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Science





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E-Book



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1 FOOD



Learning Objectives

After completing this lesson, students will be able to:

- ❖ know about spoilage of food and food preservation methods.
- ❖ list out the deficiency diseases and the prevention methods.
- ❖ know about obesity and the method of calculation of BMI.
- ❖ understand the importance of balanced diet.
- ❖ identify the safety measures to be followed in the kitchen.



Introduction

Our body needs nutrients like proteins, carbohydrates and fats for its proper functioning. We get these nutrients from the food we eat. If we do not take all these nutrients in right proportion, it results in some diseases. Sometimes, we do not preserve the food properly and it gets spoiled. Through the spoiled food also we get diseases. So, we need to preserve the food we eat. In this lesson we will study about spoilage of foods and the ways to preserve them, deficiency diseases, balanced diet and kitchen safety.



I. Spoilage of Food

Food items like fruits, vegetables, milk and meat will be fresh for very short period. These are called perishable foods and they get spoiled easily. Some food items like rice have long life time, but they also decompose. The change in the normal state of the food is called spoilage of food. Spoiled food becomes unsuitable to eat. We can notice such changes from the taste and smell of the spoiled food. Eating spoiled food may cause diseases.



Activity 1

Classify the following into perishable and non-perishable food items.

Salt, Sugar, Apple, Corn, Orange, Wheat, Pulses, Tomato, Papaya, Rice, Cucumber.

1 Causes

Once the food items are harvested they begin to decompose. Food can be spoiled by factors like air and oxygen, moisture, enzymes, microorganisms, light and temperature.

Air and Oxygen: When oxygen reacts with food contents, it produces changes in the colour and flavour of the food.

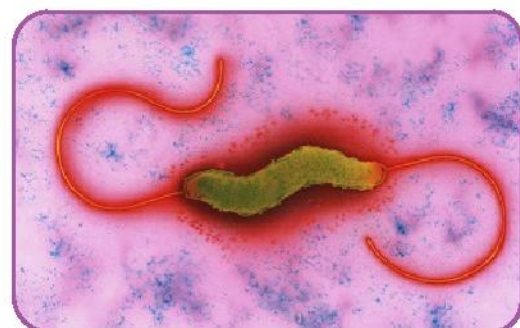
Moisture: Moisture keeps the food fresh. When the moisture is gone vegetables and fruits shrink. Due to evaporation, moisture loss occurs in foods like meat, fish and cheese.

Enzymes: Enzymes break down the larger molecules of the food in different ways like oxidation, browning and ripening. So the food items decay.

Micro-organisms: Micro-organisms such as fungi, yeast and bacteria can grow well in low temperatures. They multiply in food and spoil them.

Light: Light produces colour changes and also vitamin loss.

Temperature: Sometimes rise in temperature causes food spoilage.



Activity 2

Look at the fruits and vegetables in your house. Is there any spoiled one? Find out the reason for spoilage.

2 Effects

Spoiled foods are not suitable to eat. They may not be fresh and tasty. Sometimes it will be harmful to consume them. Micro-organisms present in spoiled foods may cause foodborne diseases like stomach pain, fever, dysentery, vomiting and indigestion.



II. Preservation of Food



The process of keeping the food materials for a long time without being spoiled is called preservation of food. Food will be spoiled if it is not prepared, preserved and handled in the right way. There are many methods used to prevent, delay and reduce the spoilage of food.

1 Food Preservation Methods

Cultivation of food requires lot of efforts. Nowadays food cultivation and the crop yield are decreasing. There are many people suffering in the world without food. So, we need to protect and preserve the food. The following are the ways to preserve food.

Drying: It is the process of removal of water content from the food by drying it in the sunlight. E.g. Grains

Addition of salt: It is the method of adding salt to food to remove the water. E.g. Fish, Pickles

Addition of sugar: In this method sugar is added to food. Sugar dissolves in the water content of the food and preserves the food items from spoilage. E.g. Jam, Fruit juices.



Do you know?

While purchasing packed food items, we should check the following details.

1. Manufactured date
2. Expiry date
3. Ingredients
4. Energy content of the food material.



Freezing: The microbial growth and the enzyme activity on the food items can be prevented by this method. E.g. Fruits, Vegetables.

Boiling: Boiling kills the micro-organisms present in the food materials. E.g. Milk, Water.

Canning: In this method, food is packed in air tight cans so that germs do not grow on them. E.g. Milk powder.

Addition of chemical preservatives: Chemical preservatives are added to stop the growth of micro-organisms in certain food materials. E.g. Sodium benzoate is added with fruits, Sulphur dioxide is added with dry fruits, Vinegar is added with pickles.



Do you know?

Irradiation is the modern method in which, food is exposed to gamma rays or ultra violet rays to kill the bacteria and the fungi. It does not affect the taste of the food or nutritive value of the foods. E.g. Onion, Potatoes.



2 Purpose of Food Preservation

Food production has increased due to modern technologies. Yet, agricultural practice is abandoned in many places as there is failure of monsoon. At the same time many people suffer in the world without food. So, food should not be wasted by any means. Preservation of food is important for the following reasons.

1. To retain the colour, taste and nutritive value of the food.
2. To make food available throughout the year.
3. To prevent the growth of micro-organisms like bacteria and fungi in the food items.
4. To reduce wastage of food items.
5. Preserving food not only protects our health but also makes food available to the people who need it.



III. Obesity

Obesity and overweight are defined as abnormal or excessive fat accumulation in the body that may affect the health. Obesity is most commonly caused by excessive food intake, lack of physical activity and genetic reasons. Obese people take more food, but work very less. When they eat more and work less, excess energy is accumulated as fat and creates problems. Obesity increases the chances of heart disease, diabetes and high blood pressure.

1 Prevention

Obesity is mostly related to our lifestyle and habits. Eating healthy foods and having regular physical activity can reduce obesity and overweight. It is important that we maintain proper weight in the young age. In order to avoid obesity and overweight we need to do the following.

1. Avoid fast foods, fried items and meat with more fat.
2. Eat fruits and vegetables, legumes, whole grains and nuts.
3. Do regular physical exercises.
4. Don't play games in computer and mobile phones.
5. Have adequate sleep.



2 Body Mass Index

People are generally classified as obese and overweight based on Body Mass Index (BMI). Body mass index is obtained by dividing a person's weight in kilograms by square of his height in metres (kg/m^2).



Do you know?

People with BMI between 18.5 and 25 have less chance of developing diseases like cancer, heart disease and diabetes.

For example, BMI of a person with 60 kg weight and a height of 190 cm can be calculated as below.

$$\begin{aligned}\text{BMI} &= \text{Weight in kg} / \text{Height in m}^2 \\ &= 60 / 1.90 \times 1.90 \\ &= 60 / 3.61 = 16.62 \text{ kg/m}^2\end{aligned}$$

If the BMI is over 30 kg/m² people are said to be obese. The BMI range of 25–30 kg/m² denotes overweight.



Activity 3

Find your B.M.I

$$\begin{aligned}\text{My B.M.I} &= \frac{\text{My weight} \text{ ---- kg}}{\text{My height} \text{ ---- in m}^2} \\ &= \text{----- kg/m}^2\end{aligned}$$



IV. DISEASE

Disease is an abnormal condition that affects a living organism. This abnormal condition affects its structure and function. Diseases may be caused by external factors as well as internal dysfunction. Each disease has symptoms. We come to know about the diseases from their symptoms.

1 Causes of Diseases

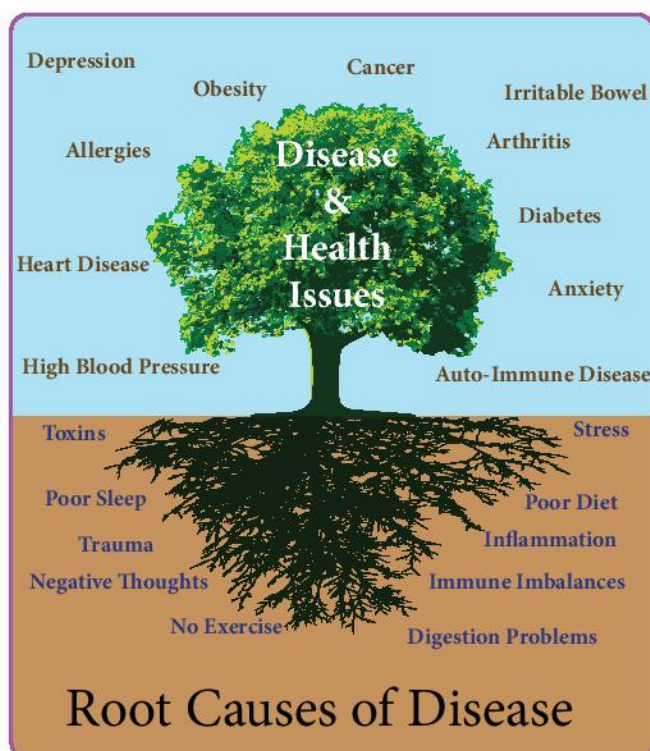
Diseases are mostly caused by micro-organisms like bacteria, virus, protozoa and fungi. They are transmitted by insects, and also through polluted air and contaminated water. Some diseases are caused when the function of the organ is affected. In general, causes of diseases can be classified as below.

