

Science Success

with Practice Assignments

7
Book

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PREFACE

The series **Science Success** is meant for **Classes 1 to 8**. It fulfills the vision of **National Curriculum Framework (NCF)** meant for the schools affiliated to **CBSE** and other schools affiliated to various **State Education Boards**. This series emphasises meaningful learning of science for the overall development of learners. It focuses on helping children understand their natural environment and correlate science with their everyday experiences in an interesting and comprehensive manner.

The text has been designed with beautiful illustrations to help children develop skills of observation, investigation and scientific attitude.

Components of this Series are:

- **Science Success Text Books — Books 1 to 8** for Primary and Middle Classes.
- **Science Success Teacher's Resource Books 1 to 8.**
- **Online Support for Books 1 to 8.**

The series has been designed for teaching a basic course in science and includes various **Key Features (Tools)** to fulfill needs and requirements of learners.

A. LEARNING TOOLS (Books 6 to 8)

These Tools help students to gain knowledge, understand concepts thoroughly and retain it in their memory.

- **Learning Objectives** : Gives a view of the main learning objectives to be achieved.
- **Comprehensive Text** : Explains the science concepts in simple and lucid language accompanied with lively illustrations, diagrams and pictures followed by examples from day-to-day life.
- **Science Bits** : Gives extra information about the topics being taught.
- **Activity** : Simple experiments to make the understanding of the concept being taught crystal clear.
- **Keywords** : Contains all the difficult terms along with their meanings/definition from the whole chapter.
- **Summary** : Gives a quick recap of the whole chapter.

B. ASSESSMENT TOOLS (Books 6 to 8)

These Tools test the understanding and knowledge of concepts through Exercises, Revision-practice and Life Skill techniques.

- **Check Your Knowledge** : Provides **in-text exercises** to evaluate the understanding of concept being covered.

- **Exercises** : Provides a variety of graded questions under various heads – MCQs, Fill in the blanks, Match the columns, True/False, Very short answer questions, Short answer questions, Long answer questions, Flow chart, Label the diagrams, HOTS questions, Value based questions.
- **Project Ideas** : Enables the students to work on some interesting projects based on the concepts learnt in chapter.
- **Activities to Ponder and Act** : Provides the situations to use the skills and values developed.
- **For the Teacher** : Gives some helpful suggestions to the teacher to make learning lively and more interesting.
- **In the Laboratory** : Gives an opportunity to the children to get practical experience.

Additional Tools

Teacher's Resource Books

- **Plan to achieve the Learning Objectives** to guide the teachers with effective teaching techniques.
- **Overview of the Lesson** to help teachers easily recapitulate the finer points of the lesson.
- **Complete Solution-key** of the Text Books.

Online Support

- **Chapterwise Assignments for practice**
- **Chapterwise Question Bank with solutions**
- **Animated Lessons**
- **Animated Activities**
- **Science Dictionary**

We hope this series fulfills all the needs and requirements of NCF and the latest syllabi. We look forward for feedback and constructive criticism from the students, teachers and parents, which will be given every consideration in the future.

—Authors

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1



Nutrition in Plants

Learning Objectives

At the end of this chapter, students will be able to understand :

- What are nutrients and their functions?
- What is nutrition and different modes of nutrition in organisms?
- What is photosynthesis?
- Why do only plants show photosynthesis but not animals?
- What are the types of heterotrophic mode of nutrition in plants?
- What are insectivorous plants?

Food is essential for all living organisms. It consists of different components such as carbohydrates, fats, proteins, vitamins, minerals and roughage. These components of food are called nutrients. Each nutrient performs a specific function, such as provides energy, helps in repair and growth of the body, helps to fight against diseases, etc.

1.1 MODE OF NUTRITION IN ORGANISMS

The process of obtaining and utilising food by organisms is called **nutrition**. They utilise the food for various purposes like to get energy, growth, reproduction, etc. Nutrition is mainly of two types: (a) Autotrophic Nutrition (b) Heterotrophic Nutrition.

(a) Autotrophic Nutrition

The mode of nutrition in which a living organism can make its own food is called **autotrophic nutrition** and the organisms having this type of nutrition are called **autotrophs**. Plants can make their own food by the process of photosynthesis. That is why, they are called autotrophs. Algae and some bacteria are also examples of autotrophs.

(b) Heterotrophic Nutrition

Most of the organisms and animals depend on the plants and other animals for their food. This type of mode of nutrition is called **heterotrophic nutrition** and those organisms having this type of nutrition are called **heterotrophs**.

You may notice that why do the heterotrophs

unable to make their own food? What and how do plants make their own food? Do all the parts of the plants make their food and what helps them to make food? How do they get their raw materials and what type of raw materials they need to synthesise their food? To know the answer of above questions, you may need to know more about the process of photosynthesis.

1.2 PHOTOSYNTHESIS

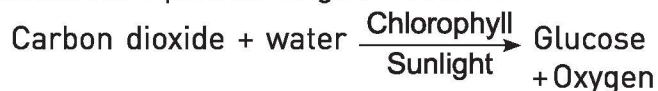
Photosynthesis is a process in which chlorophyll containing green plants, in the presence of sunlight, uses carbon dioxide and water to synthesise their food. Most of the photosynthesis occurs in leaves. Therefore, leaves are called food factories of the plant. In plants, first of all food is synthesised in the form of glucose which is a simple carbohydrate. This glucose can be stored in the form of starch.

SCIENCE BITS!

Coloured leaves of *Coleus* also perform photosynthesis. It contains many other pigments along with chlorophyll, hence, they look differently in colour.



Starch is also a complex carbohydrate. Its presence in the leaves indicates the occurrence of photosynthesis. To find the presence of starch in leaves, iodine test is done. The whole process of photosynthesis can be written in the form of a chemical equation as given below:



During photosynthesis oxygen is also released. This oxygen is utilised by all living organisms during the process of respiration to get energy from the food.

The conditions necessary for photosynthesis to occur are :

- | | |
|--------------------|--------------|
| (a) Chlorophyll | (b) Sunlight |
| (c) Carbon dioxide | (d) Water |

(a) Chlorophyll

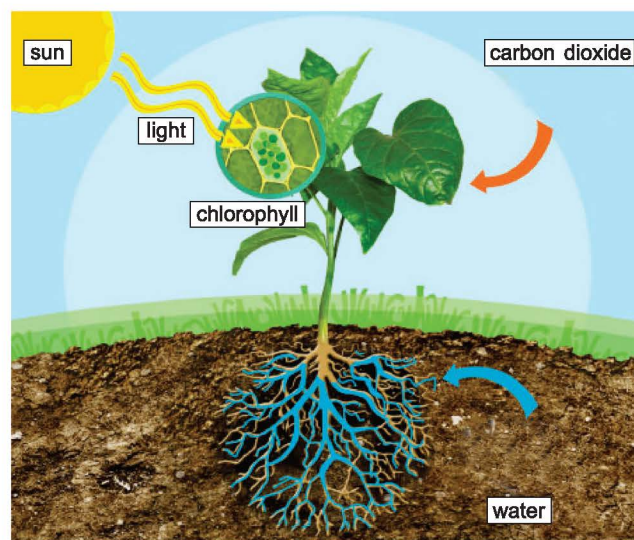
It is a green coloured substance or pigment

SCIENCE BITS!

Euglena – Is it an animal or plant?

It is a photosynthetic plant due to the presence of chlorophyll but it also moves like an animal. In 1866, **Ernst Haeckel**, a German biologist proposed a third kingdom protista to place the organisms which were neither plants nor animals.

In the presence of light *Euglena* produces food by photosynthesis but in dark it feeds on other unicellular organisms.

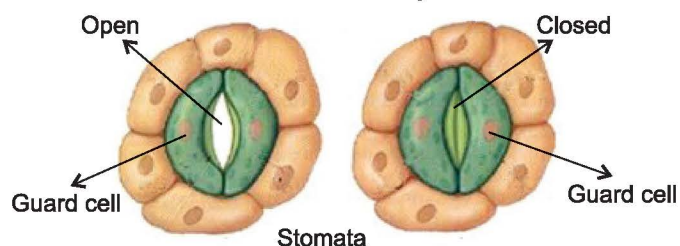


present in green parts of the plants. Chlorophyll molecules are the principal sites of light absorption during photosynthesis.

(b) Sunlight

Chlorophyll helps the leaves to capture the energy from sunlight and this energy is utilised for the synthesis of food from carbon dioxide and water. Plants can manufacture food only in the presence of sunlight because sun is the only and ultimate source of energy.

Can you imagine what happened if the sun were absent from our solar system?



ACTIVITY 1.1

Aim : To show that chlorophyll is necessary for photosynthesis.

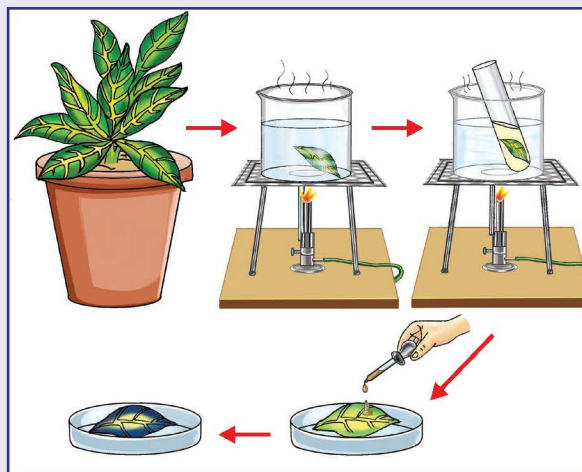
Requirements : A potted plant with variegated leaves like *Coleus* or croton, beaker, test tube, alcohol, iodine solution and watch glass.

Procedure : Take a potted plant with variegated leaves and keep it in a dark room for 72 hours. Place this destarched plant in sunlight for 6 hours. Pluck a leaf and test it for the starch.

Starch Test : Put the leaf in boiling water for 2 minutes. Take out the leaf from water and keep it in a test tube containing alcohol. Heat the test tube in a beaker containing water till the leaf loses its green colour. Take out the leaf and wash it with freshwater. Put it on a watch glass and add a few drops of iodine solution.

Observation : Green coloured part of the leaf turns blue-black whereas non-green part of the leaf remains unchanged.

Conclusion : Iodine solution gives blue-black colour with starch. Green portion of leaf turns blue-black whereas non-green portion remains brown with iodine solution. This shows only green portion of leaf contains starch while non-green portion does not contain starch. Hence chlorophyll is essential for photosynthesis.



ACTIVITY 1.2

Aim : To show that sunlight is necessary for photosynthesis.

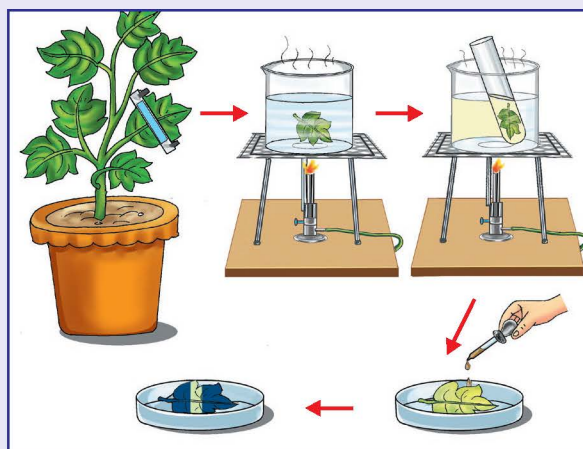
Requirements : Green plant, black paper, clip, iodine solution, alcohol, beaker, petridish and test tube.

Procedure : Destarch the plant by keeping it in a dark room for three days. Cover a part of the leaf of destarched plant using a strip of black paper. Now place this plant in sunlight for about 6 hours. Pluck the covered leaf at sunset and test it for the presence of starch.

