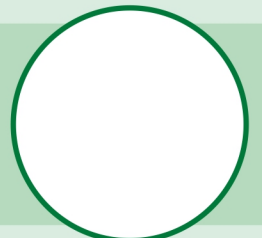


SCIENCE MASTER



A comprehensive Guide for mastering
Scientific Concepts.



Syllabus - Grade 2

- ✓ Plants
- ✓ Animals
- ✓ My Body
- ✓ Our Food
- ✓ Transport and Communication
- ✓ Our Houses
- ✓ Water
- ✓ Air
- ✓ Earth and Space
- ✓ Rocks and Minerals
- ✓ Safety
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Syllabus - Grade 3

- ✓ Living and Non-living Things
- ✓ Plants
- ✓ Eating Habits of Animals
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Syllabus - Grade 4

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- ✓ Adaptation in Plants and Animals
- ✓ Digestive System
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Syllabus - Grade 5

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Syllabus - Grade 6

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- ✓ Metals and Non-Metals
- ✓ Acids Bases and Salts
- ✓ Force and Pressure
- ✓ Light
- ✓ Work and Energy
- ✓ Electricity

Chapter 1: Plants

At a Glance:

- Where do Plants Live?
- Parts of Plants
- Types of Terrestrial Plants
- Uses of Plants

What are plants?

Plants are living things that can make their own food with the help of sunlight. They need sunlight, water, air, and soil to grow. They give us food to eat, and clean air to breathe. They make the world around us look beautiful.

1.1 Where do Plants Live?

The area where a living thing lives in nature is called its **habitat**. Plants live in two types of habitats:

1. **On Land:** Most plants live on land. They can be found everywhere, from our gardens to large forests. Plants can be as small as grasses or as tall as trees. Such plants are called **terrestrial plants**. Example: Mango tree, rose shrub, and tulsi plant (a herb).



Fig. 1.1: Terrestrial plants: Mango tree, rose bush, tulsi plant

2. **In Water:** Some plants live in water. They can be found in ponds, lakes, and even in the ocean. Example: Lilies in ponds; seaweeds in oceans and seas.



Fig. 1.2: Aquatic plants: Pond lily, seaweed

1.2 Types of Terrestrial Plants:

We see different kinds of plants around us. They differ in size, shape, colour, and place of growth. Some plants are big and some are very small. These plants are classified into the following categories.

1. **Trees:** Trees are big and tall. They are strong plants because they have a strong and thick stem called a trunk. Trees have many branches. On these branches, leaves, flowers, and fruits grow. They have strong roots that go deep in the soil. These roots give support and strength to the tree. They live for many years. Some trees even live for more than 100 years.

Examples: Mango tree, Banyan tree.



Fig. 1.3: Tree

2. **Shrubs:** Shrubs are small to medium-sized plants. They are smaller than trees. They have woody stems. They branch a little above the ground. They have many branches. Shrubs are also known as bushes. They live for a few years.

Examples: Rose, Hibiscus.



Fig. 1.4: Rosebush

3. **Herbs:** Herbs are very small, and their stems are thin and green. They are weak plants. They live for a few months only. They have a strong smell and taste. They are used to add flavours to our food.

Examples: Mint, Coriander, Tulsi (basil).



Fig. 1.5: Tulsi

4. **Climbers:** Climbers are plants with very weak stems. They need support to grow. They cannot stand straight. With the support of any stick or hard surface, they grow. They usually take the support of other plants by climbing on them.

Examples: Money plant, Grapevine.

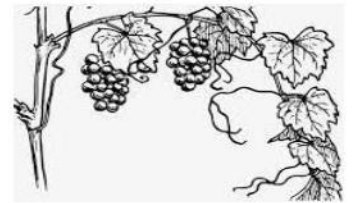


Fig. 1.6: Climbers (grapevine)

5. **Creepers:** Creepers are also plants with very weak stems. Hence, they grow along the ground. They give very big fruits.

Examples: Watermelon plant, pumpkin plant.



Fig. 1.7: Creepers (Pumpkin)

SELF EVALUATION TEST – 1

1. Fill in the blanks:

- a. Places where a living thing lives in nature is called its _____.
- b. To grow, plants need sunlight, _____, air, and soil.
- c. Aquatic plants grow in _____.
- d. _____ is an example of plants that live in water.

2. Answer in one word:

- a. Small to medium-sized plants with woody stems and many branches
- b. Tall, strong plants with thick stems
- c. Plants with thin green stems and a strong smell
- d. Plants that spread on the ground
- e. Plants that grow upwards with support

1.3 Parts of Plants:

- 1. **Roots:** They grow inside the soil and hold the plant in the ground. They also absorb water and minerals from the soil.
- 2. **Stem:** It holds the plant up. Leaves, buds, flowers and fruits grow on the stem.