- Metabolic factor. E.g. Diabetes
- Genetic factor. E.g. Colour blindness
- Microorganisms. E.g. Bacterial diseases
- Nutritional factor. E.g. Marasmus
- Environmental factor. E.g. Cholera



Activity 4

Find out the common diseases prevalent in your area. Find out the reason for them and discuss with your teacher how to get remedy for them.



2 Types of Diseases

There are four main types of diseases. They are:

- Infectious diseases
- Hereditary diseases
- Physiological diseases
- Deficiency diseases



Do you know?

More number of people die every year due to heart diseases than any other diseases.

a. Infectious diseases

Infectious diseases are caused by microorganisms which enter our body and multiply inside them. These diseases spread from one person to another. E.g. Common cold, Covid - 19.

b. Hereditary diseases

Hereditary diseases occur due to abnormalities in the gene. These diseases are passed from parents to children. E.g. Heart disease.

c. Physiological diseases

Diseases which are caused due to malfunction of the body organs are called physiological diseases. E.g. Asthma.

d. Deficiency diseases

A diet which contains all essential nutrients in correct proportion is indispensable for maintaining good health. Deficiency in one or more of the nutrients causes various diseases. These diseases are called deficiency diseases.

❖ Protein deficiency diseases

Marasmus and Kwashiorkor are the protein deficiency diseases. The child affected by marasmus loses weight and it will appear as though bones are covered by skin. The child affected by kwashiorkor develops an enlarged belly with swollen face and feet. By eating protein rich foods like egg, milk, fish and green leafy vegetables we can avoid protein deficiency diseases.



Do you know?

Kwashiorkor disease is found more among people in developing countries. It is because their diet is high in carbohydrates which is cheaper and low in proteins which is costly. As they live below poverty line, they couldn't afford protein rich food.



❖ Vitamin and mineral deficiency diseases

Certain diseases are caused by deficiency of vitamins and minerals. By eating vitamin and mineral rich food items, we can avoid these diseases. The following table gives some of the diseases caused by deficiency of vitamins and minerals and the food items which rectify them.

Name of the Vitamin / Mineral	Name of the disease	Food containing the Vitamin / Mineral
Vitamin -A	Night blindness	Egg, Milk, Carrot, Papaya
Vitamin -B	Beriberi	Milk, Peas, Cereals, Green vegetables
Vitamin -C	Scurvy	Amla, Orange, Lemon, Tomato
Vitamin -D	Rickets	Sunlight, Milk, Egg, Fish
Vitamin -E	Sterility	Apple, Wheat, Green vegetables
Vitamin -K	Haemorrhage	Green vegetables, Tomato, Cabbage
Iodine	Goitre	Iodized salt, Vegetables
Iron	Anaemia	Cashews, Beans and lentils, Spinach



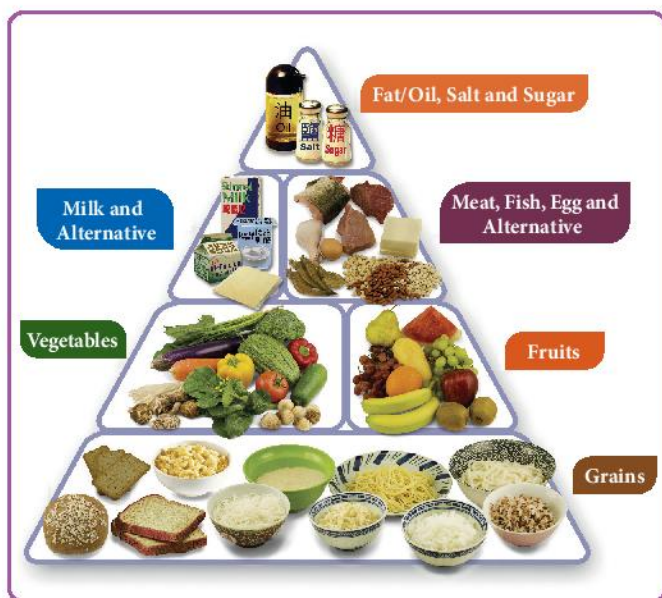
V. Food Pyramid

Food pyramid is designed to select healthy foods. Depending upon our work, age and sex, the requirement of various nutrients vary from person to person. For example, growing children need more proteins in their food. People doing hard physical work (labour) need more carbohydrate and fat in their diet. Eating healthy breakfast helps to improve concentration and it boosts metabolism also.

Balanced diet

The food we normally eat in a day is our diet. For growth and maintenance of good health, our diet should have all the nutrients in right quantities. Such a diet is called balanced diet. Pulses, groundnut, soya beans, sprouted seeds, fermented foods, banana, jaggery, seasonal vegetables and fruits provide more nutrients. Therefore, one can have a balanced diet without much expenditure. Some major food items are given in the table below.

Major Nutrients	Sources
Carbohydrates	Honey, Sugarcane, Fruits, Whole grains, Vegetables, Rice
Proteins	Legumes, Pulses, Nuts, Soya bean, Green leafy vegetables, Fish, Egg, Milk
Fats	Egg yolk, Saturated oil, Meat



Do you know?

Spinach and Ponnanganni are some of the low cost, highly nutritive food materials. They contain more minerals, vitamins, and fibrous nutrients. They are available in all seasons.



Spinach



Ponnanganni



VI. Kitchen Safety

Kitchen is an important place in our home. We prepare our food in the kitchen. We use gas cylinders for cooking. Some of us may use electric stoves. The equipments and the environment in the kitchen may be little dangerous. So we need to be cautious and careful. The dangers related to the things used in the kitchen and the safety measures to be taken are explained below.

Gas

Gas catches fire easily. Once gas is leaked there may be dangerous consequences. So, we need to be careful while handling gas cylinders. The following table gives what should we do and what we should not do while handling gas cylinders.

Do's	Don'ts
Keep the cylinder in vertical position at plain level and in a well aired place.	Do not keep the cylinder in horizontal or inverted position.
Keep the lighter ready and then turn on the gas stove knob.	Do not turn the gas stove knob before lighting the lighter. It may lead to gas leakage.
Keep the windows and doors open to ensure ventilation in case of gas leakage.	Do not turn on electrical appliances in the kitchen, if there is a gas leakage. It may lead to fire.
Always use I.S.I standard gas stoves, regulators and gas tubes.	Do not use low quality gas stoves, tubes and regulators. It may lead to gas leakage.

Electrical appliances

- Do not operate electrical appliances with wet hands, because it leads to electric shocks.

Fire

- Do not keep the inflammable materials like kerosene etc, near the stoves.
- In case of person's clothes catching fire, cover the person with a thick blanket or carpet.
- If kerosene or oil catches fire, use sand to put out the fire.
- If solid materials like wood catch fire, use water to put out the fire.
- If an electrical appliance catches fire, unplug the appliance and disconnect the electricity.
- Use proper fire extinguishers to put out the fire.



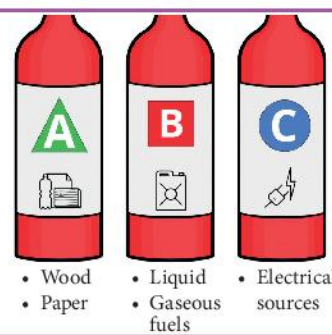
Do you know?

In order to avoid fire any one of the following should be done.

1. Cut off the fuel
2. Cut off the air supply.
3. Lower the temperature.



Type of Fire	Type of Fire Extinguisher
Class-A Wood, Paper	Water
Class-B Liquid, Gaseous fuels	Carbon dioxide
Class-C Electrical sources	Dry chemicals (Solid carbon dioxide and Sodium bicarbonate)



Burns

- In case of minor burns, the burnt area should be held under cool running water for some time and proper medical treatment should be given.
- Any blister if formed, should not be pricked.