Starch Test : Put the leaf in boiling water for 2 minutes. Take out the leaf from water and keep it in a test tube containing alcohol. Heat the test tube containing water till the leaf loses its green colour. Take out the leaf and wash it with freshwater. Put it on a watch glass and add a few drops of iodine solution.

Observation : Covered portion remains light brown while rest of the leaf turns blue-black.

Conclusion : The portion of leaf which is covered with black strip does not receive sunlight. So this part of leaf does not turn blue-black. This shows that sunlight is essential for photosynthesis.



CHECK YOUR KNOWLEDGE-1

Name the following :

- (a) The process of obtaining and utilising food by organisms. _____
- (b) The mode of nutrition in which organisms synthesise their own food. _____
- (c) Mode of nutrition in which organisms depend on other. _____
- (d) Test used to detect starch. _____

(c) Carbon dioxide

It is essential for photosynthesis. Plants take carbon dioxide from the atmosphere through small openings generally present in the lower

surface of the leaves, called stomata (singular stoma). Each stoma is surrounded by two guard cells which regulate its closing and opening.

ACTIVITY 1.3

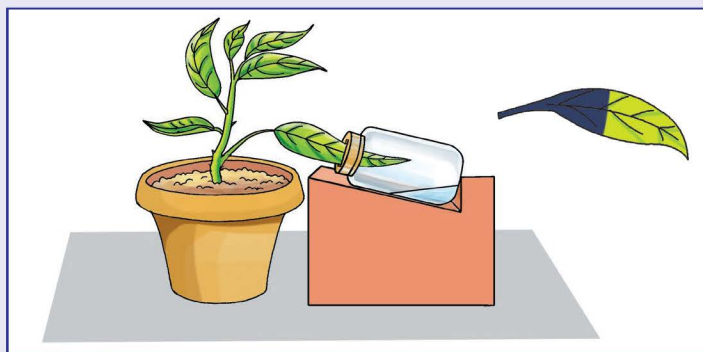
Aim : To show that carbon dioxide is necessary for photosynthesis.

Requirements : A potted plant, a wide mouthed bottle, caustic potash, iodine solution, beaker, watch glass, test tube, alcohol and cork.

Procedure : Make a slit in a cork and fit it into the mouth of the bottle having caustic potash solution. Insert about half leaf of a potted plant into the bottle through the slit present in the cork. Keep this whole arrangement in the sunlight for one day. Pluck the leaf and test it for the presence of starch.

Observation : The portion of leaf situated inside the bottle does not turn blue-black while outer portion of the leaf turns blue-black.

Conclusion : The portion of the leaf situated outside the bottle synthesises starch in the presence of carbon dioxide and sunlight by the process of photosynthesis and hence, turns blue-black with iodine solution. But caustic potash present in the bottle absorbs carbon dioxide from the bottle and no photosynthesis takes place. This shows that carbon dioxide is essential for photosynthesis.



(d) Water

It is essential for photosynthesis. Roots absorb water along with minerals from the soil and it is transported to different parts of the plant.

SCIENCE BITS!

Water helps to keep a plant cell rigid and turgid and helps plants to stand upright.

1.3 HETEROTROPHIC NUTRITION

Some plants, that do not have chlorophyll, cannot synthesise their own food. So they have to depend on other plants for food. This mode of nutrition is called heterotrophic nutrition and organisms having this type of mode of nutrition are called heterotrophs. Heterotrophs are of following types – parasites, saprophytes and symbionts.

1.3.1 Parasitic Plants

Parasites are those organisms (plants and animals) which obtain food from the other organism called host. It is a kind of association in which only parasites are benefitted.

Parasitic plants take their food from other plants. The *Cuscuta* (also called Amarbel) is a parasitic plant. It has special tubular structures



Cuscuta



Mistletoe



Rafflesia

PARASITIC PLANTS

SCIENCE BITS!

At least 3000 plant species have heterotrophic nutrition, about 590 plant species are carnivorous or insectivorous.

called **haustoria** that penetrate into the tissues of the tree from which it gets food. Mistletoe, *Rafflesia*, yellow rattle, witchweed and broomrape are some other parasitic plants.

1.3.2 Saprophytic plants

The mode of nutrition in which organism takes nutrients from dead and decaying matter is called **saprophytic nutrition**. Plants that use saprophytic mode of nutrition are called saprophytes. Examples of saprophytes are fungi (Mushroom), Indian orchid, snow orchid, etc. All saprophytes lack chlorophyll.



Mushroom

SCIENCE BITS!

Fungal spores are present in air. In rainy season, they germinate and grow on leather items and pickles and spoil them.

1.3.3 Symbiotic plants

Symbiosis is a relationship between two organisms in which both the organisms are benefitted from each other and the organisms present in this association are called symbiont. Lichen is an example of symbiosis in which two symbionts or components are an alga and a fungus. The fungus provides shelter, water and minerals to alga. In return, the alga that contains chlorophyll synthesises food by photosynthesis and provide to the fungus.



Tree trunk with many Lichens

Similar relationship is found between the legume plants such as pea, gram, etc., and a bacterium, *Rhizobium* that is found in the root nodules of these plants. *Rhizobium* converts atmospheric nitrogen into nitrates and nitrites that can be used by plants. Plants use this nitrogen to form proteins. In return, plants provide food to bacteria. This symbiotic association is very important for farmers. Leguminous plants replenish the soil with nutrients so that fertilisers are not required to be put.

1.4 INSECTIVOROUS PLANTS

Some plants trap insects with the help of special leaves present in them to get the supply of nitrogenous compounds. These plants are called insectivorous plants. Pitcher plant, venus fly trap, bladderwort, sundew are the examples of insectivorous plants.

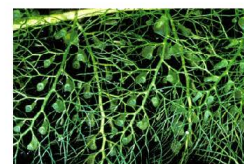
In pitcher plant a part of leaf modifies to form a pitcher like structure which is covered with a lid. Inside the pitcher hairs are present which are directed downward. When an insect



Pitcher plant



Venus flytrap



Bladder wort

INSECTIVOROUS PLANTS

lands in pitcher, the lid closes and the trapped insect is digested by the digestive juices present in pitcher.

The insectivorous plants are green in colour and can synthesise their own food. Then, why do insectivorous plants trap insects? Because, they usually grow in places where soil is deficient in nitrogenous nutrients. So, to meet the requirement of nitrogenous nutrients, they trap insects and kill to extract these nutrients.

CHECK YOUR KNOWLEDGE-2

Match the following :

Column A	Column B
(a) Green plant	(i) Symbiosis
(b) Fungi	(ii) Parasite
(c) Photosynthesis	(iii) Autotroph
(d) <i>Cuscuta</i>	(iv) Saprophyte
(e) Lichen	(v) Sunlight

KEYWORDS

- ◆ **Nutrients** : Different components of food are carbohydrates, fats, protein, water, vitamins, minerals and roughage.
- ◆ **Nutrition** : The process of obtaining and utilising food by the organism.
- ◆ **Autotrophs** : An organism synthesising their own food.
- ◆ **Heterotrophs** : The organisms which obtain food from plants or other organisms.
- ◆ **Photosynthesis** : The process of synthesising food by green plants, with the help of sunlight, water, carbon dioxide and chlorophyll.
- ◆ **Parasite** : An organism that obtain its food from other living organism and live on it.
- ◆ **Saprophyte** : An organism that obtains its food from dead and decaying material.
- ◆ **Symbiosis** : A partnership between two organisms in which both the organisms get benefit from each other.
- ◆ **Symbiont** : Each organism present in symbiotic association.

SUMMARY

- ◆ Carbohydrates, proteins, fats, vitamins, minerals and roughage are food components, called **nutrients**.
- ◆ The process of obtaining and utilising food by organisms is called **nutrition**.
- ◆ Nutrition is of two types — **Autotrophic and heterotrophic**.
- ◆ The mode of nutrition in which organisms synthesise their own food is called **autotrophic nutrition** and the organisms are called **autotrophs**.
- ◆ **Plants, algae** and some **bacteria** are autotrophs.
- ◆ Photosynthesis is a process in which chlorophyll containing plants synthesise their own food.
- ◆ **Glucose** is the food material formed by the photosynthesis which get converted into **starch** for the storage.
- ◆ **Oxygen** is also released in photosynthesis. It is utilised by other living organisms for respiration.
- ◆ The mode of nutrition in which organisms depend on the plants and other animals for their food, are called **heterotrophic nutrition**.
- ◆ The mode of nutrition in which organisms take nutrients from dead and decaying matter is called **saprophytic nutrition**.
- ◆ Those plants which trap insects with the help of some special leaves or organs and kill them to extract nutrients are called **insectivorous plants**.
- ◆ **Lichen** is a symbiotic association between an alga and a fungus.

EXERCISES

A. Multiple Choice Questions :

Select the correct option

1. Iodine solution turns the starch
 (a) blue-black (b) white (c) brown (d) colourless
2. Storage form of carbohydrate is
 (a) glucose (b) starch (c) protein (d) fat
3. Carbon dioxide enters into a leaf through
 (a) root (b) stomata (c) stem (d) haustoria
4. Which of the following is a parasite?
 (a) Mushroom (b) Fungi (c) *Cuscuta* (d) *Rhizobium*
5. In lichen the function of fungi is to
 (a) synthesise food (b) absorb nutrients (c) provide shelter (d) both (b) and (c)

B. Fill in the blanks with suitable words :

1. Leaves are called the _____ of the plants.
2. Stomata are surrounded by _____ cells.
3. Pitcher plant is an _____ plant.
4. _____ gas is released during photosynthesis.
5. Lichen is an association between _____ and _____.

C. Match the items in Column A with those in Column B :

Column A	Column B
1. Tube like structures called haustoria	(a) Algae
2. Leaves modified to trap insects	(b) <i>Cuscuta</i>
3. Grow on dead and decaying material	(c) Pitcher plant
4. Can make their own food	(d) Chlorophyll
5. Absorbs energy from sunlight	(e) Fungi

D. State True (T) or False (F) against each of the following statements :

1. All plants are autotrophs.
2. Chlorophyll, sunlight, water and oxygen are necessary for photosynthesis.
3. Parasites like *Cuscuta* takes its food from the host plant.
4. *Rhizobium* converts atmospheric nitrogen into a form that can be used by plants.
5. Insectivorous plants can synthesise their food by photosynthesis.

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E. Very short-answer type questions :

1. What are the two components of lichen?
2. List the conditions necessary for photosynthesis.
3. Name two insectivorous plants.
4. What do you understand by the term "host"?
5. Write the chemical equation of photosynthesis.
6. Which chemical is used to find out the occurrence of photosynthesis?
7. Define the term "autotroph".

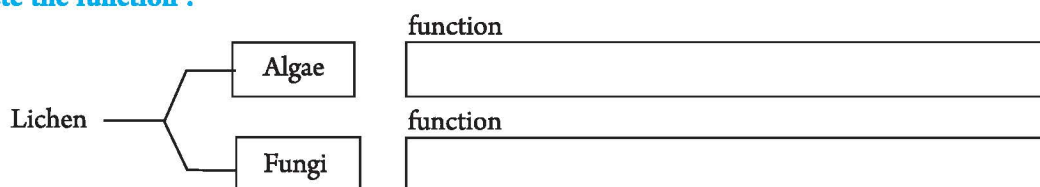
F. Short-answer type questions :

1. Why do pickles spoil in rainy season?
2. How does parasitic plants get their food?
3. What is stomata? How does it help in photosynthesis?

