Based on the **National Curriculum Framework**; adheres to the latest **NCERT** guidelines covering the latest **CBSE** and **ICSE** syllabus.

General Science

Text Book for Class VII

Authors

Shallu Singhal *M.Sc. Delhi University*

Anshu Goyal *B.Sc., B.Ed., CTET*

Amit Gupta

Edited by

Rema Sudhakaran *M.Sc., M.A., HDC, B.Ed.*

K.K. Chawla

PROGRESS PUBLISHERS

KRISHNA NAGAR, DELHI - 110 051

Visit us at : http://www.ProgressPublishers.com

ISBN : 978-81-7306-271-1

₹ 140

Syllabus

Sub-theme	Questions	Key concepts	Resources	Activities/ Processes
1. FOOD				**22**
Food from where	How do plants get their food?	Autotrophic and heterotrophic nutrition; parasites, saprophytes; photosynthesis	Coleus or any other plant with variegated leaves, alcohol, iodine solution, kit materials.	Need for light, green leaf for photosynthesis, looking at any saprophyte/parasite and noting differences from a green plant.
Utilization of food	How do plants and animals utilize their food?	Types of nutrition, nutrition in amoeba and human beings, Digestive system – human, ruminants; types of teeth; link with transport and respiration	Model of human teeth, charts of alimentary canal, types of nutrition etc., chart and model of amoeba. The story of the stomach with a hole.	Effect of saliva on starch, permanent slide of *Amoeba*. Role play with children
2. MATERIALS				**38**
Materials of daily use	Do some of our clothes come from animal sources? Which are these animals? Who rears them? Which parts of the animals yield the yarn? How is the yarn extracted?	Wool, silk – animal fibres. Process of extraction of silk; associated health problems	Samples of wool and silk; brief account of silkworm rearing and sheep breeding	Collection of different samples of woollen and silk cloth. Activities to differentiate natural silk and wool from artificial fibres. Discussion.
	What kinds of clothes help us to keep warm? What is heat? What is the meaning of 'cool'/'cold' and 'warm'/'hot'? How does heat flow from/to our body to/from the surroundings?	Heat flow; temperature	Potassium permanganate, metal strip or rod, wax, common pins, spirit lamp, matches, tumblers, Thermometer etc.	Experiment to show that 'hot' and 'cold' are relative. Experiments to show conduction, convection and radiation. Reading a thermometer.
Different kinds of materials	Why does turmeric stain become red on applying soap?	Classification of substances into acidic, basic and neutral; indicators	Common substances like sugar, salt, vinegar etc., test tubes, plastic vials, droppers, etc.	Testing solutions of common substances like sugar, salt, vinegar, lime juice etc. with turmeric, litmus, china rose. Activity to show neutralisation

Sub-theme	Questions	Key concepts	Resources	Activities/ Processes
How things change/react with one another	What gets deposited on a *tawa* / khurpi / *kudal* if left in a moist state? Why does the exposed surface of a cut brinjal become black?	Chemical substances; in a chemical reaction a new substance is formed.	Test tubes, droppers, common pins, vinegar, baking powder, $CuSO_4$, etc.	Experiments involving chemical reactions like rusting of iron, neutralisation (vinegar and baking soda), displacement of Cu from $CuSO_4$ etc. *Introduce chemical formulae without explaining them.*
	Why is seawater salty? Is it possible to separate salt from seawater?	Substances can be separated by crystallization.	Urea, copper sulphate, alum etc., beaker, spirit lamp, watch glass, plate, petri dish etc.	Making crystals of easily available substances like urea, alum, copper sulphate etc. using supersaturated solutions and evaporation.
3. THE WORLD OF THE LIVING				**42**
Surroundings affect the living	Why are nights cooler? How does having winters and summers affect soil? Are all soils similar? Can we make a pot with sand? Is soil similar when you dig into the ground? What happens to water when it falls on the cemented/ bare ground?	Climate, soil types, soil profile, absorption of water in soil, suitability for crops, adaptation of animals to different climates	Data on Earth, Sun – size, distance etc., daily changes in temperature, humidity from the newspaper, sunrise, sunset etc.	Graph for daily changes in temperature, day length, humidity etc.; texture of various soils by wetting and rolling; absorption / percolation of water in different soils, which soil can hold more water.
The breath of life	Why do we/animals breathe? Do plants also breathe? Do they also respire? How do plants/animals live in water?	Respiration in plants and animals	Lime water, germinating seeds, kit materials.	Experiment to show plants and animals respire; rate of breathing; what do we breathe out? What do plants 'breathe' out? Respiration in seeds; heat release due respiration. Anaerobic respiration, root respiration
Movement of substances	How does water move in plants? How is food transported in plants? Why do animals drink water? Why do we sweat? Why and how is there blood in all parts of the body? Why is blood red? Do all animals have blood? What is there in urine?	Herbs, shrubs, trees; Transport of food and water in plants; circulatory and excretion system in animals; sweating.	Twig, stain; improvised stethoscope; plastic bags, plants, egg, sugar, salt, starch, Benedict's solution, $AgNO_3$ solution.	Translocation of water in stems, demonstration of transpiration, measurement of pulse rate, heartbeat;after exercise etc. Discussion on dialysis, importance; experiment on dialysis using egg membrane.

Sub-theme	Questions	Key concepts	Resources	Activities/ Processes
Multiplication in plants	Why are some plant parts like potato, onion swollen – are they of any use to the plants? What is the function of flowers? How are fruits and seeds formed? How are they dispersed?	Vegetative, asexual and sexual reproduction in plants, pollination - cross, self pollination; pollinators, fertilisation, fruit, seed	*Bryophyllum* leaves, potato, onion etc.; yeast powder, sugar	Study of tuber, corm, bulb etc; budding in yeast; T.S./L.S. ovaries, w.m.pollen grains; comparison of wind pollinated and insect pollinated flowers; observing fruit and seed development in some plants; collection and discussion of fruits/seeds dispersed by different means.
4. MOVING THINGS, PEOPLE AND IDEAS				**16**
Moving objects	Why do people feel the need to measure time? How do we know how fast something is moving?	Appreciation of idea of time and need to measure it. Measurement of time using periodic events. Idea of speed of moving objects – slow and fast motion along a straight line.	Daily-life experience; metre scale, wrist watch/ stop watch, string etc.	Observing and analysing motion (slow or fast) of common objects on land, in air, water and space. Measuring the distance covered by objects moving on a road in a given time and calculating their speeds Plotting distance vs. time graphs for uniform motion Measuring the time taken by moving objects to cover a given distance and calculating their speeds. Constancy of time period of a pendulum.
5. HOW THINGS WORK				**14**
Electric current and circuits	How can we conveniently represent an electric circuit?	Electric circuit symbols for different elements of circuit.	Recollection of earlier activities. Pencil and paper.	Drawing circuit diagrams
	Why does a bulb get hot?	Heating effect of current	Cells, wire, bulb.	Activities to show the heating effect of electric current.
	How does a fuse work?	Principle of fuse	Cells, wire, bulb or LED, aluminium foil.	Making a fuse.
	How does the current in a wire affect the direction of a compass needle?	A current-carrying wire has an effect on a magnet.	Wire, compass, battery.	Activity to show that a current-carrying wire has an effect on a magnet.
	What is an electromagnet?	A current-carrying coil behaves like a magnet.	Coil, battery, iron nail.	Making a simple electromagnet. Identifying situations in daily life where electromagnets are used.
	How does an electric bell work?	Working of an electric bell.	Electric bell.	Demonstration of working of an electric bell.
6. NATURAL PHENOMENA				**24**
Rain, thunder and lightning	What causes storms? What are the effects of storms? Why are roofs blown off?	High-speed winds and heavy rainfall have disastrous consequences for human and other life	Experience; newspaper reports. Narratives/stories	Making wind speed and wind direction indicators. Activity to show "lift" due to moving air. Discussion on effects of storms and possible safety measures.

Sub-theme	Questions	Key concepts	Resources	Activities/ Processes
Light	Can we see a source of light through a bent tube?	Rectilinear propagation of light	Rubber/plastic tube/ straw, any source of light.	Observation of the source of light through a straight tube, a bent tube.
	How can we throw sunlight on a wall?	Reflection, certain surfaces reflect light	Glass/metal sheet/ metal foil, white paper.	Observing reflection of light on wall or white paper screen.
	What things give images that are magnified or diminished in size ?	Real and virtual images	Convex/concave lenses and mirrors.	Open ended activities allowing children to explore images made by different objects, and recording observations. Focussed discussions on real and virtual images.
	How can we make a coloured disc appear white?	White light is composed of many colours.	Newton's disc.	Making the disc and rotating it.
7. NATURAL RESOURCES				**24**
Scarcity of water	Where and how do you get water for your domestic needs? Is it enough? Is there enough water for agricultural needs? What happens to plants when there is not enough water for plants? Where does a plant go when it dies?	Water exists in various forms in nature. Scarcity of water and its effect on life.	Experience; media reports; case material.	Discussions. Case study of people living in conditions of extreme scarcity of water, how they use water in a judicious way. Projects exploring various kinds of water resources that exist in nature in different regions in India; variations of water availability in different regions.
Forest products	What are the products we get from forests? Do other animals also benefit from forests? What will happen if forests disappear?	Interdependence of plants and animals in forests. Forests contribute to purification of air and water.	Case material on forests.	Case study of forests.
Waste Management	Where does dirty water from your house go? Have you seen a drain? Does the water stand in it sometimes? Does this have any harmful effect?	Sewage; need for drainage / sewer systems that are closed	Observation and experience; photographs.	Survey of the neighbourhood, identifying locations with open drains, stagnant water, and possible contamination of ground water by sewage. Tracing the route of sewage in your building, and trying to understand whether there are any problems in sewage disposal.

Contents

Subjectwise Division of Chapters

Physics

- Heat and Temperature
- Weather, Climate and Adaptations
- Time and Motion
- Electric Current and its Effects
- Wind, Storm and Cyclone
- Light – Mirrors and Lenses

Chemistry

- Fibres from Animals
- Matter and Chemical Formulae
- Acids, Bases and Salts
- Physical and Chemical Changes
- Water – A Precious Resource
- Wastewater Management

Biology

- Nutrition in Plants
- Nutrition in Animals
- Soil
- Respiration in Organism
- Transportation and Excretion
- Reproduction in Plants
- Forest – Our Life Line

LESSON 1

Nutrition in Plants

Let us learn about

- Modes of nutrition – Autotrophic and Heterotrophic
- Autotrophic nutrition in plants – Photosynthesis
- Heterotrophic nutrition in plants – parasitic, saprophytic, insectivorous, and symbiotic

All living organisms require energy to carry out various life processes – respiration, growth, reproduction, and replacement of worn out cells and tissues. This energy comes from the food we eat which provides **nutrients** such as carbohydrates and fats.

The process of intake of food by an organism and its utilisation by the body is called **nutrition**.

Learn More

Nutrition is derived from the Latin word 'nutrire' which means to feed, nurse, support, and preserve. Essentially, nutrition refers to various ways in which the body makes use of food.

