



0854CH01

**P**aheli and Boojho went to their uncle's house during the summer vacation. Their uncle is a farmer. One day they saw some tools like *khurpi*, sickle, shovel, plough, etc., in the field.



I want to know where and how we use these tools.

You have learnt that all living organisms require food. Plants can make their food themselves. Can you recall how green plants synthesise their own food? Animals including humans can not make their own food. So, where do animals get their food from?

But, first of all why do we have to eat food?

You already know that energy from the food is utilised by organisms for carrying out their various body functions, such as digestion, respiration and excretion. We get our food from plants, or animals, or both.



Since we all need food, how can we provide food to a large number of people in our country?

Food has to be produced on a large scale.



In order to provide food for a large population—regular production, proper management and distribution is necessary.

### 1.1 Agricultural Practices

Till 10,000 B.C.E. people were nomadic. They were wandering in groups from place to place in search of food and shelter. They ate raw fruits and vegetables and started hunting animals for food. Later, they could cultivate land and produce rice, wheat and other food crops. Thus, was born 'Agriculture'.

When plants of the same kind are cultivated at one place on a large scale, it is called a **crop**. For example, crop of wheat means that all the plants grown in a field are that of wheat.

You already know that crops are of different types like cereals, vegetables and fruits. These can be classified on the basis of the season in which they grow.

India is a vast country. The climatic conditions like temperature, humidity and rainfall vary from one region to another. Accordingly, there is a rich

variety of crops grown in different parts of the country. Despite this diversity, two broad cropping patterns can be identified. These are:

**(i) Kharif Crops :** The crops which are sown in the rainy season are called kharif crops. The rainy season in India is generally from June to September. Paddy, maize, soyabean, groundnut and cotton are kharif crops.

**(ii) Rabi Crops :** The crops grown in the winter season (October to March) are called rabi crops. Examples of rabi crops are wheat, gram, pea, mustard and linseed.

Besides these, pulses and vegetables are grown during summer at many places.

## 1.2 Basic Practices of Crop Production



Why paddy can not be grown in the winter season?



Paddy requires a lot of water. Therefore, it is grown only in the rainy season.

Cultivation of crops involves several activities undertaken by farmers over a period of time. You may find that these activities are similar to those carried out by a gardener or even by you when you grow ornamental plants in your house. These activities or tasks are referred

to as **agricultural practices** which are listed below:

- (i) Preparation of soil
- (ii) Sowing
- (iii) Adding manure and fertilisers
- (iv) Irrigation
- (v) Protecting from weeds
- (vi) Harvesting
- (vii) Storage

### 1.3 Preparation of Soil

The preparation of soil is the first step before growing a crop. One of the most important tasks in agriculture is to turn the soil and loosen it. This allows the roots to penetrate deep into the soil. The loose soil allows the roots to breathe easily even when they go deep into the soil. Why does the loosening of soil allow the roots to breathe easily?

The loosened soil helps in the growth of earthworms and microbes present in the soil. These organisms are friends of the farmer since they further turn and loosen the soil and add humus to it. But why the soil needs to be turned and loosened?

You have learnt in the previous classes that soil contains minerals, water, air and some living organisms. In addition, dead plants and animals get decomposed by soil organisms. In this way, various nutrients in the dead organisms are released back into the soil. These nutrients are again absorbed by plants.

Since only a few centimetres of the top layer of soil supports plant growth, turning and loosening of soil brings the nutrient-rich soil to the top so that plants can use these nutrients. Thus,

turning and loosening of soil is very important for cultivation of crops.

The process of loosening and turning of the soil is called **tilling** or **ploughing**. This is done by using a plough. Ploughs are made of wood or iron. If the soil is very dry, it may need watering before ploughing. The ploughed field may have big clumps of soil called crumbs. It is necessary to break these crumbs. Levelling the field is beneficial for sowing as well as for irrigation. Levelling of soil is done with the help of a leveller.

Sometimes, manure is added to the soil before tilling. This helps in proper mixing of manure with soil. The soil is moistened before sowing.

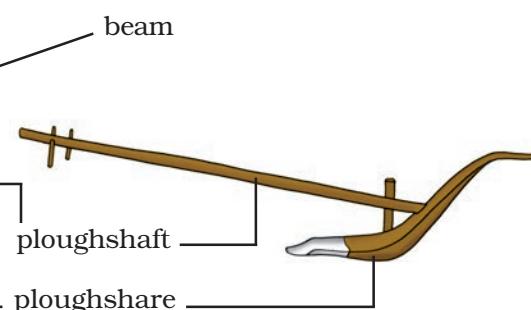
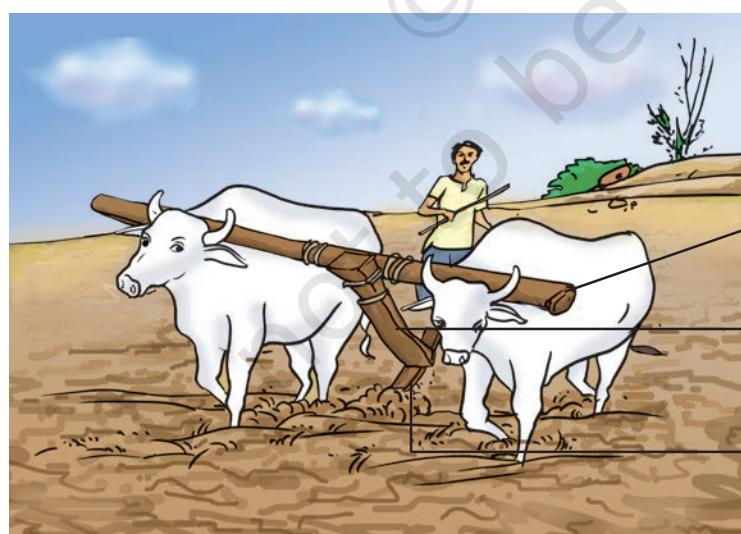
### Agricultural Implements

Before sowing the seeds, it is necessary to break soil clumps to get better yield. This is done with the help of various tools. The main tools used for this purpose are the plough, hoe and cultivator.

**Plough** : This is being used since ancient times for tilling the soil, adding fertilisers to the crop, removing the weeds and turning the soil. This is made of wood and is drawn by a pair of bulls or other animals (horses and camels). It contains a strong triangular iron strip called ploughshare. The main part of the plough is a long log of wood which is called a ploughshaft. There is a handle at one end of the shaft. The other end is attached to a beam which is placed on the bulls' necks. One pair of bulls and a man can easily operate the plough [Fig. 1.1 (a)].

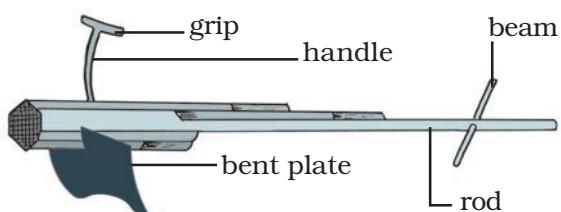
The indigenous wooden plough is increasingly being replaced by iron ploughs nowadays.

**Hoe** : It is a simple tool which is used for removing weeds and for loosening the soil. It has a long rod of wood or iron. A strong, broad and bent plate of iron is fixed to one of its ends and



**Fig. 1.1 (a) : The plough**

works like a blade. It is pulled by animals [Fig. 1.1 (b)].



**Fig. 1.1 (b) : A hoe**

**Cultivator** : Nowadays ploughing is done by tractor-driven cultivator. The use of cultivator saves labour and time. [Fig. 1.1 (c)].



**Fig. 1.1 (c) : Cultivator driven by a tractor**

## 1.4 Sowing

Sowing is an important part of crop production. Before sowing, good quality, clean and healthy seeds of a good variety—are selected. Farmers prefer to use seeds which give high yield.

### Selection of Seeds



One day I saw my mother put some gram seeds in a vessel and pour some water on them. After a few minutes some seeds started to float on top. I wonder why some seeds float on water!

### Activity 1.1

Take a beaker and fill half of it with water. Put a handful of wheat seeds and stir well. Wait for some time.

Are there seeds which float on water? Would those be lighter or heavier than those which sink? Why would they be lighter? Damaged seeds become hollow and are thus lighter. Therefore, they float on water.

This is a good method for separating good, healthy seeds from the damaged ones.

Before sowing, one of the important tasks is to know about the tools used for sowing seeds [Fig. 1.2 (a), (b)].

**Traditional tool** : The tool used traditionally for sowing seeds is shaped like a funnel [Fig. 1.2 (a)]. The seeds are filled into the funnel, passed down through two or three pipes having sharp ends. These ends pierce into the soil and place seeds there.



**Fig. 1.2 (a) : Traditional method of sowing**



Fig. 1.2 (b) : A seed drill

**Seed drill :** Nowadays the seed drill [Fig. 1.2 (b)] is used for sowing with the help of tractors. This sows the seeds uniformly at equal distance and depth. It ensures that seeds get covered by the soil after sowing. This protects seeds from being eaten by birds. Sowing by using a seed drill saves time and labour.

There is a nursery near my school. I found that little plants were kept in small bags. Why are they kept like this?



Seeds of a few plants such as paddy are first grown in a nursery. When they grow into seedlings, they are transplanted to the field manually. Some forest plants and flowering plants are also grown in the nursery.

Appropriate distance between the seeds is necessary to avoid overcrowding of plants. This allows plants to get

sufficient sunlight, nutrients and water from the soil. At times a few plants may have to be removed to prevent overcrowding.

### 1.5 Adding Manure and Fertilisers

The substances which are added to the soil in the form of nutrients for the healthy growth of plants are called **manure and fertilisers**.

I saw a healthy crop growing in a farm. In the neighbouring farm, the plants were weak.

Why do some plants grow better than others?



Soil supplies mineral nutrients to the crop plants. These nutrients are essential for the growth of plants. In certain areas, farmers grow crop after crop in the same field. The field is never left uncultivated or fallow. Imagine what happens to the nutrients?

Continuous cultivation of crops makes the soil poor in nutrients. Therefore, farmers have to add manure to the fields to replenish the soil with nutrients. This process is called manuring. Improper or insufficient manuring results in weak plants.

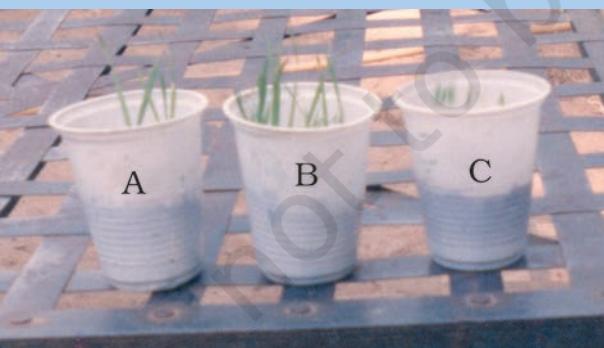
Manure is an organic substance obtained from the decomposition of plant or animal wastes. Farmers dump plant and animal waste in pits at open places and allow it to decompose. The decomposition is caused by some microorganisms. The decomposed matter is used as organic manure. You have already learnt about vermicomposting in Class VI.

## Activity 1.2

Take *moong* or gram seeds and germinate them. Select three equal sized seedlings. Take three empty glasses or similar vessels. Mark them A, B and C. To glass A add little amount of soil mixed with a little cow dung manure. In glass B put the same amount of soil mixed with a little urea. Take the same amount of soil in glass C without adding anything [Fig. 1.3(a)]. Now pour the same amount of water in each glass and plant the seedlings in them. Keep them in a safe place and water them daily. After 7 to 10 days observe their growth [Fig. 1.3(b)].



**Fig. 1.3 (a) :** Preparation of the experiment



**Fig. 1.3 (b) :** Growing seedlings with manure and fertiliser

Did plants in all the glasses grow at the same pace? Which glass showed

better growth of plants? In which glass was the growth fastest?

Fertilisers are chemicals which are rich in a particular nutrient. How are they different from manure? Fertilisers are produced in factories. Some examples of fertilisers are— urea, ammonium sulphate, super phosphate, potash, NPK (Nitrogen, Phosphorus, Potassium).

The use of fertilisers has helped farmers to get better yield of crops such as wheat, paddy and maize. But excessive use of fertilisers has made the soil less fertile. Fertilisers have also become a source of water pollution. Therefore, in order to maintain the fertility of the soil, we have to substitute fertilisers with organic manure or leave the field uncultivated (fallow) in between two crops.

The use of manure improves soil texture as well as its water retaining capacity. It replenishes the soil with nutrients.

Another method of replenishing the soil with nutrients is through **crop rotation**. This can be done by growing different crops alternately. Earlier, farmers in northern India used to grow legumes as fodder in one season and wheat in the next season. This helped in the replenishment of the soil with nitrogen. Farmers are being encouraged to adopt this practice.

In the previous classes, you have learnt about *Rhizobium* bacteria. These are present in the nodules of roots of leguminous plants. They fix atmospheric nitrogen.

**Table 1.1 : Differences between Fertiliser and Manure**

S. No.	Fertiliser	Manure
1.	Fertiliser is a man-made inorganic salt.	Manure is a natural substance obtained by the decomposition of cattle dung and plant residues.
2.	Fertiliser is prepared in factories.	Manure can be prepared in the fields.
3.	Fertiliser does not provide any humus to the soil.	Manure provides a lot of humus to the soil.
4.	Fertilisers are very rich in plant nutrients like nitrogen, phosphorus and potassium.	Manure is relatively less rich in plant nutrients.

Table 1.1 gives the differences between a fertiliser and manure.

**Advantages of Manure :** The organic manure is considered better than fertilisers. This is because

- it enhances the water holding capacity of the soil.
- it makes the soil porous due to which exchange of gases becomes easy.
- it increases the number of friendly microbes.
- it improves the texture of the soil.

## 1.6 Irrigation

All living beings need water to live. Water is important for proper growth and development. Water is absorbed by the plant roots. Along with water, minerals and fertilisers are also absorbed. Plants contain nearly 90% water. Water is essential because germination of seeds does not take place under dry conditions. Nutrients dissolved in water are transported to each part of the plant. Water also

protects the crop from both frost and hot air currents. To maintain the moisture of the soil for healthy crop growth, fields have to be watered regularly.

The supply of water to crops at regular intervals is called **irrigation**. The time and frequency of irrigation varies from crop to crop, soil to soil and season to season. In summer, the frequency of watering is higher. Why is it so? Could it be due to the increased rate of evaporation of water from the soil and the leaves?



I am very careful this year about watering the plants. Last summer my plants dried up and died.

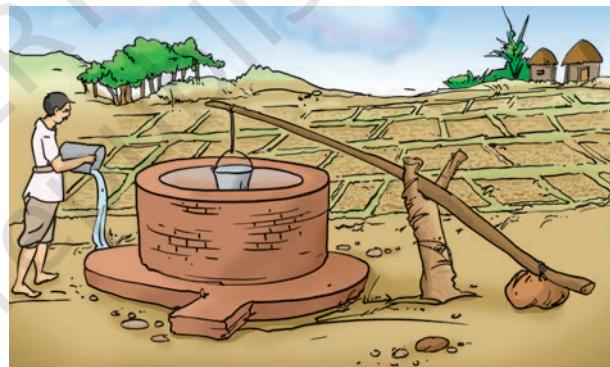
**Sources of irrigation :** The sources of water for irrigation are— wells, tubewells, ponds, lakes, rivers, dams and canals.



**Fig. 1.4 (a) : Moat**



**Fig. 1.4 (b) : Chain pump**



**Fig. 1.4 (c) : Dhekli**



**Fig. 1.4 (d) : Rahat**

### Traditional Methods of Irrigation

The water available in wells, lakes and canals is lifted up by different methods in different regions, for taking it to the fields.

Cattle or human labour is used in these methods. So these methods are cheaper, but less efficient. The various traditional ways are:

- (i) moat (pulley -system)
- (ii) chain pump

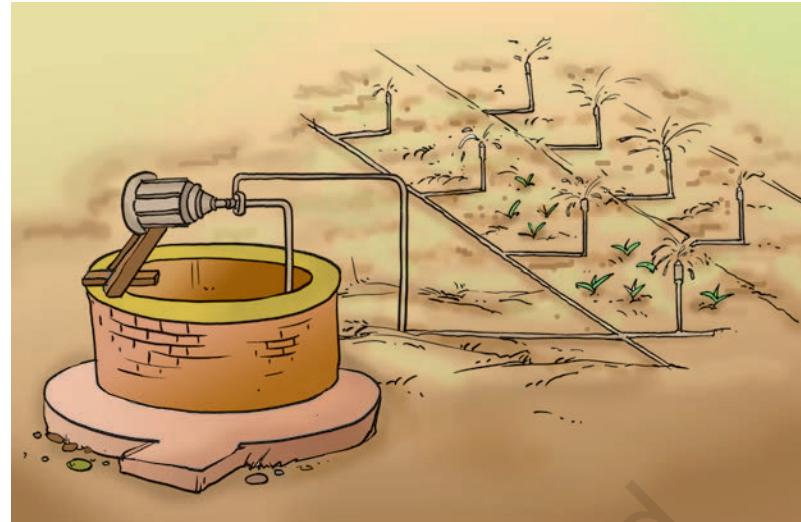
- (iii) dhekli, and
- (iv) rahat (Lever system)  
[Figs. 1.4 (a)- (d)].

Pumps are commonly used for lifting water. Diesel, biogas, electricity and solar energy is used to run these pumps.

## **Modern Methods of Irrigation**

Modern methods of irrigation help us to use water economically. The main methods used are as follows:

**(i) Sprinkler System:** This system is more useful on the uneven land where sufficient water is not available. The perpendicular pipes, having rotating nozzles on top, are joined to the main pipeline at regular intervals. When water is allowed to flow through the main pipe under pressure with the help of a pump, it escapes from the rotating nozzles. It gets sprinkled on the crop as if it is raining. Sprinkler is very useful for lawns, coffee plantation and several other crops [Fig. 1.5 (a)].



**Fig. 1.5 (a) : Sprinkler system**

**(ii) Drip system :** In this system, the water falls drop by drop directly near the roots. So it is called drip system. It is the best technique for watering fruit plants, gardens and trees [Fig. 1.5(b)]. Water is not wasted at all. It is a boon in regions where availability of water is poor.



**Fig. 1.5 (b) : Drip System**

## 1.7 Protection from Weeds

Boojho and Paheli went to a nearby wheat field and saw that there were some other plants in the field, growing along with wheat plants.

Have these other plants been planted purposely?



In a field many other undesirable plants may grow naturally along with the crop. These undesirable plants are called **weeds**.

The removal of weeds is called weeding. Weeding is necessary since weeds compete with the crop plants for water, nutrients, space and light. Thus, they affect the growth of the crop. Some weeds interfere even in harvesting and may be poisonous for animals and human beings.