Chapter 1: Living and Non-living Things

At a Glance:

- Living Things
- Non-living Things

How is a pet cat different from a toy car?

Have you ever wondered why a pet cat can run and play on its own while your favourite toy car stays still until you move it? Have you ever wondered how a beautiful flower grows from a tiny seed or why your book can't talk to you like your friend can? That's because a pet cat and a plant are living things. A toy car and the book are non-living things. Let's learn about them.

1.1 Living Things:

Living things are born; they grow and die. Living things have some special characteristics which show that they are alive:

- 1. Living things breathe:** Living things need to breathe to survive. They take in oxygen gas and release carbon dioxide. Like us and animals, plants also breathe through small pores in their leaves.
- 2. Living things need food and water:** Living things need food and water to grow and have energy. We drink water and eat food. This helps us stay healthy and strong. Animals eat plants or other animals while plants make their own food by using sunlight, water, and nutrients from the soil.
- 3. Living things move:** Living things can move by themselves. Animals can run, crawl, swim, or fly. They move to find food, escape from danger, or explore around. Even plants can move a little, like when their leaves turn towards the sunlight. Humans can walk, crawl and run.
- 4. Living things feel:** Living things can feel things. You can feel and tell if something is soft or hard, hot or cold. Animals and even some plants can feel but in their own ways. They can sense things around them and react.
- 5. Living things reproduce:** Reproduction means making new babies. Just like how you were born from your parents, living things have babies, too. Some animals lay eggs, like birds, while others give birth to live babies. Plants produce seeds to produce more plants.

Animals reproduce in two ways – either they lay eggs or produce live young ones.

Oviparous Animals:

- Oviparous animals lay eggs.
- The eggs have a special protective shell that keeps the baby safe as it grows inside. When the time is right, the baby hatches out of the egg, ready to start its own life.
- Examples: Birds (like sparrows, eagles, etc.) and reptiles (like snakes, turtles etc.)

Viviparous Animals:

- Viviparous animals give birth to live babies.
- The babies grow inside their mothers until they are ready to be born.
- Even after they are born, the parents may take care of the young ones for some time.
- Examples: Mammals (animals with fur or hair) like dogs, cats, elephants, and humans.

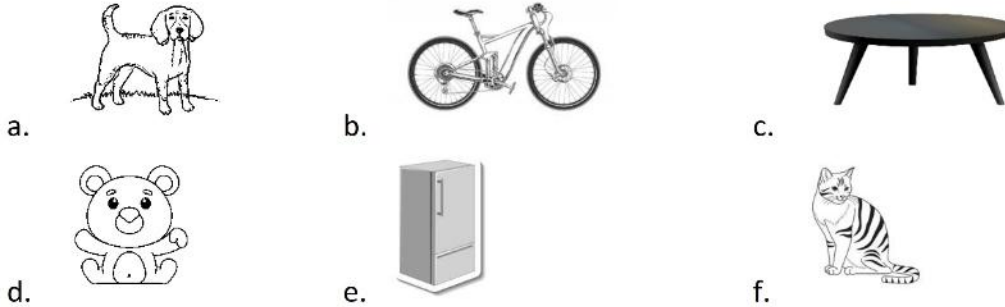
Examples of Living Things

- **Plants:** Trees, bushes, flowers, and grass are all examples of living things. They grow, make their own food, and respond to sunlight.

- **Animals:** Dogs, cats, birds, insects, and fish are all living things. They move, eat, and breathe, and some of them can even fly!
- **Humans:** We humans are living things too! We grow, eat, breathe, and do different activities.

SELF EVALUATION TEST – 1

1. Identify the living things:



2. State True or False:

- Oviparous animals give birth to live babies.
- Birds lay eggs.
- Babies of viviparous animals grow inside the mother.
- A turtle gives birth to baby turtles.
- Humans are viviparous.

1.2 Non-Living Things:

Non-living things are objects that do not have the characteristics of living things.

- Non-living things do not breathe.
- Non-living things do not need food and water.
- Non-living things do not move on their own (they could move if they are battery-operated).
- Non-living things do not feel.
- Non-living things do not die. They may get damaged.



Fig: 1.2: Non- Living Things

Examples of Non-Living Things:

Let's look at some examples of non-living things:

- Rocks:** Rocks are non-living things. They do not move, grow, or show any signs of life.
- Toys:** Your favourite toys are non-living things. They don't eat, breathe, or grow. But you can play with them!
- Vehicles:** Vehicles like cycles, cars, trucks, and buses are non-living. They do not get tired or sleep like us. They can move if someone is driving or riding them.

Chapter 1: Our Food

At a Glance:

- Food Groups and Their Roles
- Food Pyramid
- Balanced Diet
- Deficiency Diseases

Why do we need to eat food every day?