Modes of Nutrition

Modes of nutrition refer to the methods of procuring food by an organism. The main modes of nutrition in plants and animals are :

- Autotrophic nutrition
- Heterotrophic nutrition

Autotrophic Nutrition

'Auto' means self and 'trophic' means nutrition. The mode of nutrition in which an organism prepares its own food from simple inorganic raw materials, such as water, carbon dioxide and minerals, present in the surroundings is called **autotrophic nutrition**. Organisms that prepare their own food from natural raw materials are called **autotrophs**, *e.g.* green plants and some bacteria.

Green plants

Bacteria

Autotrophs

Heterotrophic Nutrition

'Hetero' means other and 'trophic' means nutrition. The mode of nutrition in which an organism obtains food from other organisms is called **heterotrophic nutrition**.

Organisms that obtain their food from other organisms are called **heterotrophs**, *e.g.* non-green plants and animals.

Non-green plant

Elephant

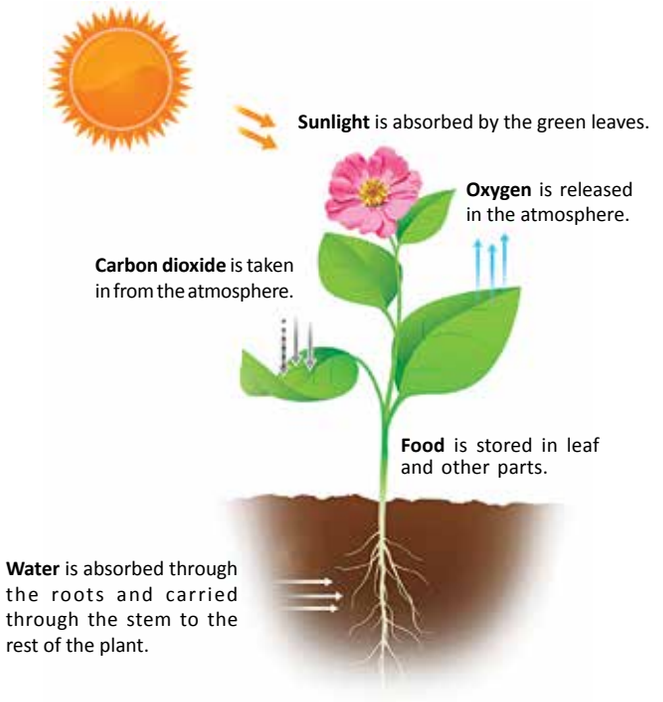
Heterotrophs

Autotrophic Nutrition in Plants – Photosynthesis

Photosynthesis is the process by which green plants prepare their own food from carbon dioxide and water in the presence of sunlight and chlorophyll. During this process, food is produced in the form of a simple carbohydrate, glucose, along with oxygen. The chemical reaction involved in photosynthesis is given below.

$$\text{Carbon dioxide} + \text{Water} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \text{Glucose} + \text{Oxygen}$$

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6O_2$$

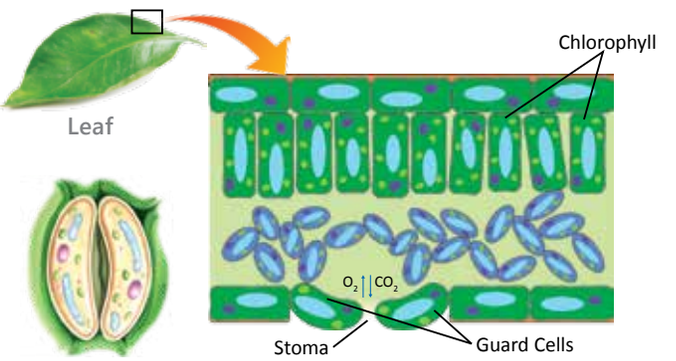


Mechanism of photosynthesis

Learn More

In 1771, Joseph Priestley demonstrated that plants produce oxygen and purify air.

The cells of green leaves and young stems of plants contain various green structures called **chloroplasts**. There green colour is due to the presence of a green pigment called **chlorophyll** that traps energy from sunlight. The tiny pores present on the underside of the leaves are called **stomata** (*singular : stoma*). Stomata help in exchange of gases – carbon dioxide and oxygen, during photosynthesis.



Stoma Section of a leaf

Water and minerals are absorbed from the soil by the roots and are transported to the other parts of the plant through the stem. The food prepared by the green leaves, in form of glucose, is transported to the different parts of the plant for utilisation. The extra glucose is converted into starch which is stored in various parts of the plant such as flowers, stems and roots.

The synthesis of food occurs primarily in the leaves of plants. Hence, they are called the **food factories** of plants.

Without photosynthesis, green plants will not be able to produce food on which all other organisms depend. Through photosynthesis, plants can convert the carbon dioxide generated by animals during respiration to oxygen. So plants play an important role in maintaining the balance between oxygen and carbon dioxide in the atmosphere.

Learn More

The leaves of a green plant which do not contain any starch are said to be destarched. Destarching occurs in the absence of sunlight when the process of photosynthesis stops and no more glucose is formed.

Conditions Necessary for Photosynthesis

The process of photosynthesis occurs when certain conditions are fulfilled. These conditions are :

- Presence of sunlight
- Availability of carbon dioxide
- Presence of chlorophyll
- Availability of water

Sunlight

Sunlight is essential for green plants to prepare their food. The heat energy of the sunlight initiates and sustains the chemical reactions occurring during photosynthesis. Photosynthesis cannot occur in the absence of sunlight.

Activity 1

Aim : To show that sunlight is necessary for photosynthesis.

Materials required : A potted plant with green leaves, black paper, beaker, test tube, ethanol, burner, iodine solution, dropper, and paper clips.

Procedure :

1. Cover a part of one green leaf with a strip of black paper and fix it with the help of paper clips.
2. Place the plant in a dark room for 2 days to destarch. (The leaf turns light brown)
3. Keep the plant in sunlight for 5-6 hours.
4. Pluck the leaf covered with the black paper strip.
5. Test the leaf for the presence of starch. (You have studied test for starch in Class VI)

Observation : The portion of the leaf covered with black paper strip remains light brown. However, the uncovered portion of the leaf turns blue-black.

Explanation : In the absence of sunlight, the covered portion of the leaf was not able to produce starch. However, the uncovered portion of the leaf regained starch in the presence of sunlight.

Conclusion : Sunlight is necessary for photosynthesis.

Chlorophyll

Chlorophyll is a green pigment present in the leaves of a plant. The green stems and green branches in some plants also contain chlorophyll. Chlorophyll traps the energy of the sunlight and uses it to enable the chemical reactions required to synthesise food.

Variegated leaves of some plants, such as coleus, contain coloured pigments other than chlorophyll. These leaves contain patches of red, yellow or white colour. These patches are incapable of photosynthesis and only enhance the appearance of the leaf.

Learn More

Algae are plant-like aquatic organisms that do not have stems or leaves. They contain chlorophyll in their body parts and are capable of photosynthesis.

Activity 2

Aim : To show that chlorophyll is necessary for photosynthesis.

Materials required : Coleus plant, paper, beaker, alcohol, burner, iodine solution, and dropper.

Procedure :
1. Take a leaf of coleus plant. This leaf is variegated and its green portion contains chlorophyll.
2. Test the leaf for the presence of starch.

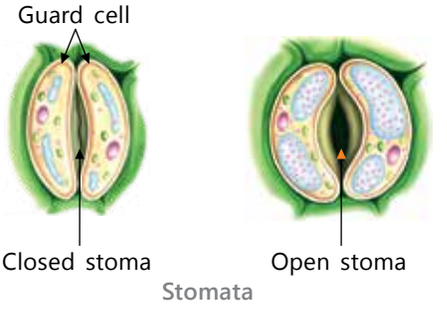
Observation : The green part of the leaf turns blue-black whereas the non-green part of the leaf does not turn blue-black.

Explanation : The non-green part of the leaf did not contain chlorophyll and was not able to synthesise starch whereas, the green part of the leaf contained chlorophyll and was able to synthesise starch.

Conclusion : Chlorophyll is necessary for photosynthesis.

Carbon dioxide

Carbon dioxide present in the air is taken by the green plants to carry out the process of photosynthesis. It enters through stomata present under the surface of leaves. Each stoma is bounded by two bean-shaped guard cells. When there is enough light and water, the guard cells swell and curve away from each other, leaving an opening through which carbon dioxide enters the stoma.



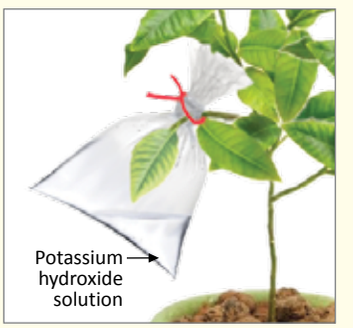
Stomata

Activity 3

Aim : To show that carbon dioxide is necessary for photosynthesis.

Materials required : A potted plant, water, polythene bag, thread, iodine solution, potassium hydroxide solution (soda lime), beaker, alcohol, burner, and dropper.

Procedure :
1. Keep the potted plant in a dark room for 2 days for destarching.
2. Take a polythene bag which contains potassium hydroxide solution. Tie this bag over one leaf of the plant with thread.
3. Keep the plant in sunlight for 5-6 hours.
4. Remove the polythene bag from the leaf and pluck it from the plant. Also, pluck another leaf from the plant.
5. Test both leaves for the presence of starch.



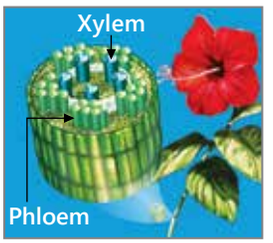
Observation : The leaf that was kept inside the polythene bag does not turn blue-black while the uncovered leaf does.

Explanation : The leaf inside the polythene bag could not perform photosynthesis because the potassium hydroxide solution absorbed all the carbon dioxide present in the bag. Hence, no starch was formed in it. The other leaf produced starch as carbon dioxide was available to it.

Conclusion : Carbon dioxide is necessary for photosynthesis.

Water

Water is essential for the process of photosynthesis. The roots of the plant absorb water and dissolved minerals from the soil. This water is transported to the leaves through a network of long, thin tubular tissues called **xylem**.



Cross section of stem

Learn More

The food produced by the leaves is transported to the various parts of the plant through a network of thin tubular tissues called **phloem**.

Synthesis of Plant Food other than Carbohydrates

The products of photosynthesis are glucose and oxygen. Glucose is a kind of carbohydrate. Carbohydrates are made up of three elements – carbon, hydrogen and oxygen.

These elements are also used to synthesise other components of food such as proteins and fats. Proteins are nitrogenous substances which contain nitrogen.

Plants are incapable of absorbing gaseous nitrogen present in air. Nitrogen-fixing bacteria, *Rhizobium*, present in the root nodules of leguminous plants, convert atmospheric nitrogen into a usable form through the process of nitrogen-fixation. This nitrogen, in the form of soluble nitrate ions or ammonium ions, is absorbed by the plant through its roots.

Heterotrophic Mode of Nutrition in Plants

Heterotrophic nutrition is the mode of nutrition in which living organisms cannot prepare their own food. Non-green plants are heterotrophs and obtain their food from other organisms.

These plants are further divided into four types :

- Parasitic Plants
- Saprophytic Plants
- Insectivorous Plants
- Symbiotic Plants

Parasitic Plants

The organism which obtains the food from the body of another organism is called a **parasite**. **Parasitic plants** are plants that derive some or all of their nutrition from other green plants. The organism from which a parasite derives its nutrition is called a **host**. A parasitic plant has special roots that pierces into the tissues of the host plant, on which it climbs and absorbs food.