Farmers adopt many ways to remove weeds and control their growth. Tilling before sowing of crops helps in uprooting and killing of weeds, which may then dry up and get mixed with the soil. The best time for the removal of weeds is before they produce flowers and seeds. The manual removal includes physical removal of weeds by uprooting or cutting them close to the ground, from time to time. This is done with the help of a *khurpi*. A seed drill [Fig. 1.2(b)] is also used to uproot weeds.

Weeds are also controlled by using certain chemicals, called **weedicides**, like 2,4-D. These are sprayed in the fields to kill the weeds. They do not damage the crops. The weedicides are diluted with water to the extent required and sprayed in the fields with a sprayer. (Fig. 1.6).



**Fig. 1.6 :** Spraying weedicide

Do weedicides have any effect on the person handling the weedicide sprayer?



As already mentioned, the weedicides are sprayed during the vegetative growth of weeds before flowering and seed formation. Spraying of weedicides may affect the health of farmers. So they should use these chemicals very carefully. They should cover their nose and mouth with a piece of cloth during spraying of these chemicals.

## 1.8 Harvesting

Harvesting of a crop is an important task. The cutting of crop after it is mature is called **harvesting**. In harvesting, crops are pulled out or cut close to the ground. It usually takes 3 to 4 months for a cereal crop to mature.

Harvesting in our country is either done manually by sickle (Fig. 1.7) or by a machine called harvester. In the harvested crop, the grain seeds need to be separated



**Fig. 1.7 :**  
Sickle

from the chaff. This process is called **threshing**. This is carried out with the help of a machine called 'combine' which is in fact a harvester as well as a thresher (Fig. 1.8).



**Fig. 1.8 : Combine**



After harvesting, sometimes stubs are left in the field, which are burnt by farmers. Paheli is worried. She knows that it causes pollution. It may also catch fire and damage the crops lying in the fields.

Farmers with small holdings of land do the separation of grain and chaff by **winnnowing** (Fig. 1.9). You have already studied this in Class VI.



**Fig. 1.9 : Winnowing machine**

### Harvest Festivals

After three or four months of hard work there comes the day of the harvest. The sight of golden fields of standing crop, laden with grain, fills the hearts of farmers with joy and a sense of well-being. The efforts of the past season have borne fruit and it is time to relax and enjoy a little. The period of harvest is, thus, of great joy and happiness in all parts of India. Men and women celebrate it with great enthusiasm. Special festivals associated with the harvest season are Pongal, Baisakhi, Holi, Diwali, Nabanya and Bihu.

### 1.9 Storage

Storage of produce is an important task. If the harvested grains are to be kept for longer time, they should be safe from moisture, insects, rats and microorganisms. Harvested grains have more moisture. If freshly harvested grains (seeds) are stored without drying, they may get spoilt or attacked by organisms, making them unfit for use or for germination. Hence, before storing them, the grains are properly dried in the sun to reduce the moisture in them. This prevents the attack by insect pests, bacteria and fungi.



I saw my mother putting  
some dried neem leaves  
in an iron drum  
containing wheat.  
I wonder why?



**Fig. 1.10 (a) : Silos for storage of grains**



**Fig. 1.10 (b) : Storage of grains in gunny bags in granaries**

Farmers store grains in jute bags or metallic bins. However, large scale storage of grains is done in **silos** and **granaries** to protect them from pests like rats and insects [Fig. 1.10 (a) and (b)].

Dried neem leaves are used for storing food grains at home. For storing large quantities of grains in big godowns, specific chemical treatments are required to protect them from pests and microorganisms.

## 1.10 Food from Animals

### Activity 1.3

Make the following Table in your note book and complete it.

S.No.	Food	Sources
1.	Milk	Cow, Buffalo, She-goat, She-camel . . .
2.		
3.		
4.		

After completing this Table, you must have seen that, like plants, animals also provide us with different kinds of food. Many people living in the coastal areas consume fish as a major part of their diet. In the previous classes you have learnt about the food that we obtain from plants. We have just seen that the process of crop production involves a number of steps like selection of seeds, sowing, etc. Similarly, animals reared at home or in farms, have to be provided with proper food, shelter and care. When this is done on a large scale, it is called **animal husbandry**.



Fish is good for health.  
We get cod liver oil from fish  
which is rich in vitamin D.

## KEYWORDS

**AGRICULTURAL PRACTICES**

**ANIMAL HUSBANDRY**

**CROP**

**FERTILISER**

**GRANARIES**

**HARVESTING**

**IRRIGATION**

**KHARIF**

**MANURE**

**PLOUGH**

**RABI**

**SEEDS**

**SILO**

**SOWING**

**STORAGE**

**THRESHING**

**WEEDS**

**WEEDICIDE**

**WINNOWING**

## WHAT YOU HAVE LEARNT

- ⦿ In order to provide food to our growing population, we need to adopt certain agricultural practices.
- ⦿ Same kind of plants cultivated at a place constitute a crop.
- ⦿ In India, crops can be broadly categorised into two types based on seasons - rabi and kharif crops.
- ⦿ It is necessary to prepare soil by tilling and levelling. Ploughs and levellers are used for this purpose.
- ⦿ Sowing of seeds at appropriate depths and distances gives good yield. Good variety of seeds are sown after selection of healthy seeds. Sowing is done by seed drills.
- ⦿ Soil needs replenishment and enrichment through the use of organic manure and fertilisers. Use of chemical fertilisers has increased tremendously with the introduction of new crop varieties.
- ⦿ Supply of water to crops at appropriate intervals is called irrigation.
- ⦿ Weeding involves removal of unwanted and uncultivated plants called weeds.
- ⦿ Harvesting is the cutting of the mature crop manually or by machines.
- ⦿ Separation of the grains from the chaff is called threshing.
- ⦿ Proper storage of grains is necessary to protect them from pests and microorganisms.
- ⦿ Food is also obtained from animals for which animals are reared. This is called animal husbandry.

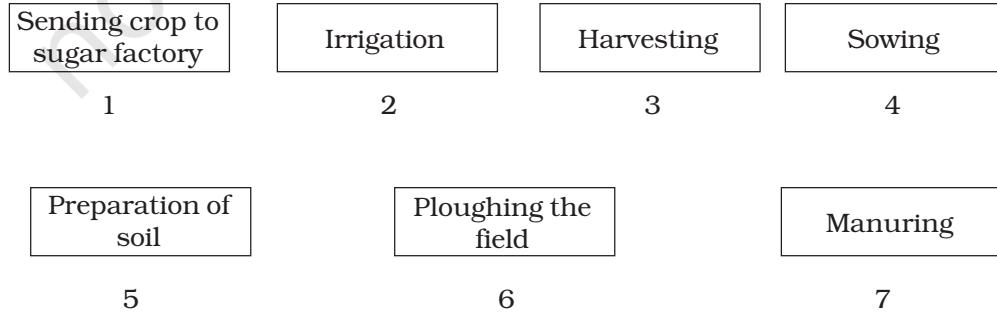
## Exercises

1. Select the correct word from the following list and fill in the blanks.

float, water, crop, nutrients, preparation

- (a) The same kind of plants grown and cultivated on a large scale at a place is called \_\_\_\_\_.
- (b) The first step before growing crops is \_\_\_\_\_ of the soil.

- (c) Damaged seeds would \_\_\_\_\_ on top of water.  
 (d) For growing a crop, sufficient sunlight and \_\_\_\_\_ and \_\_\_\_\_ from the soil are essential.
2. Match items in column **A** with those in column **B**.
- | <b>A</b>                   | <b>B</b>   |
|----------------------------|--|
| (i) Kharif crops           | (a) Food for cattle                                |
| (ii) Rabi crops            | (b) Urea and super phosphate                       |
| (iii) Chemical fertilisers | (c) Animal excreta, cow dung urine and plant waste |
| (iv) Organic manure        | (d) Wheat, gram, pea                               |
|                            | (e) Paddy and maize                                |
3. Give two examples of each.  
 (a) *Kharif* crop  
 (b) *Rabi* crop
4. Write a paragraph in your own words on each of the following.  
 (a) Preparation of soil      (b) Sowing  
 (c) Weeding      (d) Threshing
5. Explain how fertilisers are different from manure.
6. What is irrigation? Describe two methods of irrigation which conserve water.
7. If wheat is sown in the *kharif* season, what would happen? Discuss.
8. Explain how soil gets affected by the continuous plantation of crops in a field.
9. What are weeds? How can we control them?
10. Arrange the following boxes in proper order to make a flow chart of sugarcane crop production.



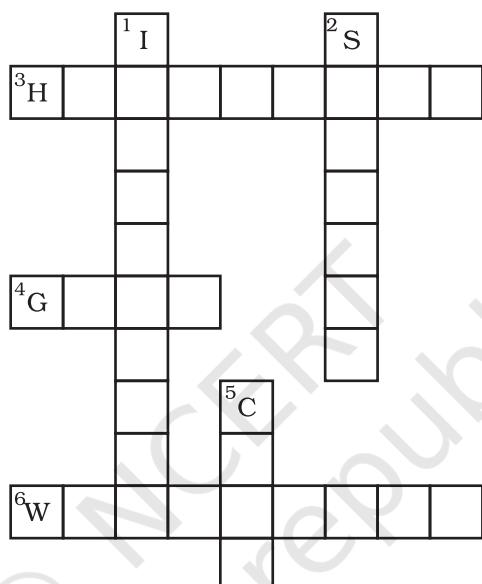
11. Complete the following word puzzle with the help of clues given below.

**Down**

1. Providing water to the crops.
2. Keeping crop grains for a long time under proper conditions.
5. Certain plants of the same kind grown on a large scale.

**Across**

3. A machine used for cutting the matured crop.
4. A *rabi* crop that is also one of the pulses.
6. A process of separating the grain from chaff.

**Extended Learning — Activities and Projects**

1. Sow some seeds in the soil and arrange to water them by drip irrigation. Observe daily.
  - (i) Do you think it can save water?
  - (ii) Note the changes in the seed.
2. Collect different types of seeds and put them in small bags. Label them.
3. Collect pictures of some other agricultural machines and paste them in a file. Write their names and uses.
4. Project Work  
Visit a farm, nursery or a garden nearby. Gather information about
  - (i) importance of seed selection.
  - (ii) method of irrigation.

- (iii) effect of extreme cold and extreme hot weather on the plants.
- (iv) effect of continuous rain on the plants.
- (v) fertilisers/manure used.

### **An Example for Field Trip Work**

Himanshu and his friends were very anxious and curious to go to Thikri village. They went to Shri Jiwan Patel's farmhouse. They had taken bags to collect some seeds and other things.

Himanshu : Sir *namaskar*, I am Himanshu. Here are my friends Mohan, David and Sabiha. We want some information about crops. Please guide us.

Shri Patel : *Namaskar* and welcome all of you. What are your queries?

Sabiha : When did you start this work and what are the main crops that you grow?

Shri Patel : About 75 years ago, my grandfather started this work. The main crops that we grow are wheat, gram, soyabean and *moong*.

David : Sir, can you tell us the difference between traditional and modern agricultural practices?

Shri Patel : Earlier we used traditional tools like sickle, bullock plough, trowel, etc., and depended on rain water for irrigation. But now we use modern methods of irrigation. We use implements like tractors, cultivators, seed drill and harvester. We get good quality seeds. We carry out soil testing and use manure and fertilisers. New information about agriculture is obtained through radio, T.V. and other sources. As a result we are able to get good crops on a large scale. This year we got 9 to 11 quintals of gram crop/acre and 20 to 25 quintals of wheat/acre. In my opinion awareness of new technology is important for better crop yield.

Mohan : Sabiha, come here and see some earthworms. Are they helpful to the farmers?

Sabiha : Oh Mohan! we learnt about it in Class VI.

Shri Patel : Earthworms turn the soil and loosen it for proper aeration, so they help the farmer.

David : Can we have some seeds of the crops you grow here?

[They put some seeds, fertilisers and soil sample in the bags.]

Himanshu : Sir, we are thankful to you for making this visit pleasant and for providing useful information.



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You have seen several kinds of plants and animals. However, there are other living organisms around us which we normally cannot see. These are called **microorganisms** or **microbes**. For example, you might have observed that during the rainy season moist bread gets spoilt and its surface gets covered with greyish white patches. Observe these patches through a magnifying glass. You will see tiny, black rounded structures. Do you know what these structures are and where do these come from?

## 2.1 Microorganisms

### Activity 2.1

Collect some moist soil from the field in a beaker and add water to it. After the soil particles have settled down, observe a drop of water from the beaker under a microscope. What do you see ?

### Activity 2.2

Take a few drops of water from a pond. Spread on a glass slide and observe through a microscope.

Do you find tiny organisms moving around?

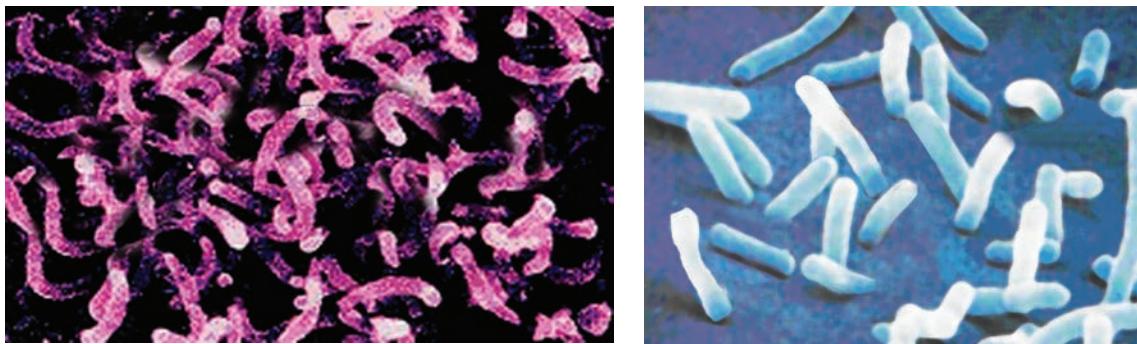
These observations show that water and soil are full of tiny organisms, though not all of them fall into the category of microbes. These microorganisms or microbes are so small in size that they cannot be seen with the unaided eye. Some of these, such as the fungus that grows on bread, can be seen with a magnifying glass. Others cannot be seen without the help of a microscope. That is why these are called microorganisms or microbes.

Microorganisms are classified into four major groups. These groups are **bacteria**, **fungi**, **protozoa** and some **algae**. Some of these common microorganisms are shown in Figs. 2.1 - 2.4.

**Viruses** are also microscopic but are different from other microorganisms. They, however, reproduce only inside the cells of the host organism, which may be a bacterium, plant or animal. Some of the viruses are shown in Fig. 2.5. Common ailments like cold, influenza (flu) and most coughs are caused by viruses. Serious diseases like polio and chicken pox are also caused by viruses.

Diseases like dysentery and malaria are caused by protozoa(protozoans) whereas typhoid and tuberculosis (TB) are bacterial diseases.

You have learnt about some of these microorganisms in Classes VI and VII.

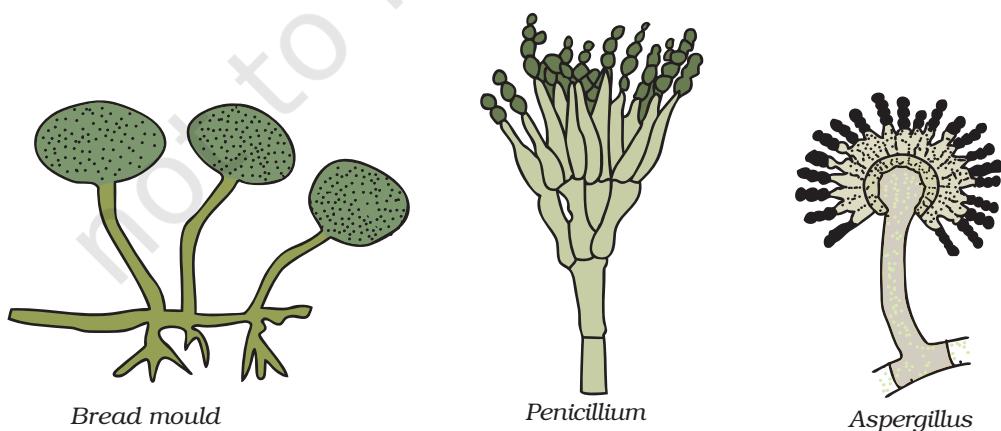


**Fig. 2.1:** Bacteria

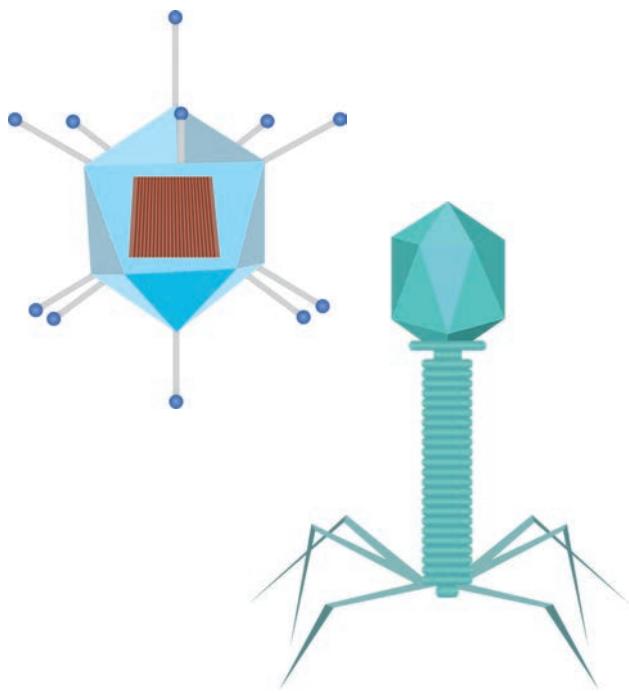


**Fig. 2.2 :** Algae

**Fig. 2.3 :** Protozoa



**Fig. 2.4 :** Fungi



**Fig. 2.5 : Viruses**

## 2.2 Where do Microorganisms Live?

Microorganisms may be single-celled like bacteria, some algae and protozoa, or multicellular, such as many algae and fungi. They live in all types of environment, ranging from ice cold climate to hot springs; and deserts to marshy lands. They are also found inside the bodies of animals including humans. Some microorganisms grow on other organisms while others exist freely.

## 2.3 Microorganisms and Us

Microorganisms play an important role in our lives. Some of them are beneficial in many ways whereas some others are harmful and cause diseases. Let us study about them in detail.

### Friendly Microorganisms

Microorganisms are used for various purposes. They are used in the preparation of curd, bread and cake.

Microorganisms have been used for the production of alcohol since ages.

They are also used in cleaning up of the environment. For example, the organic wastes (vegetable peels, remains of animals, faeces, etc.) are broken down into harmless and usable substances by bacteria. Recall that bacteria are also used in the preparation of medicines. In agriculture they are used to increase **soil fertility** by fixing nitrogen.

### Making of Curd and Bread

You have learnt in Class VII that milk is turned into curd by bacteria.