We do different things like learning, playing, and working every day. Our bodies need energy for all these activities. We also need energy to grow and recover from an illness. Food is the fuel that our bodies need to function properly. Just like a car needs the right fuel to run smoothly, our bodies need food to grow, play, and stay healthy.

1.1 Food Groups and Their Roles:

Nutrients are the important building blocks that our bodies need to stay healthy, full of energy, and grow properly. These building blocks include carbohydrates, proteins, fats, vitamins, and minerals. Different types of foods contain these special building blocks that our bodies use to stay strong and grow.

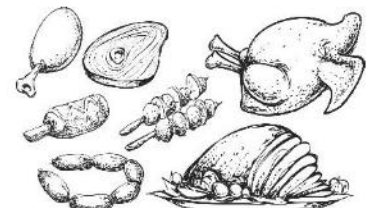
The basic nutrients that help to maintain our health are:

1. Carbohydrates (Carbs): Carbohydrates are like fuel for our bodies. They give us energy to run, jump, and play. Foods like rice, bread, and potatoes are full of carbohydrates. When we eat them, our bodies turn them into energy that helps us do all the fun things we love. We need carbohydrates in much larger amounts than we need other nutrients. However, having too many carbohydrates can lead to weight gain, so it's important to find a balance.



Carbohydrates

2. Proteins: Proteins are like the builders in our body. They are bodybuilding food. They help us grow tall and strong. Foods like eggs, milk, and beans have lots of protein. Our body uses these proteins to make our muscles and bones strong, so we can run and jump without any problems. They also help in the repair of our bodies.



Proteins

3. Fats: Fats are like helpers in our body. They give us energy too, and they help in the absorption of some vitamins. Fats help to keep our body warm. Foods like butter and nuts have fats. We need fats, but not too much. It's like having a little bit of oil in a machine to make it work smoothly. Too much fat in the body causes obesity.



Fats

4. Vitamins: Vitamins are like the superheroes inside us. They do different jobs to keep us healthy. Vitamins help our skin look healthy, our eyes see well, and our bones stay strong. They also protect us from diseases. Vitamins are of various types like vitamins A, B, C, D, E, and K. Fruits and vegetables have many vitamins. So, when we eat these foods, we're giving our body the vitamins it needs.

5. Minerals: Minerals are like the workers who help our body parts do their jobs. We need minerals like calcium, iron, etc. for our bones and muscles to stay strong. Milk, cheese, eggs, and leafy greens are foods rich in minerals. When we eat these foods, our body gets the minerals it needs to stay fit. Vitamins and minerals help our body to fight diseases and protect us from falling sick. Hence, food items rich in vitamins and minerals are called protective foods.



6. Roughage and Water: In addition to the above nutrients, our body needs dietary fibre and water. When we eat foods like cereals, fruits, veggies, and salads, some parts of the plant food are not digested and they're called dietary fibre or roughage. Roughage is important because it helps to clean our bodies by removing waste. Water is very crucial for our bodies. It helps our insides work well. We should drink enough water every day, about eight to ten glasses. Not having enough water can lead to dehydration. Remember, roughage and water keep us healthy!

SELF EVALUATION TEST – 1

1. Fill in the blanks:

- a. Nutrients are like important _____ that our bodies need for growth.
- b. Carbohydrates, proteins, fats, vitamins, and minerals are the key _____ in our food.
- c. Each nutrient has a special _____ in keeping us healthy and strong.
- d. _____ give us energy, while proteins help us grow.
- e. Fats help to absorb certain _____ and provide energy.

2. Answer in one word:

- a. What do we call the substances that our bodies need to stay healthy and grow well?
- b. Which nutrient gives us energy and helps us run, play, and think?

3. Match the nutrients with their roles:

Nutrients	Roles
i. Carbohydrates	a. Protect us from diseases
ii. Proteins	b. Give energy to run, jump, and play
iii. Vitamin	c. Help our body parts stay healthy
iv. Fat	d. Help us grow tall and strong

1.2 Balanced Diet:

All food items do not contain all nutrients. Sometimes, we might prefer certain foods and ignore others. However, this choice can impact our health, growth, and how our bodies work. To ensure that we receive all the essential nutrients in proper quantities, it's important to follow a balanced diet.

Chapter 1: Our Food

At a Glance:

- Components of Food
- Deficiency Diseases
- Food Adulteration
- Balanced Diet
- Lifestyle Diseases

Why do we need food?

All living things need food to survive. Food helps us grow and maintain good health. We get energy from the food that we eat. Food helps us to protect ourselves from diseases. It also repairs the damaged parts of the body.