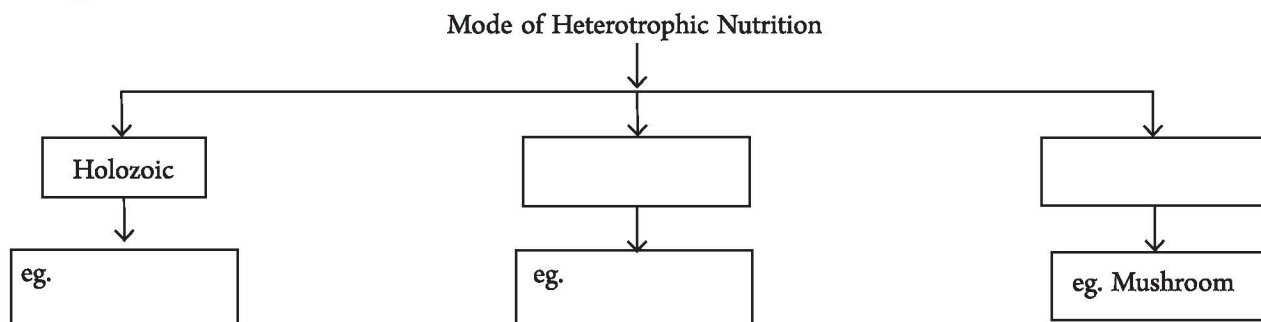
G. Long-answer type questions :

1. Differentiate between parasite and saprophytes.
2. What do you understand by the term nutrition? Name two major types of mode of nutrition in plants.
3. How can you show that chlorophyll is essential for photosynthesis?

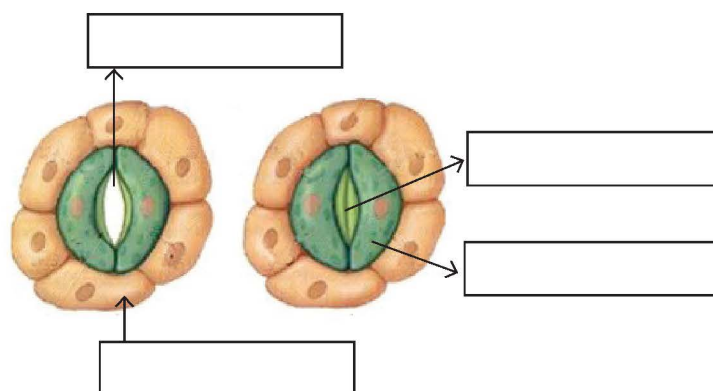
H. 1. Complete the function :



2. Complete the flow-chart :



3. Label the diagram :



4. Complete the following

(a) Carbon dioxide + $\longrightarrow$ + Oxygen

(b) Carbon dioxide $\xrightarrow{\text{is obtained from}}$

(c) $\xrightarrow{\text{is present in}}$ Leaves

(d) Sunlight $\xrightarrow{\text{is obtained from}}$

5. Give two examples of the following :

- (a) Parasitic plants _____, _____
- (b) Insectivorous plants _____, _____
- (c) Saprophytic plants _____, _____
- (d) Autotrophic plants _____, _____
- (e) Leguminous plants _____, _____

I. HOTS questions :

1. Why do insectivorous plants eat insects?
2. Visit a green house and observe how they grow plants and also how they regulate the light, temperature, water and carbon dioxide to maintain the optimum conditions for the plants.

J. Value based questions :

Ankita observed amarbel which was growing on the branches of bougainvillea plants on the boundary wall of her school. She also noted that the infected plants had smaller and yellowish leaves in comparison to a healthy plant. She removed the long, yellowish, tubular structures of amarbel from some of the bougainvillea plants. She contacted the school gardener and showed him the parasite. She also informed the class teacher about it.

Answer the following questions based on the above information :

- (a) What would have happened if Ankita did not observe the parasite?
- (b) What values are displayed by Ankita in taking this initiative?
- (c) Would you want parasites to grow on food crop plants? Give a reason in support of your answer.

PROJECT IDEAS

Take two potted plants. Keep one potted plant in a dark room and other in the sunlight for a week. After one week observe the difference in the colour of the leaves. Now, pluck a leaf from both the potted plants and level them as A and B and make an iodine test for the presence of starch. Record your observation and discuss it with your teacher.

ACTIVITIES TO PONDER AND ACT

(Life Skill and Value Development)

1. Visit a greenhouse located in your neighbourhood along with your parents. Observe how they raise plants.
 - Find out how they regulate light, water and carbon dioxide.
 - Find out how they use glass to build the house.
 - Make a report on the basis of your observations.

Objective : To know more about plants and their characteristics.

Skill and Value Development : Critical thinking, observation skill and attitude towards plants.

2. Saurabh left a slice of bread inside his lunch box. He saw a greenish-white growth on it after a few days.
 - Find out kind of organism might be growing on the slice.
 - How such organisms obtain nutrition and also find out such kind of nutrition.

Objective : To know more about nutrition and kind of organisms responsible for it.

Skill and Value Development : Thinking skills, observation skills and attitude towards plants and animals.

FOR THE TEACHER

1. You could arrange some experiments to show the presence of starch, light is essential for photosynthesis, etc., and explain to the students.
2. You could make a trip for the field study to learn more about the parasitic plant, saprophytic plant, insectivorous plant, symbiosis, etc., and discuss with the students.

IN THE LABORATORY

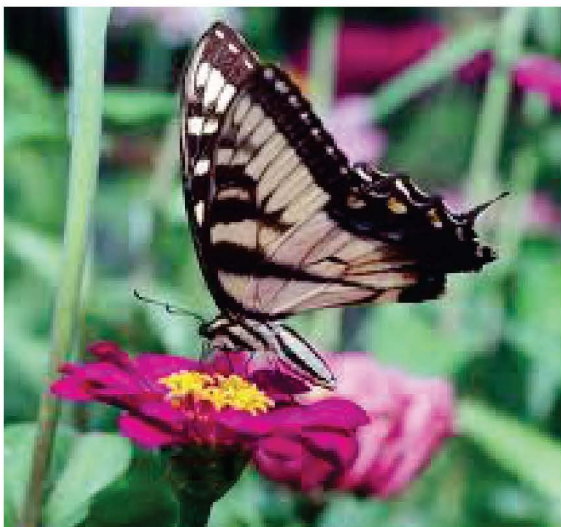
To show that chlorophyll is necessary for photosynthesis.

Materials Required : A potted plant with variegated leaves like coleus or croton, beaker, test tube, alcohol, iodine solution and watch glass.

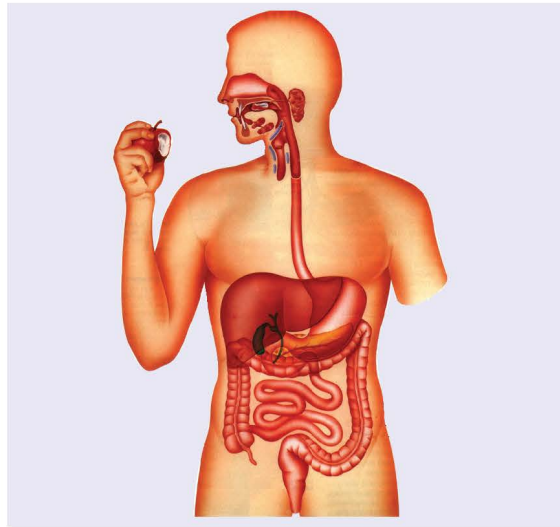
Procedure : Take a potted plant with variegated leaves and keep it in a dark room for 3 days. Put this distracted plant in sunlight for 6 hours. Pluck a leaf and put in boiling water for 2 minutes. Take out the leaf and keep it in a test tube containing alcohol. Heat the test tube till the leaf loses its green colour. Take out the leaf and wash it with freshwater. Put it on a watch glass and add a few drops of iodine solution.

Note down your observations.





2



Nutrition in Animals

Learning Objectives

At the end of this chapter, students will be able to understand :

- What type of nutrition is found in animals? • What are the feeding habits of animals? • What is nutrition and their steps? • What is intracellular digestion? • What is extra cellular digestion? • What are the functions of different parts of digestive system? • What are the functions of various glands associated with alimentary canal?

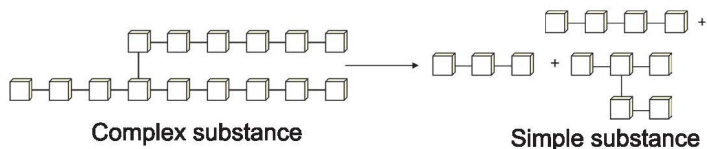
In the previous chapter, you have learnt about the nutrition in plants, their mode of nutrition — autotrophic and heterotrophic nutrition. Since, all the living organisms require food for their various life processes such as growth, repair, reproduction and other functions of the body. Plants prepare their own food by the process of photosynthesis, are called autotrophs whereas animals get their food either directly by eating plants or indirectly by eating other animals, are called heterotrophs. You know that food contains different components such as carbohydrates,

fats, proteins, vitamins, minerals and roughage, called nutrients. These nutrients are present in complex form and cannot be utilised directly by the animals. They must be converted into simpler soluble form to be absorbed by the body for utilisation.

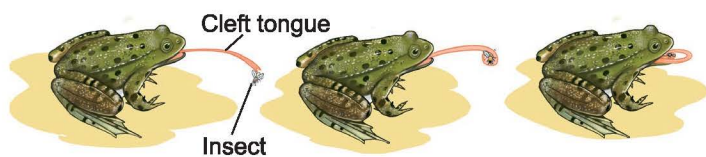
2.1 DIFFERENT MODES OF FEEDING HABITS

The different animals have different modes of feeding habits, and each animal has certain special features that help it to take in its food such as :

- (a) In *Ameoba* special feet called pseudopodia help to procure food.



- (b) Lizard, frog and chameleon have long, sticky tongue to catch their prey.

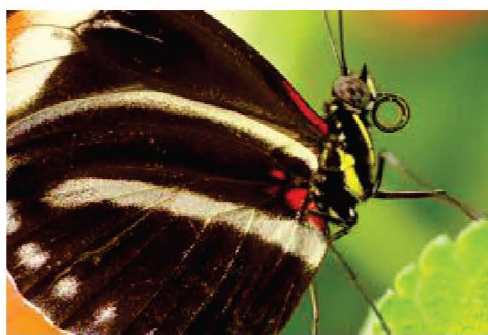


Process of nutrition in frog

- (c) Birds of prey like eagle, have sharp claws and curved beaks to grip the prey and to shred them into pieces.
- (d) Butterflies, mosquitoes feed on liquid food like nectar and blood. Houseflies also first liquify their food with the help of saliva. All these organisms have a special sucking



Mosquito sucking blood



Proboscis of butterfly

organ called proboscis to suck the liquid food.

- (e) Hydra uses its specialised sting cells cnidocytes which secrete poison to paralyse its prey. Thereafter, tentacles put this paralysed prey into its body cavity.
- (f) Snail has mouth on underside of the head. This contains many tiny teeth arranged in rows on a ribbon like tongue called radula. Snails generally feed on decaying plants.
- (g) Starfish uses its arms to grip mussels (a sea animal covered with black shell). It gradually pulls its mouth and digest the mussels' soft body.

- (h) Leaf cutting ants bite off pieces of leaves and carry them to huge underground nest. Here they chew the leaves and mix them with saliva to make a kind of compost. On this compost fungi grow which is used as food by the ant.

ACTIVITY 2.1

Make a list of animals, type of food they eat and their feeding habit. Write your observations in the following table.

S.No.	Name of the animal	Food they eat	Feeding habit
1.	Mosquito	Blood	Sucking
2.			
3.			
4.			

CHECK YOUR KNOWLEDGE-1

Write True (T) or False (F) :

(a) The feet of *Amoeba* are called proboscis.

☐

(b) Frog has a long tongue to catch its food.

☐

- (c) Hydra uses its cnidocytes to paralyse its prey.
- (d) Starfish uses its arms to grip the prey.
- (e) Woodpeckers have curved beaks to grip the food.



2.2 PROCESS OF NUTRITION

The process of obtaining food, digestion, absorption and the utilisation of food by the body is called nutrition. There are various steps of nutrition such as :

(a) Ingestion - The taking in of the food inside the body is called ingestion. In human, ingestion takes place through mouth.

(b) Digestion - The break down of the various complex nutrients present in the ingested food into simpler and soluble substances is called digestion.