I saw that my mother added a little curd to warm milk to set curd for the next day. I wonder why?

Curd contains several micro-organisms. Of these, the bacterium, *Lactobacillus* promotes the formation of curd. It multiplies in milk and converts it into curd. Bacteria are also involved in the making of cheese, pickles and many other food items. An important ingredient of *rava (sooji) idlis* and *bhaturas* is curd. Can you guess why? Bacteria and yeast are also helpful for fermentation of rice idlis and dosa batter.

### Activity 2.3

Take  $\frac{1}{2}$  kg flour (*atta* or *maida*), add some sugar and mix with warm water. Add a small amount of yeast powder and knead to make a soft dough. What do you observe after two hours? Did you find the dough rising?



*Maida with yeast powder*



*Raised maida*

**Fig. 2.6**

Yeast reproduces rapidly and produces carbon dioxide during respiration. Bubbles of the gas fill the dough and increase its volume (Fig. 2.6). This is the basis of the use of yeast in the baking industry for making breads, pastries and cakes.

### Commercial Use of Microorganisms

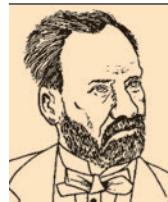
Microorganisms are used for the large scale production of alcohol, wine and acetic acid (vinegar). Yeast is used for commercial production of alcohol and wine. For this purpose yeast is grown on natural sugars present in grains like barley, wheat, rice, crushed fruit juices, etc.

### Activity 2.4

Take a 500 mL beaker filled upto  $\frac{3}{4}$  with water. Dissolve 2-3 teaspoons of sugar in it. Add half a

spoon of yeast powder to the sugar solution. Keep it covered in a warm place for 4-5 hours. Now smell the solution. Can you get a smell?

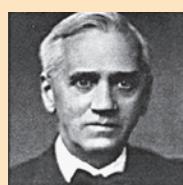
This is the smell of alcohol as sugar has been converted into alcohol by yeast. This process of conversion of sugar into alcohol is known as **fermentation**.



Louis Pasteur  
discovered  
fermentation  
in 1857.

### Medicinal Use of Microorganisms

Whenever you fall ill the doctor may give you some antibiotic tablets, capsules or injections such as of penicillin. The source of these medicines is microorganisms. These medicines kill or stop the growth of the disease-causing microorganisms. Such medicines are called **antibiotics**. These days a number of antibiotics are being produced from bacteria and fungi. Streptomycin, tetracycline and erythromycin are some of the



In 1929, Alexander Fleming was working on a culture of disease-causing bacteria. Suddenly he found the spores of a little green mould in one of his culture plates. He observed that the presence of mould prevented the growth of bacteria. In fact, it also killed many of these bacteria. From this the mould penicillin was prepared.

commonly known antibiotics which are made from fungi and bacteria. The antibiotics are manufactured by growing specific microorganisms and are used to cure a variety of diseases.

Antibiotics are even mixed with the feed of livestock and poultry to check microbial infection in animals. They are also used to control many plant diseases.

It is important to remember that antibiotics should be taken only on the advice of a qualified doctor. Also you must complete the course prescribed by the doctor. If you take antibiotics when not needed or in wrong doses, it may make the drug less effective when you might need it in future. Also antibiotics taken unnecessarily may kill the beneficial bacteria in the body. Antibiotics, however, are not effective against cold and flu as these are caused by viruses.

## Vaccine



Why are children/infants given vaccination?

When a disease-carrying microbe enters our body, the body produces **antibodies** to fight the invader. The body also remembers how to fight the microbe if it enters again. If dead or weakened microbes are introduced into a healthy body, the body fights and kills the invading bacteria by producing suitable antibodies. The antibodies remain in the body and we are protected

from the disease-causing microbes for ever. This is how a vaccine works. Several diseases, including cholera, tuberculosis, smallpox and hepatitis can be prevented by vaccination.



Edward Jenner discovered the vaccine for smallpox in 1798.

In your childhood, you must have been given injections to protect yourself against several diseases. Can you prepare a list of these diseases? You may take help from your parents.

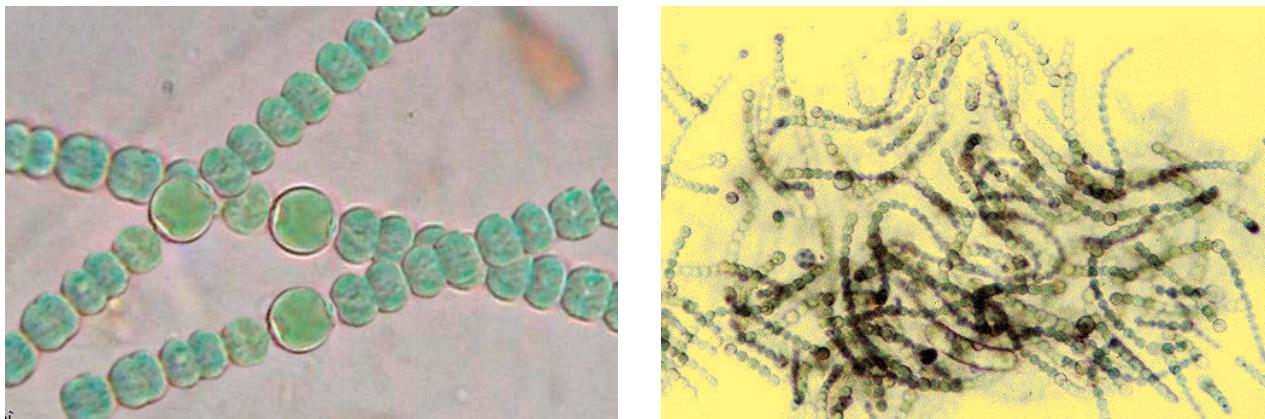
It is essential to protect all children against these diseases. Necessary vaccines are available in the nearby hospitals. You might have seen the advertisement on TV and newspapers regarding protection of children against polio under the Pulse Polio Programme. Polio drops given to children are actually a vaccine.

A worldwide campaign against smallpox has finally led to its eradication from most parts of the world.

These days vaccines are made on a large scale from microorganisms to protect humans and other animals from several diseases.

## Increasing Soil Fertility

Some bacteria (Fig. 2.7) are able to fix nitrogen from the atmosphere to enrich soil with nitrogen and increase its fertility. These microbes are commonly called biological nitrogen fixers.



**Fig. 2.7 : The Nitrogen fixing cyanobacteria (blue green algae)**

### Cleaning the Environment

Boojho and Paheli had observed the school gardener making manure. Along with their friends, they collected wastes of plants, vegetables and fruits from nearby houses and gardens. They put them in a pit meant for waste disposal. After some time, it decomposed and got converted to manure. Boojho and Paheli wanted to know how this had happened.

### Activity 2.5

Take two pots and fill each pot half with soil. Mark them A and B. Put plant waste in pot A and things like polythene bags, empty glass bottles and broken plastic toys in pot B. Put the pots aside. Observe them after 3-4 weeks.

Do you find any difference in the contents of the two pots? If so, what is the difference? You will find that plant waste in pot A, has been decomposed. How did this happen? The plant waste has been converted into manure by the action of microbes. The nutrients

released in the process can be used by the plants again.

Did you notice that in pot B, the polythene bags, empty glasses, bottles and broken toy parts did not undergo any such change? The microbes could not 'act' on them and convert them into manure.

You often see large amounts of dead organic matter in the form of decaying plants and sometimes dead animals on the ground. You find that they disappear after some time. This is because the microorganisms decompose dead organic waste of plants and animals converting them into simple substances. These substances are again used by other plants and animals. Thus, microorganisms can be used to degrade the harmful and smelly substances and thereby clean up the environment.

### 2.4 Harmful Microorganisms

Microorganisms are harmful in many ways. Some of the microorganisms cause diseases in human beings, plants and animals. Such disease-causing

microorganisms are called **pathogens**. Some microorganisms spoil food, clothing and leather. Let us study more about their harmful activities.

### Disease causing Microorganisms in Humans

Pathogens enter our body through the air we breathe, the water we drink or the food we eat. They can also get transmitted by direct contact with an infected person or carried by an animal. Microbial diseases that can spread from an infected person to a healthy person through air, water, food or physical contact are called **communicable diseases**. Examples of such diseases include cholera, common cold, chicken pox and tuberculosis.

When a person suffering from common cold sneezes, fine droplets of moisture carrying thousands of viruses are spread in the air. The virus may enter the body of a healthy person while breathing and cause infection.



Then how do you prevent the spread of communicable diseases?

We should keep a handkerchief on the nose and mouth while sneezing. It is better to keep a distance from infected persons.



There are some insects and animals which act as **carriers** of disease-causing microbes. Housefly is one such carrier. The flies sit on the garbage and animal excreta. Pathogens stick to their bodies. When these flies sit on uncovered food they may transfer the pathogens. Whoever eats the contaminated food is likely to get sick. So, it is advisable to always keep food covered. Avoid consuming uncovered items of food. Another example of a carrier is the female *Anopheles* mosquito (Fig. 2.8), which carries the parasite of malaria (Plasmodium). Female *Aedes* mosquito acts as carrier of dengue virus. How can we control the spread of malaria or dengue?

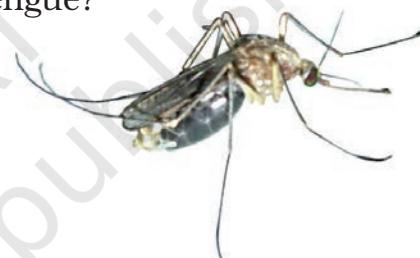


Fig. 2.8 : Female *Anopheles* mosquito



Why does the teacher keep telling us not to let water collect anywhere in the neighbourhood?

All mosquitoes breed in water. Hence, one should not let water collect anywhere, in coolers, tyres, flower pot, etc. By keeping the surroundings clean and dry we can prevent mosquitoes from breeding. Try to make a list of measures which help to avoid the spread of malaria.

**Table 2.1: Some Common Human Diseases caused by Microorganisms**

Human Disease	Causative Microorganism	Mode of Transmission	Preventive Measures (General)
Tuberculosis	Bacteria	Air	Keep the patient in complete isolation. Keep the personal belongings of the patient away from those of the others. Vaccination to be given at suitable age.
Measles	Virus	Air	
Chicken Pox	Virus	Air/Contact	
Polio	Virus	Air/Water	
Cholera	Bacteria	Water/Food	Maintain personal hygiene and good sanitary habits. Consume properly cooked food and boiled drinking water. Vaccination.
Typhoid	Bacteria	Water	
Hepatitis A	Virus	Water	Drink boiled drinking water. Vaccination.
Malaria	Protozoa	Mosquito	Use mosquito net and repellents. Spray insecticides and control breeding of mosquitoes by not allowing water to collect in the surroundings.

Some of the common diseases affecting humans, their mode of transmission and few general methods of prevention are shown in Table 2.1.

#### Disease causing Microorganisms in Animals

Several microorganisms not only cause diseases in humans and plants, but also



Robert Koch (1876) discovered the bacterium (*Bacillus anthracis*) which causes anthrax disease.

in other animals. For example, anthrax is a dangerous human and cattle disease caused by a bacterium. Foot and mouth disease of cattle is caused by a virus.

#### Disease causing Microorganisms in Plants

Several microorganisms cause diseases in plants like wheat, rice, potato, sugarcane, orange, apple and others. The diseases reduce the yield of crops. See Table 2.2 for some such plant diseases. They can be controlled by the

**Table 2.2: Some Common Plant Diseases caused by Microorganisms**

Plant Diseases	Micro-organism	Mode of Transmission
Citrus canker	Bacteria	Air
Rust of wheat	Fungi	Air, seeds
Yellow vein mosaic of <i>bhindi</i> (Okra)	Virus	Insect

use of certain chemicals which kill the microbes.

### Food Poisoning

Boojho was invited by his friend to a party and he ate a variety of foodstuff. On reaching home he started vomiting and had to be taken to a hospital. The doctor said that this condition could be due to food poisoning.



Paheli wonders how food can become a 'poison'.

Food poisoning could be due to the consumption of food spoilt by some microorganisms. Microorganisms that grow on our food sometimes produce toxic substances. These

make the food poisonous causing serious illness and even death. So, it is very important that we preserve food to prevent it from being spoilt.

### 2.5 Food Preservation

In Chapter 1, we have learnt about the methods used to preserve and store food grains. How do we preserve cooked food at home? You know that bread left unused under moist conditions is attacked by fungus. Microorganisms spoil our food. Spoiled food emits bad smell and has a bad taste and changed colour. Is spoiling of food a chemical reaction?

Paheli bought some mangoes but she could not eat them for a few days. Later she found that they were spoilt and rotten. But she knows that the mango pickle her grandmother makes does not spoil for a long time. She is confused.

Let us study the common methods of preserving food in our homes. We have to save it from the attack of microorganisms.

### Chemical Method

Salts and edible oils are the common chemicals generally used to check the growth of microorganisms. Therefore they are called **preservatives**. We add salt or acid preservatives to pickles to prevent the attack of microbes. Sodium benzoate and sodium metabisulphite are common preservatives. These are also used in jams and squashes to check their spoilage.

### Preservation by Common Salt

Common salt has been used to preserve meat and fish for ages. Meat and fish are covered with dry salt to check the growth of bacteria. Salting is also used to preserve *amla*, raw mangoes, tamarind, etc.

### Preservation by Sugar

Jams, jellies and squashes are preserved by sugar. Sugar reduces the moisture content which inhibits the growth of bacteria which spoil food.

### Preservation by Oil and Vinegar

Use of oil and vinegar prevents spoilage of pickles because bacteria cannot live in such an environment. Vegetables, fruits, fish and meat are often preserved by this method.

### Heat and Cold Treatments

You must have observed your mother boiling milk before it is stored or used. Boiling kills many microorganisms.

Similarly, we keep our food in the refrigerator. Low temperature inhibits the growth of microbes.



Why does the milk that comes in packets not spoil? My mother told me that the milk is 'pasteurised'. What is pasteurisation?

Pasteurised milk can be consumed without boiling as it is free from harmful microbes. The milk is heated to about 70°C for 15 to 30 seconds and then suddenly chilled and stored. By doing so, it prevents the growth of microbes. This process was discovered by Louis Pasteur. It is called **pasteurisation**.

### Storage and Packing

These days dry fruits and even vegetables are sold in sealed air tight packets to prevent the attack of microbes.

## 2.6 Nitrogen Fixation

You have learnt about the bacterium *Rhizobium* in Classes VI and VII. It is involved in the fixation of nitrogen in leguminous plants (pulses). Recall that *Rhizobium* lives in the root nodules of leguminous plants (Fig. 2.9), such as beans and peas, with which it has a symbiotic relationship. Sometimes nitrogen gets fixed through the action of lightning. But you know that the amount of nitrogen in the atmosphere remains constant. You may wonder how? Let us understand this in the next section.



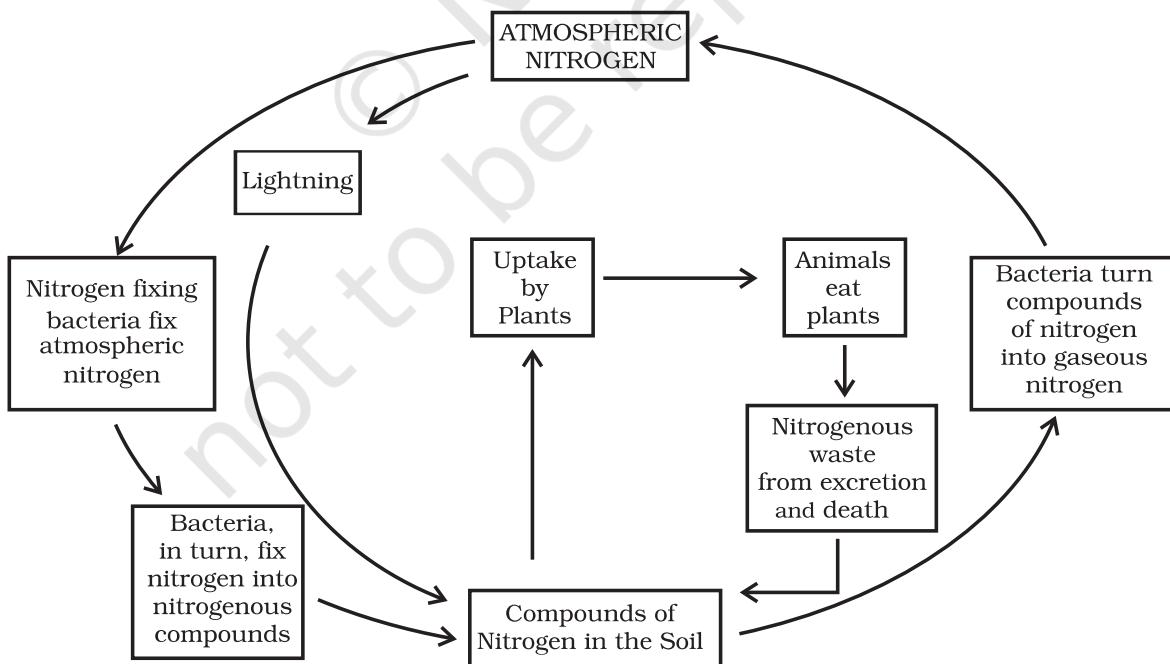
**Fig. 2.9 :** Roots of a leguminous plant with root nodules

## 2.7 Nitrogen cycle

Our atmosphere has 78% nitrogen gas. Nitrogen is one of the essential constituents of all living organisms as part of proteins, chlorophyll, nucleic acids and vitamins. The atmospheric

nitrogen cannot be taken directly by plants and animals. Certain bacteria and blue green algae present in the soil fix nitrogen from the atmosphere and convert it into compounds of nitrogen. Once nitrogen is converted into these usable compounds, it can be utilised by plants from the soil through their root system. Nitrogen is then used for the synthesis of plant proteins and other compounds. Animals feeding on plants get these proteins and other nitrogen compounds (Fig. 2.10).

When plants and animals die, bacteria and fungi present in the soil convert the nitrogenous wastes into nitrogenous compounds to be used by plants again. Certain other bacteria convert some part of them to nitrogen gas which goes back into the atmosphere. As a result, the percentage of nitrogen in the atmosphere remains more or less constant.