Parasites may be total or partial.

A **total parasite** derives all its nutrition from the host. *For example*, cuscuta (amarbel) is a total parasitic plant and derives all its nutrition from other plants.


Cuscuta (amarbel)

A **partial parasite** synthesises some of its nutrition on its own and derives the remaining from the host. *For example*, mistletoe has green leaves and is able to synthesise some of its food on its own. It derives minerals and water from the host plant on which it grows. Hence, it is a partial parasitic plant.


Mistletoe

Learn More

Rafflesia is a parasitic plant without any leaves, stem or roots. It is the largest flower in the world but has a life of 5 to 7 days only. It is a five-petaled flower with a diameter up to 106 *cm* and weighing up to 10 *kg*. It has nutrient-absorbing threads to absorb nutrients from the host on which it lives.

Saprophytic Plants

Saprophytic plants or **saprophytes** derive their food from dead and decaying organic matter. They are varied in colour and often have no leaves.

These plants secrete digestive juices on the dead and decaying matter and convert them into a solution. They absorb the nutrients from this solution. These plants generally grow in places covered with rotten dead leaves, often in deep shade, in tropical forests.

Coral root

Indian pipe

Coral root, indian pipe and fungi such as moulds and mushrooms are examples of saprophytes.

Insectivorous Plants

Some plants are capable of photosynthesis but are not able to get sufficient nitrogen from the soil required for the synthesis of proteins. These plants usually grow in areas where there is little nitrogen in the soil. Such plants derive nitrogen from the bodies of insects.

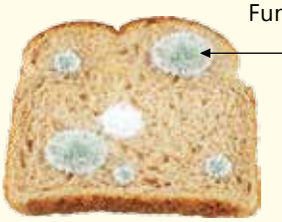
Plants that derive some of their nutrition from insects are called **insectivorous plants**. These plants have special features to trap insects and derive nutrition from their bodies.

Venus flytrap, pitcher plant, butterwort, and sundew are examples of insectivorous plants. They have attractive colourful shapes to lure the insects towards them.

Pitcher plant

In **pitcher plant**, the leaf is modified to form a pitcher-like structure which is very attractive and brightly coloured. The apex of the leaf is modified into a lid which can open and close the mouth of the pitcher. When an insect enters the pitcher, the lid closes and the insect is trapped inside. The pitcher contains hair which penetrate the body of the insect. The insect is digested by the action of enzymes present in the digestive juices released by the cells of the plant.

Activity 4



Aim : To observe fungus on bread.

Materials required : A piece of bread, water and magnifying glass.

Procedure :
1. Moisten the piece of bread.
2. Leave it in a dark and damp place for 2-3 days.
3. Observe the piece of bread under a magnifying glass.

Observation : The growth of white, green, brown or grey coloured patches, is seen on the piece of bread. When viewed under the magnifying glass, thread-like structures are observed on the surface of bread.

The patches formed on bread are a kind of fungus called **bread mould**.

In **venus flytrap**, the leaf blades terminate in distinctive traps with sharp toothed edges. The outside of the traps are generally green while the inside have red pigment that varies in shade. When an insect touches the hair, the leaves close in less than a second and the insect gets trapped. This insect is then digested by the action of enzymes.

Venus flytrap

Symbiotic Plants

The association of two different types of organisms which depend on each other for their mutual benefit is known as **symbiosis** or **mutualism**. Plants that have a mutually beneficial relationship with other organisms are called **symbiotic plants**.

Lichens are an example of symbiotic association between algae and fungi. The fungi supply water and minerals to the algae which in turn supply food to the fungi. This helps algae to grow and survive in harsh conditions.

Lichens

Rhizobium bacteria and leguminous plants also show symbiosis. Rhizobium bacteria are present in the root nodules of leguminous plants such as moong, gram and peas. Rhizobium bacteria convert atmospheric nitrogen into usable form for the plant which, in turn, provides nutrients and shelter to the bacteria.

Rhizobium in root nodules of leguminous plant

Replenishment of Nutrients in the Soil

Nitrogen, phosphorus, potassium, magnesium, and calcium are the major nutrients required by plants for their growth. In addition to these, plants also need iron, copper, manganese, and zinc. If soil becomes poorer in these nutrients, it looses its fertility and crop yield falls.

Fertile soil is one of the foundations of a healthy and productive plant. If crops are grown year after year on the same field, the soil becomes deficient in nutrients. Therefore, it is important to replenish these nutrients in the soil.

Soil can be replenished by the following methods :

- By adding manures or fertilisers which provide one or more nutrients to the soil.
- By practicing crop rotation in which farmers change their crops in each season so that soil does not become deficient in a specific nutrient.

WORD POWER

Autotrophic nutrition	:	mode of nutrition in which a living organism makes its own food
Chlorophyll	:	green pigment present in autotrophs responsible for the absorption of sunlight
Heterotrophic nutrition	:	mode of nutrition in which a living organism derives its food from other living organisms
Host	:	an organism from which a parasite derives its nutrition
Insectivorous plant	:	a plant that obtains nutrients by trapping and consuming animals, mainly insects
Nutrients	:	substances present in food that are essential for the growth and survival of living organisms
Nutrition	:	the process by which living organisms consume food and use it for growth and survival
Parasitic plant	:	a plant that derives some or all of its nutrition needed from other green plants
Photosynthesis	:	the process by which green plants synthesise food from carbon dioxide and water in the presence of sunlight
Saprophytic plant	:	a plant that derives its nutrition from dead and decaying organic matter
Stomata	:	the small pores or openings present on the underside of leaves which help in exchange of gases
Symbiotic plants	:	a plant that has a mutually beneficial relation with other organisms

POINTS TO REMEMBER

- All living organisms take in food and utilise it to get energy for their growth and maintenance.
- The two main modes of nutrition in plants are – autotrophic nutrition and heterotrophic nutrition.
- Organisms that prepare their own food from natural raw materials are called autotrophs, *e.g.* green plants.
- Organisms that obtain their food from other organisms are called heterotrophs, *e.g.* non-green plants and animals.
- The conditions necessary for the process of photosynthesis are – presence of sunlight, presence of chlorophyll, availability of carbon dioxide, and availability of water.
- The products of photosynthesis are glucose and oxygen.
- Heterotrophic plants are of four types – parasitic, saprophytic, insectivorous, and symbiotic.
- Parasitic plants have special roots that pierce into the tissues of the host plant on which they climb and absorb food.
- Saprophytic plants secrete digestive juices on the dead and decaying matter, and convert it into a solution. They absorb nutrients from this solution.
- Insectivorous plants have special features to trap insects and derive nutrition from their bodies.
- Symbiotic plants have a mutually beneficial relationship with other organisms.
- Soil can be replenished by adding manures or fertilisers to the soil, or by practicing crop rotation.

ASSESSMENT 1

A. Tick ✓ the correct option.

1. Lichens are examples of
   - ☐ insectivorous plants
   - ☐ parasitic plants
   - ☐ saprophytic plants
   - ☐ symbiotic plants
2. During symbiosis between two organisms,
   - ☐ no organism gains
   - ☐ one gains while the other loses
   - ☐ both organisms benefit
   - ☐ none of these
3. The condition not necessary for the process of photosynthesis is
   - ☐ presence of sunlight
   - ☐ presence of chlorophyll
   - ☐ availability of water
   - ☐ availability of nitrogen
4. Organisms that prepare their own food from natural raw materials are called
   - ☐ heterotrophs
   - ☐ omnivores
   - ☐ carnivores
   - ☐ autotrophs
5. Water is transported to the leaves through a network of long thin tubular tissues called
   - ☐ xylem
   - ☐ stoma
   - ☐ foliage
   - ☐ phloem
6. Nutrients in the soil can be replenished through
   - ☐ fertilisers
   - ☐ manures
   - ☐ crop rotation
   - ☐ all of these

B. Fill in the blanks.

1. $6CO_2 + 6H_2O \longrightarrow$ _____ + $6O_2$
2. An organism from which a parasite derives its nutrition is called a _____.
3. _____ bacteria convert atmospheric nitrogen into usable form for the plant.
4. _____ are called the food factories of the plants.
5. _____ plants obtain nutrition by eating insects.
6. Organisms that obtain their food from other organisms are called _____.
7. _____ is an association between organisms for mutual benefits.

C. State whether the following statements are True or False.

1. A total parasite derives all its nutrition from the host. _____
2. Stomata help in the exchange of gases during photosynthesis. _____
3. The products of photosynthesis are glucose and carbon dioxide. _____
4. Lichens are an example of symbiotic association between algae and fungi. _____
5. Chloroplast is a green pigment present in the leaves of autotrophs. _____
6. Availability of oxygen is essential for the process of photosynthesis. _____
7. Insectivorous plants derive nitrogen from the bodies of their prey. _____

D. Answer each of the following questions in a few words.

1. Name the two modes of nutrition in plants.
2. Name two saprophytic plants.
3. Name the products of photosynthesis.
4. Give two examples of parasitic plants.
5. Give two examples of insectivorous plants.

E. Answer each of the following questions in few sentences.

1. What do you mean by nutrition?
2. What are insectivorous plants? How do they trap insects?
3. What is the role of chloroplasts in green plant?
4. What are stomata? Draw the structure of stomata in the leaf of a plant.
5. Describe the role of rhizobium bacteria in replenishing nitrogen in soil.

F. Answer each of the following questions in detail.

1. Differentiate between :
   (a) Autotrophic and heterotrophic nutrition
   (b) Parasitic plants and saprophytic plants
2. Describe, with the help of a labelled diagram, the process of photosynthesis in plants.
3. Name the conditions necessary for photosynthesis. State their role during photosynthesis.
4. What are symbiotic plants? How do they derive their nutrition?
5. Explain how venus flytrap and pitcher plant trap insects and derive nutrition from them.
6. Why is it important to replenish nutrients in the soil? How can it be done?

G. Match the columns.

1. Insectivorous plant	(a) Chlorophyll
2. Saprophytic plant	(b) Cuscuta
3. Product of photosynthesis	(c) Stomata
4. Necessary for photosynthesis	(d) Pitcher plant
5. Parasitic plant	(e) Mushroom
6. Helps in exchange of gases	(f) Oxygen

1. Humans cook food for themselves. Does it mean humans are autotrophs?
2. What will happen if the leaves of a plant get covered with soot and dust particles?
3. Why do green plants not have a digestive system?