Evaluation

I. Choose the correct answer.

- The biotic factor which spoils the food item is
A) drying B) temperature
C) humidity D) bacteria
- Grains are preserved by
A) drying B) freezing
C) adding sugar D) adding salt
- Anaemia is a disease which occurs due to lack of
A) Vitamin - A B) Vitamin - B
C) Iron D) Vitamin - D
- Storage of excess fat in the body is known as
A) obesity B) head ache
C) fever D) stomach pain
- Carbohydrates are rich in
a) ghee b) fruits
c) rice d) oil



II Fill in the blanks.

- Night blindness is caused by the lack of _____
- Marasmus is a _____ deficiency disease.
- Bad smell from the food item is due to _____
- Humidity in air is one of the _____ factor, which spoils food.
- Using low quality gas tubes in the gas stove may lead to _____ leakage.

III. Match the following.

- | | | |
|-----------------------|---|----------------------|
| 1. Protein deficiency | - | Vitamin - D |
| 2. Rickets | - | Physical inactivity |
| 3. Obesity | - | Inflammable material |
| 4. Kerosene | - | Fruits |
| 5. Freezing | - | Kwashiorkor |





IV. Say True or False.

1. Vinegar is added as a preservative for pickles.
2. Irradiation affects the taste of the food materials.
3. In case of gas leakage, we can continue to use electrical appliances.
4. Deficiency due to iodine is called as beriberi.
5. Growing children need more proteins in their food.

V. Answer briefly.

1. Define deficiency disease.
2. What is known as balanced diet?
3. How can we prevent obesity?
4. What should we do in case of minor burns?
5. Define spoilage of food.
6. What is the purpose of food preservation?

VI. Answer in detail.

1. Write about food preservation methods.
2. Explain the different types of food.
3. Write about kitchen safety.



2 Water



Learning Objectives

After completing this lesson, students will be able to:

- ❖ know about the sources of water.
- ❖ understand the importance of water management.
- ❖ get awareness on water pollution.
- ❖ know about waterborne diseases.



Introduction

நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு. - திருக்குறள்

Thirukkural says, 'If it be said that the duties of life cannot be discharged by any person without water, so without rain there cannot be the flowing of water'. We cannot survive without water. Water was once available in the nature freely. Now it is sold in the shops for money. Water has become scarce nowadays. So, we should preserve it for our basic needs and also for the needs of future generation. In this lesson we will study about the sources of water, how to manage water, how it is polluted and how the polluted water causes diseases.



I. Sources of Water

Water is the most abundant substance on the Earth. It fills the seas, rivers and lakes. Water covers more than two-thirds of the earth's surface. It also exists as snow and ice on mountains. In the atmosphere, water is present in huge quantities as vapour and clouds. The following are the sources of water.

1. River water and lake water
2. Sea water
3. Well water
4. Spring water
5. Underground water

1 River Water and Lake Water

River is a channel through which fresh water flows. The origin of river is usually hills or mountains. It flows towards lakes, sea and ocean. Lake is an area filled with water. Man-made lakes created when dam is built on a river is called reservoir. Small areas filled with water are called ponds. Rivers, streams, groundwater, rainfall, melting snows or a combination of these are the sources of water in lakes, reservoirs and ponds.

As less amount of salt is dissolved in it, it is suitable for drinking and irrigation.



2 Sea Water

Sea water has salinity of approximately 3.5% or 35 parts per thousand. This means that every 1000 ml of sea water contains 35 grams of salts (Sodium chloride) dissolved in it. Due to the presence of more amount of salt, sea water is called saline water. It is not suitable for irrigation as well as drinking.



3 Underground Water

During rainfall, part of the rain water gets absorbed in the soil. It flows through various layers of the soil till it reaches hard rock, where it gets accumulated to form reservoir. This reservoir of water is the underground water. This water may contain soluble salts of calcium and magnesium. Underground water is made available for human use either as well water or as spring water.



Do you know?

Underground water is free from suspended impurities, because it is filtered by nature as it passes through several layers of the soil.

4 Well Water

When the earth's surface is dug deep, water reservoirs are found above the rocks. The depth of a well varies from place to place. Well water contains soluble impurities depending upon the nature of the soil.



5 Spring Water

Sometimes the accumulated underground water applies pressure on the rocks and comes out of the earth's surface in the form of a spring from any available opening. This water is called spring water. Spring water usually contains dissolved salts and minerals, but it is free from suspended impurities.



II. Water Cycle

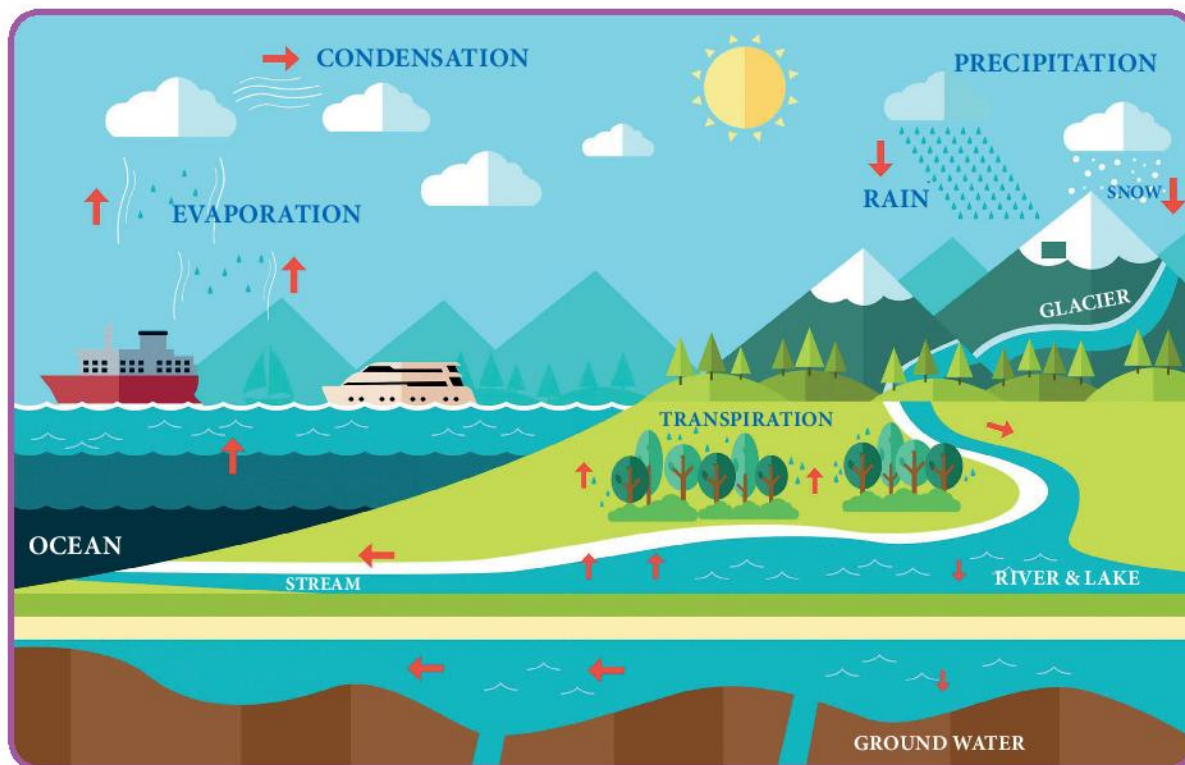
Continuous movement of water from the Earth to the atmosphere and back to the Earth is known as water cycle or hydrologic cycle. Water cycle consists of the following four stages.

❖ Evaporation

The process in which water is changed into water vapour by the heat of the sun is called evaporation. It takes place on the surfaces of rivers, oceans, lakes and ponds. Plants also release water by transpiration.

❖ Condensation

The process in which water vapour is converted into water on cooling is called condensation. Water vapour in the atmosphere being lighter, rises up and cools down. It further condenses to form tiny water droplets.



❖ Precipitation

The water droplets join together to form clouds. As they get cooler, the droplets become bigger and heavier and fall as rain. If the air is very cold, they freeze to fall as hail or snow.

❖ Flowing back to Oceans

Rain water forms streams and springs which join together to form rivers. Rivers flow finally into the sea and ocean thereby completing the water cycle.



Do you know?

In freezing conditions, water falling from the sky becomes snow or hail. Hail stones are balls of ice.