**Fig. 2.10 :** Nitrogen cycle

**KEYWORDS**

- ALGAE**
- ANTIBIOTICS**
- ANTIBODIES**
- BACTERIA**
- CARRIER**
- COMMUNICABLE DISEASES**
- FERMENTATION**
- FUNGI**
- LACTOBACILLUS**
- MICROORGANISM**
- NITROGEN CYCLE**
- NITROGEN FIXATION**
- PASTEURISATION**
- PATHOGEN**
- PRESERVATION**
- PROTOZOA**
- RHIZOBIUM**
- VACCINE**
- VIRUS**
- YEAST**

**WHAT YOU HAVE LEARNT**

- ⦿ Microorganisms are too small and are not visible to the unaided eye.
- ⦿ They can live in all kinds of environment, ranging from ice cold climate to hot springs and deserts to marshy lands.
- ⦿ Microorganisms are found in air, water and in the bodies of plants and animals.
- ⦿ They may be unicellular or multicellular.
- ⦿ Microorganisms include bacteria, fungi, protozoa and some algae. Viruses, though different from the above mentioned living organisms, are considered microbes.
- ⦿ Viruses are quite different from other microorganisms. They reproduce only inside the host organism: bacterium, plant or animal cell.
- ⦿ Some microorganisms are useful for commercial production of medicines and alcohol.
- ⦿ Some microorganisms decompose the organic waste and dead plants and animals into simple substances and clean up the environment.
- ⦿ Protozoans cause serious diseases like dysentery and malaria.
- ⦿ Some of the microorganisms grow on our food and cause food poisoning.
- ⦿ Some microorganisms reside in the root nodules of leguminous plants. They can fix nitrogen from air into soil and increase the soil fertility.
- ⦿ Some bacteria present in the soil fix nitrogen from the atmosphere and convert into nitrogenous compounds.
- ⦿ Certain bacteria convert compounds of nitrogen present in the soil into nitrogen gas which is released to the atmosphere.

## Exercises

1. Fill in the blanks.
  - (a) Microorganisms can be seen with the help of a \_\_\_\_\_.
  - (b) Blue green algae fix \_\_\_\_\_ directly from air and enhance fertility of soil.
  - (c) Alcohol is produced with the help of \_\_\_\_\_.
  - (d) Cholera is caused by \_\_\_\_\_.
2. Tick the correct answer.
  - (a) Yeast is used in the production of
    - (i) sugar
    - (ii) alcohol
    - (iii) hydrochloric acid
    - (iv) oxygen
  - (b) The following is an antibiotic
    - (i) Sodium bicarbonate
    - (ii) Streptomycin
    - (iii) Alcohol
    - (iv) Yeast
  - (c) Carrier of malaria-causing protozoan is
    - (i) female *Anopheles* mosquito
    - (ii) cockroach
    - (iii) housefly
    - (iv) butterfly
  - (d) The most common carrier of communicable diseases is
    - (i) ant
    - (ii) housefly
    - (iii) dragonfly
    - (iv) spider
  - (e) The bread or *idli* dough rises because of
    - (i) heat
    - (ii) grinding
    - (iii) growth of yeast cells
    - (iv) kneading
  - (f) The process of conversion of sugar into alcohol is called
    - (i) nitrogen fixation
    - (ii) moulding
    - (iii) fermentation
    - (iv) infection
3. Match the organisms in Column **A** with their action in Column **B**.

A	B
(i) Bacteria	(a) Fixing nitrogen
(ii) <i>Rhizobium</i>	(b) Setting of curd
(iii) <i>Lactobacillus</i>	(c) Baking of bread
(iv) Yeast	(d) Causing malaria
(v) A protozoan	(e) Causing cholera
(vi) A virus	(f) Causing AIDS
	(g) Producing antibodies
4. Can microorganisms be seen with the naked eye? If not, how can they be seen?

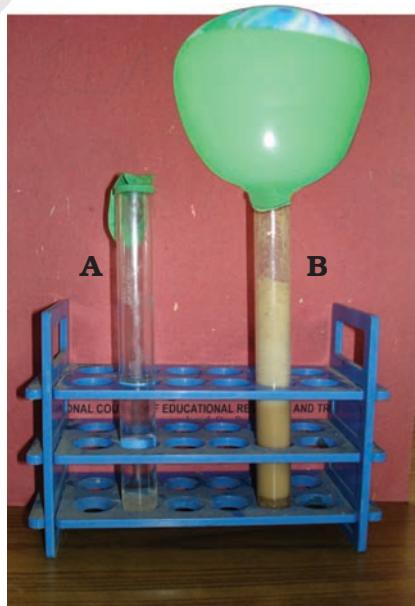
5. What are the major groups of microorganisms?
6. Name the microorganisms which can fix atmospheric nitrogen in the soil.
7. Write 10 lines on the usefulness of microorganisms in our lives.
8. Write a short paragraph on the harmful effects of microorganisms.
9. What are antibiotics? What precautions must be taken while taking antibiotics?

## Extended Learning — Activities and Projects

1. Pull out a gram or bean plant from the field. Observe its roots. You will find round structures called root nodules on the roots. Draw a diagram of the root and show the root nodules.
2. Collect the labels from the bottles of jams and jellies. Write down the list of contents printed on the labels.
3. Visit a doctor. Find out why antibiotics should not be overused. Prepare a short report.
4. Project : Requirements – 2 test tubes, marker pen, sugar, yeast powder, 2 balloons and lime water.

Take two test tubes and mark them A and B. Clamp these tubes in a stand and fill them with water leaving some space at the top. Put two spoonfuls of sugar in each of the test tubes. Add a spoonful of yeast in test tube B. Inflate the two balloons incompletely. Now tie the balloons on the mouths of each test tube. Keep them in a warm place, away from sunlight. Watch the setup every day for next 3-4 days. Record your observations and think of an explanation.

Now take another test tube filled 1/4 with lime water. Remove the balloon from test tube B in such a manner that gas inside the balloon does not escape. Fit the balloon on the test tube and shake well. Observe and explain.



### Did You Know?

Bacteria have lived on the earth for much longer than human beings. They are such hardy organisms that they can live under extreme conditions. They have been found living in boiling mudpots and extremely cold icy waters. They have been found in lakes of caustic soda and in pools of concentrated sulphuric acid. They can survive at depths of several kilometres. They probably can survive in space, too. A kind of bacterium was recovered from a camera which stood on the moon for two years. There is probably no environment in which bacteria cannot survive.



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We saw in Class VII that Paheli and Boojho had visited the forest along with Professor Ahmad and Tibu. They were eager to share their experiences with their classmates. Other children in the class were also eager to share their experiences as some of them had visited Bharatpur Sanctuary. Some others had heard about Kaziranga National Park, Lockchao Wildlife Sanctuary, Great Nicobar Biosphere Reserve and Tiger Reserve, etc.



What is the purpose of making national parks, wildlife sanctuaries and biosphere reserves?

### 5.1 Deforestation and Its Causes

A great variety of plants and animals exist on earth. They are essential for the well-being and survival of mankind. Today, a major threat to survival of these organisms is **deforestation**. We know that deforestation means clearing of forests and using that land for other purposes. Trees in the forest are cut for some of the purposes mentioned below:

- Procuring land for cultivation.
- Building houses and factories.
- Making furniture or using wood as fuel.

Some natural causes of deforestation are forest fires and severe droughts.

#### Activity 5.1

Add more causes of deforestation to your list and classify them into natural and man-made.

### 5.2 Consequences of Deforestation

Paheli and Boojho recalled the consequences of deforestation. They remembered that deforestation increases the temperature and pollution level on the earth. It increases the level of carbon dioxide in the atmosphere. Ground water level also gets lowered. They know that deforestation disturbs the balance in nature. They were told by Professor Ahmad that if cutting of trees continues, rainfall and the fertility of the soil will



How does deforestation reduce rainfall on the one hand and lead to floods on the other?

decrease. Moreover, there will be increased chances of natural calamities such as floods and droughts.

Recall that plants need carbon dioxide for photosynthesis. Fewer trees would mean that less carbon dioxide will be used up resulting in its increased

amount in the atmosphere. This will lead to global warming as carbon dioxide traps the heat rays reflected by the earth. The increase in temperature on the earth disturbs the water cycle and may reduce rainfall. This could cause **droughts**.

Deforestation is a major cause which leads to the change in soil properties. Physical properties of the soil get affected by plantation and vegetation. Fewer trees result in more soil erosion. Removal of the top layer of the soil exposes the lower, hard and rocky layers. This soil has less humus and is less fertile. Gradually the fertile land gets converted into deserts. It is called **desertification**.

Deforestation also leads to a decrease in the water holding capacity of the soil. The movement of water from the soil surface into the ground (infiltration rate) is reduced. So, there are floods. The other properties of the soil like nutrient content, texture etc., also change because of deforestation.

We have studied in Class VII that we get many products from forests. List these products. Will we face shortage of these products if we continue cutting trees?

### Activity 5.2

Animal life is also affected by deforestation. How? List the points and discuss them in your class.

## 5.3 Conservation of Forest and Wildlife

Having become aware of the effects of deforestation, Paheli and Boojho are worried. They go to Professor Ahmad and ask him how forests and wildlife can be saved.

Biosphere is that part of the earth in which living organisms exist or which supports life. Biological diversity or biodiversity, refers to the variety of organisms existing on the earth, their interrelationships and their relationship with the environment.

Professor Ahmad organises a visit to a biosphere reserve for Paheli, Boojho and their classmates. He selects a place named Pachmarhi Biosphere Reserve. He knows that the plants and animals found here are similar to those of the upper Himalayan peaks and to those belonging to the lower western ghats. Professor Ahmad believes that the biodiversity found here is unique. He requests Madhavji, a forest employee, to guide the children inside the biosphere reserve. He explains that preserving areas of such biological importance make them a part of our national heritage.

Madhavji explains to the children that apart from our personal efforts and efforts of the society, government

To protect our flora and fauna and their habitats, **protected areas** called wildlife sanctuaries, national parks and biosphere reserves have been earmarked. Plantation, cultivation, grazing, felling trees, hunting and poaching are prohibited there.

**Wildlife Sanctuary** : Areas where animals are protected from any disturbance to them and their habitat.

**National Park** : Areas reserved for wild life where they can freely use the habitats and natural resources.

**Biosphere Reserve** : Large areas of protected land for conservation of wild life, plant and animal resources and traditional life of the tribals living in the area.

agencies also take care of the forests and animals. The government lays down rules, methods and policies to protect and conserve them. Wildlife sanctuaries, national parks, biosphere reserves etc., are protected areas for conservation of plants and animals present in that area.

### Activity 5.3

Find out the number of national parks, wildlife sanctuaries and biosphere reserves in your district, state and country. Record in Table 5.1. Show these areas in an outline map of your state and India.

### 5.4 Biosphere Reserve

Children along with Professor Ahmad and Madhavji enter the biosphere reserve area. Madhavji explains that **biosphere reserves** are the areas meant for conservation of biodiversity. As you are aware that biodiversity is the variety of plants, animals and microorganisms generally found in an area. The biosphere reserves help to maintain the biodiversity and culture of that area. A biosphere reserve may also contain other protected areas in it. The Pachmarhi Biosphere Reserve consists of one national park named Satpura and two wildlife sanctuaries named Bori and Pachmarhi (Fig. 5.1).

**Table 5.1 : Protected Areas for Conservation**

Protected Areas —	National Park	Wildlife Sanctuary	Biosphere Reserve
In my district			
In my state			
In my country			



**Fig. 5.1 : Pachmarhi Biosphere Reserve**

## Activity 5.4

List the factors disturbing the biodiversity of your area. Some of these factors and human activities may disturb the biodiversity unknowingly. List these human activities. How can these be checked? Discuss in your class and write a brief report in your notebook.

## 5.5 Flora and Fauna

As the children walk around the biosphere reserve they appreciate the

green wealth of the forest. They are very happy to see tall teak trees and animals inside the forest. Suddenly, Paheli finds a rabbit and wants to catch it. She starts running after it. Professor Ahmad stops her. He explains that animals are comfortable and happy in their own habitat. We should not disturb them. Madhavji explains that some animals and plants typically belong to a particular area. The plants and animals found in a particular area are termed **flora** and **fauna** respectively of that area.

*Sal*, teak, mango, *jamun*, silver ferns, *arjun*, etc., are the flora and *chinkara*, blue-bull, barking deer, *cheetal*, leopard, wild dog, wolf, etc. are examples of the fauna of the Pachmarhi Biosphere Reserve (Fig. 5.2).



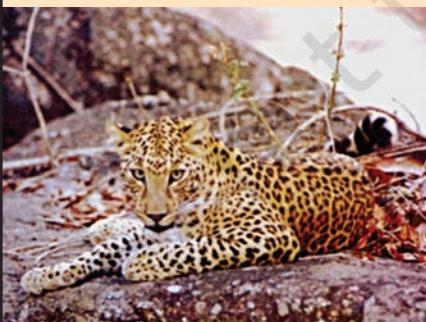
(a)



(b)



(c)



(d)



(e)



(f)

Fig. 5.2 : (a) Wild dog (b) Cheetal (c) Wolf (d) Leopard (e) Fern (f) Jamun tree

## Activity 5.5

Try to identify the flora and fauna of your area and list them.

## 5.6 Endemic Species

Soon the group quietly enters the deep forest. Children are surprised to see a very big squirrel. This squirrel has a big fluffy tail. They are very curious to know about it. Madhavji tells them that this is known as the giant squirrel and is endemic to this area.

**Endemic species** are those species of plants and animals which are found exclusively in a particular area. They are not naturally found anywhere else. A particular type of animal or plant may be endemic to a zone, a state or a country.

Madhavji shows *sal* and wild mango (Fig. 5.3 (a)) as two examples of the

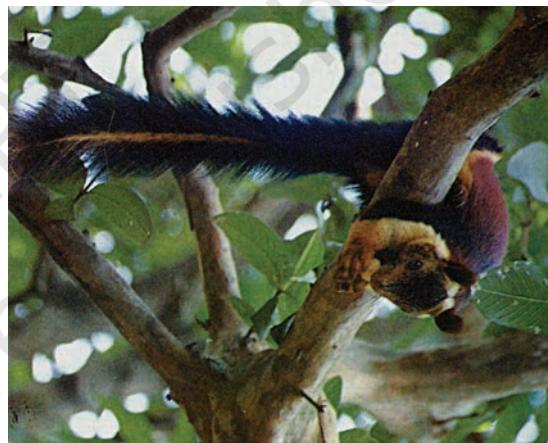


**Fig. 5.3 (a) : Wild Mango**



I have heard that some of the endemic species may vanish.  
Is it true?

endemic flora of the Pachmarhi Biosphere Reserve. Bison, Indian giant squirrel [Fig. 5.3 (b)] and flying squirrel are endemic fauna of this area. Professor Ahmad explains that the destruction of their habitat, increasing population and introduction of new species may affect the natural habitat of endemic species and endanger their existence.



**Fig. 5.3 (b) : Giant squirrel**

**Species** is a group of population which are capable of interbreeding. This means that the members of a species can reproduce fertile offspring only with the members of their own species and not with members of other species. Members of a species have common characteristics.

## Activity 5.6

Find out the endemic plants and animals of the region where you live.

## 5.7 Wildlife Sanctuary

Soon Paheli sees a board with 'Pachmarhi Wildlife Sanctuary' written on it.

Professor Ahmad explains that killing (poaching) or capturing animals in general is strictly prohibited and punishable by law in all such places. **Wildlife Sanctuaries** like reserve forests provide protection and suitable living conditions to wild animals. He also tells them that people living in wildlife sanctuaries are allowed to do certain activities such as grazing by their livestock, collecting medicinal plants, firewood, etc.

Some of the threatened wild animals like black buck, white eyed buck, elephant, golden cat, pink headed duck, *gharial*, marsh crocodile, python, rhinoceros, etc., are protected and preserved in our wild life sanctuaries. Indian sanctuaries have unique landscapes—broad level forests, mountain forests and bush lands in deltas of big rivers.

It is a pity that even protected forests are not safe because people living in the neighbourhood encroach upon them and destroy them.

Children are reminded of their visit to the zoo. They recall that zoos are also places where animals receive protection.



What is the difference between a zoo and a wildlife sanctuary?

### Activity 5.7

Visit a nearby zoo. Observe the conditions provided to the animals. Were they suitable for the animals? Can animals live in artificial setting

instead of their natural habitat? In your opinion, will the animals be comfortable in a zoo or in their natural habitat?

## 5.8 National Park

On the roadside there was another board on which was written 'Satpura National Park'.

Children are now eager to go there. Madhavji tells them that these reserves are large and diverse enough to protect whole sets of ecosystems. They preserve flora, fauna, landscape and historic objects of an area. Satpura National Park is the first Reserve Forest of India. The finest Indian teak is found in this forest. There are more than one hundred National Parks in India.

Rock shelters are also found inside the Satpura National Park. These are evidences of prehistoric human life in these jungles. These give us an idea of the life of primitive people.

Rock paintings are found in these shelters. A total of 55 rock shelters have been identified in Pachmarhi Biosphere Reserve.

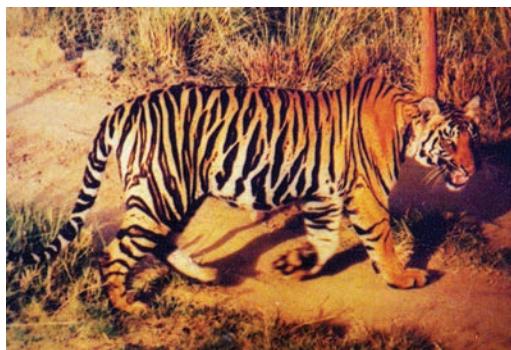
Figures of animals and men fighting, hunting, dancing and playing musical instruments are depicted in these paintings. Many tribals still live in the area.

As children move ahead, they see a board with 'Satpura Tiger Reserve' written on it. Madhavji explains that **Project Tiger** was launched by the government to protect the tigers in the country. The objective of this project was to ensure the survival and maintenance of the tiger population in the country.



Are tigers still found in this forest? I hope I can see a tiger!

Tiger (Fig. 5.4) is one of the many species which are slowly disappearing from our forests. But, the Satpura Tiger Reserve is unique in the sense that a significant increase in the population of tigers has been seen here. Once upon a time, animals like lions, elephants, wild



**Fig. 5.4 : Tiger**

buffaloes (Fig. 5.5) and barasingha (Fig. 5.6) were also found in the Satpura National Park. Animals whose numbers are diminishing to a level that they might face extinction are known as the **endangered animals**. Boojho is reminded of the dinosaurs which became extinct a long time ago. Survival of some



**Fig. 5.5 : Wild buffalo**



**Fig. 5.6 : Barasingha**

animals has become difficult because of disturbances in their natural habitat. Professor Ahmad tells them that in order to protect plants and animals strict rules are imposed in all National Parks. Human activities such as grazing, poaching, hunting, capturing of animals or collection of firewood, medicinal plants, etc. are not allowed



Are only big animals facing extinction?

Madhavji tells Paheli that small animals are much more in danger of becoming extinct than the bigger animals. At times, we kill snakes, frogs, lizards, bats and owls ruthlessly without realising their importance in the ecosystem. By killing them we are harming ourselves. They might be small in size but their role in the ecosystem cannot be ignored. They form part of food chains and food webs.

An **ecosystem** is made of all the plants, animals and microorganisms in an area along with non-living components such as climate, soil, river deltas etc.



I wonder if there is any record of all endangered species!