- **Complete the crossword with the help of the clues given.**

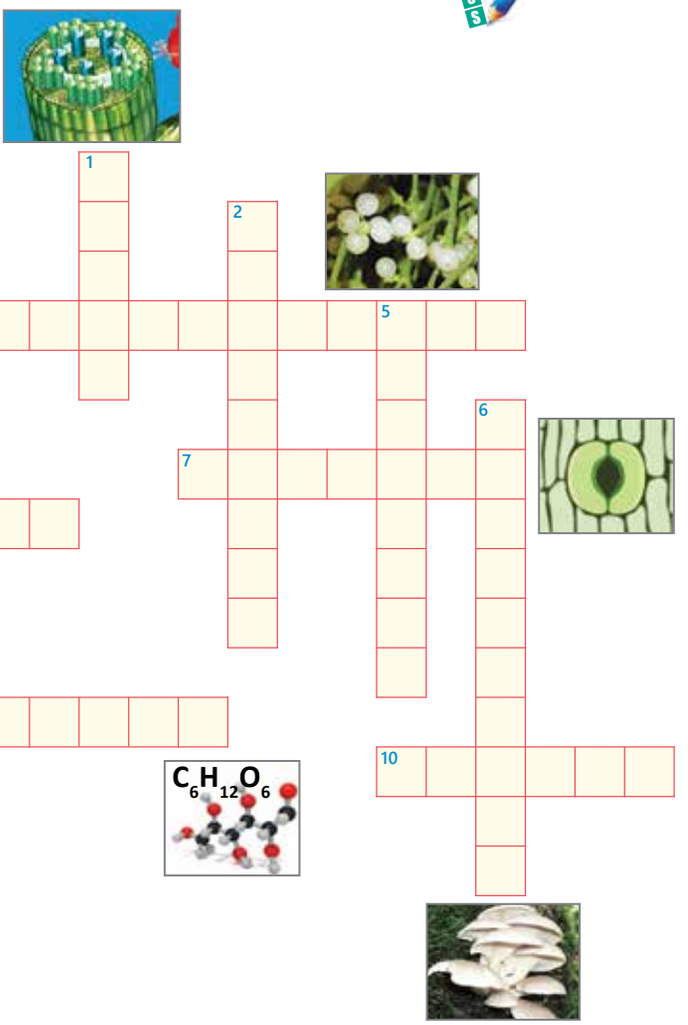
Clues

Across

4. Organisms that cannot prepare their own food.
7. Pores on underside of leaf that help in exchange of gases.
8. Organism from which a parasite derives its nutrition.
9. Simple carbohydrate which is the product of photosynthesis.
10. Gas released during photosynthesis.

Down

1. Network of long, thin tubes that transport water in a plant.
2. Taking and utilising the food by an organism.
3. Green pigment present in a leaf.
5. Organism which obtains food from the body of other organisms.
6. Plant that derives nutrition from dead and decaying matter.



Group Discussion

- What would happen if there were no autotrophs?

PROJECT IDEAS

- Prepare a report on the various mechanisms through which insectivorous plants lure their prey and derive nutrition from them. Illustrate the report with colourful pictures and samples wherever possible.

LESSON 2

Nutrition in Animals

Let us learn about

- Process of nutrition in animals
- Human digestive system
- Digestive system in ruminants
- Nutrition in amoeba

Unlike green plants, animals, including humans cannot prepare their own food. They depend directly or indirectly on plants for their food. Depending on their food habits, animals can be categorised as – Herbivores, Carnivores and Omnivores.

1. **Herbivores** feed only on plants, *e.g.* cow, camel, rabbit, deer, goat, and elephant. They have sharp front teeth for biting and cutting plants and strong and broad back teeth for chewing.
2. **Carnivores** feed only on flesh of other animals, *e.g.* tiger, vulture, lion, and snake. They have sharp and curved front teeth for tearing the flesh of the hunted animal. They also have strong and sharp paws to hunt.
3. **Omnivores** feed both on plants and animals, *e.g.* bear, dog, rat, and humans. They have strong grinding teeth for chewing flesh and bones.

Different Ways of Taking Food

The mode of consuming food varies from organism to organism.

Mammals like elephants have long trunks to grasp and pull leaves and plants into their mouth for chewing. Dogs and cats use their tongues to lick milk and water.

Reptiles like snakes swallow their food whole.

Insects like butterflies, bees and moths have long thin sucking tubes to sip nectar from flowers, while leeches and mosquitos pierce and suck the blood of the victim.

Snake swallowing fish

Butterfly sucking nectar

Birds like vultures use their beaks and claws to get their food.

Aquatic animals like oyster filter tiny particles of food floating nearby through gills and feed on them.

Learn More

A starfish has a unique feeding mechanism. It feeds on animals covered by hard shells, such as snails, clams and oysters. It uses its powerful arms to break the shells of the prey. It pushes out the stomach from its mouth to eat the digestible parts of the prey. The stomach is pulled back into the mouth where the food is slowly digested.

Nutrition in Animals

Nutrition in animals includes the various ways by which they consume food and derive nutrients for their growth and development. The food contains complex substances such as carbohydrates, proteins, minerals, vitamins, and fats. These substances are broken down into simpler forms in the body of an animal to utilise them.

The process of nutrition in animals involves five main steps – Ingestion, Digestion, Absorption, Assimilation, and Egestion.

1. **Ingestion** is the process of taking food into the body through the mouth.
2. **Digestion** is the process of breaking down of food, into simple soluble form, with the help of digestive juices produced in the body.
3. **Absorption** is the process of absorbing the simple substances, in which the food has been broken down, by the various parts of the body.
4. **Assimilation** is the process of using the absorbed food for growth and obtaining energy.
5. **Egestion** is the process of eliminating the undigested food from the body.

Nutrition in Humans

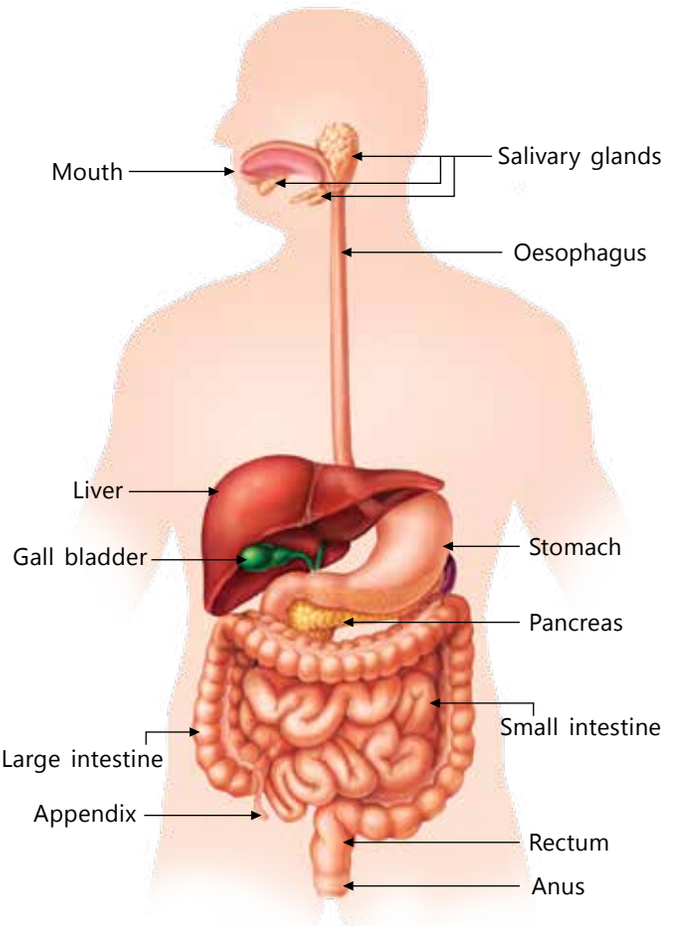
Human beings are omnivores. They obtain food from various animals and plants. This food is consumed in various forms - raw, processed and cooked.

The process of nutrition in humans takes place through a highly developed digestive system.

Learn More

Unicellular organisms do not have a dedicated digestive system. The cell performs all the processes involved in digestion of food.

The Human Digestive System



Human digestive system

The digestive system of humans is well developed and uniquely designed to convert food into energy. Food passes through a long muscular canal which begins at the mouth and ends at the anus. This canal consists of mouth, oesophagus, stomach, small intestine, large intestine, rectum and anus. All these parts together form the **alimentary canal** or the **digestive tract**. It is about 9 *m* long in an adult.

In addition to the alimentary canal, different glands such as salivary glands, liver and pancreas help the body to digest food.

Let us know about the various organs of the human digestive system and their role in the process of digestion of food.

Mouth

Food is taken into the body through the **mouth** or **buccal cavity**. Inside the mouth, there are many accessory organs that aid in the ingestion of food – tongue, teeth and salivary glands. Teeth chop the food into small pieces. The chopped food is moistened by the saliva secreted by the salivary glands. The tongue and other muscles push the food into the inner mouth for swallowing.

Teeth

In the human mouth, there are four types of teeth – incisors, canines, premolars, and molars.

Incisor Canine Premolar Molar

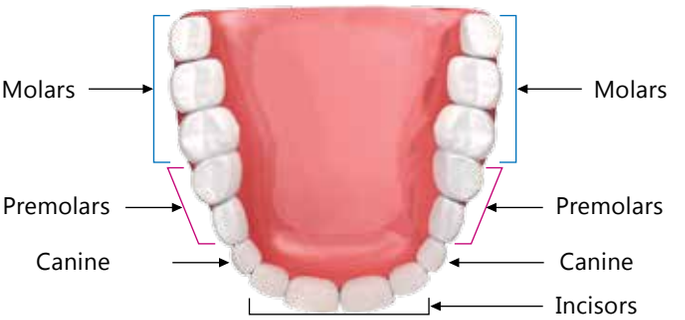
Types of teeth

Incisors are flat and blade like teeth located in the front part of each jaw. They help to cut and bite the food into small pieces. **Canines** are sharp pointed teeth located on either side of the incisors. They help to pierce and tear the food. **Premolars** and **molars** occur beside the canine teeth. They both help to grind the food and break down into smaller pieces.

In each jaw, there are four incisors, two canines, four premolars and six molars.

Human beings develop two sets of teeth in their lifetime – temporary set and permanent set.

The **temporary teeth** start developing when a child is around 3 months old. By the age of 3-4 years, a child has a full set of



Arrangement of teeth in humans

20 teeth – 10 in each jaw. These teeth are small and weak, and are called **milk teeth**.

By the age of 6 years, the milk teeth start falling and are replaced by larger and stronger teeth called **permanent teeth.** These teeth are 32 in number – 16 in each jaw. These teeth remain till old age and cannot be replaced by new natural teeth.

Care of Teeth

Bacteria are normally found in our mouth but these bacteria are not harmful to us. However, if we do not clean our teeth properly, some harmful bacteria may start growing in our mouth.

Formation of plaque

The harmful bacteria combine with small food pieces and saliva to form a sticky substance called **plaque** which builds up on the surface of the teeth. If plaque is not removed, **tooth decay** will begin. The bacteria in the plaque produce acid which corrode the surface of our teeth and causes cavities.

Eatables and drinks high in carbohydrates, such as chocolates, sweets, sugar, and fizzy drinks are major causes of tooth decay.

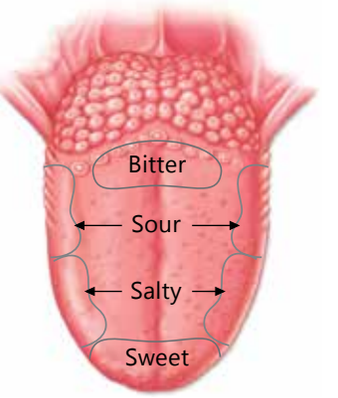
To avoid tooth decay :

- Brush teeth twice a day.
- Rinse the mouth well after each meal and avoid eating too many sweets.
- Get a dental checkup done every six months.

Tongue

The **tongue** is a fleshy and muscular sensory organ. It has several taste buds which allow us to experience tastes of food items – sweet, salty, sour, and bitter. It helps to mix saliva in the food and pushes it towards our teeth. The tongue rolls the food into a lump, called **bolus**, and makes it easy to swallow. The bolus is pushed down towards the oesophagus (food pipe).