1.1 Components of Food:

Every day we eat many types of food like vegetables, fruits, grains, pulses, dairy products, etc. Different foods provide us with different types of nutrients. Nutrients are substances in food that help our body to stay healthy and function properly. The process by which we obtain nutrients and energy from food is called nutrition. 5 basic nutrients support our health. These are carbohydrates, proteins, fats, vitamins, and minerals. Depending on what the food helps our body with, all foods can be grouped into three basic categories:

1.1.1 Energy-giving foods:

- We need energy to perform normal body functions like, breathing, digestion, running, walking, etc.
- Carbohydrates and fats are called energy-giving foods.
- Fats produce more energy than carbohydrates.
- Some carbohydrate-rich foods are rice, wheat, and maize (corn).
- Foods rich in fats are milk, nuts, seeds, ghee, butter, and oil.

1.1.2 Body-building foods:

- Foods rich in proteins are called body-building foods.
- These foods help in the physical growth and repair of our bodies. They also help in building muscles.
- We get proteins from meat, fish, eggs, beans (soyabean, kidney bean), nuts, and pulses.

1.1.3 Protective foods:

- Protective foods protect our bodies from diseases. Minerals like calcium are also needed for building healthy bones, teeth, and skin.
- Foods rich in vitamins and minerals are called protective foods.
- Both vitamins and minerals are required by our body in small quantities.
- There are many types of vitamins that we get from food. These are vitamins A, B, C, D, E, and K.
- Like vitamins, minerals are of many types. Some important ones are calcium, iron, potassium, phosphorous, and zinc.
- Fruits (especially citrus fruits), green leafy vegetables, and nuts are good sources of vitamins and minerals.

In addition to the above nutrients, our body needs roughage and water.

- **Roughage** are fibrous, indigestible parts of the food. Roughage does not contain any nutrients. But we need it because it helps to eliminate waste substances from our bodies. In short, it makes our stool soft and bulky. Fruits, vegetables, outer coverings of cereals, and pulses are good sources of roughage.
- **Water** helps to absorb nutrients from food. It also helps our body to remove dissolved wastes in the form of urine and sweat.

1.2 Balanced Diet:

The food that we eat during the entire day is our **diet**. Our diet should supply us with all the nutrients for our body to function properly. If we fail to get the nutrients in the right proportion, we will suffer from malnutrition (poor nutrition) and nutrient deficiency diseases. But any one food item does not provide us with all the nutrients. Therefore, we should include a variety of food, like cereals, vegetables, dairy products, nuts, etc., in our diet.

A **balanced diet** is a diet that provides our body with all the essential nutrients, in appropriate proportions, to support good health.

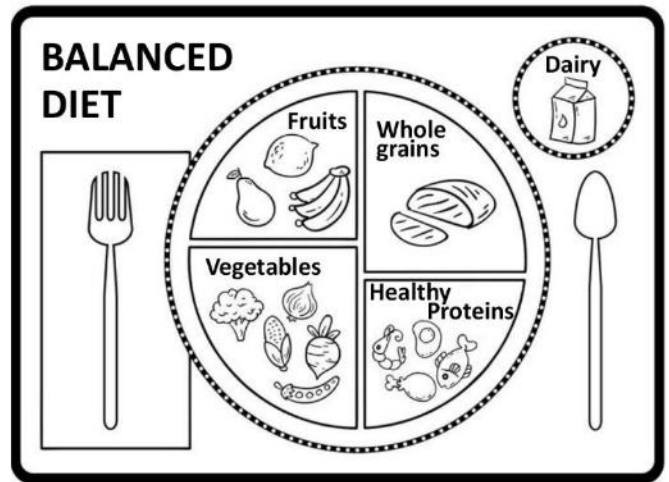


Fig. 1.1: A Balanced diet

A balanced diet should include a variety of foods from different food groups. Some of the ways to plan a healthy diet are:

1. We should eat food that has less sugar and uses less oil while cooking.
2. We must include a lot of vegetables in our food.
3. We must also eat **fermented** food as it contains bacteria that help in digestion and add nutrients to it. Fermented foods are left overnight to allow good bacteria to grow in them—for example, curd, idli, dosa, pickles, and dhokla.

SELF EVALUATION TEST – 1

1. Fill in the blanks:

- a. Sugar and starch are types of _____.
- b. Water helps to remove dissolved _____.
- c. We must eat nutritious food for the development of our body and good _____.
- d. A _____ should include a variety of foods from different food groups.
- e. _____ are substances in food that help the body to stay healthy and function properly.

2. Match the following:

Column A	Column B
i. Proteins	a. Helps to fight diseases
ii. Roughage	b. Helps to make our bones and teeth strong
iii. Carbohydrates	c. Helps to clear digestive wastes
iv. Vitamins	d. Helps to repair and build damaged cells
v. Minerals	e. Provides energy to our body

Chapter 1: Our Food

At a Glance:

- Types of Nutrients and Their Roles
- Tests for Nutrients
- Balanced Diet
- Deficiency Diseases

Why do we need food?

