BIOLOGY

Prof. K.K. Anand's
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Contents

Foundation 8th Biology

Booklet 1

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chapter 1

Crop Production & Management

Food is the main source of energy and nutrition for all organisms, including human beings. All living organisms require food for their growth, repair and functioning of body. The green plants synthesize their food by the process of photosynthesis while man and other animals directly or indirectly depend on plants for their food requirement.

Humans obtain their food from plants as well as animals. They grow plant and rear animals to meet their daily requirements.

But since, human population is increasing day by day. Also their food requirement is increasing along with it. Hence we need more than a quarter of billions of tonnes of grain every year to meet this increasing demand of food. But have you ever thought *how does the food requirement to a large number of people in a country fulfilled*? The food requirement is achieved by farming more lands, increasing the food production and by managing the production and distribution of food.

We will be discussing in this chapter about the various agricultural practices and their importance in agriculture.

But before starting, we should know the meaning of word "Crop".

Some other examples of crops are :

Crops	Examples
Cereal crops	Wheat, Paddy, Millet, etc
Pulses	Gram, Peas, Beans
Oil seeds	Mustard, Groundnut, Sunflower
Vegetables	Tomato, Cabbage, Spinach
Fruits	Banana, Mango, Orange etc.

do you know?

Agriculture forms a complex web of product, producer, distributor and consumer. All of them are interconnected and dependent upon each other for survival.

Crop is a plant grown in the fields on a large scale to obtain food. For example, if all the plants of maize are grown in a field, then it is called a maize crop. Similarly, if all the plants are grown, then it is called a wheat crop.

All the crops are grown at their respective seasons. Paddy, for example, is grown during rainy season while maize is grown during winter season. Therefore, **on the basis of seasons, all the crops are categorised into two main groups —**

(i) Kharif crops and (ii) Rabi crops

(i) Kharif crops : The crops grown in rainy season during the months of June to October are called Kharif crops. They are also known as summer or monsoon crop. Soyabean, maize, sugarcane, groundnut and paddy are the examples of Kharif crops.

(ii) Rabi crops : The crops grown in winter season from November to April are called rabi crops. They are also known as winter crop. Wheat, barley, mustard, peas etc. are some examples of rabi crops.

CHECK Point

1. **What will happen if the farmer grows Rabi crop during rainy season instead of winter?**
2. **Why crops such as paddy are grown only in rainy season?**

CHECK YOUR ANSWERS

1. If Rabi crops are sown in rainy season i.e. from June to October, then the whole plant crop will get destroyed. This could be because of factors such as lack of optimum temperature, adaptability, availability of pests and many more. Hence, Rabi crops such as wheat, mustard etc. should be sown only on winter season.
2. It is because crops such as paddy require large quantity of water. Therefore they are grown in the rainy season to fulfill their excessive water requirement.

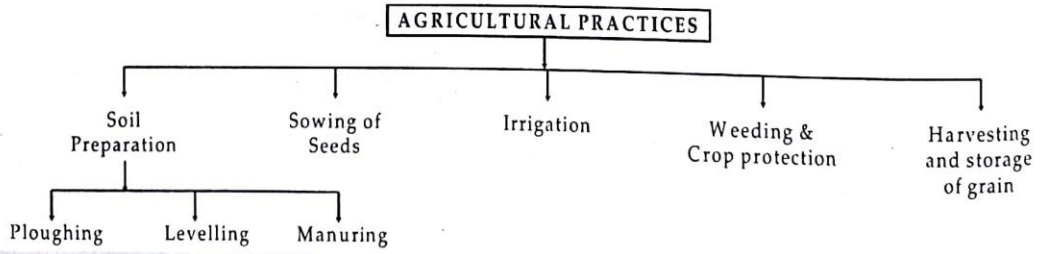
AGRICULTURAL PRACTICES

The growing of crops in the fields by the farmer for obtaining food like wheat, rice etc, is called *agriculture*. About 70% of the India's population is dependent on agriculture. They are also ranked second in terms of agricultural output.

Agriculture Ager (meaning a field) + cultura (meaning cultivation)

The reason for the increased agricultural output is the steady improvement in irrigation methods, new agricultural technology and modern agricultural practices. Farmers carry out certain activities in a particular sequence till the crops mature at harvest, known as *agricultural practices*. These practices increases the overall yield of a crop.

Basic agricultural practices carried out at various stages of crop production are :-



Let us discuss all these practices one by one in detail.

1. **SOIL PREPARATION :** Soil preparation is the first step to be followed before growing a crop. It is usually employed to loosen the soil. Plants absorb water, nutrients and salts from the soil. Therefore, it is important to prepare soil for a healthy produce. The soil is prepared for sowing the seeds of the crop by –

   (a) Ploughing (b) Levelling (c) Manuring

   (a) Ploughing : The process of loosening and turning the soil is called ploughing or tilling. A properly set up plough will break and turn the soil so that all the weeds, (grass), crop residue and debris are buried without any scrap of waste present in the field.

   The loosening of soil plays an important role in crop production because –

   (i) It allows the plant roots to penetrate freely and deeper into the soil so that plants are held firmly to the ground.

   (ii) It also allow the roots of the plant to breathe easily. It is because loose soil can hold a lot of air in its spaces.

   (iii) It helps in the growth of microbes and worms present in soil.

   (iv) It helps to remove weeds and other undesirable plants in the field.

FRIENDLY EARTHWORMS

Earthworm are called best friends of farmers. They can consume practically all kinds of organic matter. They pull down any organic matter that is deposited on the soil surface such as leaf fall, debris etc. This organic matter then undergoes biochemical change in the intestine of earthworm. Hence, earthworm converts the dead organic matter into rich humus, thereby enriching the soil with nutrients.

Earthworms are important to farmers in following respects :-

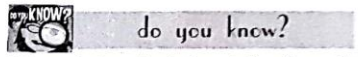
(i) It improves the soil fertility

(ii) It maintains the physical condition of soil.

(iii) It helps in mixing of sub soil and top soil

(iv) It helps in providing required nutrients to plants.

(v) It helps in recycling of waste materials in the surroundings.



Worms helps plants by mixing the soil, so gardeners love them because they are "Free" help.

Fig. 1.1 : *Earthworms*

Tools used for ploughing are :

(i) Plough (ii) Hoe (iii) Cultivator

(i) Plough : It is the most ancient method for ploughing the seed. It contains a triangular iron rod which is called ploughshare. Then there is a long log of wood called ploughshaft.

The one end of the shaft has a handle and the other end is attached to a beam which is placed on a pair of bulls or other animals such as camel, horse etc.

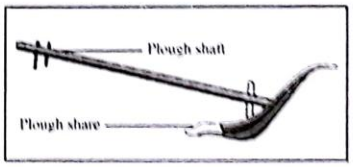


Fig. 1.2 : *Plough*

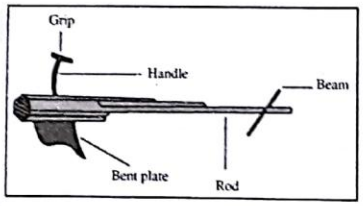


Fig. 1.3 : *Hoe*

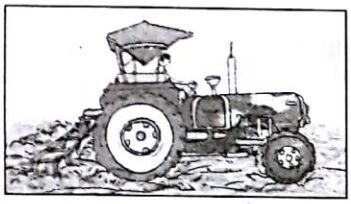


Fig. 1.4 : *Cultivator*

Importance of plough :

(i) It is used for breaking large lumps of soil into small pieces.

(ii) It is used for disposing weeds, grass, crop residues, debris etc from soil.

(iii) It is used for adding manure or fertilizers to the soil.

(ii) Hoe : Hoe are bladed tools that have a long rod of woods or iron. The one end of wood has a fixed strong blade and a bent plate of iron that works like a blade. The other end is attached to a beam that is placed on a pair of bull during ploughing the field.

Importance of hoe :

(i) To agitate surface of soil so as to remove weeds and other unwanted plants.

(ii) To dig and move the soil upside down

(iii) To chop roots and other crop residues.

(iii) Cultivator : It is the modern method of ploughing done these days. It involves the use of tractor to drive cultivator.

Importance of cultivator :

(i) It saves labor

(ii) It saves time involved during ploughing

(b) Levelling : After ploughing, the field is levelled with the help of a leveller. It is because the ploughed soil is quite loose, so it is liable to be carried away by strong winds or washed away by rain water. The ploughed soil is levelled by pressing it with wooden leveller.

Importance of levelling :

(i) It prevents the top fertile soil from being carried away by strong winds or washed away by rain water.

(ii) It helps in uniform distribution of water in fields during irrigation.

(iii) It prevents the loss of moisture from ploughed soil.

(c) Manuring : Sometimes before ploughing the manure is added to the soil. This is done for proper mixing of manure with soil. Manuring is done to increase the fertility of the soil before seed is sown in field.

2. SOWING : It is the second important step of crop production. Once the soil in the fields has been prepared by ploughing, levelling and manuring, the seeds of the crop can be now sown in it. *Sowing is the process of placing the seeds in the ground soil for future growth of crop plants.*

However seeds those are to be selected for growing should be of good quality. The quality of seed depends on the plants that are used for collecting seeds. If we collect the seeds from a healthy, vigorous and high yielding plants, we will get a healthy crop in subsequent generations.

Characteristic of plants that are used for collecting the seeds :

(i) Collect seeds from the plants that show healthy, vigorous growth.

(ii) Select seeds from the plants that are resistance to pests and diseases. It is because they will produce healthy seeds.

(iii) Collect seeds from matured, well formed plants that produce sweet tasting fruit.

(iv) Always collect healthy seeds from high yielding plants. This will ensure the good yield of plants in subsequent generation.

Two methods of sowing seeds : There are two methods of sowing the seeds in the soil. These are –

(i) **Sowing by hand :** The scattering of seed by hand is the simplest and ancient method of delivering seed to the soil. The process is known as *broadcasting*. In this method, the seeds are scattered in the field by the farmer in standing position. This method, however have few disadvantages like the seeds may not be properly distributed in field may fall in clusters at one place and at another place there may be none.

Fig. 1.5 : *Traditional Method of Sowing*

(ii) **Sowing by a seed drill :** Sowing of seeds by drill is better method of sowing than broadcasting. The seeds sown with this method are sown at right intervals and at a proper depth .

Tools used for sowing seeds are :

(i) Traditional tool (ii) Modern method (Seed drill)

(i) **Traditional Tool :** It is funnel shaped. The seeds are filled into the funnel that has a long pipe with sharp ends. The seeds from the funnel moves into the pipe placed into the soil as plough move.

(ii) **Modern Method (Seed drill) :** These days seed drills are used (for sowing seed) that involves the use of tractors.

A seed drill is a long iron tube having a funnel at the top. It is tied to back of the plough and seeds are put into the funnel of the seed drill. As the plough makes furrows in the soil, the seeds from the seed drill are gradually released and sown into the soil furrow made by plough.

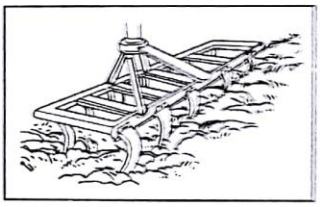


Fig. 1.6 : *A Seed Drill*

Importance of seed drill tool :

(i) It allows uniform distribution of seeds into the soil at proper depth.

(ii) It also protect the seeds from birds.

(iii) It also saves times.

Precautions to be taken while sowing seeds in soil :-

(i) **The seeds should be sown at right intervals or spacing.** It is because sowing seeds at proper distance avoids the competition among the plants. All plants in the field require optimum light, water and nutrients for their normal growth and development. So if they are grown nearby they might compete with each other and in turn would reduce the yield of crop. Therefore, it is advised to sow seeds at uniform distances.

(ii) **Seeds should be sown at right depth in soil.** It is because, if the seeds are sown too deep, then they may not germinate because they cannot breathe due to insufficient air at greater depth. Also, if you just spread the seeds on the surface of the soil, then the seeds will be easily picked and can be eaten by birds. Hence, seeds should be sown at proper depth in soil.

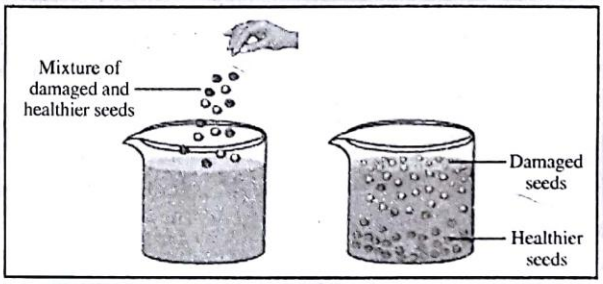
(iii) **The seeds used for sowing should be clean, healthy and free from diseases.**

IDEA BOX

How can you find whether the given sample of seeds are healthier or not?

Take a clean jar half filled with water. Put some seeds into the jar and stir it well.

Now observe the seeds present in jar.



What do you observe?

You can see some of the seeds are floating on the surface while some of them settle at the bottom.

The seeds that float on water are actually damaged seeds. They are hollow from inside. Hence, they are lighter in weight and floats at the top. Whereas healthier seeds sinks to the bottom of jar. Healthy seeds are heavier and healthy in all respects.

CHECK Point

1. **Why seeds are not sown in dry and highly wet soil?**

CHECK YOUR ANSWERS

1. Moisture in the soil is necessary for germination. So if seeds are sown in dry soil, they may not germinate. Similarly, if the seeds are sown in a highly wet soil, then on drying, the soil surface becomes too hard that the germinating seedling might not come out of ground.

Fig. 1.7 : *Paddy Seedling Transplantation*

TRANSPLANTATION

You must have seen farmers transplanting paddy (rice) seedlings in the fields. This method is known as transplantation.

In case of paddy (rice) crops, the seeds are first sown in a small plot of land and then allowed to grow into tiny plants called seedlings. After the seeds have grown into tiny plants called seedling in the nursery, only the healthy and well-developed seedlings are then picked out from the nursery and transferred to the regular field for further growth.

This process of transferring the seedlings from the nursery to the main field by hand is called transplantation. During transplantation, farmers keeps the proper distance between various seedlings and also between rows of seedling. This is done to ensure that each and every plant gets the sufficient sunlight, water and other nutrients for normal and healthy growth of plants. This process of transplantation has several advantages over the direct sowing.

Advantages of transplantation :

(i) It enable us to select only the better and healthy seedlings for the cultivation of crops.

(ii) It allows better and deeper penetration of roots in the soil.

(iii) It promotes better development of shoot system of plants.

(iv) It allows seedlings to be transplanted at the right spacings so that each and every plantlet get uniform dose of sunlight, water and nutrients.

do you know?

More than 90% of the world's Rice is grown and consumed in Asia, where people typically eat rice two or three times a daily. Rice is the staple diet of half the world's population.

CHECK Point

1. Find out more examples of crops that are cultivated by transplantation method ?

CHECK YOUR ANSWERS

1. Tomatoes and chillies

3. **ADDITION OF MANURE AND FERTILIZERS :** The plants requires number of essential nutrients for their growth and development of body. All the nutrients required by plants can be obtained from air, water and soil. Deficiency of any of these nutrients might affect the life activities of plant, which in turn can reduce the net yield of the crop.

You must have seen that in an area, some of the plants shows weak growth while some of them shows vigorous growth. Can you guess, why such variations is seen?

It is because of the lack of certain nutrients required by plant for normal growth and development. Lack of nutrients makes the soil infertile. So, unless the depleted plant nutrients are put back into the soil from time to time the growth of crop would be poor. Hence, deficiency of plant nutrients in the soil is compensated by adding **manures** and **fertilizers** to the soil.

do you know?

Composting is considered as the best recycler in nature.
Worms are used for making compost.

Manure : Manure is a natural fertilizer. It is prepared by the decomposition of plant and animal waste. It is known to have a large quantity of organic materials and little amount of plant nutrients. Thus, manures provide a lot of organic matter like humus to the soil. The humus improves the physical and chemical properties of the soil. It also improves the soil texture for better retention of water and aeration of soil.

Since manure is produced by decomposition of animal's excreta and plant waste, it protects the environment from harmful chemicals. Thus it helps in recycling of farm wastes.

Farmers add manure directly to the soil in the fields or first convert it into compost by burying it in pits.

WHAT IS COMPOSTING?

Composting is the process of converting dead organic matter into rich humus. The waste materials such as cow dung, vegetable waste, sewage waste etc are dumped into a pit. The pit is then covered with mud to prevent air and light entering it. It is then left undisturbed for few months. During this process, the microbes decompose the animal and plant waste and convert it into inorganic materials. These inorganic materials are excellent nutrients for plants.

Sometimes, the process of composting is done with the help of earthworm. Then this process is known as *vermi-composting*. Vermi composting is the process of composting organic wastes with the help of earthworm. Earthworm can consume practically all kinds of organic matter. This organic matter undergoes biochemical change in the intestine of earthworm. Hence, earthworm convert matter into rich humus, thereby enriching the soil with nutrients. The process of composting ensures the continuance of fertility cycle.

Advantages of manure :

(i) It enriches the soil with organic material.
(ii) It increases the water holding capacity of soil.
(iii) It aerates the soil by making it porous
(iv) It helps in growth of micro-organisms
(v) It improves the soil texture
(vi) It increases the crop production

Fertilizers : Fertilizers are commercially available plant nutrients. They can be organic or inorganic in nature. They ensure healthy growth and development of plants by providing required nutrients such as nitrogen, phosphorous, potassium, sulphur etc to the plant. They have nutrients in a concentrated form. So they provide quick replenishment of plant nutrients in the soil and restore its fertility. Also, they have high solubility in water. So, they are easily absorbed by the plants.

Fertilizers are good source of nitrogen, phosphorus and potassium (NPK) but are good only for short term use. Its excessive use changes the chemical nature of soil. Also it is harmful to the symbiotic micro organism that live in soil. The excess use of fertilizers also causes water pollution.

Let us perform an activity to find out how fertilizers and manure affects the plant growth.

IN THE LAB

Take some healthy gram seeds and allow them to germinate in a pot.

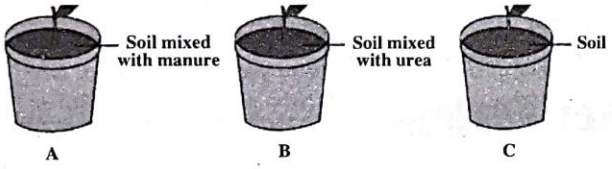
Then take three empty jars and label them as A, B and C. *In* jar *A*, add little amount of soil mixed with green manure.

In jar B, add similar amount of soil but mixed with urea, a fertilizer.

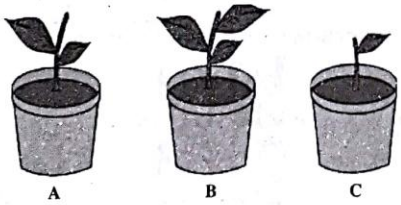
In jar C, add similar amount of soil without any manure or fertilizer.

Now water all these vessels bearing soil.

Now from the pot, select three equal sized seedlings and plant them in jar A, B and C. Keep the vessel in a safe and lighted place. Water them regularly and observe the growth.



What did you observe after few weeks?



You can observe that seedlings develop into small plantlets in all the three jars after few days. However, their growth varies in all the three. The jar B shows maximum growth while jar C showed the least growth.

Plantlets in jar B showed the maximum growth because urea is readily soluble in water and is quick acting. When it is supplied to the soil, nitrogen is rapidly changed into ammonia. Later seeds use this ammonia for its growth and development.

The plantlets in jar A also shows the growth but less compared to jar B.

The growth of plantlet in jar C is least because soil is infertile as it lack certain essential soil nutrients.

Let us summarise the differences between manure and fertilizers.

MANURE	FERTILIZERS
Manure is a natural substance that is prepared by decomposition of animal excreta and plant wastes.	They are commercially available plant nutrients.
They have large quantity of organic material and little amount of plant nutrients.	They can be organic or inorganic in nature.
They help in enriching the soil with organic matter and nutrients.	They help in enriching the soil with organic matter and nutrients in concentrated form.
It provide humus to the soil.	It does not provide any humus to soil.
It protects the environment and helps in recycling of waste	Its excessive use can cause pollution.
It is slowing absorbed by the plants.	It is readily absorbed by plants.
The example includes animal excreta, plant waste, sewage waste etc.	The example includes sodium nitrates, urea, ammoniam sulphate etc.

Crop Rotation : The fertility of soil can also be improved by crop rotation. *It is the practice of growing two or more varieties of crops on the same land in sequential seasons.* This helps in replenishing the soil with depleted nutrients.

The continuous growing of same crop over and over again might reduce the particular nutrient from the soil. Hence, farmers employ crop rotation so that they can replenish the lost nutrients.

In crop rotation, the cereal crops like wheat, maize etc are grown alternately with leguminous crops like pulses, beans, peas, etc. Legumes have nitrogen fixing bacteria in their root nodules that can fix atmospheric nitrogen.

For example, when maize crop is grown first, it takes away a lot of nitrogen from soil for its-growth and development and makes the soil nitrogen deficient. And next, when leguminous crops are grown in the same field, then leguminous crops with its nitrogen fixing bacteria, enriches the soil with nitrogen compounds and increases its fertility. When another cereal crop like wheat is grown after that, then wheat can utilize this extra nitrogen from soil for its growth and produce a crop with increased yield. In this way, rotating different crops (leguminous and non-leguminous crops) in the same field replenishes the soil with nitrogen naturally and thereby increases the crop production.

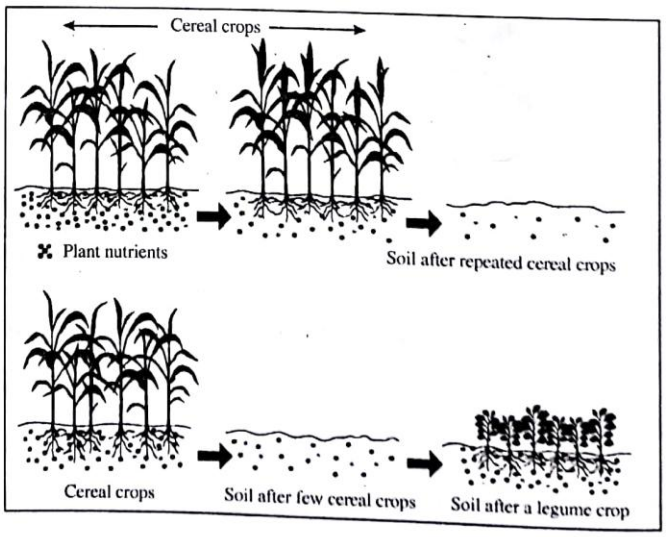
Advantages of crop rotation

(i) It improves the fertility of soil and hence brings about an increase in food production.

(ii) It reduces the need of fertilizers.

CHECK Point

Study the given sequence of pictures :



1. **What happens to plant nutrients in soil after growing cereals repeatedly in same field for many years?**
2. **Does soil fertility decreases when only cereal crops are grown again and again?**
3. **What happens to plant nutrients in soil after growing a leguminous crops?**

CHECK YOUR ANSWERS

1. The continuous plantation of crops in a field makes the soil poor in certain nutrients such as nitrogen, phosphorus, potassium etc. As a result, the soil fertility decreases and hence the crop yield.
2. The soil fertility decreases when crop with similar requirements are grown again and again. For example, when a crop like maize is grown, it takes away a lot nitrogen from soil for its growth and makes the soil nitrogen deficient. If now, the same kind of crop or crop with similar requirement is grown then it would further make the soil nutrient deficient. Thus the continuous plantation of any crop in field makes the soil poor in certain nutrients.
3. Legumes have nitrogen fixing bacteria in their root nodules that can fix atmospheric nitrogen. When the leguminous crop is grown in the same field, then the leguminous crop with its nitrogen fixing bacteria enriches the soil with nitrogen compounds and increases its fertility.

4. **IRRIGATION :** Water is essential for the growth of plants. It transports all nutrients required by the plant to each and every part of the plant body. It also maintains the moisture of soil and prevents soil from drying.

   It is therefore, necessary to supply water to crop plants in the fields, periodically. *The process of supplying water to crops in the fields is called irrigation.* The time and frequency of irrigation varies according to different seasons, crops and soil types. The various sources of irrigation are wells, canals, rivers, dams, ponds and lakes. Even rain is a source of irrigation of crops.

   Importance of irrigation :

   (i) Irrigation before ploughing makes the soil soft due to which ploughing becomes easier

   (ii) It provides moisture for germination of seeds.

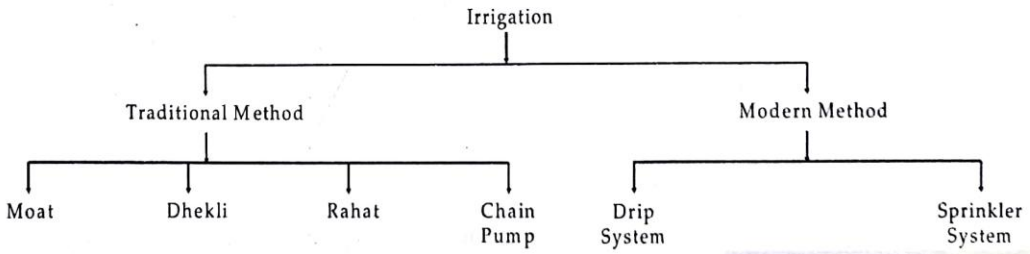
   (iii) It is important for the absorption of nutrient elements by plants from soil. The water dissolves the nutrient present in the soil to form a solution. This solution of nutrients is then absorbed by the roots for the development of plants.

do you know?

Rice and cotton uses the most water per hectare.

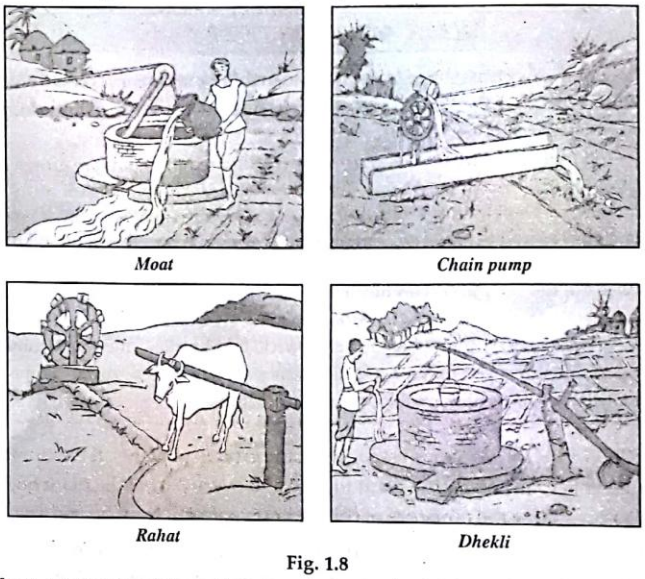
Two methods of irrigation that helps in conservation of water are :

(i) Traditional method (ii) Modern method



Traditional method : This method was used earlier for irrigation. They are cheaper but less efficient. It includes —

(i) *Moat*, which is based on pulley system
(ii) *Dhekli*
(iii) *Rahat*, which is based on lever system
(iv) *Chain pump*, which is based on pumps



Moat *Chain pump* *Rahat* *Dhekli*

Fig. 1.8

Modern Methods : These days, modern method of irrigation are used for supplying water to fields.

The two modern method of irrigation are :

(a) Drip system of irrigation (b) Sprinkler system of irrigation

(a) Sprinkler System : This system of irrigation supplies water to plants (crops) in the form of rain. In this method, water is supplied using pipes to one or more central locations within the field. When water is allowed to flow under high pressure with the help of pump, it get sprinkled on the crops. This method is more useful on uneven land that have fewer water supplies. Most of the crops such as wheat, grain, vegetable, pulses etc are irrigated by this method of irrigation.

Advantages of sprinkler method of irrigation –

(i) It provides efficient coverage of water from small to large areas.
(ii) It has a wide range of water capacity. Hence, they are used for nearly all soils.

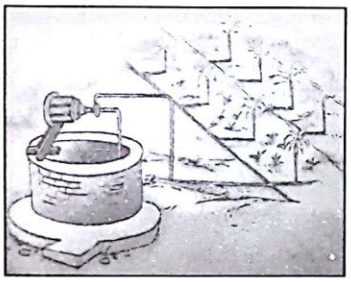


Fig. 1.9 : *Sprinkler System*

Fig. 1.10 : *Sprinkler System*

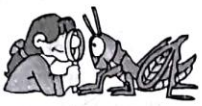
(b) Drip system : This method of irrigation is more efficient for irrigating fruits and vegetables. In this method, water is delivered at or near the roots of the plant drop by drop. Water is passed through plastic pipes that have holes in it. These plastic pipes are then laid along the rows of crop. This is the most efficient method of irrigation as there is no wastage of water at all.

Advantages of drip system :-

(i) It saves water, as water is delivered at or near the roots of the plant.
(ii) It avoids random watering of crops.
(iii) It improves water holding capacity of soil and reduces soil erosion.

CHECK Point

1. **Why gardeners need to give more water to plants in summers?**



CHECK YOUR ANSWERS

1. Gardeners give more water to plants in summers because in summers, the evaporation rate is high from soil and leaves. This makes the soil deficient. Hence, we need to give more water to plants to prevent drying of Plants.

The crops need to be irrigated with just the right amount of water, neither too little nor too much. *Why excessive irrigation of water is harmful to crops?*

1. Excessive supply of irrigation water to crop fields reduces the air trapped in the spaces between soil particles. As a result the roots of crop plants do not get sufficient air to breathe and hence they die.
2. Also, excess of water in the fields increases the amount of salt on the surface of soil, which is formed due to excessive evaporation. The accumulation of salt in the field lower the fertility of soil and hence reduces the crop growth and development.

do you know?

It takes 100 pounds of rain water to produce a single pound of food from the food.

Between 10 and 20 tons of water must pass through the roots of an acre of corn before one bushel of corn will be produced.

CHECK Point

1. **Why potted plants in our homes do not grow well if they are given excess of water?**

CHECK YOUR ANSWERS

1. It is because, excess of water expels most of the air from the spaces between soil particles. As a result, plant roots do not get sufficient air to breathe and hence they do not grow well.

WHAT IS LODGING?

The falling of mature crop plants in the fields due to action of strong winds is called lodging. The correct timing of irrigation is very important for a good crop yield. If the irrigation of a wheat field is done when the crop has fully matured or if there is heavy rainfall during harvesting season, then the wheat plants are unable to resist strong winds. In such cases, a strong wind blowing over the fields make the matured wheat plants fall on the ground. As a result, the quantity and quality of wheat crop and straw decreases. Thus lodging decreases both, the quantity and quality of crop. It also reduces yield and quality of straw.

5. **WEEDING :** *When you grow a food crop in the field, you must have noticed the growth of certain other plants along with major cultivated crop. What are these?* These undesirable plant that grow along with crop are called weeds. Weeds compete with the crop for water, nutrient, space and light. As a result of competition, crops gets lesser amount of nutrients, space and light that are required for survival. Hence, the productivity of crop reduces. Therefore, it is necessary to remove the weeds from the crop. Wild oat, Grass, *Amaranthus, Xanthium, Parthenium* are common weeds.

The process of removing weeds from the cultivated field is called weeding.

Various ways of weeding —

(i) Removal of weeds by pulling them out with hand is the traditional method of weeding.

(ii) Proper ploughing before sowing seeds helps in uprooting weeds.

(iii) Removal of weeds by using a trowel (khurpi) and harrow. *You must have seen farmers sitting in the field and uprooting certain plant with Khurpi. What are they doing?* Any guesses!! Farmers are uprooting the undesirable plants that are grown along with main crop. This is a manual method of removing weeds.

(iv) Crop rotation is another method for controlling the growth of weed. The weeds are very choosy about the crops with which they grow. Hence, by rotating the crops that has different nutrient requirement in the same field, disturbs the weed's life cycle and reduces their growth in the field.

(v) Weeds can also be destroyed by spraying special chemicals called weedicides on weeds. Benthiocarb, butachlor, 2, 4-D etc are some examples of weedicides. They are not harmful to crop but they can be harmful to farmers. Hence, these chemical should be carefully used and sprayed. Farmers are advised to cover their nose and mouth with a piece of cloth while spraying the weedicides on crops.

(a) Harrow

(b) Trowel (Khurpi)

Fig. 1.11

CHECK Point

1. **Why should weeding be done before flowering?**

CHECK YOUR ANSWERS

1. Weeding is done before flowering so that weeds cannot produce seeds to multiply their number and these seeds cannot mix with grains.

6. **HARVESTING :** Once the crop has matured, it is now time to cut the crop and transport it to market. *The process of cutting and gathering of the matured food crop is called harvesting*. Most of the crops are harvested in autumn season. In harvesting, the crops like wheat or rice are cut close to the ground by hand using a tool called *sickle*. It is manual method of harvesting crops, In large fields, the crops are harvested using machine called harvester.

How harvesting is done in India?

In India, harvesting is done mostly by sickle. Sickle is made up of curved, plain blade of carbon steel.

It has a wooden handle to hold the sickle. The tang of the blade is lightly fixed into the handle with a ferrule.

Fig. 1.12 : *Sickle*

Other methods of harvesting :-

(i) **Forage harvesters :** These are tractor drawn self propelled machines that are used to collect together, chop and then discharge the crop into field as it moves through.

(ii) **Combines :** They are farm machines that are used to harvest seed crops and grains. Combine perform cutting, threshing, separating, cleaning and grain handling operations in the field.

Fig. 1.13 : *Forage harvesters*

7. **THRESHING :** After harvesting, the next step is threshing. *You must have seen farmers rubbing the grain between palm hands or beating the crops with a hard object. What are they doing?* They are separating the grain seeds from pods or chaff or plant. This process is known as threshing. *Threshing is the process of separating the grain seeds from the chaff.* It is a slow and time consuming process if it occurs manually. Hence, it is carried out with a machine called "*Combine*". Combine is actually the combined harvester and thresher.

Fig. 1.14 : *Combine*

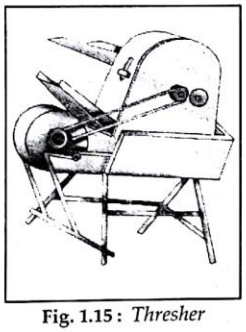


Fig. 1.15 : *Thresher*

do you know?

The first combine harvester was designed in 1836 by Americans Hiram Moore and John Hascall. It was pulled by horses.

8. **WINNOWING :** After grains are threshed, the chaff is removed from the grains. This process is known as winnowing. Hence, *winnowing is the process of separating grain from the mixture of threshed chaff.*

When the grain mixed with chaff and hay is made to fall from a height in blowing wind, the grain being heavy, falls straight to the ground, whereas chaff and hay, being much lighter, are carried some distance away by the wind. In this way, the grains forms a separate heap and can be collected and packed in a gunny bag.

The machine that is used for doing winnowing is called *winnower*. It is the most efficient, quick and easy machine to separate grain from chaff.

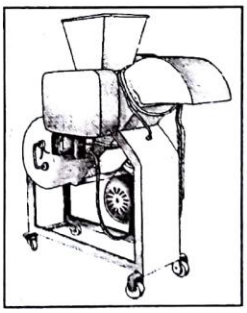


Fig. 1.16 : *Winnower*

do you know?

The harvesting of crop is considered as an important celebration for farmers. It fills the heart of all farmers with happiness and well being.

Can you name some of the festivals associated with the harvest season? Pongal, Baisakhi, Holi, Diwali, Nabomya etc are the festivals associated with the harvest season. These festivals are celebrated by farmers with great enthusiasm.

9. **STORAGE OF FOOD GRAINS :** This is the most important agricultural activity. The food grains obtained by harvesting the crops are dried in the sunshine before storing. This is because higher moisture content in grain promotes the growth of fungus and moulds on the stored grain, which later damages them. Hence, crops are dried in the sunshine before storing to reduce the moisture content of grains and to prevent their spoilage during storage.

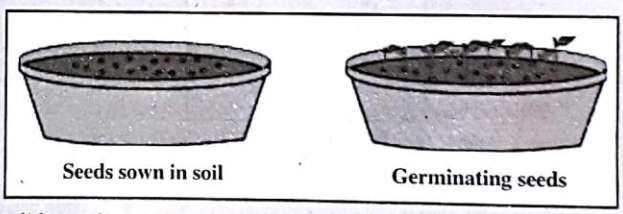
The farmers store the dried grains in metal bins and jute bags. The Government agencies like FCI (Food Corporation of India) buy grains from farmers and store it in big godowns. It is done so that it can be supplied throughout the country, round the year. The large scale storage of food grains is done in gunny bags and in grain silos.

IDEA BOX

How the viability of seed can be checked?

Take few stored seeds from the godowns Count them and place then in a tray that contains fresh compost. Water the compost and keep the tray in a warm lighted place.

Observe the growth of seeds.



Seeds sown in soil | Germinating seeds

What did you observe?

You can see that more than half of the seeds sprout. It means that these stored seeds are viable and has good chances of germinating in the garden or field. The ability of the plant to produce new plants depends on the time of harvest and the conditions of seed storage. Hence, it is important to take all necessary precautions while storing the seeds.

Precautions to be taken while storing seeds —

(i) Well-dried seeds should be stored. The viability of seeds depend on temperature and moisture. Hence, seeds should be stored at proper temperature and with proper moisture, otherwise it will deteriorate quickly.

(ii) At homes or shops the seeds should be stored in a sealed, water resistant, air tight container, then keep the container in a cool and dark place.

(iii) Protect the seed from the insects. The seeds can be protected from insects/ pests by —

(a) Storing the seed with wood ash. Wood ash prevent the entry of insect inside container.

(b) Store seeds with lime. Lime has an insect repelling property.

(c) Mix the seeds with vegetable or coconut oil.

(iv). The seeds that are in bulk quantity should be stored in silos and granaries. Silos and granaries are store house for storing threshed grain that is present in large quantity. Granaries are often built above the ground. The distance of granaries from the ground protects the grains from mice and other pest.

(v). Sometimes, the dried neem leaves are added along with grain to protect it from insects or pests. The leaves and oil of the neem are very effective against a wide range of storage pests.

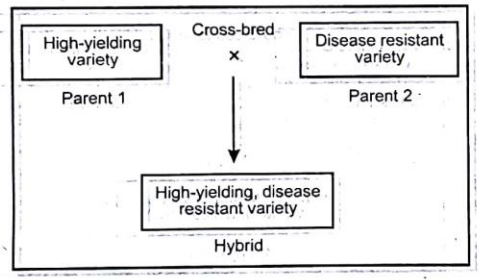
CROP IMPROVEMENT :

The improvement in crop plants is necessary for increasing the crop yield and their quality. *Can you think of a way by which you can improve the qualities of crop and their yield?*

Crop improvement can be done by breeding new varieties of crops having higher yields and resistance to pests and diseases. The agricultural scientists or plant breeders can achieve this by artificial cross-breeding or hybridisation.

For example, if you want to obtain an improved variety of a crop that have higher yield as well as are disease resistance, then you should select two existing crops, one having higher yield and other having more resistance to diseases. When higher yielding plant is crossed with disease resistant plant, then a new variety of plant is produced that contains qualities of both parents.

Thus, the new plant (hybrid) will produce higher yield as well as are disease resistant.



WHAT IS HYBRIDIZATION?

Hybridization is the process of cross-breeding two different varieties of crop plant each having a desired characteristics to obtain a new crop that have both the desired characteristics.

Some examples of high-yielding varieties of crops —

Crops	High yielding varieties in India
Wheat Sonara,	Sonalika, Kalyan sona, Sharbati Hira Moti
Paddy	Jaya, Padma, Pusa 215
Maize	Ganga 101, Rajit, Deccan hybrid

do you know?

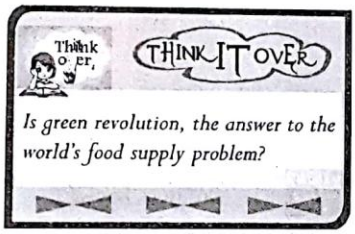
One of the most controversial scientific discoveries of the 20th century is the genetic modification (GM) of food. The genes of every living organism can be altered to change its characteristics. For example, farmers can add anti-pest genes to crops, which enable them to survive longer or grow unusually large.

THE GREEN REVOLUTION :

The average production of most of the crop in our country, India, has doubled during the last 30 years. But the production of wheat crop has tripled during the last 30 years. This great increase in the production of food - grain crops (especially the wheat crop) in India during the last 30 years is called green revolution. This is a sort of revolution taking place in Indian agriculture, leading to enormous food grain production.

Why green revolution is called green?

It is called green because it has led to unprecedented greenery of crops everywhere in country. It has made our country self sufficient in food production and even created buffer stocks of food grains for use in times of natural calamities like drought, and flood, when food production is reduced.



FOOD OBTAINED FROM ANIMALS :

Like plants, animal also provide us different types of food. The food provided by animals consists of milk, egg and meat. They are rich source of proteins. In fact, animals food provides certain proteins that are not present in plant foods.

Let us perform an activity to find out various types of animal food and their sources.

Collect the information from your surroundings to complete the given table.

Sl.No.	Category of Animal	Type of food	Sources
1.	Meat yielding	Meat	Sheep, Coat, Fish
2.	Milk yielding	Milk	Cow, Buffalo, Goat
3.	Egg yielding		
4.	Honey and wax producing insects		
5.	Fibre yielding animals		
6.	Silk producing animals		

do you know?

Twelve busy little bees must collect the nectar from 2000 flowers to make a tablespoon of honey.

Single cow can produce 46,000 glasses of milk in a year. The average cow produces 2100 pounds of milk in a month.

Hence, it is important to maintain the population of livestock as they provide various kinds of food to us. It includes various aspects like feeding & breeding and disease control of various animals. This process is known as *animal husbandry*. *Animal husbandry is the practice of feeding, breeding and raising the livestock on large scale.* It includes animals like cattle, goat, sheep, poultry and fish.

Objectives of animal husbandry are —

(i) To improve the breeds of domestic animals

(ii) To provide better nutrition and atmosphere to animals so that the yield of their product (like meat, eggs, milk etc) can be increased.