The tongue should be cleaned with a tongue-cleaner to avoid formation of food deposits and bacteria on it.



Tongue – Taste buds

Activity 1

Aim : To identify the various parts of a tongue that help to identify different tastes.

Materials required : Salt solution, sugar solution, lemon juice, bitter gourd juice, and cotton swabs.

Procedure :

1. Dip a cotton swab into salt solution and lightly touch it to the different parts of the tongue.
   - Notice the part of the tongue where you felt the taste of the solution.
2. Repeat the above steps using a fresh cotton swab with different solutions. Sip a little water between testing various solutions.

Observation : Sweet taste buds are present at the tip of the tongue. Salty taste buds are present halfway back along the sides of the tongue. Sour taste buds are present at the back along the sides of tongue. Bitter buds are present at the centre back of the tongue.

Salivary Glands

Salivary glands present in the mouth produce a digestive juice called **saliva**, that breaks down the starch present in the food into sugar and helps in swallowing the food.

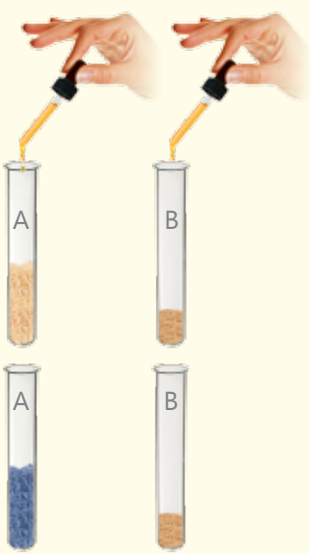
Activity 2

Aim : To study the effect of saliva on food.

Materials required : Two test tubes, boiled rice and iodine solution.

Procedure :

1. Label one test tube as A and another as B.
2. Put some boiled rice in tube A.
3. Partially chew some rice *(do not swallow)* and put it in tube B.
4. Add few drops of iodine solution into each tube and observe.



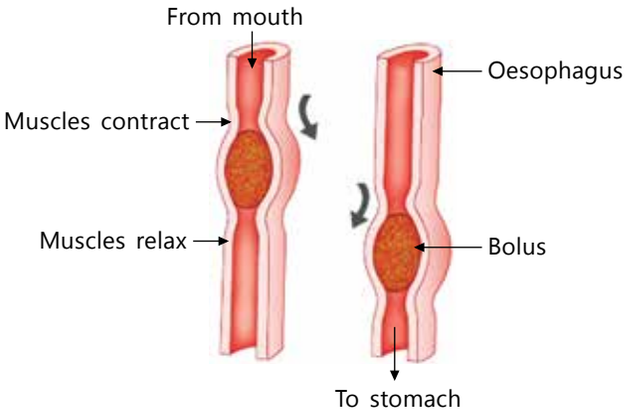
Observation : The rice in test tube A turns blue-black. However, the rice in tube B does not show any change in colour.

Explanation : In tube A, the rice turned blue-black as it contained starch. In tube B, the chewed rice did not show any change in colour as the saliva in the mouth had decomposed the starch into sugar.

Conclusion : Saliva breaks down the starch present in food into sugar.

Oesophagus

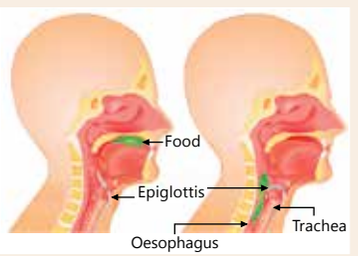
The **oesophagus**, also called the **food pipe**, is an organ which consists of a muscular tube. It is about 30 *cm* long and connects the mouth and the stomach. The walls of the oesophagus contract and relax to produce wave-like movements called **peristaltic** movements. These movements push the food we eat down to reach the stomach within six seconds of ingestion.



Movement of food through the oesophagus

Be Careful While Eating

The oesophagus carries food to the stomach. Trachea is another tube that carries air to and from the lungs for respiration.



These two tubes share a common opening at the back of our throat called the **epiglottis**. Every time we swallow food, it closes off the entrance to the trachea so that food is sent down the oesophagus into the stomach instead of lungs.

But sometimes, especially when we are laughing or talking while eating, the epiglottis does not close in time. A piece of food can slip down into the trachea causing discomfort. Our body makes us cough and forces the food back into the oesophagus.

Thus, it is advised not to speak or laugh while eating or drinking.

Stomach

The **stomach** is a muscular sac that receives the food from the oesophagus. It can hold up to two litres of food at a time. The food stays in the stomach for about two and a half hours. The inner lining of the stomach contains **gastric glands** which secrete gastric juice. **Gastric juice** mainly contains hydrochloric acid, along with mucous and digestive juices, which start digestion of protein.

Stomach

The mucous protects the inner lining of the stomach. Hydrochloric acid kills harmful bacteria that enter into the stomach along with food. It also provides an acidic medium to help the stomach in its proper functioning.

The food gets partly digested in the stomach and gets converted into a semi-solid food called **chyme**. The chyme leaves the stomach and enters the small intestine.

Learn More

The adult stomach has a very small volume when empty but expands to hold up to 2 litres of food and liquid when full.

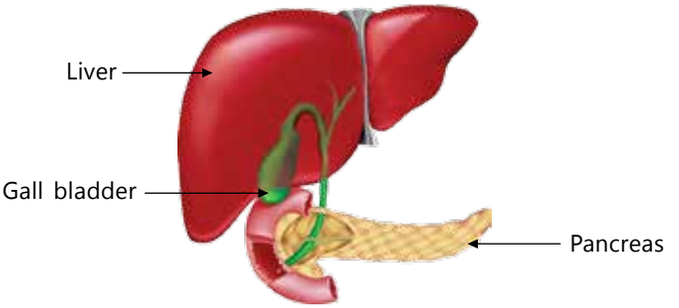
Dr. Beaumont

In 1822, an American army doctor, William Beaumont, operated on a fur trader, Alexis St. Martin, who had been shot in the stomach. The doctor saved the patient but did not close the hole properly and left it bandaged. When Dr. Beaumont looked through the hole, he found that the stomach was churning food. Its wall secreted a fluid which could digest the food. He also observed the movement of food through the stomach into the small intestine. Thus, the strange incident led to the discovery of the functioning of the stomach.

Liver

Liver is the largest gland in the body and plays a vital role in digestion. It is situated in the upper right side of the abdomen and secretes **bile** which helps in the digestion of fats. The bile breaks up fats into tiny droplets that can be easily digested and absorbed.

Bile is stored in a sac called the **gall bladder**, located near the liver.



Pancreas

Pancreas is the second largest gland which is located just below the stomach and secretes **pancreatic juice** into the intestine. This juice helps in changing fats, carbohydrates and proteins into simpler form.

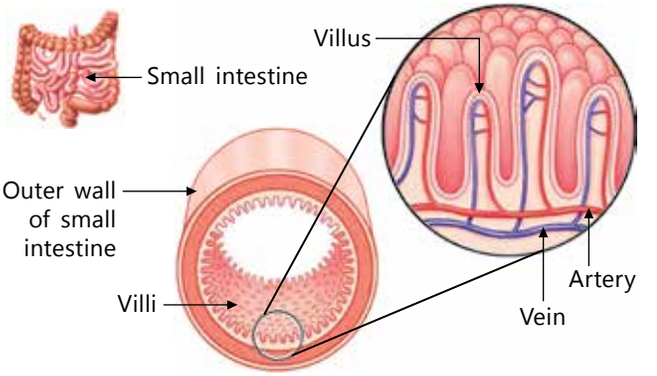
Small Intestine

The **small intestine** is the longest section of the digestive canal, about 6 to 7 *m* long. It appears small as it is arranged in the form of a coil. Its wall secretes intestinal juices. It also receives the secretion from liver and pancreas through a common duct.

The intestinal juices act upon the partially digested food and change it into simpler soluble substances.

- Carbohydrates are broken down into simple sugars, mainly glucose.
- Proteins are broken down into amino acids.
- Fats are broken down into fatty acids and glycerol.

The simpler substances into which the various nutrients get broken down are absorbed by the small intestine. Absorption occurs through numerous finger-like projections on the inner walls of the small intestine called **villi** (*singular : villus*). The villi increase the surface area for faster absorption of digestive food. After absorption by the villi, these substances are passed into the blood stream and are carried to all parts of the body through the blood vessels.



Structure of small intestine

During digestion, vitamins and minerals do not need to be changed into simpler forms. These nutrients are absorbed as they are.

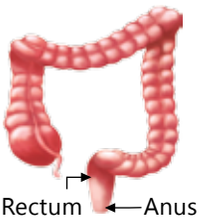
The absorbed amino acids are used to build proteins which can be utilised by the body for building and repairing of body parts. The glucose is broken down, with the help of oxygen, to provide energy through respiration. Fatty acids and glycerol are stored under the skin and act as energy reserves for future use.

The food that is not digested and absorbed fully, enters the large intestine.

Learn More

The process of digestion involves enzymes such as amylase, pepsin, trypsin, and lipase. These are called digestive enzymes and are present in various digestive juices.

Large Intestine



Large intestine

The **large intestine** is wider than the small intestine but is smaller in length, measuring one and a half metres. It is almost double the diameter of the small intestine.

The undigested food remains for a long time in the large intestine where water and some salts are absorbed from it. A semi-solid residue is left behind which is pushed into the rectum.

Rectum and Anus

The **rectum** is the final section of the large intestine where the waste materials are stored in the form of faeces. When the rectum is full, the faeces are passed out from the body through the **anus**.

Some Ailments Related to Digestion

The digestive system is continuously at work throughout the day, nourishing the body and the mind. It easily gets upset by diseases, emotional factors and even malfunctions in other parts of the body. Some common digestive disorders in humans are – Diarrhoea, Vomiting, Constipation, and Heartburn.

Diarrhoea is a digestive ailment, common among young children. It is a condition in which faeces are discharged from the bowels frequently, usually in liquid form. It leads to excessive loss of water and salts from the body causing dehydration. It can spread through dirty hands or contaminated food and water. During diarrhoea, ORS (**O**ral **R**ehydration **S**olution), a solution of water, sugar and salt, should be taken frequently to restore lost fluids and salts.

Vomiting is the forcible ejection of food present in the stomach through the mouth. It can occur due to overeating, malfunctioning of stomach, motion sickness, and food poisoning. After vomiting occurs, drink large amounts of fluids and avoid solid food for some time.

Constipation is a condition in which there is difficulty in emptying the bowels. It usually occurs due to inadequate fluid intake or less fibre content in the diet. It can be cured by drinking more fluids and consuming fibrous foods such as salads and bananas.

Heartburn or **acidity**, is caused due to excessive acid production in the stomach. This happens due to eating spicy foods or skipping meals. Antacid tablets and drinks should be taken to cure heartburn.