Activity 1

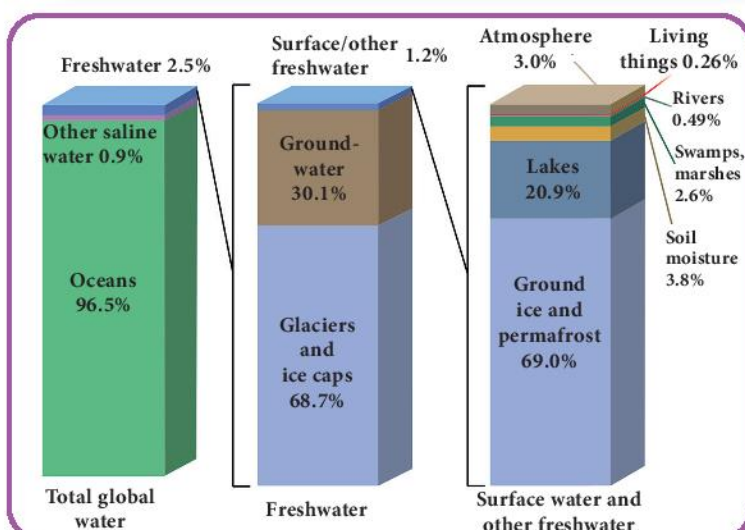


Take half a glass of water. Clean the outside part of the glass. Add few ice cubes and leave it for 5-10 minutes. You will observe drops of water appearing outside the glass. This happens because the water vapour in the air condenses on the cold surface of the glass.



III. Water Management

About 97.5% of total water available on the earth is too salty to be used for drinking and irrigation. The rest 2.5% of water is fresh water. Most of the fresh water i.e., 68.7% of the total fresh water is frozen as ice caps and glaciers and 30.1% occurs as ground water. Out of the remaining 1.2% of water, about 0.9% occurs as moisture in soil, air and in bodies of living organisms. The rest 0.3% constitutes fresh surface water sources, such as rivers and lakes. By this it is clear that a very small fraction of water is available for the use of human beings, animals and plants. The following figure shows the percentage distribution of total available water.



Do you know?

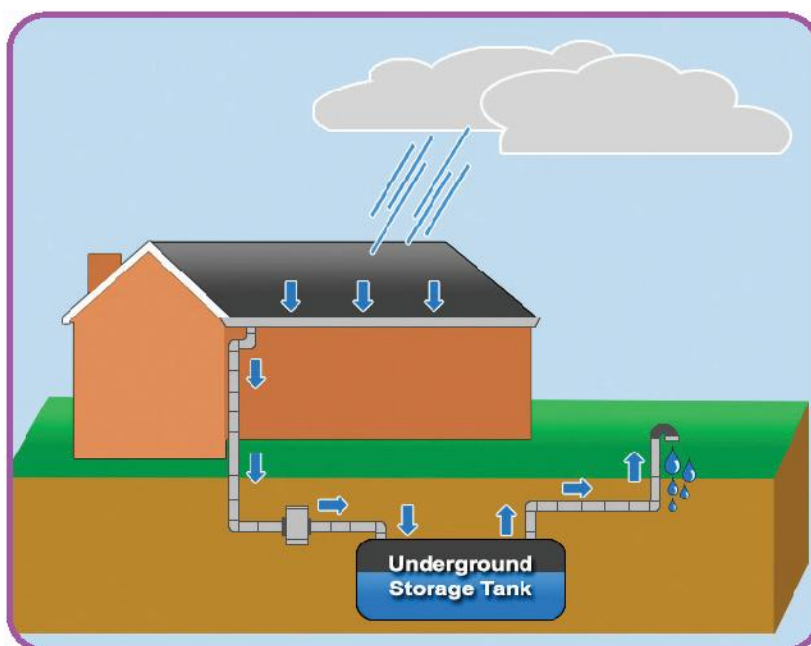
Agriculture is the source of our living. It uses most of the world's fresh water resources. It consumes around 70% of the available fresh water.

1 Fresh Water Management

Water management is the activity of planning, developing and managing the optimum use of water resources. Water which is obtained naturally from ice sheets, ice caps, glaciers, ice bergs, ponds, lakes, rivers, streams and underground are called fresh water. Fresh water is having low concentration of dissolved salts. Nowadays we don't get enough rainfall and except few, most of the rivers are drained. Due to recent changes in the climate we don't have water in lakes and ponds. People in many countries suffer because they don't have water even for their basic needs. So, we need to manage the available water.

❖ Rain Water Harvesting

The process of collecting rain water from the roof top of the buildings is called rain water harvesting. In this system rain water is stored into a storage tank for later use. Rain water available in the open spaces around the buildings may also be recharged into the ground. It is another method of rainwater harvesting. The government of Tamil Nadu leads the nation in implementing rain water harvesting programme. It has made it mandatory for all houses and buildings in the state to install rain water harvesting facility.



Advantages

- Rain water harvesting can reduce flooding in the cities.
- Rain water harvesting can reduce top soil loss.
- Ground water level can be increased.
- Ground water can be conserved.
- It can improve plant growth.



Do you know?

March 22 is observed as World Water Day.

Activity 2



Estimate the amount of water used by your family in a day for drinking, brushing, bathing, cleaning vessels, washing cloths, toilets and cleaning the floor. Find out for which activity water usage is more and how it can be minimized.

❖ Farm Ponds

A farm pond is a structure dug out on the Earth. It is usually square or rectangular in shape. Rainwater is stored in it for irrigation purposes. It is surrounded by a small bund, which prevents erosion on the banks of the pond. The size and depth of the pond depend on the type of the soil, water requirements of the farmer, its uses and the cost of excavation. Water is conveyed to the fields manually, by pumping, or by both.



2 Waste Water Management

Used water from any combination of activities such as domestic (houses), industrial, commercial, agricultural is called waste water. It is the water released after being used for laundry, bathing, dish washing, toilets and industrial purposes. Waste water also includes rain water that has been accumulated pollutants as it runs into the rivers, lakes and oceans. Pollutants are unwanted chemicals or materials that contaminate water. The goal of waste water management is to purify and protect water so that it can be reused. It also must be clean before it flows into rivers, lakes and oceans.

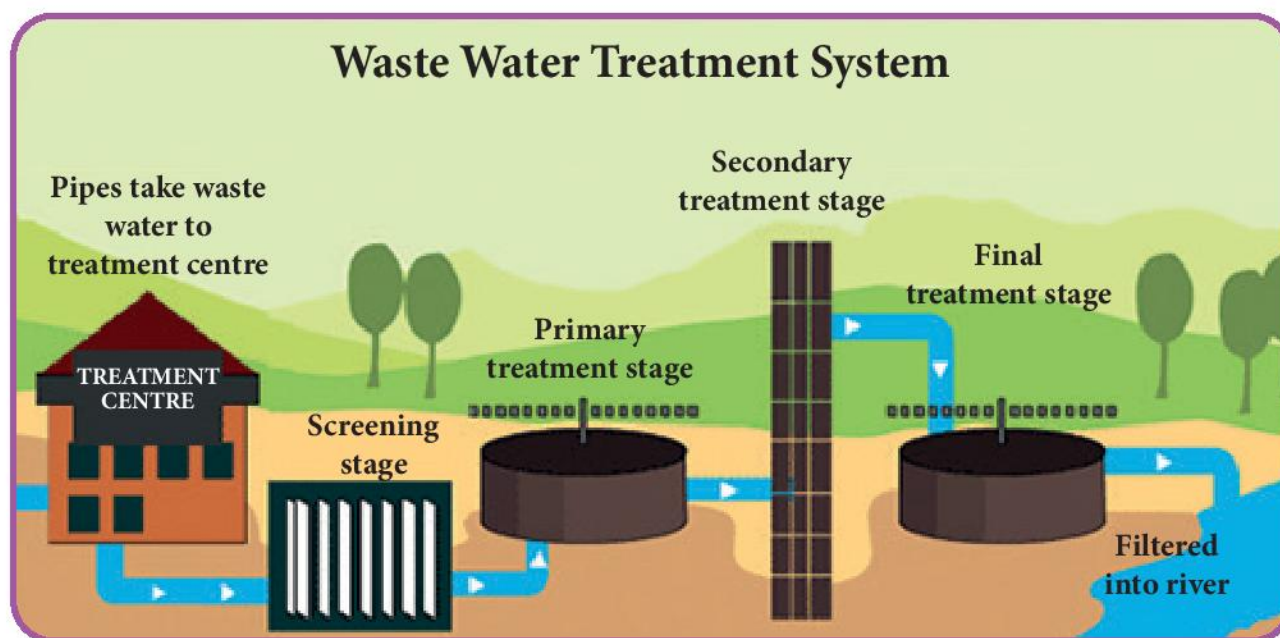
❖ Waste Water Treatment

Generally, waste water is treated by physical, chemical and biological processes using filtration, sedimentation, adding cow dung powder and bacteria. This method is followed in industries.