- Plants of same kind that grow on a large scale in an area is known as *crop*. E.g. rice, wheat, maize etc.
- The production of crops by cultivation of land is called *Agriculture*
- In India, crop can be categorised into two types based on seasons – Rabi and Kharif crops.
  - **Rabi crops** – Crops grown in rainy season (June – October). Examples, Pea, Mustard, Wheat, Gram etc.
  - **Kharif crops** – Crops grown in winter season (November – April). Examples Paddy, Maize, Groundnut etc.
- The basic activities done by farmers in the crop field to raise a particular crop is called agricultural practices.
- Seven agricultural practices done by the farmer to raise a particular crop are –
  1. Preparation of soil
  2. Sowing
  3. Adding manure and fertiliser
  4. Irrigation
  5. Protection from weeds and pests
  6. Harvesting, Threshing
  7. Storage
- The process of loosening and turning of the soil is called *tilling* or *ploughing*. This is done by plough, hoe and cultivator.
- The process of scattering seeds in the ground soil for growing the crop plants is called *sowing*.
- The sowing of seed by hand is called broadcasting while the implement used for sowing is a seed drill.
- The substances that are added to the soil in the form of nutrients for healthy growth of plants are called manure and fertilizer.
- Process of converting dead organic matter into rich humus with the help of earthworm is called *vermicomposting*.
- Practice in which leguminous and non-leguminous crops are grown alternately in the same field is called *crop rotation*.
- *Irrigation* is the supply of water to crops at different intervals.
- The sources of irrigation are wells, tube well, ponds, lakes, rivers, dams and canals.
- The traditional methods of irrigation are Moat, Dhekli, Rahat and Chain pump
- The modern methods of irrigation are sprinkler system and drip system
- Process of transferring seedlings from a nursery to the main field, by hand is called transplantation.
- The unwanted plants that grow along with a cultivated crop are called *weeds*. E.g. Grass, *Xanthium*, wild oat etc.
- The process of removing unwanted plants from a crop is called *weeding*.
- The cutting of crop after it get matured is called harvesting. It is done manually by sickle.
- In large fields, crops are cut by a motorised machine called *harvester*.
- In the harvested crop, the grain seeds need to be separated from the chaff. This process is called *threshing*.
- *Winnowing* is the process of separating grain from chaff and hay with the help of wind.
- The food grains obtained by harvesting the crops are dried in sunshine before storing.
  - Small scale – Jute bags, metallic bins
  - Large scale – Silos, granaries
- The process of rearing animals to obtain food is known as *animal husbandry*.

exercise 1

FIB FILL IN THE BLANKS :

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

1. The excess water in the field is known as _____.
2. Crops such as _____ requires a constant supply of water.
3. _____ crop is grown from the month of June to October.
4. _____ is the first step to be followed before growing a crop.
5. The process of converting dead organic matter into rich humus with the help of earthworm is known as _____.
6. _____ are good source of nitrogen, phosphorus and potassium but are good for only short term use.
7. Rotation of leguminous crop with wheat or maize is an example of _____.
8. In _____ system of irrigation, water is delivered at or near the roots of the plant drop by drop.
9. Weeds can be removed manually with a _____.
10. The seeds of paddy are first grown in small plots called _____.
11. The substances that are added to the soil in the form of nutrients for the healthy growth of plants are called _____ and _____.
12. _____ is a simple tool which is used for removing weeds and for loosening the soil.
13. _____ is the agricultural practice of breeding and raising livestock.
14. _____ are like artificial rainmakers.
15. Organisms that damage the crop are known as _____

T/F TRUE & FALSE :

DIRECTIONS : *Read the following statements and write your answer as true or false.*

1. Cotton is a Rabi crop.
2. The agricultural practice, called harvesting comes before weeding.
3. Groundnut enriches the soil with nitrogen.
4. Nitrogenous fertilizer is required for growing nitrogenous crops.
5. In addition to gunny bags, metal bins are also used for storing food grains on large scales.
6. Rotation of crop helps in controlling weeds.
7. Combine is a combination of harvester and thresher.
8. Plough is used for adding manure or fertilizers to the crop.
9. The excessive use of manure causes water pollution.
10. Rabi crops are grown in winter.

MTF MATCH THE FOLLOWING :

DIRECTIONS : *Each question contains statements given in two columns which have to be matched. Statements in column I have to be matched with terms in column II.*

S.No.	Column-I	Column-II
A.	Plant that is grown in large quantities especially as food or fodder for livestock.	(p) Rabi crops
B.	Crops planted in June and harvested in October	(q) Transplantation
C.	Crops planted in November and harvested in April	(r) Kharif crops
D.	Undesirable plants that grow with the crops	(s) Manure
E.	Process of transferring seedlings from a nursery to the main field	(t) Fertilizers
F.	Process of supplying water to crops at different intervals	(u) Weedicides
G.	Organic substance obtained from decomposition of plant and animal waste	(v) Weeds
H.	Chemical substances that are rich in plant nutrients like nitrogen, phosphorus and potassium	(w) Agriculture
I.	The chemical substance that controls the growth of weeds	(x) Crop
J.	The process of growing plants and rearing animals for food, clothing and other useful products	(y) Irrigation

VSAQ VERY SHORT ANSWER QUESTION :

DIRECTIONS : *Give answer in one word or one sentence.*

1. Name two primary cropping pattern in India?
2. What is crop?
3. Which is the first step in the cultivation of a crop?
4. What is tilling?
5. Name the implement used for ploughing the fields?
6. Which step in the preparation of soil loosens and turns the soil in the fields?
7. What is sowing?
8. Name the implement used in sowing.
9. Name the practice used for cultivating rice?
10. Name the various sources of irrigation in our country?
11. What is meant by term "water lodging" as used in agriculture?
12. Name two substances that are added to fields by farmers to maintain the fertility of soil.
13. What is compost?
14. Name two fertilizers?
15. Which crop is grown between two cereal crops in crop rotation?
16. What is crop rotation?
17. *Xanthium* is grown in a wheat field. What will it be known as?
18. What is weeding?
19. Name two implements used for weeding?
20. What are weedicides?
21. Name the chemical substances that are sprayed on crops to protect them from damage.
22. Which agricultural practice is carried out with the help of sickle?
23. Name the process in which grains are separated from chaff and hay with the help of wind.
24. Name the two ways in which farmers store food grains?
25. Name the machine used both for harvesting and threshing?
26. Give two examples of Rabi crops.
27. Give two examples of Kharif crops.
28. What do you mean by nitrogen fixation?
29. Give two example of crop grown from June to October.
30. Name the nitrogen fixing bacteria in root nodules of leguminous plants.

SAQ SHORT ANSWER QUESTION :

DIRECTIONS : *Give answer in 2-3 sentences.*

1. How Kharif crop is different from Rabi crop?
2. Give four importance of soil loosening?
3. What are the advantages of levelling?
4. Write down differences between fertilizers and manure?
5. Explain how soil is affected by the continuous plantation of crops in a field?
6. Why preparation of soil is considered to be an important step in agricultural practices.
7. What are *Rhizobium* bacteria? Why are they useful?
8. Why is manure better than fertiliser?
9. How are weeds removed manually? When is the best time to remove them?
10. List the steps involved in crop production in sequential order.
11. Differentiate between insecticides, rodenticides and fungicides.
12. Why grains are dried before storage?
13. What enables leguminous plants to fix nitrogen?
14. Which of the following are Kharif crops and which are Rabi crops?
    Soyabean, Barley, Mustard, Peas, Cotton, Groundnut
15. What types of crops are grown :
    (i) During November to April?
    (ii) During June to October ?
16. Name three steps involved in the preparation of soil for sowing the seeds.
17. What precautions should be taken in sowing the seeds?
18. Which of the following are cultivated by transplantation?
    Paddy, Chillies, Tomatoes, Maize, Wheat
19. State two advantages of the process of transplantation of growing crops?
20. What is the necessity of irrigating the crops?
21. How do weeds affect the growth of crops?
22. What is weeding? State the various methods of weeding.
23. What are pests? What steps are taken to protect crops from pests?
24. Why should the grains, fruits and vegetables be washed properly before use?
25. Define the terms –
    (i) Harvesting (ii) Threshing (iii) Winnowing
26. What is a "combine" that is used in agriculture? State its function.
27. What is the advantage of storing food grains in gunny bags?
28. What is done to protect the grains stored in gunny bags in big godowns from damage?
29. Explain the irrigational methods that are used in modern times.
30. How manure is prepared.

exercise 2

MCQ MULTIPLE CHOICE QUESTIONS :

DIRECTIONS : *This section contains* **18** *multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct. Choose the correct option.*

1. Person known for his pioneering efforts in promoting the green revolution in India is
   (a) Benjamin Franklin (b) Norman Borlang
   (c) Robert Brown (d) Albert Einstein
2. Which of the following is not a rabi crop?
   (a) Wheat (b) Mustard
   (c) Sugarcane (d) Peas
3. Which of the following crops would enrich the soil with nitrogen?
   (a) Apple (b) Beans
   (c) Paddy (d) Potato
4. The process of turning and loosening of soil is called
   (a) Tilling (b) Harvesting
   (c) Threshing (d) Irrigation
5. Threshing is the process of
   (a) Separating chaff from the grain
   (b) Cutting of mature crop
   (c) Sowing seeds by lands
   (d) Turning and loosening of soil
6. Which of the following statements is not correct about fertilizer?
   (a) It enriches the soil with organic material
   (b) It provides nutrients to the soil immediately in concentrated from
   (c) It increases the crop production several times
   (d) It is available in all seasons
7. Which of the following is a modern method of Irrigation?
   (a) Rahat (b) Moat
   (c) Chain pump (d) Drip system
8. Which of the following is incorrectly matched?

	Agricultural Steps	Implements Used
(a)	Ploughing	Hoe
(b)	Irrigation	Sprinklers
(c)	Weeding	Trowel
(d)	Harvesting	Harrow

9. The simple tool used for removing weeds and for loosening the soil is called
   (a) Plough (b) Sickle
   (c) Harrow (d) Trowel
10. The process of putting seeds in the soil for germination is known as
    (a) Sowing (b) Manuring
    (c) Weeding (d) Tilling
11. Ploughing in bigger fields is done by using
    (a) Hoe (b) Cultivator
    (c) Combine (d) Sickle
12. Which of the following statements is correct about ploughing?
    (a) It facilitates deeper penetration of soils
    (b) It maintains fertility of soil
    (c) It helps in proper mixing of organic matter and nutrients evenly
    (d) It helps in enriching the soil with organic matter and nutrients
13. The process of removing weeds from the cultivated field is known as
    (a) Weeding (b) Weedicide
    (c) Tilling (d) Crop rotation
14. An example of manure is
    (a) Cow dung
    (b) Urea
    (c) Ammonium sulphate
    (d) Super phosphate
15. The large scale storage of food grains is done in
    (a) Gunny bag + Jute bags
    (b) Jute bags + Metal bins
    (c) Metal bins + Grain silos
    (d) Grain silos + gunny bag
16. The last step in crop production is
    (a) Soil preparation (b) Crop harvesting
    (c) Irrigation (d) Sowing
17. An example of fertilizer is
    (a) Cow dung (b) Plant waste
    (c) Urea (d) Urine
18. Which of the following statement is incorrect?
    (a) Always use certified seeds to maintain the quality of crop.
    (b) Harvest the crop when grains are fully matured.
    (c) Use recommended dose of fertilizers.
    (d) Irrigate the soil with polluted water.

MTOC MORE THAN ONE CORRECT

DIRECTIONS : *This section contains 6 Multiple Choice Questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONE OR MORE may be correct.*

1. The basic requirement that lead to a good agricultural yield is / are
   (a) An open field that gets plenty of sunlight and air.
   (b) Inadequate nutrients for the proper growth of plants.
   (c) Insufficient sources of water for irrigation.
   (d) Properly loosened and aerated soil in the field.
2. Which of the following is a biological method of pest control in a field?
   (a) Use of pesticide
   (b) Fences around the field
   (c) Use of scarecrow in a strategic position.
   (d) Rotation of crop.
3. Combine is used for
   (a) Threshing (b) Winnowing
   (c) Harvesting (d) Weeding
4. The soil needs to be prepared for sowing of seeds through
   (a) Ploughing (b) Levelling
   (c) Manuring (d) Irrigation
5. An example of crop rotation is
   (a) Pea, Wheat, Bean (b) Wheat, Maize, Paddy
   (c) Pea, Wheat (d) Maize, Soyabean
6. Which statement about manure is correct?
   (a) They are natural organic substances
   (b) They are rich in inorganic nutrients
   (c) They are prepared in fields
   (d) They are prepared in factories

PBQ PASSAGE BASED QUESTION :

DIRECTIONS : *Study the given paragraph(s) and answer the following questions.*

The term Green Revolution is applied to the period from 1967 to 1978 and even into today. Between 1947 and 1967, efforts at achieving food self-sufficiency were not entirely successful. Efforts until 1967 largely concentrated on expanding the farming areas. But starvation death were still being reported in the newspapers.

Also, the population was growing at a much faster rate than food production. This called for drastic action to increase yield. The action came in the form of Green Revolution. Green Revolution began in many third world countries to enhance food production and was most successful in India. The Green revolution resulted in a record grain output of 131 million tons in 1978-79. The crop area under high yield varieties grew from 7% to 225 of the total cultivated area during the 10 years of the green revolution.

However, even today, India's agricultural output sometimes falls short of demand. Thus, the green revolution, howsoever impressive was not succeeded in making India totally and permanently self sufficient in food. Also, India failed to extend the concept of high-yield value seeds to all crops or all regions. In terms of crops, it remains highly confined to food grains only, not to all kinds of agricultural produced. In regional terms, only Punjab and Haryana states showed the best results of the Green Revolution. The eastern plains of the River Ganges in West Bengal state also showed reasonably good results. But results were less impressive in other parts of India.

Thus, Green Revolution cannot therefore be considered to be a 100 percent success.

Based on above passage, answer the following questions.

1. **In which states of India was the Green Revolution successful?**
2. **By how much percent did the production increased during the 10 years of the Green revolution.**
3. **List two positive results of the Green revolution in India.**
4. **List two limitations of the Green revolution in India**
5. **Why green revolution was not equally successful in all parts of India?**

A&R ASSERTION & REASON :

DIRECTIONS : *Each of these questions contains an Assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) If both **Assertion** and **Reason** are **correct** and Reason is the **correct explanation** of Assertion.
(b) If both **Assertion** and **Reason** are correct, but Reason is **not the correct explanation** of Assertion.
(c) If **Assertion** is **correct** but **Reason** is **incorrect**.
(d) If **Assertion** is **incorrect** but **Reason** is **correct**.

1. **Assertion :** Gram and clover are Rabi crops
   Reason : They are grown during the months of November to April.
2. **Assertion :** Fertilizers provide quick replenishment of plant nutrients in the soil and restore its fertility
   Reason : They are easily absorbed by the plants.

3. **Assertion :** A fertilizers provides a lot of organic matter like humus to the soil.
   Reason : They are very rich in plant nutrients like NPK.
4. **Assertion :** Crop improvement can be done by breeding new varieties of crops having higher yields.
   Reason : The main aim of plant breeding is to produce new crops superior to existing ones.
5. **Assertion :** When the crop is changed during crop rotation, the weeds associated with it usually disappear.
   Reason : The weeds are very choosy about the crop with which they grow.
6. **Assertion :** Earthworm are called a farmer's friends.
   Reason : The burrowing action of earthworms helps to loosen the soil particles.

MMQ MULTIPLE MATCHING QUESTIONS

DIRECTIONS : *Each question has four statements (A, B, C and D) given in Column I and five statements (p, q, r, s) in Column II. Any given statement in Column I can have correct matching with one or more statement(s) given in Column II. Match the entries in column I with entries in column II.*

1.

Column I	*Column II*
(A) Rabi crop	(p) Barley
(B) Kharif crop	(q) Maize
(C) Cereals	(r) Pea
(D) Pulses	(s) Cotton

2.

Column I	*Column II*
(A) Ploughing	(p) Cow dung
(B) Manure	(q) Plough
(C) Irrigation	(r) Khurpi
(D) Weeding	(s) Dhekli

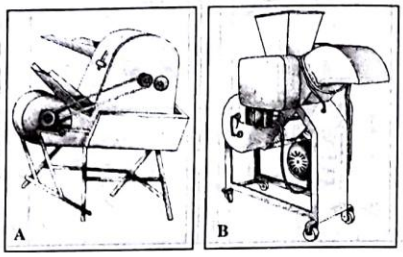
PBQ PICTURE BASED QUESTIONS

DIRECTIONS : *Study the given picture(s) and answer the following questions.*

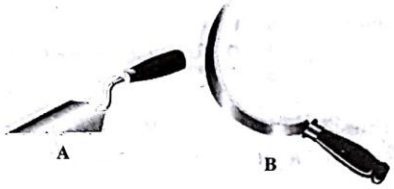
1. Study the given figure

What is the importance of given figure in agriculture?

2. Identity the given machines.



3. (a) Identify the given tools.



(b) Based on the function they perform, differentiate tool A from tool B?

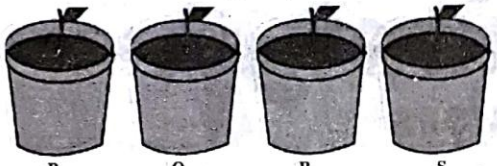
4. Identify the given picture. Why they are placed in paddy fields by farmers?

ABQ ACTIVITY BASED QUESTIONS :

DIRECTIONS : *Study the given activities and answer the following questions.*

1. Sanjana was given a sample of wheat seeds. How will you select good, healthy seeds for sowing?
2. In an experiment, Reena took few healthy gram seeds and allowed them to germinate in a pot.
   Then she took three empty vessels and labelled them as P, Q, R and S.
   In vessel P, she put soil mixed with compost.
   In vessel Q, she put soil mixed with NPK fertilizer.
   In vessel R, she put some soil mixed with both compost and NPK fertilizer.
   In vessel S, she put some soil with no manure or fertilizer mixed with it.

Then she selected equal sized seedlings and planted two seedlings in the soil mixture in each vessel. She watered each vessel regularly.



P	Q	R	S
Soil Mixed with compost	Soil Mixed with NPK	Soil Mixed with compost and NPK	Soil only

Based on the experiment, answer the following questions.

(i) In which vessel the growth of seedling is fastest and why?

(ii) What conclusion can be drawn from the experiment?

3. **Number the following boxes in the correct sequence.**

Irrigation on large scale ☐	Ploughing and levelling ☐	
Threshing and drying ☐	Paddy at harvest time ☐	Application of Fertilizers ☐
Storage and Packaging ☐	Transplantation ☐	
Protection of crops from weeds and insects ☐	Sowing seeds in a nursery ☐	

4. Discuss the importance of the following in improving the quality of crops.

(i) Green Revolution

(ii) Crop rotation

5. **Fill in the blank spaces in the given passage about green revolution.**

The green revolution is a programme that began in _____. It refers to the dramatic increase in agricultural productivity due to use of genetically _____ varieties of seeds. _____, an American agricultural was the first to promote this programme in India, Mexico and _____. During this programme, high-yielding, disease resistant varieties of wheat were introduced in India from _____ . _____ was the India's premier green revolution scientist. He bought a variety of seeds developed in _____ and cross bred them with the local varieties in India to obtain a _____ variety. This variety yielded more grains than the traditional types. His efforts in biotechnology helped to transform India from _____ prone food importer to an _____ self sufficient nation.

HSQ HOTS SUBJECTIVE QUESTIONS :

DIRECTIONS : *Answer the following questions.*

1. Why do farmers normally use a mixture of manures and fertilizers in the fields?
2. Which method of irrigation will you use if you live in a dry area with shortage of water?
3. Discuss two methods of weeding in which poisonous chemicals are not used.
4. Why does the government maintain a buffer stock of grains?
5. ***Crop rotation is practised by farmers so that they have different products to sell in the market in every season***

Do you agree? Give reason in support of your answer.

6. Four students proposed four different ways to fulfil the food requirement to a large number of people in our country.

Which method according to you can bring about the maximum increase in crop production in our country?

Increase land under cultivation	Use more manure and fertilizers
Less wastage in storage	Use better varieties of crops plants

7. What happens if the farmer grows Mustard during rainy season instead of winter?
8. "Indian farmers gamble with the monsoon". Illustrate this statement.
9. The recent incidents farmers' suicides in different states of the country are the result of indebtedness. Do you agree with this?
10. How do insect or pest reduce crop productivity?
11. How does continuous rainfall affect crop production?

SOLUTIONS

BRIEF EXPLANATIONS OF SELECTED QUESTIONS

EXERCISE 1

FIB FILL IN THE BLANKS :

1. Water logging, **2.** Paddy, **3.** Soyabean, **4.** Preparation of soil, **5.** Vermicomposting, **6.** Fertilizers, **7.** Crop rotation, **8.** Drip, **9.** Harrow/Khurpi, **10.** Nurseries, **11.** Manure, fertilizers, **12.** Hoe, **13.** Animal husbandry, **14.** Sprinklers, **15.** Pests.

T/F TRUE & FALSE :

1. False. Cotton is a Kharif crop.
2. False. Harvesting comes after weeding.
3. True
4. False. Nitrogenous fertilizer is not required for growing nitrogenous crops, since leguminous crops can fix the atmospheric nitrogen themselves by using nitrogen fixing bacteria present in their root nodules.
5. False. In addition to gunny bags, silos are also used for storing food grains on large scales.
6. True
7. True
8. True
9. False. The excessive use of fertilizer causes water pollution.
10. True

MTF MATCH THE FOLLOWING :

A – (x), B – (r), C – (p), D – (v), E – (q), F – (y), G – (s), H – (t), I – (u), J – (w)

VSAQ VERY SHORT ANSWER QUESTION :

1. Kharif and rabi crops.
2. Large scale cultivation of plants of same kind at one place is called crop.
3. Soil preparation
4. Turning and lossening of soil.
5. Plough / Hoe
6. Ploughing
7. Process of placing seed in the ground soil for growth of crop plants.
8. Seed drill
9. Transplantation
10. Wells, canals, rivers, dams, ponds and lakes
12. Manure and fertilizers
14. Urea, Ammonium sulphate
15. Leguminous crops
17. Weeds
19. Harrow and Trowel
22. Harvesting
23. Winnowing
24. Small scale – Jute bags, metallic bins
    Large scale – Silos, granaries
25. Combine
26. Pea, mustard
27. Paddy, Maize
29. Groundnut, Maize (Kharif crops)
30. *Rhizobium*

SAQ SHORT ANSWER QUESTION :

1.

	Rabi Crop	*Kharif Crop*
(a)	Grown in winter season	(a) Grown in rainy season
(b)	Seeds are sown in October and harvested in march.	(b) Seeds are sown in June and harvested in September.
(c)	E.g. pea, mustard, wheat, gram etc.	(c) E.g. paddy, maize, groundnut etc.

2.
- Roots penetrate deep into the soil and breathe easily, water holding capacity of soil increases
- Helps in the growth of microbes and earthworm which help in turning the soil and add humus in soil.
- The nutrient rich soil comes up and nutrients are absorbed by plants.
- Proper mixing of manure in the soil.

4.

	Manure	*Fertilizer*
(a)	Obtained by the decomposition of plant and animal waste	Obtained from inorganic salt.
(b)	Prepared in fields	Prepared in factories
(c)	Provides humus to soil	Does not provide humus
(d)	Rich in plant nutrient	Less rich in plant nutrient

8.
- Enhances water holding capacity of soil
- Makes soil porous due to which exchange of gases become easy.
- Increases number of friendly microbes.
- Improves texture of soil.

25.
- Harvesting-Cutting of crop plants after maturation is called harvesting. It is done by cutting the crop plants close to the ground or pulling the crop plants.
- Threshing-Separation of grains from chaff is called threshing.
- Winnowing-Separation of grains from chaff by the help of wind is called winnowing.

30.
- Manure is obtained from the decomposition of plant or animal wastes.
- Plant and animal wastes are dumped in pits at open places and allow it to decompose by microbes.
- The decomposition product is manure.

MCQ MULTIPLE CHOICE QUESTIONS :

1. (b) Dr. Norman Borlang, an American agricultural scientist was the first to promote the green revolution in India.
2. (c) Sugarcane is not a Rabi crop. It is a Kharif crop. Kharif crops are grown in rainy season.
3. (b) Beans is a leguminous crop that enriches the soil with nitrogen, Leguminous crops fix the atmospheric nitrogen themselves by using nitrogen fixing bacteria present in their root nodules.
4. (a) The process of turning and loosening of soil is called ploughing or filling Harvesting is the process of cutting the crop and gathering them to transport it to the market. Threshing is the process of separating the chaff from the grain. Irrigation is the process of watering the plants in a field.
5. (a) Threshing is the process of separating the grain seeds from pods or chaff. The process of cutting of mature crop is known as harvesting. The process of sowing seeds by lands is known as broadcasting while ploughing is the process of turning and loosening of soil.
6. (a) Manure enriches the soil with organic material (humus). A fertiliser does not provide any humus to soil.
7. (d) Drip system of irrigation is a modern method of irrigation. In this method water is delivered at or near the roots of the plant drop by drop. Moat, Rahat and chain pump are traditional methods of irrigation, they are cheaper but less efficient.
8. (d) Harrow is used for removing unwanted plants (weeds) from the crops. The implements used for harvesting are sickle, and harvesting machine. Hence, option (d) is incorrectly matched.
9. (a) 10. (a)
11. (b)
12. (d) Manuring helps in enriching the soil with organic matter and nutrients
13. (a) 14. (a) 15. (d)
16. (b) 17. (c) 18. (d)

MTOC MORE THAN ONE CORRECT

1. (a), (d) 2. (b), (c), (d)
3. (a), (c) 4. (a), (b), (c)
5. (a), (c), (d) 6. (a), (c)

PBQ PASSAGE BASED QUESTION :

1. Punjab, Haryana, West Bengal
2. From 7% to 22%
3. Two positive results –
   (a) Industrial growth created new jobs and improved the quality of life of the people in villages.
   (b) Industrial growth due to need of more fertilizer and more pesticides contributed to the country's GDP.
4. Limitations of Green Revolution :-
   (a) Poor farmer could not afford High yield variety seed (HYV)
   (b) HYV seeds need more water and fertilizer, which is expensive and unaffordable by the poor farmers.
5. (a) Irrigation facilities were limited only to Punjab, Haryana and Western UP.
   (b) Farmer's were not aware of modern technology and its accessibility.
   (c) Good and high yielding varieties of seeds were not easily available
   (d) Poverty of farmers

A&R ASSERTION & REASON :

1. (a) 2. (a)
3. (d) **Assertion** is incorrect but **Reason** is correct.
4. (b) Both the statements are true.
5. (a) Both the statements are correct and Reason is the correct explanation of Assertion.
6. (a) Both the statements are correct and **Reason** is the correct explanation of **Assertion**.

MTF MULTIPLE MATCHING QUESTIONS :

1. (A) – (r); (B) – (q, s); (C) – (p, q); (D) – (r)
2. (A) – (q); (B) – (p); (C) – (s); (D) – (q, r)

PBQ PICTURE BASED QUESTIONS

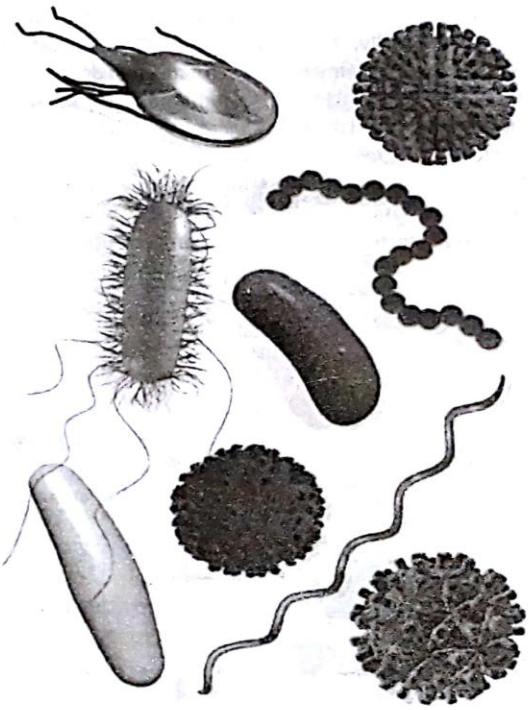
1. The figure represents a method of winnowing. After threshing, the grain has to separated from chaff. This can be done manually with the help of wind and is called winnowing.
2. A – Thresher
   B – Winnowing machine
3. (a) A – Trowel
   B – Sickle
   (b) The tool A is a trowel and is used for removing weeds from a field. The tool B is a sickle and is used for cutting matured crops from the field.
4. The given picture is of Scarecrow. It is an image in the shape of a human being that is placed in fields to frighten away birds.

ABQ ACTIVITY BASED QUESTIONS :

1. - A beaker is taken half filled with water.
   - A handful of seeds is put into it and stirred well.
   - The seeds which float on water are damaged one. They are hollow and are thus lighter.
   - The healthier being heavier sink and are separated.
2. (i) Plantlets in vessel R shows the maximum growth because NPK fertiliser is readily soluble in water and is quick acting. When it is applied to the soil, nitrogen is rapidly changed into ammonia. Later seeds use this ammonia for its growth and development.
   The plantlets in vessel P and Q shows normal growth but less compared to vessel C.
   The growth of the plantlets in vessel D is least because the soil is infertile due to lack of certain soil nutrients.
   (ii) From the experiment, it can be concluded that plants require nutrients (manure and fertilizers) for better growth.
5. 1960s, improved, Dr. Norman Borlang, Pakistan, Mexico, Dr. M.S. Swaminathan, Mexico, Hybrid, Famine, agriculturally.

HSQ HOTS SUBJECTIVE QUESTIONS :

2. Sprinkler system of irrigation
3. Crop rotation and proper ploughing before sowing seeds helps in removing weeds.
4. An extra stock called buffer stock is maintained so that grains are available in plenty even if there is a short fall in production in a particular year, for example due to monsoon failure.
5. No, this is not true. Crop rotation helps replenishment of the soil with nitrogen.
6. To fulfil the food requirement of increasing population in our country we need to constantly increase the food grain production. This can be done by increasing the land under cultivation. But we cannot indefinitely go on increasing farmland, as this leads to environmental problems.
   Hence, improvement in the methods of agricultural practices is the most suitable alternative to increase crop produce. Better irrigation methods, proper use of manure and fertilizers etc will help improving the crop produce.
   Also, by providing better storage methods, we can reduce wastage of food grain. However, recently, an increase in crop produce has come about from using better varieties of crops that have higher yield and more resistance to diseases.
   Hence, these days, use of better varieties of crop plants has brought about maximum increase in crop production in our country.
8. (i) Uneven distribution of rainfall-spatial and temporal
   (ii) Uncertainty of monsoon.
   (iii) Lack of irrigation facilities
   (iv) Frequent flood and drought is a common phenomenon associated with the monsoon.
9. Yes, the reasons are as follows :
   (1) Less income or savings.
   (2) Crop failure
   (3) Difficult procedure of financial institution which has pushed them to borrow from private money lenders at high rate of interest.
   (4) Inadequate support price of procurement of crops
   (5) Low returns from agriculture.
   (6) Lack of implementation of land reforms.

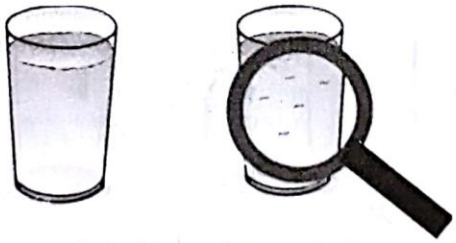


chapter

2

Micro-organisms

Doctors often advise us to use aqua-guards, water purifying system for drinking safe water. *Have you ever wondered why do they say so?* They say so, because, the water that seems to be clear and transparent is not always safe for drinking. It may contain some of the disease causing germs and other dissolved impurities that can not be seen with our naked eyes. However if you view the water with the magnifying glass, you can see several small organisms into it.



These tiny monsters or germs are called *microorganisms* or *microbes*.

do you know?

Microbes are the oldest form of life on earth. They have been here for 3.8 billion years.

Microbes are the tiniest possible living organisms that are too small to be seen through naked eyes - actually, they are living organism that can be only seen with a microscope or a magnifying glass. Microscope is a device that produces enlarged images of very small objects. The simple student's microscope that is often used in schools are called *compound microscope*. A compound microscope has two lens system — The eye piece and the objective lenses. The microscope can normally make an object look 25 to 400 times its actual size. So, while you are observing a object in a microscope, you are observing its magnified image.

The lens of a compound microscope is made up of convex (magnifying) lenses

do you know?

Microscopes use light (generally sunlight) to illuminate the object, so these compound microscopes are called light microscopes.

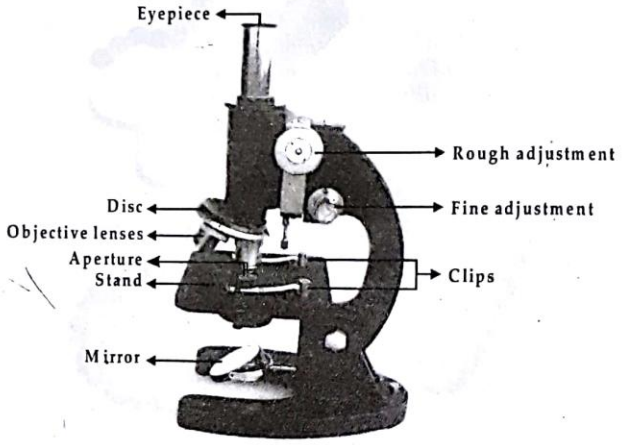


Fig. 2.1 : *A compound microscope*

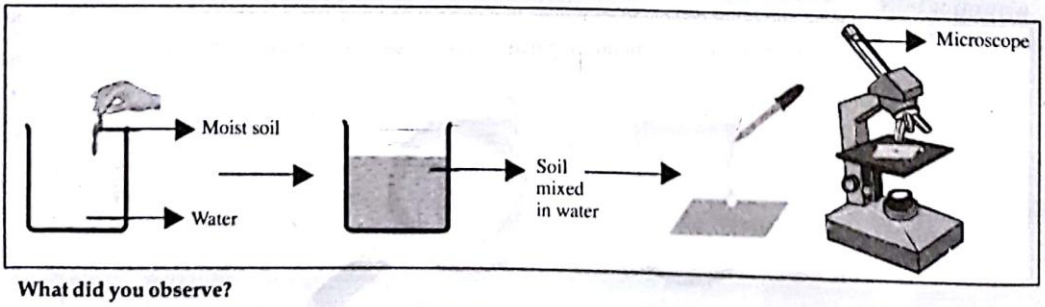
do you know?

The study of microorganism is called microbiology and the scientist involved in the study are called microbiologists

Microorganism was observed for the first time by Anton Von Leenwenhoek of Holland.

Let us perform an activity to observe some common microbes.

Collect some moist soil from your garden and add little water to it. Shake the beaker to mix soil and water thoroughly. Now allow the soil particle to settle done. Then take a drop of water from the beaker and spread it over a clean glass slide. Place a coverslip over the slide and observe it under microscope.



What did you observe?

You can observe several minute organisms floating in water. These tiny organism are called *microbes*.

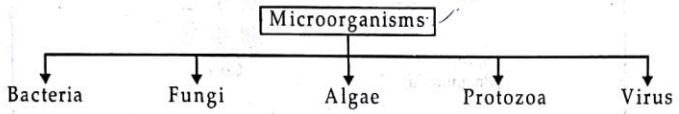
Microorganisms are present every where in our environment, in soil, water and in air. They are also present in our house, in refrigerator, in the bathroom, in foods, floors, toys, and even in our body. They make up the largest living organism in the planet. They are not just billions or trillions around the earth but are trillions of trillions and many more.

Fun TIME

Name three advertisement that you see in television where germs are shown.

CLASSIFICATION OF MICROORGANISMS

There is a huge variety of microorganism on the earth. Hence, based on their size, they are classified into five major groups.



1. **BACTERIA :** Bacteria are small, single-celled organism, present everywhere, on land, in water and in the air. Their size vary from 0.2 to 100 μ in diameter.

***Structure of bacteria* :** Bacteria consists of a mass of a cytoplasm enclosed by a cell membrane and covered by a hard cell wall. There is no distinct nucleus in the bacterial cells. The nuclear material (DNA) is present in the form of strand called nucleoid.

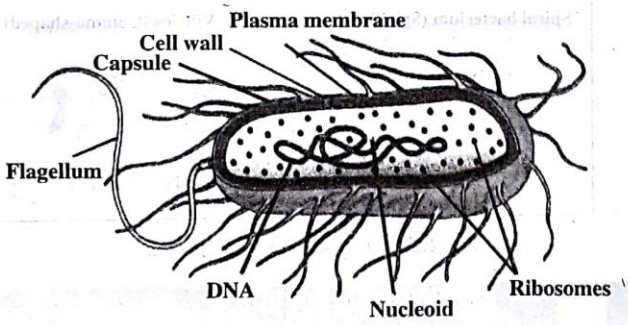


Fig. 2.1 : *Structure of a bacteria*

They use binary fission as a mode of reproduction. A moist and warm environment is good for bacterial growth. Their growth rate slows down when the environment is dry and the temperatures are either too high or too low.

Depending on the shape, bacteria are classified into three groups.

(i) **Rods –** They are rod shaped bacteria and are called bacilli. The example includes *E.coli*, *Salmonella typhi* etc.

(ii) **Spherical –** They are round in shape and are called as cocci. An example of cocci is *Staphylococci*, *Diplococcus*.

(iii) **Spirals –** They are spiral shaped and are called spirilli. The example includes *vibrio cholerae* and *Treponema pallidum*.

Check Your Knowledge

The bacteria which need oxygen for their respiration are called ***aerobic bacteria****. Those bacteria which do not need oxygen for respiration are called* ***anaerobic bacteria****.*

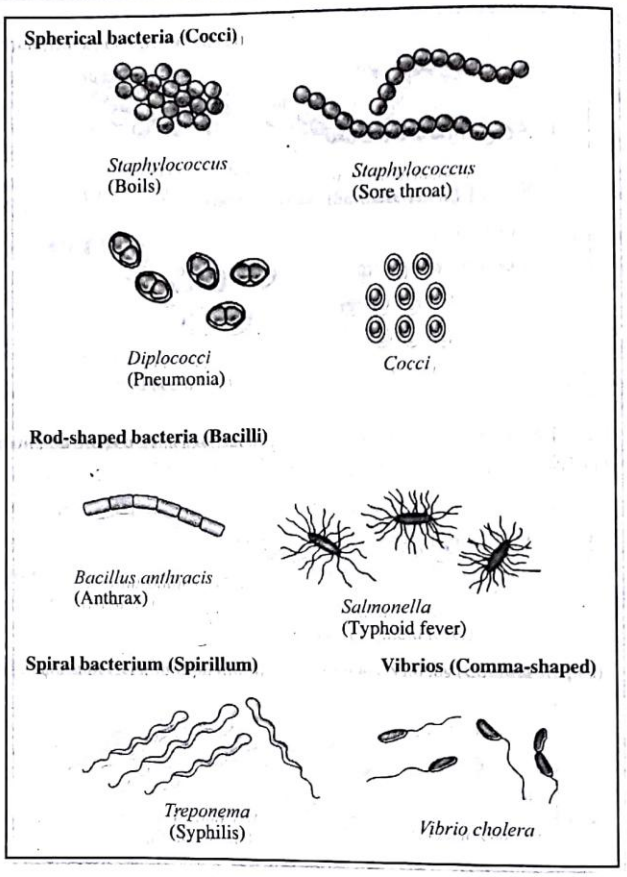


Fig. 2.2 : *Some disease causing bacteria*

Bacteria are viewed under a microscope using a special stain. The stain that is traditionally used for this is the *Gram Stain*.

In 1884, a Scientist named Christian Gram developed a stain or dye called "Gram's stain" that showed that all bacteria are divided into two groups. They poured purple dyes (Gram's stain) over bacterial smear on a microscope slide. The cell wall of the bacteria take up the colour. Now, if a solvent is applied to the slide, bacteria that have got a cell wall keep their purple colour, but bacteria that have got an extra cell membrane outside their cell wall quickly lose the purple stain and become colourless.

Hence, on the basis of the response to Gram's stain, all the bacteria are divided into two groups –

(i) Gram positive bacteria

(ii) Gram negative bacteria

(i) ***Gram Positive Bacteria*** :- Bacteria that manage to keep the original purple dye (Gram's stain) are called gram positive. The gram positive bacteria include *Staphylococcus, Streptococcus.*

(ii) ***Gram Negative Bacteria*** :- Bacteria that do not retain the original purple dye (Gram's stain) are called Gram negative. The example includes *Escherichia coli, Salmonella, Pseudomonas.*

2. **FUNGI :** Fungi are non-green plant-like organisms that do not contain chlorophyll. They are multicellular organism. Most of the fungi are invisible to the naked eyes. For example, yeast and bread moulds. However, there are some examples of fungi that are not microscopic and hence can be seen through naked eyes. For example, mushroom. Mushroom can be seen through naked eyes. It is a fleshy fungus that comprises a cap at the end of a stem. It arises from an underground mycelium and are used extensively in cooking.

You all must have noticed the presence of whitish grayish patch on the slice of bread. What are these? Any guesses? The whitish grayish patch are fungus, a multicellular organism that has developed on the surface of slice of bread. If you carefully observe this slice of bread under microscope or magnifying glass, you can see several tiny thread like structures called hyphae. A mass of hyphae is known as mycelium.

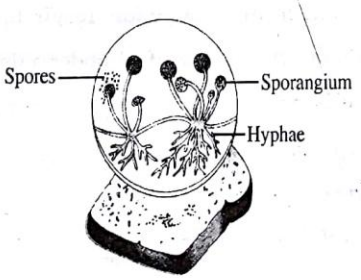


Fig. 2.4 : *Bread mould (Rhizopus)*

The sexual and asexual reproduction of fungi is via the spores. A ripe fungus releases a large number of tiny spores in the air. These spores are so light that they are easily blown out by the wind. When an airborne spore lands on a suitable food material, it germinates to produce a new fungus. However, yeast is a fungus that does not reproduce by forming spores. Yeast reproduces by budding.