Food is one of the basic necessities of life. All living things need energy. This energy comes from the food that we eat. Food contains essential substances necessary for the growth, repair, and maintenance of body tissues and the proper functioning of vital processes. Food also helps us to protect ourselves from diseases.

1.1 Types of Nutrients and Their Roles:

Nearly everything that we eat comes from plants or animals. They provide us with many types of food like vegetables, fruits, grains, dairy products, etc. The process by which we obtain nutrients and energy from food for growth and development is called **nutrition**. Different foods provide different types and amounts of nutrients. Nutrients are chemical compounds in food that help the body maintain health and function properly.

The 5 basic nutrients that help to maintain our health are:

- 1. Carbohydrates:** They are the main source of energy for our body. There are two main types of carbohydrates, namely sugar and starch. Carbohydrates can be found in grains (rice, wheat, oats), fruits, some vegetables (potato, corn), and legumes.
- 2. Proteins:** Every cell of our body, be it our skin or hair, contains protein. They are the building blocks of our body. They aid in building and repairing tissues. Food from animal sources is rich in proteins—for example, meat, fish, and eggs. We also get protein from plant sources like beans (soya beans, kidney beans), nuts, pulses, and grains.
- 3. Fats:** Fats give us more energy than carbohydrates. They act as energy reserves. Fats also aid in absorbing vitamins A, D, E, and K. Healthy fats can be found in foods like avocados, milk, nuts, seeds, ghee, butter, and olive oil.
- 4. Vitamins:** These are essential nutrients required in small quantities. They protect our body against diseases. Vitamins can be fat-soluble or water-soluble. Fat-soluble vitamins dissolve in fat. They can be stored in the body, whereas water-soluble vitamins dissolve in water and are not easily stored, so they must be replenished more frequently.

Table 1.1: Vitamins, Their Roles and Sources

Name	Role in Body	Solubility	Sources
Vitamin A	Supports vision, immune system, and skin health	Fat-soluble	Green leafy vegetables, papaya, mango, carrots, fish liver oil
Vitamin B-complex	Helps convert food into energy and supports various body functions	Water-soluble	Green leafy vegetables, cereals, eggs, meat, milk, nuts
Vitamin C	Boosts the immune system and aids in collagen production	Water-soluble	Citrus fruits

Vitamin D	Facilitates calcium absorption for strong bones and supports immune health	Fat-soluble	Our body produces vitamin D when it gets sunlight. Milk, egg yolk, fish, fish liver oil are other sources of vitamin D.
Vitamin E	Acts as an antioxidant, protecting cells from damage	Fat-soluble	Sunflower seeds, almonds, spinach
Vitamin K	Aids in blood clotting and bone health	Fat-soluble	Green leafy vegetables like spinach

5. **Minerals:** Like vitamins, minerals are also required in small quantities. They have various functions in our body.

Table 1.2: Important Minerals, Their Roles and Sources

Name	Role	Sources
Calcium	Makes our bones and teeth strong, and helps muscles work properly.	Vegetables, milk, cheese, egg, meat, whole grains
Iron	Carries oxygen in our blood and gives us energy.	Leafy greens, legumes, spinach, jaggery
Potassium	Helps our nerves and muscles work together and keeps our heart healthy.	Bananas, oranges, melons, broccoli, potatoes and sweet potatoes
Phosphorous	Necessary for strong bones and teeth	Green vegetables, bajra, ragi, dairy products, nuts
Zinc	Helps our immune system fight off germs and aids in wound healing.	Meat, shellfish, legumes, nuts and seeds
Iodine	An essential component of thyroid hormones that regulate metabolism and overall growth and development	Seafood, iodised salt, leafy vegetables

In addition to the above nutrients, our body needs dietary fibre and water. Dietary fibres or **roughage** are fibrous, indigestible parts of the food. Roughage does not contain any nutrients but adds to the bulk of our body, helping eliminate undigested food from our body. It also helps to absorb and retain water in our body. Fruits and vegetables are rich sources of roughage. **Water** helps to absorb nutrients from food. It also helps our body to remove dissolved wastes in the form of urine and sweat. Normally, our body needs 2-3 litres of water every day. Most of our body's water requirement is met by the liquids we drink.

SELF EVALUATION TEST – 1

1. Fill in the blanks:

- Carbohydrates are a primary source of _____ for our body.
- Proteins play a crucial role in _____ and repairing tissues.
- _____ serve as reserves of energy in our body.
- _____ and minerals are required in small quantities.
- Vitamin A is essential for good _____.

2. Answer in one word:

- The process by which we obtain nutrients and energy from food for growth and development.
- Nutrients that are required in small quantities, but they are important to build immunity.