Activity 3

Visit an industry in your area with the help of your teacher. Observe and note the waste water treatment process.



Advantages

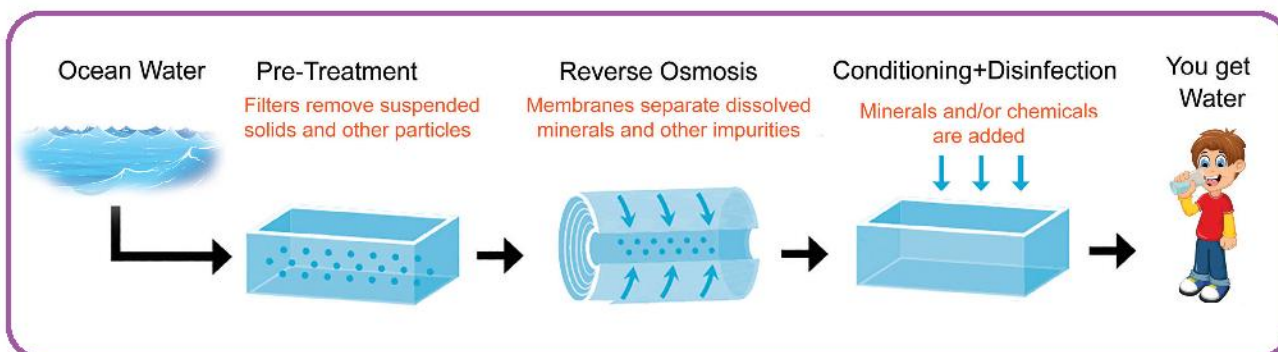
- Waste water treatment ensures that the environment is clean.
- There is no water pollution.
- It prevents waterborne diseases.
- It ensures that there is adequate water for irrigation.

3 Desalination of Sea Water

Desalination is an artificial process of converting saline water (sea water) into fresh water. The common desalination processes are:

- Distillation
- Reverse Osmosis

The process in which both evaporation and condensation go side by side is called distillation. Reverse osmosis is a process of forcing water under pressure through a semi permeable membrane. Tiny pores in the membrane allow water to pass but exclude most salts and minerals. The reverse osmosis process helps to solve the water scarcity problem.



IV. Water Pollution

Contamination of water bodies by human activities is called water pollution. Our water resources (pond, lake, river, canal and well) are polluted by sanitary water, industrial wastes, insecticides, fertilizers, sewages, synthetic detergents, chemical fertilizers, oil, heavy metals and radioactive wastes. These unwanted and harmful substances which pollute water are called water pollutants.

1 Sources of Water Pollution

The major sources of water pollution are industrial waste, sewage, domestic waste, chemical fertilizers and insecticides, synthetic detergents and oil spill.



Do you know?

25% of the world population does not get safe drinking water.

❖ Industrial Waste

The discharge of untreated industrial wastes from the industries into rivers and lakes is one of the main causes of water pollution. The industrial wastes contain harmful substances such as acids, alkalis and hot water. The chemicals like arsenic, lead, mercury and cadmium are released by the industries and it leads to toxicity in plants and animals.



❖ Sewage

The dumping of sewage into rivers and lakes is the second major cause of water pollution in big cities.



❖ Domestic Waste

Food waste, soaps and detergents, garbage, wrappers, plastics and other materials carried by the flowing water pollute the water bodies.

❖ Chemical Fertilizers and Insecticides

The excess use of fertilizers and pesticides causes water pollution. Because these chemicals are washed into the rivers and lakes with rainwater, they pollute the soil and underground water also. Pesticides like DDT (Dichloro Diphenyl Trichloroethane) enter the bodies of aquatic animals and reach the human body by way of food chain.



❖ Synthetic Detergents

Excess use of synthetic detergents for washing purposes produces foam and they pollute the water.



❖ Oil Spill

Oil leakages on the surface of the sea affect the marine organisms.

2 Prevention of Water Pollution

- Excess use of fertilizers and pesticides should be avoided in agricultural land.
- Use of synthetic detergents should be minimized or biodegradable detergents should be used.
- Trees and shrubs should be planted along the banks of the rivers or lakes.

- Plastic wastes, food materials and vegetables should not be thrown into open drains.
- Proper sewage treatment and management should be implemented.



V. Waterborne Diseases



Illness caused by the micro-organisms present in the untreated or contaminated water is called waterborne diseases.

They are responsible for morbidity and mortality in all age groups particularly among children under 5 years of age. It is believed that 80% of all diseases in the world are caused by inadequate sanitation and polluted water. Poverty, illiteracy, overcrowding and low health services are also directly or indirectly responsible for the prevalence of these diseases.

1 Types of Waterborne Diseases

Diarrhoea, dysentery, typhoid and cholera are some of the common waterborne diseases. They are caused by micro-organisms like bacteria and virus. Some of them are spread by mosquitoes. The following table gives the causative agents and the symptoms of few waterborne diseases.

Name of the Waterborne Diseases	Causative Agents	Symptoms
Diarrhoea	Bacteria and Parasites (Salmonella, Shigella and E.coli)	Indigestion, Sweating, Abdominal pain, Vomiting, Stomach cramps
Dysentery (Shigellosis)	Bacteria (Shigella)	Blood in stool, Indigestion, Vomiting, Dehydration, Fever, Weight loss
Typhoid Fever	Bacteria (Salmonella)	High fever, Head ache, Stomach pain, Muscle weakness, Weight loss
Cholera	Bacteria (Vibrio Cholerae)	Severe diarrhoea, Vomiting, Dehydration
Hepatitis -A	Virus (Hepatitis)	Vomiting, Fever, Dark urine, Itching, Yellow skin and eyes, Lack of appetite
Hepatitis - E	Virus (Hepatitis-E)	Vomiting, Fever, Dark urine, Itching, Yellow skin and eyes, Lack of appetite





Do you know?

People all over the world are worstly affected by diarrhoeal diseases. Three million people die worldwide every year due to these diseases.



Activity 4

Visit a primary health centre in your area and find out the common waterborne diseases prevalent among the people. Also find out the causes for them.

2 Prevention of Waterborne Diseases

- Good personal hygiene should be practiced and basic sanitation should be improved.
- Chlorinated and boiled water should be used for drinking.
- Drink boiled or pasteurized milk.
- Dispose infectious wastes properly.



VI. Other Diseases

Apart from the waterborne diseases mentioned above, there are many other diseases which are spread by vectors which breed in stagnant water in our surrounding. For example, aedes mosquito breeds in stagnant water and it causes dengue fever. Similarly, pigs feed in the stagnant sewage water. The pigs infected by virus spread Swine flu.

1 Dengue Fever

Dengue is a viral disease, spread by aedes female mosquitoes that bite during day time. They breed in clean stagnant water found in containers like vessels and buckets.

Symptoms

- Symptoms may include high fever, severe head ache, muscle and joint pain and a characteristic skin rash.
- Symptoms of dengue fever typically begin three to fourteen days after infection.
- Deficiency of platelets in blood.
- Intense stomach pain.
- Regular vomiting with blood.



Prevention

- Spray the house with anti-mosquito spray.
- Try to wear cloths that cover skin areas.
- Close the doors and windows during early morning and evening.
- Do not leave stagnant water anywhere in and around the house.



Do you know?

Aedes mosquitoes also transmit Chikungunya and Yellow fever. This can result in death if any treatment is not taken.

Treatment

- Dengue is caused by a virus and so there is no specific treatment or cure.
- A high fever and vomiting can dehydrate the body. So the person should drink clean water (bottle water).
- Rehydration salts can help replace the fluids and minerals lost in the body.
- Taking pain killers like Tylenol or Paracetamol can help to reduce fever and pain.

2 Swine Flu (H_1N_1)

Swine flu is a respiratory disease caused by Influenza virus that infects the respiratory tracts of pigs and results in barking cough. It can be transmitted to human beings. People who are constantly exposed to pigs are at risk of Swine flu infection. By keeping our surrounding free from sewage water, we can avoid exposure to pigs.