Fig. 2.3 : *Mushroom*

do you know?

Some fungi look like plants, but they cannot make their food like plants do. Unlike algae or plants, fungi lack the chlorophyll necessary for photosynthesis and must therefore live as parasites or saprobes. Saprobes are organism that derives its nourishment from dead, decaying organic matter.

do you know?

Rhizopus fungus is commonly known as bread mould.

Fig. 2.5 : *Yeast*

THINK IT OVER

What is Mycorrhizae?

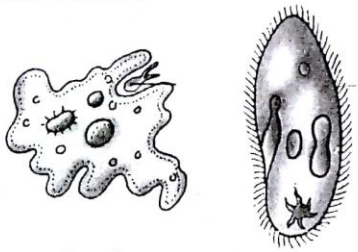
KNOWLEDGE ENHANCER

Some fungi are involved in symbiotic relationships. For example, Lichens. Lichens show an ultimate mutualistic relationship between a fungus and an algae or a cyanobacterium. Here, the fungus, helps in absorption of nutrients and provides protection, while algae prepares the food.

do you know?

The gelatinous substance "agar" used in culture medium for growing microorganisms (such as bacteria) in laboratory is made from red algae.

3. **PROTOZOAN :** Protozoan is a microscopic organism that include *Amoeba, Paramecium, Plasmodium* etc. They can be unicellular or multicellular. They are animal like, just as algae are plant like. Their sizes vary from 2 to 200 µ. They do not possess a cell wall.



Amoeba *Paramecium*

Fig. 2.6

A typical cell of protozoan contains membrane bound protoplasm and cell organelles such as nucleus and mitochondria. The single cell carries all the life processes like feeding, excretion, respiration, reproduction and locomotion. Protozoans are classified under animals and are the most abundant animals in the world in terms of number and biomass.

do you know?

Algae are important as primary producers of organic matter at the base of food chain. They also provide oxygen for other aquatic life.

4. **ALGAE :** *You must have seen a 'green layer' floating on the surface of a pond or a lake or even in the stagnant parts of a river. Have you ever thought what are these green layer or patches in pond called?*

These are actually *Spirogyra. Spirogyra* is a green filamentous alga that is commonly seen in freshwater habitats. It appear as bright dark green filaments that gently move along with water currents. Algae is a large group of simple, plant like organisms. They contain chlorophyll and produce food by photosynthesis just like plants.

Some other examples of algae are – Diatoms, blue-green algae and sea-weeds.

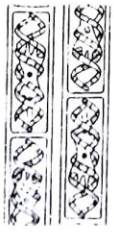


Fig. 2.7 : *Spirogyra*

5. **VIRUSES :** Virus is the smallest microorganisms that is visible only through electron microscope. Viruses are much smaller than bacteria. They do not show most of the characteristics of living things. For example, they do not respire, feed, grow, excrete or move on their own. They are just capable of reproducing. Viruses can multiply and reproduce only inside the cells of other organisms like plant, animal and bacterial cells. Thus, as long as viruses are outside the living cells, they behave as non-living things but as soon as viruses enter the living cells of other organisms, they start behaving as living by carrying out the process of reproduction. The virus gets inside the host cells and makes hundred and thousand copies of itself by using the host machinery. Hence, *viruses are said to be on the border line dividing the living things from non-living things.* Rous Sarcoma virus and HIV are examples of viruses.

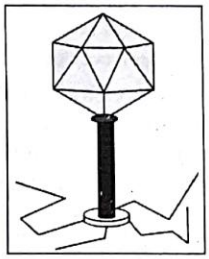


Fig. 2.8 : *Virus*

Now that you have classified the Microorganisms, let us discuss some of the important features of microorganism that make them unique and diverse in environment.

Characteristics of Microorganisms :

1. Microorganisms can be unicellular or multicellular. Bacteria, some algae and protozoan are single celled organism while algae and fungi are multicellular organism.
2. They can be solitary or colonial. A protozoan, say *Amoeba* can spend its whole life alone moving in water whereas others like fungi and bacteria live and work together in colonies to help each other.
3. Microorganism can be autotrophic or heterotrophic. Some bacteria, few fungi and viruses are heterotrophs while algae and some fungi are autotrophs. They can prepare their own food by the process of photosynthesis.
4. Microorganisms can reproduce sexually, asexually or both. Sexual reproduction involves formation of new individual by fusion between their parent gametes while asexual reproduction involves the splitting of microbes into two identical pieces by itself. A bacterium, for example, reproduces asexually by binary fusion or sexually by conjugation.

By now, we have learnt that there is a huge variety of microorganisms on Earth. These organisms play a vital role in keeping the planet running. Let us now discuss, *how Microorganisms are beneficial to mankind and how they keep the planet earth running?*

do you know?

Viruses are not functional outside the host body and thus acts like a non-living being.

Check Your Knowledge

Bacteria play a vital role in maintaining the Earth as a suitable place for inhabitation by other forms of life, and protozoa play a vital role in controlling their numbers and biomass.

BENEFICIAL ORGANISMS

Microbes or microorganisms carry out about 90% of the biochemical reaction that occurs in our planet. They are useful in the following ways —

(I) In food and beverage industry

(II) In making medicines and vaccines

(III) In agriculture

(IV) In cleaning the environment

do you know?

Curd is a nutritious food that helps in digestion. Lactobacillus bacteria inhibit the growth of disease - causing microorganism inside intestinal tract and promote beneficial bacteria needed for digestion.

(I) FOOD AND BEVERAGE INDUSTRY :

1. Bacteria helps us in making food. They play an important role in formation of curd and cheese. *You must have seen your mother adding a teaspoon of curd to lukewarm milk. Have you ever thought why she does so?* She adds curd to the warm milk because curd contains a bacterium called *Lactobacillus*. It is this bacterium, that multiplies and converts the milk into curd. Similarly, there is another bacterium called *Rennin* that is used for making cheese from milk. Rennin ferments the milk sugar to produce lactic acid. This lactic acid separates the milk into solid curd and liquid called milk whey. Whey is the watery part of the milk that is separated from curd during cheese formation. Later on, this separated curd from the milk is used to make cheese.
2. Bacteria and yeast also helps in the process of fermentation. Before discussing how bacteria and yeast helps in process of fermentation, let us understand *what fermentation is*?

   Fermentation is the process of converting a complex organic substance into simpler substance with the action of bacteria or yeast. Both of these organisms can ferment the sugar present in various foods like fruits, milk, grain etc. During the process of breaking down of sugar, alcohol is formed and carbon dioxide is given off.

$$\text{Glucose} \xrightarrow[\text{Oxygen}]{\text{without}} \text{Alcohol} + \text{Energy} + CO_2$$

In The LAB

Let us perform an experiment to observe the increase in volume during fermentation of sugar by yeast cells.

Take two test tubes and mark them as A and B. Clamp both the test tubes on a stand and keep it in a safer place. Pour about 4-5 drops of yeast and sugar mixture in test tube B only. Test tube A acts as control test tube, with only water in it. Now take two stretched balloon and tie them on the mouth of each test tube. Now set both the test tubes aside in a warm place and record your observations.

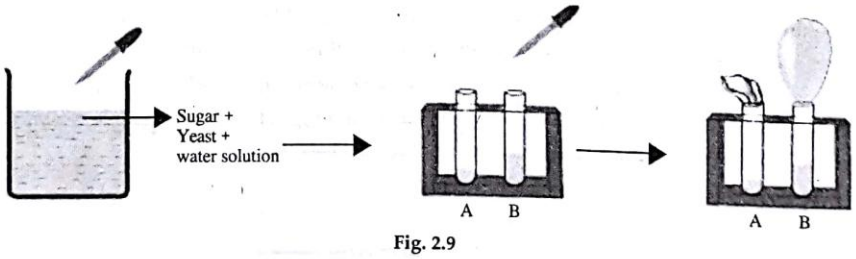


Fig. 2.9

Observation : You will observe that balloon in test tube B inflates after few minutes whereas balloon in test tube A remains deflated.

Result : This happens because yeast cells present in the solution of test tube B ferments the sugar present in it. As the yeast keeps on feeding sugar, it produces carbon dioxide. Since, there is no place for carbon dioxide to go except for going up, so it fills the balloon. This process is known as *fermentation*.

Yeast is commonly used in baking of cake or bread as it ferments the sugar present in the dough into carbon dioxide. The carbon dioxide released from the yeast fills the dough and increases its volume. When this dough is baked, more bubbles of gas are formed due to the heat. As the gas escapes, the bread rises and becomes soft and fluffy.

Fig. 2.10

3. Microorganisms are also used for commercial production of alcohol and wine.

In the LAB

Let us perform an experiment to show that fermentation of sugar by yeast produces alcohol. Take some warm water in a flask so that it is one-third full. Then add 2-3 teaspoons of sugar into it and mix well. Now add half a teaspoon of yeast to it. Cover the flask and keep it in a warm place for 4 to 5 hours. Now smell the solution.

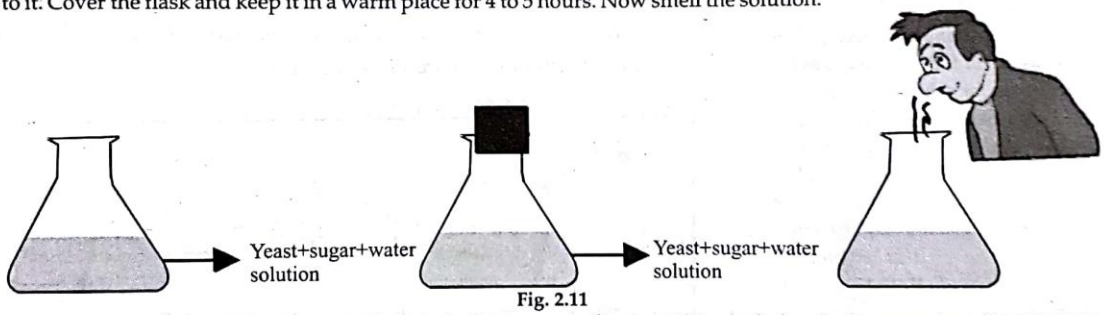


Fig. 2.11

Can you smell alcohol in it? Yes, the yeast in the solution converts the sugar into alcohol and releases carbon dioxide. This process is known a *fermentation*.

$$\text{Glucose} \xrightarrow[\text{absence of oxygen}]{\text{In the}} \text{Alcohol} + \text{Energy} + CO_2$$

Thus, yeast is used in the manufacture of alcoholic drinks such as beer and wine.

(II) MAKING MEDICINES AND VACCINES

Bacteria and fungi are used for making medicines called antibiotics. *Antibiotics* are medicines that are produced by certain microorganisms, to kill other disease-causing microorganisms. These medicines either kill or stop the growth of disease – causing microorganisms. Penicillin, tetracycline, streptomycin and erythromycin are some examples of antibiotics. Antibiotics destroy the bacteria by weakening their cell wall. As a result of weakened cell wall, the immune cells such as white blood cells enter into the bacterial cell and causes *cell lysis*. Cell lysis is the process of destruction of cells such as blood cell and bacteria.

Though antibiotics are used to kill disease causing microorganisms but it is necessary to take certain precautions while using antibiotics.

do you know?

Edward Jenner developed the smallpox vaccination method in 1796. In 1788, the English town Gloucestershire was plagued with smallpox. Jenner observed that milkmaids who suffered the mild disease of cowpox never contracted smallpox. Subsequently, Jenner proved that on having been inoculated with cowpox, one could remain immune to smallpox. The invention of this method of vaccination ultimately resulted in the eradication of smallpox.

do you know?

Jenner coined the term "vaccination," which comes from the latin world "vaccinia" meaning 'cowpox'.

INFORMATION!!

Louis Pasteur

The anthrax vaccine was developed by Louis Pasteur in 1881. Anthrax was the first disease for which the causative agent was isolated in 1863 by C.J. Davaine and for which an effective vaccine was developed. Pasteur studied about the bacteria that cause the disease and performed many experiments. Finally he produced a weak and harmless anthrax bacterium and tested the vaccine on cattle and sheep.

Precautions that need to be taken while using antibiotics are –

(i) Always take antibiotics on the advice of well-qualified doctor.

(ii) Courses of antibiotic should be completed as per the prescription given by the doctor.

(iii) Always take antibiotics in right amount and at right time. An inappropriate dose of antibiotic makes it ineffective. Also, its excessive consumption may kill the useful bacteria present in our body.

Microorganisms are also used as vaccines. *You must have heard about pulse polio programme organised by government. Have you ever thought what are these programmes all about?* Polio drops given to children are actually vaccines. *Vaccines* protect humans and other animals from several diseases such as Cholera, Typhoid, Tuberculosis, Hepatitis, Chicken pox, Measles, Polio and Small pox. They are suspension of killed microbes that mimics the disease causing microorganisms. When they are swallowed or injected into the body of patient, the body produces antibodies to fight them. *Antibodies* are body's defensive cells that fight against several infectious foreign substances mostly germs. The antibodies remain in the body and protect it from any future attack of germs.

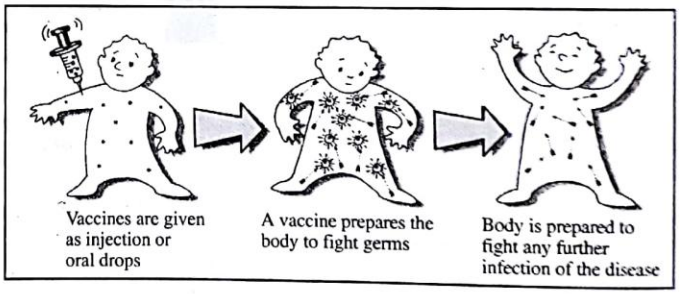


Fig. 2.12

CHECK Point

1. Why do we take Antibiotics?

CHECK YOUR ANSWERS

1. Antibiotics are chemicals. When these chemicals are put into the body they kill or stop the growth of certain kinds of germs. In other words they help our body to fight off diseases. The body is then said to have developed immunity against the disease. Vaccine is therefore called as *immunization*. Hence, vaccines teach our immune system, to fight against that microbe. If ever you get sick with a particular disease, you will be able to fight off the infection because you are vaccinated against that microbe.

KNOWLEDGE ENHANCER

FEVER

Our body has an average temperature of 98.6° Fahrenheit or 32°C when it is healthy. Some diseases make this temperature rise and we call this higher temperature fever. So *what exactly is fever*?

Fever actually helps us fight off sickness. Fever makes the vital processes and organs in the body work faster. The body produces more hormones, enzymes and blood cells. As our blood circulates faster, we breathe faster and so we get rid of wastes and poisons in our system.

do you know?

It is important to get rid of the fever as quickly as possible as it destroys vital proteins in our body.

KNOWLEDGE ENHANCER

ALEXANDER FLEMING

Penicillin was the first antibiotic discovered by Alexander Fleming in 1929. He got nobel prize for the discovery of penicillin in 1945. *How penicillin was discovered by Alexander Fleming?*

Alexander Fleming accidently discovered penicillin. He was actually working on a culture of disease-causing microorganisms called *Staphylococci*. He left the culture and went for a holiday. When he returned from the holiday, he noticed that petri dishes were contaminated by a fungus and bacteria. *Staphylococcus* could not grow into the area because of invaded mould (fungus). The fungus invaded into the culture dish from nearby opened window. Fleming extracted the antibiotic substance from the mould and named it as penicillin. Penicillin was named because it came from a species of a mould called *Penicillium*.

ALEXANDER FLEMMING

(III) MICROBES IN AGRICULTURE

Microorganisms such as bacteria and algae enriches the soil with essential nutrients. These nutrients are required by plants for their normal growth and development.

How microorganisms enrich the soil with nutrients? There are million and trillions of tiny bacteria in soil. These bacteria feed upon dead plants and animals and break them into their component parts. Then these rotting parts of plants and animals get mixed with the soil and enrich the soil with nutrients. These nutrients are then recycled back in the atmosphere through food chains. Bacteria that helps in break down of dead plants and animals are called decomposing bacteria or decomposers. The decomposers convert dead organic matter into rich humus, thereby enriching the soil with nutrients.

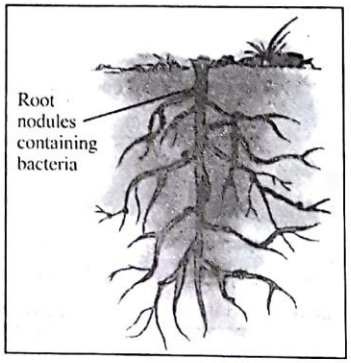


Fig. 2.13 : *Nitrogen Fixation*

Some bacteria such as *Rhizobium* live in the root nodules of plants such as gram, pea, etc. These bacteria can fix atmospheric nitrogen and convert it into usable nitrogenous compounds. These nitrogenous compound then can be easily absorbed and utilized by plants for synthesis of proteins and other compounds. Such type of bacteria are called *nitrogen fixers*. They produce nitrogen in exchange for carbohydrate produced by pea and bean plants. Some blue green algae can also fix atmospheric nitrogen.

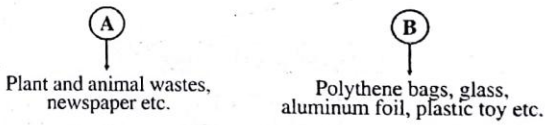
(IV) MICROBES IN CLEANING OF ENVIRONMENT

Last but not the least, the bacteria play an important role in cleaning the environment.

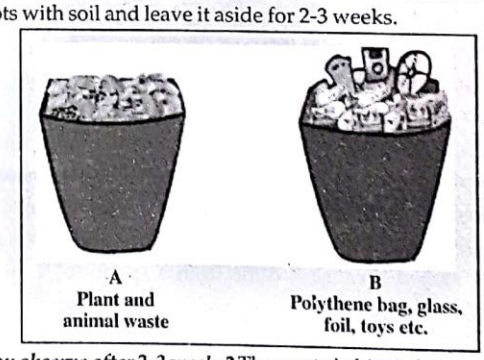
IDEA BOX

Let us perform an activity to understand how microbes help in cleaning of environment

Collect the garbage from your house and separate them into two groups called A and B. Group A contains wastes like dead leaves, peels of fruits and vegetable, newspaper etc. Group B contains wastes like polythene bags, glass, aluminium foil, plastic toys etc.



Put these garbage into two different bins and label then as A and B. Now cover both the pots with soil and leave it aside for 2-3 weeks.



What do you observe after 2-3 weeks? The waste in bin A decomposes whereas waste in bin B does not get decomposed.

Explanation – The microorganism present in the soil decomposes the organic matter in waste A and turns them into dark brown manure. This manure add nutrients to soil and increase its fertility. This process is known as decomposition. *Decomposition* is the process of breaking down organic matter from dead bodies of plants and animals into raw materials like carbon dioxide, water and nutrients. This process occurs with the help of decomposing organisms like bacteria and fungi. The decomposing organisms contain enzymes that are able to digest plant and animal waste. But, these bacteria are not able to digest some of the substance such as polythene bag, plastic toys, aluminium foil etc. It is because, they do not have enzymes for digesting these substances. So the waste present in pot B does not get degraded or decomposed by decomposing bacteria and hence remains in its usual form.

Some microbes are also used in biological treatment of sewage and industrial effluents. They break down the waste material into certain usable form and helps in cleaning of environment. This is nature's method of keeping the environment free from pollution.

(V) SOME OTHER USES OF MICROORGANISMS :

(i) Certain bacteria and protozoan are found in the digestive system of some animals like cows, goats and sheep. These bacteria help the animals digest grass and plants.

(ii) Bacteria are useful in tobacco, leather and jute industries. Tanning, a process to make animals skin into leather by treating it with chemicals, is done with the help of bacteria.

(iii) Some bacteria decomposes, animals waste, leafy waste from crops etc. in the absence of oxygen to produce methane. Methane is used as a fuel and is one of the chief constituents of biogas.

HARMFUL MICROORGANISMS

By now, you have learnt that some microorganisms are beneficial to humans. *But do all microorganisms are helpful*? No, not all microorganisms are harmful. There are some organisms that causes disease in humans, animals and plants. The disease causing microorganisms are called *pathogen*. To cause disease, the germs have to first enter our body. You can become sick if germs enter your body.

At times, germs enter the human body. If the germs are present in large numbers, the person is said to be infected. These germs do not allow the body to function properly and the person becomes sick. A particular disease is caused by a specific kind of germ. For example, typhoid is caused by a kind of bacteria which is different form that which causes cholera. Let us discuss about agents that spread diseases. Diseases can spread through various means such as air, water food and vector.

Means of spread of diseases :

(i) Air : Certain disease causing microorganisms are expelled into air by coughing, sneezing, talking etc. When a person suffering from common cold or flu sneezes, coughs or spits, germs are released in the air. As a result, the person breathing this air can get infected. The diseases that can spread through air are common cold, flu, chicken pox, mumps, measles, tuberculosis, polio etc.

(ii) Water : Sometimes, the causal microorganism get mixed with water and spreads water-borne diseases. Cholera, typhoid, hepatitis are water borne diseases.

(iii) Food : Sometimes, the disease is transferred from the food that we eat. The bacteria may survive in the food that is not properly cooked and hence causes food – borne diseases.

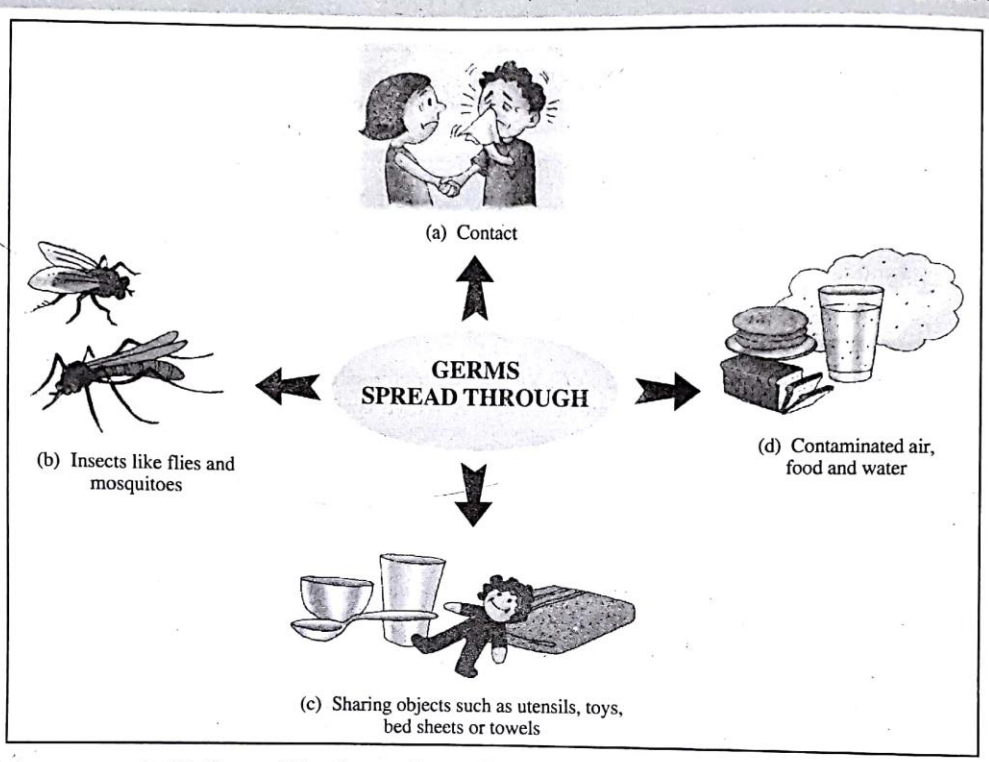
(iv) Vector : *Vector* is an organism that carries microbes and is responsible for its transmission. Diseases such as malaria spread by animals called vector or carrier. The vector for malarial disease is female *Anopheles* mosquito. Aedes mosquito acts as a carrier for the dengue virus. Another example of vector that spread disease is houseful. Housefly sits on uncovered food and transfers microorganisms or pathogen to it. Hence it is always advised not to leave the food uncovered.

do you know?

During sneezing, a germ can travel at so miles per hour across a room.

do you know?

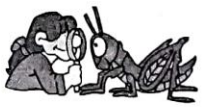
Aedes mosquito has small, black and white strips on its legs and back. It bites during day time in early hours of morning and late hours of afternoon.



What are communicable diseases? The diseases that can be transferred from an infected person to a healthy person through air, water, food and vector are called *communicable diseases*. Cholera, tuberculosis and common cold are communicable diseases.

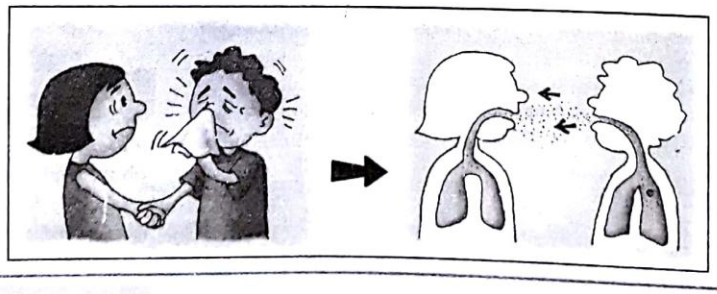
CHECK Point

1. Why it is advised to stay away from the person who is suffering from cough and cold?



CHECK YOUR ANSWERS

1. It is advised to stay away from the person who is suffering from cough and cold because if you are sitting next to the person who is suffering from cough and cold, it is likely that you may also catch cold. The virus that causes cold might enter your body through air and cause diseases.



How can you prevent the spread of communicable disease? Let us have a look.

Preventive measure to be taken for air-borne diseases :-

(i) Stay away form infected person.
(ii) Keeping a handkerchief on the nose while sneezing.
(iii) Complete isolation from diseased person.
(iv) Get vaccinated at right time.

Preventive measures for water borne diseases :-

(i) Ensure proper disposal of sewage.
(ii) Ensure safe supply of drinking water.
(iii) Maintain good sanitary habits.
(iv) Always drink boiled water
(v) Get vaccinated at right time

Preventive measures for vector–borne diseases :-

(i) Do not allow water to stagnate in your surroundings
(ii) Keep your surroundings neat and clean
(iii) Use mosquito repellant

Note: *The inoculation of a vaccine in the body to produce immunity is called vaccination.*

CHECK Point

1. **Why do people say "Do not let the water to collect anywhere in your house or locality".**

CHECK YOUR ANSWERS

1. They say so because the stagnant water is place for mosquito breeding and the female *Anopheles* mosquito is the carrier of malarial parasite.

IDEA BOX

There are certain **Don'ts** that make conditions unfavourable for growth of microorganisms and certain **Do's** that will help destroying diseases causing microorganisms. *Find out those Don't and Do's and write your answers in the space provided below.*

"Don'ts" that make conditions unfavourable for the growth of Microorganisms	"Do's" that destroys disease causing Microorganisms
1. Do not keep your surroundings dirty.	1. Get Vaccinated at right time.
2	2
3	3
4	4

Some common human diseases caused by Mircoorganisms

Human Diseases	Causative Micro-organisms	Transmitting agents	Preventive Measures (General)
Tuberculosis	Bacteria	Air	(i) Isolation of the infected person. (ii) Vaccination at suitable age.
Measles	Virus	Air	
Chicken Pox	Virus	Air/Contact	
Polio	Virus	Air/Water	
Cholera	Bacteria	Water/Food	(i) Maintaining personal hygiene. (ii) Consuming properly cooked food. (iii) Drinking boiled water. (iv) Vaccination helps in prevention.
Typhoid	Bacteria	Water	
Hepatitis B	Virus	Water	(i) Drinking boiled water. (ii) Vaccination helps in prevention.
Malaria	Protozoa	Mosquito	(i) Using mosquito nets or repellents. (ii) Spraying insecticides. (iii) Destroying breeding grounds of mosquitoes such as stagnant water.

do you know?

Hepatitis-B virus causes many deaths in only one day as by AIDS virus in one year. In India, about 4.30 crore people suffer from hepatitis-B. The vaccine against hepatitis-B is available.

Microorganisms causing disease in plants

Plant disease	Means of transmission
Bacterial disease	
Soft Rot / Red stripe of sugarcane	Air
Citrus Canker	Air / water / insects
Bacterial Blight of gram	Air
Viral diseases	
Tobacco mosaic disease	Wind / water
Yellow vein mosaic of *bhindi*	Insect
Tomato mosaic	Air
Fungal disease	
Rust of wheat	Air / seeds
Late blight of potato	Rain / wind
Fungal blight of gram	Wind / water

FOOD PRESERVATION

Food which is left in the open for a few days often goes bad. It becomes blackish, smelly and mushy, i.e., it becomes soft and wet. This is because of the action of microbes like bacteria and fungi. They feed on the food and break it down into simpler substances. During the process, carbon dioxide and poisonous substances are produced.

Why we get very sick if we eat food that has gone bad? It is because of food poisoning. *Food poisoning* is a food-borne illness that occurs suddenly after you consume a contaminated food or drink. Sometimes, the food is spoiled by some microorganisms producing certain toxic substances. These toxic substances make the food poisonous. The typical symptoms of food poisoning are nausea, vomiting, abdominal cramp and diarrhea. But *how do decomposers get onto the food?* The spores of bacteria and fungi are small and light. They are blown about in the air. Food left in the open is exposed to them and they start to grow when they land on the food. Bacteria and fungi grow and multiply quickly when there is sufficient air, water and warmth. Under these conditions food decays very quickly. *Can you stop food from getting spoilt or contaminated?*

(i) By killing the microbes in the food and

(ii) By stopping them from growing again.

This process is known as food preservation.

IMPORTANT TERM

***Food preservation** is the process of protecting food from growth of microorganisms.*

If you take a piece of bread, sprinkle a few drops of water and leave it undisturbed in a warm place for a few days, what do you think will happen? You will observe a cotton like mesh growing on the surface of slice of bread. This thread like structures is a type of mould. Fungus spoils the bread and make it unfit for consumption.

Hence, microorganisms are one of the major causes of food spoilage. Therefore, it is advised to preserve the food properly before storing. Food preservation creates conditions unfavourable for the growth of microbes. Different food preservation techniques are employed for different types of food.

Advantages of preserving food —

(i) It avoids wastage of food.

(ii) Preservation techniques facilitates the distribution of food like fruits and vegetables to other countries.

(iii) This allows the availability of food every year. For example, frozen strawberries are available in all year.

(iv) It maintains nutritional value, texture and flavor of food.

Let us discuss some common methods for food preservation.

1. **Heating** – Heating food at high temperature kills microbes. For example, milk and water are boiled to kill microbes.

   The milk stored in packets does not get spoiled as it has been pasteurized. The pasteurized milk can be consumed directly as it is free from microbes. The milk is made sterile by heating it at 70°C for about 15 to 30 seconds. Then the boiled milk is suddenly chilled and stored inside the packets. This process is known as pasteurization. *Pasteurization* is the process of heating milk at 70°C for about 15 to 30 seconds and then storing it. This method kills most of the bacteria without affecting the flavour.

do you know?

Pasteurization was invented by Louis Pasteur.

INFORMATION!!

You mut have noticed that most of the food items that we get from market have "expiry date" or "best before" on them. What are these?

Expiry data refers to the date before which the supplier want the food to be consumed. It is unhealthy to consume food after the expiry date because they are likely to have deteriorated either in flavour, texture, appearance or nutrional value.

2. **Cooling** – Storing of food in refrigerator slows the bacterial action because of low temperature. All food and drinks like meat, fruits and vegetables and beverages are preserved by this method. However, once the food is taken out of freezer and warmed, microbes start growing again.
3. **Chemical preservatives** – Certain chemical preservatives like sodium benzoate and sodium metabisulphite helps to control the microbial growth. These are used to preserve jams, squashes and ketch ups.

   Other examples of preservatives used are –

   (a) **Salting :** It checks the growth of bacteria by forcing microorganisms to lose water by a process called osmosis. It is used to preserve meat, fish, pickles, chips etc.

   (b) **Sugar :** It inhibits the growth of bacteria and therefore is used as preservative in jams, jellies and squashes. Sugar also makes microbes lose water by osmosis.

   (c) **Pickling :** Pickling are used to preserve pickles. It uses preservative qualities of salt along with the preservative qualities of acid, such as vinegar. Vinegar provides acidic medium to pickles and inhibits the growth or bacteria. Cucumber, for example is preserved for several years when it is soaked in a 10% of salt water brine for several days.
4. **Drying** – Drying is the oldest method of food preservation. It removes all the moisture from the food. As a result, there will be no bacterial growth. Cereals, pulses, spices and dry fruits are stored by drying method.
5. **Canning** – Canning store the food for a long time. It is a process whereby you boil the food to kill the bacteria and then store it in a can with a seal. Many canned food items are available in market. However note that after breaking the seal of the can, any number of bacteria can enter and spoil the food. So it is advised to refrigerate the food contents as soon as the can is opened.
6. **Freeze drying** – It is a special type of preserving food. In this, the food is frozen and then placed in a vacuum to change the ice crystals directly into vapour form. It involves the direct conversion of solid form into vapour without going into liquid stage. This method is used to make instant cooling.

Give an example of each of these preserving methods.

Method	How it works	Example
Pickling	The food is mixed with vinegar. The acid in vinegar stops microbes growing.	
Drying	Microbes cannot grow without water.	
Preservatives	Preservatives are chemicals that kill microbes or stop them from growing.	
Canning	Food is cooked and then sealed so that no more bacteria can get in.	
Sugar	Food is cooked in sugar. The sugar is too concentrated for microbes.	
Radiation	Radiation kills microbes.	
Salting	Microbes cannot grow in salt. It is too concentrated.	

CHECK Point

1. **Why it is advisable to consume sweets made from milk like rasagulla within 24 hours of preparation?**

CHECK YOUR ANSWERS

1. Every food item has a specific shelf life, beyond which it may become unsuitable for consumption. Shelf life is the length of time a product may be stored such that it remains suitable for use or consumption.

IDEA BOX

Look up the packets of food items listed in the given table. Try to fill in the required information.

Sl. No.	Type of Food	Method of Packaging (Bottles, Cans, Cartons)	Storage area	Shelf life
1.	Crispy items (Chips, Biscuits)			
2.	Diary products (Butter, Ghee, Chocolates)			
3.	Jam, Sauce			

Based on your observation answer the following questions :–

(i) Which type of food items have the shortest "best before" or "expiry date"?

(ii) Which type of food have the longest "best before" or "expiry date"?

NITROGEN FIXING BACTERIA

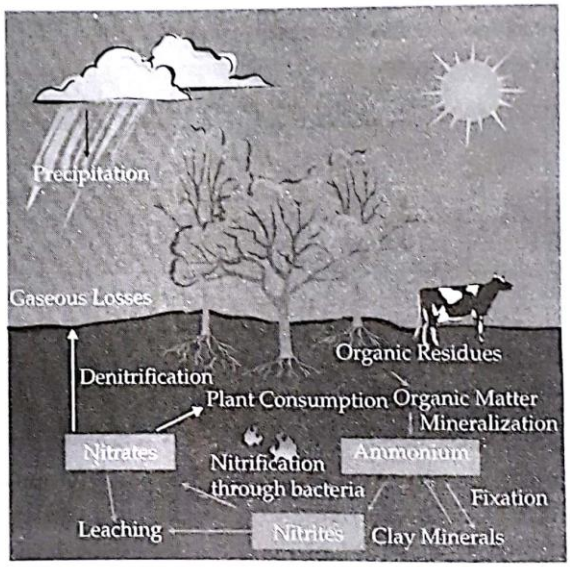
Rhizobium is a soil bacterium that is involved in nitrogen fixation from atmosphere. They form a symbiotic relationship with the leguminous plant such as pea, beans etc. In this relationship, both the bacterium and the plants are benefitted by each other. Bacteria produce ammonia that is exchanged by plants for carbohydrate. Sometimes, the fixation of nitrogen occurs by lightning.

Now as some of the atmospheric nitrogen is fixed by the bacteria present in soil and some by lightning, you must be wondering how this fixed nitrogen is recycled back into the atmosphere. There are certain other bacteria that convert the nitrogenous compound present in soil to nitrogen gas. To understand the process let us discuss nitrogen cycle.

NITROGEN CYCLE

The nitrogen cycle is a cyclic process that transforms nitrogen and nitrogen containing compounds in nature. Earth's atmosphere has about 78% of nitrogen gas. It forms essential constituents of all living organisms and is essential for

many biological processes. It is present in all amino acid, proteins, nucleic acid and vitamins. In plants, nitrogen is a part of chlorophyll molecule. Fixation of nitrogen is an essential process as nitrogen cannot be directly taken by plants and animals. So it needs to be fixed and then converted into some usable compounds. Certain bacteria and some blue green algae are able to fix the nitrogen and assimilate it as organic nitrogen. An example of N_2 fixing bacteria is *Rhizobium*. This process is called biological fixation. Once the nitrogen is converted into usable form it is absorbed from the soil by the plant. Animals obtain this nitrogen directly or indirectly from the plants. When plant or animals dies, nitrifying bacteria and some fungi present in the soil converts all the organic nitrogen into ammonia, nitrites and nitrates. Another type of bacteria then convert these nitrites and nitrates into elemental nitrogen which is then released into atmosphere, completing the nitrogen cycle. Hence nitrogen passes from atmosphere to soil and water in the form of simpler compounds and then back into the atmosphere in the form of nitrogen molecule.



do you know?

Rhizobium are gram negative, aerobic bacteria. It is believed that **Rhizobium** has a nitrogen fixing bacteria that controls the synthesis of nitrogenase. These bacteria form the nodules on the secondary roots of the legumes. The enzyme nitrogenase reduces nitrogen to ammonia.

Hence, nitrogen cycle involves the following steps-

(i) *Nitrogen fixation* - It is the process of converting free nitrogen gas of atmosphere into nitrogen compunds using nitorgen fixing bacteria.

(ii) *Nitrogen assimilation* :- It is the proces of conversion of inorganic nitrogen compounds into organic compounds like proteins

(iii) *Ammonification* : It is the process of conversion of complex organic compounds like proteins into ammonia and ammonium compounds by bacteria and fungi.

(iv) *Nitrification* : It is the process of conversion of ammonia into nitrates using nitrifying bacteria like *Nitrosomonas* and *nitrobacter*

(v) *Denitrification* : It is the process of converting nitrates to free nitrogen gas using denitrifying bacteria like *Pseudomonas*.

- Microorganisms are too small to be seen through naked eyes.
- Bacteria, Fungi, Viruses, Protozoa and Algae are five major groups of microorganisms.
- Microbes can survive in all conditions - hot, cold, wet, dry and humid.
- Air, water and moisture are the three main requirements for microbial growth.

BENEFICIAL MICROORGANISMS

- Some microorganisms are useful for commercial production of alcohol and wine.
- Bacteria play an important role in making curd, bread, cheese and pickles.
- *Fermentation* is the process of converting a complex organic substance into simpler substance with the help of bacteria or yeast.
- Microorganisms are useful for making medicines. Example, penicillin.
- *Antibiotics* are medicines that are produced by certain microorganisms, to kill other disease causing microorganisms.
- Microorganisms are used as vaccines.
- *Vaccines* are suspension of killed microbes that mimics the disease causing microorganisms.
- *Vaccination* is the protection of the body from infectious disease by administration of vaccines.
- *Antibodies* are protein molecules produced in the blood by immune system to fight against the antigen.
- Microorganisms such as bacteria and fungi enrich the soil with nutrients
- *Decomposition* is the process of break down of organic matter from the dead bodies of plants and animals into raw materials such as CO_2, H_2O and nutrients.
- Bacteria play an important role in cleaning of environment.
- Microorganisms cannot decompose materials like polythene bags, glass, bottles etc.

HARMFUL MICROORGANISMS

- Some harmful microorganisms cause diseases in human being, plants and animals.
- Disease causing microorganisms are called *pathogens*.
- They are responsible for causing food poisoning.
- *Communicable diseases* are diseases that spread by harmful microbes from an infected person to a heathy person through air, water or physical contact.
- *Food preservation* is the process of protecting food from the growth of microorganisms.
- *Various Methods of food preservation :*
  1. Salt – Meat, Fish, Amla, Raw Mangoes
  2. Edible oil and vinegar – Pickles
  3. Sugar – Jams, jellies, squashes
  4. Chemical like sodium benzoate and sodium meta bisulphite
  5. Refrigeration
  6. Air tight packaging
- *Pasteurization* is the process of heating milk at 70°C for about 15 to 30 seconds and then rapidly cooling it.
- The cyclic process of nitrogen being fixed, used by plants and animals and later returned to atmosphere is termed as *nitrogen cycle.*

exercise 1

FIB FILL IN THE BLANKS :

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

1. _____ can reproduce and multiply only inside the cells of other organisms.
2. _____ spreads by the bite of female, *Anopheles* mosquito.
3. The protection of the body from infectious disease by administration of vaccines is called _____.
4. _____ accidently discovered penicillin.
5. _____ teaches our immune system to fight against the microbe.
6. Bacteria such as _____can fix atmospheric nitrogen and convert it into usable nitrogenous compounds.
7. The process of breakdown of organic matter from the dead bodies of plants and animals into raw materials is known as _____.
8. The causative microorganism of disease, measles, is a _____.
9. Common cold is a/ an _____ borne disease.
10. Raw mangoes and tamarind can be preserved by _____.

T/F TRUE & FALSE :

DIRECTIONS : *Read the following statements and write your answer as true or false.*

1. Microorganisms live only in air.
2. All microorganisms are harmful.
3. Bacteria and fungi have the ability to decompose organic matter.
4. Amoebic dysentery is caused by a protozoan called *Entamoeba histolytica*.
5. Viruses are non-cellular organisms.
6. Rabies is a fatal disease caused by bacteria.
7. Pasteurization is a technique of preserving food especially milk.
8. Algae is able to convert sugar into alcohol and carbon dioxide.
9. All blue green algae have the ability to fix nitrogen.
10. Rennin converts milk into curd.
11. Viral fever can be treated by giving antibiotics.

MTF MATCH THE FOLLOWING :

DIRECTIONS : *Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D, E) in column I have to be matched with statements (p, q, r, s, t) in column II.*

1.

Column-I (Microorganisms)	Column-II (Organisms)
A. Bacteria	p. Plasmodium
B. Protozoan	q. Yeast
C. Fungi	r. *Staphylococci*
D. Algae	s. HIV
E. Viruses	t. *Spirogyra*

2.