## 5.9 Red Data Book

Professor Ahmad explains about Red Data Book to the children. He tells them that **Red Data Book** is the source book which keeps a record of all the endangered animals and plants. Red Data Book is maintained internationally by an organisation. India also maintains Red Data Book for plants and animals found in India.

## 5.10 Migration

The excursion party then enters deeper into the forest under the guidance of Madhavji. They sit near the Tawa



What would happen if we had no wood? Is there any alternative available to wood?

I know that paper is one of the important products we get from forests.

I wonder whether there are any alternatives available for paper!

Reservoir to relax for some time. Paheli observes some of the birds near the river. Madhavji tells the children that these are migratory birds. These birds have flown here from other parts of the world.

Migratory birds fly to far away areas every year during a particular time because of climatic changes. They fly for laying eggs as the weather in their natural habitat becomes very cold and inhospitable. Birds who cover long distances to reach another land are known as migratory birds.

## 5.11 Recycling of Paper

Professor Ahmad draws attention of the children to another cause of deforestation. He tells them that it takes 17 full grown trees to make one tonne of paper. Therefore, we should save paper. Professor Ahmad also tells that paper can be recycled five to seven times for use. If each student saves at least one sheet of paper in a day, we can save many trees in a year. We should save, reuse used paper and recycle it. By this we not only save trees but also save energy and water needed for manufacturing paper. Moreover, the amount of harmful chemicals used in paper making will also be reduced.



Is there any permanent solution to the problem of deforestation?

## 5.12 Reforestation

Professor Ahmad suggests that the answer to deforestation is reforestation. Reforestation is restocking of the destroyed forests by planting new trees. The planted trees should generally be of the same species which were found in that forest. We should plant at least as many trees as we cut. Reforestation can take place naturally also. If the deforested area is left undisturbed, it re-establishes itself. In natural reforestation there is no role of human beings. We have already caused tremendous damage to our forests. If we have to

retain our green wealth for future generations, plantation of more trees is the only option.

Professor Ahmad told them that in India we have the Forest (Conservation) Act. This act is aimed at preservation and conservation of natural forests and meeting the basic needs of the people living in or near the forests.

After some rest Madhavji asks the children to start heading back because it is not advisable to stay in the jungle after sunset. On getting back, Professor Ahmad and the children thank Madhavji for guiding them through this exciting experience.

## KEYWORDS

- BIODIVERSITY**
- BIOSPHERE RESERVE**
- DEFORESTATION**
- DESERTIFICATION**
- ECOSYSTEM**
- ENDANGERED SPECIES**
- ENDEMIC SPECIES**
- EXTINCT**
- FAUNA**
- FLORA**
- MIGRATORY BIRDS**
- NATIONAL PARK**
- RED DATA BOOK**
- REFORESTATION**
- SANCTUARY**

## WHAT YOU HAVE LEARNT

- ⦿ Wildlife sanctuary, national park and biosphere reserve are names given to the areas meant for conservation and preservation of forest and wild animals.
- ⦿ Biodiversity refers to the variety of living organisms in a specific area.
- ⦿ Plants and animals of a particular area are known as the flora and fauna of that area.
- ⦿ Endemic species are found only in a particular area.
- ⦿ Endangered species are those which are facing the danger of extinction.
- ⦿ Red Data Book contains a record of endangered species.
- ⦿ Migration is the phenomenon of movement of a species from its own habitat to some other habitat for a particular time period every year for a specific purpose like breeding.
- ⦿ We should save, reuse and recycle paper to save trees, energy and water.
- ⦿ Reforestation is the restocking of destroyed forests by planting new trees.

## Exercises

1. Fill in the blanks.
  - (a) A place where animals are protected in their natural habitat is called \_\_\_\_\_.
  - (b) Species found only in a particular area is known as \_\_\_\_\_.
  - (c) Migratory birds fly to far away places because of \_\_\_\_\_ changes.
2. Differentiate between the following.
  - (a) Wildlife sanctuary and biosphere reserve
  - (b) Zoo and wildlife sanctuary
  - (c) Endangered and extinct species
  - (d) Flora and fauna

3. Discuss the effects of deforestation on the following.
  - (a) Wild animals
  - (b) Environment
  - (c) Villages (Rural areas)
  - (d) Cities (Urban areas)
  - (e) Earth
  - (f) The next generation
4. What will happen if.
  - (a) we go on cutting trees.
  - (b) the habitat of an animal is disturbed.
  - (c) the top layer of soil is exposed.
5. Answer in brief.
  - (a) Why should we conserve biodiversity?
  - (b) Protected forests are also not completely safe for wild animals. Why?
  - (c) Some tribals depend on the jungle. How?
  - (d) What are the causes and consequences of deforestation?
  - (e) What is Red Data Book?
  - (f) What do you understand by the term migration?
6. In order to meet the ever-increasing demand in factories and for shelter, trees are being continually cut. Is it justified to cut trees for such projects? Discuss and prepare a brief report.
7. How can you contribute to the maintenance of green wealth of your locality? Make a list of actions to be taken by you.
8. Explain how deforestation leads to reduced rainfall.
9. Find out about national parks in your state. Identify and show their location on the outline map of India.
10. Why should paper be saved? Prepare a list of ways by which you can save paper.

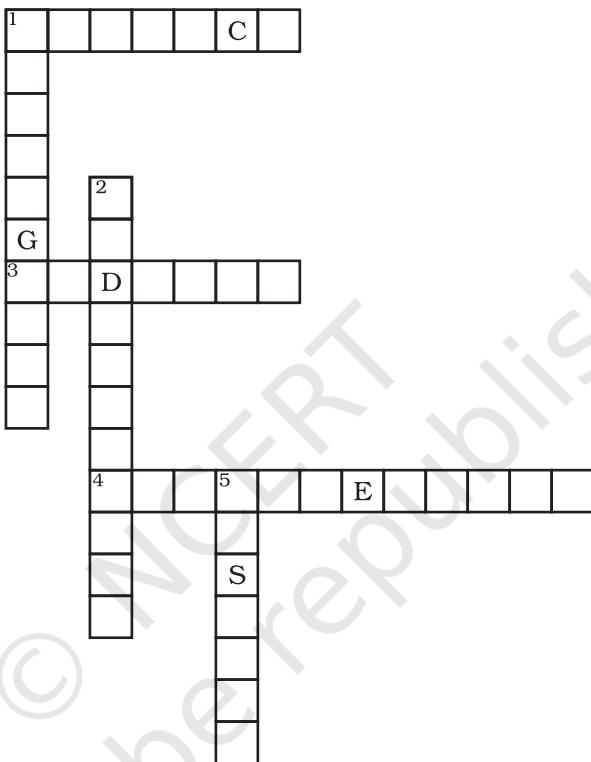
11. Complete the word puzzle.

**Down**

1. Species on the verge of extinction.
2. A book carrying information about endangered species.
5. Consequence of deforestation.

**Across**

1. Species which have vanished.
3. Species found only in a particular habitat.
4. Variety of plants, animals and microorganisms found in an area.



### Extended Learning - Activities and Projects

1. Plant at least five different plants in your locality during this academic year and ensure their maintenance till they grow.
2. Promise yourself that this year you will gift at least 5 plants to your friends and relatives on their achievements, or on occasions like birthdays. Ask your friends to take proper care of these plants and encourage them to gift plants to their friends on such occasions. At the end of the year count the plants that have been gifted through this chain.

3. Is it justified to prevent tribals from staying in the core area of the forest? Discuss the matter in your class and note down the points for and against the motion in your notebook.
4. Study the biodiversity of a park nearby. Prepare a detailed report with photographs and sketches of the flora and fauna.
5. Make a list of the new information you have gathered from this chapter. Which information did you find the most interesting and why?
6. Make a list of various uses of papers. Observe currency notes carefully. Do you find any difference between a currency paper and paper of your notebook? Find out where currency paper is made.
7. Karnataka Government had launched 'Project Elephant' to save Asian elephants in the state. Find out about this and other such campaigns launched to protect threatened species.

### Did You Know?

1. India has more than half of the world's wild tigers, 65% of the Asian elephants, 85% of the great one-horned rhinoceros and 100% of the Asian lions.
2. India is sixth on a list of 12 mega-biodiversity countries in the world. It contains two of the 34 biodiversity hotspots of the world – Eastern Himalayas and the Western Ghats. These areas are very rich in biodiversity.
3. One of the most important factors that threatens wildlife today is habitat destruction due to encroachment.
4. India contains 172 species of animals considered globally threatened or 2.9% of the world's total number of threatened species. Eastern Himalayas hotspot has merely 163 globally threatened species including several animal and plant species. India contains globally important population of some of Asia's rarest animals such as the *Bengal fox*, *Marbled cat*, Asiatic lion, Indian elephant, Asiatic wild ass, Indian rhinoceros, *gaur*, Wild asiatic water buffalo, etc.

For knowing more, you may contact:

- Ministry of Environment, Forest and Climate Change, Govt. of India  
Environment, Forest and Wildlife Department  
Indira Paryavaran Bhavan, Jor Bagh Road, New Delhi - 110003  
Website: <http://envfor.nic.in>



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**D**o you recall the processes of digestion, circulation and respiration which you have studied in your previous classes? These processes are essential for the survival of every individual. You have also learnt about the process of reproduction in plants. Reproduction is essential for the continuation of a species. Imagine what would have happened if organisms had not reproduced. You will realise that reproduction is very important as it ensures the continuation of similar kinds of individuals, generation after generation.

You have already learnt in your previous class about reproduction in plants. In this chapter, we shall learn how reproduction takes place in animals.

### 6.1 Modes of Reproduction

Have you seen the young ones of different animals? Try to name some of the young ones by completing Table 6.1 shown in examples at S. No. 1 and 5.

You must have seen the young ones of various animals being born. Can you tell how chicks and caterpillars are born? How are kittens and puppies born? Do you think that these young ones looked the same before they were born as they do now? Let us find out.

Table 6.1

S. No.	Animal	Young one
1.	Human	Baby
2.	Cat	
3.	Dog	
4.	Butterfly	
5.	Hen	Chick
6.	Cow	
7.	Frog	

Just as in plants, there are two modes by which animals reproduce. These are:

- (i) Sexual reproduction, and
- (ii) Asexual reproduction.

### 6.2 Sexual Reproduction

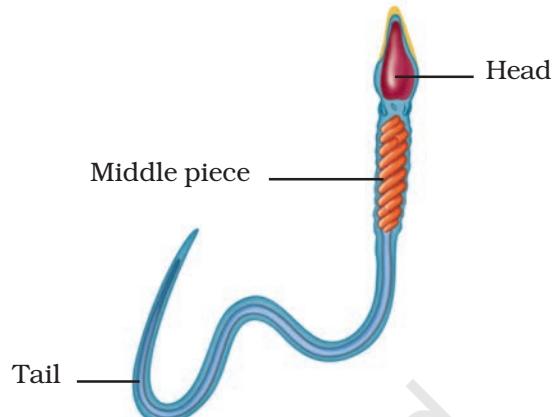
Try to recall reproduction in plants which you studied in Class VII. You will remember that plants that reproduce sexually have male and female reproductive parts. Can you name these parts? In animals also, males and females have different reproductive parts or organs. Like plants, the reproductive parts in animals also produce gametes that fuse to form a zygote. It is the zygote which develops into a new individual. This type of reproduction beginning from the fusion of male and female gametes is called **sexual reproduction**. Let us find out the reproductive parts

in humans and study the process of reproduction in them.

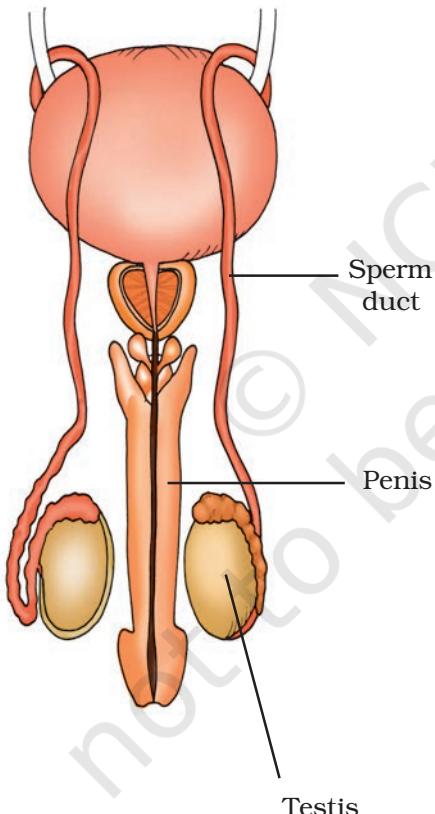
### Male Reproductive Organs

The male reproductive organs include a pair of testes (singular, testis), two sperm ducts and a penis (Fig. 6.1). The testes produce the male gametes called **sperms**. Millions of sperms are produced by the testes. Look at Fig. 6.2 which shows the picture of a sperm. Though sperms are very small in size, each has a head, a middle piece and a tail. Does it appear to be a single cell? Indeed, each

sperm is a single cell with all the usual cell components.



**Fig. 6.2 : Human sperm**



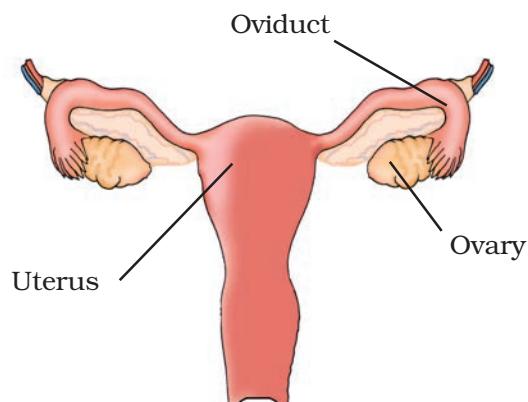
**Fig. 6.1:** Male reproductive organs in humans



What purpose does the tail in a sperm serve?

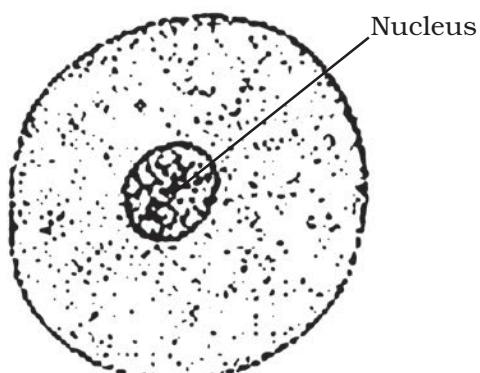
### Female Reproductive Organs

The female reproductive organs are a pair of ovaries, oviducts (fallopian tubes) and the uterus (Fig. 6.3). The ovary produces



**Fig. 6.3 :** Female reproductive organs in humans

female gametes called **ova (eggs)** (Fig. 6.4). In human beings, a single matured egg is released into the oviduct by one of the ovaries every month. Uterus is the part where development of the baby takes place. Like the sperm, an egg is also a single cell.



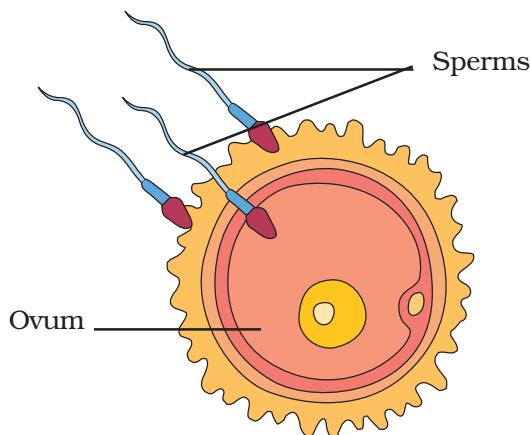
**Fig. 6.4 : Human Ovum**

Boojho recalls that the size of eggs in animals varies. The egg may be very small as in humans, much larger as in hens. Ostrich egg is the largest!



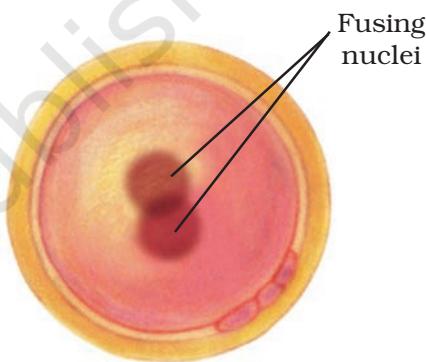
## Fertilisation

The first step in the process of reproduction is the fusion of a sperm and an ovum. When sperms come in contact with an egg, one of the sperms may fuse with the egg. Such fusion of the egg and the sperm is called **fertilisation** (Fig. 6.5). During fertilisation, the nuclei of the sperm and the egg fuse to form a single nucleus. This results in the formation of a fertilised egg or **zygote** (Fig. 6.6). Did



**Fig. 6.5 : Fertilisation**

you know that the zygote is the beginning of a new individual?



**Fig. 6.6 : Zygote**

The process of fertilisation is the meeting of an egg cell from the mother and a sperm cell from the father. So, the new individual inherits some characteristics from the mother and some from the father. Look at your brother or sister. See if you can recognise some characters in them similar to those of your mother or your father.

Fertilisation which takes place inside the female body is called **internal fertilisation**. Internal fertilisation occurs in many animals including humans, cows, dogs and hens.

### Have you heard of test tube babies?

Boojho and Paheli's teacher once told them in the class that in some women oviducts are blocked. These women are unable to bear babies because sperms cannot reach the egg for fertilisation. In such cases, doctors collect freshly released egg and sperms and keep them together for a few hours for **IVF** or **in vitro fertilisation** (fertilisation outside the body). In case fertilisation occurs, the zygote is allowed to develop for about a week and then it is placed in the mother's uterus. Complete development takes place in the uterus and the baby is born like any other baby. Babies born through this technique are called **test-tube babies**. This term is actually misleading because babies cannot grow in test tubes.

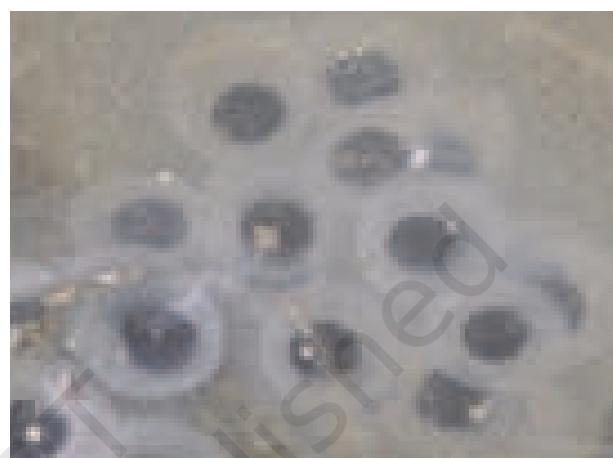
You will be surprised to know that in many animals fertilisation takes place outside the body of the female. In these animals, fertilisation takes place in water. Let us find out how this happens.

