIENCE

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.