Column-I	Column-II
A. *Virus*	p. Fungus which is used to make a drug.
B. *Cyanobacteria*	q. A kind of protozoan
C. *Plasmodium*	r. They are bacteria having chlorophyll
D. *Spirogyra*	s. An ultramicroscopic organism that is visible only through electron microscope.
E. *Penicillium*	t. Green filamentous alga commonly found in fresh water habitats

VSAQ VERY SHORT ANSWER QUESTION :

DIRECTIONS : *Give answer in one word or one sentence.*

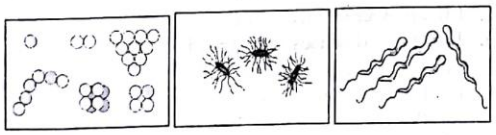
1. Which term is used to refer the tiniest organisms that can only be seen through a microscope.
2. Name the instrument used to see microorganisms?
3. Name a food product prepared by the action of bacteria.
4. Which of the two is a spherical bacteria :- Coccus or bacillus.
5. Name the microorganisms which are much smaller than bacteria and cause diseases?
6. To which category of microorganisms do the given organism belongs – Mushroom and yeast

7. Name the disease caused by
   (i) Plasmodium (ii) Entamoeba
   (iii) Trypanosoma
8. Which *Anopheles* mosquito – male or female, transmits plasmodium through its bite?
9. Which microorganism is used in the production of alcohol from sugar?
10. Name one fungus which is used as a food.
11. Name two plant diseases caused by fungi.
12. Name an antibiotic manufactured from fungi.
13. What are pathogens?
14. Define antibiotics.
15. What do you understand by "expiry date" written on packed food items?

SAQ SHORT ANSWER QUESTION:

DIRECTIONS : *Give answers in 2-3 sentences.*

1. What are major groups of microorganisms? Give two examples of each.
2. How is nitrogen utilised by living organisms?
3. Define antibodies and antibiotics. What precautions should be taken while taking antibiotics.
4. What is pasteurization?
5. What are preservatives? List the various methods of preservation.
6. How does bacterium *Lactobacillus* helps in curd formation?
7. Name the three types of bacteria shown in the figure below.



(a) (b) (c)

8. Write three ways by which bacteria are useful to us and three ways by which they are harmful?
9. Which organism makes the bread soft and fluffy. Explain.
10. Which two microorganism act as decomposer? How is this activity useful to us?
11. How do the following help in food preservation?
    (a) Salt (b) Sugar
    (c) Heating (d) Drying.
12. How penicillin was discovered by Alexander Fleming?
13. How decomposers help in enriching the soil with nutrients?
14. Explain how nitrogen is recycled back into atmosphere?
15. How *Rhizobium* helps in nitrogen fixation?
16. List down ten diseases and their causative agents.
17. Write down preventive measures for
    (a) Air–borne diseases
    (b) Water–borne diseases
    (c) Vector – borne diseases
18. All fungi are not microscopic. Do you agree? Explain.
19. How do fungi help in recycling of dead organic materials in nature?
20. Yeast is capable of converting sugar into two products. Name these two products. Explain the process involved?
21. Write a short note on vaccines.
22. What are vectors. How do they spread diseases.
23. Explain the role of bacteria in nitrogen cycle.
24. Why it is advised to keep distance from a person suffering from tuberculosis?
25. Why it is advised to maintain good sanitary habits.

exercise 2

MCQ MULTIPLE CHOICE QUESTIONS :

DIRECTIONS : *This section contains* **27** *multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct. Choose the correct option.*

1. Which of the following organisms is considered to be on the borderline of living and non-living?
   (a) Bacteria (b) Algae
   (c) Virus (d) Fungi
2. *Amoeba* and *Paramecium* belongs to group
   (a) Bacteria (b) Algae
   (c) Fungi (d) Protozoan
3. Which microbes is used to make curd from milk?
   (a) Bacteria (b) Virus
   (c) Fungi (d) Protozoan
4. What makes the bread soft and fluffy?
   (a) Finely ground flour
   (b) Alcohol given off during fermentation of sugar
   (c) Carbon dioxide gas given off during fermentation of sugar
   (d) Oxygen gas
5. The gas released during fermentation of sugar by yeast cells is
   (a) Carbon dioxide (b) Carbon monoxide
   (c) Hydrogen (d) Oxygen
6. Which of the following bacterium is responsible for the formation of moulds on moist bread?
   (a) *Lactobacillus* (b) *Streptococcus*
   (c) *Rhizobium* (d) *Rhizopus*
7. Which disease is caused by virus?
   (a) Tuberculosis (b) Common cold
   (c) Typhoid (d) Malaria
8. Which of the following is not preventive measures for water borne disease?
   (a) Proper disposal of sewage
   (b) Maintenance of good sanitary habits
   (c) Drinking boiled water
   (d) Covering mouth or nose while sneezing
9. Bacteria can be seen only
   (a) In light
   (b) In darkness
   (c) Under a microscope
   (d) Under a magnifying glass
10. Which of the following microorganisms cannot multiply on their own?
    (a) Bacteria and Protozoa
    (b) Algae and Fungi
    (c) Fungi and Virus
    (d) Viruses
11. The process that releases free nitrogen back into the air is known as
    (a) Ammonification (b) Nitrification
    (c) Denitrification (d) Purification
12. Which of the following is a nitrifying bacteria?
    (a) *Nitrosomonas* and *Nitrobacter*
    (b) *Nitrosomonas* and *Pseudomonas*
    (c) *Nitrobacter* and *Pseudomonas*
    (d) *Nitrobacter* and *Lactobacillus*
13. The suspension of killed microbes that mimics the disease causing microorganisms is known as
    (a) Antibiotics (b) Vaccines
    (c) Vector (d) Pathogen
14. Which microorganism is smaller than bacteria?
    (a) Protozoan (b) Virus
    (c) Fungi (d) Algae
15. Which of these elements help to increase the soil fertility?
    (a) Hydrogen (b) Nitrogen
    (c) Carbon (d) Oxygen
16. How does adding yeast change bread dough?
    (a) Yeast changes the bread's colour.
    (b) More dough is produced as yeast multiply.
    (c) Bubbles of gas form in the dough
    (d) Yeast makes it less lumpy
17. Which of the following describes the most ideal location for microorganisms to live?
    (a) Nearly everywhere (b) In warm, humid places
    (c) Sunny, dry areas (d) Underwater
18. Microbes are an important part of the environment because they
    (a) Break down waste products
    (b) Cause the water cycle
    (c) Protect the ozone layer
    (d) Block global warming
19. Infectious diseases can spread
    (a) From one person to another
    (b) By eating only frost fruit
    (c) From washing your hands
    (d) By Inheritance
20. The mode of transmission of dengue is
    (a) Air (b) Contact
    (c) Water (d) Vector
21. What is the most important way to stop infections from being spread?
    (a) Cleanliness (b) Heating
    (c) Eating (d) Taking tablets

22. What does your stomach use to kill microbes?
(a) Acid (b) Water
(c) Salt (d) Alkali

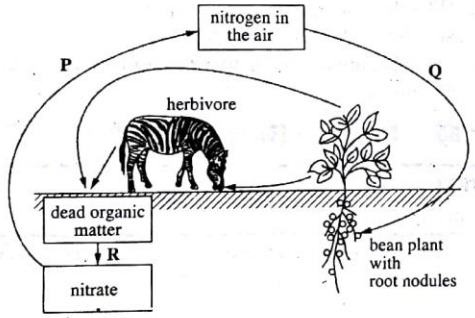
23. Which of the following correctly describes the size of fungi compared to the size of bacteria?
(a) Fungi are larger
(b) Bacteria are larger
(c) They are about the same size
(d) They are the same size but different shapes

24. Most bacteria can be killed by
(a) Cooking (b) Refrigeration
(c) Freezing (d) Salting

25. When a person is made immune to a disease by an injection they have usually been
(a) Vaccinated (b) Infected
(c) Infectious (d) Communicable

26. How do bacteria help our bodies to function?
(a) They make our muscles and lungs stronger.
(b) They help to digest food in the intestines.
(c) They circulate in our blood and help carry oxygen.
(d) They make our skin flexible and clean.

27. Study the given diagram of the nitrogen cycle.



Which arrow identify nitrogen fixation and denitrification?

	Nitrogen Fixation	Denitrification
(a)	P	Q
(b)	P	R
(c)	Q	P
(d)	Q	R

MTOC MORE THAN ONE CORRECT

DIRECTIONS : *This section contains 9 Multiple Choice Questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONE OR MORE may be correct.*

1. Which of the following diseases is caused by Virus?
(a) Tuberculosis (b) Chicken pox
(c) Hepatitis (d) Typhoid

2. The preventive measures that need to be taken to prevent Hepatitis B are –
(a) Drinking boiled water
(b) Vaccination at suitable age
(c) Maintaining personal hygiene
(d) Destroying breeding grounds of mosquitoes.

3. Which of the following is a communicable disease?
(a) Common cold (b) Chicken pox
(c) Cancer (d) Diabetes

4. Which of the following bacteria are called bacilli?
(a) *Bacillus anthracis* (b) *Salmonella*
(c) *Treponema* (d) *Streptococcus*

5. Which of the following bacteria are useful to mankind?
(a) *Lactobacillus* (b) *Acetobacter aceti*
(c) *Rennin* (d) *Rhizobium*

6. Which of the following is/are an Fungi?
(a) *Rhizopus* (b) *Penicillium*
(c) *Entamoeba* (d) *Escherichia*

7. Which of the following microbes causes food poisoning?
(a) *Penicillium notatum* (b) *Salmonella*
(c) *Staphylococcus* (d) *Mycobacterium*

8. Which of the following diseases spread by air?
(a) Tuberculosis (b) Polio
(c) Typhoid (d) Hepatitis (B)

9. Yeast can be used in making
(a) Bread (b) Wine
(c) Alcohol (d) Curd

A&R ASSERTION & REASON :

DIRECTIONS : *Each of these questions contains an Assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) If both **Assertion** and **Reason** are **correct** and Reason is the **correct explanation** of Assertion.

(b) If both **Assertion** and **Reason** are correct, but Reason is **not the correct explanation** of Assertion.

(c) If **Assertion** is **correct** but **Reason** is **incorrect**.

(d) If **Assertion** is **incorrect** but **Reason** is **correct**.

1. **Assertion** – Viruses can be seen with the help of electron microscope.
Reason – It is much smaller than bacteria.

2. **Assertion** – Pathogens are harmful to mankind.
Reason – They either kill or prevent the growth of microorganisms.

3. **Assertion** – *Rhizobium* lives in the root nodules of leguminous plants.
Reason – It fixes nitrogen through a symbiotic relationship.

4. **Assertion** – Salting is used for preserving meat and fish by common salt.
   Reason – It does not allow the growth of bacteria.
5. **Assertion** – Salt is added to chips and pickles.
   Reason – Salting removes oxygen from the food item.
6. **Assertion** – Fermentation is the process of decomposition of sugar molecules by microorganisms to produce an acid or alcohol.
   Reason – Cheese is prepared by the bacterial fermentation of milk.

MMQ MULTIPLE MATCHING QUESTIONS

DIRECTIONS : *Each question has four statements (A, B, C and D) given in Column I and five statements (p, q, r, s) in Column II. Any given statement in Column I can have correct matching with one or more statement(s) given in Column II. Match the entries in column I with entries in column II.*

1.

Column I	*Column II*
(a) Bacilli	p. Influenza
(b) Typhoid	q. *Escherichia coli*
(c) Virus	r. Vaccinia
(d) Bacteria	s. *Salmonella*

2.

Column I	*Column II*
(a) Tuberculosis	p. Vaccination
(b) Cholera	q. Destroying breeding grounds of mosquitoes.
(c) Hepatitis B	r. Drinking boiled water
(d) Malaria	s. Maintaining personel hygiene

HSQ HOTS SUBJECTIVE QUESTIONS :

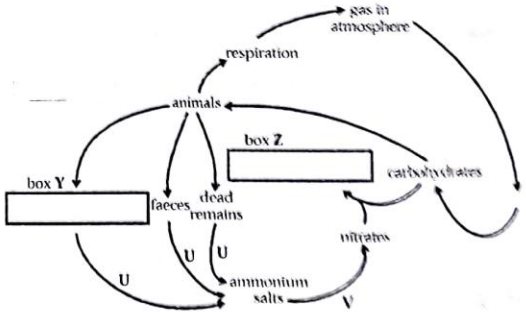
DIRECTIONS : *Answer the following questions.*

1. Priya wants to see if apples that are kept cold will rot or stay edible. So she places the apple in the refrigerator and records the date. What she should use as a control?
2. Sonia noticed that the milk she brought on his breakfast is lumpy and tastes sour. What inference should Sonia make?
3. Shashi and her friends wonders if pond water smells bad because it has microorganisms in it. Describe a way they could find out this.
4. Why do curd sets faster in summer than in winter?
5. The sealed packets in which food items such as chips are sold are usually filled with nitrogen. What is the use of this nitrogen?
6. Why it is advised to wash your hands before handling food and after going to the toilet?
7. How will you determine whether or not food inside a sealed can is infested with microbes?
8. There are few indicators that tell us whether a given sample of food is suitable for consumption or not. List down five indicators of food spoilage.
9. Manish forgot his lunch box in school on Friday. His lunch box has a leftover rice and some vegetables. What do you think would have happened to the leftover food by Monday morning? Give reasons.
10. Microorganisms helps in keeping the planet Earth running. Justify, giving two examples.
11. What is food poisoning? What precautions should be taken to avoid food poisoning?
12. Why is virus called a mysterious micro organism?
13. Mention the discoveries made by following scientists.
    (i) Louis posteur
    (ii) Alexander. Fleming
    (iii) Edward Jenner.
14. Why the Garbage that include plant and animal waste smells very bad after few days.
15. Microbes are too many to count and too small to find. Comment.

PBQ PICTURE BASED QUESTIONS

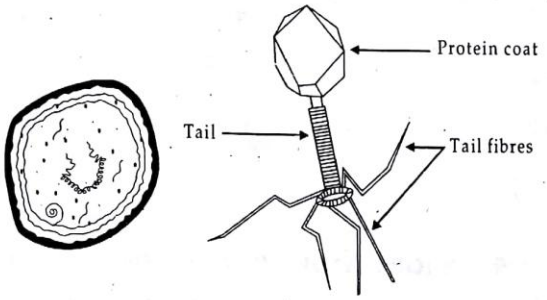
DIRECTIONS : *Study the given picture(s) and answer the following questions.*

1. The given figure shows two interlinked natural cycle.



(i) Name the cycle
(ii) Name the processes occurring at U and V and the type of organism that brings about each process.
(iii) Complete the figure by filling in boxes Y and Z.
(iv) How plants that can digest insects grow successfully in soils lacking in nitrates?

2. Study the given picture(s) of **Bacteria (A) & Virus (B).**



(A) (B)

(A) Bacteria are the oldest forms of life. They were the only life forms until about 2.1 billion years ago. Other life forms evolved from bacteria. Bacteria grow, reproduce, and carry out respiration.

(B) Viruses are much smaller than bacteria. They are not an ancient life form. Viruses can cause diseases like the flu or chicken pox. Most biologists agree that viruses are not alive. Viruses do not move, grow or carry out respiration. Viruses need living host cells to reproduce.

Based on given picture and text, find out the microbes being describe - bacteria or virus.

(a) They are not the oldest life form on Earth._____
(b) They can grow, reproduce, and carry out respiration._____
(c) They are the oldest life form on Earth._____
(d) Most biologists agree they are not alive._____
(e) They are alive._____
(f) They do not move, grow, or carry out respiration. _____
(g) They need a living host to reproduce._____
(h) Other life forms evolved from them._____

ABQ ACTIVITY BASED QUESTIONS :

DIRECTIONS : *Study the given activities and answer the following questions.*

1. Sanjana left four food items in a plastic bags in a warm container for five days. After five days, she observed the following results.

S. No.	Food items	Observations
1	Bread	Covered with black, fuzzy stuff
2	Banana	Banana turned slimy, black and soft
3	Hamburger	Turned brown with green sports
4	Cheese	Has white and green areas

Based on above experiment, answer the following questions.

(i) Which of these hypothesis was tested by Sanjana?
  (a) Foods left in the dark will rot differently than foods in light.
  (b) Foods react differently in plastic bags
  (c) In different foods, different bacterias' grow
  (d) Which kind of bacteria is best for making cheese.

(ii) Which variable was tested in this experiment?
  (a) The length of time it takes food to rot.
  (b) What kind of bags allows roting to occur.
  (c) The temperature microorganisms like the best.
  (d) How different kinds of food rot.

(iii) What conclusion can be drawn from the given data?
  (a) Bread is more likely to rot than cheese or meat.
  (b) Bread is better for you to eat than cheese
  (c) Different microorganisms grow on different foods
  (d) Hamburger is less safe to eat than other foods because it turns brown

(iv) What important functions do microorganism have in an ecosystem?
  (a) They produce food from sunlight
  (b) They reduce the number of large animals
  (c) They decompose dead organisms
  (d) They help to clean the air

2. Complete the given table.

Micro-organism	Disease	Mode of Transmission
(i) _____	Tuberculosis	(iii) _____
	Cholera	(iv) _____
	(ii) _____	Water
(v) _____	Measles	(vii) _____
	(vi) _____	Air/Contact
	Polio	(vii) _____
	Hepatitis B	(viii) _____
Protozoa	(ix) _____	Mosquito

3. Rearrange the following steps of the nitrogen cycle in the correct order?
I. Conversion to Ammonia
II. Ammonification
III. Nitrogen fixation
IV. Denitrification
V. Nitrification

4. Sanjana is supposed to tell her teacher the methods of preservation and preservatives, but she mixed the words. Can you help Sanjana by unscrambling the given words.
(i) S T A L (ii) A G E R I V N
(iii) R A U G S (iv) L O I
(v) R E G I R F E R N I O T A
(vi) U I M D O S A T E O N Z E B
(vii) U R I Z E T A S P A N I O T

SOLUTIONS

BRIEF EXPLANATIONS OF SELECTED QUESTIONS

EXERCISE 1

FIB FILL IN THE BLANKS :

1. Virus, 2. Malaria, 3. Vaccination, 4. Alexander Fleming, 5. Vaccine, 6. *Rhizobium*, 7. Decomposition, 8. Virus, 9. Air, 10. Salt.

T/F TRUE & FALSE :

1. False, 2. False, 3. True, 4. True, 5. True, 6. False, 7. True, 8. False, 9. False, 10. False, 11. False

MTF MATCH THE FOLLOWING :

1. A→ r, B→ p, C→q, D→t, E→ s
2. A→s, B→ r, C→ q, D→t, E→ p

VSAQ VERY SHORT ANSWER QUESTION :

1. Microbes / Microorganisms
2. Microscope
3. Curd, prepared by *Lactobacillus.*
4. Coccus
5. Virus
6. Fungi
7. *Plasmodium* – Malaria
   Entamoeba – Amoebic dysentery
   Trypanosoma – Sleeping sickness
8. Female *Anopheles*
9. Yeast, a fungus
10. Mushroom
11. Rust of wheat and Rust of rice
12. Penicillin
13. Pathogens are disease causing microorganisms.
14. Antibiotics are medicines that are produced by certain microorganisms, to kill other disease causing microorganisms.
15. Expiry date refers to the date which the supplier intended the food to be consumed.

SAQ SHORT ANSWER QUESTION :

18. No, not all fungi are microscopic. Fungi such as mushroom can be seen through naked eyes.
19. Fungi together with bacteria decompose the organic matter present in dead plants and animals and convert it into simple soluble minerals, water and gases, which then go into the soil, water bodies and air. Hence, fungi help in recycling dead organic materials in soil.
20. Yeast ferments the sugar present in various food and produces alcohol, with the release of carbon dioxide and little energy.

$$\text{Glucose} \xrightarrow[\text{Yeast}]{\text{without oxygen}} \text{Alcohol} + \text{Energy} + CO_2$$

The process involved is known as fermentation. Fermentation is the process of converting complex organic substances into simpler substances.

EXERCISE 2

MCQ MULTIPLE CHOICE QUESTIONS :

1. (c) 2. (d)
3. (a) A bacterium, called *Lactobacillus*, to used to make curd from sour milk.
4. (c) Yeast ferments the sugar present in the dough into carbon dioxide. The CO_2 released from the yeast fills the dough and increases its volume. Once, the bread has baked, the heat causes the bubbles to break and makes the bread light and fluffy.
5. (a) Fermentation is the process of converting complex organic substance into simpler substance with the action of yeast or bacteria. Yeast ferments the sugar into alcohol, carbon dioxide and little energy.
6. (d) 7. (b)
8. (d) Covering mouth or nose while sneezing, coughing is a preventive measure for air-borne disease.

9. (c) 10. (d) 11. (c) 12. (a)
13. (b) 14. (b) 15. (b)
16. (c) Yeast ferments the sugar present in the dough into carbon dioxide. The CO_2 released from the yeast fills the dough and increases its volume. Once the bread has baked, the heat causes the bubble to break and makes the bread light and fluffy.
17. (b) 18. (a)
19. (a) Infectious diseases can spread from one person to another through air, water and food.
20. (d) 21. (a) 22. (a) 23. (a)
24. (a) If the temperature is high enough and the cooking is reasonably prolonged, the majority of bacteria will be killed. Refrigeration of 4°C does not kill bacteria but slows down the rate of reproduction so that food remains safe for longer period. Freezing and salting stops bacteria from reproducing but does not kill them.
25. (a) 26. (b) 27. (c)

MTOC MORE THAN ONE CORRECT

1. (b), (c) 2. (a), (b), (c)
3. (a), (b) 4. (a), (b)
5. (a), (b), (c), (d) 6. (a), (b)
7. (b), (c) 8. (a), (b)
9. (a), (b), (c)

A&R ASSERTION & REASON:

1. (a)
2. (c) Assertion is correct but reason is incorrect pathogens are harmful to mankind as they cause death and severe fatal diseases. Antibiotics either kill or prevent the growth of microorganisms.
3. (a) Both assertion and reason are correct and statement 2 is the correct explanation of assertion. *Rhizobium* lives in the root nodules of leguminous plants to fix nitrogen through a symbiotic relationship.
4. (a) Salting is used for preserving meat and fish by common salt as it does not allow the growth of bacteria.
5. (c) The assertion is correct but reason is incorrect. Salt is added to chips and pickles. Salting forces micro organisms to lose water by a process known as osmosis, thus preventing their growth and reproduction. Chemical preservatives get as antioxidants and remove oxygen from the food item.
6. (b) Both assertion and reason are correct but reason is not correct explanation for assertion.

MMQ MULTIPLE MATCHING QUESTIONS:

1. (a) – q, s; (b) – s; (c) – p, r; (d) – q, s
2. (a) – p; (b) – r, s; (c) – r, p; (d) – q

HSQ HOTS SUBJECTIVE QUESTIONS:

1. Priya should keep another apple in a warm place for the same length of time.
2. Milk is lumpy and tastes sour so it means that milk is old or has been left in a warm place.
3. Shashi and her friend could use a microscope and look at the pond water to see if microorganisms are visible or not. Also, they can boil the pond water to kill or get rid of microorganisms to see if it still smells.
7. Any kind of swelling of the sealed can is a cause of suspicion as this indicates the formation of gas inside the tin. This swelling could be due to the production of gaseous by products due to microbial growth.
8. **Indicators of food spoilage:-**
   (i) **Odour :** Repulsive odours are produced when the bacteria break down the protein present in food.
   (ii) **Sliminess :** It occurs due to bacterial growth.
   (iii) **Discolouration :** Microbial growth may result in discolouration of food.
   (iv) **Souring :** Food items become sour due to production of acids by bacteria.
   (v) **Gas formation :** Bacteria and yeast produces gaseous by-products that affects the texture of food items.
9. Cooked rice gives out moisture. Since, moisture is one of the main requirements for microbial growth, so the leftover food will start producing repulsive odours, become slimy and sometimes may have coloured spores that give the food a distinctive colour.
10. Microorganisms play a vital role in the lives of plant and animals. They carry about 90% of the biochemical reaction that occurs in our planet. For example,
    (i) Microorganisms enrich the soil with nutrients.
    (ii) Certain microbes are also used in the biological treatment of sewage and industrial effluents.
11. Food poisoning is a food borne illness that occurs suddenly after your consume a contaminated food or drink. To avoid food poisoning –
    (i) Wash fresh food items well before eating them.
    (ii) Avoid eating leftovers after a long time.
    (iii) Eat properly cooked and heated food items.
    (iv) Check the shelf life of packaged food items

12. Viruses are mysterious because they fall on the threshold of living and non living beings. They are tiny microorganisms, about thousand times smaller than bacterial cells. Viruses do not have enzymes or the chemicals, which are important for life sustaining chemical reactions. Thus viruses need a host cell such as bacteria, plant or animal to exist, grow and reproduce to act like a living being.

PBQ PICTURE BASED QUESTIONS

1. (i) Nitrogen cycle
   (ii) *Process U* – Decomposition. The type of organism that brings about decomposition is bacteria & fungi.
   Process V – Nitrification. The type of organism that brings about nitrification is *Nitrosomonas* and *Nitrobacter*.
   (iii) Box Y – Animal excreta.
   Box Z – Proteins
   (iv) All plants need nitrogen for their growth and development. They obtain it from soils in the form of nitrates. The plants that cannot manufacture proteins capture insect and uses the insects protein / amino acid for their growth. Such plants are known as insectivorous plants. Example, pitcher plant.

2. (a) Virus (b) Bacteria (c) Bacteria
   (d) Virus (e) Bacteria (f) Virus
   (g) Virus (h) Bacteria

ABQ ACTIVITY BASED QUESTIONS :

1. **(i)** (c) **(ii)** (d) **(iii)** (c) **(iv)** (c)
2. (i) Bacteria (ii) Typhoid
   (iii) Air (iv) Water / food
   (v) Virus (vi) Chicken pox
   (vii) Air / Water (viii) Water
   (ix) Malaria
3. III, I, II, V, IV
4. (i) SALT, (ii) VINEGAR
   (iii) SUGAR (iv) OIL
   (v) REFRIGERATION (vi) SODIUM BENZOATE
   (vii) PASTEURIZATION

chapter

3

Conservation of Plants and Animals

The world is full of animals. If you look around, you may find different kinds of plants and animals. For example, in your neighbourhood park, you may find variety of flowers, trees ranging from big trees such as banyan to small bushes etc. You may also see variety of animals such as dogs, cats etc. A variety of birds such as crows, sparrows, pigeon etc, may also be found sitting and chirping on branches of trees. Along with birds you may also find insects such as butterflies and honey bees sitting on the colourful petals of flower. *Now if your neighbourhood garden have such a diverse variety of plants and animals, then what about forests*? Forest are believed to house millions of species of plants, some of them yet undiscovered by human beings. Forests are home of several kinds of plants and animals. The existence of diverse variety of plants, animals and other living organisms is known as *biodiversity* or *biological diversity*.

Biodiversity of Earth includes all organisms-big and small, from an Amoeba to a Blue whale and from Algae to the Sequoia tree, that exist on our planet. The biodiversity of a region depends on the environment of that region. For example, plants, animals and even micro organisms living in a desert region are very different from those living in a forest. Similarly, organisms living in a grassland are entirely different from ocean. This means every different region on Earth has its own biodiversity.

In this chapter we will learn about the need to conserve the diverse types of plants and animals found on Earth. But before that let us first understand *what is conservation*.

Conservation refers to wise use of natural resources with an aim to preserve living and non-living resources. The word "resource" means supplying a material generally held in reserve. The common natural resources include energy, air, water, land, minerals, micro organisms, plants and animals. Wild life and Forest constitute the biotic resource of nature, while air, water, land etc. are abiotic resource of nature.

do you know?

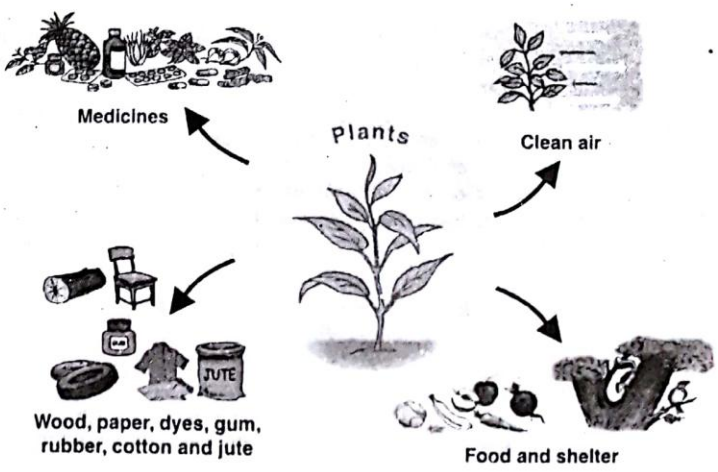
- India is sixth on a list of 12 mega-biodiversity countries in the world.
- It contains two of 13 biodiversity hot spots of world called North East India and Western Ghats.
- Tropical rainforests are rich storehouse of biodiversity.

CONSERVATION OF BIODIVERSITY:

To conserve biodiversity we need to establish protected areas for plants and animals, restoring ecosystems and managing already existing plant and animals. Biodiversity refers to the number and variety of various life forms such as plants, animals and micro organism in an area. Plants and animals depend on each other for survival. You have studied about the importance of forests and wildlife in earlier classes. *Can you recall some of their major uses. Lets have a look.*

Importance of forests (plants) and wildlife (animals) :

1. Roots of trees help to bind the soil. It helps to prevent the topsoil from getting eroded by wind, wind and water.
2. Trees and other vegetation form the habitat of many animals. Hence, destroying forest would lead to destruction of natural habitat of many species of plants and animals.
3. Forest maintains a balance between carbon dioxide and oxygen levels on atmosphere.
4. It provide us useful products such as gum, timber, medicines, etc from trees.
5. Plants and animals form vital links in food chains and food webs.



All living things need food to live. If they are starved for food, they get weaker and eventually dies. Plants make their own food by photosynthesis. They are *food producers*. Animals feed on plants or other animals and are *food consumer*. It means a food relationship exists between plants and animals. This relationship is shown by a *food chain*. A *food chain* starts with green plants because they are *food producers*. Animals which eat the plants form the second link of the chain. Plant-eaters are the *first* or *primary food consumers* in a food chain. Next come predators which feed on the plant-eaters. Animal-eaters are *second* or *secondary food consumers*. Some animal-eaters are in turn eaten by other animals, for example, a snake feeds on a toad which in turn feeds on fruit flies. These animal eaters are called *tertiary food consumers*. The last link of food chain is occupied by *decomposers*, that feeds on dead plants and animals.

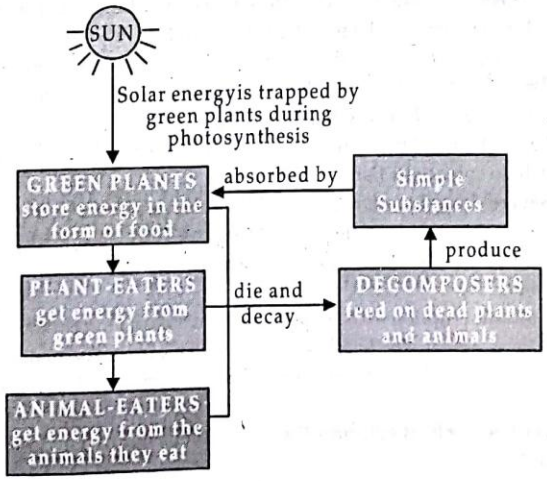
A food chain can be written as – Leaf ⟶ Caterpillar ⟶ Bird
[**Note :** The ⟶ (arrow) stands for "is eaten by"]

Some examples of food chain :

Food producer		Primary food consumer		Secondary food consumer		Tertiary food consumer
Grass	⟶	Grasshopper	⟶	Hen	⟶	Fox
Algae	⟶	Water flea	⟶	Guppy	⟶	Angelfish
Fruit	⟶	Fruit fly	⟶	Toad	⟶	Snake

How energy flows in a food chain

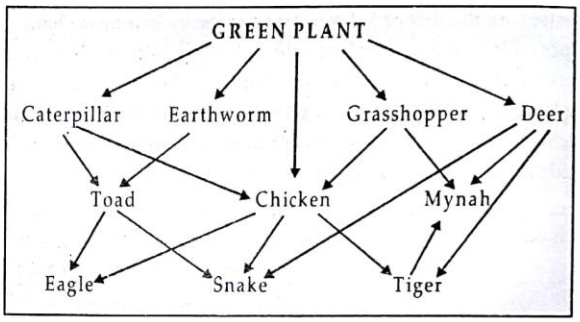
Food chain show energy pathways. Energy from the Sun is used by plants to make food. This energy then goes to all animals through food chain. Eventually the food stored in plants and animals are broken down to simpler substances by decomposers. Plants make use of these simple substances as food. This is how energy flows from plants to decomposers, which in turn recycles it back to plants.



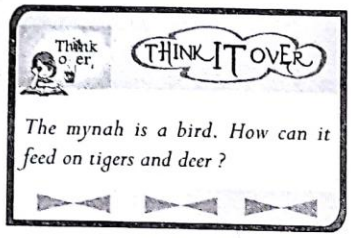
Food Webs

Green plants are eaten by several plant-eater. These plant-eaters in turn are eaten by several animal-eaters. In this way, many food chains become linked together to form a food web. *Food web* shows many food chains linked together.

For example :



The destruction of either of the two, plant or animal, will affect the life of other. Hence, we need to conserve biodiversity to maintain the balance of nature. But since, due to the overgrowing demands of over-population and urbanization our forest covers and wild life are under threat. One of the major threat to biodiversity is deforestation. Let us first discuss. *"What deforestation is"*?



do you know?

How interaction among different species help in conserving biodiversity. An increase or a decrease in the population of one member of a food chain affects the populations of the other members of the food chain. For example, in a given community the population of plant-eaters will increase when there are more plants available as food. As the plant-eaters increase in number, more plants are eaten up. After some time there may not be enough plant food for the animals. When this happens, many of the plant-eaters will die or move away from the area. With fewer animals eating them, the plants have a chance to grow and increase in number. Once again there will be much plant food available for the plant-eaters. The plant-eating population will correspondingly start to increase. This is how the population of plant-eaters depends on the population of plants and vice versa.

In the same way the population of animal-eaters depends on the population of plant-eaters and vice versa.

DEFORESTATION

Deforestation is the cutting or removal of trees or other vegetation from an area for industrial, agricultural or other purposes. Forests are cut for many reasons without planting new trees to replace the lost trees.

Causes of deforestation **:** The cause of deforestation can be classified into two classes :-

(i) Man-made causes of deforestation – These are the primary and the most common reason for deforestation.

(a) Forests are cleared for accommodating expanding urban areas and for fulfilling their ever-increasing requirements.

(b) Forests are destroyed to clear lands for crops and cattle grazing.

(c) Trees are also cut down to be used for firewood and fuel.

(ii) Natural causes of deforestation –

(a) Forest fires – These are started by lightning and strong winds that help to spread the flames.

(b) Severe droughts – Drought in the forest has increased the amount of flammable bush and debris on the forest fires. As a result, the forest catches fire easily and destroys the immeasurable amount of valuable timber.

(c) Volcanic eruption – It is one of the several natural forces that are capable of causing damage to forests. The ashes emitted during the eruption coat tree leaves, which in turn interfere with photosynthesis and destroy the plants.

(d) Typhoon or heavy storm – These are violent storms that destroys much of the rain forest.

Consequences of deforestation :

(i) Deforestation increases the temperature and pollution level on Earth. Plants absorb CO_2 from the atmosphere to perform photosynthesis. If the plants are destroyed then the level of CO_2 in the atmosphere will rise. As a result, CO_2 will trap more radiations, there by adding to global warming. *Global warming* refers to an average increase in earth's temperature. An increase in the temperature of the earth will disturb the natural water cycle. As a result, there will be a change in rainfall pattern. This in turn could lead to drought.

(ii) Deforestation leads to loss of biodiversity. If we go on cutting trees the natural habitats of many animals will get completely destroyed. As a result the biodiversity of many areas will be severely affected.

(iii) It also destroys the habitat of many wild animals. The habitat of an animal provides shelter, food and protection to animals. If the habitat of an animal is disturbed then it will force the animals to go other places in search of food and shelter. As a result, the animal could get killed easily by other animals in this process.

(iv) Deforestation increases soil erosion. Roots of plants hold soil particles together. In the absence of plants, the top layer of the soil will be easily removed by the action of high speed winds or water flow. Thus deforestation increases the chances of soil erosion.

(v) Deforestation leads to desertification. In the absence of trees, soil erosion occurs more rapidly exposing the lower hard and rocky layer. As a result, soil loses humus and becomes less fertile. Hence, a fertile land, which act as a source of living for farmers, gets converted into a desert. This process is known as *desertification* of land.

(vi) Deforestation also reduces the level of ground water. It is because in the absence of tree cover the seeping of water is reduced and thus the ground water does not get replenished. This could then cause floods.

(vii) It causes the shortage of products we get from forests.

There, we need to conserve biodiversity for our survival and to maintain the natural ecological balance.

IMPORTANT TERM

Habitat is the natural surroundings of a plant or animal, where it grows, multiplies and thrives naturally.

do you know?

Forest is the storehouse of biodiversity.

CONSERVATION OF FOREST & WILDLIFE

Several steps have been taken by government towards the conservation of our biodiversity (forest and wildlife). *Wildlife protection act* was passed in 1972 and amended in 1981. *Forest protection act* was passed in 1980 while *environment protection act* was passed in 1986. Under the wild life protection act a large number of sanctuaries, national parks and biosphere reserves were established in different parts of the country.

Ways to conserve biodiversity

There are two main ways to conserve biodiversity :

(I) Outside their natural habitat

(II) In their natural habitat

(I) *CONSERVING BIODIVERSITY IN THEIR NATURAL HABITAT :*

1. Biosphere Reserves

- It is large protected area meant for conservation of biodiversity.
- It helps in the conservation of various organism such as plants, animals and micro organism.
- It includes protected areas and surrounding lands that has managed to combine both conservation and sustainable use of natural resource.

do you know?

Biosphere reserve is a form of protection of the uniqueness of the area.

- In this areas, conservation of plants, animals and micro organisms are done along with traditional life forms, living in that area. Thus it includes much more area than wild life sanctuary and National park.
- At present 14 biosphere reserves are identified in our country.

Some of the important biosphere reserves and their location in India are given below in the table.

Biosphere Reserves	Location
Nilgiri	Karnataka, Kerala, Tamil Nadu
Nanda Devi	Uttar Pradesh
Uttar Khand (Valley of flowers)	Uttar Pradesh
Nokrek	Meghalaya
Kaziranga	Assam
Sunderbans	West Bengal
Thar desert	Rajasthan
Kanha	Madhya Pradesh
Namdapha	Arunachal Pradesh
Gulf of Mannar	Tamil Nadu
Rann of Kutch	Gujrat
Great Nicobar	Andaman and Nicobar
North Islands of Andamans	Andaman and Nicobar
Manas	Assam

2. Wildlife Sanctuaries

- It is an area within which animals are protected from all possible dangers such as hunting.
- Sanctuaries provide protection and suitable living conditions to wild animals.
- These sanctuaries protects some of the threatened wild animals such as black buck, Indian elephant, Pink headed duck, Gharial, Python, One horned rhinoceros etc.

At present there are 508 sanctuaries in India. *Some of the important wildlife sanctuaries and the main type of animal species for which they are famous are given below in the table.*

S. No.	Name of the Sanctuary	Organisms for which they are known
1	Dachigam Sanctuary	Kashmir Stag.
2	Bharatpur Bird Sanctuary (Rajasthan)	Siberian Crane
3	Rann of Kutch Sanctuary	Wild ass, the Flamingo, the Star tortoise and the Desert fox
4	Gir Sanctuary (Gujrat)	Asiatic lion, Chital, Sambhar and Neelgai.
5	Bandipur Sanctuary (Karnataka)	Indian elephant.
6	Madumalai Sanctuary (Tamilnadu)	Indian elephant.
7	Sanctuaries in Annamalai region	Protect the most biologically rich areas of Shola forest.

3. National Parks

- A national park is an area of land that is protected by the government to conserve wild life.
- In national park, animals can freely roam about and use the natural resources.
- At present there are 97 national parks in India.

Some of the important national parks and the main type of animal species for which they are famous are given below in the table.

S. No.	Name of the National Park	Organisms for which they are known
1	Kaziranga National park (Assam)	One horned rhinoceros.
2	Desert National Park (Thar)	Neelgai, Chinkara, Black buck and Great Indian Bustard
3	Corbett National Park (Uttarkhand)	Tiger
4	Kanha National park (Madhya Pradesh)	Wild Tigers

The main aim of establishing these protected areas is to preserve plant and animal life in their natural habitat. They are allowed to breed and multiply so that their numbers increases. The cutting down of trees and hunting animals in these protected areas are strictly prohibited.

Difference table between wild life sanctuary and biosphere reserve.

S. No.	Wildlife sanctuary	Biosphere reserve
1	It is an area within which animals are protected from possible dangers such as hunting. Their habitat is also conserved in this area.	It is a large protected area constructed for the conservation of biodiversity.
2	It provides protection and suitable living conditions to wild animals.	It helps in the conservation of various life forms such as plants, animals, and micro-organisms.
3	An example of wild life sanctuary is Pachmarhi sanctuary.	An example of biosphere reserve is Pachmarhi biosphere reserve.

4. Forest Reserves

These are large protected areas of forests cover that are protected from human exploitation. Strict laws have been enacted to prevent the cutting of trees. Thus, *forest reserves have been established with the following objectives :*

(i) Prevention of deforestation.

(ii) Plantation of more plants

(iii) Protection of food and shelter that are meant for wild life.

II. *CONSERVING BIODIVERSITY OUTSIDE THEIR NATURAL HABITAT :*

1. Zoological park (Zoo)

A Zoo or zoological park refers to any park, cage or an enclosure in which live animals are kept for public exhibition. It plays a major role in creating awareness among common people about the need to conserve nature. It is an artificial habitat that serve as breeding centres for some rare and endangered animals. Here, animals are bred under controlled conditions so that babies are well protected and preserved.