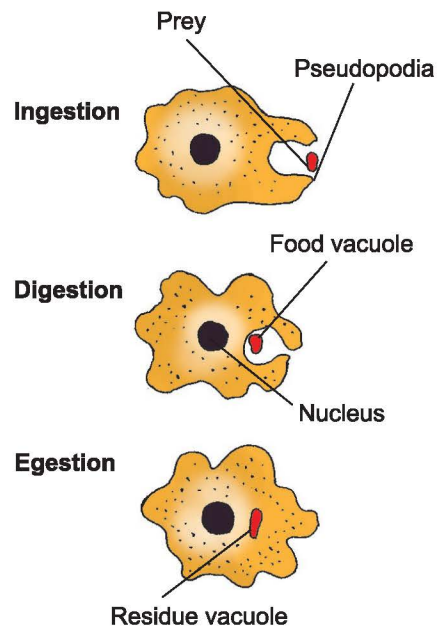
(c) Absorption - Absorption is the process of absorbing the digested food by the body to reach in the blood.

(d) Assimilation - It is the utilisation of absorbed food materials for the process of growth, reproduction or repair by the living organisms.

(e) Egestion - Removal of undigested food and solid waste material from the body is called egestion.

2.3 NUTRITION IN AMOEBA

Amoeba is a unicellular organism. All the five steps of nutrition in an *Amoeba* occur within a cell. At the time of ingestion false feet called pseudopodia (singular pseudopodium) surrounds



Feeding habit in *Amoeba*

the food to form a structure called **food vacuole**. In food vacuole digestive juices are released which convert the complex substances present in food into simpler, soluble substances. Digested food is absorbed and assimilated to get energy and maintain the life processes. Undigested food is thrown out of the cell.

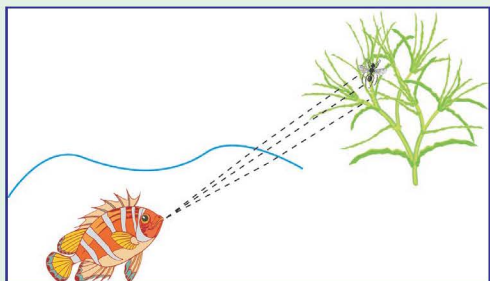
In *Amoeba*, the process of digestion takes place within the cell. This type of digestion is called intracellular digestion.

2.4 NUTRITION IN HUMAN BEINGS

In human, hands help in the process of taking food into mouth, called ingestion. Further the digestion of **ingested** food is carried by the digestive system. Digestive system consists of mouth, oesophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas and anus. The part of digestive system from oesophagus to the anus is called alimentary canal. Different parts of digestive system are mouth, tongue, salivary glands oesophagus, stomach, small intestine and large intestine.

SCIENCE BITS!

Archer fish spits drop of water at insects on overhanging twigs. The insect fall off from the twig into the water. Fish gulps this insect.

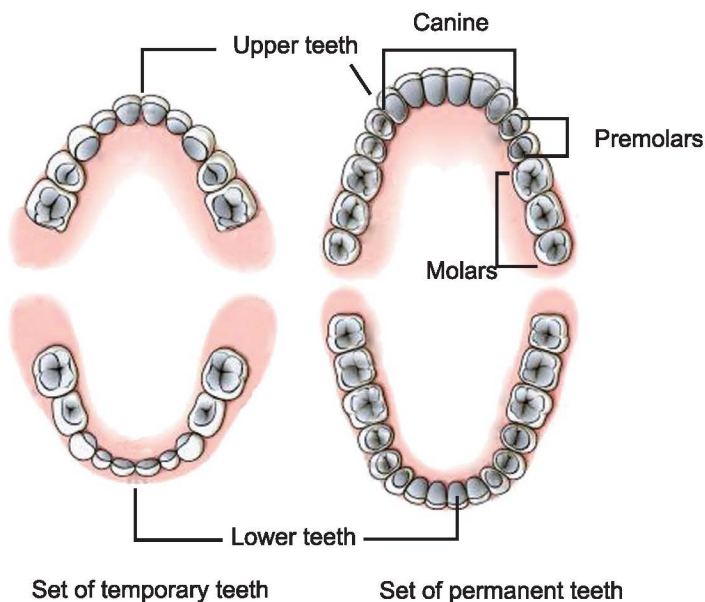


2.4.1 Mouth

The process of digestion starts inside the mouth (buccal cavity). It contains different types of teeth.

Teeth help in chewing of the food and break it into small pieces. This process is called mastication. In human, teeth grow twice in their life span. The first set of teeth is called **temporary teeth** whereas second set of teeth is called permanent teeth.

(a) Temporary teeth - This set consists of twenty teeth. They develop in a child from 5-6 months till two years. Children start losing their temporary teeth by the age of six to eight.



(b) Permanent teeth - When milk teeth fall off one by one the new teeth appear and remain for the whole life are called permanent teeth. They are 32 in number, 16 in each jaw. Four types of teeth present in our mouth are-

(i) **Incisors** - These teeth are present in front and help to bite the food. Eight incisors are present in the mouth, four in each jaw.

(ii) **Canines** - One canine tooth is present on either side of incisor in each jaw. Thus, four canines are present in mouth, two in each jaw. These teeth help in tearing the food.

(iii) **Premolars** - Next two teeth on each side of jaw are premolars. They are eight in number. They help in grinding the food.

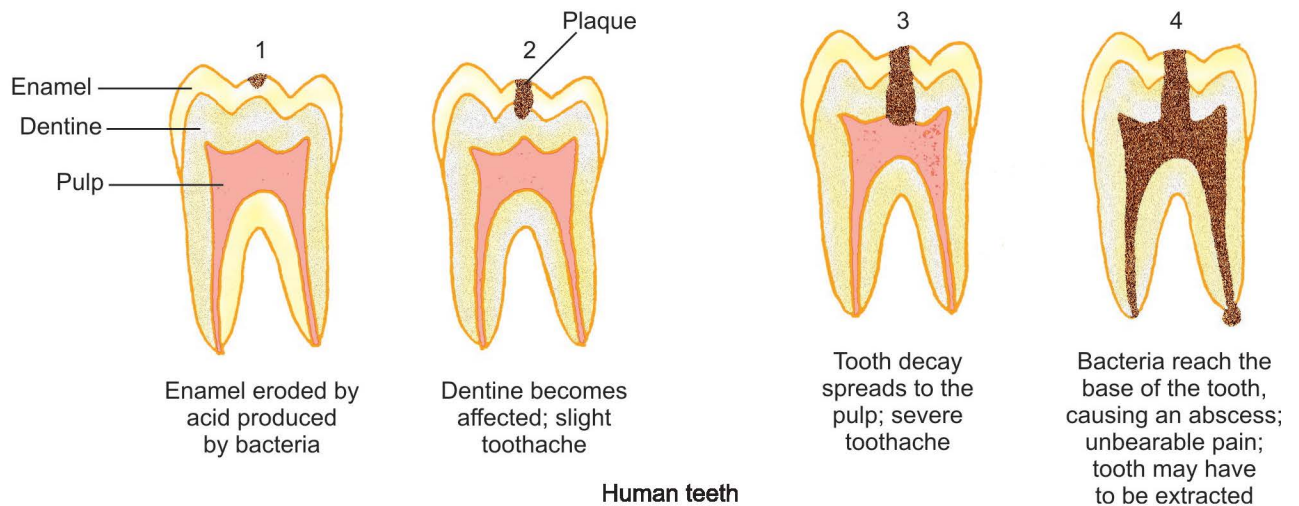
(iv) **Molars** - These are situated at the innermost area of both the jaws. They are twelve in number, six in each jaw and help to chew and grind the food.

SCIENCE BITS!

A garden snail has 14000 teeth.

Care of teeth

If you will not care the teeth by brushing and cleaning them after each meal, gradually, teeth become yellowish due to accumulation of some sticky film containing food particles mixed with saliva. This is called plaque. The sugary food material present in plaque is converted into acids by some bacteria generally present in the mouth and do not harm us. The acid so formed damages the enamel, causing tooth decay and leads to the



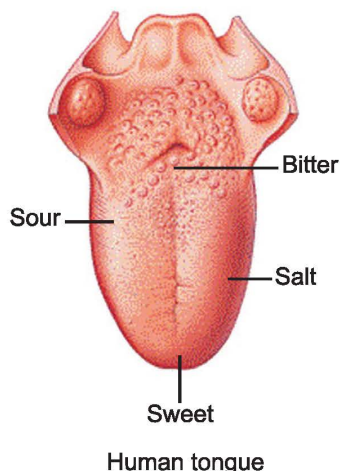
formation of cavity which causes severe pain. Therefore one should clean the teeth with brush twice a day.

2.4.2 Tongue

It is a flat, muscular organ attached to the back from the floor of the buccal cavity. It is an important organ because it performs the following functions :

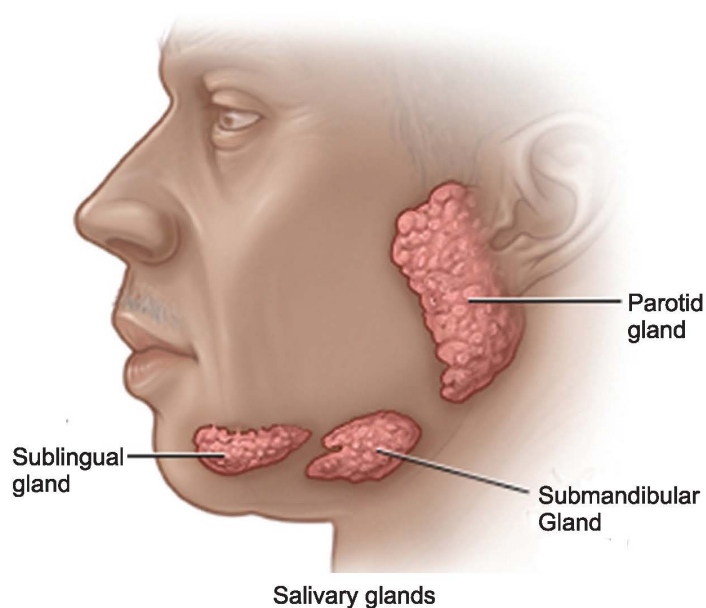
- It helps to mix saliva with food.
- It helps to find out the taste of food.
- It helps in swallowing the food.

Tongue contains taste buds that help to determine bitter, sour, sweet and salty taste.



2.4.3 Salivary Glands

Salivary glands secrete a digestive juice called saliva. Saliva contains an enzyme called amylase that break down starch into sugar.



2.4.4 Oesophagus

It is a hollow tube that connects mouth to the stomach. Here, food is pushed downward by the contraction of the wall. Then this wall relaxes and next part of the oesophagus contracts. This creates a wave like movement called peristalsis.

2.4.5 Stomach

It is a J-shaped structure. The stomach receives food from the oesophagus at one end, and opens into a small intestine at the other end. The gastric glands are present in the inner wall of stomach, which secretes gastric juices. These juices contain enzymes that help to digest the food. Stomach also secretes mucous and hydrochloric acid. Hydrochloric acid kills the bacteria present in the food. Mucous protects the lining of stomach from hydrochloric acid.

ACTIVITY 2.2

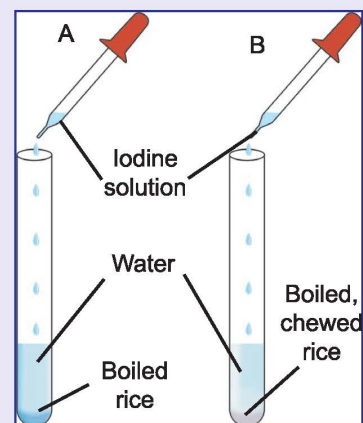
Aim: To study the effect of saliva on starch.

Requirements : Two test tubes, boiled rice, dropper, iodine solution.