Learn More

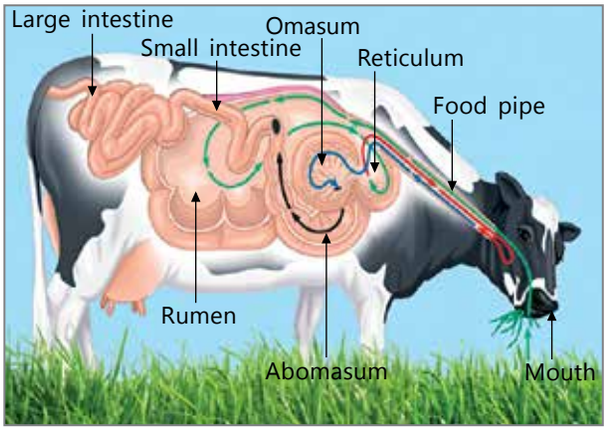
If you eat spicy food or skip meals, excess hydrochloric acid is produced which destroys the lining of the stomach. It causes painful wounds on the wall of the stomach called **stomach ulcers**.

Nutrition in Ruminants

Ruminants are plant-eating animals who swallow their food and bring it back to mouth after sometime to chew it again. Ruminants include cattle, sheep, goat, buffalo, deer, giraffe, and camel. These animals have a unique digestive system as their stomachs have four chambers – Rumen, Reticulum, Omasum and Abomasum.

Ruminants ingest food with the help of their tongue. They have sharp incisors and large molars with powerful jaw muscles for chewing the plants.

After chewing once, the food passes down into the rumen for digestion.



Digestive system of a cow

- **Rumen** is the first and the largest chamber of the stomach. It stores large quantities of food that have been quickly swallowed. Rumen has bacteria and protozoa essential for breaking down the cellulose found in the food. The partially digested food is called **cud**. The cud is then pushed to reticulum.
- **Reticulum** is the second chamber of the stomach. From here, the cud is sent back into the mouth for rumination. The process of chewing the food again that has been swallowed and partially digested is called **rumination**. It primarily takes place when the animal is resting. When the food is completely chewed, it is sent to the omasum.
- **Omasum** is the third and the smallest chamber of the stomach. Here, excess water present in the food is absorbed and the food is pushed to abomasum.
- **Abomasum** is the fourth chamber of the stomach. It is the **true stomach** of the ruminants. In this chamber, the gastric juices are secreted to carry out the process of digestion.

The food now reaches the small intestine where nutrients and water are absorbed. The undigested food is passed on to the large intestine and is finally egested.

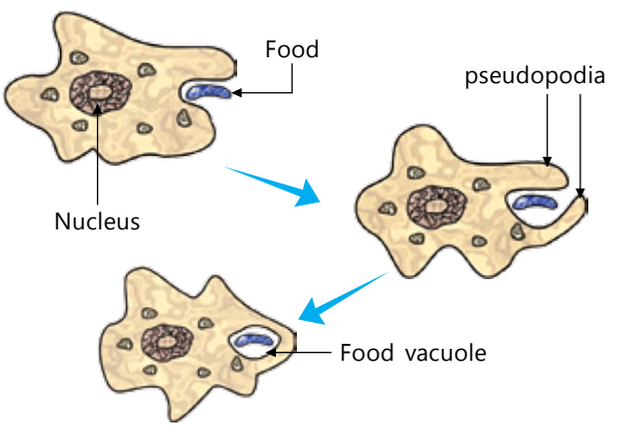
Learn More

A cow makes 40000 to 60000 jaw movements in a day during rumination.

Nutrition in Amoeba

Amoeba is a unicellular organism, usually found in pools, ponds and ditches. It is the simplest living creature in the world. It constantly changes its shape by pushing out finger like projections called **pseudopodia** or **false feet**. These false feet are also used to capture food and for locomotion. Amoeba eats microscopic plants and animals found in its surroundings.

When amoeba comes in contact with food particles, it pushes out its pseudopodia around the particles. The tips of the pseudopodia fuse with each other gradually and a cup like structure is formed called **food vacuole**. The digestive juices in the vacuole decompose the food into simpler soluble substances which are absorbed and utilised by the amoeba. The undigested food gathered inside the vacuole is then pushed out of the body.



Nutrition in amoeba

Learn More

About six species of amoeba are found in the alimentary canal of humans. Out of these, the entamoeba histolytica causes a digestive ailment called amoebic dysentery.

WORD POWER

Absorption	:	the process in which soluble forms of nutrients are passed into the blood
Amino acid	:	naturally occurring simple compounds that are the building blocks of proteins
Assimilation	:	the process of utilising the absorbed food for the production of energy, growth and repair of cells and tissues
Bile	:	digestive juice, secreted by the liver, which is stored in the gall bladder
Egestion	:	the process in which the undigested food is expelled from the body
Fatty acid	:	simple compound that is one of the constituents of fats
Food vacuole	:	cup-like structure formed by pseudopodia which holds food and carries out the digestive function in amoeba
Gall bladder	:	a small, sac-shaped organ in which bile is stored after secretion by liver
Ingestion	:	the process of taking food into the body by an organism
Oesophagus	:	the part of the alimentary canal that connects the mouth to the stomach
Pancreas	:	a large gland located just below the stomach which secretes pancreatic juice
Pseudopodia	:	finger-like projections of the body of amoeba that aid in movement and capturing food
Rumen	:	the first part of the stomach of a ruminant, which receives and partly digests food
Rumination	:	the process by which the swallowed food is brought back from the stomach to the mouth of a ruminant for chewing again
Saliva	:	a watery liquid, secreted into the mouth by salivary gland, which helps in decomposition of starch into sugar
Salivary gland	:	gland that secretes saliva into the mouth

POINTS TO REMEMBER

- Depending on their food habits, animals can be categorised as herbivores, carnivores and omnivores.
- The process of nutrition in animals involves five main steps – ingestion, digestion, absorption, assimilation, and egestion.
- In humans, food passes through a long muscular canal, called alimentary canal, which begins at the mouth and ends at the anus.
- The teeth and tongue present in the mouth help in chewing and swallowing of food.
- Human mouth has four different types of teeth – incisors, canines, premolars, and molars.
- Humans develop two sets of teeth in their lifetime – temporary set and permanent set.
- The tongue rolls the food into bolus and makes it easy to swallow.
- The walls of the oesophagus produce peristaltic movements which push the food to the stomach.
- The food gets partly digested in the stomach and is converted into a semi-solid form called chyme.
- The intestinal juices act upon the partially digested food and change it into simpler soluble forms.
- The small intestine absorbs the simpler substances through the blood vessels present in villi.
- The absorbed nutrients are transported to various parts of the body by the blood and used for different purposes.
- The large intestine stores the undigested food and absorbs water and salts from it.
- The undigested food is passed out from the body through the anus, in the form of faeces.
- Some common digestive disorders in humans are – diarrhoea, vomiting, constipation, and heartburn.
- Ruminants have a four chambered stomach consisting of rumen, reticulum, omasum, and abomasum
- Amoeba ingests its food with the help of pseudopodia. The food is digested in the food vacuole.

ASSESSMENT 2

A. Tick ✓ the correct option.

1. Molars are used for

   ☐ tasting food ☐ grinding food ☐ tearing food ☐ chewing food

2. The walls of the large intestine absorb

   ☐ water ☐ digested food ☐ undigested food ☐ cellulose

3. Digestive disorder caused due to excessive acid produced in the stomach is

   ☐ vomiting ☐ constipation ☐ heartburn ☐ diarrhoea

4. Organisms that feed both on plants and animals are called

   ☐ omnivores ☐ carnivores ☐ herbivores ☐ heterotrophs

5. The undigested food in humans is passed out through

   ☐ kidneys ☐ rectum ☐ anus ☐ villi

6. The true stomach of ruminants is

   ☐ abomasum ☐ omasum ☐ reticulum ☐ rumen

7. The largest gland in the human body is

   ☐ liver ☐ pancreas ☐ salivary gland ☐ gall bladder

B. Fill in the blanks.

1. Bile is stored in the _____.
2. The inner lining of the stomach is protected by _____.
3. The major part of digestion takes places in the stomach and the _____ intestine.
4. Small intestine has _____ that increase the surface area for absorption of food.
5. Animals that re-chew the swallowed food are called _____.
6. _____ acid kills harmful bacteria that enter the stomach along with food.
7. The condition in which watery stools are passed out from the body is called _____.

C. State whether the following statements are True or False.

1. Salivary glands secrete bile into the mouth. _____
2. The small intestine is longer than large intestine. _____
3. Trachea carries air to and from the lungs for respiration. _____
4. Abomasum is the fourth chamber of the stomach of a ruminant. _____
5. The tongue rolls the food into bolus and makes it easy to swallow. _____
6. The process of digestion in humans is completed in small intestine. _____
7. Constipation is caused due to excessive acid produced in the stomach. _____

D. Give one word for each of the following :

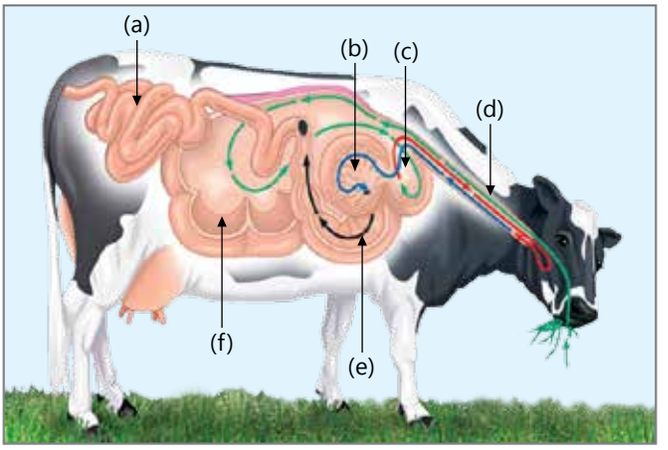
1. The partly digested food in the stomach. _____
2. The sac-like organ that receives the food from the oesophagus. _____
3. The organ that pushes down the food we eat to the stomach. _____
4. The organ through which faeces are passed out from the body. _____
5. The gland in the mouth that break down the starch into sugar. _____
6. The finger-like projections on the inner walls of the small intestine. _____
7. The gland located just below the stomach which secretes insulin. _____

E. Answer each of the following questions in few sentences.

1. Give examples to show the different modes of consuming food in different organisms.
2. Name the different types of teeth in humans and state the function of each type.
3. Differentiate between the following :
   (a) Milk teeth and permanent teeth (b) Cud and chyme
4. What is tooth decay? What precautions should one take to avoid tooth decay?
5. What is the role of stomach in the process of digestion in human beings?
6. Why is it advised not to speak or laugh while drinking or eating food?
7. How does an amoeba get its food?

F. Answer each of the following questions in detail.

1. Explain the process of digestion in ruminants.
2. Draw a diagram of the tongue in humans and mark different taste buds in it.
3. Explain the various steps involved in the process of nutrition in animals.
4. Explain any three digestive disorders in human beings. Also state how they can be cured.
5. What are digestive juices? Name the digestive juices produced by salivary gland, stomach, pancreas, and liver. Write the function of each.
6. Explain the role of small intestine in digestion, absorption and assimilation of food in human body.
7. Draw a well labelled diagram of the human digestive system.
8. Label the various parts of the digestive system of a cow in the diagram given below.