2. Botanical Gardens

- Botanical gardens are large protected areas established to conserve rare plants and threatened plants.
- They serve as seed banks and have reserve of seeds of several species of plants. Here, seeds are preserved under controlled conditions.

IMPORTANT TERM

Wild Life : *Wild life includes all undomesticated organisms living in their natural habitat. These organisms play a vital role in ecosystem.*

do you know?

Forest reserves aim at protecting natural habitats, while botanical gardens are zoos of plant world.

IMPORTANT TERM

Flora : *It refers to all plants found in a particular area. For example, sal, teak, mango, jamun etc are flora of the Pachmarhi Biosphere Reserve in Madhya Pradesh.*

Fauna : *It refers to all animals found in a particular area. For example, chinkara, blue-bull, barking deer, wolf, wild dog etc are examples of fauna of Pachmarhi Biosphere Reserve.*

CHECK Point

1. **If a fish is to be conserved outside its habitat, where should it be kept ?**
2. **What is the difference between zoo and wild life sanctuary?**

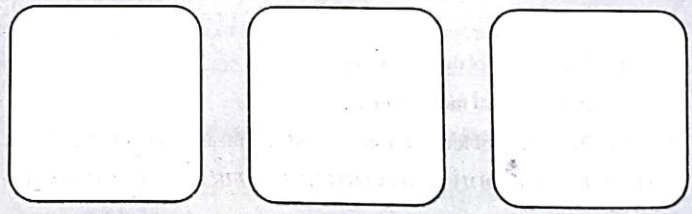
CHECK YOUR ANSWERS

1. Fishes and aquatic organisms can be conserved in large aquaria.
2.

Zoological Park (Zoo)	Wild Life Sanctuary
It is a facility where animals are kept for public exhibition	It is an area within which animals are protected from possible dangers such as hunting.
It is an artificial habitat.	It conserves the natural habitat of animals.

IDEA BOX

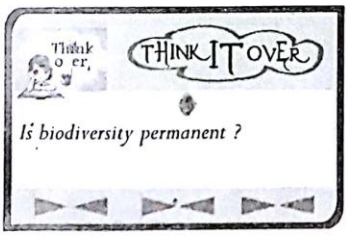
Try to identify the various type of flora and fauna present in your locality. Click their photo and make a scrap book.



IMPORTANCE OF BIODIVERSITY

An *ecosystem* is a community of organisms consisting of producers, consumers and decomposers interacting with one another and with the environment. For example, a pond, a forest etc. The relationship among species in an ecosystem are usually complex and maintains the balance of nature. For example, if all lions are removed from jungle, then deer population will increase to such an extent that they will damage the entire forest due to overgrazing.

Hence, conserving the biodiversity on earth is the duty of every human being. To promote conservation, government and non-government bodies at the local, national and international levels are constantly organizing awareness programmes and issuing rules and regulations to protect the biodiversity.



International Union for Conservation of Nature and Natural Resources (IUCN) works towards assessing the global conservation status of plant and animal species. It maintains a comprehensive list shown as IUCN Red List of threatened species. The use of this Red list are –

(i) Developing awareness about the importance of threatened bio-diversity.
(ii) Identification and documentation of endangered species.
(iii) Providing a global index of the decline of bio-diversity.
(iv) Defining conservation priorities at the local level and guiding conservation action.

Also, *IUCN has recognized eight Red list categories of species*. They are :

1. Extinct
2. Extinct in the world
3. Critically Endangered
4. Endangered
5. Vulnerable
6. Lower risk
7. Data deficient
8. Not evaluated

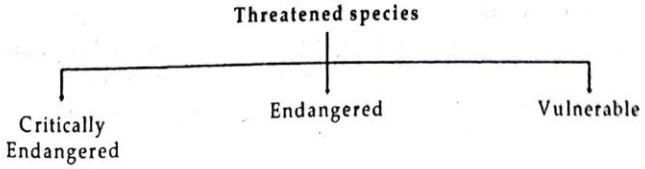
The 2000 Red List contains assessments of more than 18,000 species, 11,000 of which are threatened. According to the Red List, in India –

44 Plant species – Critically endangered
113 Plant species – Endangered
87 Plant species – Vulnerable
18 Animal species – Critically endangered
54 Animal species – Endangered
143 Animal species – Vulnerable

Let us now learn about some extinct, threatened and endangered species.

What are extinct, threatened and endangered species.

1. **Extinct Species :** You must have heard about dinosaurs. *Have you ever thought what happened to the dinosaurs that once existed on the Earth*? Yes, dinosaurs died and gradually disappeared from Earth. Many species die and disappear from earth if they are not able to reproduce and adapt to climate changes or when they are unable to compete with other organisms. Such species that no longer exist on Earth are called *extinct species*. Dodo, passenger pigeon etc are some examples of extinct species.
   (a) *Dinosaur* got extinct due to natural reasons.
   (b) *Dodo* became extinct mainly due to people hunting it for food.
2. **Threatened Species :** Threatened species are any species of wild life that are likely to disappear from the world sooner or later. In the Red list, all species listed under the categories critically endangered, vulnerable and endangered are together described as threatened species.

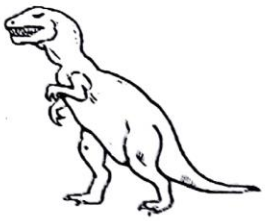


do you know?

In red data book, 'red' stands for "danger".

IMPORTANT TERM

Species is a group of population that are able to reproduce offsprings only with members of a species that share common characteristics. For example, Homo sapiens or human beings form.



(a) Dinosaur

(b) The Dodo bird

Fig. 1.1

Endangered species are those species that are on verge of becoming extinct. For example, blue whale, tiger, leopard etc are examples of endangered species. *Vulnerable species* on the other hand, are those species that already exists in low number and are likely to move into endangered category in the near future, if causal factors such as habitat destruction, over-exploitation and other environmental disturbances, continues over a period of time. Musk deer, Sambhar deer, black buck etc are examples of vulnerable species.

3. **Rare species :** Rare species includes those species whose population in the world is very small. So if they are not protected then they might fall into the category of vulnerable or endangered species. For example, Indian Elephant, Wild buffalo, Bengal fox, Gaur etc are rare species.

Do only big animals face extinction?

No, small animals are much more in danger of becoming extinct than bigger animals. Some times, we kill many small animals like snakes, frogs, lizards, owls etc without realising their importance in the ecosystem. They form part of food chains and food webs. So if small animals like snakes are killed, then grasshopper population will increase in nature to such an extent that they will damage the entire plant species. Thus, killing of snakes disturbs the food chains and food webs of which they form a part. This ultimately harm us. Hence, they seem to be small in size but actually they play an important role in the ecosystem that can not be ignored by any one.

How do we know that particular species is threatened or endangered?

Environmentalists do periodic surveys, record data and then analyses the populations of different species living all over the world to find a rough estimate of threatened species. Several systems of animals tracking have been developed. Sometimes environmentalists uses a small computer chips that is attached to the animal's body, to monitor the activities and where about of these animals through the computer. After analysing they evaluate the population of species. If they find their numbers below a certain level or a habitat shrinks to a certain size then species recovery programmes are put in place to get such species back into their stable numbers.

do you know?

The black rhino has been reduced down to about 2,550 due to poaching. Most of the ones that survive today live in protected areas.

PROJECT TIGER

You must be aware of fact that population of tiger is declining day by day or we can say that they have become an endangered species that are on verge of extinction and or will become extinct sooner or later. Due to this rapid decline in populations of tigers across the world, the government has started certain conservation programmes that aimed at saving tigers. For example, Project tiger. The project tiger was launched on 1st April, 1973 by our government to protect the tigers of our country. Its objective was to ensure the maintenance of a viable population of our country.

Strategy followed in project tiger

(i) Sites were identified as tiger reserves in a variety of regions all over India. About nine such reserves were identified, such as Manas (Assam), Corbett (UP), Kanha (MP), Bandipur (Karnataka), Ranthambhore (Rajasthan), Sunderbans (West Bengal) etc.

(ii) Tigers were protected in these areas with a philosophy of 'Do nothing' to interfere with nature.

Then several plans were made such as –

(i) All forms of human exploitation is removed from core areas.

(ii) To restore the natural ecosystem of these reserves, human beings were restricted from the sites. The government decided to shift villages that came under the reserves to different areas.

(iii) The flora and fauna of these areas were monitored and were researched if they show any change.

Achievement – You will be surprised to know that due to this programme, tiger population in Satpura tiger Reserve showed a significant increase.

4. **Endemic species :** Endemic species are those species of plants and animals that are found exclusively in that area. For example, Bison and Indian giant squirrel are endemic flora of Pachmarhi Biosphere reserve whereas sal and wild mango are endemic fauna of this area.

The Great Indian Bustard is endemic to India. However it has been classified as endangered species that are on verge of extinction.

Let us discuss some of the factors that are responsible for extinction of animals.

Many factors contribute to extinction of wild life.

1. **Poaching :-** Illegal hunting of animals is called *poaching*. The organized poaching by anti-social elements threatens the extinction of species. Some people hunt and kill animals, sometimes for fur and sometimes to earn money by selling the body parts of the killed animals. For example, elephants are killed for ivory, rhinoceros for horns and snakes for their skins.
2. **Habitat loss :-** This is the most serious threat to wildlife. Habitats have been destroyed due to developmental works, deforestation and pollution. As a results the animals are forced to go to other places in search of food and shelter. Sometimes the animal, could get by other animals in this process.
3. **Introduction of new species :-** International or chance introduction of exotic species into new islands or countries by man adversely affects the native species. For example, Rabbits and goats introduced in pacific and Indian ocean islands are destroying the habitats of many native plants, reptiles and birds.
4. **Increase in human population** and use of land for agricultural and urban development has led to a large scale destruction of forests and river flood plains.
5. **Climatic changes,** example, global warming due to natural and man-made reasons have also forced species to adapt to the changing environment. Those species that are not able to adapt the changing environment sooner or later die.

Can you find out some other wild life projects in India ?

1. **Lion project** in Gir forest of Gujrat was started in 1972.
2. **Project Hanghul** at Dachigam Sanctuary, Jammu and Kashmir was started in 1970.
3. **Snow leopard project** at 12 reserves throughout the Himalayas was started.

do you know?

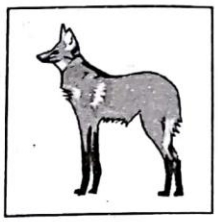
Giant panda and the island fox are two examples of species whose existence on Earth has been threatened due to destruction of their habitat.

CHECK Point

1. **When do animals become extinct ?**

GIANT PANDA: Less than 1,000 remaining

YELLOW-EYED PENGUIN: About 3,000 left in the wind



RED WOLF: Only 200 exist in capacity, none in the wild

CHECK YOUR ANSWERS

1. According to the theory of evolution, some animal species become extinct because they are less successful than other species that gradually replace them. These so-called "failed" animals are also unable to adapt the changing circumstances. Also, humans have speeded up this extinction by changing the environment so rapidly that animals do not have the time to adapt.
   Hunting is another main reason for the reduced numbers and probably extinction of animals such as tiger, the blue whale and the giant panda.

do you know?

- Many fishes migrate in both fresh water and the ocean.
- Tuna make some of the longest migrations. The need to migrate due to sea temperature, as fish need the correct temperature in order to breed.

MIGRATION :

You must have heard of the Siberian crane that are actually endemic to Siberia. Do you know, they travel large distances and come to India in groups during winter. *Have you ever wondered why do they travel large distances and come to India*? Actually, they travel long distances and come to India to escape the cold, unfavourable conditions of Siberia. This process of movement of animals in large numbers from one place to another to overcome unfavourble conditions is called *migration*. Migration is caused by the need to find food, by climatic changes during the year, and by the need to breed. Every autumn, for example, Swallows gather in large flocks to rest before they begin their long migration to Africa. Swallows, and their relatives, swifts and martins, all migrate to Africa when the weather becomes too cold for them to catch their insect prey. They return in the spring when the weather in northern Europe begins to warm up.

The Arctic tern makes the longest known migration of any bird, by travelling from the Arctic to the Antarctic and then back again. On it flight it passes through Japan, Alaska, Canada and Fiji before returning home again to breed.

Advantages of migration:-

(i) It provides the migrating species with more favourable conditions of temperature, food and water. For example, Siberian crane migrates to India during winters.

(ii) It also provides suitable place for reproduction that may not be available in their native place. For example, salmon migrates from salt water to freshwater to lay eggs and then comes back. Hence, we can say organisms migrate from one place to another to avoid inhabitable climatic conditions or for breeding.

CHECK Point

1. **Migratory birds are susceptible to become endangered. Can you give the reason, why ?**

CHECK YOUR ANSWERS

1. Migratory birds are susceptible to become endangered because many of the places they used to migrate have been altered by human actions. As a result, these animals don't have any place to go when weather condition become harsh or food in their habitat becomes scarce.

RECYCLING OF PAPER

Trees, as we know, are important to maintain the balance of nature. Therefore, in order to save tree and to prevent the impact of their loss, we need to use paper intelligently.

Methods to save paper :

(1) **Recycling of paper :** *Recycling* is the process of collecting wastes and to regain materials in order to use them again. By recycling of paper, not only we can save trees but also can save energy and water needed for manufacturing paper. Hence collect used paper and recycle it.

(2) Use both the sides of paper for writing.

(3) Use paper intelligently.

(4) Spread awareness among people regarding the importance of paper.

do you know?

It takes seventeen full grown trees to make one ton of paper.

REFORESTATION / AFFORESTATION :

Reforestation is the process of planting more trees. It is a positive step towards restoration of forests and wild life. However, it is a slow process, since, the new sapling would take many years to grow big.

The *forest conservation Act* in India aims at reservation and conservation of natural forests. But, inspite of such laws, poachers do cut trees for timber and other commercial purposes.

Can you list, some of the advantages of replenishing forests.

Advantages of replenishing forests are-

(i) Tress help in preventing soil erosion by keeping the top soil intact.

(ii) They are the natural habitat of animals. Trees help in conserving and preserving plants and animals.

(iii) Trees help in lowering atmospheric temperature and also in purification of air.

(iv) Trees transpire large amount of water that helps in formation of cloud.

Do you know, there are certain, non-Government organization that also play a major role in conservation of environment with the government. You must have heard about Chipko Andolan movement. What was it for?

do you know?

If the deforested area is left undisturbed, it re-establishes itself. This is known as natural reforestation. There is no role of human being in it.

do you know?

World Wide Fund for Nature (WWF) : It is an organisation founded by 1961 by Sir Peter Scott. It aims at conservation of nature. It also plays a large role in raising funds towards projects concerned with saving wildlife in various parts of the globe.

CHIPKO ANDALON : Chipko Andolan was started in 1973 in Gopeswar town in Chamoli district in Uttar Pradesh. In this andolan, the villagers of Chamoli stopped the contractors from cutting off the trees by hugging them. It is interesting to note that in the Chipko movement, the women of the village were in the forefront and not the men. A public agitation was also started to prevent the construction of hydroelectric project in the silent valley region in Kerala. It is an example of people's awareness about the importance of forest.

VANAMAHOTSAVA PROGRAMME

The Vanamahotsava programme was started by the Government of India whose objective was at reviving lost forest cover. It is celebrated throughout the country in the first week of July every year. During this period, lakhs of sapling of different tree species are planted with active involvement of government agencies like the forest and horticulture department.

- *Conservation* is the wise use of natural resources with an aim to preserve living and non-living resources.
- *Biodiverssity* refers to variety of living organisms in a specific area.
- Plants and animals depend on each for survival.
- *Deforestation* is the process of cutting trees from an area for industrial, agricultural or other purposes.
- *Causes of deforestation* :
  - Man-made causes
  - Natural causes
- *Consequences of deforestation* :
  - Soil erosion
  - Loss of biodiversity
  - Floods and droughts
  - Climate change due to global warming
  - Disruption of water cycle
  - Desertification
- Under the wild life protection act, a larger number of sanctuaries, national park and biosphere reserve were established in different parts of the country.
- *Sanctuaries* are areas where animals are protected from any disturbance to them and their habitat.
- *National park* are areas reserved for wild life where they can freely use the habitats and natural resources.
- *Biosphere reserves* are large protected areas for conservation of wildlife, plant and animal resources and traditional life of the tribals living on the area.
- IUCN (International Union for Conservation of Nature and Natural resources) works towards assesing the global conservation status of plants and animals.
- *Red data book* is the source book which keeps a record of all the endangered plants and animals
- Plants and animals of a particular area are known as flora and fauna, respectively, of that area.
- *Endangered animals* are animals whose numbers are diminishing to a level that they might face extinction.
- *Endemic species* are those species of plants and animals that are found exclusively in a particular area.
- *Extinct animals* are animals that no longer exist in nature.
- *Project tiger* was launched on 1st April 1973 by government to protect the tigers of our country.
- *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 purposes 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.
- If a forest area is left undisturbed for a long time, it restablished itself.

exercise 1

FIB FILL IN THE BLANKS :

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

1. The diverse plant species found in a particular area is known as _____
2. In a wild life sanctuary, poaching of animals is _____
3. _____ results in depletion of wild life.
4. Animals whose numbers are rapidly falling are called _____ species.
5. Illegal hunting of animals for their valuable body parts is called _____
6. The natural surroundings of a plant or animal species is called _____
7. Group of population capable of interbreeding is called _____

T/F TRUE & FALSE :

DIRECTIONS : *Read the following statements and write your answer as true or false.*

1. Afforestation can cause desertification.
2. An average increase in Earth's temperature is known as global warming.
3. Tiger is an endangered species.
4. An animal that is widely distributed over the earth is said to be endemic.
5. Saving paper means saving trees.
6. Wildlife conservation and soil conservation are closely related.
7. Migratory birds fly to far away places every year during a particular time for a holiday.
8. The red data book show species that are at the risk of extinction.

MTF MATCH THE FOLLOWING :

DIRECTIONS : *Each question contains statements given in two columns which have to be matched. Statements in column I have to be matched with statements in column II.*

1. (a)

Column I	Column II
A. Biodiversity	(p) Conversion of fertile land into deserts
B. Desertification	(q) Movement of species
C. Deforestation	(r) Variety of living organisms in specific area.
D. Reforestation	(s) Clearing of forests
E. Biosphere Reserve	(t) Plantation of new trees.
F. Migration	(u) Large protected area meant for conservation of biodiversity

(b)

Column I	Column II
A. Biosphere Reserve	(p) Areas where animals are protected from any disturbance to them and their habitat.
B. National Parks	(q) Areas reserved for wild life where they can freely use the habitats and natural resources.
C. Wildlife Sanctuaries	(r) Large protected areas for conservation of wild life, plant and animal resources and traditional life of the tribals living in that area.

(c)

Column I	Column II
A. Arctic tern	(p) Extinct species
B. *Homo sapiens*	(q) Endemic to Assam
C. Dodo	(r) Threatened species
D. Giant Panda	(s) Forest Reserves
E. Pachmarhi Biosphere reserve	(t) A species
F. One-horned Rhino	(u) A migratory bird

VSAQ VERY SHORT ANSWER QUESTION :

DIRECTIONS : *Give answer in one word or one sentence.*

1. Define biodiversity.
2. If one wants to conserve an organism outside its habitat, where should it be kept?
3. Name one endemic animal of India.
4. Is migratory animals susceptible to become endangered?
5. Name two animals that have become endangered due to poaching.

6. When an animal is said to be an extinct.
7. What results in desertification, global warming and shortage of forest products?
8. Expand IUCN.
9. Give two examples of each flora and fauna of Pachmarhi biosphere reserve.
10. Why do birds migrate?
11. Who publishes the Red list of Threatened species?
12. Name three programmes that have gained recognition for conservation of nature.
13. What is conservation?
14. Which term refers to illegal hunting of animals?
15. What is the main aim of the IUCN Red list?
16. Name one international organization that aim at conservation of nature.
17. What does "Red" in Red Data book stands for?

SAQ SHORT ANSWER QUESTION :

DIRECTIONS : *Give answer in 2-3 sentences.*

1. Why is biodiversity under threat?
2. How forest reserves help in conserving biodiversity?
3. How do the following help in protecting wildlife –
   (a) Sanctuaries
   (b) Zoological park
4. Name few sanctuaries in India, along with animals they protect?
5. Write a short note on Project Tiger.
6. What is recycling of paper? How recycling of paper helps in saving trees.
7. How deforestation lead to reduced rainfall?
8. Why it is necessary to conserve Wild Life?
9. List four causes and consequences of deforestation.
10. What are the causes of extinction of Wild Life?
11. Define
    (1) Threatened species
    (2) Extinct species
    (3) Endemic species
    (4) Endangered species
12. How deforestation can lead to desertification?
13. How wild life conservation and forest conservation related to each other ?
14. List four ways in which forests are useful to us.
15. Why did IUCN prepare red data book?
16. How can governments ensure the preservation of biodiversity?
17. 

Do you agree with this? Give reason.
18. *Differentiate* –
    (i) Flora and Fauna
    (ii) Endangered and threatened species
    (iii) Endemic and extinct species
    (iv) Wildlife sanctuary and zoological park.

MCQ MULTIPLE CHOICE QUESTIONS :

DIRECTIONS : *This section contains* **14** *multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.*

1. The human activity that is responsible for loss of biodiversity is
   (a) Urbanization
   (b) Afforestation
   (c) Establishment of biosphere reserve respiration
   (d) Respiration
2. Species native to a particular habitat is known as
   (a) Endemic species (b) Endangered species
   (c) Threatened species (d) Extinct species
3. An example of extinct species is –
   (a) The Royal Bengal tiger
   (b) The Giant Panda
   (c) The African elephant
   (d) The Dinosaur
4. The Kaziranga wildlife sanctuary preserves
   (a) Elephant (b) Rhinoceros
   (c) Asiatic Lions (d) Royal Bengal Tiger

5. The endangered species are listed out in
   (a) Blue data book (b) Red date book
   (c) Yellow data book (d) Green data book
6. The diverse animal species found in their natural surroundings is called
   (a) Flora (b) Fauna
   (c) Endemic species (d) Endangered species
7. Which of these is not caused by deforestation?
   (a) Global warming
   (b) Desertification
   (c) Reduction in ground water
   (d) Storms
8. Which one of these is not included under Red list?
   (a) Extinct (b) Endemic
   (c) Endangered (d) Vulnerable
9. World wild fund for Nature Works in the field of
   (a) Wildlife conservation
   (b) Forest conservation
   (c) Water conservation
   (d) Soil conservation
10. The Indian Government launched "Project Tiger" in
    (a) 1970 (b) 1973
    (c) 1974 (d) 1975
11. The variety of forms of life found in a region is
    (a) Biodiversity (b) Flora
    (c) Fauna (d) Endemic
12. Decrease in population size over few years and decrease in the size of its habitat indicates that an organism is
    (a) Threatened (b) Vulnerable
    (c) Extinct (d) Endemic
13. An area made up of living components like plants, animals and micro organisms along with non-living component such as climate, soil etc is known as
    (a) Ecosystem (b) Population
    (c) Community (d) Organism
14. Which is not a consequence of deforestation?
    (a) Desertification (b) Global warming
    (c) Poaching (d) Floods

MTOC MORE THAN ONE CORRECT

DIRECTIONS : *This section contains* 8 *Multiple Choice Questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONE OR MORE may be correct.*

1. Which of the following factors affect the natural habitat of endemic species?
   (a) Destruction of their habitat
   (b) Increasing human population
   (c) Introduction of new species
   (d) Introduction of same species
2. Which of the following are examples of threatened and protected species?
   (a) Python (b) Gharial
   (c) Dinosaur (d) Dodo
3. Which of the following statements is correct about deforestation?
   (a) It increases the chances of soil erosion
   (b) It decreases the chances of soil erosion
   (c) It decreases the level of oxygen
   (d) It increases the level of carbon dioxide
4. The examples of fauna of the Pachmarhi Biosphere reserve is
   (a) Sal (b) Arjun
   (c) Chinkara (d) Cheetal
5. Which of the following organisms are protected in Rann of kutch sanctuary?
   (a) Wild ass (b) Flamingo
   (c) Desert fox (d) Asiatic Lion
6. Indian elephant is protected in
   (a) Bandipur sanctuary
   (b) Madumalai sanctuary
   (c) Dachigam sanctuary
   (d) Bharatpur sanctuary
7. Migratory birds are
   (a) Siberian Crane (b) Arctic tern
   (c) Pigeon (d) Parrot
8. Wildlife can be conserved by
   (a) Habitat preservation
   (b) Habitat preservation
   (c) Building wildlife sanctuaries
   (d) Poaching

A&R ASSERTION & REASON :

DIRECTIONS : *Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) If both **Assertion** and **Reason** are **correct** and Reason is the **correct explanation** of Assertion.
(b) If both **Assertion** and **Reason** are correct, but Reason is **not the correct explanation** of Assertion.
(c) If **Assertion** is **correct** but **Reason** is **incorrect**.
(d) If **Assertion** is **incorrect** but **Reason** is **correct**.

1. **Assertion** : Spotted dear and black buck belongs to category of vulnerable species.
   Reason : They are species whose number is declining and if not protected they can become endangered species.

2. **Assertion :** The Earth was once dominated by dinosaurs

   Reason : Dinosaurs got extinct due to natural resources.

3. **Assertion :** The great Indian Bustard has been threatened.

   Reason : It is due to introduction of new species in their habitat.

4. **Assertion :** IUCN publishes a comprehensive list known as IUCN Red list of endemic species.

   Reason : IUCN Red list is to focus the attention of conservationists towards species that are under threat of becoming extinct.

5. **Assertion :** Blue whales are mainly killed for oil and blubber.

   Reason : The blue whale is the largest mammal.

6. **Assertion :** Afforestation is a positive step towards restoration of forest and wildlife.

   Reason : Afforestation is a slow process

MM MULTIPLE MATCHING QUESTIONS :

DIRECTIONS : *Each question has some statements given in Column I and five statements (p, q, r, s and t) in Column II. Any given statement in Column I can have correct matching with one or more statement(s) given in Column II. Match the entries in column I with entries in column II.*

1.

Column I	Column II
A. Flora	p. Arctic tern
B. Fauna	q. Great Indian Bustard
C. Extinct species	r. Teak
D. Endemic species	s. Asiatic Lion
E. Migratory bird	t. Plantation of new trees.

2.

Column I	Column II
A. Kaziranga National Park	p. Neelgai
B. Corbett National Park	q. One horned Rhinoceros
C. Desert National Park	r. Great Indian bustard
D. Dachigam Sanctuary	s. Tiger
	t. Kashmir stag

HSQ HOTS SUBJECTIVE QUESTIONS :

DIRECTIONS : *Answer the following questions.*

1. 

   It this statements correct? Explain using example.

2. Introduction of an exotic species to a habitat has a negative impact on the diversity of that region. Comment.
3. How is diversity related to environmental health?
4. Captive breeding programmes help in maintaining biodiversity. How?
5. Why are migratory animals susceptible to face extinction?
6. Suppose an animal species 'X' not normally found in your area is released where you live. If that animal has no natural enemies there, what might happen?
7. Why Indian Rhinoceros and Asian elephants are placed in the Red List. Explain, giving example.
8. 

   Do you agree with the statement given. Give reason in support of your answer.

9. (a) A tiger from wildlife sanctuary was shifted in a Zoological garden. Where do you think the tiger will be happier.

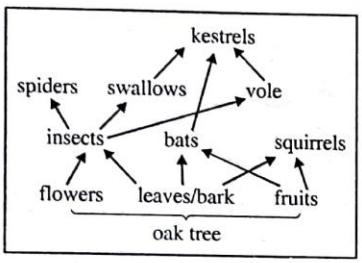
   (b) What is the difference between a Zoological garden and a wildlife sanctuary.

10. A construction company used to cut 10 trees every month and planted 10 new saplings every month as replacement. Do you think they are successful in maintaining the number of trees in a forest. Justify.
11. State the laws that your state has for the protection of endangered wildlife. Find out if there is a state endangered species list. Report your findings in your

PBQ PICTURE BASED QUESTIONS :

DIRECTIONS : *Study the given picture and answer the following questions.*

The diagram shows a food web.



Choose each of the following from the given food web.

(i) Primary consumers
(ii) Producers
(iii) Tertiary consumers

ABQ ACTIVITY BASED QUESTIONS :

DIRECTIONS : *Study the given activities and answer the following questions.*

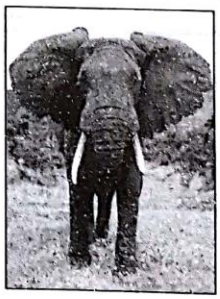
1. Find out five
   (a) National park
   (b) Wildlife sanctuary
   (c) Biosphere Reserve
   in our country, India and show their location on the outline map of India.
2. Find out various projects undertaken by government, which aim to conservation of Forests and Wildlife.
3. Name at least five endangered species. Give reasons why they have become endangered.
4. Identify the animals and name them. Also find out in which parts of India these animals are found.

(i) 

(ii) 

(iii) 

(iv) 

(v) 

(vi) 

SOLUTIONS

BRIEF EXPLANATIONS OF SELECTED QUESTIONS

EXERCISE 1

FIB FILL IN THE BLANKS :

1. Fauna
2. Prohibited
3. Deforestation
4. Endangered
5. Poaching
6. Habitat
7. Species.

T/F TRUE & FALSE :

1. False. Deforestation can cause desertification
2. True
3. True
4. False
5. True
6. True
7. False
8. True

MTF MATCH THE FOLLOWING :

1. (a) A. (r), B. (p), C. (s), D. (t), E. (u), F. (q)
   (b) A. (r), B. (p), C. (q)
   (c) A. (s), B. (t), C. (p), D. (r), E. (s), F. (q)

VSAQ VERY SHORT ANSWER QUESTION :

2. Zoological park
3. Great Indian Bustard
4. Yes
5. Rhinoceros and Tiger
6. When an organism, no longer exist in nature, it is said to extinct.
7. Deforestation
8. International Union for Conservation of Nature and Natural Resources.
9. Sal and teak are the flora and chinkara and leopard are examples of Fauna of Pachmarhi Biosphere Reserve.
10. Birds migrate from one place to another to beat unfavourble conditions and for breeding.
11. IUCN
12. Vanmahotsav Programme, the Chipko Andolan and Project Tiger.
13. Conservation refers to wise use of natural resources with an aim to preserve or protect living and non-living resources.
14. Poaching
16. WWF (World Wide Fund for Nature)
17. "Red" stands for "Danger".

SAQ SHORT ANSWER QUESTION :

1. *Causes of loss of biodiversity*
   (a) Increase in human population
   (b) Pollution of air, water and land
   (c) Climatic changes. Example, global warming
   (d) Poaching
   (e) Natural disasters such as earthquake, floods, droughts etc.
2. *Forest reserves aims at serving the following purposes :*
   (a) Prevention of deforestation.
   (b) Replenishment of lost forest by afforestation
   (c) Protection of food and shelter meant for wildlife.
6. One tonne of paper requires the chopping of 17 full grown trees. Therefore our huge need of paper would require more cutting down of trees. This in turn would lead to deforestation and disruption in the balance of nature. Hence, in order to save trees, we should minimize the wastage of paper or we should use recycled paper.
9. *Causes of deforestation :-*
   (i) Procurement of land for crop production.
   (ii) Procurement of land for urban settlement
   (iii) Use of wood for timber and fuel.
   (iv) Natural calamities such as forest fires and droughts
   Consequences of deforestation
   (i) Loss of biodiversity
   (ii) Soil erosion
   (iii) Change in climatic conditions
   (iv) Flood and droughts
10. *Causes of extinction of wildlife –*
    (i) Habitat loss
    (ii) Poaching
    (iii) Introduction of new species
    (iv) Natural calamities
    (v) Lack of strict wildlife laws.

12. Deforestation causes soil erosion or removal of fertile top layer of the soil. This leaves the soil devoid of humus and makes it infertile, gradually converting it to a desert.
15. IUCN publishes Red Data Book that lists rare species and those in danger of extinction.
17. No, protected forests are not completely safe for wild animals. It is because people who live nearby use the resources from those forest for their own benefits. This activities in turn disrupts the life system and also endangers the animals living there.

2

MCQ MULTIPLE CHOICE QUESTIONS :

1. (a) Urban development has led to a large scale destruction of forest and loss of biodiversity.

2.	(a)	3.	(d)	4.	(b)	5.	(b)
6.	(b)	7.	(d)	8.	(b)	9.	(a)
10.	(b)	11.	(a)	12.	(a)	13.	(a)
14.	(c)						

MTOC MORE THAN ONE CORRECT

1.	(a), (b), (c)	2.	(a), (b)
3.	(a), (c), (d)	4.	(a), (b)
5.	(a), (b), (c)	6.	(a), (b)
7.	(a), (b)	8.	(a), (b), (c)

A&R ASSERTION & REASON :

1. (a)
2. (a)
3. (c) **Statement-1** is true while **statement-2** is false.
4. (d) **Statement-1** is false while **statement-2** is true.
5. (b)
6. (b)

MM MULTIPLE MATCHING QUESTIONS :

1. (A) → r; (B) → p, q, s, t; (C) → t; (D) → q, s; (E) → p
2. (A) → q; (B) → s; (C) → p, r; (D) → t

HSQ HOTS SUBJECTIVE QUESTIONS :

4. Endangered plants and animals can be conserved outside their natural habitats through captive breeding programmes. For example : Animals can be taken care of in zoos, plants in botanical garden and fishes and aquatic animals in large aquaria. When the numbers of species increases sufficiently outside their natural habitat, they are then reintroduced into the wild. This helps in maintaining biodiversity.
5. Migratory animals face extinction because the places they used to migrate have been altered by human actions. As a result, these animals have no place to go anywhere (when weather conditions becomes harsh or food in their habitat become scarce).
6. The population of species 'X' will increase.
7. The Indian rhinoceros are poached mainly for their horns that are believed to have medicinal value.

   Asian elephants are threatened mainly because of habitat destruction.
8. No, I don't agree. Though it is not justified to cut trees to meet ever increasing demands of human population, but one can look for alternate ways to conserve forest or to fulfill human needs. We can plant more and more trees and encourage people to plant trees by informing them about importance of trees.
9. (a) Tiger will be happier in its natural habitat.

   (b)

Zoological Garden	Wildlife Sanctuary
1. It is a facility in which animals are kept for public exhibition	It is an area within which animals are protected from possible dangers such as hunting.
2. It is an artificial habitat.	It conserves the natural habitat of animals.

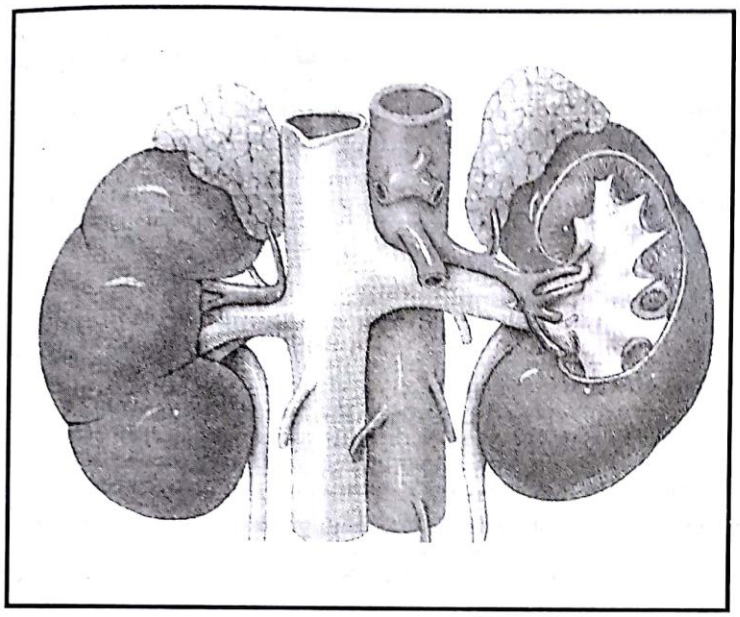
10. There is no doubt that afforestation is a positive step towards restoration of forests and wildlife. But it is a slow process as new plant would take several years to grow big.

PBQ PICTURE BASED QUESTIONS :

(i) Insects, Bats, Squirrels
(ii) Flowers, Leaves, Fruits
(iii) Spiders, Swallows, Vole

ABQ ACTIVITY BASED QUESTIONS :

4. (i) Siberian crane (Rajasthan, Bharatpur bird sanctuary)
   (ii) Asiatic Lion (Gujarat, Gir sanctuary)
   (iii) Neelgai (Gujarat, Cir sanctuary)
   (iv) One horned Rhinoceros (Assam, Kaziranga National Park)
   (v) Great Indian Bustard (Thar, Desert National Park)
   (v) Tiger (Uttar Khand, Corbett National Park)
   (vii) Elephant (Karnataka, Bandipur sanctuary)



chapter

4

Life Processes

Things which have life are called living things. All the plants and animals are the example of living things. We can see various example of living things in our surroundings, like the birds flying in the sky, horse grazing in field, a small plant that grows to a big tree, a small baby that grows to an adult, cows giving birth to calves etc.

Generally, as we know that an individual —referring to human life, animal life or plant life —needs food and air (oxygen) for the sustenance. True it is, but there is something beyond it. Requirement of sustenance also includes transportation of food within the body (or across different cells), as well as flushing of wastes out of the body. Just eating without digestion and transportation makes no sense. And, digestion/ transportation of food without excretion seems to be a dangerous proposition.

So, various life processes keeps on occurring inside the body of all living organisms and all these processes are very necessary for all the organisms. These maintenance functions keep on going even when we are not doing any particular work i.e. at rest time. The processes which together perform these maintenance job are called ' life processes'.

Various functions of life processes are :-

(i) Nutrition (ii) Respiration (iii) Transportation (iv) Excretion

Let us discuss various processes, that are essential to maintain life.

do you know?

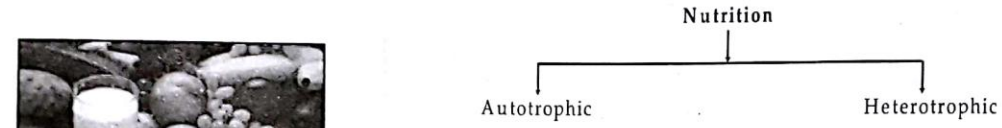
An adult man of average weight and doing moderate work needs about 500 gms of carbohydrate

NUTRITION

Nutrition refers to all activities included in obtaining food and its utilization in the body. As we all know, all living organisms need food that provides energy for various activities of the body. Carbohydrates, proteins and fats are vital for energy or growth. They are called *nutrients*. Vitamins minerals and water are accessory food, that helps human body to work properly.

Different organism take food through different modes. *Based on the mode of getting food, organisms can be classified as follows :-*

Fig. 4.1



Nutrition in Plants (Autotrophs)

Plants are autotrophs. They prepare their own food by photosynthesis. *Photosynthesis* is the process by which plants can manufacture their own food. Leaves are the "food factories of plants". They can make food because they contain chlorophyll. Most leaves are green in colour.

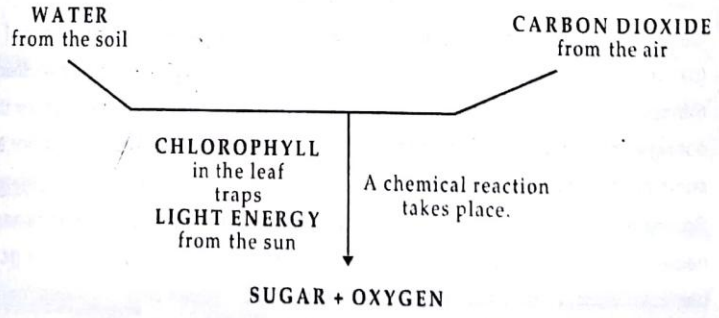
How do leaves make food? Leaves make food by a process called photosynthesis. It takes place only when water, carbon dioxide, sunlight and chlorophyll are present. Water comes from the soil. It is absorbed by the roots. It travels up the fine tubes in the roots and the stem and the veins of the leaves. Carbon dioxide comes from the air which enters the leaves through the breathing pores. Chlorophyll is the green pigment found naturally in plants. It is most abundant in the leaves. Sunlight comes from the sun.

When there are chlorophyll, water and carbon dioxide present in a leaf, a special chemical reaction takes place in the presence of sunlight. Water combines with carbon dioxide to form sugar and oxygen. The sugar is used by the plant as food. The oxygen passes out of the leaf through the breathing pores. Sunlight provides the energy of the chemical reaction.

This happens during photosynthesis :

Carbon dioxide + Water + Light energy ⟶ Sugar + Oxygen

Photosynthesis is the process by which green leaves in sunlight combine carbon dioxide and water to form sugar and oxygen.



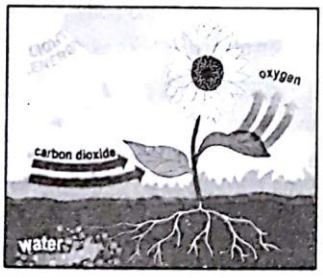


Fig. 4.2 : *Plant Photosynthesis*

CHECK Point

1. **Why is photosynthesis so important?**

CHECK YOUR ANSWER

1. Photosynthesis is very important *firstly* because it makes food. All animals, whether they are plant-eaters or animal-eaters, ultimately depend on plants for food. There will be no food for the animals if there are no plants or no photosynthesis.
   Secondly, photosynthesis keeps the air fresh by removing carbon dioxide and replacing it with oxygen. This ensures that there is always enough oxygen in the air for plants and animals to breathe. Plants and animals will suffocate and die if the air does not have enough oxygen.

A small number of plants do not photosynthesize, they feed on living things.

1. **Parasites :-** A small number of plants are parasites. This means that they do not make their own food, but live and feed on other living things, called hosts. The dodder plant, for example, attaches itself firmly to its host, plant by sinking thread like structures called haustoria into it. Dodder stems then grow rapidly all over the host, which becomes completely covered and eventually dies.
2. **Saprotrophs :-** Some organisms feed on dead matter instead of living on a host or making their own food. They are known as saprotophic plants or saprotrophs. Fungi and some orchids are saprotrophs.
3. **Meat eaters or Insectivorous plants :-** Some plants can kill and digest small creatures, such as insects. They are called carnivorous plants. They attract their victims into deadly traps using colour or particular smell. Once inside, the insect is dissolved by powerful chemicals called enzymes.
   Such plants grow in soil which contains few minerals. They absorb what they need from the bodies of their prey by digesting them. For example, pitcher plants catch animals in their jug like leaves called pitchers.