Chapter 1: Nutrition in Plants

At a Glance:

- Mode of Nutrition in Plants
- Other Modes of Nutrition in Plants
- Symbiotic Relationship
- Photosynthesis
- Saprotrophs
- How Nutrients are Replenished in the Soil

How do plants get their food?

Plants obtain their food through a process called **photosynthesis**. They use chlorophyll in their leaves to capture the energy of the sunlight, take in carbon dioxide from the air through tiny openings called **stomata**, and absorb water from the soil through their roots. With these ingredients, plants produce glucose, a type of sugar, and release oxygen as a by-product. This glucose serves as their food source, providing energy for growth and other life processes. Some glucose is used immediately, while the rest is stored as starch for future needs. Photosynthesis is a crucial process that not only sustains plants but also produces oxygen and forms the foundation of the food chain in ecosystems.

1.1 Mode of Nutrition in Plants:

Plants have a unique way of getting their food, and it all revolves around their specific mode of nutrition. **Nutrition** is the mode of taking food by an organism and its utilisation by the body for growth, energy, and various metabolic activities.

1. **Autotrophic Nutrition:** The mode of nutrition in which organisms make their own food from simple substances is called autotrophic (auto = self; trophos = nourishment) nutrition.
2. **Heterotrophic Nutrition:** The mode of nutrition in which organisms rely on others for their nutrition is called heterotrophic (hetero = other; trophos = nourishment) nutrition.

Most of the plants follow an autotrophic mode of nutrition. However, some plants rely on other organisms for nourishment and follow a heterotrophic mode of nutrition. Some plants exhibit mixotrophic nutrition, where they can switch between autotrophic and heterotrophic modes depending on environmental conditions. Orchids are examples of plants that exhibit mixotrophic nutrition by obtaining nutrients from both photosynthesis and mycorrhizal fungi.

1.2 Photosynthesis — Food-Making Process in Plants:

Leaves are the food factories of plants. So, to make the plant's food, all the raw materials like water, carbon dioxide, sunlight, and minerals must reach the leaves. Water and minerals are absorbed by the plant's roots from the soil and transported to the leaves. Inside the leaves of plants are tiny parts of plant cells called "chloroplasts." These chloroplasts have a special green pigment called "chlorophyll." Chlorophyll helps plants to absorb sunlight to make food. Also, plants have small openings on their leaves called "stomata." These stomata let the plants take in the carbon dioxide and release oxygen with the help of guard cells, just like we breathe.

Photosynthesis:

It is a process by which green plants make their food in the presence of sunlight, carbon dioxide, and water. They take in carbon dioxide from the air through stomata and water from the ground through

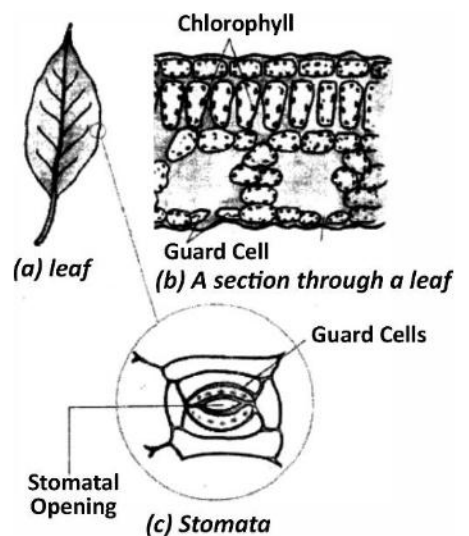


Fig 1.1: Location of chlorophyll and stomata in leaves

their roots. When sunlight, air, and water come together inside the leaves, they convert into food. This process is called "photosynthesis." During this process, plants convert carbon dioxide and water into glucose (their food) and oxygen in the presence of sunlight. Plants utilise the produced glucose for their life processes and release oxygen into the environment.

Photosynthetic Process:

The photosynthetic process can be summarized in three main stages:

Stage 1: Absorption of Light

Chlorophyll in the chloroplasts absorbs sunlight, which provides the energy needed for photosynthesis.

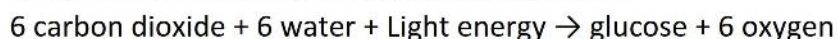
Stage 2: Conversion of Light Energy

During this stage, water molecules are split into oxygen and hydrogen. Oxygen is released as a by-product, while hydrogen is used in the next stage.

Stage 3: Synthesis of Glucose

The hydrogen molecules from the previous stage combine with carbon dioxide to form glucose. This glucose is used by plants for energy and to make other substances like cellulose and starch. Cellulose is used in building cell walls. Starch is stored in seeds and other plant parts as a food source.