(a) _____

(b) _____

(c) _____

(d) _____

(e) _____

(f) _____

- **Complete the crossword with the help of the clues given.**

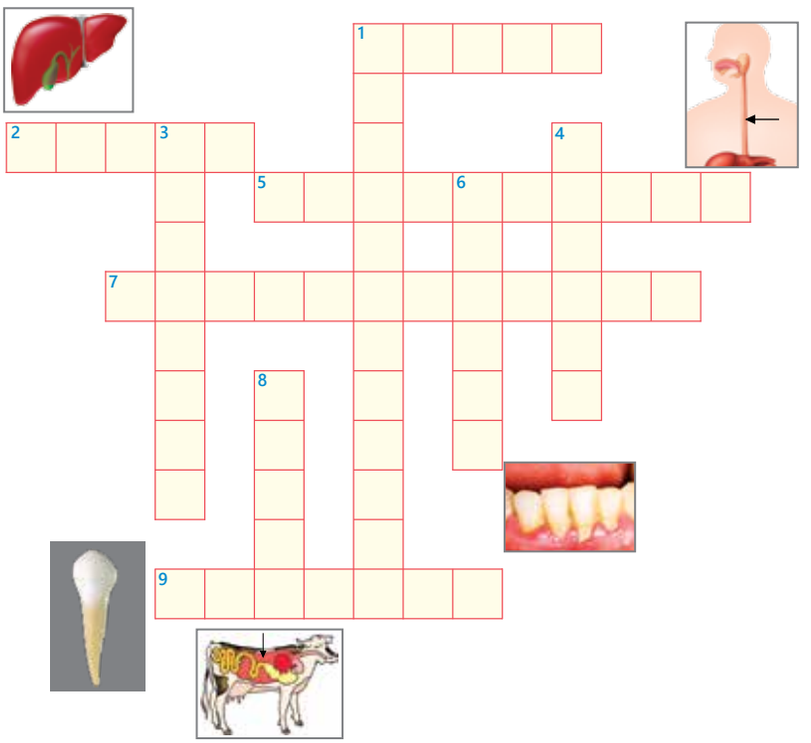
Clues

Across

1. Semi-solid form of food produced after digestion in stomach of humans.
2. Gland that secrets bile juice.
5. Another name for food pipe in humans.
7. Process of utilising the absorbed food for production of energy.
9. Sharp pointed teeth used for tearing food.

Down

1. Ailment which results in improper emptying of bowels.
3. Process by which undigested food is expelled from the body.
4. Digestive juice in mouth that converts starch into sugar.
6. Sticky substance built up on teeth due to action of saliva and bacteria.
8. Largest chamber in stomach of ruminants.



HOTS Questions
High Order Thinking Skill

1. Why cannot we digest grass and bark of trees?
2. Athletes usually drink glucose or eat chocolates before going for exercises. Why?

Group Discussion

- Proper functioning of the digestive system is must for our good health.

PROJECT IDEAS

- Make a model of the human digestive system using materials like cloth, plastic, rubber, hosepipe, etc.
- Prepare a report on various methods used by various organisms for ingesting food.

LESSON 3

Fibres from Animals

Let us learn about

- Fibres from animal sources – wool and silk
- Obtaining wool – rearing of sheep
- Obtaining silk – rearing of silkworm
- Health hazards associated with wool and silk production

The clothes we wear are stitched from fabrics. A fabric is made of threads prepared from fibres. A **fibre** is a hair-like strand which is obtained from **natural sources** or **man-made sources**. Fibres can be classified into two categories :

- Natural fibres
- Synthetic fibres

Natural Fibres

Natural fibres are obtained from plants and animals. Fibres obtained from plants are called **plant fibres**, *e.g.* cotton, jute, flax, and hemp. Fibres obtained from animals are called **animal fibres**, *e.g.* wool and silk.

Cotton

Jute

Plant fibres

Wool

Silk

Animal fibres

Synthetic Fibres

Synthetic fibres are manufactured in factories from various chemicals, *e.g.* nylon, rayon, polyester, and plastic.

Nylon

Plastic

Let us learn about two common animal fibres – Wool and Silk.

Wool

Wool is an animal fibre obtained from the hair of certain animals such as sheep, goat, angora rabbit, alpaca, yak, and camel. The body of these animals is covered with a thick coat of hair called **fleece**. The fleece protects their body from cold. Crimps or circular waves in the fleece make it bulky and fluffy.

The thick coat of hair traps a lot of air inside it. Air is an insulator of heat and creates an insulating barrier between the body of the animal and the surrounding cold air. Thus, the fleece keeps the body of the animal warm.

Wool obtained from sheep is the most widely used animal fibre.

Wool from Sheep

Sheep is reared all around the world for the purpose of obtaining wool. The hairy skin of the sheep has two types of fibres.

1. The outer layers of fibres, called **kemp**, are coarse and not used as wool.
2. The inner layers of fibres, called **fleece**, close to the skin are fine, soft and used as wool.

The wool from different varieties of sheep differs in texture, shine, length, and strength.

Rearing of Sheep

Sheep are reared on a large scale for the purpose of obtaining wool and other useful products. Sheep graze on grass and plants in grasslands and pastures. They are also fed a mixture of pulses, jowar, minerals, oil cakes, and corn. Sheep are kept in open pens or sheds. In winters, sheep are kept in covered sheds and fed leaves, dry fodder and grains.

Sheep pen

In India, sheep are reared mostly in mid-Himalayan zone in the states of Jammu and Kashmir, Arunachal Pradesh, Sikkim, Himachal Pradesh, Uttarakhand, Haryana, Punjab, Rajasthan, and Gujarat.

Learn More

Wool is made of same proteins that makes up the outer protective layer of our skin. Wool is naturally antimicrobial and thus, does not need to be washed daily like other fibres.

Breeding of Sheep

Breeding is the process of rearing animals with desired characteristics. In this process, two individuals having desirable characteristics are selected as parents. They are mated to reproduce a new breed of the animal, having desirable characteristics of both the parents. This process is also known as **selective breeding**. Through the process of selective breeding, high yielding breeds of sheep are obtained. They have thick and luxurious coat of fleece with better quality and larger volume.

Some high yielding breeds of sheep reared in India are Kashmir Merino, Hissardale, Nilgiri, Bakharwal, Patanwadi, and Marwari.

Merino is the breed of sheep, which remains popular worldwide for its superior quality wool.

Merino sheep

Other Wool Yielding Animals

Cashmere Goat – Cashmere goat is found in the cold Himalayan region of Kashmir. Cashmere wool is obtained from a cashmere goat and is rare and expensive. The famous pashmina shawls are woven from this wool.

Cashmere goat

Angora Rabbit – Angora wool is obtained from the soft fur of angora rabbit. Angora rabbit provides very fine wool, though in small volume. It is much warmer and lighter than other wool.


Angora rabbit

Angora Goat – Mohair wool is a silk-like fibre obtained from the fleece of angora goat. It is durable, naturally elastic, flame resistant, and crease resistant.


Angora goat

Camel – Camel wool is obtained from the fine hair of the bactrian camels, found in China, Mongolia and Siberia. It is one of the finest camel wool. It is light and warm but not very elastic.


Bactrian camel

Yak – Yak is found in cold mountainous regions. The wool obtained from the hair of yak is similar to cashmere wool and warmer than sheep wool.


Yak

Process Involved in Preparing Yarn from Wool Fibre

Conversion of wool fibre into yarn is a skilful process which involves shearing, scouring, sorting and grading, carding, dyeing, and yarn making.

1. **Shearing** – Shearing is the process of removal of fleece from the animal. It is done after the animal develops a thick wool coat. Shearing is done either manually with a large razor or mechanically using a shearing machine. Shearing usually takes place in summer.


Shearing

2. **Scouring** – Scouring is the removal of dust, dirt, dried sweat, grease, and dry plant matter from the sheared hair of the animal. It is done by washing the hair in hot soapy water. It is usually done by machines.


Scouring

3. **Sorting and Grading** – Sorting of wool involves removal of inferior or broken fibres obtained after scouring. The process of sorting the wool fibre on the basis of length, colour, texture, and quality of fibre is called grading.


Sorting and Grading

4. **Carding** – Carding of wool is the process of brushing the wool fibres to straighten them. It is done by passing the wool

fibres through rollers that have thin wire teeth. It also removes residual dirt and other matter left in the wool.


Carding


Dyeing

5. **Dyeing** - The wool obtained from animals is usually white or light brown in colour. It is dyed to impart various colours to it.
6. **Yarn making** - The dyed fibres are spun into wool yarn. The wool yarn is wound onto spindles, resulting in cones of yarn. The longer wool fibres are used to make sweaters while the shorter fibres are used to make fabrics for jackets and suits.

Properties of Wool Fibre

Wool has certain properties which make it one of the most common fibres used to make fabrics. Some of these properties are :

1. Wool is extremely durable and elastic.
2. It is soft and comfortable to wear.
3. It burns slowly without producing any flame.
4. It absorbs sound.
5. It absorbs heat and acts as an insulator.

Health Hazards Associated with Wool Production

There are various health hazards which workers in the wool industry face. Few of these hazards are :

1. The bacteria **anthrax**, present in wool from infected organisms, causes a fatal blood disease called **sorter's disease**.
2. Wool spinning mills are full of floating fibres in the air. These fibres may get into the breathing canal of the workers and cause serious breathing problems such as asthma and bronchitis.
3. Various chemicals used for washing and dyeing of wool lead to irritation in eyes and allergies in skin.
4. The workers face the risk of spinal and skeletal disorders and getting injured due to head butts from sheep during shearing.

Silk

Silk is an animal fibre produced by the silkworm. The silkworm is the larva or caterpillar of the adult **silk moth**.

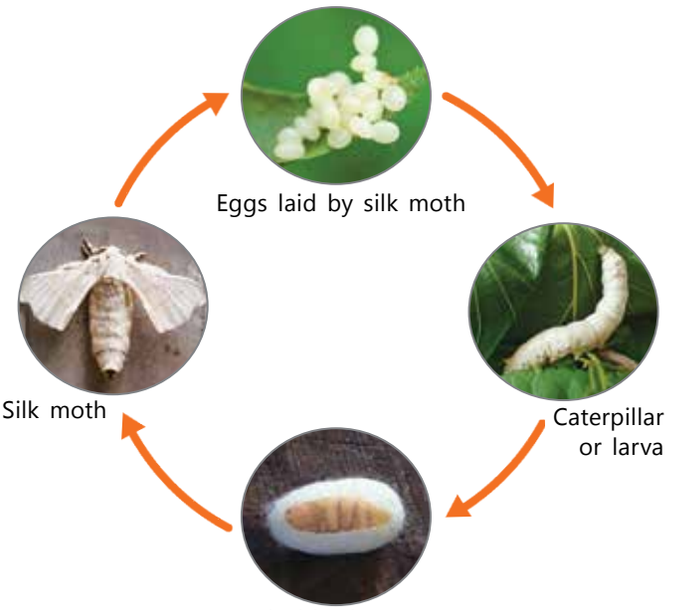
Discovery of Silk

Silk is one of the oldest fibres and originated in China. According to an old Chinese legend, one day in 2640 BC, Empress Hsi Ling Shi was sipping tea under a mulberry tree. A cocoon fell into her cup from the branch of the tree. She observed its shining fibre as it began to unwind. Later, the empress developed the process of producing silk fibre. The Chinese kept this secret safe from the rest of the world for a long time.

Life Cycle of a Silk Moth

The male and female silk moth mate together. The female moth lays a large number of tiny eggs on tender leaves of mulberry tree. After a few days, the fertile eggs turn grey. The eggs hatch within two weeks and tiny caterpillars emerge from them. This is called the **larval stage**.