KNOWLEDGE ENHANCER

Autotrophs are divided into two types :

(i) **Photoautotrophs :** The autotrophs which do photosynthesis in the presence of sunlight, are called photoautotrophs. *Examples* include green plant, algae and some bacteria.

(ii) **Chemoautotrophs :** The autotrophs which do photosynthesis without sunlight, are called chemoautotrophs. *Examples* include certain bacteria found in deep sea.

do you know

Some bacteria found in ocean depth do photosynthesis with out sunlight

Try yourself

A simple test to show that sunlight is needed for photosynthesis.

Take a houseplant with broad, lightgreen leaves and fold a piece of paper around one leaf. Secure it with a paper clip. Leave the plant in a sunny place for a few days, then remove the paper. The leaf will have a yellow strip, where it has been unable to photosynthesize.

Fig. 4.3 : *A parasite : Cuscuta*

Fig. 4.4 : *Pitcher plant*

CHECK Point

1. **What is the difference between autotrophs and heterotrophs.**

CHECK YOUR ANSWER

1. **Autotrophs :** 1. They can make their own food from raw materials in presence of sunlight.
   2. They take in simple inorganic substances and change it into complex organic food. e.g., all green plants.
   Heterotrophs : 1. They cannot make their own food.
   2. They take in compled food and break it into simple food e.g., all animals and fungi and non-green plants.

Nutrition in Animals (Heterotophs)

Animals can not make their own food. They depend on the food synthesized by plants. The food intake by animals is *holozoic*. Organisms which depend on other organisms for their food are called *heterotrophs*. Their mode of intake of food is called *heterotrophic nutrition*.

Digestive System in Humans

Human body needs food which contain many substances, that is used to help the body grow and repair itself. It also provides energy to move about. Water is needed to continually replenish the supply of water in the blood stream. Taking in food and breaking it into tiny pieces, small enough to absorb into the body, is known as *digestion*. The human digestive system includes :-

Mouth, Teeth, Tongue, Oesophagus, Stomach, Small Intestine, Large Intestine, Liver, Pancreas

Let us now discuss the process of digestion. As food passes through your body, it is broken down into pieces small enough to be dissolved in our blood. This process, called **digestion**, takes place in the **digestive tract** or **alimentary canal**. Alimentary canal is a tube that run from your mouth to a hole in your bottom called the **anus**. Food is broken down physically by chewing and churning, and chemical by the action of **digestive juices**, made by organs called **glands**.

Stages of digestion :-

1. Food is chewed in the mouth and mixed with a digestive juice called *saliva*, which is made in your *salivary glands*. Saliva moistens the food so it slides down your throat easily. It also starts to break down starch in the food into a sugar called *maltose*.
2. Our throat muscles guide the food through the *pharynx* into a passage called the *gullet* or *oesophagus*. As you swallow, a flap called the *epiglottis* blocks off the top of your *windpipe* or *trachea*, so the food does not go down the wrong way.
3. Food travels down the gullet into your stomach. Muscles in the wall of the gullet contract to push the food along. This action, called *peristalsis*, takes place all along your digestive tract.
4. In the *stomach*, food is churned up with *gastric juices*. These start to digest protein and they also contain hydrochloric acid which kills germs in the food. Your stomach lining has folds called *rugae*, which flatten as it fills.
5. The food moves into a tube called the *small intestine*. This has three sections: the *duodenum*, the *jejunum* and the *ileum*. In the duodenum, digestive juices made by the liver and pancreas break down fats, protein and starch.

do you know?

In adult the whole digestive tract is about 9m long.

The longest part of the digestive system, is the small intestine, measuring 6m.

The large intestine is 1.5 m long.

6. The small intestine, especially the *ileum*, is lined with tiny, finger-like projections called *villi* which increase it surface area. Each villus contains minute blood vessels, which absorb the digested food, and carry it to the liver for further processing before it is carried around the body.

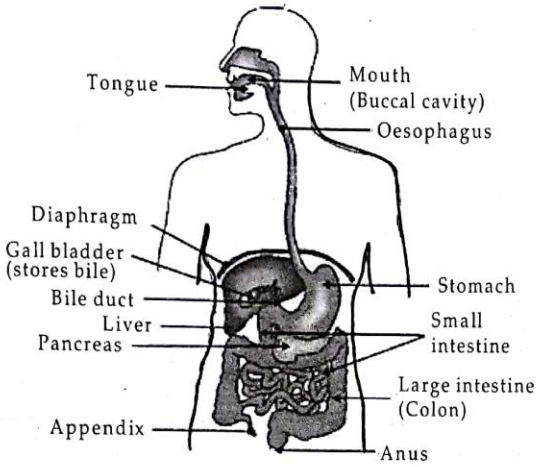


Fig. 4.5 : *Human alimentary canal*

Digestive Glands

Digestive glands make fluids needed for digestion. Many digestive juices contain chemicals called *digestive enzymes*, which help to break down your food. Some digestive glands are tiny, and set into the walls of digestive organs. For example, the wall of your stomach contains *gastric glands*. Other glands, such as your salivary glands, are separate organs.

The largest digestive glands are the liver and pancreas. Your liver makes a green liquid called *bile*. This acts like a detergent, breaking up fats into tiny drops so that enzymes can work on them. Bile is stored in a sac called the *gall bladder*. Pancreas makes *pancreatic juice*. This contains enzymes which break down fats, protein and starch. Your liver and pancreas also have other important jobs to do, for example controlling the amount of glucose in our blood.

Timeline of digestion

0 hour – Food is chewed and swallowed.

1 hour – Food is churned with acids and juices in the stomach.

2 hours – Partially-digested food begins to flow into the small intestine for further digestion and absorption.

4 hours – Most food has left the stomach and passed to the small intestine.

6 hours – Leftover and undigested foods pass into the large intestine, which takes the water and returns it to the body.

10 hours – The leftovers begin to collect in the last part of the system, the rectum, as faeces.

16-24 hours – The faeces pass through the last part of the system, the anus, and out of the body.

Digestive Enzymnes : Sources, Effects

Part/Organ	Source	Enzymes
Mouth	Salivary glands	Amylase
Stomach	Gastric glands	Pepsin
Pancreas	Pancreatic juice	Trypsin
		Carboxy peptidase
		Amylase
		Lipase
		Amino peptise,
		Maltase

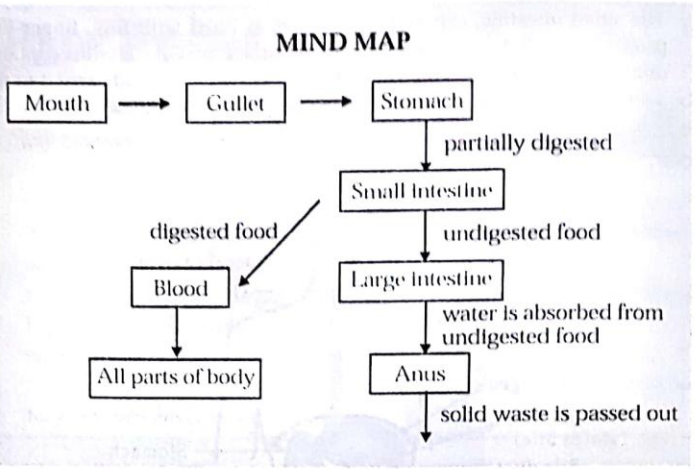
Fig. 4.6 : *Lichen*

Try yourself

Put a piece of bread in your mouth and notice the taste as you start to chew it.

After a minute of chewing, you will find that bread starts to taste sweeter. This happens as your saliva begins to turn starch into sugar.

MIND MAP



Digestive system carries following functions

(i) Intake of food (ii) Digestion of food
(iii) Assimilation of food (iv) Expulsion of waste products.

(II) RESPIRATION

Respiration involves exchange of gases, i.e. breathing and also oxidation of food to release energy. The oxygen taken in during breathing oxidises the food to release energy. Carbon dioxide is released during this process and is given out. The process of taking in oxygen (inhalation) and giving out carbon dioxide (exhalation) is called respiration. It is the most vital process that never stops in organisms.

Respiration in plants : Respiration or exchange of gases among plants takes place through the pores called stomata. *Stomata* found in leaves and stems of plants which allows oxygen and carbon dioxide and water vapour to come in or come out of plants. The stomata pores are enclosed by two guard cells which are surrounded by several subsidiary cells. Generally, more number of stomata are present on the lower surface of leaf.

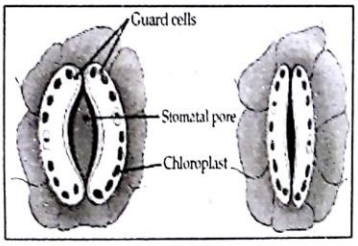


Fig. 4.7 : *Stomata*

Respiration in animals : Some unicellular animals such as *Amoeba* and *Hydra* take oxygen and give out carbon dioxide through cell membrane. Insects such as cockroach, mosquito takes oxygen through the air holes (spiracle) present on the side of the body. Fishes respires through gills. The tadpoles takes oxygen through gills but when they changes to adult frog, gills are replaced by lungs.

Higher organisms like tigers, birds, rats, snakes, human have lungs as their respiratory system.

Respiratory system in humans :-

The *respiratory system* is made up of *lungs* and the passages that lead to them. Humans breathe air into lungs, and oxygen from the air passes into the blood, which carries it around whole body. Waste, carbon dioxide passes from the blood into the lungs and is breathed out.

Parts of the Respiratory system

When you breathe in air, it is sucked through your nose or mouth and down a tube called the *windpipe* or *trachea*. The lining of your nose and trachea make a slippery liquid called *mucus*. This warms and moistens the air, so it can travel more easily along the passages. It also traps dirt and germs in the air. Tiny hairs called *cilia* waft the mucus away from your lungs towards your nose and throat. Your trachea divides into two tubes, each called a *primary bronchus*, one leads to

each lung. There the bronchi branch off, to become *secondary* and *tertiary bronchi*, and eventually form narrow tubes called *bronchioles*.
Each bronchiole ends in a cluster of air sacs called *alveoli*. These are surrounded by capillaries.
Oxygen passes through the thin walls of the alveoli into the network of capillaries. Carbon dioxide in the blood, produced by cells during internal respiration, passes into the alveoli. It is removed from your body when you breathe out.

Aerobic respiration : It occurs in the presence of molecular oxygen. During the process, the oxygen completely oxidises the food to CO_2 and water, releasing large amount of Energy.

$$\underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6O_2} \longrightarrow \underset{\text{Carbon dioxide}}{6CO_2} + \underset{\text{Water}}{6H_2O} + \text{Energy}$$

Anaerobic respiration : It occurs in the absence of molecular oxygen. During this process, food is partially oxidised so that only a part of energy is released and rest remains trapped in intermediate form.

$$\underset{\text{Glucose}}{C_6H_{12}O_6} \xrightarrow{\text{In yeast}} \underset{\text{Ethanol}}{2C_2H_5OH} + 2CO_2 + \text{Energy}$$

$$\underset{\text{Glucose}}{C_6H_{12}O_6} \xrightarrow{\text{In muscle cells}} \text{Lactic acid} + \text{Energy}$$

CHECK Point

1. **Why do we sneeze?**

CHECK YOUR ANSWER

1. We sneeze to expel foreign particles from our nose. When pollens, dust or smoke enter our nose, they cause irritation. Sneezing involves a sudden and violent expiration of air through the nose and mouth. When the never endings in the nose lining detect any irritating substances, it controls involuntary actions. The brain then sends signals to the respiratory organs, like lungs and pharynx, to squeeze and then expel a gust of air with a loud blast.

do you know?

Sea anemone has the simplest type of respiratory surface and diffusion starts across a thin layer.

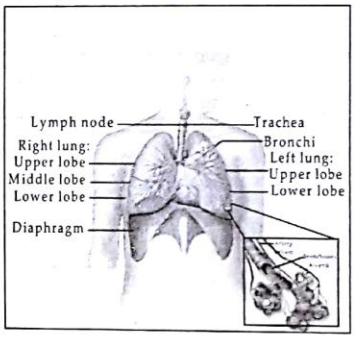


Fig. 4.8 : *Respiration*

do you know?

A sneeze usually starts with release of chemicals, such as histamine, by inflmmatory cells in nose, signalling that there is urgent need to expel something out of the nose.

KNOWLEDGE ENHANCER

ATP

ATP is the energy currency for most cellular processes. The energy released during the process of respiration is used to make an ATP molecule from ADP and inorganic phosphate.

$$ADP + (P) \xrightarrow{Energy} ADP \sim (P) = ATP$$

(P) : Phosphate

Endothermic processes in the cell then use this ATP to drive the reactions. When the terminal phosphate linkage in ATP is broken using water, the energy equivalent to 30.5 kJ/mol is released.

Think of how a battery can provide energy for many different kinds of uses. It can be used to obtain mechanical energy, light energy, electrical energy and so on. Similarly, ATP can be used in the cells for the contraction of muscles, protein synthesis, conduction of nervous impulses and many other activities.

(III) TRANSPORTATION

By now, we have learnt that every cell needs a regular supply of nutrients and oxygen to provide energy. The food that we eat is broken down into smaller components to be absorbed by the cells. The oxygen that we inhale is also absorbed by all the cells of the body. Our body also requires a constant removal of wastes materials such as carbon dioxide. *Have you ever thought how these nutrients and oxygen is transported in our body?.OR How the oxygen is transported to all the body cells?* The oxygen is transported through blood and the blood is pumped to different parts of our body through an organ called heart. For the supply of useful materials and removal of wastes from the body cells, human body consists of a transport system called circulatory system. It is the transportation system of our body. *Transportation* is the movement of substances, especially oxygen, water, food molecules, carbon dioxide and waste products into or out of cell.

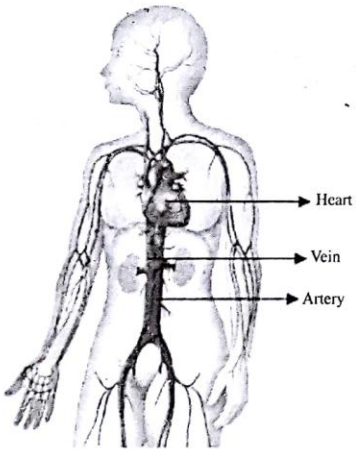


Fig. 4.9 : *Circulatory system*

Circulatory System

The human circulatory system is composed of three major parts.

- *Heart:* A pumping organ to transport blood
- *Blood vessels:* Arteries, Veins, Capillaries
- *Blood:* Red blood cells (RBCs), White blood cells (WBCs), Platelets

(i) BLOOD

What happens when your finger is pricked with a needle? A red colour fluid, called blood flows out. The main function of blood is to transport – oxygen and nutrients to various parts of the body.

The blood consists of liquid or fluid called *plasma* with red blood cells, white blood cells and platelets floating in it. *Plasma* is the colourless fluid of the blood. It helps in the transport of food, CO_2, wastes and salts.

1. *Red blood cells (RBCs):* Red blood cells are the most abundant cells in the blood. These cells contain a red pigment called *haemoglobin*. It is the haemoglobin which carries oxygen and transports it to all parts of the body.
2. *White blood cells (WBCs):* WBCs are colourless cells without haemoglobin.

do you know?

There is no substitute for human blood. It is known as river of life. A new born baby has about one cup of blood in his body.

They are the largest cell of the blood. They fight against infections and protect the body from foreign particles. The foreign particles include germs and bacteria. Basically, WBCs are like soldiers that protect the body from various infections.

3. *Platelets:* Platelets are small irregular bodies present in the blood. They contain essential chemicals that help in clotting. The main function of platelets is to prevent bleeding.

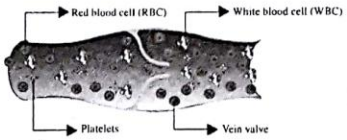
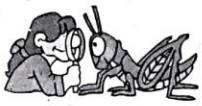


Fig. 4.10 : *Blood Vessel*

CHECK Point

1. **When you get injured, blood comes out from the site of injury. But within few minutes, the blood stops and a dark red colour clot appears. How red colour clot is formed?**



CHECK YOUR ANSWER

1. The clot is formed because of platelets. Platelets release blood clotting chemicals at the site of injury. These chemical form a clot and prevent further bleeding.

do you know?

Our blood vessels (arteries, veins and capillaries) are over 60000 miles long which is long enough to go around the world more than twice!

(ii) BLOOD VESSELS

Blood vessels are hollow tubes that carry blood to all parts of the body. They are located throughout the human body.

There are three types of blood vessels: Arteries, Veins, and Capillaries

1. **Arteries:** Arteries are tough, elastic tubes that carry blood from the heart to various organs of the body. They generally carry O_2 rich blood except for *pulmonary artery*. Pulmonary artery is the only artery that carries CO_2 rich blood from heart to lungs.

Gently place your middle and index finger of right hand on the inner side of your left wrist.

Observation: You will feel something beating strongly or violently. This is called your *pulse*.

Conclusion: Pulse arises due to rhythmic contraction and expansion of the arteries with each beat of the heart. The number of beats per minute is called the pulse rate.

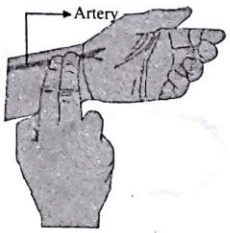


Fig. 4.11 : *Pulse in wrist*

2. **Veins:** Veins are thin walled, non elastic blood vessels. They transport blood towards the heart from the various organs. Veins carry CO_2 rich blood except for *pulmonary vein*. Pulmonary vein carries oxygen rich blood from the lungs to the heart. Though veins are thin-walled but they possess valves. The valves are present to prevent the backflow of waste materials to the tissues.
3. **Capillaries:** As the arteries move away from the heart to the various organs and tissues, they divide into smaller vessels called capillaries. The wall of the capillaries is very thin. They form networks which reach every living cell of the body. These capillaries then join to form veins which carry blood to the heart.

do you know?

You can check your pulse rate where an artery comes close to the skin such as your wrist, neck, temple area behind the knee or top of your foot.

IDEA BOX

Count the number of beats of your pulse in 30 seconds by placing your middle and index finger of right hand on the inner side of your left wrist. Then double the count result to get the number of beats per minute. *How many pulse beat could you count?*
A resting person usually has a pulse rate between 72 to 80 beats per minute.

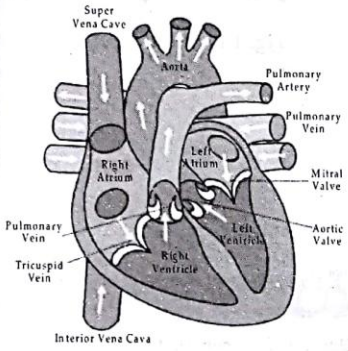


Fig. 4.12 : *Human Heart*

(iii) HEART

Heart is a hollow muscular organ as big as your fist. It contracts and relaxes rhythmically to pump blood throughout the body. The heart beats approximately 70-90 times per minute.

Human heart consists of four chambers. The *upper two chambers* are called *atria* while the *lower two chambers* are called *ventricles*.

Hence, the human heart is four chambered. *The right atrium* receives carbon dioxide rich blood from the body. Blood from the right atrium then enters the *right ventricle*, which contracts and pumps the blood to the lungs. In the lungs the blood becomes oxygenated with the help of the oxygen present in the lungs as a result of breathing. On the other hand, oxygen rich blood from the lungs returns to the *left atrium*. From the left atrium, blood enters the *left ventricle*. The left ventricle contracts and pumps the blood to all parts of the body.

The rhythmic contraction and expansion of various chambers of the heart maintains the transport of oxygen to all the parts of the body.

Check Your Knowledge

Which instrument does the doctor uses to measure your heart beat?
Doctors use a stethoscope for listening to the sound generated by heart inside your body.

Fig. 4.13

do you know?

Amoeba takes food by pseudopodia (false foot). It simply engulfs food.

KNOWLEDGE ENHANCER

BLOOD PRESSURE

The force that blood exerts against the wall of a vessel is called blood pressure. This pressure is much greater in arteries than in veins. The pressure of blood inside the artery during ventricular systole (contraction) is called systolic pressure and pressure in artery during ventricular diastole (relaxation) is called diastolic pressure. The normal systolic pressure is about 120 mm of Hg and diastolic pressure is 80 mm of Hg.

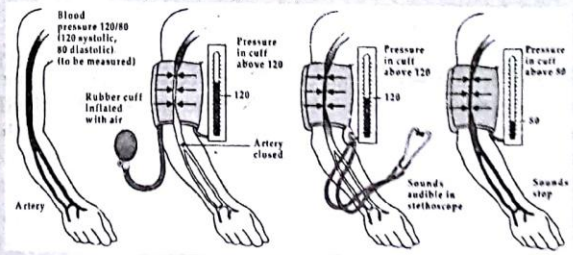


Fig. 4.14

Blood pressure is measured with an instrument called sphygmomanometer. High blood pressure is also called *hypertension* and is caused by the constriction of arterioles, which results in increased resistance to blood flow. It can lead to the rupture of an artery and internal bleeding.

Transportation of substances in Plants

Plants have tube like vessels which transport water and minerals from the soil to the leaves and food from the leaves to all plant parts. The tissues involved in transport are collectively known as *vascular tissue*.

- *Xylem* transports water and minerals from the soil via roots (root hair) to rest of the plant body.
- *Phloem* transports food materials from the leaves to different parts of the plant body. Thus xylem and phloem transport water and food respectively.

(iv) EXCRETION

The waste products are usually toxic and that may prove to fatal if remain inside the body. These wastes need to be removed. The biological process in which removal of these harmful metabolic wastes by simple diffusion from the body surface in to the surrounding water, is called excretion.

Excretion in plants :-

Plants use a variety of methods to get rid of waste materials. For example, they get rid of excess of water by transpiration. *Transpiration* is the evaporation of water from the plants. The water evaporates through the stomata, present on the surface of leaves. Some plants may stored waste materials in the cell vacuoles as gum and resin. Plants removed in the falling leaves or excreted in to the surrounding soil. Also oxygen is excreted through of as a waste product during photosynthesis.

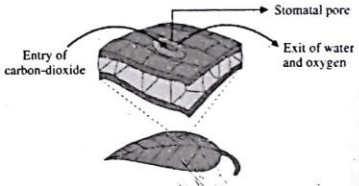


Fig. 4.15

Excretion in Animals :-

The process of removing waste products produced in the cells of living organism is called *excretion*. It is an essential process in all forms of the life.Different organisms has different kind of mechanism for excretion. In one celled organisms, wastes are discharged through the surface of cell. In humans, the main organs of excretion are the kidneys.

The parts involved in the process of excretion are called *excretory system*.

Excretion in Humans :-

The excretory system of humans consists of- a pair of kidneys, a pair of ureters, a urinary bladder and a urethra. The main excretory organs of the human body are the *kidneys*. They are connected via the ureter to the *urinary bladder*, which is then connected to *urethra*. The most important structure in the kidneys is the microscopic blood capillaries that filter the blood to produce urine.

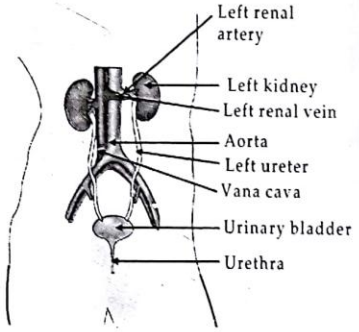
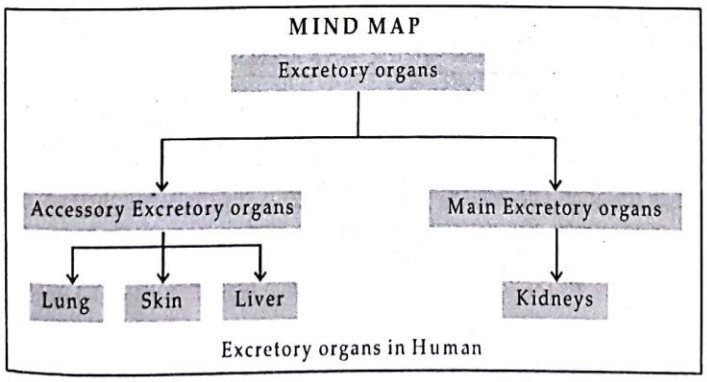
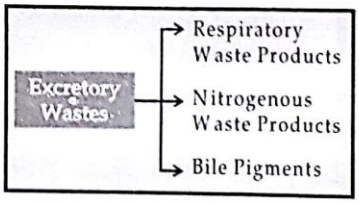


Fig. 4.16 : *Human Excretory System*





Excretory Wastes in Humans

do you know?

- Kidney receives more blood for their size than almost any other body organ about 1.2 litres every minutes.
- All the body's blood flows through the kidney more than 300 times a day.

KNOWLEDGE ENHANCER

HAEMODIALYSIS

Haemodialysis is a method for removing waste products such as creatinine and urea, as well as free water from the blood when the kidneys are in renal failure. The mechanical device used to clean the patients blood is called a dialyser, also known as an *artificial kidney*. Modern dialysers typically consist of a cylindrical rigid casing enclosing hollow fibers cast or extruded from a polymer or copolymer, which is usually a proprietary formulation. The combined area of the hollow fibers is typically between 1-2 square meters. Intensive research has been conducted by many groups to optimize blood and dialysate flows within the dialyser, in order to achieve efficient transfer of wastes from blood to dialysate.

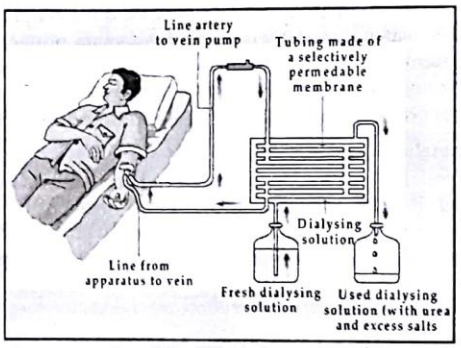


Fig. 4.17 : *Haemodialysis*

CHECK Point

1. **How urine is produced in body?**
2. **What happens if your kidney fails?**
3. **Why do kidney work to fail?**

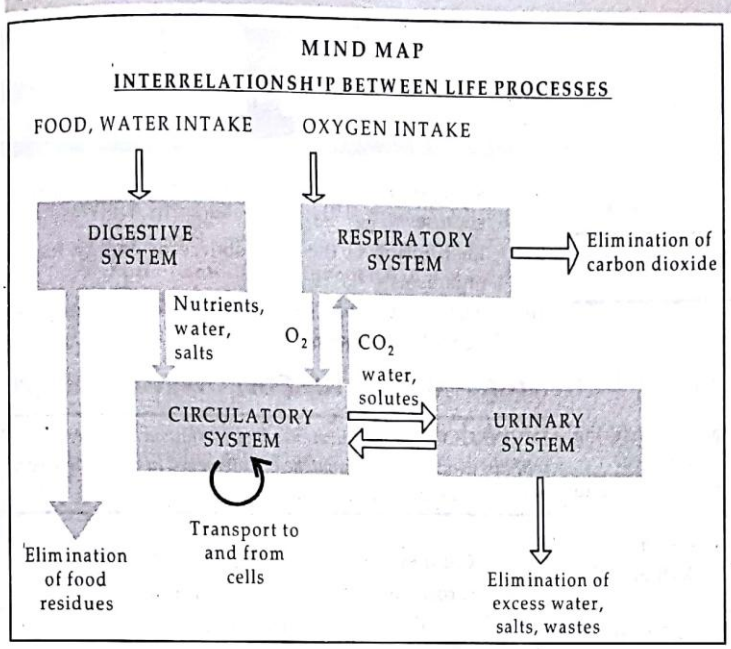
CHECK YOUR ANSWERS

1. During blood circulation the blood passes through the kidneys. This blood contains both useful and waste materials. The kidneys filter the wastes from the blood and produce urine. From the kidneys, the urine goes into the urinary bladder through two narrow tubes called the ureters. The urinary bladder stores the urine until it is forced out of the body, through an opening known as the urethra.
2. Kidneys remove excess fluid and other wastes from the body. If kidneys fail to function wastes may accumulate and damage internal organs of the body. This can even lead to death. Therefore in case of kidney failure to remove the accumulated wastes from the body blood must be filtered periodically through an artificial kidney. This process of removing wastes using an artificial kidney is known as dialysis.
3. Most kidney diseases attack the nephrons, causing them to lose their filtering capacity. Damage to the nephrons may happen quickly, often as the result of injury or poisoning. But most kidney diseases destroy the nephrons slowly and silently. Only after years or even decades will the damage become apparent. Most kidney diseases attack both kidneys simultaneously.

   The two most common causes of kidney disease are diabetes and high blood pressure. If your family has a history of any kind of kidney problems, you may be at risk for kidney disease.

MIND MAP

INTERRELATIONSHIP BETWEEN LIFE PROCESSES



- The maintenance of life requires processes like nutrition, respiration, transportation of materials with in the body and excretion of waste products.
- Plants show *autotrophic* nutrition, wheras animals show *heterotrophic* mode of nutrition.
- The process of nutrition in animals includes ingestion, digestion, absorption, assimilation and egestion.
- Some plants are heterotrophic. *Heterotrophs* are divided as insectivorous, saprophytes, parasites and symbiosis.
- Transport of minerals and water takes place through xylem and phloem.
- In human beings, transport of material such as oxygen, carbon dioxide, food and excretory product is a function of the circulatory system. The *circulatory system* consists of heart, blood and blood vessels.
- *Respiration* may be aerobic or anaerobic. Aerobic respiration makes more energy than anaerobic respiration.
- In plants respiration takes place by stomatal pores.
- Plants do not have specialised excretory organ but remove waste through stomata.
- Human beings excrete sweat through skin, urea through kidney and carbondioxide through lungs.

exercise 1

FIB FILL IN THE BLANKS :

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

1. Man is _____ in nutrition.
2. Digestion process starts in _____.
3. _____involves the intake of complex material prepared by other organisms.
4. Ninety percent of the water lost by the plants during transpiration is through the _____of the leaf
5. The major function of the _____blood cells is to transport oxygen.
6. Arteries carry blood _____ from the heart.
8. The functional unit of the mammalian kidney is the _____
9. Largest digestive gland in the human body is _____
10. The structural and functional unit of lung is_____
11. Kidney eliminate the excretory waste materials as _____
12. Respiration may be _____or _____
13. In human beings, excretory products in the form of soluble nitrogen compounds are removed by the _____in the kidneys.
14. Insects have respiratory tubules known as _____
15. Pitcher plant is an example of _____

T/F TRUE & FALSE :

DIRECTIONS : *Read the following statements and write your answer as true or false.*

1. The loss of water vapour by a plant is called transpiration.
2. A complete digestive tract consists of an oral and an anal opening.
3. Only the multicellular organisms require transporting mechanisms.
4. The exchange of nutrients and waste products between the blood and cells occurs within the arteries.
5. In humans the alveoli are the functioning units of external respiration.
6. Fishes respire though the skin.
7. External respiration is also called breathing.
8. Sugar manufactured in the leaf are translocated to storage organs through the xylem in the form of sucrose.
9. Respiration is the only source of energy for all organisms
10. All animals have a system of vessels and tubes called a circulatory system.

MTF MATCH THE FOLLOWING :

DIRECTIONS : *Each question contains statements given in two columns which have to be matched. Statements in column I have to be matched with statements in column II.*

1.

Column I (Processes)	Column II (Definition)
(A) Nutrition	(p) The process of obtaining food.
(B) Synthesis	(q) Combining small molecules to create larger and more complex molecules.
(C) Growth	(r) The increase in cell size and/or number
(D) Transport	(s) The movement of materials within the cell or within the organism.

2.

Column I	Column II
(A) Reproduction	(p) The chemical process of oxidizing organic molecules to release energy.
(B) Respiration	(q) The removal of metabolic waste
(C) Excretion	(r) Production of new organism

VSAQ VERY SHORT ANSWER QUESTION :

DIRECTIONS : *Give answer in one word or one sentence.*

1. Name the term used to refer transportation of food from leaves to other parts of plants.
2. Name the pigment present in plants which can absorb solar energy.

3. Name the excretory unit of a kidney.
4. Name the respiratory organs of :
   (i) Fish (ii) Mosquito (iii) Earthworm.
5. Name the type of blood vessels which carry blood from various organs to the heart.
6. Name the mode of nutrition in *Amoeba*.
7. Which organelle in a cell is associated with the production of energy by aerobic respiration ?
8. Write the name of basic functional unit of kidney ?
9. What is the other name for food pipe ?
10. What is the source of the O_2 and the CO_2 exchanged in alveoli ?
11. Define digestion.
12. If the stomata were closed, would the CO_2 concentration within the leaf increase or decrease ?
13. Write the name of any parasite plants.
14. How parasite plants obtain their food ?
15. Give example of two saprophytic plants.
16. Which type of nutrition is found in Algae ?
17. Define omnivorous animals.
18. Write the name of the organ by which plants respires.
19. Which tube is used both by the digestive and respiratory system ?
20. What is the main function of small intestine ?

SAQ SHORT ANSWER QUESTION :

DIRECTIONS : *Give answer in 2-3 sentences.*

1. Write the differences between aerobic and anaerobic respiration ? Name some organisms that use anaerobic mode of respiration.
2. What is transpiration ?
3. Draw a well labelled diagram of a xylem vessel.
4. What are the methods used by plants to get rid of their waste products ?
5. What are blood vessels ?
6. Which processes would you consider essential for maintaining life?
7. What is respiration ?
8. Define excretion.
9. Name an respiratory pigment present in the human blood.
10. Name the oxygen carrying pigment.
11. What is nutrition ?
12. What nutrients do animal need ?
13. How is the digested fat absorbed in the body ?
14. Explain the role of the following in the process of digestion in the human body ?
    (a) Saliva (b) Gastric juices (c) Trypsin
15. Draw a diagram of the human respiratory system showing larynx, trachea, primary bronchus and lungs.
17. Give three points of difference between respiration in plants and respiration in animals.

LAQ LONG ANSWER QUESTIONS :

DIRECTIONS : *Give answer in 4-5 sentences.*

1. Explain why photosynthesis is considered the most important process in the biosphere.
2. How does liver serve both as a digestive as well as an excretory organ .
3. Explain how oxygenated blood transports from heart to different part of body.
4. Define breathing. Explain the mechanism of breathing in human beings.

exercise 2

MCQ MULTIPLE CHOICE QUESTIONS :

DIRECTIONS : *This section contains* **16** *multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.*

1. The major site of biological action of the human circulatory system occurs in –
   (a) The arteries (b) The veins
   (c) The capillary bed (d) The heart
2. Which of the following is not an important function of the vertebrate circulatory system –
   (a) Transport of nutrients and respiratory gases
   (b) Regulation of body temperature
   (c) Protection of the body by circulating antibodies
   (d) Removal of waste products for excretion from the body
3. The gas-exchange portion of the human respiratory system is the –
   (a) Larynx (b) Trachea
   (c) Bronchi (d) Alveoli
4. The exchange of gases in human beings takes place in–
   (a) In skin (b) In mouth
   (c) In nostrils (d) In lungs
5. The autotrophic mode of nutrition requires :
   (a) Carbon dioxide and water
   (b) Chlorophyll
   (c) Sunlight
   (d) All of the above
6. Plants are green in colour because –
   (a) They absorb green light only
   (b) The reflect green light
   (c) The absorb green light but reflect all other lights
   (d) None of the above are correct
7. Digestion of food in human starts from –
   (a) Duodenum (b) Small intestine
   (c) Mouth (d) Large intestine
8. Blood vessel carrying blood from lung to heart through–
   (a) Pulmonary artery (b) Pulmonary vein
   (c) Coronory artery (d) None of these
9. Excretion is removal of –
   (a) CO_2
   (b) Harmful and useless ingredients
   (c) Extra water
   (d) Metabolic waste
10. The by-products of photosynthesis are –
    (a) O_2 and H_2O (b) CO_2 and H_2S
    (c) O_2 and CO_2 (d) H_2O and H_2S
11. The process of carbon assimilation is known as –
    (a) Transpiration (b) Respiration
    (c) Photosynthesis (d) Excretion
12. Phloem transports –
    (a) Minerals
    (b) Food prepared by leaves
    (c) Water
    (d) All the above
13. Vessels that take blood to the heart from the body are called.
    (a) Arteries (b) Veins
    (c) Capillaries (d) None
14. Animals that only eat plant material for food are called
    (a) Carnivores (b) Herbivores
    (c) Omnivores (d) None of the above
15. Which of these is a part of your digestive system?
    (a) Stomach (b) Pancreas
    (c) Rectum (d) All of the above
16. What tube is used by both the digestive and respiratory systems ?
    (a) Esophagus (b) Larynx
    (c) Pharynx (d) None of these

MTOC MORE THAN ONE CORRECT

DIRECTIONS : *This section contains* **9** *Multiple Choice Questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONE OR MORE may be correct.*

1. Which of the following is the wastes secreted from plant?
   (a) Gums (b) Fruits
   (c) Resin (d) Carbon dioxide
2. What is the waste product sectreted from animals?
   (a) Hormones (b) Urea
   (c) Carbon dioxide (d) Oxygen
3. What is the function of kidney?
   (a) Removes the poisonous substance urea
   (b) Helps in circulation of blood
   (c) Protects the body from diseases
   (d) Releases excess water from blood.

4. Which of the following statements is correct about Photosynthesis ?
   (a) Oxygen diffuses out
   (b) Oxygen diffuses in
   (c) Carbon dioxide diffuses out
   (d) Carbon dioxide diffuses in
5. Which of the following gaseous exchange occurs in leaves of plant at the time of respiration?
   (a) Oxygen diffuses out
   (b) Oxygen diffuses in
   (c) Carbon dioxide diffuses out
   (d) Carbon dioxide diffuses in
6. Respiration occurs in which part of the plant?
   (a) Root
   (b) Leaves
   (c) Green stems
   (d) Hard and woody stems
7. Which of the following is an heterotrophs?
   (a) Green plants (b) Most of bacteria
   (c) Animals (d) Most of the fungi
8. Which of the following is essential for autotrophic mode of nutrition?
   (a) Carbon dioxide & water
   (b) Sunlight
   (c) Chlorophyll
   (d) Oxygen
9. Which of the nutrients are most essential for plant?
   (a) Iron (b) Sodium
   (c) Phosphorus (d) Magnesium

PBQ PASSAGE BASED QUESTION :

DIRECTIONS : *Study the given paragraph(s) and answer the following questions.*

Plants produce a number of waste products during their life processes. As compared to animals, the plants produce waste products very slowly and in very small amounts. The plants have no special organs for waste removal like the animals. The plants remove their waste products by different methods. The main waste products by plants are carbon dioxide, water vapour and oxygen. Carbon dioxide and water vapour are produced as wastes during respiration by plants whereas oxygen is produced as a waste during photosynthesis. The gaseous wastes of respiration and photosynthesis in plants (carbon dioxide, water vapour and oxygen) are removed through the 'stomata' in leaves and 'lenticles' in stems and released to the air. The plants excrete carbon dioxide produced as a waste during respiration only at night time. This is because the carbon dioxide produced during respiration in day time is all used up by the plant itself in photosynthesis. The plants excrete oxygen as a waste only during the day time (because oxygen is produced by photosynthesis only during the day time when the sunlight is there). Water vapour produced as a waste by respiration is, however, excreted by plants all the time (day as well as night). This waste water is excreted out by transpiration.

The plants also store some of the waste products in their body parts. For example, some of the waste products collect in the leaves, bark and ripe fruits fall off from a tree, then the waste products contained in them are excreted. Some of the plant wastes get stored in the fruits of the plant in the form of solid bodies called **raphides.** These wastes are removed when the fruits get detached from the plant. For example, the fruit called 'yam' (*zamikand*) has needle-shaped raphides on its surface. The plants secrete their wastes in the form of gum and resins from their stems and branches. The plants also excrete some waste substances into the soil around them.

Based on above passage, answer the following questions.

1. What gaseous waste products are excreted by plants?
2. What is transpiration ?
3. Write the name of a waste gas excreted by plants.
   (a) Only during day time
   (b) Only during night time.
4. What is raphides?
5. Where does the plant stores waste in its body?

FTP FILL IN THE PASSAGE

DIRECTIONS : *Fill in the blank spaces in the given passage about circulation in human being.*

The one-way flow of blood in human heart is from .....1..... where blood poor in oxygen enters, the .....2..... which pumps blood through the .....3..... artery to the lungs. Oxygen rich blood returns to the heart by way of pulmonary .....4..... which empty into the .....5..... . Then blood moves to the .....6..... which pumps the blood through the .....7..... and then to all the arteries of the body except these carrying blood to lungs.

A&R ASSERTION & REASON :

DIRECTIONS : *Each of these questions contains two statements 1 and 2. This is followed by four choices. You have to select the one that best describes the two statements.*

(a) Statement-1 is true, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(b) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1.

(c) Statement-1 is True, Statement-2 is False.

(d) Statement-1 is False, Statement-2 is True.

1. **Statement - 1 :** ATP is the energy carrier of cell.
   Statement - 2 : ATP is a nucleotide
2. **Statement - 1 :** Thick layers of muscles are present in the wall of alimentary canal.
   Statement - 2 : The muscles help in the mixing of food materials with the enzymes coming from different gland in the alimentary canal.
3. **Statement - 1 :** Saliva is the secretion of salivary glands.
   Statement - 2 : Saliva is a mixture of water and electrolyte derived from blood plasma.
4. **Statement - 1 :** Extra cellular digestion occur in vertebrates.
   Statement - 2 : Digestion in vertebrate occurs in a cavity.
5. **Statement - 1 :** Fishes respire through gills.
   Statement - 2 : Counter current flow occurs in gills.
6. **Statement - 1 :** Arteries carry blood from various body organs to heart.
   Statement - 2 : Veins carry blood from various body organ to heart.
7. **Statement - 1 :** Cardiovascular system involves blood, blood vessels and heart.
   Statement - 2 : The human circulatory system is composed of heart, vessels and blood.