Procedure : Take two test tubes. Label them "A" and "B". In test tube A put one teaspoonful boiled rice. In test tube B put one teaspoonful boiled rice that have been chewed for 3-5 minutes. Add 3ml of water in each test tube. Now pour 2-3 drops of iodine solution in each test tube.

Observation : The solution in the test tube A turns blue-black whereas the solution in the test tube B does not change its colour.

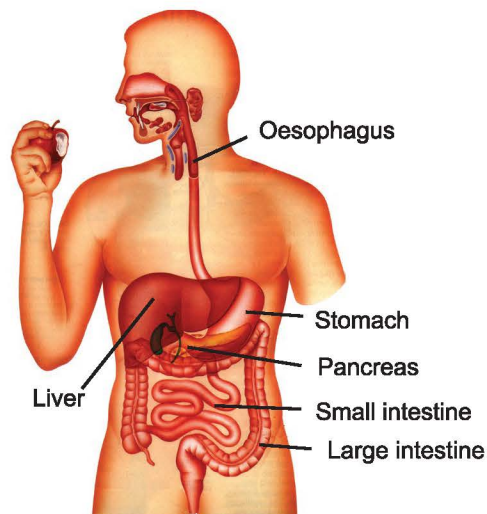
Conclusion : In test tube A boiled rice is present which is a rich source of starch. The chewing of rice mixes saliva in boiled rice. It results in break down of starch into sugar.



Diarrhoea – Diarrhoea is very common in India, especially in children. This is caused by an infection, food poisoning or indigestion. In diarrhoea, you may have experienced the frequent watery stool. Under severe conditions it may be fatal, because of the excessive loss of water and salt from the body. At this time, patients need immediate treatment and should be given plenty of boiled and cooled water with a pinch of salt and sugar dissolved in it. This is called Oral Rehydration Solution (ORS) and the process of treatment is called Oral Rehydration Therapy.

2.4.6 Small Intestine

It is the longest part (about 7.5 m) of the alimentary canal. It is also the site of complete

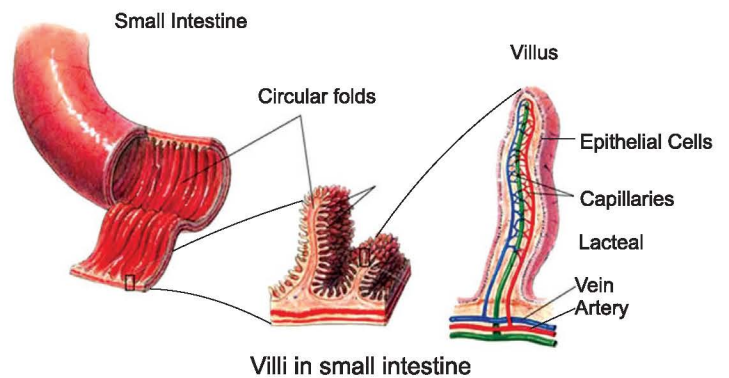


Human Digestive System

digestion. Here, carbohydrates completely break down into glucose, fats into fatty acid and glycerol and protein into amino acid.

Two glands liver and pancreas secrete their juices in small intestine. Liver secretes bile which get stored in a sac like structure called gall bladder. Bile helps to digest fat. Pancreas secretes pancreatic juice that also helps in digestion.

The inner wall of small intestine has millions of finger like projections called villi (sing. vilus). These villi increase the surface area so that maximum absorption of digested food takes place. This absorbed digested food reaches to blood.



2.4.7 Large intestine

The undigested food that remains in the small intestine passes into the large intestine. Here some amount of water is absorbed by the walls of large intestine. Remaining waste is passed to rectum and then expelled from the body through the anus. The length of large intestine is 1.5 metres.

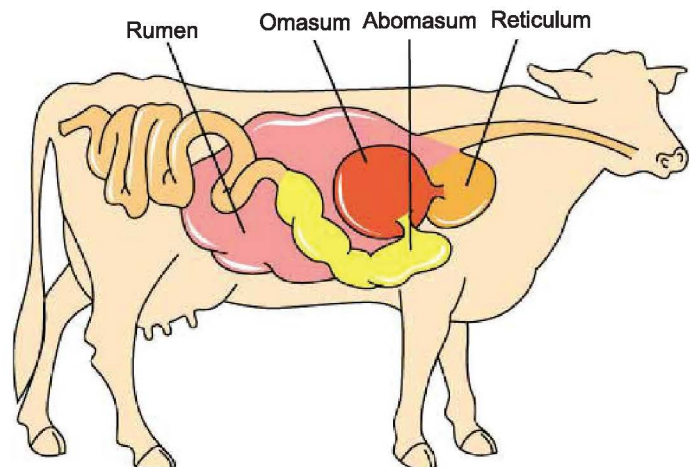
In human beings, digestion takes place outside the cells in the alimentary canal. This type of digestion is called extra cellular digestion.

SCIENCE BITS!

Many animals, including humans cannot digest cellulose due to the absence of an enzyme called cellulase.

2.5 NUTRITION IN RUMINANTS

All plant cells consist of a complex carbohydrate called cellulose. Digestion of cellulose requires a special type of digestive system in which stomach is divided into four chambers – rumen, reticulum, omasum and abomasum.



Digestive system in ruminant

SCIENCE BITS!

Grass-eating animals for example cow, keep chewing (partially digested cud) even if they are not eating food.

In grass eating animals, half chewed plant material reaches to first chamber of stomach called rumen where bacteria act upon cellulose. The partially digested food enters in the second chamber. From here, partially digested food

which is back to mouth is called cud. Cud is further chewed by the animal. This process is called rumination and the animal that does it is called ruminant. The ruminated food is swallowed again and reaches directly to the third chamber of stomach. Here ruminated food is broken down into smaller pieces. Finally it reaches to fourth chamber where enzymes convert the complex nutrients into simpler ones to complete the digestion.

CHECK YOUR KNOWLEDGE-2

1. Name the following :

- (a) The mode of nutrition in animals. _____
- (b) The structure helps in taking in of food in *Amoeba*. _____
- (c) The structure helps in detecting taste of food in human. _____

2. Fill in the blanks :

- (a) The taking of food into mouth is called _____ .
- (b) Elimination of undigested food and waste solid material is called _____ .
- (c) The process of digestion starts in _____ of human.
- (d) The number of incisors present in human is _____ .

KEYWORDS

- ◆ **Proboscis** : A tube like mouth part present in butterflies that helps in sucking of liquid food.
- ◆ **Tentacle** : A soft appendage present in hydra that helps to procure the food.
- ◆ **Food vacuole** : A vacuole present in unicellular organisms in which food becomes trapped and digested thereafter.
- ◆ **Pseudopodia** : Finger-like projections that help in locomotion and capture of food in *Amoeba*.
- ◆ **Salivary glands** : Saliva secreting glands present in the mouth.
- ◆ **Oesophagus** : A tube like part of alimentary canal that connects mouth to stomach.
- ◆ **Gastric glands** : Glands situated in the inner wall of stomach that secretes gastric juices.
- ◆ **Liver** : The biggest gland situated in upper part of our abdomen.
- ◆ **Villi** : Finger-like projections found in the inner wall of small intestine.

SUMMARY

- ◆ Animals get food either directly by eating plants and indirectly by eating other animals; hence they are called heterotrophs.
- ◆ The complex nutrients must be converted into simpler, soluble form.
- ◆ Different animals have different modes of feeding habits.
- ◆ The process of taking food, digestion, absorption and utilisation of food by the body is called nutrition.
- ◆ Nutrition involves five steps : Ingestion, digestion, absorption, assimilation and egestion.
- ◆ *Amoeba* is a unicellular organism.
- ◆ Pseudopodia help in the ingestion of food.
- ◆ Human digestive system consists of mouth (buccal cavity), oesophagus (foodpipe), stomach, small intestine, large intestine, liver, gall bladder, pancreas and anus.
- ◆ The part of digestive system from oesophagus to anus is called alimentary canal.

- ❖ Digestion of food starts in the mouth and completes in small intestine.
- ❖ Ruminants have four-chambered stomach – rumen, reticulum, omasum and abomasum.

EXERCISES

A. Multiple Choice Questions :

Select the correct option

- The intake of food in the body is called
(a) ingestion (b) egestion (c) digestion (d) absorption
- In *Amoeba*, food procuring structure is
(a) tongue (b) tentacle (c) pseudopodium (d) radula
- Salivary glands are situated in
(a) mouth (b) stomach (c) liver (d) small intestine
- How many incisor teeth are present in a human?
(a) 8 (b) 12 (c) 14 (d) 20
- Which of the following is not a ruminant?
(a) Cow (b) Buffalo (c) Lion (d) Deer

B. Fill in the blanks with suitable words :

- Digestion starts in _____.
- The inner wall of _____ has many finger-like projections called villi.
- In *Amoeba* digestion takes place in _____.
- Ruminants have _____ chambered stomach.
- Further chewing of cud is called _____.

C. Match the items of Column A with those in Column B :

Column A	Column B
1. Bile	(a) absorption of digested food
2. Large intestine	(b) secrete saliva
3. Small intestine	(c) secretion of hydrochloric acid
4. Stomach	(d) get stored in gall bladder
5. Salivary glands	(e) absorption of water

D. State True (T) or False (F) against each of the following statements :

- Canine teeth are used for tearing of food.
- Hydra traps food with the help of sticky tongue.
- Salivary glands are situated in mouth.
- In human, extra cellular digestion takes place in the alimentary canal.
- Bile helps to digest carbohydrates.

☐
☐
☐
☐
☐

E. Very short-answer type questions :

- Which is the largest part of alimentary canal?
- Give two examples of ruminants.
- List the five steps of nutrition.
- Which mouth part does help in sucking of liquid food in butterflies?

5. Name two animals having sticky tongue.
6. Which food processing structure is present in Hydra?
7. In which animal does intracellular digestion take place?
8. What are the four types of teeth present in human?
9. Which enzyme is secreted by salivary glands?
10. Name an organism in which extracellular digestion takes place.

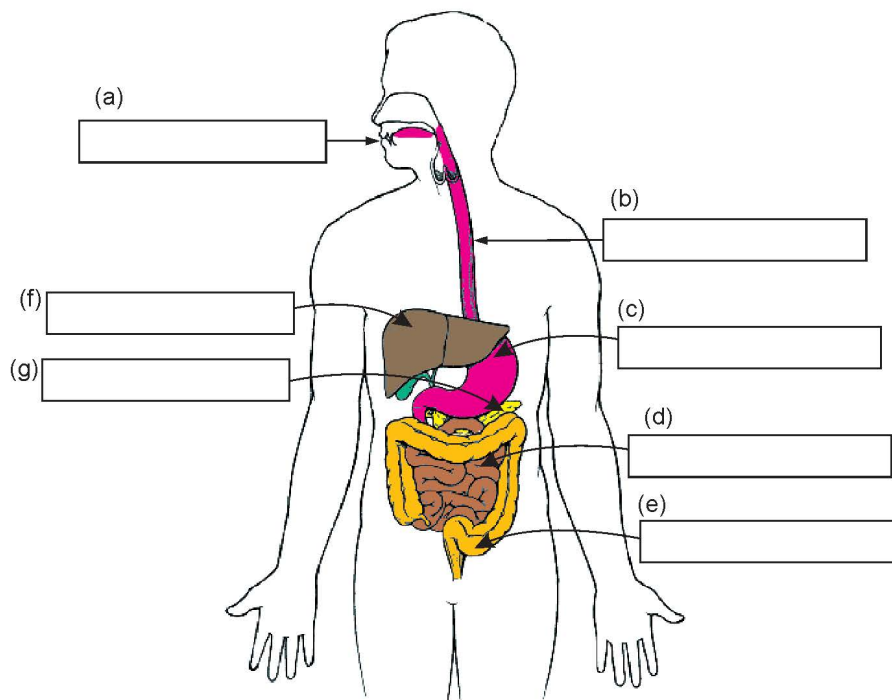
F. Short-answer type questions :

1. What is peristaltic movement?
2. What is bile? How does it help in digestion?
3. Why is digestion of food essential?
4. What do you understand by the terms egestion and ingestion?
5. What are villi? Where are they located?
6. What is alimentary canal?