### Activity 6.1

Visit some ponds or slow-flowing streams during spring or rainy season. Look out for clusters of frog's eggs floating in water. Write down the colour and size of the eggs.

During spring or rainy season, frogs and toads move to ponds and slow-flowing streams. When the male and female come together in water, the

female lays hundreds of eggs. Unlike hen's egg, frog's egg is not covered by a shell and it is comparatively very delicate. A layer of jelly holds the eggs together and provides protection to the eggs (Fig. 6.7).



**Fig. 6.7 : Eggs of frog**

As the eggs are laid, the male deposits sperms over them. Each sperm swims randomly in water with the help of its long tail. The sperms come in contact with the eggs. This results in fertilisation. This type of fertilisation in which the fusion of a male and a female gamete takes place outside the body of the female is called **external fertilisation**. It is very common in aquatic animals such as fish, starfish, etc.



Why do fish and frogs lay eggs in hundreds whereas a hen lays only one egg at a time?



Though these animals lay hundreds of eggs and release millions of sperms, all the eggs do not get fertilised and develop into new individuals.

This is because the eggs and sperms get exposed to water movement, wind and rainfall. Also, there are other animals in the pond which may feed on eggs. Thus, production of large number of eggs and sperms is necessary to ensure fertilisation of at least a few of them.

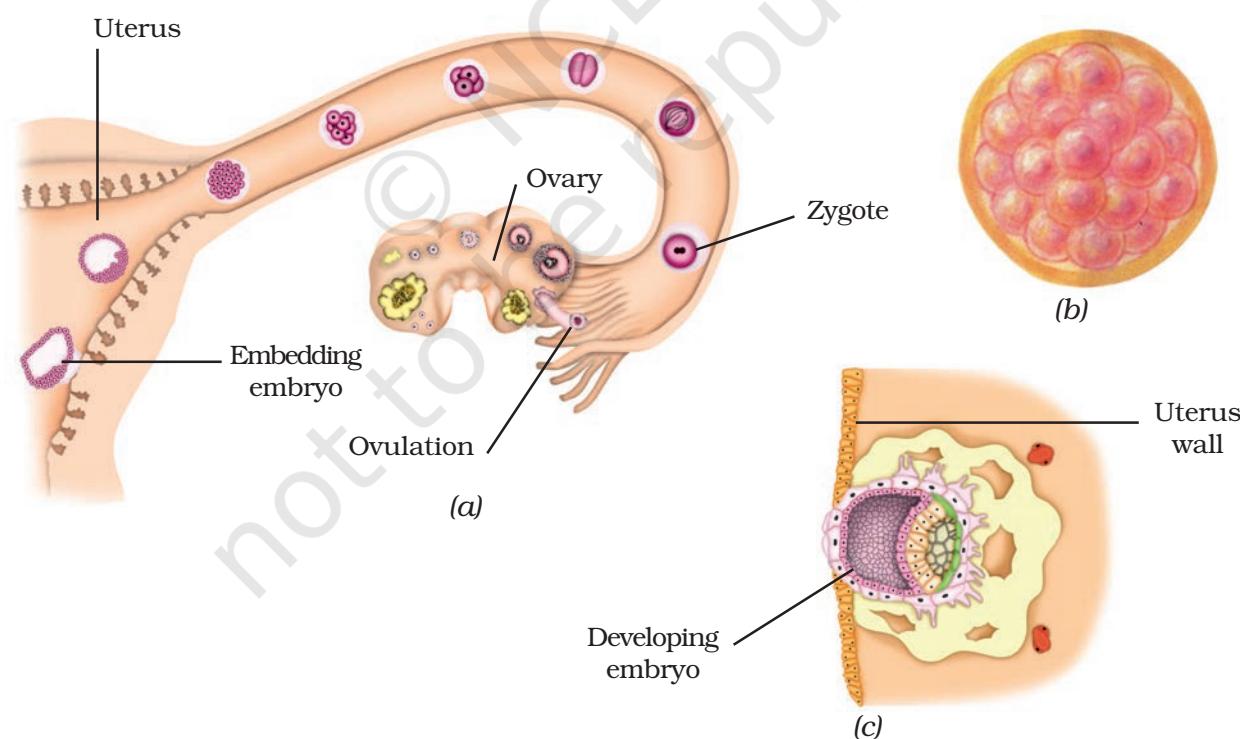
How could a single cell become such a big individual?



### Development of Embryo

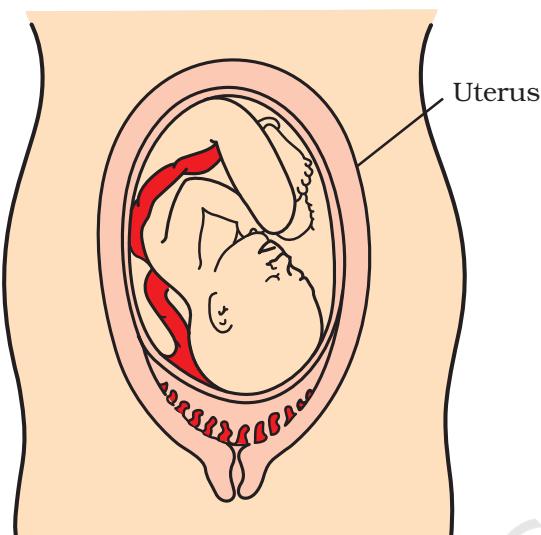
Fertilisation results in the formation of zygote which begins to develop into an embryo [Fig. 6.8(a)]. The zygote divides repeatedly to give rise to a ball of cells [Fig. 6.8(b)]. The cells then begin to form groups that develop into different tissues and organs of the body. This developing structure is termed an **embryo**. The embryo gets embedded in the wall of the uterus for further development [Fig. 6.8(c)].

The embryo continues to develop in the uterus. It gradually develops body



**Fig. 6.8 :** (a) Zygote formation and development of an embryo from the zygote; (b) Ball of cells (enlarged); (c) Embedding of the embryo in the uterus (enlarged)

parts such as hands, legs, head, eyes, ears etc. The stage of the embryo in which all the body parts can be identified is called a **foetus** (Fig. 6.9). When the development of the foetus is complete, the mother gives birth to the baby.



**Fig. 6.9 : Foetus in the uterus**

Internal fertilisation takes place in hens also. But, do hens give birth to babies like human beings and cows? You know that they do not. Then, how are chicks born? Let us find out.

Soon after fertilisation, the zygote divides repeatedly and travels down the oviduct. As it travels down, many protective layers are formed around it. The hard shell that you see in a hen's egg is one such protective layer.

After the hard shell is formed around the developing embryo, the hen finally lays the egg. The embryo takes about 3 weeks to develop into a chick. You must have seen the hen sitting on the eggs to provide sufficient warmth. Did you know that development of the chick takes

place inside the egg shell during this period? After the chick is completely developed it bursts open the egg shell.

In animals which undergo external fertilisation, development of the embryo takes place outside the female body. The embryos continue to grow within their egg coverings. After the embryos develop, the eggs hatch. You must have seen numerous tadpoles swimming in ponds and streams.

### Viviparous and Oviparous Animals

We have learnt that some animals give birth to young ones while some animals lay eggs which later develop into young ones. The animals which give birth to young ones are called **viviparous** animals. Those animals which lay eggs are called **oviparous** animals. The following activity will help you understand better and differentiate between viviparous and oviparous animals.

### Activity 6.2

Try to observe eggs of the following organisms – frog, lizard, butterfly or moth, hen and crow or any other bird. Were you able to observe eggs of all of them? Make drawings of the eggs that you have observed.

The eggs of a few animals are easy to observe because their mothers lay them outside their bodies. These are examples of oviparous animals. But you would not be able to collect the eggs of a dog, cow or cat. This is because they do not lay eggs. The mother gives birth to the young ones. These are examples of viviparous animals.

Can you now give some more examples of viviparous and oviparous animals?

### Young Ones to Adults

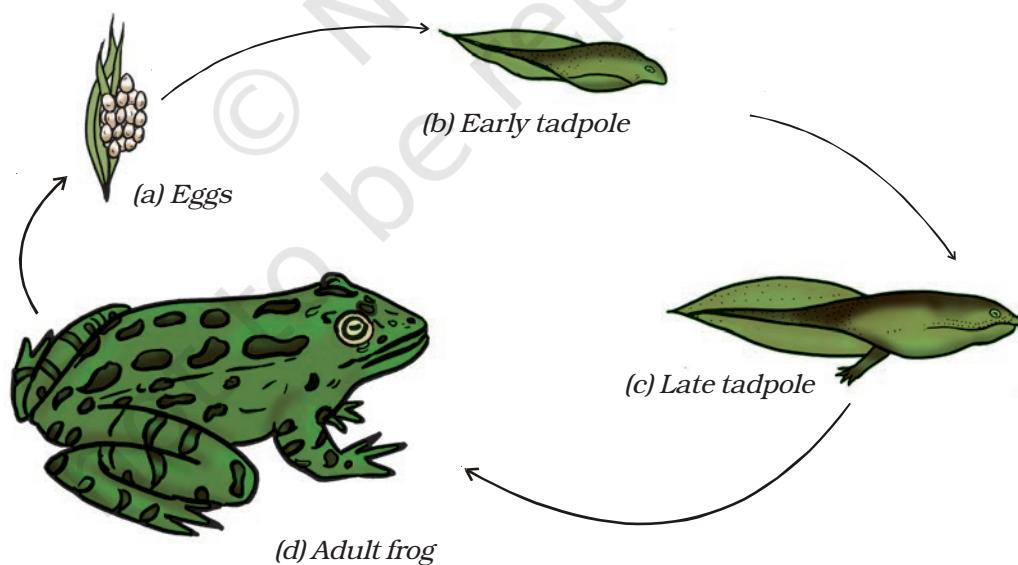
The new individuals which are born or hatched from the eggs continue to grow till they become adults. In some animals, the young ones may look very different from the adults. The life cycle of frog is shown in Fig. 6.10.

Observe the different stages of frog starting from the egg to the adult stage. We find that there are three distinct stages, that is, egg → tadpole (larva) → adult. Don't the tadpoles look so different from the adults? Can you imagine that these tadpoles would some day become frogs?

The tadpoles transform into adults capable of jumping and swimming. The transformation of the larva into an adult through drastic changes is called **metamorphosis**. What about the changes that we observe in our body as we grow? Do you think we too undergo metamorphosis? In human beings, body parts similar to those present in the adults are present from the time of birth.

### 6.3 Asexual Reproduction

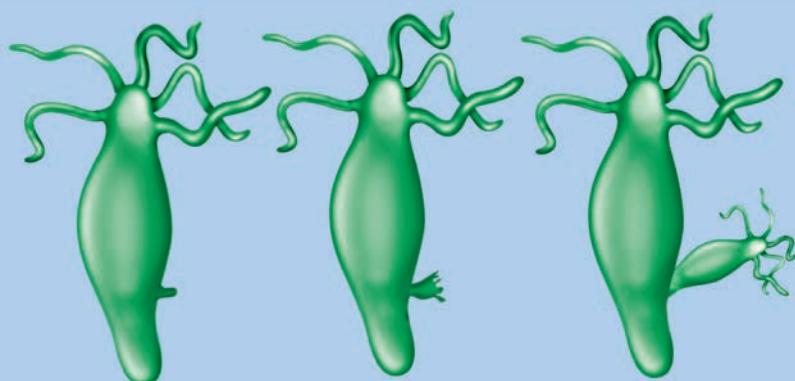
So far, we have learnt about reproduction in some familiar animals. But what about very small animals like hydra and microscopic organisms like amoeba? Do you know how they reproduce? Let us find out.



**Fig. 6.10 : Life cycle of frog**

### Activity 6.3

Get permanent slides of hydra. Observe them using hand lens or a microscope. Look out for any bulges from the parent body. Count the number of bulges that you see in different slides. Also, note the size of the bulges. Draw the diagram of hydra, as you see it. Compare it with the Fig. 6.11.

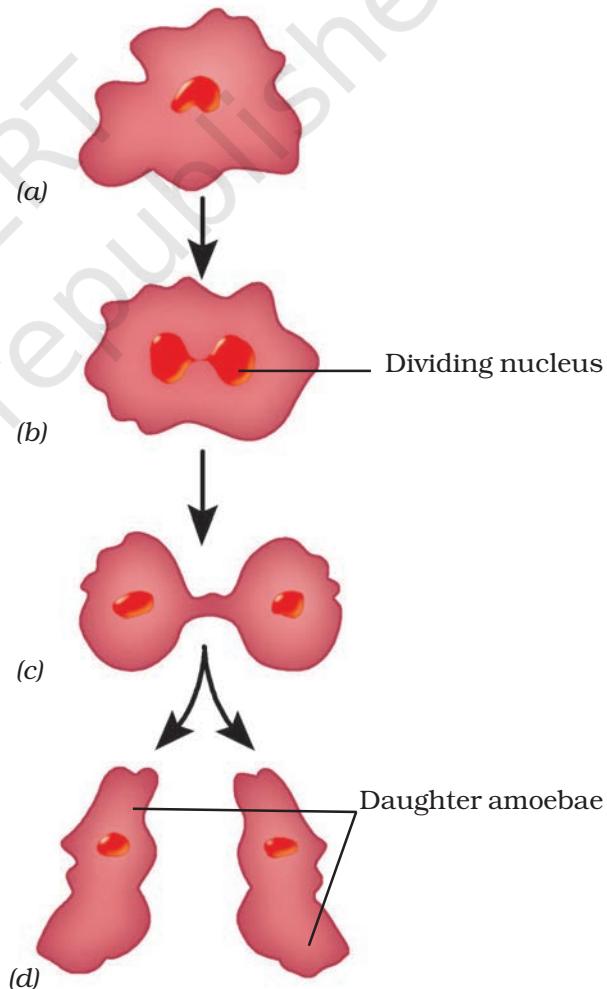


**Fig. 6.11 : Budding in Hydra**

In each hydra, there may be one or more bulges. These bulges are the developing new individuals and they are called **buds**. Recall the presence of buds in yeast. In hydra too the new individuals develop as outgrowths from a single parent. This type of reproduction in which only a single parent is involved is called **asexual reproduction**. Since new individuals develop from the buds in hydra, this type of asexual reproduction is called **budding**.

Another method of asexual reproduction is observed in the microscopic organism, amoeba. Let us see how this happens.

You have already learnt about the structure of amoeba. You will recall that amoeba is a single-celled organism [Fig. 6.12(a)]. It begins the process of reproduction by the division of its nucleus into two nuclei [Fig. 6.12(b)]. This is followed by division of its body into two, each part receiving a nucleus [Fig. 6.12(c)]. Finally, two amoebae are produced from one parent amoeba [Fig. 6.12(d)]. This type of asexual



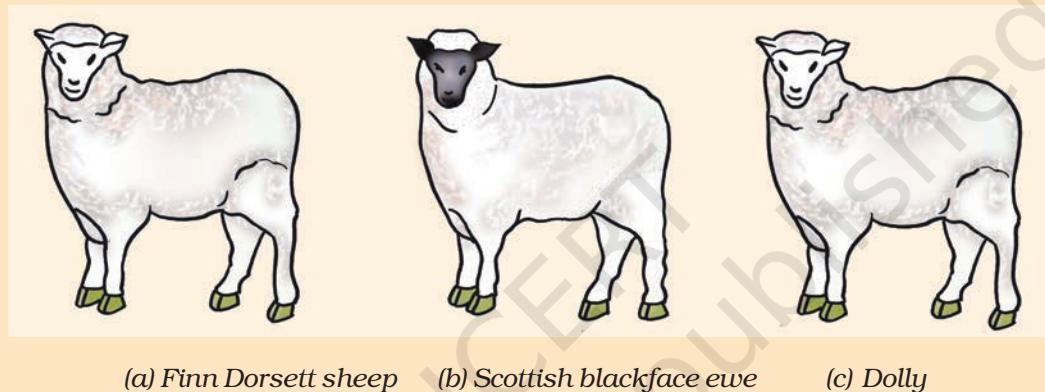
**Fig. 6.12 : Binary fission in Amoeba**

reproduction in which an animal reproduces by dividing into two individuals is called **binary fission**. Apart from budding and binary fission,

there are other methods by which a single parent reproduces young ones. You will study about these in your higher classes.

### Story of Dolly, the Clone

Cloning is the production of an exact copy of a cell, any other living part, or a complete organism. Cloning of an animal was successfully performed for the first time by Ian Wilmut and his colleagues at the Roslin Institute in Edinburgh, Scotland. They successfully cloned a sheep named Dolly [Fig. 6.13 (c)]. Dolly was born on 5<sup>th</sup> July 1996 and was the first mammal to be cloned.



**Fig. 6.13**

During the process of cloning Dolly, a cell was collected from the mammary gland of a female Finn Dorsett sheep [Fig. 6.13 (a)]. Simultaneously, an egg was obtained from a Scottish blackface ewe [Fig. 6.13 (b)]. The nucleus was removed from the egg. Then, the nucleus of the mammary gland cell from the Finn Dorsett sheep was inserted into the egg of the Scottish blackface ewe whose nucleus had been removed. The egg thus produced was implanted into the Scottish blackface ewe. Development of this egg followed normally and finally Dolly was born. Though Dolly was given birth by the Scottish blackface ewe, it was found to be absolutely identical to the Finn Dorsett sheep from which the nucleus was taken. Since the nucleus from the egg of the Scottish blackface ewe was removed, Dolly did not show any character of the Scottish blackface ewe. Dolly was a healthy clone of the Finn Dorsett sheep and produced several offspring of her own through normal sexual means. Unfortunately, Dolly died on 14<sup>th</sup> February 2003 due to a certain lung disease.

Since Dolly, several attempts have been made to produce cloned mammals. However, many die before birth or die soon after birth. The cloned animals are many-a-times found to be born with severe abnormalities.

**KEYWORDS****ASEXUAL  
REPRODUCTION****BINARY FISSION****BUDDING****EGGS****EMBRYO****EXTERNAL  
FERTILISATION****FERTILISATION****FOETUS****INTERNAL  
FERTILISATION****METAMORPHOSIS****OVIPAROUS ANIMALS****SEXUAL  
REPRODUCTION****SPERMS****VIVIPAROUS ANIMALS****ZYGOTE****WHAT YOU HAVE LEARNT**

- ⦿ There are two modes by which animals reproduce. These are: (i) Sexual reproduction, and (ii) Asexual reproduction.
- ⦿ Reproduction resulting from the fusion of male and female gametes is called sexual reproduction.
- ⦿ The reproductive organs in the female include ovaries, oviducts and uterus.
- ⦿ The reproductive organs in male include testes, sperm ducts and penis.
- ⦿ The ovary produces female gametes called ova and the testes produce male gametes called sperms.
- ⦿ The fusion of ovum and sperm is called fertilisation. The fertilised egg is called a zygote.
- ⦿ Fertilisation that takes place inside the female body is called internal fertilisation. This is observed in human beings and other animals such as hens, cows and dogs.
- ⦿ Fertilisation that takes place outside the female body is called external fertilisation. This is observed in frogs, fish, starfish, etc.
- ⦿ The zygote divides repeatedly to give rise to an embryo.
- ⦿ The embryo gets embedded in the wall of the uterus for further development.
- ⦿ The stage of the embryo in which all the body parts are identifiable is called foetus.
- ⦿ Animals such as human beings, cows and dogs which give birth to young ones are called viviparous animals.
- ⦿ Animals such as hen, frog, lizard and butterfly which lay eggs are called oviparous animals.
- ⦿ The transformation of the larva into adult through drastic changes is called metamorphosis.
- ⦿ The type of reproduction in which only a single parent is involved is called asexual reproduction.
- ⦿ In hydra, new individuals develop from buds. This method of asexual reproduction is called budding.
- ⦿ Amoeba reproduces by dividing itself into two. This type of asexual reproduction is called binary fission.