The process can be represented in an equation:



This equation shows how six carbon dioxide molecules and six water molecules, with the help of light energy, transform into one glucose molecule and six oxygen molecules.

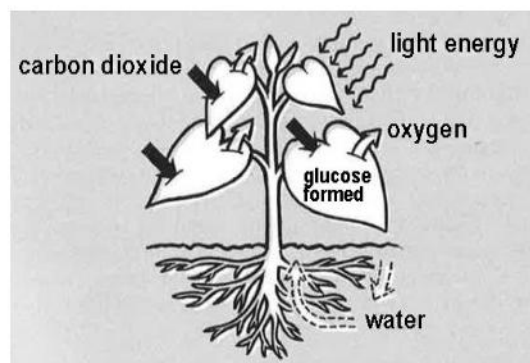


Fig 1.2: Photosynthetic process

Iodine Test:

The presence of starch in leaves indicates the occurrence of photosynthesis and an iodine test is performed to check the presence of starch. Iodine is a chemical element that is known for its ability to react with starch. When iodine comes into contact with starch molecules, it forms a distinct blue-black colour complex. This colour change indicates the presence of starch.

To perform the iodine test, follow these steps:

- 1. Collect a Leaf:** Choose a healthy leaf from a plant as leaves are the primary sites of photosynthesis due to the presence of chlorophyll.
- 2. Boil the Leaf:** Place the leaf in boiling water for a few minutes. This step is important to soften the leaf's cell walls and release the starch that might be stored within.
- 3. De-colouring the Leaf:** Once the leaf has been boiled, chlorophyll has to be removed. This is done by placing the leaf in alcohol which removes the chlorophyll.
- 4. Rinse the Leaf:** After de-starching, the leaf is rinsed with water to remove excess alcohol.
- 5. Iodine Solution:** Now comes the critical step. Gently drop a few drops of iodine solution onto the leaf. The iodine solution will spread over the leaf's surface.
- 6. Observe the Colour:** Watch closely for any colour change. If the leaf turns a deep blue-black colour, it indicates the presence of starch. This colour change is the result of the interaction between iodine and the starch molecules within the leaf cells.

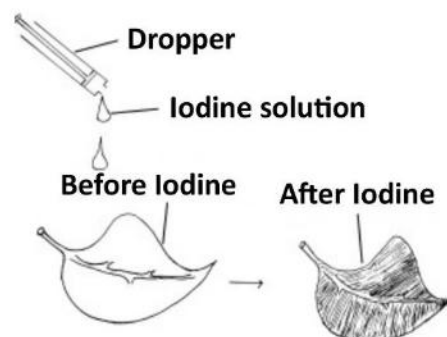


Fig 1.3: Iodine test

Chapter 1: Crop Production and Management

At a Glance:

- Types of Crops
- Animal Husbandry
- Importance of mushrooms and yeast in the food industry
- Green revolution and white revolution
- Steps in Farming
- Role of bacteria in the food industry

Why is crop production vital for humans?

Crop production is the process of cultivating and growing plants for various purposes, mainly for human consumption, animal feed, industrial raw materials, and other uses. It plays a vital role in ensuring food security and economic development. Its significance includes:

- Ensuring a stable food supply for global nutrition.
- Creating jobs, income, and supporting related industries. Boosting rural development and reducing poverty.
- Diversifying diets with fruits, vegetables, and grains.
- Supplying raw materials for industries like textiles and sugar.
- Providing livestock feed (forage crops) from crops like grains and leaves after harvest.

1.1 Types of crops:

There are broadly two types of crops depending upon the season they are grown:

- Kharif crops** are grown during the rainy season, which usually starts around June and lasts until September. These crops are well-suited to the monsoon conditions. Some examples are:
 - Rice:** This is one of the most important Kharif crops. It requires a lot of water and grows well in the rainy season.
 - Maize (corn):** Maize is another staple kharif crop. It's used for food, animal feed, and industrial purposes.
 - Cotton:** Cotton plants thrive during the rainy season, and their fibres are used to make clothing and textiles.
- Rabi crops** are grown during the winter season, which starts in October and lasts until March. These crops are adapted to cooler and drier conditions. They depend on irrigation and residual moisture in the soil. Some examples are:
 - Wheat:** Wheat is a major rabi crop and a staple food in many parts of the world.
 - Barley:** Barley is used for food, animal feed, and making beverages.
 - Mustard:** Mustard seeds are used for extracting cooking oil and in traditional medicine.