G. Long-answer type questions :

1. Why should we brush after eating sugar products?
2. What are the differences between intracellular digestion and extracellular digestion?
3. Draw a labelled diagram of tongue showing taste buds for bitter, sweet, salty and sour taste.
4. Define the following terms :
(i) Ingestion (ii) Digestion (iii) Egestion.

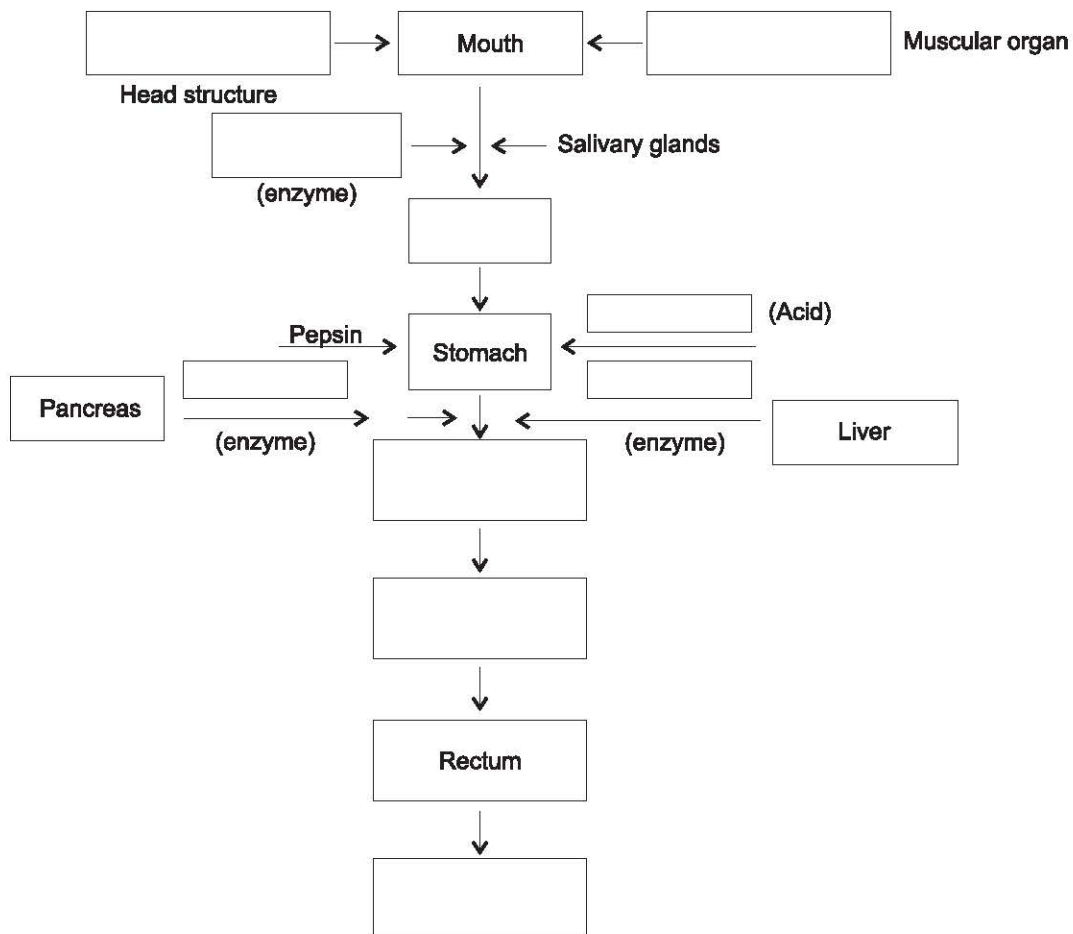
H. 1. Label the following diagram :



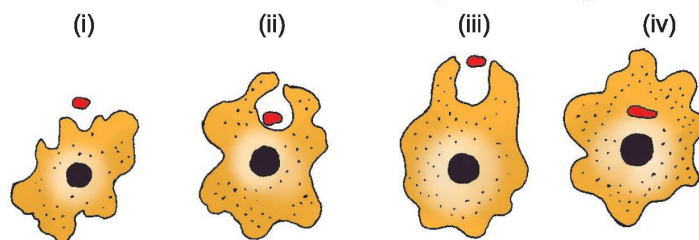
2. Fill in the blanks :

Organ	Juice secreted
Salivary glands	(a) _____
(b) _____	Hydrochloric acid
(c) _____	Pepsin
Liver	(d) _____
Gall bladder	(e) _____
Pancreas	(f) _____
(g) _____	Intestinal juice

3. Complete the following flow-chart :

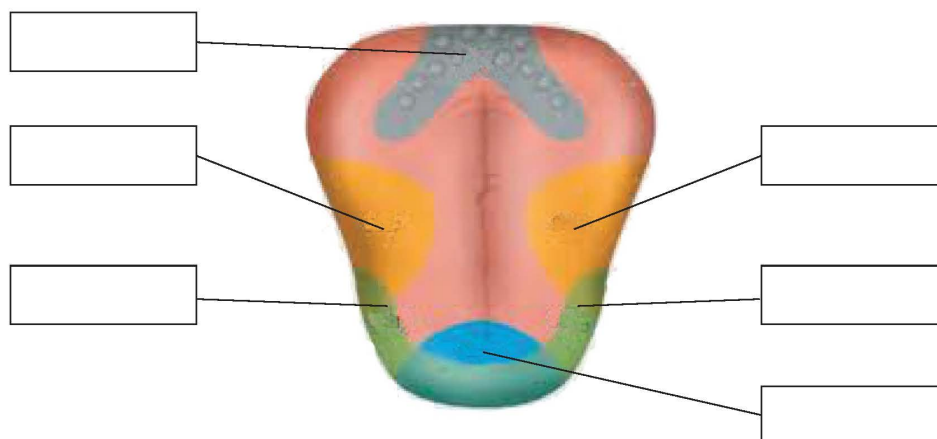


4. The steps involved in digestion of food in Amoeba have been placed wrong. Put them in correct sequence :

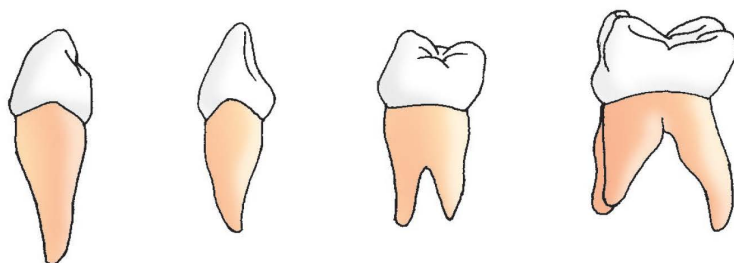


The correct sequence is — → → →

5. Label the following tasting regions of tongue :



6. Look at the pictures below :



Premolars Incisors Molars Canines

Is the above labelling of teeth correct? If not, write the correct names and also write the function of each.

I. HOTS questions :

1. How does saliva help in digestion?
2. What would happen if we do not have a tongue?

J. Value based question :

Ritika was suffering from toothache. Her father took her to a dentist. The doctor, after examination, told her that she was suffering from cavity formation, and that she had come well in time, otherwise tooth pain would have become unbearable. He advised her (i) that sweet foods like sweets, chocolates and ice creams should be avoided, and (ii) teeth should be brushed regularly after every meal.

Answer the following questions based on the above information :

- (a) Why Ritika was suffering from toothache?
- (b) What is the message you get from Ritika's action?
- (c) Suggest one more way (other than those mentioned above) to control cavity formation in our teeth.

PROJECT IDEAS

1. Prepare separate solution of sugar, salt, lemon juice and bitter gourd. Now, ask your friend or classmate to close his/her eyes and to take out the tongue. Use a clean toothpick to put the above solution one by one using separate toothpick on the different areas of the tongue. Now, ask which area of tongue detect the above solution. Record your observation and discuss it to the teacher for more information.
2. Visit a dentist and ask more about the dental care and how to protect it from tooth decay and share this information to your classmate and your family members.

ACTIVITIES TO PONDER AND ACT

(Life Skill and Value Development)

1. The digestive juices in our stomach contain dilute hydrochloric acid. The hydrochloric acid is a strong and dangerous acid.
Find out why it normally does not damage the stomach.
Objective : To know more about human digestive system.
Skill and Value Development : Critical thinking, research analysis, and curiosity.
2. Visit a nearby hospital and find out when and under what conditions a patient is provided a drip of glucose.
Write down how glucose helps the patient to recover.
Objective : To know more about nutrition in animals.
Skill and Value Development : Thinking skill, observation skill and attitude towards healthy life.

FOR THE TEACHER

1. You could explain more and detailed information about the digestive system with the help of 2D–3D model of the digestive system in the class.
2. You could explain more by showing the enzymatic activity of the saliva or salivary amylase of the food (carbohydrate) in the class.

IN THE LABORATORY

To study the effect of saliva on starch.

Materials Required : Two test tubes A and B, boiled rice, dropper, iodine solution.

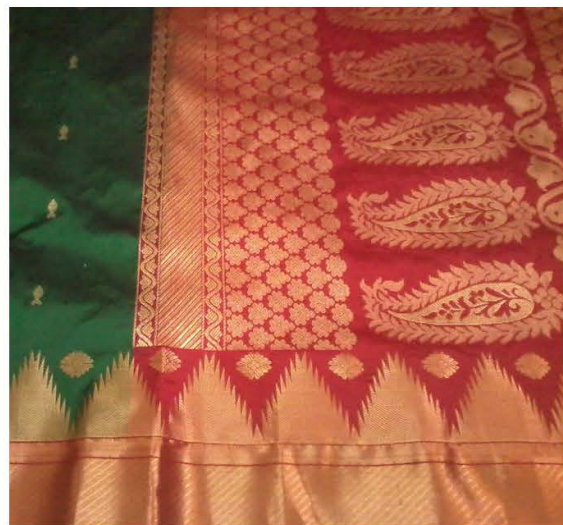
Procedure : In test tube A put one teaspoonful boiled rice. In test tube B put one teaspoonful boiled rice that have been chewed for 3–5 minutes. Add 3 ml of water in each test tube. Now pour 2–3 drops of iodine solution in each test tube.

Write down your observations.





3



Fibre to Fabric

Learning Objectives

At the end of this chapter, students will be able to understand :

- Which animals yield wool? • How are sheep reared and bred? • How are the fibres processed into wool? • Life-cycle of a silk moth. • How are silkworms reared? • How is silk fibre processed? • What are the health hazards of the people working in wool and silk industry?

Clothes are one of the basic needs of life. But its significance lies in the fabrics. You have already read that fabrics are made from yarn and yarn from fibres. Among the natural fibres cotton, jute and flax are derived from plants. Wool and silk are derived from animals. These fibres are used to make different kinds of fabrics. Woollen yarn is knitted into sweaters while silk fibres are woven into silk sarees or silk clothes.

3.1 WOOL

Wool is obtained from the thick coat of hair which grows on the bodies of sheep and goat. These hairs are known as **fleece**. The fur (hair) on the bodies of Alpaca and Llama camels, Angora rabbits and yak also produce smaller quantities of this fibre.

Wool is a soft, light, durable, elastic and a wrinkle resistant fibre. It is highly porous and traps air in between the spaces of the fibre. Since air is a poor conductor of heat, it acts as an insulator and does not allow the body heat to escape. Therefore, it keeps the animals warm and woollen fabrics keep us warm during winter.



Wool

Wool is made up of proteins. It shrinks and burns slowly, with a smell of burning hair when held under a flame. The fibres obtained from sheep are of two types :



Sweater

(a) The coarse beard hair, and

(b) The fine soft underhair close to the skin.

The woollen fibres are produced from the fine underhair.

Sheep are specially bred to produce only soft underhair. In this process, the sheep are carefully chosen to produce offsprings which grow only soft and fine underhair. The above process of selecting parents which produce special characters in their offsprings is known as selective breeding.

Animals that yield wool

Sheep are mainly reared for wool. Different breeds of sheep produce different varieties of woollen fibres which are used for various purposes. The finest wool is obtained from the fleece of **Merino** sheep. In our country **Pashmina** is one of the finest quality wools, obtained from a breed of sheep, found in Kashmir and surrounding Himalayan areas. It is a fine, light, fluffy and warm wool which is made into Pashmina shawls.

Wool is also obtained from the fur or hair of goat, yak, camel and rabbit. The fleece obtained

Besides the breed of sheep, the quality of wool depends upon the length, thickness, shine, colour and strength of the fibre.

Rearing and breeding of sheep

Sheep are reared in dry places with low rainfall, where the temperature is moderate. They are found in the following regions:

(a) **Hot desert** regions of Australia, Asia and the Middle East, and

(b) **The cold countries** like Northern Europe, Russia, Iceland and South America.

The best wool comes from the **International Wool Secretariat (IWS)** member countries like Australia, New Zealand, South Asia and Uruguay.

In India sheep are reared in :

- **Hill regions** of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Arunachal Pradesh and Sikkim.

- **Plains** of Haryana, Punjab, Rajasthan and Gujarat.

Sheep are herbivores and graze mainly on grass and weeds. They are also fed on a mixture of pulses, jowar, corn, oil cakes and leaves. In winter, they are kept indoors and given dry fodder and leaves. They need freshwater and fresh air to survive. During the hot weather, fans are provided in barns to keep them comfortable.

A selectively bred sheep produces a large quantity of good quality wool.

Processing fibres into wool

The following steps are carried out to process the hair or fleece obtained from the animals into wool :

(a) **Shearing** : In this process, the thick growth of hair of the sheep, along with a layer of skin is removed. It can be done in two ways :



Llama



Sheep



Yak



Alpaca

WOOL PROVIDING ANIMALS

from the Cashmere goat found in the mountains of China and Tibet, is extremely soft and very expensive. **Mohair**, the fleece of Angora goat, is white, smooth and lustrous. Angora fibre, obtained from Angora rabbit has soft and fine hair. Yak is found in Tibet and Ladakh and Alpaca and Llama camels in South America.



Sheep shearing

SCIENCE BITS!

- The population of sheep is the largest in China. India comes third just after Australia.
- The process of shearing, which removes the upper layer of the skin along with the fleece does not hurt the sheep. This is because the upper layer of the skin is dead.

- Manually with a large razor, clipper or a pair of scissors.
- With the help of a shearing machine when a large number of sheep have to be sheared.

Shearing is carried out mainly during summer so that the hair grows back in winter.

(b) Scouring : In this step, the sheared wool is washed with a detergent in large tanks, to remove dirt, grease and sweat. In large factories, machines are used for scouring. The washed wool is treated with an acid and dried by low heating.

(c) Sorting : In this process, the cleaned wool is sorted according to its texture.

(d) Separating burrs :

Burrs are the small fluffy fibres which are present in the fleece of sheep. These can also be seen on some of the sweaters we wear.

The burrs are separated and the process of scouring is repeated. The hairs are then twisted into fibres.

(e) Dyeing :

The fleece of sheep and goat is naturally black, brown or white in colour. It is dyed in different colours according to requirement.

(f) Rolling :

The fibres are straightened, combed and rolled into yarn. Two types of yarn are produced by this method. The longer ones, are knitted into sweaters, shawls, etc., while the shorter ones, are woven into blankets, carpets, etc.



Burrs on sweater



Scouring by machines



Rolling

CHECK YOUR KNOWLEDGE-1

Answer the following questions :

1. What is selective breeding?
2. Which properties of wool help in grading the fibre into different qualities?
3. Why is scouring of the sheared wool necessary?
4. What are burrs?
5. What is rolling of woollen yarn?

SCIENCE BITS!

- Mulberry silk is the main variety of silk produced in India. About 90% of the mulberry silk comes from Karnataka, Andhra Pradesh and Tamil Nadu.
- A single caterpillar produces nearly 300 m of silk thread.
- To produce one kg of raw silk, we require about 5500 silk moth.

3.2 SILK

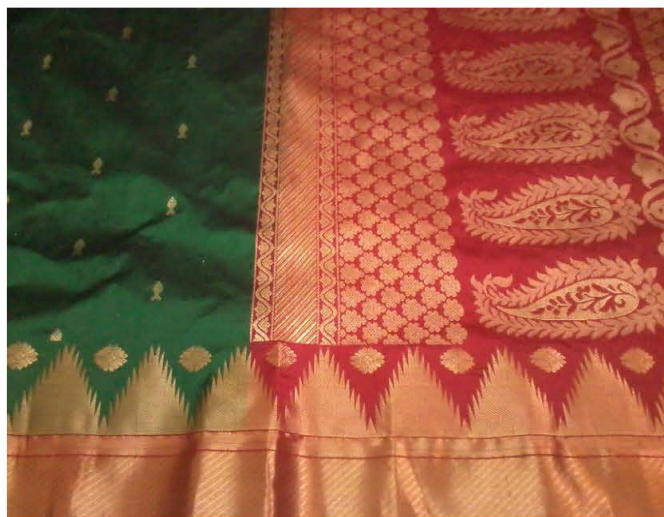
Silk is obtained as a long continuous strand from the thread-like filaments which the silkworm spins around itself, to form a cocoon. It is a natural **protein** secreted by the larva of the silkworm. The fibre is soft, strong, durable and lustrous. Its lustre makes it an extremely desirable and expensive fabric. Since it is also a protein, like wool, it shrinks away from the flame and burns with the smell of charred meat. It does not melt or emit the smell of burning plastics like artificial silk do, when they are burnt.

The rearing of silkworm on a commercial scale to produce silk is called **sericulture**. **China** is the world's largest producer of silk, followed by India. In our country, **silk farming** is carried out in the states of Assam, Bihar, Madhya Pradesh, Odisha, Karnataka and Tamil Nadu.

Discovery of Silk

Silk was used in China around 27th century B.C., though its exact date of discovery is not known. According to a Chinese legend, silk was discovered by Empress Si-lung-Chi. She was asked by the Emperor, Huang Ti, to search for the reason that was damaging the mulberry leaves in the palace garden. She discovered caterpillars feeding on the leaves and building their cocoons. In order to destroy the problem, she put a cocoon in hot water and was surprised to find a delicate, single thread unwind itself. This was how silk was discovered.

Silk production was kept a secret by the Chinese for thirty centuries. But they traded this material with other countries. Thus, a trade route known as the **Silk Route** was born. It connected China to Central Asia, Northern India, Roman empire and the areas around the Mediterranean sea.



Silk Saree

Life Cycle of a Silk moth

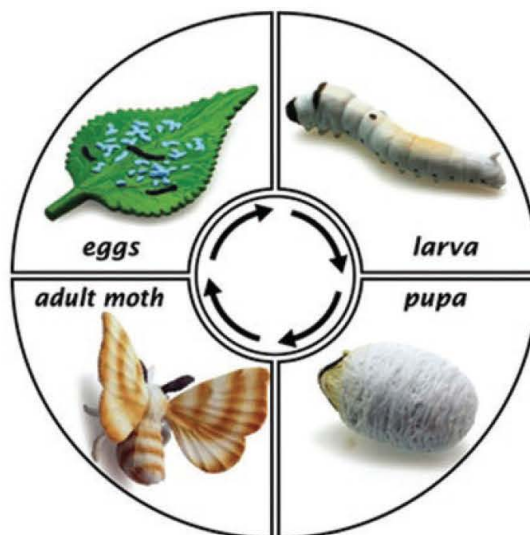
There are four stages in the life-cycle of a silk moth — **egg, larva, pupa and adult**.

(a) The female silk moth lays eggs which hatch into black worm-like larvae. The larva of a silk moth is known as a **caterpillar** or a **silkworm**.

(b) The larva feeds on mulberry leaves continuously and grows in size. During this time, it sheds its skin four times. This process of shedding the skin to grow a new one is known as moulting.

(c) At the end of this period, it climbs the branch of the tree and attaches itself to it by weaving a net. Then it starts spinning a cocoon.

The salivary glands present in larvae's heads secrete a sticky fluid [protein] which is wound around their bodies in a long continuous thread.



Life cycle of a silk moth

The protein solidifies when it comes in contact with air and forms silk fibre. The head swings from side to side and draws the figure eight (8) like structure while spinning. The process takes 3-7 days to complete. The larva continues to develop inside the cocoon. This stage is called the pupa stage.

[d] When the worm matures into an adult moth, it secretes a fluid which dissolves the silk fibres of the cocoon so that it can emerge out of it.

Production of Silk

Rearing silkworms : The eggs laid by the female silk moths are collected and hatched in an incubator. The eggs should be kept under hygienic conditions and provided with optimum temperature and humidity for hatching. They are made to hatch at the time when the mulberry trees grow new leaves.

The worms are kept on rearing trays and fed on freshly chopped mulberry leaves for about 25-30 days. They feed on these leaves almost continuously. Then they move into the tiny chambers of the tray or are provided with twigs or branches to spin cocoons. The caterpillar is killed once this stage is complete otherwise a fluid secreted by the adult moth, to dissolve the silk, damages the fibre.

Processing Silk : The silk fibre is obtained from the cocoon by killing the insect inside it. The worms are killed when the cocoons are exposed to the heat of the sun. It can also be done by boiling the cocoons in water, exposing them to steam or treating them in ovens. The process in which a large number of cocoons are boiled to kill the worms is called **cooking**.

SCIENCE BITS!

Rearing trays are large trays made of bamboo.

The sticky substance of the cocoons dissolves in hot water and the fibres separate out. The method of obtaining the silk fibre from the cocoons is called **reeling** or **filature**. Reeling is done either manually or by special machines, when the silk fibres are delicately unwound. The fibres from four to eight cocoons are joined and twisted to produce silk yarn. This is raw silk. The soft silk yarn is as strong as a thread of steel of the same thickness.

There are different varieties of silk fibre depending on the kind of silkworms producing them. Mulberry silk is the most common variety of silk fibre.



Reeling manually



Reeling by machine

Others, like tassar silk, mooga silk, eri silk and kosa silk are some popular varieties of silk in our country.

The quality of silk fibre depends on the rearing of the silkworm (i.e. quality of leaves fed and incubation temperature) and the reeling process that is carried out.

In India, many women are employed in rearing silkworms, reeling of silk from cocoons and also in silk production industries.

CHECK YOUR KNOWLEDGE-2

Answer the following questions :

1. What is the larva of a silk moth known as?
2. Why is moulting necessary for the larvae of a silk moth?
3. Why is a caterpillar killed as soon as the pupa stage is complete?
4. Which is the most common variety of silk?

3.3 HEALTH HAZARDS OF THE WORKERS IN THE WOOL AND SERICULTURE INDUSTRY

In the wool industry, the workers engaged in sorting, get infected by the bacteria, **anthrax**. It causes a deadly disease of the blood known as **Sorter's disease**.

In the sericulture industry, the workers are generally affected by respiratory diseases such as **asthma** and **bronchitis**. This is due to inhalation of the vapours during cooking, steaming and reeling processes. Severe headache, bodyache, fever, neck pain, low back pain, eye problems are few other health disorders which are observed.

SCIENCE BITS!

PETA (People for Ethical Treatment of Animals), an organisation which looks after the welfare of animals, has raised objections to the inhuman way in which the silkworms are killed.

This is caused because the workers have to stand for 12-16 hours continuously, during the reeling process. Skin infections also occur due to constant dipping of the hands in boiling water or exposing them to steam. Noise produced from the spinning and winding machines causes hearing problems.