## Exercises

1. Explain the importance of reproduction in organisms.
2. Describe the process of fertilisation in human beings.
3. Choose the most appropriate answer.
  - (a) Internal fertilisation occurs
    - (i) in female body.
    - (ii) outside female body.
    - (iii) in male body.
    - (iv) outside male body.
  - (b) A tadpole develops into an adult frog by the process of
    - (i) fertilisation
    - (ii) metamorphosis
    - (iii) embedding
    - (iv) budding
  - (c) The number of nuclei present in a zygote is
    - (i) none
    - (ii) one
    - (iii) two
    - (iv) four
4. Indicate whether the following statements are True (T) or False (F).
  - (a) Oviparous animals give birth to young ones. ( )
  - (b) Each sperm is a single cell. ( )
  - (c) External fertilisation takes place in frog. ( )
  - (d) A new human individual develops from a cell called gamete. ( )
  - (e) Egg laid after fertilisation is made up of a single cell. ( )
  - (f) Amoeba reproduces by budding. ( )
  - (g) Fertilisation is necessary even in asexual reproduction. ( )
  - (h) Binary fission is a method of asexual reproduction. ( )
  - (i) A zygote is formed as a result of fertilisation. ( )
  - (j) An embryo is made up of a single cell. ( )
5. Give two differences between a zygote and a foetus.
6. Define asexual reproduction. Describe two methods of asexual reproduction in animals.
7. In which female reproductive organ does the embryo get embedded?
8. What is metamorphosis? Give examples.
9. Differentiate between internal fertilisation and external fertilisation.

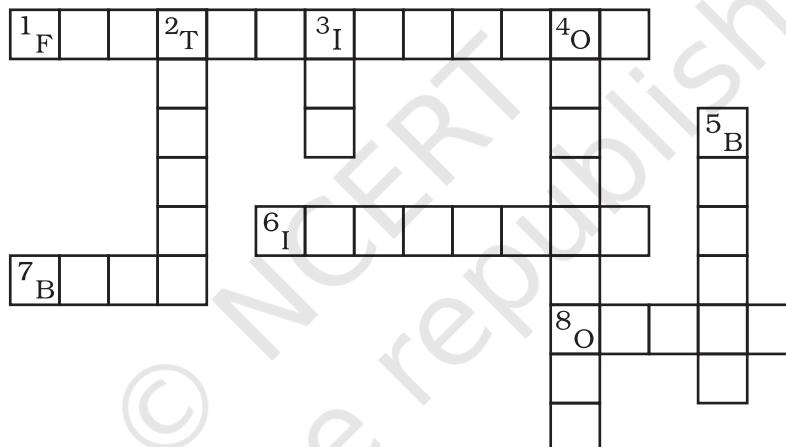
10. Complete the crossword puzzle using the hints given below.

**Across**

1. The process of the fusion of the gametes.
6. The type of fertilisation in hen.
7. The term used for bulges observed on the sides of the body of hydra.
8. Eggs are produced here.

**Down**

2. Sperms are produced in these male reproductive organs.
3. Another term for in vitro fertilisation.
4. These animals lay eggs.
5. A type of fission in amoeba.



### Extended Learning — Activities and Projects

1. Visit a poultry farm. Talk to the manager of the farm and try to find out the answers to the following.
  - (a) What are **layers** and **broilers** in a poultry farm?
  - (b) Do hens lay unfertilised eggs?
  - (c) How can you obtain fertilised and unfertilised eggs?
  - (d) Are the eggs that we get in the stores fertilised or unfertilised?
  - (e) Can you consume fertilised eggs?
  - (f) Is there any difference in the nutritional value of fertilised and unfertilised eggs?

2. Observe live hydra yourself and learn how they reproduce by doing the following activity:

During the summer months collect water weeds from ponds or ditches along with the pond water and put them in a glass jar. After a day or so you may see several hydra clinging to the sides of the jar.

Hydra is transparent, jelly-like and with tentacles. It clings to the jar with the base of its body. If the jar is shaken, the hydra will contract instantly into a small blob, at the same time drawing its tentacles in.

Now take out few hydras from the jar and put them on a watch glass. Using a hand lens or a binocular or dissection microscope, observe the changes that are taking place in their body. Note down your observations.

3. The eggs we get from the market are generally the unfertilised ones. In case you wish to observe a developing chick embryo, get a fertilised egg from the poultry or hatchery which has been incubated for 36 hours or more. You may then be able to see a white disc-like structure on the yolk. This is the developing embryo. Sometimes if the heart and blood vessels have developed you may even see a red spot.
4. Talk to a doctor. Find out how twinning occurs. Look for any twins in your neighbourhood, or among your friends. Find out if the twins are identical or non-identical. Also find out why identical twins are always of the same sex? If you know of any story about twins, write it in your own words.

For more information on animal reproduction, you can visit :

- [www.saburchill.com](http://www.saburchill.com)
- [www.teenshealth.org/teen/sexual-health](http://www.teenshealth.org/teen/sexual-health)

### Did You Know?

An interesting organisation is observed in a honey bee hive, a colony of several thousand bees. Only one bee in the colony lays eggs. This bee is called the queen bee. All other female bees are worker bees. Their main job is to build the hive, look after the young and feed the queen bee adequately to keep her healthy so that she can lay eggs. A queen bee lays thousands of eggs. The fertilised eggs hatch into females, while the unfertilised eggs give rise to males, called drones. It is the job of the worker bees to maintain the temperature of the hive at around 35°C to incubate the eggs.



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In the previous chapter, you have learnt how animals reproduce. It is only after 'growing up' to a certain age that human beings and many other animals can reproduce. Why can humans reproduce only after a certain age?

In this chapter, you will learn about changes that take place in the human body after which a person becomes capable of reproduction.

In Chapter 6, you have learnt about human reproductive organs. Here, we shall discuss the role that hormones play in bringing about changes that make a child grow into an adult.

### 7.1 Adolescence and Puberty

Boojho was celebrating his 12th birthday. After his friends left, Boojho and Paheli began chatting with their parents. Paheli studies in an all-girls school. She started laughing. She remarked that many of Boojho's school friends, whom she met after a year, had suddenly shot up in height. Some of them were looking very funny with a hairy line above their lips. Her mother explained that the boys had grown up.

Growth begins from the day one is born. But upon crossing the age of 10 or 11, there is a sudden spurt in growth which becomes noticeable. The changes taking place in the body are part of growing up. They indicate that you are

no longer a child but are on the way to becoming an adult.



I wonder how long this period marked by changes in the body will last!



It is a strange period of life when you are neither a child nor an adult. I wonder whether this period between childhood and adulthood had a special name!

Growing up is a natural process. The period of life, when the body undergoes changes, leading to reproductive maturity, is called **adolescence**. Adolescence begins around the age of 11 and lasts upto 18 or 19 years of age. Since this period covers the 'teens' (13 to 18 or 19 years of age), adolescents are also called 'teenagers'. In girls, adolescence may begin a year or two earlier than in boys. Also, the period of adolescence varies from person to person.

The human body undergoes several changes during adolescence. These changes mark the onset of **puberty**. The most important change which marks puberty is that boys and girls become capable of reproduction. Puberty ends when an adolescent reaches reproductive maturity.



Paheli and Boojho realised that sudden increase in height and hairy line above the lips in boys were signs of adolescence. They wanted to know more about other changes at puberty.



the tallest and who might be the shortest in your class.

Age in Years	% of full height	
	Boys	Girls
8	72%	77%
9	75%	81%
10	78%	84%
11	81%	88%
12	84%	91%
13	88%	95%
14	92%	98%
15	95%	99%
16	98%	99.5%
17	99%	100%
18	100%	100%

## 7.2 Changes at Puberty

### Increase in Height

The most conspicuous change during puberty is the sudden increase in height. At this time the long bones, that is, the bones of the arms and the legs elongate and make a person tall.

### Activity 7.1

The following chart gives the average rate of growth in height of boys and girls with age. The figures in columns 2 and 3, give the percentage of the height a person has reached at the age given in column 1. For example, by the age 11, a boy has reached 81% of his probable full height, while a girl has reached 88% of her full height. These figures are only representative and there may be individual variations.

Use the Table for your friends and work out how tall they are likely to be. Find out who is likely to be

### Calculation for full height (cm)

$$\frac{\text{Present height (cm)}}{\% \text{ of full height at this age}} \times 100$$

(as given in the chart)

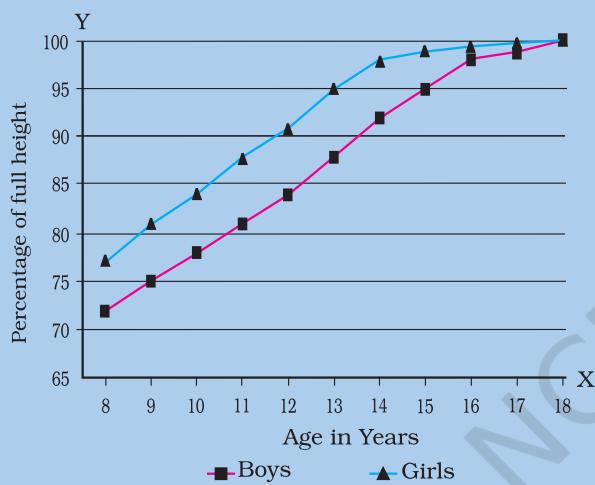
Example:

A boy is 9 years old and 120 cm tall. At the end of the growth period he is likely to be

$$\frac{120}{75} \times 100 \text{ cm} = 160 \text{ cm tall}$$

## Activity 7.2

Use the data given in Activity 7.1 to draw a graph. Take age on the X-axis and per cent growth in height on the Y-axis. Highlight the point representing your age on the graph. Find out the percentage of height you have already reached. Calculate the height you might eventually reach. Tally your graph with the one given here (Fig. 7.1).



**Fig. 7.1 :** Graph showing percentage of height with age

Initially, girls grow faster than boys but by about 18 years of age, both reach their maximum height. The rate of growth in height varies in different individuals. Some may grow suddenly at puberty and then slow down, while others may grow gradually.

I am worried. Though I have become taller, my face looks much smaller compared to my body.



There is no need for Paheli to worry. All parts of the body do not grow at the same rate. Sometimes the arms and legs or hands and feet of adolescents look oversized and out of proportion with the body. But soon the other parts catch up and result in a proportionate body.

You must have noticed that height of an individual is more or less similar to that of some family member. This is because height depends on the genes inherited from parents. It is, however, very important to eat the right kind of food during these growing years. This helps the bones, muscles and other parts of the body get adequate nourishment for growth. You will find nutritional needs of adolescents discussed later in the lesson.

### Change in Body Shape

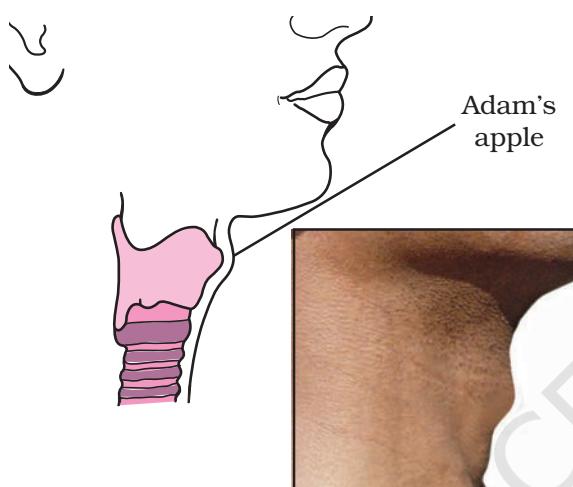
Have you noticed that boys in your class have broader shoulders and wider chests than boys in junior classes? This is because they have entered the age of puberty when shoulders generally broaden as a result of growth. In girls, the region below the waist becomes wider.

In boys, the muscles of the body grow more prominently than in the girls. Thus, changes occurring in adolescent boys and girls are different.

### Voice Change

Did you notice that sometimes the voice of some of the boys in your class cracks? At puberty, the **voice box** or the **larynx** begins to grow. Boys develop larger voice boxes. The growing voice box in boys can be seen as a protruding part of the throat

called **Adam's apple** (Fig. 7.2). In girls, the larynx is hardly visible from the outside because of its small size. Generally, girls have a high pitched voice, whereas boys have a deep voice. In adolescent boys, sometimes, the muscles of the growing voice box go out of control and the voice becomes hoarse. This state may remain for a few days or weeks after which the voice becomes normal.



**Fig. 7.2 : Adam's apple in a grown up boy**



Many of my classmates have a hoarse voice. Now I know why?

### Increased Activity of Sweat and Sebaceous Glands

During puberty the secretion of sweat glands and sebaceous glands (oil glands) increases. Many young people get acne

A few glands such as sweat glands, oil glands and salivary glands release their secretions through ducts. Endocrine glands release hormones directly into the bloodstream. So, they are also termed ductless glands.

and pimples on the face at this time because of the increased activity of these glands in the skin.

### Development of Sex Organs

Look up Fig. 6.1 and 6.3 of the previous lesson which show sex organs of humans. At puberty, male sex organs like the testes and penis develop completely. The testes also begin to produce sperms. In girls, the ovaries enlarge and eggs begin to mature. Also ovaries start releasing mature eggs.

### Reaching Mental, Intellectual and Emotional Maturity

Adolescence is also a period of change in a person's way of thinking. Adolescents are more independent than before and are also self conscious. Intellectual development takes place and they tend to spend considerable time thinking. In fact, it is often the time in one's life when the brain has the greatest capacity for learning. Sometimes, however, an adolescent may feel insecure while trying to adjust to the changes in the body and mind. But as adolescent learners, you should know that there is no reason to feel insecure. These changes are a natural part of growing up.

### 7.3 Secondary Sexual Characters

You have learnt in Chapter 6, that testes and ovaries are the reproductive organs. They produce the gametes, that is, sperms and ova. In girls, breasts begin to develop at puberty

and boys begin to grow facial hair, that is, moustaches and beard. As these features help to distinguish the male from the female they are called **secondary sexual characters**. Boys also develop hair on their chest. In both, boys and girls, hair grows under the arms and in the region above the thighs or the pubic region.

Both Boojho and Paheli wish to know what initiates changes at puberty.

The changes which occur at adolescence are controlled by **hormones**. Hormones are chemical substances. These are secretions from **endocrine glands**, or endocrine system. The **male hormone** or **testosterone** begins to be released by the testes at the onset of puberty. This causes changes in boys about which you have just learnt, for example, the growth of facial hair. Once puberty is reached in girls, ovaries begin to produce the **female hormone** or **estrogen** which makes the breasts develop. Milk secreting glands or mammary glands develop inside the breasts. The production of these hormones is under the control of another hormone secreted from an endocrine gland called **pituitary gland**.

#### 7.4 Role of Hormones in Initiating Reproductive Function

Endocrine glands release hormones into the bloodstream to reach a particular body part called **target site**. The target site responds to the hormone. There are many endocrine glands or ductless glands in the body.

The testes and ovaries secrete sex hormones. You have just learnt that these hormones are responsible for the male and female secondary sexual characters. Further, the sex hormones are under the control of hormones from the pituitary gland (Fig. 7.3). The pituitary secretes many hormones, one of which makes ova mature in the ovaries and sperms form in the testes.

Hormones from pituitary stimulate testes and ovaries to release testosterone (in male) and estrogen (in female)

Released in the blood stream and reach parts of the body (Target site)

Stimulate changes in the body at onset of puberty

**Fig. 7.3 :** The onset of puberty is controlled by hormones

Paheli and Boojho have now understood that puberty marks the beginning of the reproductive period when one becomes capable of reproduction. But they want to know if reproductive life, once begun, continues, or it ends some time.

## 7.5 Reproductive Phase of Life in Humans

Adolescents become capable of reproduction when their testes and ovaries begin to produce gametes. The capacity for maturation and production of gametes lasts for a much longer time in males than in females.

In females, the reproductive phase of life begins at puberty (10 to 12 years of age) and generally lasts till the age of approximately 45 to 50 years. The ova begin to mature with the onset of puberty. One ovum matures and is released by one of the ovaries once in about 28 to 30 days. During this period, the wall of the uterus becomes thick so as to receive the egg, in case it is fertilised and begins to develop. This results in pregnancy. If fertilisation does not occur, the released egg, and the thickened lining of the uterus along with its blood vessels are shed off. This causes bleeding in women which is called **menstruation**. Menstruation occurs once in about 28 to 30 days. The first menstrual flow begins at puberty and is termed **menarche**. At 45 to 50 years of age, the menstrual cycle stops. Stoppage of menstruation is termed **menopause**. Initially, menstrual cycle may be irregular. It takes some time to become regular.



Paheli says that the reproductive life of a woman lasts from menarche to menopause. Is she right?

Menstrual cycle is controlled by hormones. The cycle includes the maturation of the egg, its release, thickening of uterine wall and its breakdown if pregnancy does not occur. In case the egg is fertilised it begins to divide and then gets embedded in the uterus for further development as you have learnt in Chapter 6 (Fig. 6.8).

## 7.6 How is the Sex of the Baby Determined?



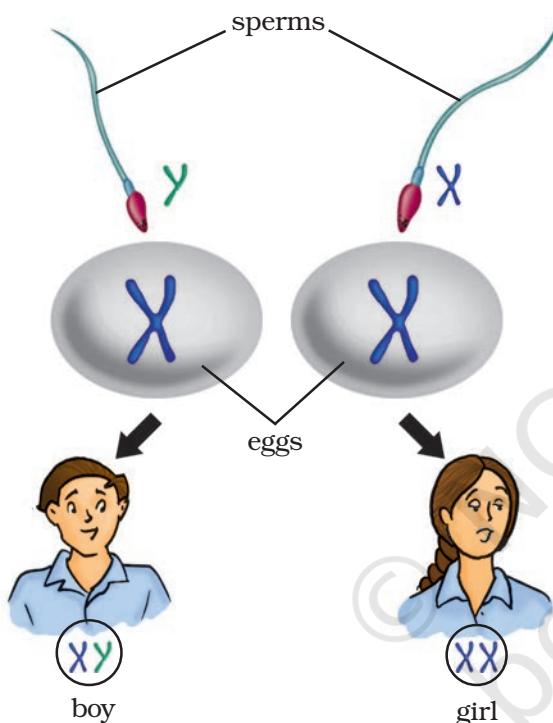
I heard my mother and my aunt talking about my cousin who is going to have a baby. They were discussing whether she would give birth to a boy or a girl. I wonder what makes the fertilised egg develop either into a boy or a girl!