Name of the Diseases	Causative Agents	Symptoms
Dengue Fever	Virus (Flavi Virus)	High fever, Severe head ache, Muscle and joint pain, Vomiting with blood and Stomach pain
Swine Flu (H_1N_1)	Virus (Influenza)	Infection in respiratory tracks, Indigestion, Nasal secretions



Evaluation



I. Choose the correct answer.

- Which of the following micro-organisms causes waterborne diseases?
a) Bacteria b) Virus c) Protozoa d) All
- Water is present in huge quantities as vapour and clouds in the _____.
a) sky b) earth c) atmosphere d) rain



3. _____ water is free from suspended impurities.
a) Sea b) Well c) River d) Underground
4. _____ of water is found in oceans.
a) 96.5% b) 87% c) 47% d) 77.5%
5. _____ is an artificial process of converting sea water into fresh water.
a) Distillation b) Reverse Osmosis c) Desalination d) All of these

II Fill in the blanks.

1. The accumulated underground water comes out in the form of _____.
2. The process of changing water into water vapour by the heat of the Sun is called _____.
3. Rain water forms streams and _____ which join together to form rivers.
4. The process of collecting and storing rain water is called _____.
5. Cholera is caused by _____.

III. Match the following.

- | | |
|-------------------------|----------------------------|
| 1. Leakage of oil | - Cloud |
| 2. Reservoir | - Plant growth |
| 3. Condensation | - Pollute marine organisms |
| 4. Rainwater harvesting | - Influenza virus |
| 5. Swine Flu | - Man-made lake |

IV. Answer briefly.

1. Write down the sources of water.
2. What is desalination?
3. What are the processes involved in water cycle?
4. What are reservoirs?
5. How can we prevent dengue fever?

V. Answer in detail.

1. Write the advantages of rainwater harvesting.
2. How can we prevent waterborne diseases?



3 Plants



Learning Objectives

After completing this lesson, students will be able to

- ❖ know about the types of pollination and the agents of pollination.
- ❖ understand the life cycle of flowering plants.
- ❖ identify different types of soil.
- ❖ know how honey bee, earthworm, dragon fly are useful to farmers.



Introduction

Plants are useful to us in a number of ways. They produce their own food. At the same time they are used as food by men and animals. Plants are not only used as food but also as medicine. Almost all parts of the plants are useful to us. As a natural resource they are beautiful and pleasing to our eyes. They release oxygen, which is essential for our survival, into the atmosphere. Some plants grow in our surrounding naturally and some are grown by us. We need to know about plants which are useful to us in many ways. Let us study in this lesson about the life cycle of plants, agriculture and the types of soil.



I. Reproduction in Plants

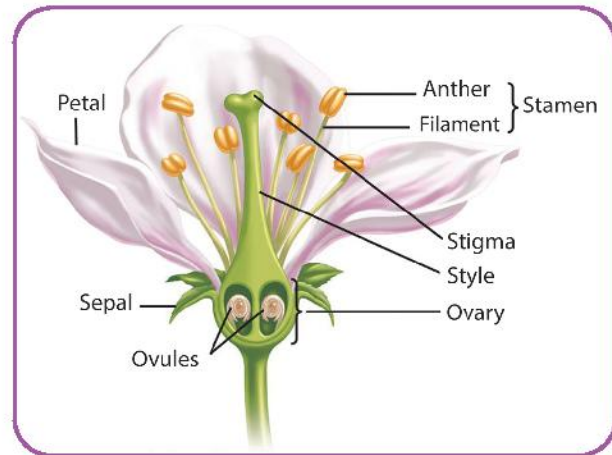
Reproduction is the process by which new plants of the same species are produced. Both plants and animals reproduce. The flowers perform the function of reproduction in plants. There are two kinds of reproduction that take place in plants. They are sexual reproduction and asexual reproduction. In asexual reproduction, new plants are produced from roots, leaves, stems and buds. In sexual reproduction, new plants emerge from seeds.



1 Flower

Flower is the reproductive part of a plant. It is a modified shoot. Flowers have four important parts. They are:

- Sepal
- Petal
- Androecium
- Gynoecium



❖ Sepal

It is the outer part of the flower. Usually it is small and green in colour. It protects the bud in the early stage.

❖ Petal

It is often colourful and it attracts the insects.

❖ Androecium

It is the male reproductive part of the flower. It is composed of stamens. Each stamen consists of a stalk called filament and a small bag like structure called anther at the tip. The pollen grains are produced in the anther within the pollen sacs.

❖ Gynoecium

It is the female part of the flower. It has three parts. They are: ovary, style and stigma. The ovary contains the ovules.

The flowers which contain either androecium or gynoecium are called **unisexual flowers**. E.g. Corn, Papaya, Cucumber. The flowers which contain both androecium and gynoecium are called **bisexual flowers**. E.g. Mustard, Rose.



Papaya (Unisexual flower)



Rose (Bisexual flower)

To attract the pollinators (E.g. Insects) plants are bright in colour and produce smell in their flowers. Plants which are pollinated by the honey bees and butterflies have sweet scents and bigger colourful petals. E.g. Sunflower, Pumpkin. Pigments present in petals give them different colours. Plants which are pollinated by the

moth and bats release their fragrance mostly at night and have colourless petals. E.g. Mango, Banana, Guava, Jasmine etc. The following table gives the names of the pigment present in petals.

Colour of the petals	Name of the pigment
Red, Pink, Blue, Purple	Anthocyanin
Yellow, Orange	Carotenoids
Green	Chlorophyll



Activity 1

Take a hibiscus flower or a rose flower. Display the parts like sepal, petal, gynoecium and androecium in a chart paper and note down their colour and shape.



Do you know?

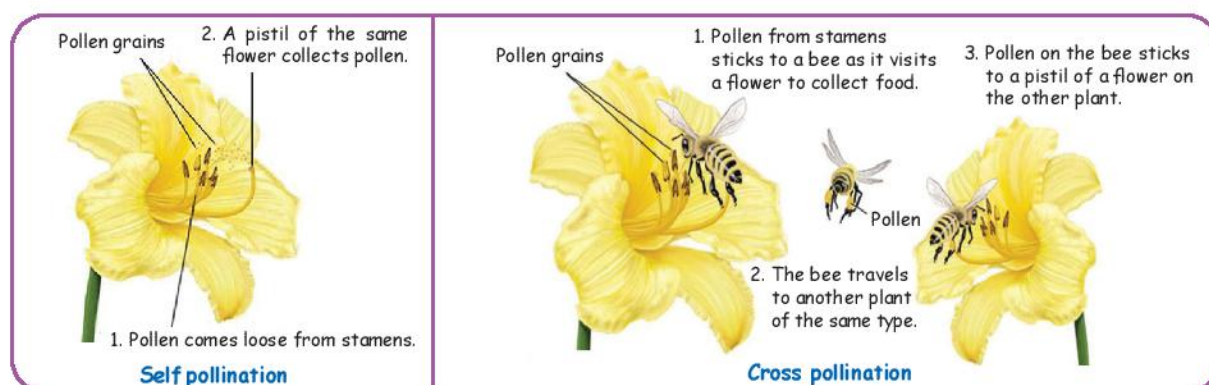
Kurinji or **Neelakurinji** (*Strobilanthes kunthiana*) is a shrub that is found in the Chola forests of the Western Ghats in South India. Nilagiri Hills, which literally means the blue mountains, got their name from the purplish blue **flowers** of Neelakurinji that blossoms once in 12 years.



2 Pollination

The transfer of pollen grains from the anther to stigma of a flower is called pollination. Pollination is the first important event in the development of fruit and seed. Pollination is followed by fertilization. Two types of pollination take place in the flowering plants. They are self pollination and cross pollination.

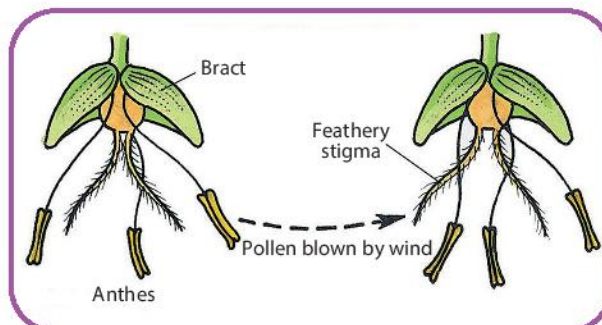
The transfer of pollen grains from the anther of a flower to the stigma of the same flower is called self pollination. The transfer of pollen grains of a flower to the stigma of another flower of a different plant of the same species is called cross pollination.