The caterpillars feed on fresh mulberry leaves for about four weeks. It grows to about 3 inches in size and sheds its skin



Life cycle of a silk moth

four times to become a **larva**. The process of shedding of skin by the caterpillar to become a larva is called **moulting**.

The larva weaves a net to hold itself by moving its head around in a figure 8 pattern. During this movement of the head, the larva secrets fine filaments from its salivary glands which come out through a tiny opening in its head. These filaments are made of a protein that hardens on contact with air and becomes silk fibre.

The larva continues to form a complete cover of silk fibres around it called a **cocoon**. Inside the cocoon, the larva changes into a pupa. After few weeks, the pupa becomes an adult moth which comes out of the cocoon.

Sericulture

The practice of rearing silkworms commercially to obtain silk is called **sericulture**.

The eggs laid by a female silk moth are stored in specially made bamboo trays or cardboard boxes in controlled conditions of temperature and humidity. Twigs and chopped mulberry leaves are spread in the trays.

When the eggs hatch, the larvae crawl on the trays and eat chopped mulberry leaves almost continuously for about four weeks and undergo the stages of moulting. The larvae spin cocoons on the twigs for about a week.


Silkworms feeding


Cocoons on tray

As soon as the cocoons are ready, they are picked before the pupa matures into the moth. The cocoons are soaked in hot water to loosen and unwind the silk filaments.


Cocoons in hot water

The process of separating the silk filaments from the cocoons is called **filature** or **reeling**.

Silk filaments are twisted together into a strong thread or fibre which is wound on a reel. The raw silk is further dyed into different colours and woven into silk fabric.


Silk threads of different colours

Silk moths produce different qualities of silk when they feed on leaves of different

plants. Different varieties of silk vary in texture and quality. The major types of silk produced in India are Mulberry, Tussar, Muga, and Eri.

Mulberry silk is obtained from the cocoons of silkworms which feed on the leaves of mulberry plant.

Tussar silk is obtained from the cocoons of silkworms which feed on the leaves of sal, saja and arjun plants.

Muga silk is obtained from the cocoons of silkworms which feed on the leaves of som and soalu plants.

Eri silk is obtained from the cocoons of silkworms which feed on the leaves of castor plants.

Properties of Silk Fibre

Silk is one of the most desirable fibres for making fabrics. Some properties of silk fibre are :

1. It is the thinnest and strongest natural fibre.
2. It is shiny, soft and does not attract dirt.
3. It can absorb moisture.
4. It can be dyed easily in any colour.
5. It is a good insulator of heat.

Health Hazards Associated with Silk Production

There are various health hazards, which workers in sericulture industry face. Few of these are listed below :

1. There is a risk of getting burns during the process of dipping cocoons in boiling water.
2. Skin infections can occur due to handling of dead silkworms and pupae.
3. Vapours from the boiling cocoons and dyes used to colour silk fibres cause respiratory ailments.
4. Reeling of silk fibres can cause arthritis of hands and fingers.

Learn More

Silk is the strongest natural fibre in the world and can be stretched between 30 to 40 percent of its length before breaking. The strength of the silk fibre makes it a preferred choice for making fibre optic cables and biomedical devices.

WORD POWER

Cocoon	:	a silky case spun by the larva of silkworm for its protection
Fleece	:	the thick coat of hair on bodies of animals like sheep, camel and yak
Moulting	:	the process of shedding of skin by the caterpillar to become a larva
Reeling	:	the process of separating the silk filaments from the cocoons
Scouring	:	the process of removing dirt, dust and grease from the sheared hair
Sericulture	:	the practice of rearing silkworms commercially to obtain silk
Shearing	:	the process of removal of the fleece from the body of an animal
Silk moth	:	an insect whose larva (caterpillar) spins a protective, silken cocoon
Silkworm	:	the larva of a silk moth, which spins a cocoon which is processed to yield silk fibre
Sorting	:	the process of separating wool fibres of different textures

POINTS TO REMEMBER

- Fibres can be classified into two categories – natural fibres and synthetic fibres.
- Natural fibres are obtained from plants and animals, *e.g.* cotton, jute, flax, wool, silk, and hemp.
- Synthetic fibres are manufactured in factories from various chemicals, *e.g.* nylon, rayon, polyester, and plastic.
- Wool is an animal fibre obtained from the hair of certain animals such as sheep, goat, angora rabbit, alpaca, yak, and camel.
- Conversion of wool fibre into yarn involves shearing, scouring, sorting and grading, carding, dyeing, and yarn making.
- There are several health hazards associated with wool production - breathing problems, sorter's disease, irritation of eyes, allergies of skin, and spinal and skeletal disorders.
- Silk is an animal fibre obtained from the silkworm.
- The major types of silk produced in India are mulberry, tussar, muga, and eri.
- There are several health hazards associated with silk production - respiratory ailments, arthritis of hands and fingers, burns and skin infections.

ASSESSMENT 3

A. Tick ✓ the correct option.

1. A synthetic fibre among the following is

☐ cotton ☐ rayon ☐ silk ☐ wool

2. The wool used to make pashmina shawls is obtained from

☐ yak ☐ angora goat ☐ cashmere goat ☐ sheep

3. During winters, sheep are kept indoors and fed on

☐ leaves ☐ grains ☐ dry fodder ☐ all of these

4. Silk fibre is obtained from

☐ sheep fleece ☐ cotton boll ☐ cocoon ☐ jute stalk

5. Wool is graded according to its

☐ length ☐ texture ☐ colour ☐ all of them

6. Rearing and breeding of silkworms for the production of silk is called

☐ pisciculture ☐ agriculture ☐ sericulture ☐ apiculture

7. Silkworms feed on

☐ mango leaves ☐ neem leaves ☐ mulberry leaves ☐ sesame leaves

B. Fill in the blanks.

1. _____ is the thinnest natural fibre.
2. Wool is obtained by the process of _____.
3. _____ wool is obtained from the fleece of angora goat.
4. The two types of hair found in sheep are _____ and _____.
5. The silkworm is the larva or caterpillar of the adult _____.
6. The anthrax bacteria in the wool causes _____.
7. The process of separating the silk filaments from the cocoons is called _____.

C. State whether the following statements are True or False.

1. Silk is the strongest natural fibre. _____
2. Silk varies in quality and texture due to dyeing. _____
3. Wool fibres absorb heat and act as an insulator. _____
4. Asthama is a sericulture related respiratory health hazard. _____
5. The cocoons are placed in hot water to loosen silk filaments. _____
6. Breeding is the process to obtain animals with desired characteristics. _____
7. Synthetic fibres are manufactured in factories from various chemicals. _____

D. Answer each of the following questions in few words.

1. Name two animal fibres and plant fibres each.
2. Name the goat that gives the best quality of wool.
3. Name three states in India where sheep are reared for production of wool.
4. Name three Indian breeds of sheep that give wool.
5. Name the stages in the life cycle of a silk moth.
6. Name the place where silk was first discovered.

E. Answer each of the following questions in few sentences.

1. List any three health hazards associated with the production of wool.
2. List any three health hazards associated with the production of silk.
3. Differentiate between natural fibres and synthetic fibres.
4. Define the following terms :
   (a) Sorting (b) Scouring (c) Moulting (d) Reeling
5. What is silk? Write any three properties of silk.
6. What is wool? Write any three properties of wool.
7. What do you mean by breeding of sheep? Why is it done?
8. Name any four types of silk produced in India. Where are they obtained from?

F. Answer each of the following questions in detail.

1. Name any four wool yielding animals other than sheep. Also describe the quality of wool produced by each of them.
2. Explain the steps involved in obtaining silk from the silk moth.
3. Explain, with diagram, the life cycle of a silk moth.
4. Explain the steps involved in the production of wool.

- **Complete the crossword with the help of the clues given.**

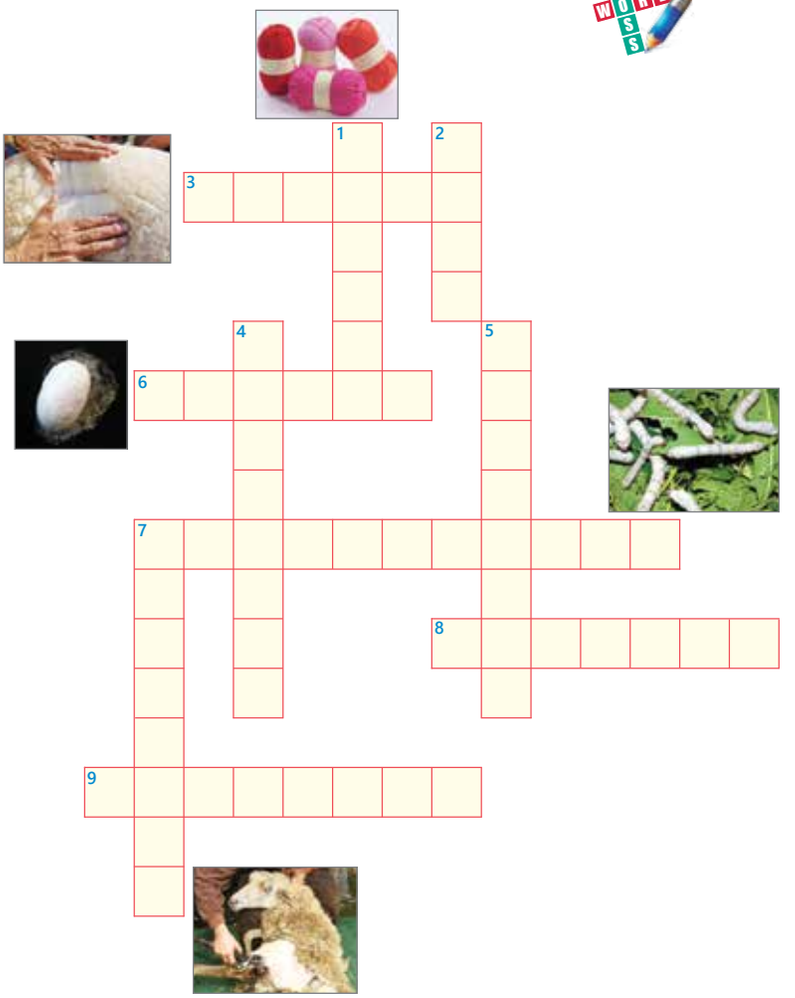
Clues

Across

3. Coat of hair from which wool is obtained.
6. Cover of silk fibres woven by a larva around itself.
7. Commercial rearing of silkworms.
8. Bacteria present in infected wool, which causes sorter's disease.
9. Process of removing silk filaments from the cocoon.

Down

1. Breed of sheep which produces a superior quality of wool, popular worldwide.
2. Outer, coarse layers of fleece.
4. Removal of dirt, sweat and grease from sheared hair.
5. Process of shedding skin by caterpillar of a silk moth to become a larva.
7. Removal of the fleece from the body of an animal.



HOTS Questions
High Order Thinking Skill

1. Sheep are dipped in an antiseptic solution soon after shearing. Why?
2. Caterpillars should not be collected with bare hands. Why?
3. Why does shearing of fleece not hurt the sheep?

Group Discussion

- Is it a good practise to rear silkworms and then kill them for getting silk?

PROJECT IDEAS

- Collect pictures and information on animals whose hair are used as wool. Prepare a report illustrated with pictures and images.
- Collect the information about the different varieties of silk available in India. Make a collage of samples of different varieties of silk on a chart paper.