### Boy or Girl?

Inside the fertilised egg or zygote is the instruction for determining the sex of the baby. This instruction is present in the thread-like structures, called **chromosomes** in the fertilised egg. Chromosomes are present inside the nucleus of every cell. All human beings have 23 pairs of chromosomes in the nuclei of their cells. Two chromosomes out of these are the **sex chromosomes**, named X and Y. A female has two X chromosomes, while a male has one X and one Y chromosome. The gametes (egg and sperm) have only one set of chromosomes. The unfertilised egg always has one X chromosome. But

sperms are of two kinds. One kind has an X chromosome, and the other kind has a Y chromosome.

See Fig. 7.4. When a sperm containing X chromosome fertilises the egg, the zygote would have two X chromosomes and develop into a female child. If the sperm contributes a Y chromosome to the egg (ovum) at fertilisation, the zygote would develop into a male child.



**Fig. 7.4 : Sex determination in humans**

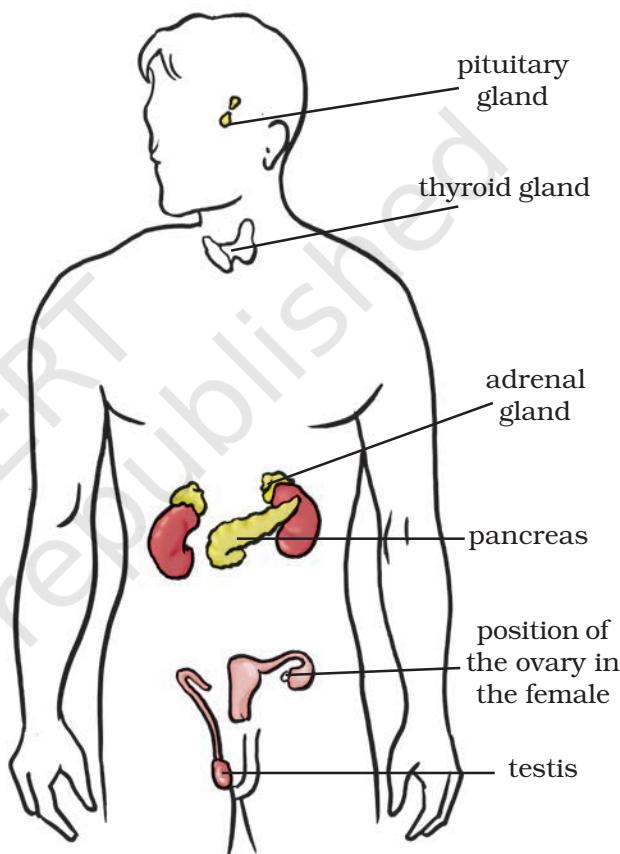
Now you know that the sex chromosomes of the father determine the sex of an unborn baby. The belief that the mother is responsible for the sex of her baby is completely wrong and to blame her for this is totally unjustified.

## 7.7 Hormones other than Sex Hormones

Look at Fig. 7.3 again. The hormones secreted by the pituitary stimulate testes

and ovaries to produce their hormones. You have already learnt that the pituitary gland is an endocrine gland. It is attached to the brain.

Apart from the pituitary, the testes and the ovaries, there are other endocrine glands in the body such as thyroid, pancreas and adrenals (Fig. 7.5).



**Fig. 7.5 : Position of endocrine glands in the human body**

Boojho and Paheli had once visited their aunt who was a doctor and remembered that a boy named Kaka had a very big and bulging throat. Their aunt had told them that Kaka was suffering from 'goitre', a disease of the **thyroid gland**. Kaka's thyroid gland was not producing the hormone **thyroxine**.

Their aunt also told them that their uncle was suffering from 'diabetes' because his pancreas was not producing the hormone **insulin** in sufficient quantities. Boojho and Paheli then asked their aunt about the adrenal glands, which are also shown in the chart hung on the wall of her clinic. The aunt told them that adrenal glands secrete hormones which maintain the correct salt balance in the blood. Adrenals also produce the hormone **adrenalin**. It helps the body to adjust to stress when one is very angry, embarrassed or worried.

Thyroid and adrenals secrete their hormones when they receive orders from the pituitary through its hormones. Pituitary also secretes **growth hormone** which is necessary for the normal growth of a person.



Are there hormones in other animals also? Have they any role to play in reproduction?

## 7.8 Role of Hormones in Completing the Life History of Insects and Frogs

You have already learnt about the life cycle of the frog. The tadpole passes through certain stages to become a frog (Chapter 6). This change from larva to adult is called **metamorphosis** (Fig. 6.10). Metamorphosis in insects is

controlled by **insect hormones**. In a frog, it is controlled by **thyroxine**, the hormone produced by **thyroid**. Thyroxine production requires the presence of iodine in water. If the water in which the tadpoles are growing does not contain sufficient iodine, the tadpoles cannot become adults.

If people do not have enough iodine in their diet, will they get goitre caused by lack of thyroxine?



## Activity 7.3

Collect information from magazines or from doctors and prepare a note on the importance of consuming iodised salt. You can also look for this information on the internet.

## 7.9 Reproductive Health

The physical and mental well being of an individual is regarded as an individual's health. To keep the body healthy, every human being, at any age, needs to have a balanced diet. The person must also observe personal hygiene and undertake adequate physical exercise.

During adolescence, however, these become even more essential as the body is growing.

### Nutritional Needs of the Adolescents

Adolescence is a stage of rapid growth and development. Hence the diet for an

adolescent has to be carefully planned. You have already learnt what a **balanced diet** is. Recall that a balanced diet means that the meals include proteins, carbohydrates, fats and vitamins in requisite proportions. Our Indian meal of *roti/rice*, *dal* (pulses) and vegetables is a balanced meal. Milk is a balanced food in itself. Fruits also provide nourishment. For infants, mother's milk provides all the nourishment that they need.

Iron builds blood and iron-rich food such as leafy vegetables, jaggery, meat, citrus, Indian gooseberry (*amla*) are good for adolescents.

Check items for lunch and dinner in your meal. Is the meal balanced and nutritious? Does it include cereals which give energy and milk, meat, nuts and pulses which provide proteins for growth? Also, does it include fats and sugar that give energy? What about fruits and vegetables which are protective foods? **Chips and packed or tinned snacks, though very tasty should never replace regular meals as they do not have adequate nutritional value.**

#### Activity 7.4

Make a group with your friends. Write down the items of food in your breakfast, lunch and dinner you had on the previous day. Identify the items responsible for proper growth. Also identified the junk food that you consumed the previous day.

#### Activity 7.5

Get ideas from the pictures given in Fig. 7.6. Prepare charts or posters and paste them in the class so that you are aware of the diet for adolescents. You may use your creative ideas and present it like an advertisement. You may even organise a competition on this topic.

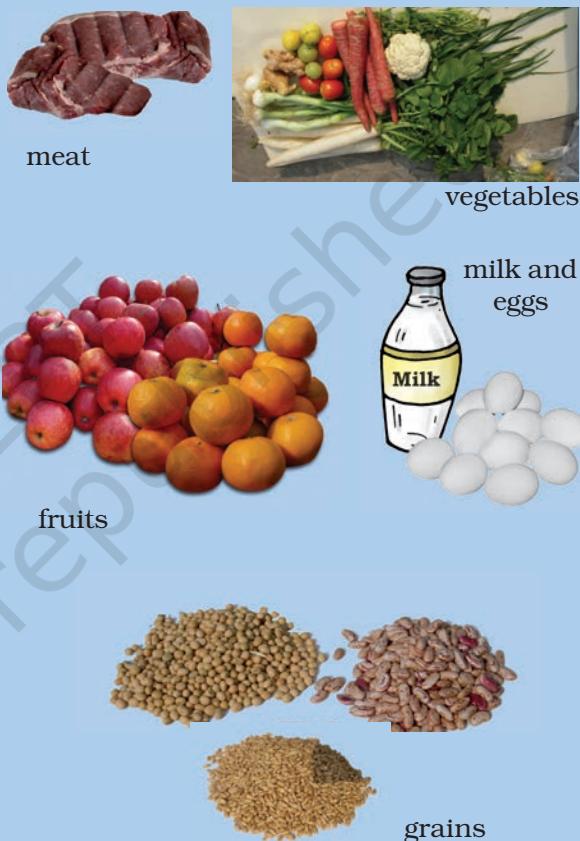


Fig. 7.6 : Nutritious items of food

#### Personal Hygiene

Everyone should have a bath at least once everyday. It is more necessary for teenagers because the increased activity of sweat glands sometimes makes the body smelly. All parts of the body should be washed and cleaned everyday. If

cleanliness is not maintained there are chances of catching **bacterial** infection. Girls should take special care of cleanliness during the time of menstrual flow. They should keep track of their menstrual cycle and be prepared for the onset of menstruation. Use sanitary napkin or clean homemade pads. Change pads after every 4–5 hours as per the requirement.

### Physical exercise

Walking and playing in fresh air keeps the body fit and healthy. All young boys and girls should take walks, exercise and play outdoor games.

#### Myths, Taboos, Do's and Don'ts

You have learnt here and from Chapter 6 the scientific facts related to human reproduction. There are many wrong notions which you should now be able to discard as informed adolescents. For example, there are myths and taboos regarding bodily changes that adolescents experience. Some of these are given below and you can now argue why these are myths and not facts.

1. A girl becomes pregnant if she looks at boys during menstruation.
2. The mother is responsible for the sex of her child.
3. A girl should not be allowed to work in the kitchen during menstruation.

You may come across many other myths and taboos. Discard them.

### Activity 7.6

Collect data on the number of children in your class who exercise regularly and who do not exercise regularly. Did you notice any difference in their fitness and health? Prepare a report on the benefits of regular exercise.

### Say “NO” to Drugs

Adolescence is a period of much activity in the body and mind which is a normal part of growing up. So do not feel confused or insecure. If anybody suggests that you will get relief if you take some drugs, just say ‘No’ unless prescribed by the doctor. Drugs are addictive. If you take them once, you feel like taking them again and again. They harm the body in the long run. They ruin health and happiness.

You must have heard about AIDS which is caused by a dangerous virus, HIV. This virus can pass on to a normal person from an infected person by sharing the syringes used for injecting drugs. It can also be transmitted to an infant from the infected mother through her milk. The virus can also be transmitted through sexual contact with a person infected with HIV.

### Adolescent Pregnancy

You might be knowing that in our country, the legal age for marriage is 18 years for girls and 21 years for boys. This is because teenage mothers are not prepared mentally or physically for motherhood. Early marriage and motherhood cause health problems in the mother and the child. It also curtails employment opportunities for the young woman and may cause mental agony as she is not ready for responsibilities of motherhood.

**KEYWORDS**

- ADAM'S APPLE**
- ADOLESCENCE**
- ADRENALIN**
- BALANCED DIET**
- ENDOCRINE GLANDS**
- ESTROGEN**
- HORMONES**
- INSULIN**
- LARYNX**
- PITUITARY GLAND**
- PUBERTY**
- REPRODUCTIVE HEALTH**
- SECONDARY SEXUAL CHARACTERS**
- SEX CHROMOSOMES**
- TARGET SITE**
- TESTOSTERONE**
- THYROXINE**
- VOICE BOX**

**WHAT YOU HAVE LEARNT**

- ⦿ Humans become capable of reproduction after puberty sets in. Children between the ages of 11 and 19 years are called adolescents.
- ⦿ The onset of puberty brings about growth of the reproductive organs. Hair grow at various places on the body. Breasts develop in girls and facial hair (moustache and beard) appear in boys. Voice of boys becomes hoarse as voice box enlarges during adolescence.
- ⦿ Children gain height during adolescence.
- ⦿ The onset of puberty and maturity of reproductive parts are controlled by hormones.
- ⦿ Hormones are secretions of endocrine glands which pour them directly into the blood stream.
- ⦿ Pituitary gland secretes hormones which include growth hormone and hormones that make other glands such as the testes, ovaries, thyroids and adrenals, secrete hormones. Pancreas secretes insulin, thyroid produces thyroxine and adrenals produce adrenalin.
- ⦿ Testosterone is the male hormone and estrogen, the female hormone. The uterine wall in females prepares itself to receive the developing fertilised egg. In case there is no fertilisation, the thickened lining of the uterine wall breaks down and goes out of the body along with blood. This is called menstruation.
- ⦿ Sex of the unborn child depends on whether the zygote has XX or XY chromosomes.
- ⦿ It is important to eat balanced food and maintain personal hygiene during adolescence.

## Exercises

1. What is the term used for chemical secretions of endocrine glands responsible for changes taking place in the body?
2. Define adolescence.
3. What is menstruation? Explain.
4. List changes in the body that take place at puberty.
5. Prepare a Table having two columns depicting names of endocrine glands and hormones secreted by them.
6. What are sex hormones? Why are they named so? State their function.
7. Choose the correct option.
  - (a) Adolescents should be careful about what they eat, because
    - (i) proper diet develops their brains.
    - (ii) proper diet is needed for the rapid growth taking place in their body.
    - (iii) adolescents feel hungry all the time.
    - (iv) taste buds are well developed in teenagers.
  - (b) Reproductive age in women starts when their
    - (i) menstruation starts.
    - (ii) breasts start developing.
    - (iii) body weight increases.
    - (iv) height increases.
  - (c) The right meal for adolescents consists of
    - (i) chips, noodles, coke.
    - (ii) *chapati, dal, vegetables.*
    - (iii) rice, noodles and burger.
    - (iv) vegetable cutlets, chips and lemon drink.
8. Write notes on—
  - (a) Adam's apple.
  - (b) Secondary sexual characters.
  - (c) Sex determination in the unborn baby.

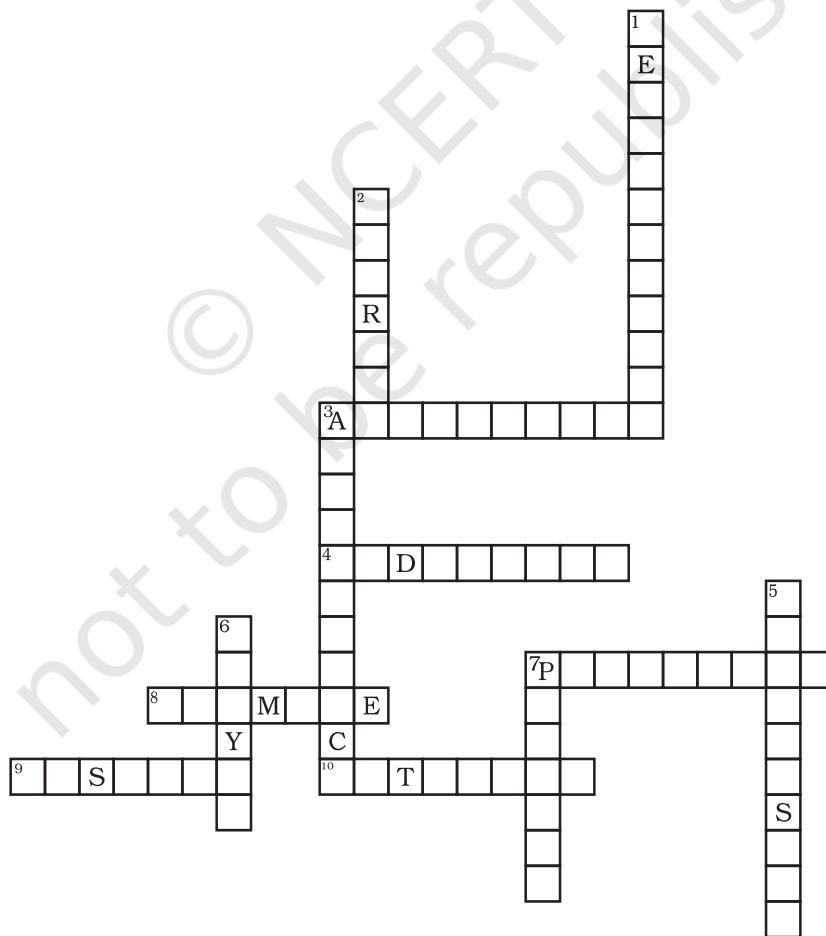
- 9. Word game : Use the clues to work out the words.**

## Across

- 3. Protruding voice box in boys
  - 4. Glands without ducts
  - 7. Endocrine gland attached to brain
  - 8. Secretion of endocrine glands
  - 9. Pancreatic hormone
  - 10. Female hormone

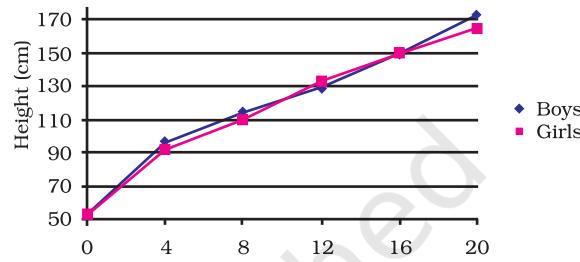
Down

1. Male hormone
  2. Secretes thyroxine
  3. Another term for teenage
  4. Hormone reaches here through blood stream
  5. Voice box
  6. Term for changes at adolescence



10. The table below shows the data on likely heights of boys and girls as they grow in age. Draw graphs showing height and age for both boys and girls on the same graph paper. What conclusions can be drawn from these graphs?

Age (Years)	Height (cm)	
	Boys	Girls
0	53	53
4	96	92
8	114	110
12	129	133
16	150	150
20	173	165



### Extended Learning — Activities and Projects

- Find out from your elder relatives about their awareness of the legal status of early marriage. You yourself may get information on it from your teacher, parents, a doctor or the internet. Write a two-minute speech explaining why early marriage is not good for the couple.
- Collect newspaper cuttings and information in magazines about HIV/AIDS. Write a one page article of 15 to 20 sentences on HIV/AIDS.
- In our country, according to 2011 census, there are 940 adolescent females for every 1000 males. Find out.
  - the concerns of the community regarding this low ratio. Remember that the chance of having a boy or a girl is equal.
  - what amniocentesis is and how useful this technique is. Why is its use for identification of sex of the unborn child banned in India?
- Put your ideas together and write a short note on the importance of knowing facts about reproduction.  
For more information visit :
  - [www.teenshealth.org/teen/sexual\\_health/](http://www.teenshealth.org/teen/sexual_health/)
  - [www.adolescenthealth.com](http://www.adolescenthealth.com)