In self pollination, seeds produce weak plants and new varieties of plants cannot be produced. In cross pollination, seeds produce good plants and new varieties of plants can be produced. Pollination takes place through different agents. They are explained below.

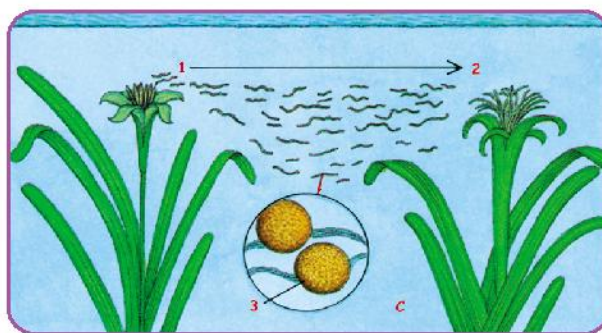
❖ Pollination by Wind (Anemophily)

The flowers pollinated by wind are mostly small in size and do not have any attractive colour, smell and nectar. The pollen grains are non-sticky, dry, light and powdery. Hence, they are easily carried away by the wind. E.g. Grass, Maize, Pine.



❖ Pollination by Water (Hydrophily)

The flowers of water plants are not colourful and they have no nectar. Pollen grains of these plants have mucilaginous covering to protect them from getting wet. They float in water and reach other plant. E.g. Vallisneria, Hydrilla, Zosteria.



❖ Pollination by Insects (Entamophily)

This is the most common type of pollination in plants like sunflower, ladies finger, brinjal and pumpkin. Some flowers are large in size and they have sweet smell. Some of these flowers produce nectar. They attract insects like butterflies and honey bees.



Do you know?

Fruit bats, humming birds and ants may also act as pollinating agents. Pollination by birds is known as Ornithophily.



Activity 2

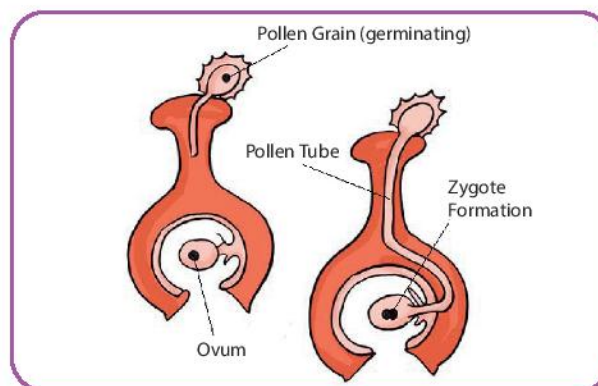
Classify the plants based on the pollination types.

Vallisneria, Hydrilla, Sunflower, Grass, Brinjal, Maize, Pumpkin.

Hydrophily	Entamophily	Anemophily

3 Fertilization

The process of fusion of male (pollen grains) and female (stigma) gametes is called fertilization. The cell which results after fusion of these gametes is called zygote. The zygote then develops into embryo.



4 Fruits and Seed formation

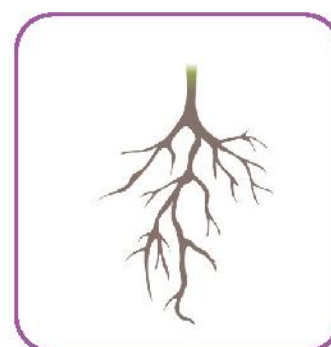
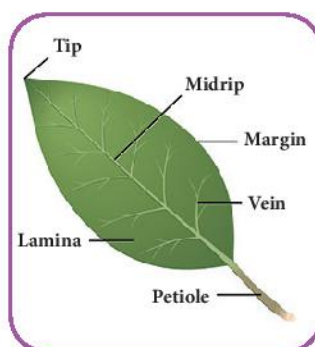
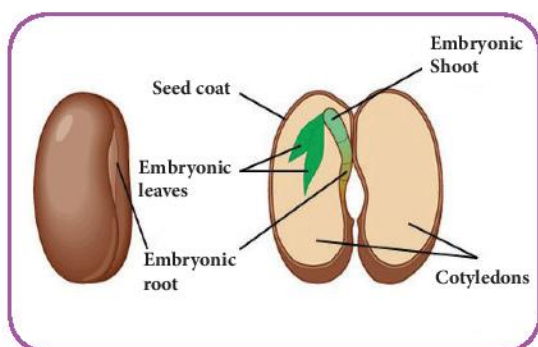
After fertilization, the ovary grows into a fruit and other parts of the flower fall off. The seeds develop from the ovules. The seed contains an embryo enclosed in a protective seed coat. Based on the number of cotyledons in the seed, flowering plants have been divided into two groups namely, dicotyledon and monocotyledon.



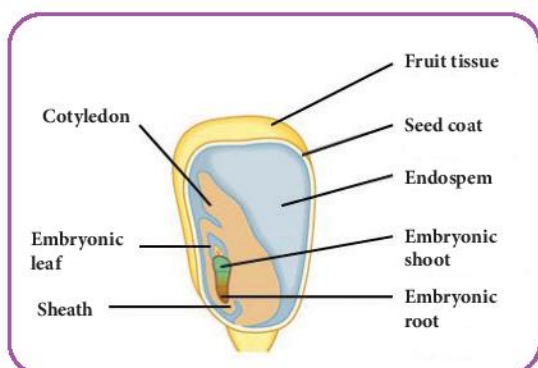
Activity 3

Collect seeds of different plants from your area. Find out whether they are monocotyledons or dicotyledons.

Dicotyledons have seeds with two cotyledons. E.g. Pea, Bean, Castor. They have leaves with netted venation and taproot system.



Mono cotyledons have seeds with one cotyledon. E.g. Maize, Rice, Wheat. They have leaves with parallel venation and fibrous root system.



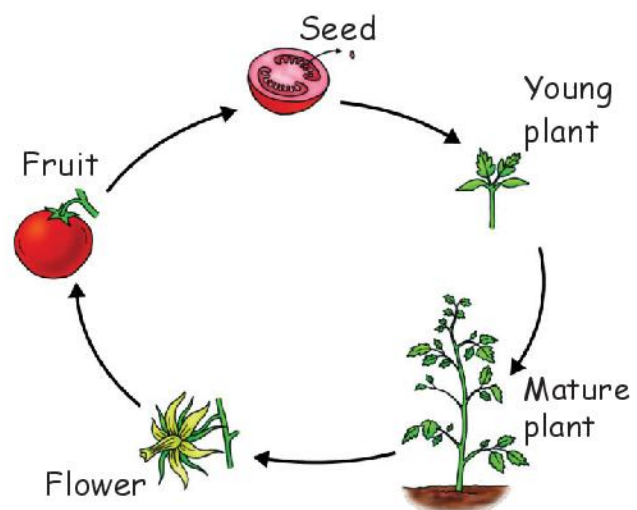


II. Life Cycle of a Flowering Plant

The major stages of the flowering plants are: germination of seed, growth, flowering, re-production (pollination), seed formation and seed spreading. Every seed has minute plant called embryo. Under favourable conditions like sunlight, water and soil, embryo grows into a new plant. This new plant bears fruits with seeds and multiplies. This cycle continues forming the life cycle of flowering plants.

1 Dispersal of Seeds

Spreading of seeds from one place to another with the help of agents like air, water, animals and birds is known as dispersal of seeds. A single plant produces a large number of seeds. If all these seeds fall directly below the parent plant, the seedlings would have to compete for space, water, oxygen, minerals and sun light. When the seedlings are grouped together in one place, they can easily be destroyed by grazing animals. So, by nature the seeds and fruits of plants are distributed far and wide through various agencies.



❖ Dispersal by Wind (Anemochory)

The seeds which are smaller, lighter and tiny float in air over long distance. Some of them proceed with hairs and membranous wing like structures and so they are carried away easily. E.g. Cotton seed, Drumstick.



❖ Dispersal by Water (Hydrochory)

Fruits which are dispersed by water have outer coats modified to enable them to float. The mesocarp (middle layer) of coconut is fibrous and is easily carried away by water. They reach different places and grow into a new plant. E.g. Lotus, Coconut.



❖ Dispersal by Animals (Zoochory)

Some fruits have hooks, spines, bristles, stiff hair etc, on their outer coat. These fruits stick on the furry coats or skins of some animals and are carried from one place to another. E.g. Xanthium, Achyranthus.



❖ Dispersal by Birds

While eating fruits like tomato and guava, birds eat seeds along with the edible portion and they are passed out in the excreta later. These types of seeds are protected from the digestive juices by their seed coat.