MMQ MULTIPLE MATCHING QUESTIONS

DIRECTIONS : *Each question has four statements given in Column I and five statements in Column II. Any given statement in Column I can have correct matching with one or more statement(s) given in Column II. Match the entries in column I with entries in column II.*

1.

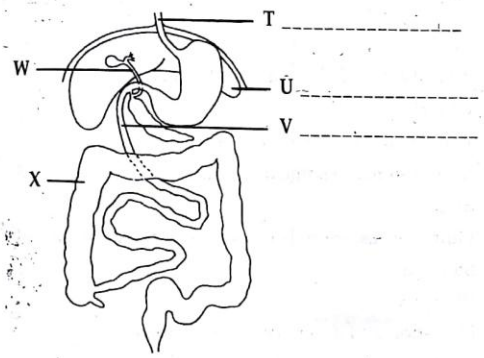
Column I	*Column II*
(A) Oral cavity	(p) This tube structure transports food from oral cavity to stomach.
(B) Oesophagus	(q) This organ absorbs most of the water from undigested food.
(C) Stomach	(r) This structure is the site where the chemical breakdown of protein first occurs.
(D) Small intenstine	(s) This organ is the section of alimentary canal where most of the food is absorbed.
(E) Large intenstine	(t) This is a storage site for feaces before being egested from the body.
(F) Rectume	(u) The site for intake of food matter to the body.
	(v) Release of hydrochloric acid happens.
	(w) Small bile salt breaks the macro nutrients.
	(x) Villi is present.

HSQ HOTS SUBJECTIVE QUESTIONS :

DIRECTIONS : *Answer the following questions.*

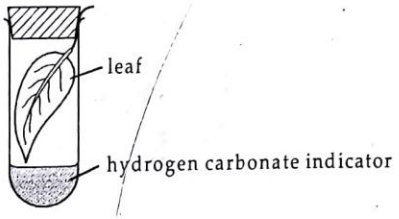
1. What is hypertension? Why it is caused?
2. As an athelete is running a 5 kilometer race, his cells need more oxygen. Which change will help his body meet the increased demand for oxygen?
3. What is the mode of nutrition in round worms?
4. What is variegated leaves?
5. Why do we boil the leaf in alcohol, when we are testing it for starch?

6. Why do the xerophytic plants have thick cuticle?
7. How do alveoli help in gas exchange?
8. What is the reason that dehydrated patients are given intravenous solution of pure water with a small amount of dissolved salt rather than just pure water?
9. Figure shows a diagram of the human alimentary canal.



(a) On Figure label structures **T, U** and **V**.
(b) Name the secretion which passes down tube **W**, and explain how it helps in fat digestion.
(c) In cases of diarrhoea, name the major process in region **X** which no longer occurs normally.

10. A leafy shoot is placed in a closed, transparent container with some hydrogencarbonate indicator solution which changes colour as shown.



Colour	Percent carbon dioxide	
Purple	0.01	less than normal
Red	0.04	normal
Yellow	0.1	more than normal

Which colour will the hydrogencarbonate indicator be at midday and at midnight? Choose the correct option.

	at midday	at midnight
A	Purple	Yellow
B	Red	Purple
C	Yellow	Purple
D	Yellow	Red

SOLUTIONS

BRIEF EXPLANATIONS OF SELECTED QUESTIONS

EXERCISE 1

FIB FILL IN THE BLANKS :

1. Heterotrophic, 2. Mouth-cavity, 3. Heterotrophic nutrition 4. Stomata, 5. Red, 6. Away, 7. Nephron, 8. Liver, 9. Alveoli, 10. Urine, 11. Aerobic, anaerobic, 12. Nephrons, 13. Trachea, 14. Insectivorous plant

T/F TRUE & FALSE :

1.	True	2.	True	3.	False
4.	False	5.	True	6.	False
7.	True	8.	False	9.	False
10.	True				

MTF MATCH THE FOLLOWING :

1. (A) - p, (B) - q, (C) - r, (D) - s
2. (A) - r, (B) - p, (C) - q

VSAQ VERY SHORT ANSWER QUESTION :

1. Translocation.
2. Chlorophyll.
3. Nephron.
4. Respiratory organs of :
   (i) Fish – Gills
   (ii) Mosquito – Air tubes or trachea
   (iii) Earthworm – Skin.
5. Veins.
6. The mode of nutrition in *Amoeba* is holozoic.
7. Mitochondria.
8. Nephron.
9. Alimentary canal
10. Oxygen is in the atmosphere, CO_2 is generated during cellular respiration reactions.
11. Conversion of complex and indiffussible food components into simple and diffusible food particles with the help of enzymes is called digestion.
12. The CO_2 concentration would decrease.
13. *Cuscuta*
14. Parasite plants live on the body of other plants.
15. Mushroom and some bacteria
16. Symbiosis
17. Omnivorous animals consume plants and animals
18. Stomata
19. Pharynx
20. Digestion and absorption of nutrients .

SAQ SHORT ANSWER QUESTION :

1. **ANAEROBIC RESPIRATION :**
   (i) When oxidation of nutrients occurs without the utilisation of molecular oxygen, it is called anaerobic respiration.
   (ii) Less amount of energy is produced as oxidation is not complete.
   (iii) It occurs in higher organisms.

   AEROBIC RESPIRATION :
   (i) When oxidation of food nutrients occurs in the presence of molecular oxygen, it is aerobic respiration.
   (ii) More energy is produced as oxidation is complete
   (iii) It occurs in lower organisms.
7. Respiration is the chemical activity that takes place within the protoplasm of the cell and results in the liberation of energy.
8. Removal of nitrogeneous waste product by the excretory organ is called as excretion.
9. Haemoglobin.
10. Haemoglobin
11. Nutrition is defined as the sum of all the process from which an organism derives energy to work and other materials necessary for growth and maintenance of various activities of life.

12. Different animals has specific nutrient requirement such as lipids, carbohydrate, proteins, minerals vitamins and water. These nutrients are broken down to liberate energy for body.

13. Bile salts from bile juice combine with fats in the intestine to form small, spherical, water soluble fat droplets called micelle. From micelle, fatty acids and glycerides are actively absorbed into the intestinal cells.

17. Respiration in plants differs from that in animals in three respect :
   (i) All parts of a plant, like the root, stem, leaf perform respiration individually.
   (ii) There is little transport of gases from one part of a plant to another, unlike in animals.
   (iii) Plant respiration occurs at much slower rate than animal respiration.

LAQ LONG ANSWER QUESTIONS :

1. Photosynthesis is considered the most important process in the biosphere because :
   (i) Photosynthesis is the only known process which converts light energy into chemical energy for utilisation by all living organisms.
   (ii) It manufactures organic food. All heterotrophs are dependent on the organic food prepared by the green plants by photosynthesis.
   (iii) A number of plant products of economic importance such as timber, fibres, resins, alkaloids, gums, tannins, oils, rubber, cork, etc. are produced by photosynthesis.
   (iv) Coal, natural gas and petroleum are products of photosynthetic organisms that lived in the past on this earth.
   (v) It maintains the concentration of atmospheric carbon dioxide and oxygen.

2. Liver serves both as a digestive as well as an excretory organ in the following way :
   (i) The bile juice secreted by the liver make the chyme (the semisolid and partly digested food) alkaline for the action of enzymes secreted by pancreas and small intestine.
   (ii) Bile emulsify the fats for their digestion and easy absorption.

3. (i) The pulmonary vein brings oxygenated blood to the human heart.
   (ii) The left auricle of human heart receives oxygenated blood.
   (iii) (a) When oxygenated blood comes into the left atrium it contracts and pours blood into left ventricle.
   (b) The left ventricle contracts and the oxygenated blood from here is distributed to all parts of the body through aorta.

4. **Breathing**: The process of letting in oxygen from air into the lungs and carbon dioxide out of the lungs is called breathing.

Mechanism of Breathing in Human beings: Breathing is a complex mechanical process that involves muscular movement which in turn alters the volume of the thoracic cavity and thereby that of the lungs.

Breathing occurs involuntarily but its rate is controlled by the respiratory centre of brain.

The space of thoracic cavity increases or decreases by outward and inward movements of the ribs caused by external intercostal and internal intercostal muscles.

This action is also assisted by the contraction and expansion of the diaphragm.

The floor of the thoracic cavity is completely closed by diaphragm. It is a thin muscular septum separating the abdominal and thoracic cavities.

The inhalation and exhalation of the air take place continuously in the respiratory system.

Inspiration or inhalation is concerned with the taking in of atmospheric air or oxygen into the thoracic cavity.

Expiration or exhalation is concerned with the expelling of carbon dioxide from lungs. It takes place when the volume of the thoracic cavity decreases and the pressure of the contained air in the thoracic cavity increases.

2

MCQ MULTIPLE CHOICE QUESTIONS :

1. (c)	2. (d)	3. (d)
4. (d)	5. (d)	6. (b)
7. (c)	8. (b)	9. (d)
10. (d)	11. (a)	12. (c)
13. (b)	14. (c)	

15. (d) All of these choices are a part of your digestive system. Your digestive system has many other associated organs including the small intestine, large intestine, and liver. The stomach is an area of food digestion. The pancreas releases hormones

that affect the digestive process. The rectum is the last place you store you food before the process of elimination (pooping).

16. (c) The pharynx connects the mouth to an area in your throat with a flap. The flap is the epiglottis. The flap moves to one side for food and the other side as you breathe. The branching point leads to the larynx or the esophagus.

MTOC MORE THAN ONE CORRECT

1.	(a, c)	2.	(b, c)	3.	(a, d)
4.	(a, d)	5.	(b, c)	6.	(b, c)
7.	(b, c, d)	8.	(a, b, c)	9.	(a, c, d)

PBQ PASSAGE BASED QUESTION:

1. Plants excrete carbon dioxide at night and oxygen at daytime during photosynthesis.
2. Transpiration is a process by which plants excrete waste water from body.
4. Plants store the waste product in fruits of the plant in the form of solid bodies
5. The wastes store at the shedding of leaves, peeling of bark and felling of fruits.

FTP FILL IN THE PASSAGE

1. Right atrium, 2. Right ventricle, 3. Pulmonary, 4. Veins, 5. Left atrium, 6. Left ventricle, 7. Systemic aorta

A&R ASSERTION & REASON:

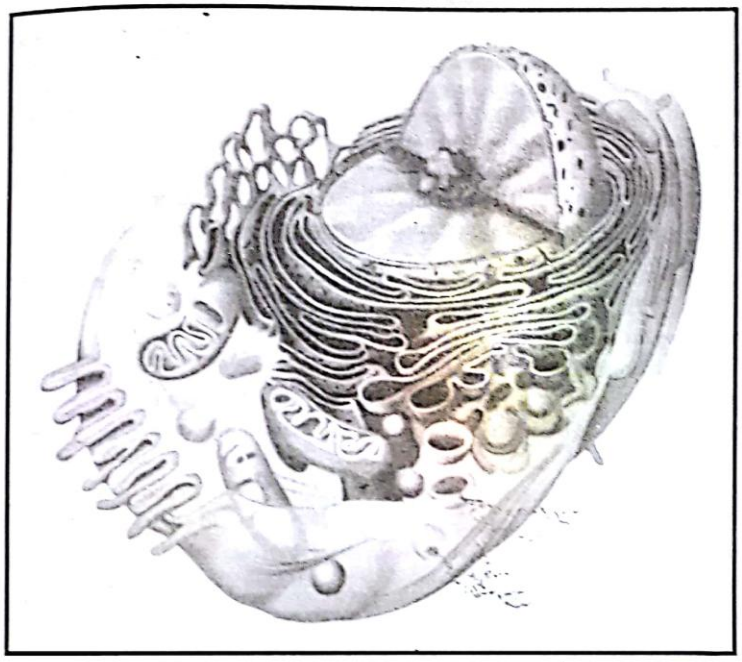
1.	(c)	2.	(a)	3.	(b)	4.	(a)
5.	(a)	6.	(d)	7.	(d)		

MMQ MULTIPLE MATCHING QUESTIONS

1. (A)-u, y; (B)-p, (C)-r, v; (D)-w, s; (E)-q, x; (F)-T

HSQ HOTS SUBJECTIVE QUESTIONS:

2. As the athlete's heart rate increases, the rate at which blood travels through her body also increases. Blood carries oxygen from the lungs to body cells. Therefore, as blood travels faster through the body, more oxygen can be transported to body cells.
4. Most of the common plants have leaves which are totally green (chlorophyll found). But in some plants leaves are partly green and partly white. The green part of such a leaf contains chlorophyll but the white part of such a leaf does not contain chlorophyll. The leaves which are partly green and partly white are called 'variegated leaves'. The plants such as croton and coleus have variegated leaves which are partly green and partly white.
5. Boiling the leaf in alcohol removes chlorophyll present in it. By this we can properly identify the starch present in the leaf.
6. Plants living in very dry regions are called xerophytic plants. They are specially adapted to stop them from loosing too much water. They have smaller leaves which are spiny and have no leaves. They also conserve water by having a thick waxy coat over their leaves and stems.
7. Alveoli are site of gas exchange. They are tiny sac-like air chambers at the end of each bronchiole inside the lungs. Alveoli are thin walled structure that are surrounded by a network of small blood vessels where the exchange of gases between lungs and blood occurs. The inhaled oxygen present inside the alveoli of lungs goes to blood in the capillaries. The blood in turn passes the carbon dioxide to the alveoli of lungs.
8. The fluid inside and outside cells is not pure water; it contains dissolved substances such as salts and sugars. To prevent cells from shriveling or swelling because of osmosis, it is best to give a patient an intravenous solution with a concentration of dissolved substances that is close to the concentration of dissolved substances in the body's fluids.
9. (a) **T** – oesophagus, **U** – liver, **V** – duodenum,
   (b) (i) Bile;
   (ii) Bile helps in emulsification of fat.
   (c) absorption of water
10. (a)



chapter

5

Cell-Structure and Function

There is large variety of living organisms around us. There are plants like rose, sunflower, mango tree, banyan tree and many other. Similarly there are animals like dog, cat, man and many other. All these organisms have different shapes and sizes. Their food habits and living places are also different. Inspite of these great variations in size, shape, food habits etc, all these organisms have a basic similarity among them. *Can you tell what basic similarity do all plants and animals have? It is the cell.* Cell is the basic unit of life. A baby,a banyan tree and a bacterium, all look different from one another but they all are made of tiny cells. *The cell is the smallest unit of matter that can carry on all the processes of life*. A single cell is so small that it can be seen only with a microscope. The simplest plants and animals consists of only one cell. But others are made up of millions and millions of cells. Although a cell is tiny, it has a complex structure. And it lives just as a person lives. It needs to take in oxygen, digests food and expel waste materials.

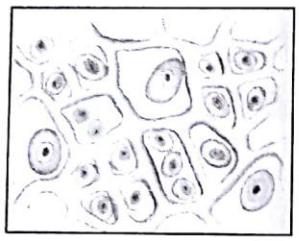


Fig. 1.1

DISCOVERY OF CELL

In 1665, on english scientist named Robert Hooke first discovered the existence of cells. He used a microscope to investigate the structure of a thin slice of cork. Cork is a dead plant structure. He observed that cork had a several tiny compartments in it. He called these tiny compartments as cells. However the cell discovered by Hooke, were dead and only cellulose walls were visible.

The first living cell was seen under microscope by Dutch discoverer Anton Von Leeuwenhoek. He named these animals as *animalcules*. Years later as microscopes improved, other biologists continued the work of Hooke and Leenwenhoek, learning more about cells. In the 1830s, two German Scientists Malthius Schleiden and Theodor Schwann, helped to convince other scientists that all living things are made of cells. They proposed cell theory.

According to Cell theory -

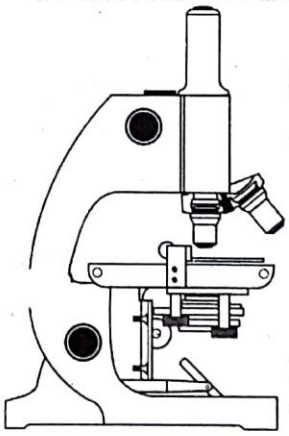
(i) All living things are made of cells.
(ii) Cells are basic units of structure and function in living things.
(iii) All cells arise from pre-existing cells by cell division.

do you know?

The cell theory applies to every living organism in the world.

IDEA BOX

The given figure represents the structure of a compound microscope. Based on your knowledge, label the parts of this wonderful invention.



Compound Microscope

Microscope is used to make object look _____

do you know?

Microscope was invented by Anton Van Leewenhoek. It is the biggest invention in the history of science. It allows biologists to study the microscopic organisms like bacteria, fungi etc.

do you know?

Microscope enable us to see the object as small as one millionth of a meter (10-6m). Such magnifying power microscopes have helped the scientists to study the minute details of cell.

CELLS

Are all cells the same? No !! Not all cells are alike. There are many many different kind of cells. Even cells within the same organism show enormous diversity of size, shape and internal organization. Our body contains 10^{13} to 10^{14} cells of around 300 different cell types. Cells not only differ in size and function, but each type of cell looks quite different from every other type of cell. Some are like little round blobs of jelly. Others are like tiny coils, doughnuts, needles, boxes, leaves, or space satellites. Some have no particular shape at all. But most of them have basically the same structure.

There is variety of number, shape and size in cells. Let us have a look.

1. **Cell size :** The cells are of many different sizes. A few types of cells are large enough to be seen through naked eye.
   - The largest cell is an egg of ostrich that measures as much as 6 inches in diameter with shell and 3 inches without shell. Also, there are cells that are very small in size and hence cannot be seen with the naked eyes.
   - The smallest cell so far observed is considered to be of PPLO (Pleuropneumonia like organism) or Mycoplasma i.e. 0.1 µm.
   - The viruses are still smaller in size but cannot be considered as cell because of sub-cellular nature.

   Why cells are small in size. It is because -

   (i) The cell's nucleus can only control a certain amount of active cytoplasm.

   (ii) Also, the cells are limited in size because of their surface area to volume ratio.

   A group of small cells has a relatively larger surface area than a single large area of same volume. It is an important factor. A cell requires nutrients, oxygen and other materials for its survival and growth. Hence, it is necessary that all these materials should enter through its surface. As cell grows larger at some point, its surface area become too small to allow these materials to enter the cell quickly enough to meet the cell's need. Thus, as cell increases in size, its surface to volume ratio decreases that causes the cell to function less efficiently.

2. **Cell shape :** Cells come in a variety of shapes – depending on their function. Look at the structure of *Amoeba*. *What type of shape does Amoeba have*? The shape of *Amoeba* appears to be irregular. Unlike other organisms, it does not have definite shape. It keeps on changing its shape. *Why do Amoeba change its shape*? The change in shape is due to formation of pseudopodia. Pseudopodia are finger like projections protruding out of its body. The protrusions help *Amoeba* in movement and capturing food.

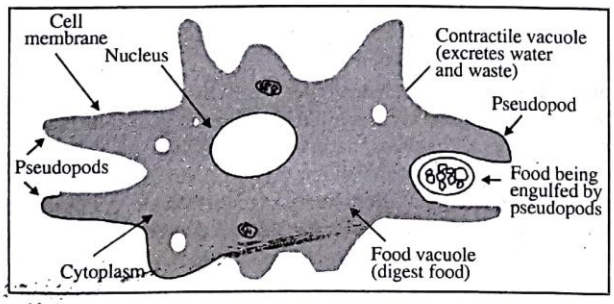


Fig. 1.2 : *Amoeba capturing food*

Similarly in human beings, white blood cell (WBC) has the ability to change its shape. They eat up or kill bacteria that enter the blood and save us from many diseases.

The cells are different in shapes and sizes so that they can perform different functions. Or we can say, cells are specialized to do different job.

INFORMATION!!

- *Metabolically active cells are smaller in size.*
- *Cells of a particular type have almost same volume.*
- *Size of cell has no relation with the size of the body of the animal or plant. It is related to its function.*

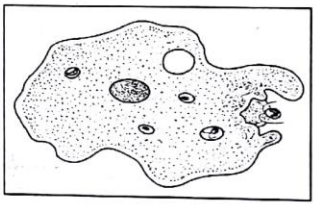
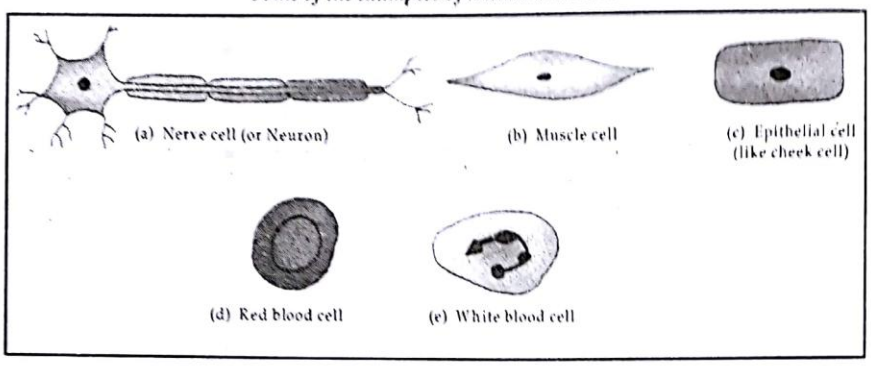
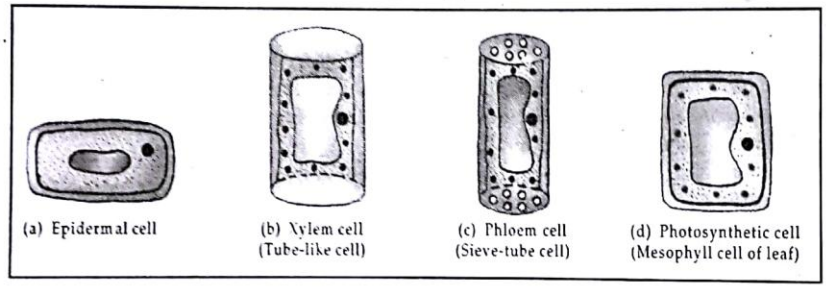


Fig. 1.3 : *Amoeba*

Some of the examples of animal cells are:



Some of the examples of plant cells are :



Note: *WBC is a cell while Amoeba is a full fledge organism that are capable of independent existence.*

Let us now discuss how shape of a cell helps in its functioning. A nerve cell is very long and has a wire like branches coming out of it. This large length of nerve cell helps it to carry impulses over long distances in the body. Also, the wire like branches helps it to make contact with and carry messages between brain and other parts of body. Hence, nerve cells are specially adapted to transmit messages. Similarly, muscle cells are spindle in shape and are adapted for movement. They bring about movement of body parts by contraction and relaxation. On the contrary, in the plant cells, Xylem cells are tube like plant cells that carry water and mineral salts from the roots of the plant to its leaves whereas phloem cells carry the food made by leaves to all other parts of the plant.

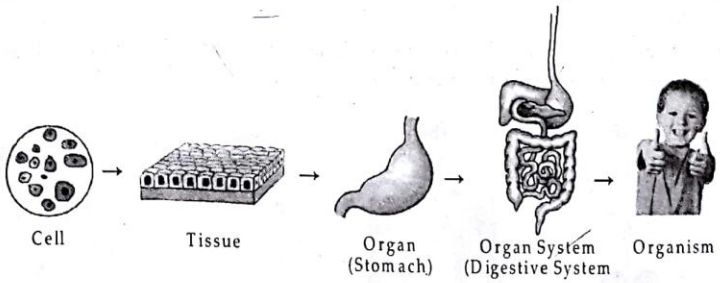
do you know?

The whole body contains more than 50 billion cells.

3. **Number of cells :** There are many types of cells that are unique to each type of organism. Human body has million and trillions of cells that vary in shapes and sizes. Organisms made up of more than one cells are called *multicellular organisms*. (Multicellular = Multi : many; Cellular : Cell). The example includes humans, dog, horse, pigeon, frog etc. All multicellular organisms start their life from a single cell called zygote. This cell divides by cell division to form large number of cells due to which organism become multicellular. In multicellular organisms, all the life activities are not performed by a single cell. The different functions are divided among various cells or group of cells. Hence there is division of labour in such organisms. This means that each type of cells are specialised to perform a particular job. For example, a nerve cell carries messages over long distances in body. A muscle cells bring about movement of body parts and red blood cells carry oxygen and distribute it to all part of body. Hence, all the cells in a multicellular organisms work together in groups of similar cells called tissue.

The increasing order of complexity in multicellular organisms is–

Cell → Tissue → Organ → Organ System → Organism



Increasing order of complexity

Galaxies > Universe
↑
Solar Systems
↑
Earth
↑
Ecology { Biosphere ↑ Biomes ↑ Ecosystems ↑ Communities ↑ Populations ↑ Organisms
↑
Organs
↑
Tissues
↑
Cells
↑
Protoplasm
↑
Atoms > Molecules

Levels of organization

LEVEL 1 – Cell

- Cell are the basic unit of structure and function in living things.
- They are like microscopic 'building block' in many shapes and sizes, which carry out different jobs.
- Examples include Blood cell, nerve cells, bone cells etc.

How cell increases its number? The cells in a living body increases its number by constant cell division. *Cell division* is a process where cell divides into two new cells. All the living cells grow bigger in size after digesting food. However, it grows upto a certain maximum size. After growing to its maximum size, the 'parent cell' divides to form two similar and smaller cells called "daughter cells". These daughter cells are identical to parent cell, but are smaller in size. Hence, with time, it grows to its maximum size and then divide to produce more and more cells. The main factor that is responsible for the growth of a small plant into a big tree is continuous cell division. For example, a young tree grows into a big tree due to large increase in its number of cells brought about by constant cell division. Similary in humans, a baby grows into an adult man/ woman by continuous cell division.

But, do all cells grow and divide throughout life? No, not all cells in our body grow and divide throughout life. There are some cells that do not grow in number after a certain age. For example, the cells in the skin of our body grow and divide throughout life, but brain cells do not grow in number after a certain age, that is, after 18 years. Then ***when do cells die?*** Cell have a fixed lifespan and are replaced automatically as they die off. The more active the cells the shorter the time it will live.

Below is the list of the lifespan of certain cells :

- Skin cells live for 19 days
- Eyelashes live for 3-4 months
- Liver cells live for 2-4 years
- Sperm live for 2 months
- RBCs live for 4 months
- Bone cells live for 15-25 years

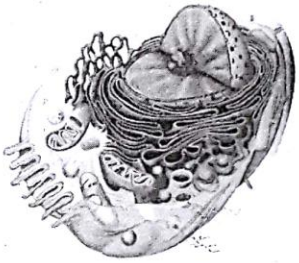


Fig. 1.4 : *A cell*

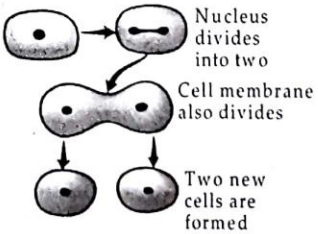


Fig. 1.5 : *Cell division*

do you know?

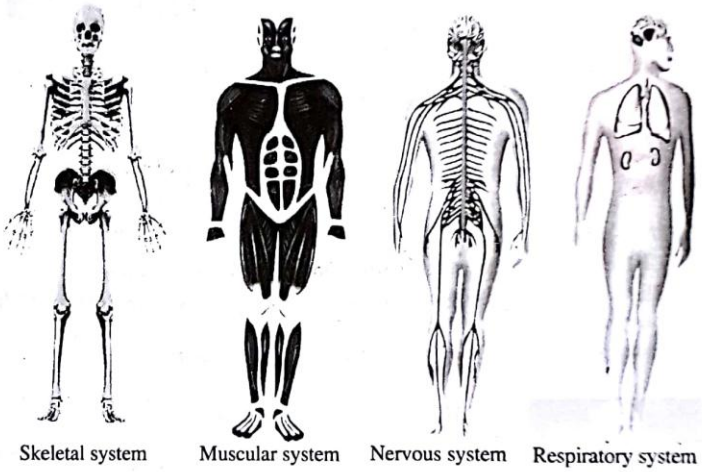
A cell without a nucleus dies in short time. Eg. human erythrocytes

THINK IT OVER

_____ are the only cells that cannot be replaced.

LEVEL 2 – Tissues

- Tissues are made up of cells that are similar in structure and function that work together to perform a specific activity.
- Examples include muscle tissue, which can shorten or contract to cause movement.
- Nerve tissue, which carries nerve signals and connective tissues, which fills the gaps between other tissues.



Skeletal system Muscular system Nervous system Respiratory system

LEVEL 3 – Organs

- Organs are made up of tissues that work together to perform a specific activity
- For example, eyes perform the function of sight, whereas lungs helps in respiration. Similarly, kidney helps in excretion.

Kidney *Eyes* *Lungs*

LEVEL 4 – Organ Systems

- Organ systems are groups of two or more tissues that work together to carry out job or particular task to help keep the body alive and working well.
- Human body has 11 major organ systems – Circulatory, Digestive, Endocrine, Excretory (urinary), Immune (lymphatic), Integumentary, Muscular, Nervous, Reproductive, Respiratory and Skeletal.
- For example, the heart, blood vessels and blood make up the circulatory system. Circulatory system or circulates blood all around the body and supplies every tiny part with essential substances such as oxygen, nutrients, and collects wastes for removal, from body.

LEVEL 5 – Organisms

- Organism is an entire living thing that can carry out all basic life processes. It means they can take in materials, release energy from food, release wastes, grow, respond to the environment and reproduce.

do you know

- The biggest organ within the body is the liver, while the largest organ of the whole body is skin.
- Among the smallest cells in the human body are red blood cells which are only 0.007 mm across.

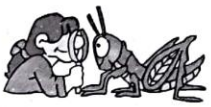
- They are usually made up of several organ systems.
- Examples – Bacteria, *Amoeba*, mushroom, sunflower, human.

Organisms made up of single cell are called *unicellular organisms*. In such organism a single cell controls all the body function, like feeding, movement, respiration, reproduction etc. The example includes *Amoeba*, *Paramecium*, yeast etc. Thus, the simplest organisms like *Amoeba* consists of only one cell and is called *unicellular organism* while a complex organism like humans is made of millions of cells and is called *multicellular organism*.

do you know?

A body starts when two special cells meet a sperm cell from a man's body and an egg cell from a woman's body. When joined inside the woman's body these two cells grow into a whole new person.

CHECK Point

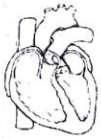


1. **Why cell is called structural and functional unit of life?**
2. **Why are cells important?**
3. **The main organs of various system has been given. Find out their respective human organ system.**

(a)  *Lungs*

(b)  *Bone*

(c)  *Brain*

(d)  *Heart*

(e)  *Stomach*

(f)  *Kidney*

CHECK YOUR ANSWERS

1. Cells are called structural and functional unit of life because –
   (i) All living beings are composed of cells and their products.
   (ii) Each living cell, either as a unicellular organism or as a part of multicellular organism has certain basic functions to perform in the body.
2. Cells are basic functional and structural unit of life. Human body is made up of more than 10 trillion cells. Cells work together as tissues. Several kinds of tissues arrange together to form organs and perform special functions. Various organs combine to form organ systems. All organ systems coordinate together to make the body function smoothly.
3. (i) Respiratory system (ii) Skeletal system (iii) Nervous system
   (iv) Circulatory system (v) Digestive system (vi) Excretory system

Observation :

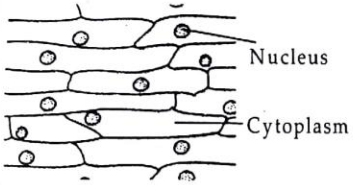


Fig. 1.6 *: Cells observed in an onion peel*

Observation :

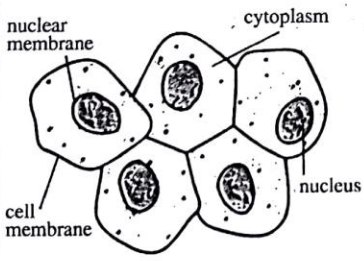


Fig. 1.7 : *Human cheek cells*

PLANT CELL AND ANIMAL CELL

Each cell is an amazing world into itself. It can take in nutrients, convert these nutrients into energy, carry out specialized function and reproduce as necessary. Even more amazing is that each cell stores its own set of instructions for carrying out each of its activities. *Cells are of two types –*

(i) Plant cells (ii) Animal cells

In the LAB

Let us perform an experiment to study plant and animal cells with a microscope.

PART A : Plant cells (Onion skin mount)

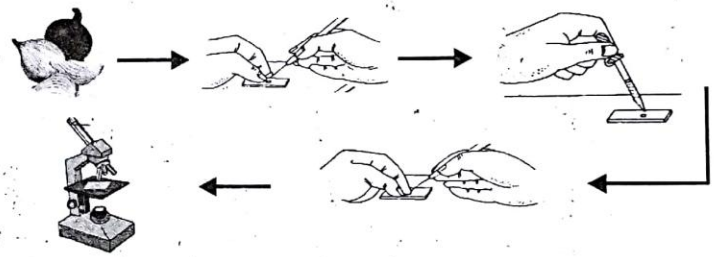
Procedure :

(i) Take a onion piece and peel the delicate transparent tissue from its inner surface using forceps.

(ii) Place this tissue, unwrinkled in a small drop of water on a glass slide.

(iii) Then add a small drop of Safranine stain to the tissue and cover it with a cover slip. While placing the coverslip ensure that there is no air bubbles under the coverslip.

(iv) Now observe the slide under a microscope.



Observation :

You will see several small rectangular shaped cells. The boundary of each cell is covered by a cell nembrane which in turn is covered by another thick covering called the cell wall. In the center of cell, there is a dense round body called the nucleus. In between the nucleus and the cell membrane, there is a jelly like substance called cytoplasm.

PART B : Animal cell (Cheek cells)

Procedure :

(i) Take a clean glass slide and place a drop of water on it.

(ii) Gently scrap the inside of your cheek with the blunt end of a clean toothpick.

(iii) Then stir the material on the toothpick in the drop of water on the slide.

(iv) Add a small drop of methylene blue stain to the slide.

(v) Now carefully place a coverslip over slide and observe the slide under microscope.

Observation :

You can see large number of irregular shaped cells with a thin cell membrane. Cell wall is absent in animal cells. In the center of cell, nucleus is present. It is stained dark blue.

Though many things are common between animal cells and the plant cells but they differ in some way. Animal cells differ from plant cells in terms of structure and types of organelles.

What do you understand by the word organelle? The word organelle seems a big word that means small organ. The various structure present inside the cell are called organelles. They functions to provide the needs of the cell. They work to bring in food supplies, get rid of waste, protect the cell, repair the cell and help it grow and reproduce.

We will first discuss the basic parts of the cells and then describe the structure of an animal cell and a plant cell.

BASIC PARTS OF A CELL

I. Plasma membrane / Cell membrane
II. Cytoplasm
III. Nucleus

I. **PLASMA MEMBRANE :** The plasma membrane is the outer covering of every cell. It separates the content from everything around it. *Can you tell or imagine how the plasma membrane keeps all the pieces inside.* Let us have a look at the structure of plasma membrane. Plasma membrane appears like a big plastic bag with some tiny holes. This bag holds all of the cell pieces and fluids inside the cell. Also, it keeps nasty things outside the cell pieces and fluids inside the cell. The holes are there to let some things move in and out of cells.

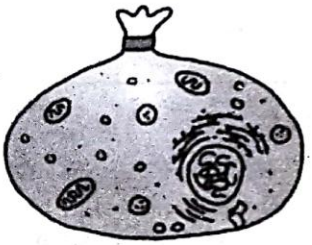


Fig. 1.8

Structure of plasma membrane :

Cell membrane is a bilipid membranous layer composed of proteins and carbohydrates. The phospholipid makes the basic bag. The proteins are found around the holes and helps to move molecules in and out of cells.

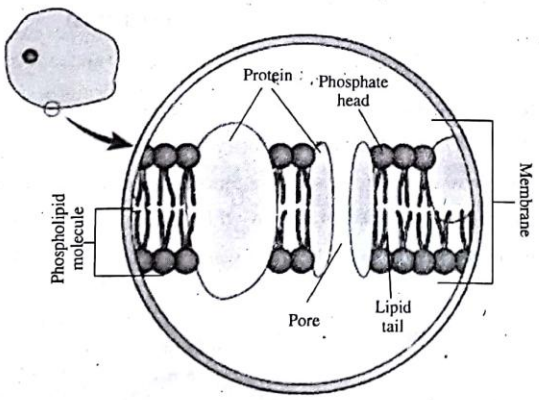


Fig. 1.9 : *Structure of plasma membrane*

Functions :

(i) It protect the cell from external injury.
(ii) It gives shape to the cell.
(iii) It controls the movement of substances 'into the cell' and 'out of cell'. Hence, it is also known as **selectively permeable membrane.**

Have you ever thought how does movement of substance take place inside the cell? Let us have a look.

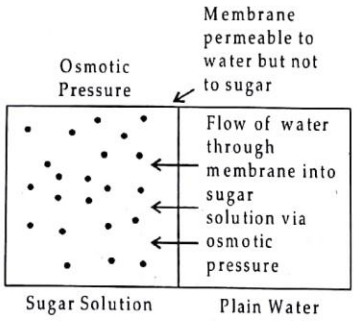


Fig. 1.11 : Osmosis

Movement of carbon dioxide or oxygen : The movement of carbon dioxide or oxygen across the cell membrane occurs by a process called *diffusion*. **Diffusion** is the process of movement of molecules from regions of high concentration to region of low concentration. No energy is used in this process.

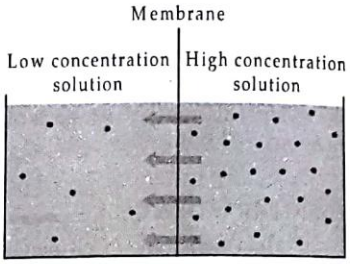


Fig. 1.10 : Diffusion

Movement of water across cell membrane : The movement of water through a selectively permeable membrane occurs by *Osmosis*. Osmosis is the diffusion of water across a selectively permeable membrane from a region of high water concentration to a region of low water concentration.

In The LAB

Let us perform an activity to understand the process of osmosis.

(a) Take an animal or a plant cell. Place it in a medium that has higher water concentration than the cell. *What will happen*? The cell will gain water by osmosis. Such type of solution are known as *hypotonic solution*. Since, water molecules are free to pass across the cell membrane in both directions, so when cell is placed in a hypotonic solution, more water will come into the cell than it leaves. As a result, the cell is likely to swell up.

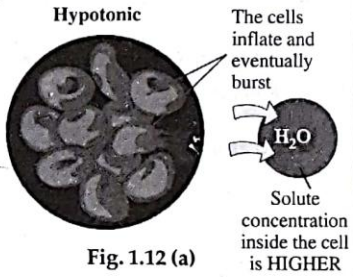


Fig. 1.12 (a)

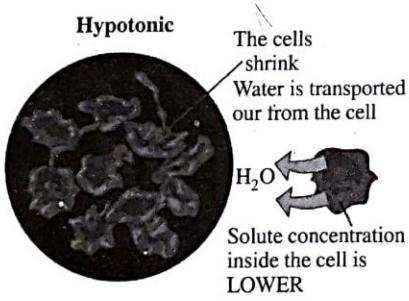


Fig. 1.12(b)

(b) Now, place the cell in a medium that has lower water concentration. *What will happen*? The cell will lose water by osmosis. Such a solution is known as *hypertonic solution*. Since, water molecules are free to pass across the membrane, so when cell is placed in hypertonic solution, it will lose water. As a result the cell will shrink.

(c) *What will happen, if a cell is placed in a medium that has same water concentration as cell*? There will be no net movement of water across the membrane. Such a solution is called *isotonic solution*. In isotonic solution, the amount water going into and out of cell is same. Hence, there is no movement of water and cell stays in same size.

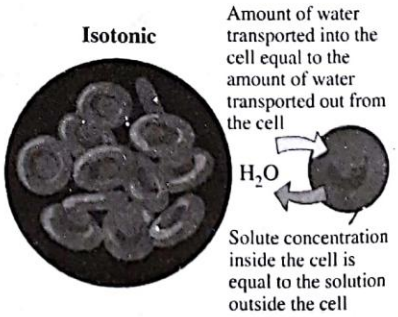
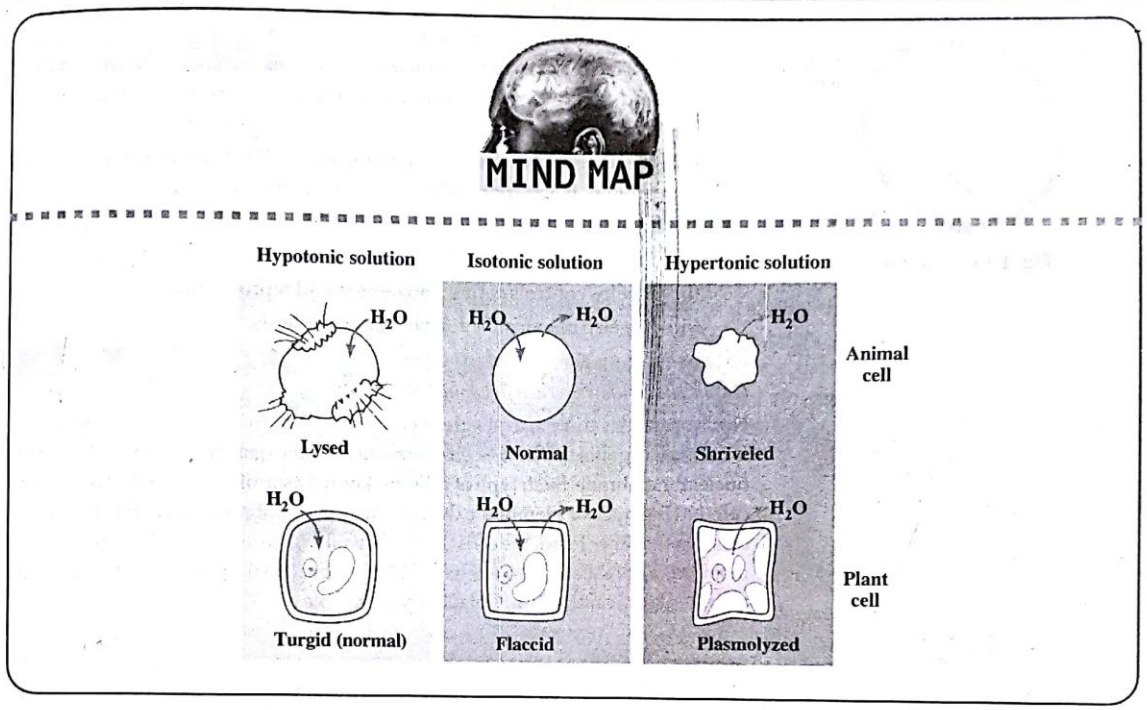


Fig. 1.12(c)



II. **CYTOPLASM :** Cytoplasm is a transparent, jelly like material that fills the cell between nucleus and cell membrane.