1.2 Steps in Farming:

Agriculture refers to the practice of cultivating crops, raising animals, and other activities that involve the production of food, fibre, medicinal plants, and other materials used to sustain and enhance human life. Farming or agricultural practice is a complex and time-consuming process. It can be broken down into many steps. Let us study these in detail.

a. Soil Preparation:

Proper soil preparation is vital for enabling roots to access nutrients. It involves loosening and overturning the soil before planting. Ploughing or tilling is the process of turning the top soil layer to break compaction. It is crucial for several reasons:

- i. It evenly mixes soil nutrients for plant use.
- ii. It makes the soil loose and airy, allowing roots to reach deeper for nutrients and water.
- iii. It encourages the growth of microorganisms and earthworms in the soil, enhancing soil composition and fertility. Earthworms create tiny air pockets through burrowing.
- iv. Organic materials like crop residues can be incorporated into the soil, enriching it with nutrients and improving fertility.

Traditional ploughing involves using a plough pulled by animals or a tractor, which cuts and flips the soil as it moves forward. The ploughshare is the cutting blade that slices through the soil.

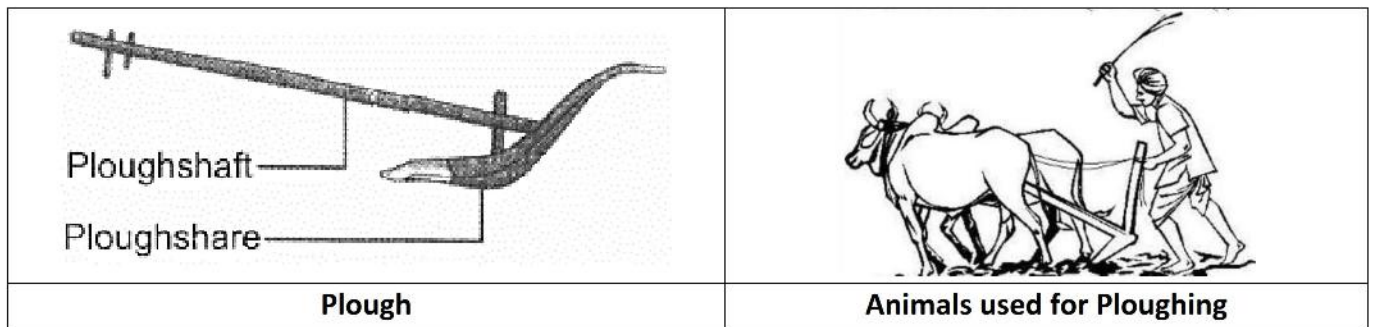


Fig 1.1: Agricultural tools – Plough and Hoe

A hoe is a simple hand tool used in agriculture for tasks related to tilling, weeding, and planting. It has a long rod of wood or iron. A strong, broad, and bent plate of iron is fixed to one of its ends, which works like a blade. It is pulled by animals.

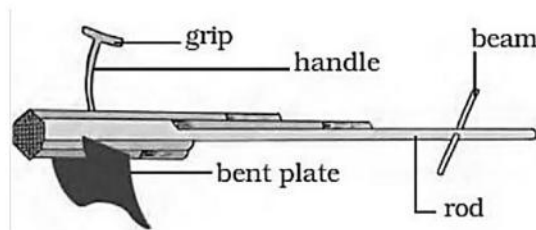


Fig 1.2: Hoe

A cultivator is an agricultural tool for soil preparation and upkeep in fields or gardens. It breaks soil, manages weeds, and readies a planting bed for seeds. Cultivators can be manual or mechanised, and vary in design for diverse farming purposes.

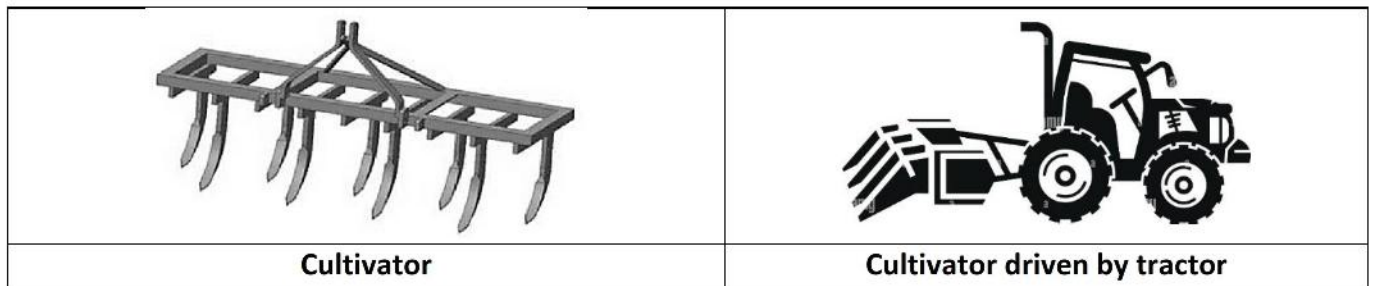


Fig 1.3: Cultivator

b. Sowing Seeds:

After soil preparation, planting seeds is a vital agricultural step. It involves: