GOVERNMENT OF KARNATAKA

Directorate of Text Books

SCIENCE

Part - II

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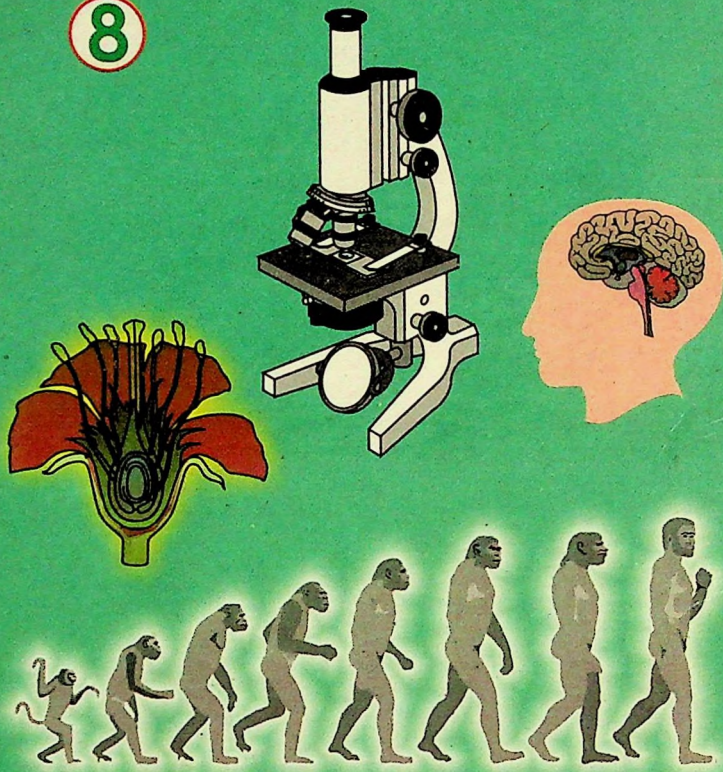

8th Standard

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FOREWORD

This text book is prepared as per the syllabus framed based on National Policy on Education 1986. The Core Elements and Human values that are stressed in the National Policy on Education are addressed at length in developing lessons.

The Directorate is grateful to all those who have participated in the production of this book.

The Text Books are reprinted after editing and making necessary corrections. The Directorate welcomes suggestions for further improvement of the book.

(M. Jalaja Bai)
Director
Directorate of Text Books
Bangalore - 4.

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Contents

Chapter 1

THE WORLD OF MICRO-ORGANISMS

There are hundreds of varieties of living organisms around us in our world. The shapes and sizes of these organisms are different. Some are larger in size than human beings and some others are much smaller. Some cannot be seen by the human eye. The size of these small organisms is one micron or even less. [$1/1000^{th}$ part of a millimeter is called one micron]. Hence such small organisms are called "microbes" or "micro-organisms". You will find it surprising to know that these organisms live in the soil, in water, in air, on the objects that we use, on our body and even inside our body.

Activity 1:1 *Take water in a beaker and put a few pieces of hay into it. Expose it to air. Observe it after four days. You will not find any living thing in the beaker if you see by your naked eye. Put a drop of the water from the beaker on a slide and cover it by a cover slip [Take care that air bubbles are avoided]. Observe the slide through a microscope in your school. What do you see?*

Or

Take a drop of water on a slide and allow it to dry. Add five drops of gentian violet. Dry it again. Add a drop of cedar wood oil or liquid paraffin oil on the dried, coloured water drop. Observe the drop through the oil immersion objective of microscope. What do you see?

The microbes that are visible to us in a microscope are magnified several times. They live around us in all parts of our planet. They can exist in very hot or cold climatic conditions. Some microbes are helpful to us. For example, it is with the assistance of microbes that milk turns into curds; wet ground paste of idly and dosa get fermented and bread becomes soft. The antibiotics or vaccines that protect us against infectious diseases, are also gifts of these helpful microbes.

But not all microbes are helpful. Some microbes produce fatal diseases, like tuberculosis, leprosy, cholera, typhoid, dysentery, brain fever (meningitis) or flu (influenza) and so

Different types of Microbes:

There are different kinds of micro-organisms. They are:

Viruses, bacteria, unicellular organisms and some algae. Of these, bacteria and algae are the oldest organisms on earth. They have high capability to adjust to any environment. These were the first organisms to live on land.

Viruses:

These are the smallest organisms. Their size varies from 0.01 to 0.3 microns. They have simple structure. They have nucleic acid surrounded by a thin film of protein. They cannot live independently. They can live and grow inside living cells.

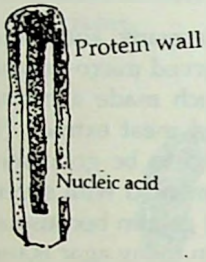

Figure 1.2 Virus

The main characteristic of a virus is to enter a living cell, make use of its complete mechanism for its survival and reproduction. Viruses replicate rapidly and multiply within a very short time. Viruses are the cause of many infectious diseases such as common cold, small pox, Measles, Polio and Meningitis (brain fever) and AIDS which trouble human beings.

Algae:

They are found in lakes, rivers, oceans or at places which are wet and moist. The largest proportion of photosynthetic

activity around the world is due to algae. This activity of the algae facilitates reduction of the carbon dioxide content and increase the oxygen content in the atmosphere. Algae consumed as food by fish and other aquatic animals. There are different kinds of algae:

blue green algae, brown and red algae, green algae, and diatoms.

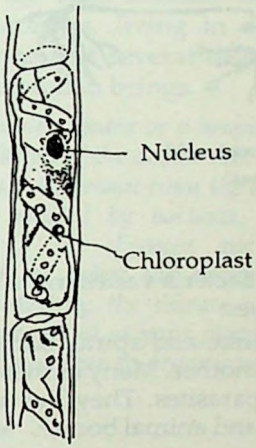

Figure 1.3 SPIROGYRA - An alga

Fungi:

Fungi grow on dead and decaying plants or animal matter. Many of them do not have the ability to move. They obtain food from plants or animals on which they grow and branch out to further growth. Their spores are carried and spread by the wind and are found deposited on edible food-stuffs, on leather goods and also on uncleaned human body. Penicillin, the much useful

antibiotic, is a gift of the fungus. Yeast is another fungus which is useful in the manufacture of alcohol. There are many fungi which can cause diseases.

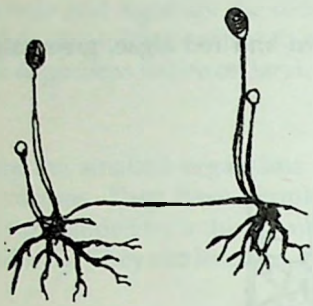

Figure 1.4 bread mold (Rhizopus)

Figure 1.5 Yeast (Saccharomyces)

Bacteria:

The size of bacteria varies from 0.4 to 1.5 microns. They are of different shapes:

Round, rodlike and spiral. Sometimes, bacteria are found clinging to one another. Many of them, can move by themselves, and many are parasites. They live and propagate in different parts of human and animal bodies.

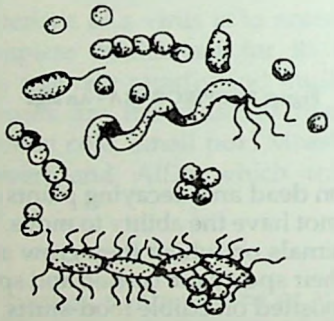

Figure 1.6 Different kinds of bacteria

Bacteria are responsible for many serious and not so serious diseases. For example: sore throat, sepsis (of wounds), pneumonia, cholera, tuberculosis, leprosy, sexually transmitted diseases, dysentery etc.

Unicellular organisms: (Protozoa).

Protozoa are the biggest in size among micro-organisms. Their size varies from 2 to 100 microns. They are the most primitive from of life.

Some of them live on dead animals and plants. But a majority of them are parasites, living in different parts of plants and animals. They inflict several diseases like malaria and amoebic dysentery to human beings.

Activity 1:3 *Visit a health centre or a hospital or a clinic near your house. With the permission of the doctor talk to the patients and find out about their sickness. Ascertain from the doctor, who among the patients, got diseases caused by bacteria, viruses, fungi or protozoa. Prepare a list of the diseases and micro-organisms responsible for them. Find out what the doctor does to keep the disease under check or to destroy the disease causing organisms. Likewise go to a veterinary hospital at your place. Find out and list the diseases which are inflicted by micro-organisams in animals.*

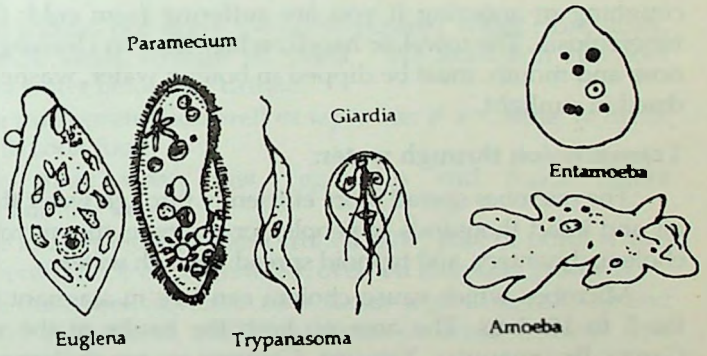

Figure 1.7 Unicellular organisms

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t contamination of nearby water sources by microbes.

Transmission of microbes from one to another

The disease causing microbes are parasites. In order to live, grow and multiply, they need a host (an animal or a human body or any organism). Microbes cannot move very far by themselves. To move from one body to another, they use media like, wind, water and soil. They use even animals and human beings to get transported.

Transmission through wind:

Remember when you or your relative in your house had a common cold. Cough and sneezing are common symptoms when somebody suffers from cold. When he coughs or sneezes, millions of infecting microbes are thrown out into the wind. When this contaminated wind is inhaled by somebody else, then that person also catches cold. Now, this is how if one in the family catches flu, then the others and neighbours also catch flu.

Similarly, when a patient suffering from pulmonary or lung tuberculosis, coughs or spits, millions of microbes enter the air. When the contaminated air is inhaled by healthy people, they may also get infected. This illustrates as to why it is necessary to cover your mouth with a handkerchief while coughing or sneezing if you are suffering from cold; flu, or tuberculosis. The towel or handkerchief used in cleaning your nose and mouth, must be dipped in boiling water, washed and dried in sunlight.

Transmission through water:

The microbes spread more efficiently through water than by air and infect thousands of people, for example, the microbes of cholera, dysentery, and typhoid spread through water.

Microbes which cause cholera can live in stagnant water for 5 to 10 days. The area on both the banks of the rivers, Ganga, Brahmaputra, Yamuna, Cauvery etc are cholera-prone. The micro-organisms which are living in affected persons pollute the river water when they bathe, wash, urinate in the

river water. When a healthy person uses this contaminated water, they get infected by the micro-organisms easily. In this way, dangerous diseases spread like wildfire killing hundreds of people at a stretch.

Cholera is a very dangerous disease because, when infected, the patient passes watery stools and vomits repeatedly and uncontrolably. Within a few hours the patient becomes dehydrated and dies.

The dreaded typhoid is also a water borne-disease caused by Salmonellatyphae. These microbes reach the intestine and lymph glands and then they spread all over the body. In about 7 or 8 days after infection, fever develops.

Another dreaded disease causing microbe is Entamoeba histolytica (a protozoan) which causes amoebic dysentery. These protozoa attack the intestine, causing wounds which develop into ulcers and produce loose motions. There will be cysts of these microbes in the faeces. A patient suffering from this disease may discharge 5 crores of cysts in the excreta during a single day.

We can protect ourselves from water borne microbes by using pure water and also by remembering the following points.

1. We should not drink the contaminated water from lakes, ponds, wells, streams or rivers. - We must boil and cool that water before we drink.
2. We must prefer borewell or tap water if available, to drink or to cook food.
3. We must wash raw vegetables and fruits before consuming them.
4. We must not drink water from a river, lake or pond which is found to be contaminated, even on religious grounds.
5. We must seek advice from a doctor regarding nursing and care of patients suffering from cholera, typhoid and dysentery.

The following precautions must be taken in order to prevent contamination of nearby water sources by microbes.

1. Defecating near the water sources (well, pond or river) should be avoided.
2. One must build hygienic lavatories for this purpose. If this is not possible sanitary pits can be dug.

   These pits should be covered with fresh soil after use.
3. One should not wash soiled clothes in ponds, streams or rivers.
4. We must ensure that sewage or contaminated water does not mix with wells, river, stream or pond etc.

Activity 1:4 *Make a list of additional measures by which pollution of our water resources can be prevented?*

Transmission through soil:

Tetanus is a fatal disease caused by the microbe "Clostridium tetani". A person affected by tetanus will first feel that it is difficult to open his jaws. It is because of the stiffening of muscles. The stiffening of muscles spreads to the face, neck and throat. Swallowing becomes difficult. With the spread of the disease, the body bends like a bow and the person dies. These bacteria live in the intestine of the herbivorous animals. Spores of these bacteria get into the soil through faeces dropped by these animals. Then, they enter the human body through cuts or wounds. By understanding this mode of transmission, steps can be taken to prevent the spread of the disease by the following measures.

1. If you get injured by a fall or an accident or when wounded by a sharp blade or knife, first wash the wound with clean water thoroughly and ensure that the soil or dust particles are removed.
2. Ensure that dirt, dust or cowdung does not come in contact with the wound. Do not wipe the wound with the dirty cloth.
3. Do not use rusted blades, knives or other material left unused for a long time.
4. Seek doctor's advice. Get vaccinated against tetanus and act as per his advice.

Transmission through insects:

Mosquitoes, flies, bed bugs, cockroaches and fleas are the common carriers of disease causing microbes or germs. The microbes stick to the legs of flies or cockroaches while they feed or walk over dirt or faeces. When such insects sit or walk over or come into contact with the food that we eat, the germs contaminate them and gain entry into our body.

The wounds caused by injuries get infected and will be filled with pus. Insects like flies which are carriers of microbes are the cause of health hazards like vomiting, loose motion, pus formation in wounds (sepsis), worms in the intestine etc.

Biting insects like mosquitoes, bed bugs and fleas, bite a sick person first, and pass on this infection to a healthy person next, when they bite him to suck blood.

The mosquito and malaria:

Malaria is caused by a protozoan called 'Plasmodium'. They gain entry to the human blood stream through the bite of female Anopheles mosquito. They reach the liver and multiply in its cells. They destroy and break open these cells in great numbers and attack red blood corpuscles in the blood and gain entry into them.

They grow, multiply and destroy the red blood corpuscles. Forming male and female Gametocytes, they travel in the blood stream to cause shivering and fever in victims. These are symptoms of malaria.

When the female Anopheles mosquito sucks the blood of a malaria patient to feed, these male and female gametocytes reach its stomach. Here they unite and reproduce. These young ones so formed reach the salivary glands of the mosquito. At this stage, if the mosquito bites a healthy person, young ones enter into the human body and the life cycle is repeated. Thus, the protozoa causing malaria reproduce or multiply asexually in the human body.

They reproduce sexually in the mosquitoes. Thus in

malaria control, it is very important to destroy the mosquitoes which are the carries of the causative agent. As stagnant water is necessary for the growth of mosquitoes, care must be exercised to see that water is not allowed to stagnate near the places where we live. We must cooperate with the health authorities when they visit to spray malathion and other insecticides.

We must fix wired mesh to the windows and doors so as to prevent mosquitoes from entering our house. We must use mosquito curtains to protect us from them.

Activity 1:5 *Observe where mosquitoes and flies are plentiful around your house. Ascertain what conditions are necessary for their growth and development. Are your surroundings and your house clean? If not, try to keep them clean. Consult the health authorities regarding the insecticides and the plan of action to destroy mosquitoes. Educate your family members and your neighbours on the importance of maintaining their surroundings clean and healthy.*

Life Cycle and reproduction of the mosquito and the fly:

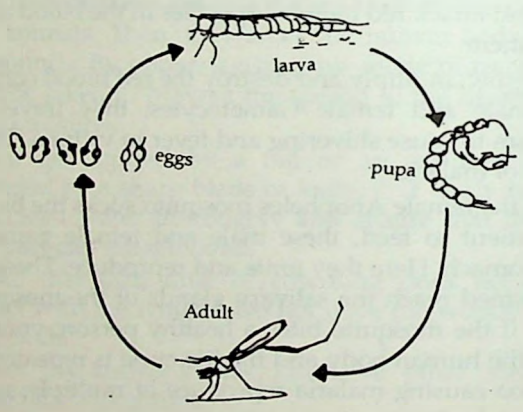

Figure 1.9 Life Cycle of Anopheles mosquito

The female mosquito is capable of laying about 100 to 1000 eggs at a time in stagnant water. The eggs of the anopheles mosquito are boat like in shape. These eggs develop into worm shaped larvae within a couple of days. They float on water and feed on algae, bacteria and plants. After about 6 or 7 days, they reach the pupa stage. They stay inactive and take rest without taking any food during this period. In a day or two the adult mosquito emerges out of this. This transformation from the egg to an adult mosquito takes about 7 to 10 days.

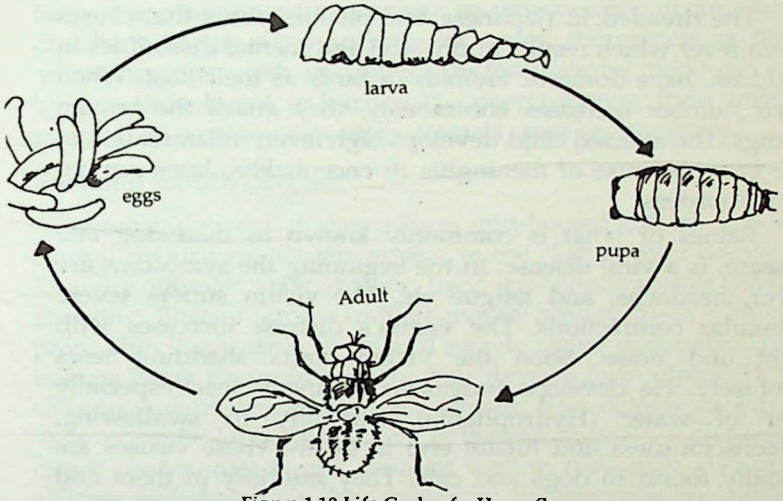

Figure 1.10 Life Cycle of a Housefly

Flies develop in four stages. The female fly lays about 120 to 250 eggs at a time, on decaying organic matter, like animal or human faeces, manure pits, rubbish heaps etc. The larvae come out of the eggs within a short time of 3 to 24 hours. These larvae do not have legs. They hide in rubbish or manure or decaying organic matter. They cannot withstand light, but they feed voraciously. They enter into the pupa stage by about 2 to 7 days and the adult fly emerges after 6 days. A pair of flies (male and female) is capable of producing 325,200,000,000 flies during a single summer!

Transmission through animals:

The animals we bring up as pets or the animals we rear like the cow, buffalo, goat, sheep, cat, dog, pig etc. also spread many microbes. These animals may themselves get infected and become sick or may take part in the transmission of a certain disease without getting sick themselves. For example, a person drinking milk without boiling, or eating curds, ghee and other milk products of a cow affected by tuberculosis, may also get the disease.

The dreaded JE (Japanese Encephalitis) virus that causes brain fever which results in physical and mental disabilities in children, have domestic animals or birds as their host. When their number increases enormously, they attack the human beings. The affected child develops high fever, inflammation of the brain because of meningitis or encephalitis, loses normal consciousness.

Rabies or what is commonly known as mad dog bite disease, is a viral disease. In the beginning the symptoms are fever, headache, and fatigue etc. The victim suffers severe muscular contractions. The victim's distress increases with light and noise. Soon the victim starts shedding tears profusely. He develops unreasonable anger, fear, especially fear of water (Hydrophobia), difficulty in swallowing, unconsciousness and finally end in death. These viruses are usually found in dogs and cats. They multiply in them and cause sickness to it. Even the saliva of these animals are found to be contaminated with the viruses. When a human being is bitten by a sick dog or cat, or even when a wound on his body is licked by them, viruses enter the body.

Infectious diseases in animals caused by micro-organisms:

Micro-organisms cause a number of infectious diseases in animals. If our pet animals and livestock are infected by these diseases, we not only suffer losses but we may also be infected and suffer heavily. For example: rabies, tuberculosis, brain fever etc.

Anthrax: Goat, sheep, pig and cattle suffer from a disease called anthrax which is caused by 'Bacillus anthrosis'. When an animal gets infected and fall ill, fluids ooze from the eyes which turn deep red. The animal will become inactive and stands without touching its food or chewing the cud. Its stomach bulges out due to constipation. It may also collapse and die all of a sudden. At the time of such death, black coloured blood oozes out from the natural opening like eyes, mouth, anus, etc., of its body. Infection spreads to other animals which come into contact with this contageous blood. Since these bacteria can continue to remain alive in the skin and hairs of the dead animals for years, the carcass of the animal together with any other infected material made use of by it must be burnt, or burried in a deep pit away from water sources. As a precaution, other animals must be immunised.

Foot and mouth disease:

Foot and mouth disease afflicts split-hoofed animals and is caused by viruses. Blisters appear in the cleft of their hooves. The sick animals start shaking their legs continuously while standing. Blisters appear in their mouth causing them a lot of pain. They are unable to eat and secrete saliva profusely. The blisters break down in three or four days to form ulcers. This disease usually occurs during summer. The disease causing viruses can be found in the milk of the sick animals. If children drink contaminated milk without boiling they may also get blisters and diarrhoea. It is beneficial to immunise the cattle before the commencement of every summer.

Diseases of the plant:

Fungi, viruses and bacteria are responsible for a variety of diseases and destruction among many types of plants.

Fungal diseases: Yellow, red, brown, grey or white specks appear on leaves, stem and other parts of the plant. The diseased part dries up and looks as if they are burnt. The plant sags and withers. Example: The disease which decays the root

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Diseases of the plant:

Fungi, viruses and bacteria are responsible for a variety of diseases and destruction among many types of plants.

Fungal diseases: Yellow, red, brown, grey or white specks appear on leaves, stem and other parts of the plant. The diseased part dries up and looks as if they are burnt. The plant sags and withers. Example: The disease which decays the root

portions of paddy and ragi crop is the blast disease. The field affected by this disease appears as if it is burnt. The disease hits the plants at all stages of growth and about 50 to 80% of the crop is lost. Leaves of the paddy crop are covered by grey spots due to a disease called 'sheath-blight disease' resulting in the decay of the leaf sheath. In advanced stages, the grain becomes hollow causing heavy losses to the farmer. Similarly, grapes are affected by a disease due to fungus called 'powdery mildew'.

Viral diseases: A number of plants wither losing their vigour and brightness due to viral diseases. The green coloured leaves and stem turn yellow. Some times parts of the plant or the whole plant may rot. The diseases occurring in chillies, ragi, maize, grape wines (yellow mosaic virus disease and pear disease) are due to viruses. Sometimes the infected plant may not show any signs of sickness. Such a plant spreads infection to neighbouring plants without the knowledge of the farmer. For example: Cucumber plant.

Bacterial diseases: The disease 'Late blight of potato' is caused by the bacterium 'Pseudomonas'. The affected part turns brown. When a piece of affected stem is dipped in water, we can observe the bacterial mass emerging out like a white thread. The bacterium 'Ervinis' causes the rotting of stems. Agro bacterium Rhigogen is responsible for the formation of hair like roots in affected apples.

Control of disease: There are several measures to control the spread of diseases that affect plants.

1. Healthy seeds must be used for sowing.
2. The plot or land must be tilled well, cleaned and all the unnecessary weeds must be removed.
3. The sick or diseased parts must be removed and burnt.
4. Fungicides and pesticides should be used as prescribed. For example. sulphur, dithane, copper sulphate, streptocyclin.
5. Insecticides that destroy insects which assist transmission of microbes should be used.

Example: organophosphorus and similar compounds.

Activity 1:6 *Visit a garden near your house or school. Observe closely the shrubs, plants and trees that grow there. Search for diseased leaves, fruits, flowers, stem or other parts of plants. Show those collected diseased parts to an expert (An agricultural officer or a botanist). Learn from him about the affecting diseases, their causes and methods of prevention. After a good understanding, write an essay about the same.*

Immunisation and Vaccines used in disease control

If weakened or attenuated microbes of certain diseases are injected into animals or human beings, they bring about immunity without causing that disease. The credit goes to Louis Pasteur and Edward Jenner for the discovery of cholera and small pox vaccines which are saving the lives of crores of people.

There are two methods of Immunisation:

1. Active immunisation
2. Passive immunisation

Our body is capable of recognising immediately any foreign body entering it. For example, protein substances that enter our body encounter resistance from the body's defence mechanism and produce antibodies. These antibodies in turn destroy the foreign protein substances. These protein materials which excite our body mechanism and generate antibodies are named as antigens. Micro-organisms posses protein substances that act as antigens. The antibodies develop due to these antigens and fight against the invading microbes. In human beings, spleen and the lymph glands are the organs where a large amount of antibodies are produced. The antibodies produced against the toxins of microbes are called 'Immunoglobulins'. The immunity of a human body depends on the capability of the body to produce immunoglobulins, and the presence of antibodies against antigens. This capability is derived in humans from the following sources:

1. When in the womb, the infant gets immunoglobulins

through the placenta.

2. After birth, through the breast milk of the mother.
3. When attacked by microbes.
4. When immunised.

It is very important that the infant is breast-fed right from one day after delivery because mother's breast milk produced during this period is rich in immunoglobulins as well as other essential nutrients. People have a wrong notion that this milk is not good for the child. This wrong notion must be changed.

In active immunisation, the antibody producing antigens are introduced into the body system in order to produce antibodies. This provides immunity for a certain period which differs from disease to disease. Examples of this kind are B.C.G. vaccination against tuberculosis, D.P.T. against diphtheria, whooping cough and tetanus.

In passive immunisation, the antiserum containing antibodies is administered to people.

Such vaccines give immunity against the disease for a period of about six weeks. Examples of this kind are: Antiserum used in the cases of diphtheria, tetanus, measles.

You might have observed vaccines are being given to pregnant women and children by health personnel. They follow the following table:

Ideal Immunization Schedule

For pregnant women:

Early in Pregnancy	Tetanus toxoid - T.T.1. (Injection)
One month after T.T.1	T.T.2 or T.T. booster (injection)

For infant:

At 1 $\frac{1}{2}$ months	For tuberculosis diphtheria whooping cough tetanus for polio	B.C.G. (injection) D.P.T. - 1 (injection) O.P.V - 1 (dose)
At 2 $\frac{1}{2}$ months		DPT - 2 (injection) O.P.V. - 2 (dose)

At 3 $\frac{1}{2}$ months		DPT - 3 (injection) O.P.V - 3 (dose)
At 9 months	for measles, mumps and rubella	M.M.R. injection
At 16-24 months		D.P.T. - 4 (booster injection) O.P.V. - 4 (dose)
At 5-6 years	for diphtheria and tetanus for typhoid	diphtheria (injection), T.T. (injection) T.A.B. (injection, twice with an interval of 4 weeks)
At 10th year		T.T. (injection)
At 16th year		T.T. (injection)

Even if late for an injection or immunization dose, one must still get them, in consultation with health personnel. Those preventive measures are very important for the life of an infant, the young, as well as the old. By adopting these beneficial measures, probable disabilities, that make a child mentally retarded, due to brain damage etc. can be prevented. The normal and regular physical and mental growth takes place unhindered by decapacitating diseases and the child develops, following a disease free growth pattern.

By the timely utilization of the benefits conferred by these vaccines to all the children of the community, immunity of the entire community will be taken care of and the catastrophic striking power of these diseases is prevented.

Every individual must get himself suitably vaccinated whenever an epidemic strikes. For ex: when a person gets typhoid, the family must get vaccinated. When there is a case of cholera, the entire village should be immunized against cholera. Pilgrims and visitors to fairs and festivals should take anticholera injections. If one gets wounded, antitetanus injection is a must: Similarly, when bitten by a mad dog or a street dog, antirabies injection is a must. One must not forget the vaccination of the pet animals like dog, cat, cow and sheep according to the advice of veterinary doctor from time to time.

Activity 1:7 *Visit a general hospital and a veterinary hospital. Ascertain from the staff regarding the vaccines to be given to human beings as well as animals. To which diseases do they give protection? Learn about the time gap of vaccinations, the number of times to be given, etc.*

Understand the sources of these antiserums and vaccines, their preservation and how to maintain and protect their quality, their effectiveness and the possible effects caused by them.

The cleanliness of the habitats where we live and bring up our pet animals is also as important as getting immunized. We should take care to see that our surroundings are kept clean, free from dust, dirt, moisture, excreta, cowdung as well as stagnant water. The flooring must be preferably of cement or stone slabs, swept and washed every day. Disinfectants like phenol could be sprinkled, often care also should be taken to keep ourselves as well as animals clean. It is a healthy habit to wash the body with clean water. Care must also be taken regarding the grazing place of the animals. The advice of a veterinary doctor may be taken before admitting a new animal into the old lot.

Besides, if we and our pets eat nutritious food containing proteins, vitamins, mineral salts etc immunity system of the body will be further strengthened.

Preservation of food

Many of the foodstuffs get contaminated by microbes and become stale. Such food stuffs are not fit for consumption. If eaten it may result in vomiting, diarrhoea or sometimes even death due to food poisoning. So, it is essential for the well being of ourselves and pet animals, to store food in a scientific way and protect it from microbes. There are different methods to achieve this.

1. Heating and boiling:

By boiling the water and food that we consume, the microbes present in them are destroyed. Do you now

understand, why soup or porridge which is kept unboiled get spoiled and give bad smell?

Pasteurisation: The microbes that are naturally prevalent in milk are Lacto bacillus, Lactis, strepto and staphylo cocci mycobacterium tuberculosis and brucella. It is necessary to heat the milk and kill the microbes. This is known as pasteurisation. In some dairies, milk is heated by using steam to about 140° to 160°C for a few seconds. By pasteurisation, the microbes are destroyed and not the vitamin contents. The taste of milk remains unchanged.

2. Removal of water content from food stuffs.

The reproduction rate of microbes increases in the presence of moisture. If foodstuffs are absolutely dry and do not have moisture, microbes cannot grow in them. Fruits are dried from time immemorial, and preserved for use for a long time. There are other examples . Raisin, dates, fish and meat in dried condition can be preserved for a long time. While moist cooked rice gets spoiled quite-soon, chapatis roasted on hot charcoal or hot pan remain unspoiled for many days. Fungus does not grow on the pieces of potato and mango fruit dried in the sun.

3. Refrigeration

When the temperature in the surroundings is 5° C or less, the growth and reproduction of the microbes is retarded. The enzymes in them responsible for this activity become inactive at low temperatures. That is why foodstuffs like vegetables, fruits and other eatables kept in a fridge remains fresh for several days. Have you now understood the advantages of using refrigerators in dairies, vegetables, meat, fish stalls and in medical stores?

4. Usage of sugar, salt and vinegar

From ancient times, salt has been used in preserving fish, meat and pickles. Likewise sweets remain unspoiled when

they are kept in sugar syrup for a few days. Similarly 4% acetic acid in vinegar preserves food items.

5. Chemical substances

There are certain chemical substances which do not harm us but retard the growth of microbes. For example sodium citrate, sodium benzoate, potassium-meta-bisulphate etc. When sodium-benzoate is added to fruits juice and jams, they remain fresh for a long time.

Activity 1:8 *Visit a chemist's shop near your house. List out the chemical substances used in preserving foodstuffs that are sold there. Find out the details of their use. Visit a government food godown. Collect information of the methods employed in the preservation of food stuffs. Learn about the methods of preservation from elders and your teachers. Discuss the principle behind these methods.*

Preservation of food grains

In olden days, villagers, used to preserve food grains in underground vaults made of bamboos, mud and mortar. The villagers took precautions to see that these Granaries were moisture proof, thick walled, well protected and out of reach of rodents. Even then, the so preserved grains were destroyed by the attack of microbes. Nowadays, we have safe metal or cement godowns wherein food grains can be stored. Chemicals are used to prevent attack from microbes.

The following are the methods by which food grains can be safely stocked and preserved:- Using cover lids to prevent exposure to atmosphere, keeping away from insects, keeping warm without moisture, usage of plastic bags which are non absorbers of water, periodical spreading of the grains open in the sunshine etc.

Preservation of cloth, leather and wooden materials

You must have observed that clothing material kept in almirahs or in wooden boxes for a long time unused are found

tattered and eaten up by insects. You must have noticed your mother removing costly silk clothes out of almirahs and spreading them in sunshine. You may also be using moth balls or napthalene balls to keep away cockroaches and other insects. Clothes get spoiled more easily during rainy season than in summer. Leather articles likewise get covered with fungus during rainy season. Wooden materials painted with varnish do not get wornout. But when not so painted with varnish, they are eaten away by white ants. You must have noticed that the bottom portion of the wooden piece which is burried underground is coated with black paint or tar. Now you know the reason for this practice.

Food poisoning

You must have heard that, sometimes an entire group of people who have taken food at some function have developed vomiting, loose motions, and stomach cramps. The reason is that, the food they have eaten was contaminated with poisonous substances. Such food poisoning can occur due to many reasons but a majority of cases are caused by microbes.

If we consume stale food, particularly meat, then bacteria called clostridium perfringens will gain entry in to our stomach.

Salmonella, a kind of microbes are found in foodstuffs prepared in unhealthy surroundings. It is dangerous to consume contaminated food. People may die due to food poisoning. Therefore every precautionary measure should be taken to ensure that food is safe for consumption.

Cooks and food servers must maintain bodily cleanliness. Those suffering from skin diseases and wounds especially in the hands, must not be allowed to serve. Otherwise they are likely to spread a bacterium namely Staphylococci. Cooks and servers should wear clean cloths.

The kitchen as well as the dining places must be hygienic and free from dust, dirt, insects and other rubbish.

Cooking utensils and water used must be clean. One must

wash hands thoroughly with soap before eating. Finger nails must be trimmed regularly.

Remember: Food poisoning can be prevented by taking adequate precautions and maintaining cleanliness while preparing, serving and eating the food.

Beneficial Micro-organisms

Even though many micro-organisms cause diseases and are dangerous to us, some are very helpful due to their food and medicinal value. They serve us as friends due to their insecticidal properties. They even assist in our industries.

1. **Food:** You have already known about the role of micro-organisms in dairy products like curds, butter, milk, cheese, in making bread, jam, dosa, idly, pickles etc. Algae serve as food for fish and thus indirectly provide food for us through them.
2. **Medicine:** You have observed that doctors prescribe penicillin injection, tetracycline capsules, erythromycin tablets, gentamycin drops or ointment for treatment of infections (sore throat, cough, pus formation in the ear, inflammation of the eyes, brain fever or meningitis, urinary infection and during surgery etc). These antibiotics are all derived from micro-organisms.

A particular substance produced by one kind of micro-organism may retard the growth and replication of another micro-organism or may even kill them. The substance may break open the outer shell of the micro-organism or destroy the inner membrane or prevent the formation of proteins which are necessary for the growth and multiplication. Such a substance is called ANTI BIOTIC. Sir Alexander Fleming discovered the first antibiotic. **'Penicillin'** from a fungus called Penicillium notatum' in 1928.

Activity 1.9 *Make a list of the antibiotics commonly used (with the help of a doctor). Try to understand the precautions to be taken as well as the side effects of such antibiotics.*

NITROGEN FIXATION

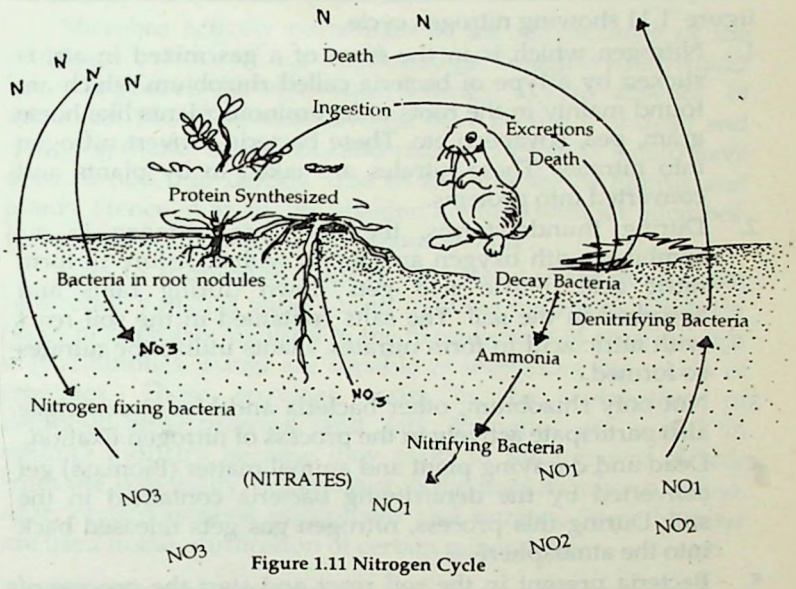


Figure 1.11 Nitrogen Cycle

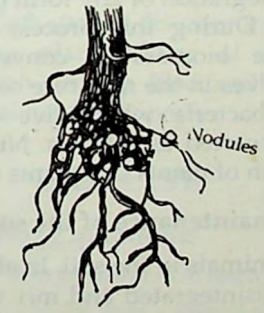


Figure 1.12 Roots with nodules

You already know that the air in our atmosphere contains nitrogen, oxygen, carbon-di-oxide and other gases. Nitrogen, which is an inert gas can also exist in different forms in rocks, soil, plants and animal bodies. Study carefully the details in figure 1.11 showing nitrogen cycle.

1. Nitrogen which is in the form of a gas mixed in air, is sucked by a type of bacteria called rhizobium which are found mainly in the roots of leguminous plants like horse gram, pea, soyabean etc. These bacteria convert nitrogen into nitrates. These nitrates are taken in by plants and converted into proteins.
2. During thunderstorms, the inert gas nitrogen in air combines with oxygen and mixes with moisture to form nitric acid. Nitric acid gets down during rains and absorbed in the soil. The salts contained in the soil react with nitric acid to form nitrates. Plants utilize the nitrates so formed.
3. Not only rhizobium, other bacteria and blue green algae also participate actively in the process of nitrogen fixation.
4. Dead and decaying plant and animal matter (Biomass) get converted by the denitrifying bacteria contained in the soil. During this process, nitrogen gas gets released back into the atmosphere.
5. Bacteria present in the soil react and start the process of decay and disintegration of any form of biomass. (Plant or animal matter) During this process the excess protein material of the biomass is converted to ammonia. Ammonia dissolves in the moisture content of the soil. By the action of bacteria which live and grow in soil, ammonia is converted as nitrates. Nitrogen as fertilizers enrich the growth of plants. All plants utilize it.

Conservation and maintenance of the soil

We bury dead animals in the soil. In about a few days, the burried bodies get disintegrated and mix with the soil, except for the bones. Likewise all dead animals, leaves, flowers, stem etc falling on the ground also become a part of the soil. Such a

soil is fertile and is known as 'Humus' (fertilized soils). Humus is very essential for all plant life, especially for food and commercial crops. The role played by micro-organisms in the formation of humus has no parallel.

Microbes actively participate in the maintenance of the ecological balance of our surroundings. Imagine what would have happened to our surroundings in the absence of microbes! The whole earth would have been full of dead and decaying matter of animals and plants. Our lands would have been turned into deserts, due to the absence of humus and plants. Hence, if at all, we imagine a world without microbes, we have to imagine a world without any life.

Uses in Industries: Yeast is very useful in the preparation of alcohol, which is widely used in many industries. Different types of microbes are used in the manufacture of organic acids and antibiotics. Fungi are capable of increasing the yields of enzymes. These enzymes assist in the metabolism of carbohydrates, proteins, and fats. Enzymes are useful in tanning industry because they assist in the removal of hair from the skin easily. Algae assist in the manufacture of iodine, agar, certain mineral phosphates and nitrates. Some bacteria are used in the purification of certain mineral ores.

Biological control of pests

The microbes which causes diseases in insects usually do not harm animals or plants. Some of these are used in controlling pests which destroy food and commercial crops. This is called biological control of pests.

EXERCISE

I. **Answer the following questions:**

1. Point out any two special features of micro-organisms.
2. "Micro-organisms can be man's enemies as well as friends" Explain.
3. List any four diseases caused by microbes. Explain the different

methods by which those diseases are spread.

4. How do microbes come into contact with water?
5. What are the roles of man and mosquito in the life of a malarial parasite?
6. What is 'Pasteurisation'?
7. What are vaccines? When are they to be given to the child and pregnant women?
8. Name a few diseases caused by microbes in pet animals. How can they are prevented?
9. What are antibiotics? Give two examples.
10. Which methods are used in the preservation of foods?
11. What is meant by 'food poisoning'? How can this be prevented?
12. What is the role of microbes in the conservation of fertility of the soil?

II. Choose the correct answer and mark (√) against the correct answer.

1. The pioneer who drew attention towards the existence of microorganisms as well as responsible for the discovery of vaccination is

   a. Robert Koch b. Louis Pasteur
   c. Joseph Lister d. Alexander Fleming

2. The smallest among the following

   a. bacteria B. algae
   c. virus c. protozoa

3. Cholera is caused due to,

   a. drinking impure water
   b. curse of village diety or God
   c. deficiency of nutritious food
   d. deficiency of oxygen in the atmosphere

4. Rabies occurs

   a. When an infected dog bites
   b. when a dog licks our skin

c. *by a fly or through air*

d. *only in children*

5. The chemical substance used in the preservation of food is

a. *Potassium permanganate.*

b. *Ethyl alcohol*

c. *Potassium meta-bi-sulphite*

d. *Copper sulphate.*

6. A child may suffer from polio due to

a. *the Sins committed by parents.*

b. *the incomplete dosage of polio drops*

c. *Witchcraft*

d. *Diphtheria*

III. Match the following:

	A		B
1.	**Disease**		**Micro-Organism**
	a. Flu	**a.**	**Protozoa**
	b. Anthrax	**b.**	**Bacteria**
	c. Amoebic dysentry	**c.**	**Virus**
	d. Tuberculosis	**d.**	**Algae**
		e.	**Bacillus anthrosis**
2.	Disease		Carrier of germs
	a. Rabies	a	Air
	b. Typhoid	b.	Pig
	c. Cholera	c.	Fly
	d. Tuberculosis	d.	Water
		e.	dog
3.	**Food**		**Preservation method**
	a. Pickles and Meat	a.	Use of Sodium benzoate
	b. Jam and Juices	b.	Pasteurisation
	c. Grapes and mangoes	c.	Salt
	d. Milk	d.	Drying

Chapter 2

ADAPTATION and ORGANIC EVOLUTION

Organisms live in different types of environment. Many animals and plants live on land, some others live in water. Organisms have adapted to their environment by adjusting their living activities. Organisms adapt themselves to the changes taking place in the environment. Because of this, all the organisms can survive and continue to reproduce.

Activity 2:1 *List the names of animals and plants that live on land. List the names of some animals and plants that live in water. List the organisms that live in soil.*

The environment of organisms has a number of things or factors which form the environment namely soil, water, air, light, temperature etc.

There are many types of environment on our earth. For example, cold regions covered with snow, torrid regions where temperature is high, desert with sands, oceans with salt water, forest covered with dense plant life. Living things in these different environments live by adapting their life pattern to the surroundings and to their environmental condition. Because of these reasons there are variations in the structure of living things. Camels living in deserts and cactus are different from fish and lotus which exist in water. We can see variations in the body structure and life functions of living beings according to the environment in which they live.

Activity 2:2 *Mark the deserts, torrid regions, dense forests in the map of India and find out the names of some animals and plants which live in these regions. List the names of five animals living in a well and five animals living in sea.*

Organisms have the ability to adapt because of certain structural features in their organs and living characteristics in tune with their environment. For example, fish in water, camels in desert, monkeys which live in trees, pigeons that fly in air. There are differences in the body structure and functions

of these animals. All these animals have adapted to their environment. Fish cannot live in sand and camel cannot live in water. The reason for this is that a particular structure of their organs helps them to adapt to a particular type of environment adapted by them.

Activity 2:3 *Observe the body structure of the fish and the pigeon. List the features of their organs which help them to adapt to their environment.*

Body structure of fish

The body of a fish is boat shaped. This shape helps fish to move about efficiently in water. The fish has fins for swimming. It has gills which draw out oxygen dissolved in water. In this way, gills, fins and the body shape function in a unique manner to make the fish live in water.

Activity 2:4 *Draw a diagram of a fish and label the parts. Observe the gills, fins and the shape of the body of fish.*

Body structure and adaption of Camel

Camels live in deserts. In deserts, water is scare and temperature is high. Camels very often live without drinking water for 15 days. The camel's skin is protected from heat as there is a fat layer under the skin. Owing to this, camel can live comfortably even in temperatures of 34°C to 40°C. Because the kidneys retain much water and release little quantity of water by way of thick urine, the total water content of the camel is retained at a comfortable level. The camel has a four chambered stomach which facilitates the digestion of rough type of vegetation that it eats. The camel has strong teeth. The skin layers in its mouth are thick. In this way, camels have adapted themselves to their environment and have survived.

Body structure of pigeon and its adaptation

Pigeon, a common bird is well adopted to aerial mode of life. A bird's body structure is different from that of other animals. To suit its life in air, its bones are light to facilitate

flight. The fore-limbs have been modified into wings. There are feathers on its body. The shape of its body is pointed. So it can pierce through the air and fly.

Activity 2:5 *Draw a sketch of a pigeon and label its external parts. Study its beak, feet and food habits.*

Like animals, plants also have to adapt to their environment, failing which they cannot survive and become extinct.

There are unique structural features in aquatic plants - plants that live in water. For example, roots are short, there are air chambers in the stem and the stem is soft.

Activity 2:6 *Observe lotus, valisnaria plants and list the structure and characteristic of their parts.*

If we study the structure of a cactus plant, it is easy to learn about the adaptation in plants. Cactus normally grows in dry and sandy areas. In this plant, the stem keeps it always moist. The leaves are like thorns. All these modifications facilitate the cactus plant to adapt to its dry and inhospitable environment. Since the stem is green, it participates in manufacturing food. As the leaves are modified into thorns, transpiration (evaporation of water) is prevented and keeps the cactus plant moist always.

Activity 2:7 *There are many species of cactus. Observe a common cactus like Opuntia. List the differences between bean plant and Opuntia*

Water, air, light and temperature have their effect on organisms in different ways. These factors have tremendous influence on the adaptations in organisms. As a result of this changes in the body structure and functions of the organisms is a continuous and ongoing process.

Example: The evolution of aquatic animals into terrestrial animals has taken place because of many changes in the structures and functions. Formation of legs facilitate movement, blood stores essential water content and also has protective mechanism, fertilization occurs within the body etc.

Animals and plants that live in cold regions also exhibit adaptations. They do not get water in the winter season as water becomes ice. At that time trees shed their leaves. This helps the plants to prevent transpiration, and retain water within the body. Hence shedding of leaves indicates adaptation.

Activity 2:8 *The polar bear lives in the polar region and the camel lives in deserts. Make a list of the body structures which help in their adaptation.*

Organic evolution

When you look around you, you will see hundreds of types of animals and plants. You will wonder whether all the living things were created at the same time, or in stages. Such questions have been pursued by many people from a long time. However, it is difficult to answer these questions accurately. But scientists have come to certain conclusions on the basis of their observations and study.

Hundreds of millions of years ago, when the earth was born, it was not like what it is now. The earth was a ball of hot gases. Gradually, the earth began to cool and its outer cover solidified and was converted into rocks and stones. Slowly, mountain ranges and oceans were formed. Due to incessant rains, oceans and seas were formed. Extremely simple organisms were created first and they increased in number and variety, finally resulting in the formation of animals and plants. This continuous process of gradual change from simple forms of life into complex organisms is called Organic evolution.

The earth is a planet. Life appeared on the earth millions of years ago. Life was created when many simple things on earth underwent chemical changes continuously and modified into very complex support mass also called biotic soup from which life emerged.

Organisms that lived on earth 150 crores years ago were protozoa, bacteria, unicellular organisms algae and molluscs.

These organisms lived for a long time and went on adapting to their environment. About 18 crore years ago some reptiles appeared on earth. Some examples are giant reptiles like dinosaur, tyranosaurs. In course of time they became extinct. Later, birds and mammals appeared. The earliest man must have appeared about 20 lakhs years ago. Animals and plants have been continuously showing changes in a slow pace in order to adapt to the changing environment. Even now organisms are changing.

How did organic evolution take place? Why did it take place? Charles Darwin was the first biologist who gave satisfactory explanation to these questions.

Exploration of the earth and fossils

These studies will indicate that the earliest organisms had very simple structure. It is most likely that these simple organisms evolved gradually into complex organisms. These are definite evidences to show that this slow change has indeed occurred and continues to occur.

Important evidences are fossils, structural and functional features of organs and embryology.

Fossils

From ancient times, the entire body or organs of some organisms or imprints have been preserved in the layers of the earth. These are called fossils. Fossils may be the skeletons, shells, the marks of the feet of animals or may even be plants. The fossils of animals or plants that lived thousands of years ago may be found in the layers of the earth.

Fossils as evidence

From the study of fossils, we can make out the structure of the body of animals and plants that lived long ago. By comparing them with the body structure of the present organisms, the resemblences and differences become clear. On the basis of this, we can deduce how a particular form of

organism might have been modified gradually to evolve into the present day organism.

The oldest fossils discovered in rocks belong to the simple forms of life and the recent ones relate to the complex forms. From this, one can deduce that complex forms of life are really modified from the simple forms existed before.

Observe the picture of an Archaeopteryx which lived long ago and has become fossilised. It had teeth as in reptiles, wings and beak as in birds. The fore-limbs had become wings. To establish this, we find fingers with nails in the margin of the wings. It had a long tail of a single feather.

From the careful examination of such fossils it becomes clear that some animals belonging to the reptile group have gradually changed to birds of today.

There are fossils of plant forms also. All these fossil evidences support the theory of evolution.

Figure 2.1 Archaeopteryx

Structural and functional evidences. It we study the anatomical pattern of the forelimbs of some animals and the human hands, we see some similarities and some differences in them. Observe the flippers of the seal, the whale, wings of bat (mammals) fore-limbs of a horse and human hand. The

structural pattern of the bones are similar. But, due to differences in activities to suit a particular environment, differing structural adaptations have emerged.

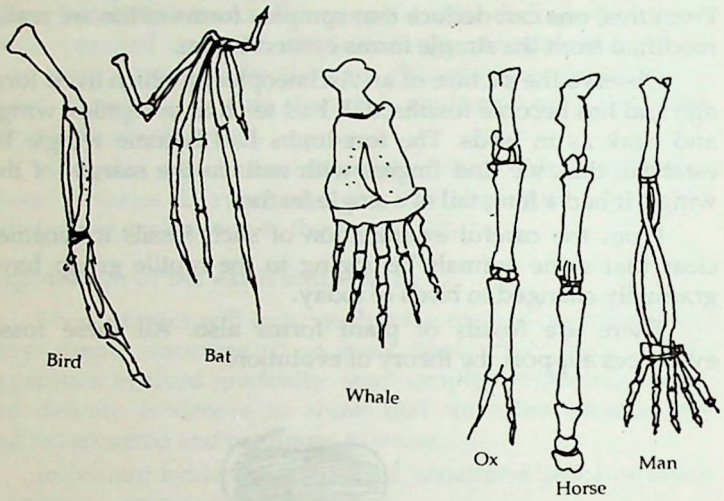


Figure 2.2 Fore-limbs of some vertebrate animals

If the basic structure is the same but functions are changed forced by adaptation, then, such findings support the theory of evolution.

Sometimes, the basic structural make up may have been different, but on going process of evolution forces the adaptation to obey the requirements of ecological surroundings.

Example: The wings of birds and butterflies are different in their structure but their function is the same. This shows that according to functional requirements there may be evolution in organic structures.

Figure 2.3 Wings of insect, bird.

Activity 2:9 *Make a list of similarities and differences in the structure of wings of butterfly and a bird.*

Embryological evidences:-

There are some similarities in the development of plants and animals. All organisms start their development from a single cell. If the development of the embryos of some animals is studied, it can be seen that, all organisms develop from a single cell. The embroyos of all vertebrates (animals having back-bones) have some similarities in the beginning stages. Later on, they develop variation in their individual characteristics.

Activity 2:10 *Study the embryos of these animals. Fish, amphibian, bird and man.*

When the figures 2.4 are studied with care and compared, we learn that amphibians birds and mammals start from the stage of fish-like from, and have undergone changes or evolved into their present form due to environmental pressures.

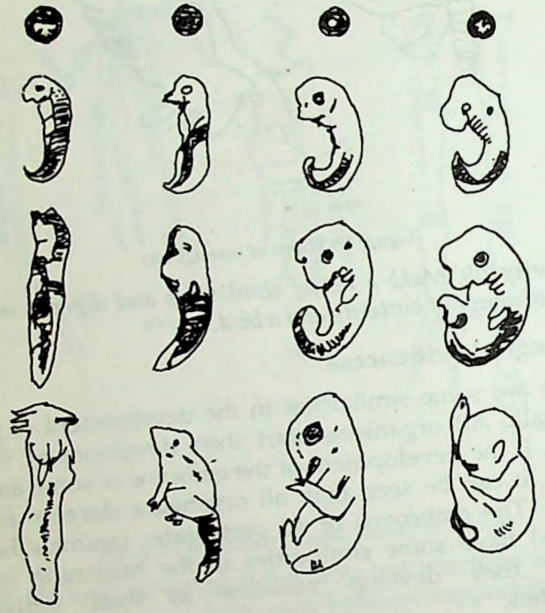


Figure 2.4 Stages of development of embryos

Activity 2.11 Observe the following figure and write the changes found in the neck of Giraffe

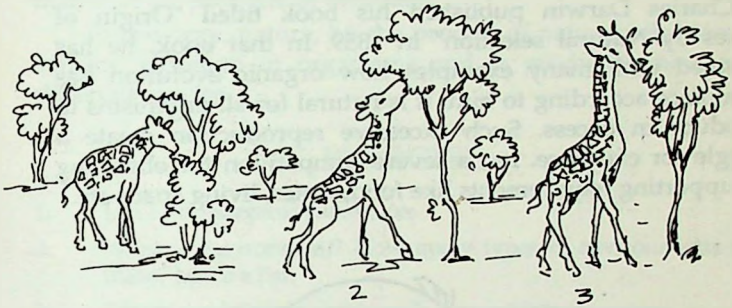


Figure 2.5 Evolution of giraffe according to Lamarck

Theories of organic evolution:

There are two important theories of organic evolution. They are

a. Lamarck's theory of use and disuse of parts. (known today as the theory of inheritance of acquired characters)
b. Darwin's theory of natural selection.

a. Lamarck's theory of use and disuse of parts

Study the figure 2.5 carefully. By comparing the picturised versions of evolution, we can guess how the giraffe's neck got elongated, on the basis of Lamarck's theory. By using their necks and front legs continuously to eat the leaves in the tall trees, the necks and front legs of the giraffes grew long.

Therefore the modern giraffes have long necks and legs.

The same reasoning also argues that since snakes were crawling their hands and legs became useless and gradually they lost them. Therefore, the present snakes are limbless.

The appendix in human body remains without use. Similarly unused is the third lid membrane of the eye.

b. **Darwin's theory of evolution based on natural selection.**

Charles Darwin published his book titled "Origin of Species by Natural selection" in 1859. In that book, he has explained with many examples how organic evolution has taken place according to him. It is natural for all organisms to reproduce in excess. Such excessive reproduction create a struggle for existence. i.e., a severe competition for obtaining life supporting requirements like food, water, living space etc.

Figure 2.6 Charles Darwin

This results in the destruction of many organisms before they attain the age of reproduction. Only those few capable organisms which fight and survive, will be able to reproduce and live successfully. Darwin called this process as the "survival of the fittest". This means that the nature itself selects some organisms as fit to live and reproduce. He termed this process as "natural selection". Accordingly, it is claimed that man is at the pinnacle of evolution.

In this way, nature, by the process of natural selection, is causing variation in organisms and is producing new and different species.

EXERCISE

1. List four inorganic substances.
2. What is environment? How many types of environments are there? Make a list.
3. Fill up the following table with appropriate organisms.

Aquatic animals and plants.	**Animals and plants living in deserts.**
Animals	**Animals**
1.	1.
2.	2.
3.	3.
Plants	**Plants**
1.	1.
2.	2.
3.	3.

4. What are the important adaptations in the body structure of the fish which help them to live in water?
5. Which important features of pigeon's body structure help it to fly in air?
6. What are the modifications in the cactus which enable it to adapt to dry climate and desert regions?

7. The plants that grow in Tundra region shed leaves during summer. What is the advantage of this to these plants?
8. What are the important characteristics of the body structure of camels which help them to adapt to the climate in deserts?
9. What are fossils?
10. List the names of animals that are imprinted on two fossils.
11. What do we learn by studying structural and functional characteristics of organs?
12. What is Lamarck's theory of evolution called? Explain.
13. What are the important points of Darwin's theory of evolution?
14. What is meant by organic evolution?

Chapter 3

USEFUL PLANTS AND ANIMALS

Plants, animals and micro-organisms influence our life in many ways. While some organisms are useful to us, some others are harmful. In summary, in order to live we depend upon many organisms. The food material, medicines, clothes, furniture and other materials that we need, are products created by the assistance and activities of many organisms. It is also true that many of the useful things we need are destroyed by micro-organisms and insects.

Activity 3:1 *List some plants and animals used for food. List some names of things of plant and animal origin that we use everyday.*

Plants are useful to us in many ways. Plants give us food materials. Plants store food they have produced with the help of sunlight in different forms. Such stored plant food materials are consumed by all forms of animals as their food.

Activity 3:2 *List the names of food materials obtained from plants.*

Observe pulses and different vegetables and list out their names.

Due to green revolution in our country, vegetables, pulses, tubers, grains and other food yielding are being grown by adopting modern methods.

Activity 3:3 *In the map of India, mark the names of places where different food crops are grown.*

For wood required for construction of building and furniture, we utilise different species of trees like teak, casuarina, honne, rose wood etc. Therefore, we put to our use and comfort many materials drawn from plants.

Activity 3:4 *List useful things made from trees (Wood).*

We use roots, leaves and nuts of some plants as medicine. Ginger, pepper, clove, baje are used by the Ayurvedic system of medicine to cure many diseases. The ayurvedic system of

medicine has been in vogue in our country from ancient times. In this system, medicines prepared from plants are used to cure many diseases.

Activity 3:5 *Visit an Ayurvedic Hospital and know the names of medicinal plants.*

Beverages are prepared from the parts of some plants. For example, millions of people drink beverages prepared from coffee, tea and cocoa. Similarly plants like rubber, jute, cotton are used for manufacturing clothes. Scents and colognes are manufactured from plants like rose, jasmine, champak, sandal, pandams etc.

Activity 3:6 *1. List the names of temple handicrafts in Karnataka.*
2. List the source of plants used in these handicrafts.
3. List the places where rubber is grown. If possible visit a rubber plantation and learn about the production of rubber.

Because of plants, our atmosphere is cool and the air is fresh. Since plants are very useful. we should grow plants and also protect them. Plants should never be destroyed.

Activity 3:7 *How many beautiful gardens exist near your house? What species of plants grow there? Find out and write notes on the programme of the Karnataka Government to protect plants.*

Our economic condition improves by selling plant products. Substantial profits can be earned from plants like coffee, tea, tobacco, coconut, paddy, sugarcane.

Activity 3:8 *List the crops grown in the fields near your house. Write notes on the crops which have economic value.*

Animals have been useful to us since ancient times. Animals help us in transporting things. They provide us food, wool, silk, lac, shell lime, pearls and other things of utility.

Animals used as food

Fish, crabs, prawn are used as food by many people. Since fisheries are being run in an organised way, it has become possible to get good species of fishes for food.

Activity 3:9 *Observe a nearby fishery. List the names of edible fish grown and supplied.*

Eggs, like milk, are also rich in nutrients. Chickens are used as meat.

Activity 3:10 *Visit a nearby poultry farm. Learn what arrangements are made to rear chicken.*

The flesh of goats, sheep, pigs and other animals are used as food. In some countries, flesh parts of animals like giraffe, buffalo, cow, mule, frog, snake etc., are taken as food. Dairy products are got by many types of modern projects.

We obtain milk from cows, buffaloes and goats. Recently, great developmental activities have taken place in dairy farming. Huge quantities of milk, butter and ghee are being produced. Modern dairy processing has improved the quantity and efficiency of diary products.

Activity 3:11 *Find out about the activities of government dairy farms. If possible, visit one.*

Bees gather honey and pollen from flowers and provide honey and wax. Honey is used as food and medicine.

Activity 3:12 *Visit apiaries and collect facts about the methods of rearing bees and producing honey.*

Silk worm feeds on mulberry leaves and grows. The caterpillar that comes out of the egg eats vigorously and grows into pupa stage. It then secretes the silk yarn from its salivary glands and builds its cocoon. These cocoons are boiled, the worms with-in are killed and silk yarn is spun out. Expensive silk cloth is woven from the silk yarn. Silk cloth produced in Karnataka is exported to other countries.

Activity 3:13 *Visit a nearby place where silkworms are reared. Study the way the silkworms are reared. Also study how silk cloth is produced.*

After killing certain animals and using their flesh as food, their skin is removed and tanned. Skin can be used to make many things. For example, the skin of animals like cow, buffalo

and horse is tanned and is used to make footwear, belts, bags, musical instruments and other useful things. The Karnataka government has launched many projects to encourage leather craft.

Activity 3:14 *List the names of things made from skin. Visit a nearby leather factory and collect information about the process of tanning skin.*

The shells of animals that live in rivers and oceans are used for many purposes. They are used in preparing lime which is used in the construction of buildings. Shelled animals like oysters are reared and precious pearls are obtained.

Activity 3:15 *Collect animal shells to understand their variety. observe their colour, pattern and structure.*

Wild animals like tiger, lion, elephant, rabbit, deer, crocodile are killed indiscriminately. Many types of colourful things are made from them. The government has prepared plans to prevent unwanted killing of wild animals.

Activity 3:16 *Make a list of ornamental things made from animal sources which are sold in the market. Discuss whether they are really useful to us. Correspond with the forest department and collect information about preservation of wild life.*

Rearing animals has been a hobby from time immemorial. While some animals like the dog, cat, parrot, snake, bear, tiger are kept for pleasure, other animals like rabbits, rats and guinea pigs are used in laboratories for experiments. In recent times, animals are used in for space exploration and investigations to find out the effect of newly discovered medicines.

Activity 3:17 *Make a list of animals used in laboratories for experiments.*
Which animals are used for space investigation?

Harmful plants and animals:

While many plants are useful to man, a few other plants are harmful. Some times, plants cause damage by being

harmful to other organisms also. Some parts of plants may cause disease in man. For example. parthenium is causing health hazards in recent times. If parts of these plants are touched, our body suffers from skin diseases, cough, asthma etc. Certain type of mushrooms are poisonous.

Activity 3:18 *If there are harmful plants near your school find out their names and the harm caused by them.*

Decayed and spoiled parts of plants may also be poisonous.

Some animals are also harmful. Insects destroy many useful things in our environment. Insects like cockroach, termites, locusts, ants, cause loss of materials worth crores of rupees every minute.

To destroy these insects, scientists are experimenting and discovering many insecticides. Insects are destroying thousands of tons food every year. Furniture and other substances are also destroyed by insects. Such harmful action can be prevented by taking suitable remedial measures.

Activity 3:19 *List the names of things destroyed by termites. Explain how furniture is affected by termits. Explain what methods are followed in your houses to destroy cockroaches.*

Some animals spread dangerous diseases from person to person. Mosquitoes spread malaria and filaria. Flies spread cholera and dysentery. Rats spread plague. Therefore, we must keep our houses and surroundings clean and free from such insects and pests.

Activity 3:20 *Observe what actions are undertaken to control mosquitoes. Explain.*
Know how insects like bugs are destroyed.

EXERCISE

1. List the names of 15 plants used for food.
2. What is meant by the green revolution?
3. List the names of furniture made from teak wood.

4. List the names of useful things made from leather.
5. What is afforestation? (Vana Mahotsava)
6. If forests are destroyed, nature's balance is upset. How?
7. What is a sanctuary? What are its uses?
8. Why are eggs considered as wholesome food?
9. What are the advantages of a dairy farm?
10. Name 5 plants used for medicinal purposes.
11. Mention the uses of animal shells.
12. Name the programmes launched by the government to protect wild life?
13. What are the health hazards caused by parthenium plants? What methods are followed to control parthenium?
14. Mention the harm caused by cockroaches, termites and locusts. How are they controlled?

Chapter 4

CONSERVATION OF NATURAL RESOURCES

Crores of people and countless Organisms live on the earth. All these organisms depend on a few vital natural resources in order to live. Solar energy, oxygen, water, carbondioxide, minerals are a few essential things required. Since these things are available in nature in abundance, they are called natural resources. Solar energy is the most abundantly available source of energy. Similarly, water and air are also natural resources.

Activity 4:1 *List the natural resources available in nature. Which resources are stored by man. Make a list of gadgets used to obtain solar energy for our benefit.*

We obtain most of our essential natural requirements, from the surface of the earth by mining and digging the earth and also from the atmosphere. We get solar energy, the source of all forms of energy in the form of light and heat from the sun. Natural resources are available in different forms. Oxygen, carbon-di-oxide, nitrogen are abundant in the form of gases. These gases are needed by all organisms for their life processes.

Water and petroleum are the most important forms of liquid resources. Water is found in rivers, oceans and under the ground. We all know the importance of water. Petroleum is stored in the earth. Human Activities would be adversely affected if these petroleum products were not there. Minerals which are solid form of natural resources, occur inside and also on the surface of the earth. We all know the uses of minerals.

Soil is essential for the growth of plants. Soil also is one of the natural resources. Without soil, it would be difficult to construct buildings. Natural resources in different life forms are available as forests, animals and their products as

medicines and food materials.

Activity 4:2 *List the natural resources found on the surface of the earth*
List the importance of natural resources. Mark the places where minerals are found in the map of India.

Activity 4:3 *Mention the uses of water. Mark in the map of India, sancturies where wild animals are protected.*
List the uses of the plants that grow in forests.

Natural resources can be grouped in two ways. Some natural resources can be reused even after repeated uses. Such resources are known as renewable resources.

For example: It is possible to renew water, air,nitrogenous matter and food materials.

Yet, if there is indiscriminate and excessive use of earth, seas and forests by man for his demands of life, like buildings and energy, the balance in nature may get disturbed. Therefore, these natural resources have to be used and renewed in a systematic and innovative manner.

Forests are being destroyed for timber, fuel and sites are cleared for buildings. If forests are destroyed, many natural resources are also destroyed. For example, there will be defects in watercycle and untimely rainfall, destruction of crops, danger to wild life, erosion of soil etc.

Activity 4:4 *Know the plans for renewal of forests. How will nature be affected by construction of dams? What are the ill effects, if unwanted things are dumped into the seas?*

Water resources are essential for living process and we are using them in a variety of ways. We use water for drinking, in industries, for irrigation and to produce electricity etc.

Water resources can be renewed. But for this process, assistance of plant life is essential. Plants absorb underground water and release it to the atmosphere through transpiration. Clouds are formed and generate rainfall supplying water to the sources. By deforestation, the rate of transpiration from plants is reduced and the water cycle gets affected. This causes

many changes in the atmosphere.

Activity 4:5 *There are many plans to utilise the water resources. Collect information about this and organise a science exhibition. Study the water and air cycles.*

Activity 4:6 *Know about recent activity in the field of food processing. Know more about the effects of deforestation, rendering more land for irrigation etc.*
Know the programs for using and increasing the products of fish and other sea products.

We use many things available in the earth for our needs and progress. But such utilisation is increasing day by day, with the result they are getting more and more scarce. Minerals, petroleum oils, coal and such things are getting scarcer. It is not possible to renew or produce these materials by us. These materials are called non-renewable resources. Since these resources are available in limited quantities and take a very long time for their formation they have to be preserved and we have to plan for their controlled use.

Activity 4:7 *Find out reasons why coal utilisation is reduced. Find out at what depth in the earth petroleum oil (crude) is found.*

We use energy in different forms. Electricity is a form of energy. Likewise, petroleum is also a form of energy. Indeed all energies are different forms of solar energy. Since we have abundant sunlight, we must try using more solar energy. Nowadays, many industries have started using solar energy. Solar energy is used to boil water and run machines from the steam thus got. Solar energy is also used for cooking in many houses. Solar ovens can be easily manufactured.

Activity 4:8 *If there are solar energy ovens manufacturing factories nearby, visit them.*
You can also prepare solar energy ovens with the help of mirrors.

Air, water, forests and mineral wealth which are in limited supply are put to increasing uses day by day. The reason for this is the growing human population. We are using all natural resources excessively and unsystematically.

By cutting down trees in the forests we are destroying the forests. Deforestation causes natural imbalance. It has many evil effects such as erratic climatic changes, Soil erosion, changes in the water cycle, loss of many animals and plants. It is for this reason, reforestation programmes are undertaken. This increases plant wealth and maintains the natural water cycle and climatic balance.

Activity 4:9 *Know why the Silent Valley project in Kerala State has been stopped.*
How many plants and trees are generally destroyed for laying out of a residential colony?
List the inconveniences caused to animals by this.
How much forest and how many animals are destroyed when a dam is built? Discuss.

We are changing the natural features in recent times by excessive and unsystematic use of the natural resources. Deforestation, construction of dams, starting industries, atomic energy centres, fertilizer factories, founding of big cities and other man made environmental changes are putting undue pressure on the natural environment and increasing pollution.

Due to these activities, there is pollution of air, water food and the very land we live on. These are causing harm to our life. Many hazards are also caused recently due to radiation.

All these activities are deforming the structure and character of our environment and are destroying natural resources.

Activity 4:10 *List the types of fertilizers used in agriculture.*
List the ill effects of the Chernobyl accident in Russia.
List the activities that pollute the environment.
List the various plans to preserve forests.

To preserve and use the natural resources systematically, governments have prepared major plans. Governments have also implemented many community projects to preserve forests and protect wild animals. They have also introduced planning and control of big cities and industrial growth. Unlike before, dams are built with an eye on ecological

repercussion.

At the national level, important projects are: soil protection and conservation projects, afforestation, reforestation, and sanctuaries, environmental and water control programmes. All these efforts are intended to protect and systematize the innovative use of our natural resources.

The outer layer of the earth where plants grow is the fertile soil. This soil contains important minerals, nitrogenous matter and salts which are essential for the growth of plants. In addition, this soil contains a variety of bacteria. In order to prevent soil erosion many 'soil conservation projects' have been initiated.

Activity 4:11 *Visit a nearby soil preservation centre and collect information about the projects there. Organise an exhibition of the various projects.*

The forests departments have prepared reforestation projects. Important activities under this are growing new forests, planned method of growing plants, preventing destruction of forests. There are National Forest Research Centres where research is carried on in forest development activities. Forests are grown on shallow lands, deserts and hilly regions.

Activity 4:12 *Visit a nearby forest department. Study its programmes. Observe the activities of the forest department during your journey.*

Activity 4:13 *Visit Nagarhole, Bandipur and such places. Know activities that are undertaken there,*
Correspond with the forest department and collect more information about preservation of wild life.

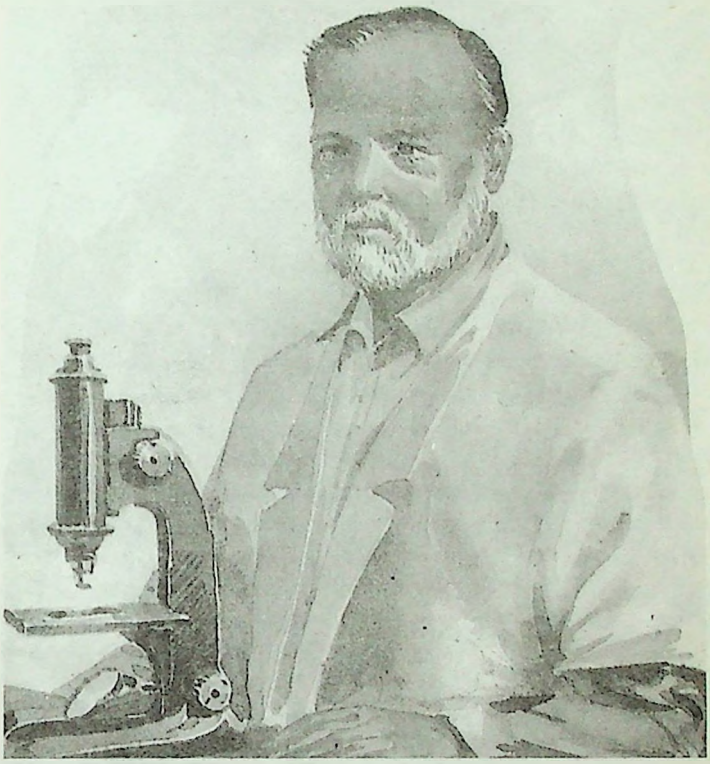
To protect wild life, the government has many projects and has been systematically maintaining many sanctuaries Nagarhole, Ranganathittu and Bandipur are such sanctuaries. Try to know how wild life is preserved there.

Air, water and atmosphere belong to all living beings. Therefore at the international level many rules have been

framed as an attempt to protect natural resources. If these resources get diminished, our life may be destroyed. Therefore, all of us should join in the efforts in preventing the excessive use and pollution of our natural resources.

EXERCISE

1. List 10 natural resources that are available inside the earth.
2. Mention activities that are performed using solar energy.
3. Which gas is required for life activities of organisms?
4. What are the disadvantages of continuously using petroleum oil found underground?
5. Which natural resources are renewable?
6. What is meant by natural water cycle? What is the relationship between deforestation and water cycle?
7. How can water resources be renewed?
8. What programmes are there to renew the sources of food? What is meant by green revolution?
9. Substantiate the statement that all energies are different forms of solar energy.
10. How do you support the argument that it is not possible for us to lead healthy life, if environment is polluted/
11. What is meant by reforestation?
12. Why should wild animals be protected?



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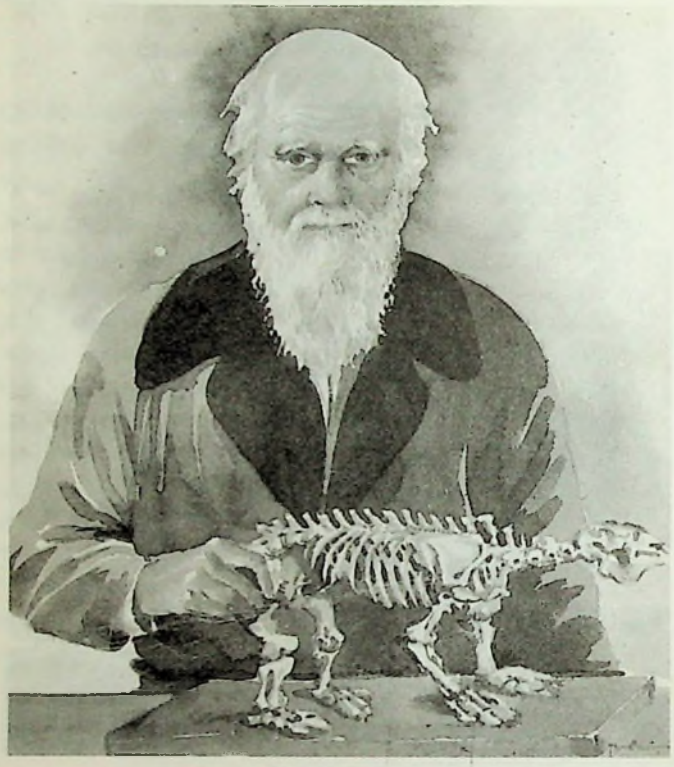

Charles Darwin

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