❖ Self Dispersal Method (Autochory)

Some fruits disperse their seeds in the wind through an explosive mechanism and spread them. E.g. Ladies finger, Balsam.



Activity 4

Collect variety of seeds with hair, wings, hooks and spines. Keep them in a cardboard box separately. Name them and collect information on how they are dispersed.



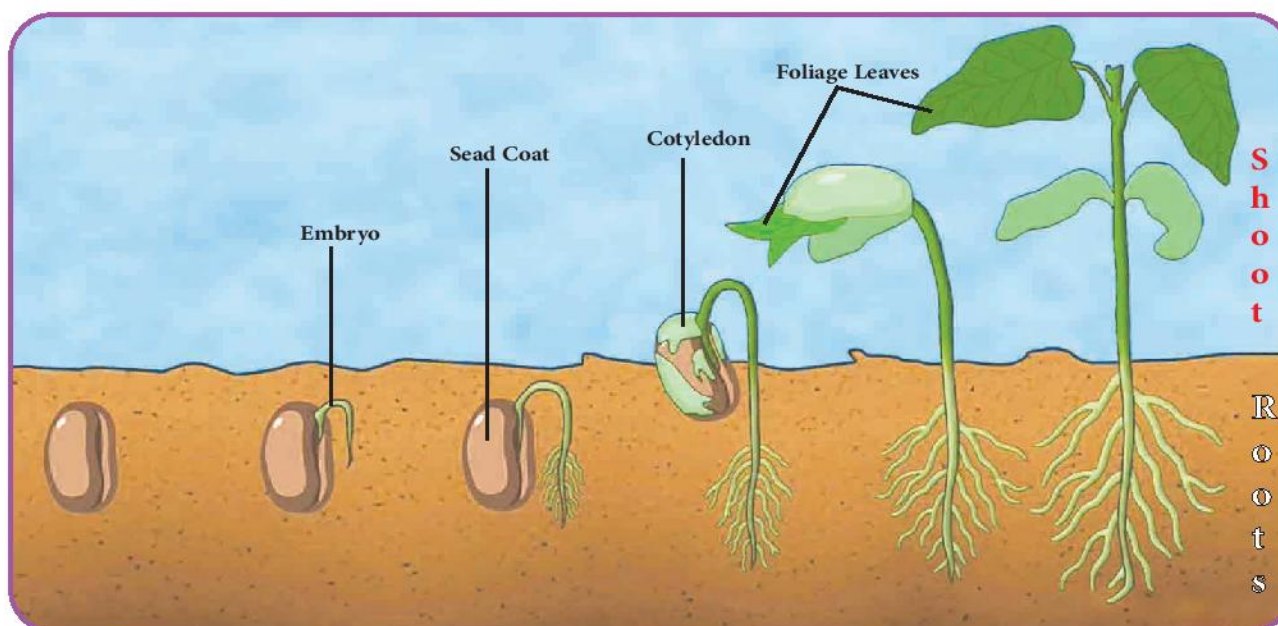
Do you know?

Man is also responsible for the dispersal of many fruits and seeds. Useful plants like cinchona, rubber and eucalyptus have been successfully introduced by men, to the new surroundings far away from their original habitat.

2 Germination of Seeds

The seed is a fertilized ovule. It consists of embryo, food materials which are protected by the seed coat. During favourable conditions, the seed germinates and gives rise to a new seedling. During the early stages of germination, the seedlings get the food required for its growth from the cotyledons. After the food stored in the cotyledons has been used up, the seedling gets its food from the soil. The seedling absorbs water and nutrients from the soil with the help of its roots. It develops leaves and grows into a plant.

Various stages of germination of seed



III. Agriculture

Man started practicing agriculture thousands of years back. This was one of the developments of civilization. In the modern days agriculture is practiced on a large scale due to the advancement of science and technology. Application of modern technologies like plant breeding and usage of chemicals like fertilizers and pesticides have increased the yield. Major agricultural products are cereals, vegetables, fruits and oil seeds. They are cultivated not only for our basic needs but also for commercial purpose.

1 Soil

Soil is one of the most important natural resources. It is essential for agriculture. It supports the growth of plants by holding the roots and supplying water and nutrients. It is the home for many organisms. Soil is formed by the breaking of rocks by the action of wind, water and climate. The mixture of rock particles and humus is called the soil. The soil is classified on the basis of the proportion of various sizes.



❖ Sandy soil

It contains greater proportion of big sand particles. They cannot fit closely together. Water can drain quickly through the spaces between the sand particles. So, sandy soils tend to be light, well aerated and dry.

❖ Clay soil

It contains greater proportion of fine particles, packed tightly together, leaving little space for air. It can retain lot of water in the tiny gaps between the particles. Plants like paddy grow well in this soil.

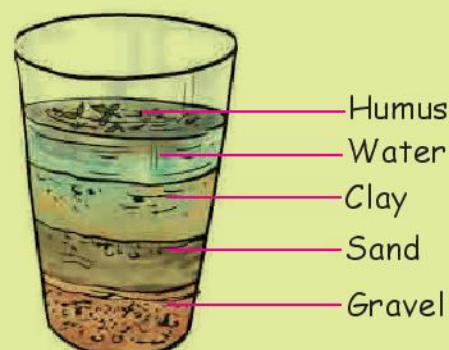
❖ Loamy soil

Loamy soil contains large and fine particles in almost same proportion. It is the best top soil for growing plants. It is a mixture of sand, clay and another type of soil particle known as silt. Silt occurs as a deposit in river beds. It has water holding capacity for the growth of plants. Clay and loamy soil are suitable for growing wheat, gram and paddy.



Activity 5

Take a little amount of soil and powder it. Put this soil in a glass tumbler. Mix it with water and stir it well with a small stick to dissolve the soil. Do not disturb it for some time. Now you can see different layers of soil. The rotting matter floating on the water is called humus. The other layers are clay, sand and gravel. From this we can see that the soil is a mixture of various particles.



2 Classroom Agriculture

Classroom agriculture creates the basic understanding about agricultural practices in the classes. Through this, we come to know about the values and importance of agriculture. To mould us into better members of the society, this programme teaches the connections between agriculture and the environment, food, energy, animals, society, economy, science and technology.



IV. Friends of Farmer

Insects are generally considered to be harmful. But, many of them are helpful to us in a number of ways. Earthworm, honeybee and dragonfly are useful to plants and farmers.

❖ Earthworm

Earthworms help to increase the amount of air and water that gets into the soil. They break down organic matters like leaves and grass into smaller particles so that plants can use them. When they eat them, they leave behind castings that are a type of fertilizer. The process of decomposing bio-degradable wastes by earthworms is known as vermicompost.



Activity 6

Visit a nursery garden in your area and observe how the varieties of saplings are growing there. Prepare a report about it.

❖ Honey bee

Honey bees are helpful for cross pollination in flowers. They are attracted by the colour and smell of the flowers. They convert the pollen which is the only natural protein source for them into honey. Honey is used as food and also for medicinal purposes. Bees also produce wax, which is used for making candles.

❖ Dragon fly

It destroys the egg and larva of harmful insects and mosquitoes and thus prevents the spreading of diseases. It is also helpful in cross fertilization.



Evaluation



I. Choose the correct answer.

- Male reproductive organ of the flower is
 - sepal
 - petal
 - androceium
 - gynoceium
- Pollination by wind is also known as
 - anemophily
 - hydrophily
 - entamophily
 - ornithophily
- Dispersal of seed by water is known as
 - anemochory
 - hydrochory
 - zoochory
 - autochory



4. Entomophily is

- a) pollination by insects
- c) pollination by water

- b) pollination by wind
- d) pollination by animal

5. Pollination takes place by wind in

- a) grass
- b) vallisneria
- c) hydrilla
- d) lotus

II. Fill in the blanks.

1. Spreading of seeds from one place to another is known as _____.
2. Autochory is known as _____.
3. The seed is a fertilized _____.
4. Paddy grow well in _____ soil.
5. The soil which contains bigger sized particle is _____.

III. Match the following.

1. Earthworm - Destroys the egg and larva of mosquitoes
2. Birds - Honey
3. Coconut - Ornithophily
4. Bee - Dispersal by water
5. Dragon fly - Vermi-compost

IV. Answer briefly.

1. Define pollination.
2. What is germination of seed?
3. How soil is formed?
4. What is known as vermi-compost?
5. How the seeds are spread by water?

V. Answer in detail.

1. Write a note on parts of flower.
2. Explain the methods of pollination.
3. Draw the picture of a flower and label the parts.





NOTES