These types of health hazards or risks faced by the workers of these industries are called occupational hazards.

ACTIVITY 3.1

Aim : To find which part of a plant or animal provides different kinds of fibres and the properties of these fibres.

Requirements : Fabrics made of cotton, jute, silk and wool, chart paper, glue and sketch pens.

Procedure : Make the following table in a chart paper. Stick the fabrics made of the various fibres under the category "Sample". Write the part of the plant or animal which yields the fibre. Observe whether the fibre is smooth or rough, shiny or dull and write under the column " Properties of the fibres".

Fibre	Sample	Part which yields the fibre	Properties of the fibre
Cotton			
Jute			
Wool			
Silk			

CHECK YOUR KNOWLEDGE-3

Answer the following questions :

1. What are occupational hazards?
2. How does the process of reeling affect the health of the people working there?
3. Why are the workers of the sericulture industry affected by respiratory diseases?
4. What is Sorter's disease?

KEYWORDS

- ◆ **Fleece** : The hair of sheep from which wool is extracted.
- ◆ **Selective breeding** : The process of selection of parents which produces special characters in their offspring.
- ◆ **Pashmina** : It is one of the finest quality of wool derived from the sheep reared in Kashmir and surrounding Himalayan areas.

- ◆ **Shearing** : The process of removing the fleece of sheep, along with a layer of skin by a large razor, clipper or a shearing machine.
- ◆ **Scouring** : The process of washing the sheared wool with detergents to remove dirt, grease and sweat.
- ◆ **Sorting** : The process of grading wool according to their textures.
- ◆ **Burrs** : Small fluffy fibres present in the fleece of sheep.
- ◆ **Dyeing** : Colouring the fibres in different colours.
- ◆ **Rolling** : The straightening, combing and spinning of the woollen fibres into yarns.
- ◆ **Sericulture** : The rearing of silkworms on a commercial scale.
- ◆ **Moulting** : The process of shedding the skin, to grow a new one by insects, like a caterpillar.
- ◆ **Cooking** : The process of boiling the cocoons in water, to kill the silkworm.
- ◆ **Reeling or filature** : It is the method of obtaining silk fibres from the cocoons.
- ◆ **Anthrax** : Bacteria that cause Sorter's disease.
- ◆ **Sorter's disease** : A fatal blood disease caused by the bacteria, Anthrax.

SUMMARY

- ◆ Natural fibres are obtained from plants or animals.
- ◆ Silk comes from silkworms and wool from sheep, goat and yak. Hence, silk and wool are animal fibres.
- ◆ Wool is obtained from the fur of the sheep, camel, llama, alpaca, yak and even goat and rabbit.
- ◆ There are two ways of obtaining wool, by shearing the fur of the animal, or by collecting fallen and loose hair from the skin.
- ◆ Silk is obtained from the cocoons of the silkworm.
- ◆ Silkworms or caterpillars are the larvae of the silk moth.
- ◆ Silkworms take three to seven days to prepare the cocoon, formed by concentric layers of a single thread.
- ◆ About two thousand silkworms give a yield of about $\frac{1}{2}$ kg of silk.
- ◆ During their life-cycle, the worms spin cocoons of silk fibres.
- ◆ Silk fibres from cocoons are taken out and reeled into silk threads.
- ◆ There are several health hazards associated with sericulture, respiratory problems and skin infections being the major ones.
- ◆ Sorters in the wool industry get infected by a bacterium, called Anthrax, which causes a fatal disease called Sorter's disease.

EXERCISES

A. Multiple Choice Questions :

Select the correct option

1. Which of the following does not yield wool?
 (a) Yak (b) Camel (c) Goat (d) Wooly dog
2. The silkworm is :
 (a) caterpillar (b) larva (c) pupa (d) both (a) and (b)
3. A lot of feeding is required at the
 (a) silkworm stage (b) cocoon stage (c) adult stage (d) egg stage
4. Wool is graded according to its
 (a) length (b) texture (c) dyeing capacity (d) all of these
5. Silkworm feeds on :
 (a) neem leaves (b) mulberry leaves (c) peepal leaves (d) blackberry leaves

6. The practice of rearing silkworms for silk is called :
 (a) agriculture (b) pisciculture (c) sericulture (d) apiculture
7. Animals that give wool are :
 (a) sheep (b) goat (c) rabbit (d) all of these
8. The majority of the woollen units in India are in :
 (a) Bihar (b) Punjab (c) Assam (d) West Bengal
9. Which of the following is obtained from plants?
 (a) Wool (b) Polyester (c) Silk (d) Cotton
10. Which of the following is not an animal fibre?
 (a) Wool (b) Silk (c) Jute (d) Pashmina

B. One-word answer type questions :

1. Silk is obtained from
2. When a silkworm spins a cocoon, the stage is known as
3. Bacteria responsible for Sorter's disease
4. India is the world's second largest producer of silk after
5. The fibre obtained from the Angora goat is called
6. The animal which is the main source of wool
7. The sheep are sheared to remove
8. Silk thread is extracted from the cocoon by a process called
9. Silk and wool fibres are obtained from
10. Cotton, coir and jute are obtained from

C. State True (T) or False (F) against each of the following statements :

1. Wool is obtained only from sheep.
2. Wool traps more air in it as compared to cotton.
3. Silk and wool both are obtained from animals.
4. Silk fibre is made of protein.
5. Silk is a plant fibre.
6. Shearing is the process of shaving hairs (fleece of the sheep).
7. Silk fibres are long, even straight and fine.
8. The insect in the cocoon is killed before reeling the silk.
9. Rearing of goat, camels, etc., is called sericulture.
10. Sri Lanka and Malaysia are two main producers of wool.

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D. Fill in the blanks with suitable words :

1. The sticky fluid secreted by a larva from its salivary glands is a _____.
2. The four stages in the life of a silk moth are _____, _____, _____, and _____.

3. Silk is obtained from the _____ of silkworms.
4. The cocoons are put in a pot of _____ which kills the worms and loosens the filaments.
5. The best wool comes from _____ and _____.
6. _____ fibres are rough to touch.
7. The thread obtained in the reeling process is called _____.
8. Silk thread is extracted from the cocoons by a process called _____.
9. About _____ silkworms are required to produce one kilogram of raw silk.

E. Match the items of Column A with those of Column B :

Column A	Column B
1. Yak	(a) Food of silkworm
2. Scouring	(b) Mohair
3. Cocoon	(c) Yields silk fibre
4. Mulberry leaves	(d) Finest wool
5. Merino sheep	(e) Wool yielding animal
6. Angora goat	(f) Cleaning sheared skin
7. Alpaca and llama	(g) Wool yielding animals of the camel family

F. Differentiate between :

1. Silk moth and silkworm.
2. Silk and wool.
3. Shearing and scouring.
4. Sorter's disease and asthma.

G. Give reason :

1. Wool is used as a winter clothing.
2. Sericulture is opposed by the people working for animal protection.
3. Silkworms are killed by placing the cocoons in hot water.
4. The workers working in woollen industries suffer from Sorter's disease.
5. Caterpillars need to shed their skin.

H. Very short-answer type questions :

1. What is meant by the following terms :
(a) Rearing (b) Shearing
2. What is meant by reeling of silk?
3. Describe in brief the first two stages of the life history of a silk moth.
4. Define sericulture.
5. What is Sorter's disease? How does it spread?
6. Is it fair on the part of humans to rear sheep for getting wool! Why or why not?
7. Define — sorting and scouring of wool.
8. Name the four countries which are the leading producers of wool. Which country produces the best wool in the world?
9. Give examples of two health hazards associated with sericulture.

I. Short-answer type questions :

1. What is the maximum length of continuous silk thread that can be obtained from a cocoon?
2. Which of the two, silk or wool is smooth to touch?
3. Why does the caterpillar of a silk moth feed continuously?
4. (a) Which bacterium is found in the wool processing work? What disease is caused by this bacterium?
(b) Name two health problems associated with silk processing.
(c) Why should the silkworms be killed by placing the cocoons in boiling water?

J. Long-answer type questions :

1. Describe the processing of fibres into wool in detail.
2. Describe with a labelled diagram the life history of a silk moth.
3. Describe in details the production of silk.
4. Enumerate a few health hazards associated with sericulture and the wool industry.

K. HOTS questions :

1. Why is shearing carried during summer?
2. Why does shearing not hurt the sheep?
3. Why does on burning wool smell like burning hair?

L. Value based questions :

Mohan looks after his sheep very well. He takes care of their feeding and living in a proper way. He removes the fleece of sheep in starting of summer, so that fleece grows again before winter comes and sheep do not feel cold.

Answer the following questions based on the above information :

- (a) What values are shown by Mohan in doing such kind of job?
- (b) What do we get from sheep other than wool?

PROJECT IDEAS

1. Paste pictures of different animals which produce wool in a scrapbook. Write a brief note about the animals on the following :
 - (a) the place where they are found
 - (b) the quality of wool produced
 - (c) any other special feature of the wool/animal
 - (d) special name (if any) of the wool
 - (e) natural colour of the wool
2. Find out how many different varieties of silk are produced in our country and name the place where they are obtained. Note down any special feature of each variety.

ACTIVITIES TO PONDER AND ACT

(Life Skill and Value Development)

1. You are aware that while working in wool industry labourers can suffer from various respiratory diseases. Find out how many workers have suffered from these diseases in our country for last one decade. What are government regulations related to wool industry? What are the compensations given to them?

Objective : To know the pros and cons of the fibre industry. To know the in and out of the conditions prevailing in fibre industry.

Skill and Value Development : Compassion and love towards society, survey and research aptitude and positive attitude towards society.

2. After a fibre is reeled into yarn, it is dyed in various colours. Some of these dyes are Azo dyes and other chemicals harmful for skin. They can cause skin diseases and in extreme cases can even cause cancer. Make a list of dyes which can be prepared naturally. Find out which plants are helpful in saving us from these chemical dyes and providing us with natural ones. Also find out where in our country natural dyes are used to make clothes patterns.

Objective : To know more about plants and their uses. To know more about harmful chemicals for us.

Skills and Value Development : Attitude towards environment and knowledge about different states of India. Also what is right or wrong for us. i.e. decision making.

FOR THE TEACHER

1. Fibres from different fabrics may be pulled out and their thickness may be compared.
2. A trip to a woollen or a silk industry can be organised.
3. A discussion can be organised on the problems of using child labour in the silk industry and how this problem can be overcome.

IN THE LABORATORY

To find out the basic unit (cellulose or protein) that constitutes a woollen and a silk fibre.

Materials Required : A piece of wool, a silk fabric, a matchbox and a pair of tongs.

Procedure : Hold the sample of woollen fabric with a pair of tongs and burn it in the flame of a matchstick. Note the odour given off. Repeat the same with the silk fabric.

From your observation deduce what is the basic unit (protein, carbohydrate, etc.) which makes up the two fabrics.

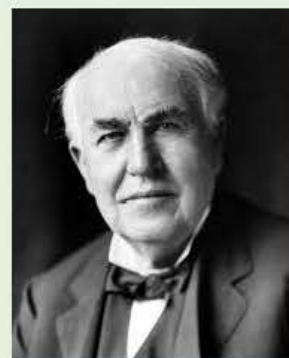
KNOW THE SCIENTISTS



Stephanie Kwolek

Stephanie Kwolek (1923–June, 2014) a researcher in Dupont's fibre research group in USA invented **Kevlar**, a lightweight fibre five times stronger than steel. This material is used in bullet proof body armours, space vehicles, boats, parachutes, skies and building materials.

Thomas Alva Edison (1847 – 1931) was an American inventor and businessman who invented and developed many devices which greatly influenced the quality of life. He invented the first commercially practical incandescent (glow) light. He is also credited with the invention of the first phonograph, a device for recording and replaying sound in 1877.



Thomas Alva Edison