Function :

(i) It hold cell's organelles in place.

(ii) It also gives the shape to cell structure.

(iii) Most of the chemical reaction (which keeps the cell alive) takes place in cytoplasm. The various structures present in the cytoplasm of a cell are called organelles. The most important organelles are the mitochondrion, the ribosome, the golgi apparatus, the endoplasmic reticulum and the lysosome.

III. **NUCLEUS :** The nucleus is a large, spherical organelle present in all the cells.

- In animal cell, it is located at the center of cell, while,
- In plant cell, it is located at the periphery, near the edge.

Structure : The nucleus consists of nuclear envelope, nucleous, chromatin and nucleoplasm.

(i) **Nuclear envelope :** It is a double membranous structure with a fluid-filled space.In spots, the nuclear envelope fuses to form nuclear pores that are selectively permeable. It is selectively permeable to control movement of substances/molecules in or out of cells.

IMPORTANT TERM

PROTOPLASM : *(Proto = first and plasma = liquid.)*
Protoplasm is a liquid substance that is present inside the cell membrane. It includes cytoplasm, nucleus and other organelles. It is an aggregate of molecules of various chemicals. Most of these contains organic molecules like proteins, fats, carbohydrate etc. Cytoplasm, on the other hand, includes everything in the cell leaving out the nucleus and plasma membrane, which is basically, all cell-organelles and their medium.

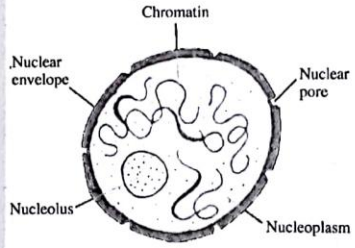


Fig. 1.13 : *Nucleus*

(ii) Chromatin : Nucleus contains a fibrous material known as chromatin. Chromatin forms a long thread like structure called chromosomes during cell division. It contains instructions that control cell metabolism and heredity. *Heredity* is the transfer of character from parents to offspring.

(iii) Nucleolus : Nucleolus is a dense area of RNA (ribonucleic acid) and protein. It is responsible for protein synthesis.

Function :

(i) The nucleus acts like the brain or control center of the cells.

(ii) It helps controls eating, movement and reproduction

(iii) It is also responsible for ribosome synthesis.

Do all cells contain a well defined nucleus structure?

No. Not all cells contain a well defined nucleus. The nucleus of the bacterial cell is not well organised like the cells of multicellular organisms. They do not have nuclear membrane. Such type of cells are known as prokaryotic cells. Hence, the cells having nuclear membrane without nuclear membrane are called *prokaryotic cells*. On the other hand, the cells that have well organised nucleus with a nuclear membrane are called *eukaryotic cells*. Eukaryotic cell usually have organelles such as endoplasmic reticulum, Golgi body, lysosome etc.

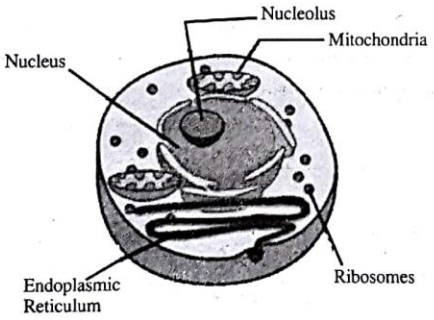


Fig. 1.14 : *Eukaryotic Cell*

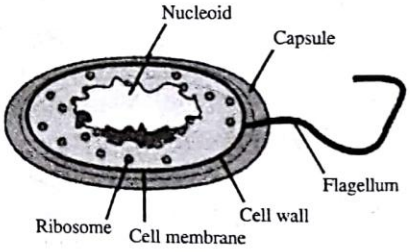


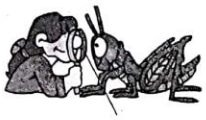
Fig. 1.15 : *Prokaryotic Cell*

Difference table between prokaryotic and Eukaryotic cell.

	Prokaryotic cells (Pro-Primitive + karyon – nucleus)	Eukaryotic cells (Eu-Good + karyon – nucleus)
(i)	They do not have organized nucleus. The DNA present in nucleus is clumped in an area but there is no organized nucleus with a membrane.	They have an organized nucleus with a nuclear envelope. It means they have true nucleus.
(ii)	They do not have any organelle except for ribosomes.	Eukaryotic cells usually have organelles such as endoplasmic reticulum, Golgi bodies, lysosomes etc.
(iii)	Prokaryotic cells are usually small compared to other cells.	Eukaryotic cells are large in size compared to prokaryotic cell.
(iv)	Examples include bacteria and blue green algae.	Examples include plant and animal cells

CHECK Point

? **Why is nucleus important?**



CHECK YOUR ANSWERS

The nucleus is a round body near the centre of the cell. It is the cell's brain and controls all its activities. In it, tiny threads called chromosomes are present that carry genes. The genes are the cell's built in inherited instructions. They shape the body and every thing in it, and say how all the different parts of the body will work.

DNA - The blueprint of life

In the center of every plant and animal cell, there is a copy of the organism's genetic material, called DNA or Deoxyribo nucleic acid. The DNA carries a complete blue print of the organism that transfers characteristics from one generation to the next. Our DNA comes from our parents and their DNA come from their parents too. That is why, relatives have similar DNA to each other.

Structure of DNA

James Watson and Francis Crick found that DNA looks like two threads twisted around each other held together by many bridges between the stands. This shape is known as double helix. The genetic information is stored on the threads.

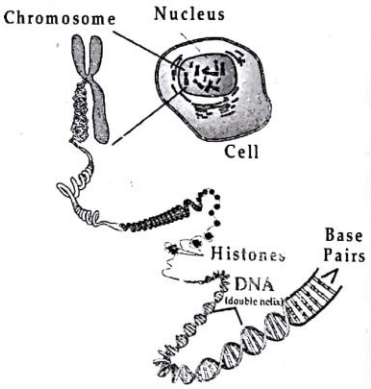
Gene gives an identity to each an every organism. It is the basic unit of inheritance in living organisms. It controls the transfer of heredity characteristics from parents to offspring . They are packed up in long strings called chromosomes. Chromosomes are made up of amazing chemical called DNA.

We inherit our genetic material through DNA from our parents - half from our father and half from our mother that is why we often look like our parents.

MIND MAP

Genes —Make→ **Proteins** —Make→ **cells** —Make→ **Body**

Genes —on→ **DNA** —in→ **Chromosomes** —in→ **Nucleus** —in→ **Body** —in→ **cell**



Genes- Identity card.

do you know?

Cells of all living things contain DNA. DNA is made up of four chemicals -

1. Adenene (A) (2) Guanine (G) (3) Cytosine (C) (4) Thymine (T).

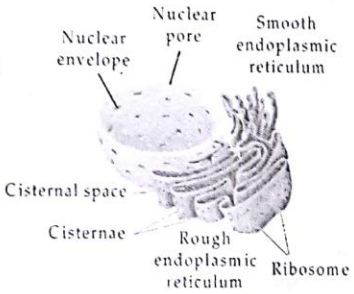


Fig. 1.16 : *Endoplasmic reticulum*

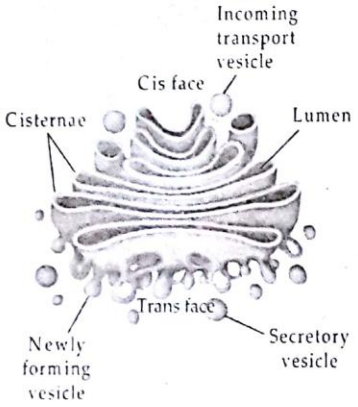


Fig. 1.17 : *Golgi apparatus*

Do you know?

Golgi apparatus was discovered by Italian Antomist Camillo Golgi.

CHECK Point

Why do we often look like our parents ?

CHECK YOUR ANSWERS

The characteristics of individual human beings are passed from one generation to next in their chromosomes. Each of our parents gives us 23 chromosomes making 46 in all. That means we have two versions of each of our genes, but one is often dominant. We see the effect of the dominant gene but the other (recessive) gene is still there and can be passed onto our children.

ORGANELLES FOUND IN BOTH PLANT AND ANIMAL CELLS

I. **Endoplasmic reticulum (ER) :** It is a network of membranous canals which encloses a fluid -filled lumen.

It is of two types –

(i) *Rough endoplasmic reticulum* (RER) – It is lined with ribosomes and is rough in appearance.

(ii) *Smooth endoplasmic reticulum* (SER) – It contains no ribosomes and hence are smooth in appearance.

Function :

(i) The ER is the "transport system" of the cell. It transports chemical between cells and within cells.

(ii) It provides large surface area for the organization of chemical reactions and synthesis.

(iii) RER plays an important role in protein synthesis

(iv) SER plays an important role in lipid synthesis.

II. **Ribosomes :** Ribosome is a non-membranous, spherical body composed of RNA (ribonucleic acid) and protein enzyme. Ribosomes are also present separately in cytoplasm. It is the site of protein synthesis.

III. **Golgi Bodies :** Golgi bodies consists of a set of smooth, flattened sac-like structures called cisternae. These are usually stacked together in parallel rows.

Function :

1. The golgi apparatus is responsible for taking the proteins which were created by ribosomes and making them bigger and better. When the golgi apparatus is done, it releases the new proteins into the cell, where they can be used to strength and build up cells. It is also involved in formation of lysosomes and peroxisomes
2. It plays an important role in modification, secretion and storage of chemicals.

IV. **Mitochondria :** Mitochondria are rod shaped organelles bordered by double

membrane. The outer membrane is smooth whereas inner membrane folds over many times to form cristae. *Cristae* greatly increases the surface area of the inner membrane. The fluid inside the mitochondria is called matrix.

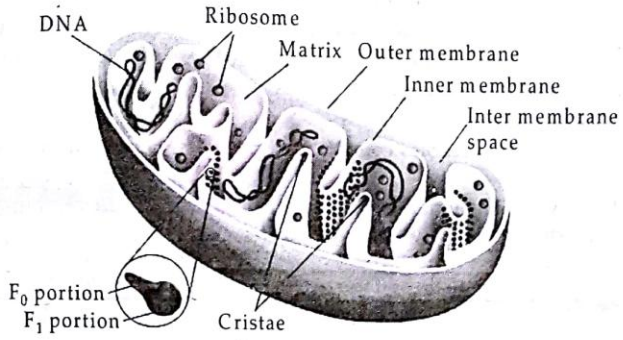


Fig. 1.18 : *Mitochondria*

Function :

Mitochondria contain enzymes for cellular respiration in which energy is released. *You all must have learnt about cellular respiration in previous classes. Can you recall it.* In case, you are not sure, let me give you a brief overview. During respiration, you take in oxygen which the blood transports to all the cells in the body. During cellular respiration, using this oxygen, glucose gets oxidised to form ATP molecules. ATP is a form of energy that the body can use.

Glucose + Oxygen ⟶ Carbon dioxide + Water + Energy (ATP)

These organelles are hence called as powerhouse of the cell. They take in nutrients, breaks them down, and creates energy for the cell.

IMPORTANT TERM

Mitochondria are able to make their own proteins So they are regarded as semi autonomous organelles. The singular of mitochondria is mitochondrion.

V. **Lysosome :** Lysosomes are present in animal cells only. They are sac-like structure surrounded by a single membrane. The membrane bound bag contains powerful digestive enzymes capable of either digesting or breaking down all organic material. It act as a mini digestive system within the cell.

Function of Lysosomes :-

(i) They contain powerful enzymes capable of either digesting or breaking down all organic material.

(ii) They serve as an intracellular digestive system i.e. a *mini-digestive system* within the cell.

(iii) Lysosomes destroy any foreign materials that manages to make it inside the cell such as bacteria etc.

(iv) They also remove worn-out or poorly functioning organelles from the cell. They may even sometimes digest the entire damaged or dead cells containing them. Hence also known as *suicidal bags*.

VI. **Vacuoles :** Vacuoles are fluid filled organelles enclosed by a membrane. It

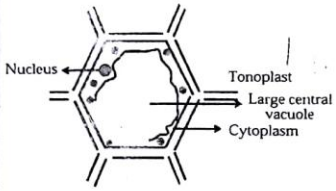


Fig. 1.19 : *Vacuoles in plant cell*

appears as an empty space under the microscope. All plant cells have a large vacuole. Their vacuole is filled with a liquid called "cell sap" that contains dissolved sugar and salts.

Function of vacuole in plant cells –

(i) It keeps the plant cell firm or turgid.

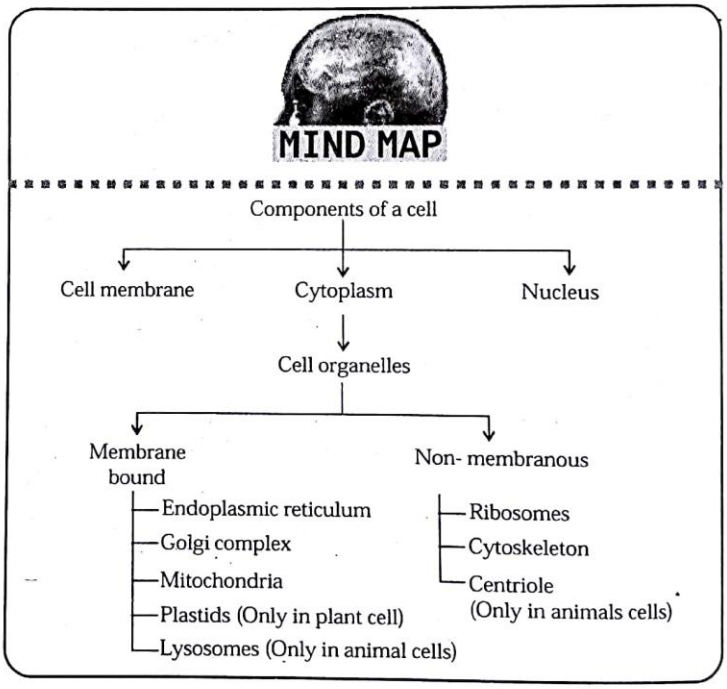
(ii) It stores various substances including waste products of the cell.

Animal cells may or may not have vacuole. However, vacuoles are much smaller than those found in plant cells.

Function of vacuole in animal cells –

(i) In *Amoeba*, vacuoles contain food particles, hence, known as food vacuole.

(ii) They store materials such as food, water, sugar, minerals and waste products.



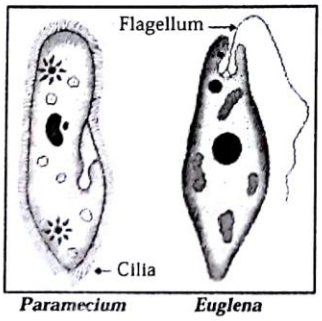


Fig. 1.20 : *Cilia and flagella*

ORGANELLES FOUND ONLY IN ANIMAL CELLS

CILIA AND FLAGELLA

Cilia are short, hair like projections that occur in large numbers on the outside surface of certain animal cells. They cover the entire surface of a cell. For example, *Paramecium* is a single celled organism, that has cilia on its surface. Cilia are the organs of locomotion in *Paramecium*.

Flagella are long, thread like structure at one end of cell. There are usually a few flagella on a cell. For example, *Euglena*, a single - celled organism, has flagellum at its mouth region in the front. Like cilia, flagella also helps in movement of organism.

ORGANELLES FOUND ONY IN PLANT CELLS

I. **CELL WALL :** The plant cells have a thick and rigid cell wall around them, outside the cell membrane. It is composed of tough material called cellulose.

Function :

(i) It gives shape and support to plant cell.

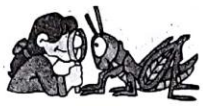
(ii) It protects the cell from mechanical injury.

(iii) It contains pores that allow materials to pass to and fro the cell membrane.

INFORMATION!!

Cell wall is present only in plant cell. Animals cells lack cell wall.

CHECK Point



1 **Why do plants have cell walls, and not animals?**

2. **What would happen if the cells in our body had cell walls?**

CHECK YOUR ANSWERS

1. Plants grow tall, towards the Sun's light. In order to provide plants strength and necessary support, the cells within the plant have this hard cell covering. If the tree were soft like an animal, they could not stand strong and tall.
2. If an animal's body were made of plant cells, the animals would be very stiff and unable to move easily.

II. **PLASTIDS :** Plastids are double membrane bound organelles. They occur in most plant cells and are absent in animal cells. Plastids are found in the cytoplasm. Depending upon their pigment colour, they are classified two main types :

(i) **Leucoplasts :** It is colourless organelle that store starch or other plant nutrients. For example – Starch stored in potato.

(ii) **Chromoplast :** It contains different coloured pigment. The most important type of chromoplast is chloroplast. Chloroplast are green–coloured organelles present in cytoplasm of plant cells. The process of food making by plants (known as photosynthesis) takes place in chloroplasts. Hence, chloroplasts are the food producers of the cell.

Like the mitochondria, plastids also have their own genome i.e., DNA and ribosomes. They are self-replicating organelles like the mitochondria i.e., they have the power to divide.

Chloroplast contains green colour pigment called chlorophyll in them. Chlorophyll absorbs energy from the Sun and helps the plant in the process of photosynthesis.

do you know?

The plastids can also have pigments of other colours. For examples, the red colour of tomatoes is due to presence of plastids that have red pigment.

Structure of chloroplast :

Each chloroplast is a double membranous structure. Two membranes contains and protect the inner parts of the chloroplast. Inner to the membrane, matrix is present that is divided into two portions called *Grana* and *Stroma*.

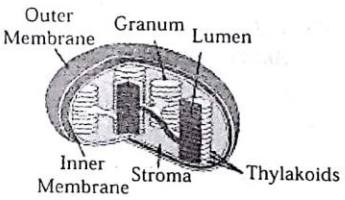


Fig. 1.21 : *Chloroplast*

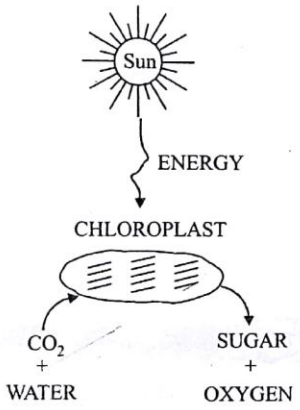


Fig. 1.22 : *Photosynthesis*

(i) *Grana* consists of membranous or lamellar system. This lamellar system is made up of thylakoid. One thylakoid stock is called a granum. Each *thylakoid* have chlorophyll molecules on their surface that trap sunlight and take part in process of photosynthesis.

The stacks of sacs are connnected by *stromal lamellae.* The lamellae act like the skeleton of chloroplast, keeping all the sacs a safe distance from other and increasing the efficiency of organelle.

(ii) The *stroma* is an area inside of the chloroplast where all chemical reactions occurs and starch (sugars) is synthesized.

Functions of Plastid –

Chloroplast is the site of photosynthesis. In chloroplast, carbon dioxide and water combine in the presence of sunlight energy to produce food such as glucose. Thus, chloroplasts help in synthesis of food by green plants.

$$CO_2 + H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} \text{Glucose} + \text{Oxygen}$$

Now, we have studied that plants and animals are similar in many respects but they are also different in some respects. Let us know see the important similarities and dissimilarities between plant cells and animal cells.

Similarities between plant and animal cell –

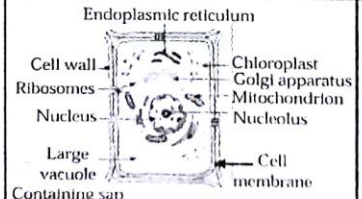
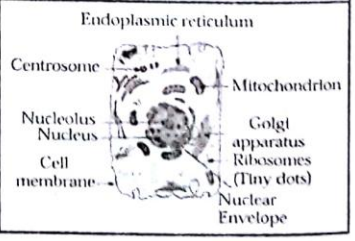
(i) They both have a cell membrane or plasma membrane around them.

(ii) Both the cells have cytoplasm.

(iii) Both the cells have nucleus.

(iv) Both the cells have mitochondria.

Difference table between plant and animal cell -

Plant Cell	Animal Cell
1. A plant cell has a cell wall around it.	An animal cell does not have a cell wall around it.
2. A photosynthetic plant cell has plastids in it.	An animal cell does not have plastid in it.
3. A plant cell has a centrally located large vacuole in it.	An animal cell does not have large vacuoles. Only some animal cells have small vacuoles.
	

Let us summarise the functions of different parts of a cell.

CELL	Functions
Cell membrane	1. It gives form and support to the cell.
	2. It allows the entry and exit of cellular materials.
Nucleus	1. It controls all the activities of the cell.
	2. It is responsible for genetic characteristics.
	3. It synthesizes and stores proteins.
Endoplasmic reticulum	It is involved in the synthesis, storage, and transport of cell products.
Mitochondria	These tiny spherical or rod-like bodies act as sites of energy production. So they are also called the powerhouses of the cell.
Ribosomes	These granular structures act as sites of protein synthesis.
Golgi apparatus	They are responsible for the secretion of enzymes, hormones, and proteins.
Lysosomes	They are capable of digesting damaged cells and a variety of extra-and-intra-cellular materials.
Vacuoles	These fluid-filled spaces store excess water, useful minerals, salt, food substances, pigments and waste products.

The following table compares the presence of few features of plants, animal and bacterial cell. Tick mark the organelles present in plant, animal and bacterial cells.

Cell part	Plant cell	Animal cell	Bacterial cell
Cell membrane			
Cell wall			
Nucleus			
Nuclear Membrane			
Cytoplasm			
Plastids			
Vacuole			

- *Cell* is the basic unit of life that can carry out all the processes of life
- *Robert Hooke* was the first person to observe cells under a microscope.
- *Schleidan and Schwann* proposed the Cell Theory in 1838.
- All organisms are made of smaller parts called organs. *Organs* are made of still smaller parts called cell.
- *Tissue* is a group of cells that are alike and work together to perform a specific function
- *Organ* is a relatively independent part of the body. It is a group of tissue that carries out one or more specialised function.
- *Organisms* made of more than one cell are called *multicellular organisms*. Examples plants and animals.
- Organisms made of single-cell are called *unicellular organisms*. Examples, *Amoeba*, *Paramecium*.
- The single cell of unicellular organisms performs all the basic functions performed by a variety of cells in multicellular organisms
- A white blood cell (WBC) in human blood is an example of single cell which can change its shape.
- The cell has three main parts –
  - Cell membrane
  - Cytoplasm
  - Nucleus
  - Vacuole
- Cells without well organised nuclei (i.e., lacking nuclear membrane) are called *prokaryotic cells*. For example, bacterial cell.
- Cells having well organised nuclei with a nuclear membrane are called *eukaryotic cells*. For example, onion cells and cheek cells.
- *Plasma membrane* is a *selectively permeable* membrane. It regulates the movement of molecules in and out of cell.
- Plant cells differ from animal cells in having an additional layer around cell membrane called *cell wall*.
- When a plant cell is put in a hypertonic solution, it losses water due to osmosis (exosmosis) and as a result, protoplast is shrinked away from the cell wall. This is called plasmolysis.
- Various membrane bound cell organelles present in eukaryotic cell are nucleus, endoplasmic reticulum, golgi aparatus, mitochondria, plastids, lysosomes etc.
- *Mitochondria* form powerhouse of cell. They use molecular oxygen and generate energy-rich compunds.
- *Chloroplasts* are chlorophyll containing green plastids. They use water and CO_2 and convert radiant energy of sunlight into chemical energy of carbohydrates.
- *Ribosomes* are sites of protein synthesis.
- *Endoplasmic reticulum* are of two types — SER and RER, SER synthesizes lipids and RER synthesises proteins
- *Golgi apparatus* is the site for the storage, processing and packaging of various cellular secretions.
- *Lysosomes* form garbage disposal system of animal cells
- *Nucleus* contains thread like structure called chromosomes, which carry genes and helps in transmission of characters.

exercise 1

FIB FILL IN THE BLANKS :

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

1. Cell theory was proposed by _____ and _____ .
2. _____ is considered as the biggest cell.
3. _____ is considered as the smallest cell.
4. One micron is _____ of a meter.
5. _____ controls all the activities of cell.
6. The process by which water enters through a selectively permeable membrane is called _____ .
7. Cellular respiration occurs in _____ part of cell.
8. _____ is called suicidal bag of cell.
9. Genetic material of plant and animal cell is found in _____ .
10. _____ gives shape and support to the plant cell.
11. Plastids are present only in _____ cells.
12. _____ acts as the skeleton of chloroplast.
13. The 'cell sap' of vacuole contains dissolve _____ and _____ .
14. Nerve cells are known as _____ .
15. A group of cells performing a similar function is called a _____ .

T/F TRUE & FALSE :

DIRECTIONS : *Read the following statements and write your answer as true or false.*

1. Animal cells have cell wall and around that the cell membrane.
2. Chromosomes carry genes.
3. Plastids and chloroplasts are found in plant cells.
4. Onion cells and cheek cells are the examples of prokaryotic cell.
5. Pseudopodia is found in higher animals.
6. Nerve cells are long and have branches.
7. *Amoeba* is a multicellular organism.
8. Plant cells are made up of cellulose.
9. Xylem and Phloem are example of tissue.
10. Energy is stored in the cell in the form of molecules called ADP.

MTF MATCH THE FOLLOWING :

DIRECTIONS : *Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D and E) in column I have to be matched with statements (p, q, r, s, t) in column II.*

1.

Column-I (Functions)	Column-II (Organelles)
A. Entry and exit of cellular materials	p. Vacuoles
B. Transmission of genetic character	q. Mitochondria
C. Production of energy	r. Nucleus
D. Secretion of enzyme and proteins	s. Cell membrane
E. Store excess water mineral, food substances and pigments	t. Golgi apparatus

2.

Column-I (Organelles)	Column-II (Definitions)
A. Endoplasmic Reticulum	p. Spherical or rod shaped body which produces energy.
B. Prokaryotic cells	q. Contains cell organelles and found in both plant and animal cell.
C. Eukaryotic cells	r. A network of cytoplasmic tubes and channels.
D. Mitochondria	s. Cells having nuclear material without nuclear membrane.
E. Cytoplasm	t. Cells having well organised nuclei with a nuclear membrane

VSAQ VERY SHORT ANSWER QUESTION:

DIRECTIONS : *Give answer in one word or one sentence.*

1. What is cell?
2. Name the scientist who had first observed the free cell under microscope.
3. Where organelles are embedded in a cell?
4. What is the difference between unicellular and multicellular organisms.
5. Name the outer layer of an animal cell.
6. What is cytoplasm?
7. Where do most of the chemical reactions takes place in a cell?
8. Name any five common constituent elements of protoplasm.
9. Name the largest floating body generally found in the center of cell?
10. Write a function of ribosome.
11. Who had developed the first microscope?
12. Which cell has the ability to change its shape?
13. Write the function of xylem and phloem cells.
14. Give one difference between rough endoplasmic reticulum and smooth endoplasmic reticulum.
15. In which part of the chloroplast all chemical reactions occurs.
16. What is protoplasm?
17. Which cell organelle regulates the process of cell division?
18. Give an example of unicellular organism.
19. Which cell organelle helps transport substances within the cell?
20. What is cell division?

SAQ SHORT ANSWER QUESTION:

DIRECTIONS : *Give answer in 2-3 sentences.*

1. Why cell membrane is called selectively permeable?
2. Why chloroplasts are present only in plant cells?
3. State the difference between prokaryotic and eukaryotic cells.
4. Give an important characteristic of a muscle cell.
5. Why mitochondria is called the powerhouse of the cell?
6. Where the ribosomes are found? Write their functions?
7. How chromosomes carry genetic characters?
8. Write a short note on DNA.
9. Write the different levels of organization in multicellular organism.
10. What are plastids? How they are classified?
11. Give structure and functions of nucleolus.
12. How plant cell is different from animal cell with respect to the vacuoles?
13. How prokaryotic cell is different from eukaryotic cells?
14. Which part of cell controls all activities of the cell?
15. Draw a well labelled diagram of an animal cell.
16. Draw a well labelled diagram of a plant cell.
17. What are tissues? Write about plant and animal tissues?

LAQ LONG ANSWER QUESTION:

DIRECTIONS : *Give answer in 8-10 sentences.*

1. Discuss the main components of a typical cell.
2. Briefly explain the various components of a plant cell.
3. Explain the structure and function of nucleus.
4. Make a list of functions of all eukaryotic cell organelles.

exercise 2

MCQ MULTIPLE CHOICE QUESTIONS :

DIRECTIONS : *This section contains* 18 *multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct. Choose the correct option.*

1. Which of the following statements is not correct?
   (a) In plant cells, vacuoles are absent
   (b) Vacuole is bounded by a single membrane
   (c) In *Amoeba*, contractile vacuole is important for excretion.
   (d) Flagellum is important for transport of bacteria.
2. Which of the following cell organelles are non-membranous and found in both prokaryotic and eukaryotic cells?
   (a) Lysosome (b) Vacuoles
   (c) Ribosome (d) Mitochondria
3. The main constituents of cytoplasm is C, N, O, H. These are derived from
   (a) Protein (b) Carbohydrate
   (c) Water (d) None of these
4. How many cells are present in human body?
   (a) One million cells (b) One billion cells
   (c) One trillion cells (d) More than a trillion cells
5. The scientist who described cell as "many little boxes" was
   (a) Roberty Hooke
   (b) Theodar Schwann
   (c) Anton Van Leeuwenhoek
   (d) Rudolf Virchow
6. The characteristic of a nerve cell that relates directly to its function is its
   (a) Long extensions
   (b) Flat shape
   (c) Ability to change shape
   (d) Ability to engulf bacteria
7. Which of the following statements is correct?
   (a) Prokaryotic cells are surrounded by a cell membrane.
   (b) Prokaryotic cells have a nucleus
   (c) Eukaryotic cells have genetic information
   (d) Eukaryotic cells have membrane bound organelles
8. Old organelles, viruses, bacteria etc. that a cell can ingests are broken down in
   (a) Ribosomes (b) RER
   (c) SER (d) Lysosomes
9. Organelles that are surrounded by two membranes are
   (a) Nucleus and Mitochondria
   (b) Nucleus and Golgi bodies
   (c) Endoplasmic reticulum and Lysosomes
   (d) Endoplasmic reticulum and Mitochondria
10. A cell that contains a cell wall, chloroplasts and a central vacuole is
    (a) Plant cell (b) Animal cell
    (c) Yeast cell (d) Bacterial cell
11. When a human RBC is placed in a hypotonic environment, it
    (a) Undergoes turgidity
    (b) Undergoes plasmolysis
    (c) Is at equilibrium
    (d) Experiences decreased turgor pressure
12. Cells that have a high energy requirement generally have many
    (a) Ribosomes (b) Nucleus
    (c) Mitochondria (d) Chloroplast
13. Which of the following statements is correct about plasma membrane?
    (a) It allows all substances to pass into and out of cells
    (b) It prevents all substances from passing into and out of cell
    (c) It is composed mainly of a protein bilayer
    (d) It is composed mainly of a lipid bilayer
14. Which of the following organelles is found in plant cells but not in animal cells?
    (a) Nucleus (b) Mitochondrion
    (c) Chloroplast (d) Golgi apparatus
15. Smallest cell organelle is
    (a) Mitochondria (b) Ribosome
    (c) Vacuole (d) Lysosome
16. A function of golgi body is
    (a) Excretion (b) ATP synthesis
    (c) Secretion (d) RNA synthesis

17. Plasma membrane is
(a) Permeable (b) Selectively permeable
(c) Impermeable (d) Semi-permeable

18. When the concentration of water and solutes on either side of the cell membrane is same, the solution is said to be :
(a) Hypertonic (b) Isotonic
(c) Hypotonic (d) None of these

PBQ PASSAGE BASED QUESTIONS

DIRECTIONS : *Study the given paragraph and answer the following questions.*

Different parts of human body perform different functions. Human body has heart to pump blood, stomach to digest food, skeletal muscles to perform movement and locomotion and so on. Heart has a special type of muscle cells called **cardiac muscles** which contract rapidly, rhythmically and tirelessly; they never get fatigue during life time of an orgamism. Stomach has special cells such as **mucous cells** to secrete mucus for lubricating the food, zymogen cells (or Chief cells) to secrete a proenzyme of protein digestive enzyme, the pepsin, called **pepsiogen, parietal cells** or **oxyntic cells** to secrete hydrochloric acid (HCI) activating pepsinogen into functional pepsin and also for killing germs of food. Skeletal muscles are striated and voluntary muscles, i.e., their contraction depends on your will or control. Due to this property of skeletal muscle cells, you are able to move your hands and ten fingers in the desired ways.

Like the human body, the cell has got division of labour. In fact, each cell has got certain specific components within it known as **cell organelles.** Each kind of cell organelle performs a special function, e.g., making of new material in the cell such as protein synthesis by ribosomes, food (glucose/starch) synthesized by chloroplasts, clearing up the waste substances from the cell by the lysosomes, etc. Thus, a cell is able to live and perform its functions because of these organelles. These organelles together constitute the basic building blocks called the **cells**. Quite interestingly all cells are organised to have the same basic structure, no matter what their function is or what organism they are found in.

(i) Which type of muscle is found in heart?
(ii) Which type of cells secrete a proenzyme of protein?
(iii) Which cells secretes mucus for lubricating food?
(iv) Which part of cell cleans the waste substances present in it?

FIP FILL IN THE PASSAGE

DIRECTIONS : *Fill in the blank spaces in the given passage about cell biology.*

.....is the branch of biology, which deals with the study of cell structure and functions. Currently..... term is more commonly used for studying living organisms at the cellular and molecular levels. Cell is the ..... unit of which was discovered and named by ..... after observation of ..... of dead plant tissue. The original structure seen by Robert Hooke was published in .... are exception to cell theory. These are ..... parasites which lack internal organisation. Outside the cell they are just like non-living inert particles and are called ....

A&R ASSERTION & REASON :

DIRECTIONS : *Each of these questions contains an Assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) If both **Assertion** and **Reason** are **correct** and Reason is the **correct explanation** of Assertion.
(b) If both **Assertion** and **Reason** are correct, but Reason is **not the correct explanation** of Assertion.
(c) If **Assertion** is **correct** but **Reason** is **incorrect**.
(d) If **Assertion** is **incorrect** but **Reason** is **correct**.

1. **Assertion** : Mitochondria does not help in photosynthesis.
Reason : Mitochondria have enzymes for photosynthesis.
2. **Assertion :** Lysosomes have basic enzymes.
Reason : Lysosomes are called autophagosomes.
3. **Assertion** : A cell membrane shows fluid-mosaic behaviour.
Reason : A membrane is composite of lipids and proteins.
4. **Assertion :** Bacteria cell wall is more complex than plant cell wall.
Reason : Bacteria cell wall contains proteins and oligosachharide.
5. **Assertion** : The true nucleus is generally absent in prokaryotes.
Reason : An undifferentiated, unorganised fibrillar nucleus is observed in prokaryotic cells.
6. **Assertion :** Mitochondria is called power house of cell.
Reason : Mitochondria produce ADP.

MMQ MULTIPLE MATCHING QUESTIONS

DIRECTIONS : *Each question has four statements (A, B, C and D) given in Column I and five statements (p, q, r, s and t) in Column II. Any given statement in Column I can have correct matching with one or more statement(s) given in Column II. Match the entries in column I with entries in column II.*

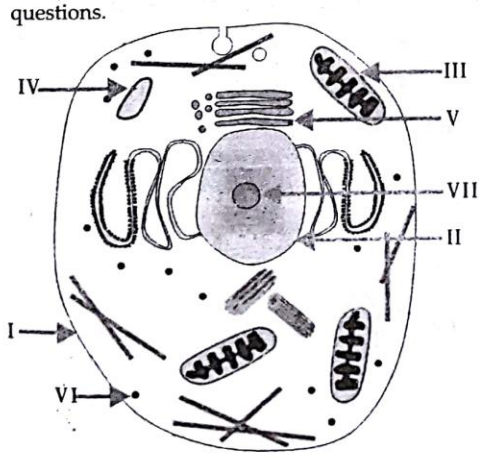
1.

Column I	*Column II*
(A) *Euglena*	p. Unicellular organism
(B) *Paramecium*	q. Flagella
(C) Chromosome	r. Prokaryotic cell
(D) *E. coli*	s. Cilia
	t. 23 pairs in human cells

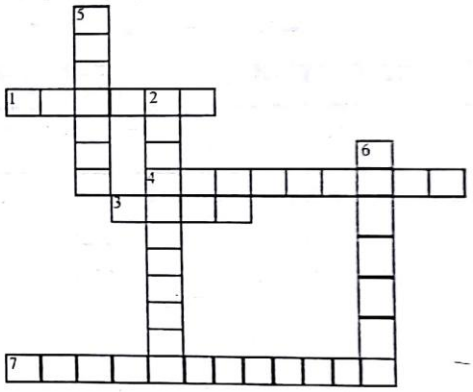
HSQ HOTS SUBJECTIVE QUESTIONS :

DIRECTIONS: *Answer the following questions.*

1. White blood cells has the ablity to change its shape. Comment on this.
2. Cells of ants and elephants are same in size. Do you agree with this? Give reason.
3. "Cell is the structural and functional unit of life." Explain.
4. Bacteria have a region called nucleoid, in which their genetic material is located. Why, then bacteria are classified as prokaryotic cell and not eukaryotic.
5. Make a model of plant cell and animal cell by using household waste.
6. Briefly explain :
   (i) WBC (ii) RBC
   (iii) Platelet (iv) Nerve cells
   (v) Muscle cells
7. Which type of cell came first in evolution — the eukaryotic or prokaryotic cell?
8. Study the given figure and answer the following questions.



   (i) Which organelle is called a suicidal bag?
   (ii) Which organelle is called "engine of the cell"?
   (iii) Which structure is called "Little nucleus"?
   (iv) Which organelle is called the powerhouse of the cell.
   (v) Which labelled area is known as selectively permeable membrane.
9. Give a term for the following processes.
   (i) Swelling of resins in water.
   (ii) Exchange of gases during respiration.
   (iii) Crenation of erythrocytes.
   (iv) Change of flaccid cell into turgid cell.
10. Complete the crossword-puzzle of cell structure and function :



Across

1. A group of similar cells performing a specific function.
3. It helps in transfer of characters from the parents to the offsprings
4. The jelly like substance between the nucleus and the cell membrane.
7. The green coloured plastids responsible for photosynthesis.

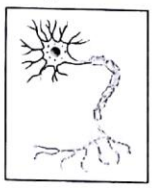
Down

2. The organism which are made up single cell.
4. The structural and functional unit of all living organisms.
5. The cell organelle present in plants which are mainly responsible for imparting colour.
6. An empty structure in the cytoplasm which performs storage function.

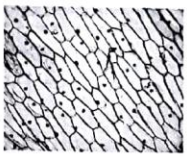
PBQ PICTURE BASED QUESTIONS

DIRECTIONS : *Study the given picture(s) and identify them.*

Identify the following pictures :

(i) 

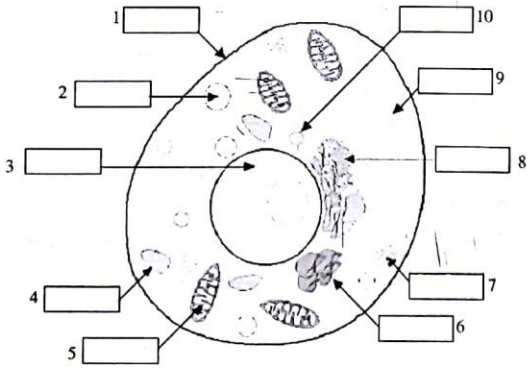
(ii) 

(iii) 

ABQ ACTIVITY BASED QUESTIONS :

DIRECTIONS : *Study the given activities and answer the following questions.*

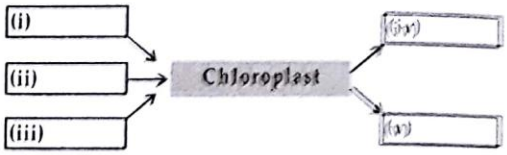
1. Identify the organelles of a cell and write their name in boxes.



2. Compare cellular respiration and photosynthesis. Label each input and output in the provided flow chart.

(a) Cellular Respiration

(b) Photosynthesis

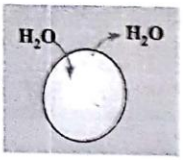


3. The given figure show the appearance of red blood cells and plant cell in isotonic, hypotonic and hypertonic environments. Find out the environment?

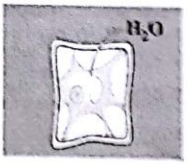
I. Red blood cell

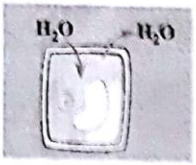
(i) 

(ii) 

(iii) 

II. Plant cell

(i) 

(ii) 

(iii) 

SOLUTIONS

BRIEF EXPLANATIONS OF SELECTED QUESTIONS

EXERCISE 1

FIB FILL IN THE BLANKS :

1. Schleiden and Schwann
2. Egg of Ostrich
3. *Mycoplasm* bacteria
4. 10^{-6}
5. Nucleus
6. Osmosis
7. Mitochondria
8. Lysosome
9. Nucleus
10. Cell wall
11. Plant
12. Lamella
13. Sugar and salt
14. Neuron
15. Tissue

T/F TRUE & FALSE :

1. False
2. True
3. True
4. False
5. False
6. True
7. False
8. True
9. True
10. False

MTF MATCH THE FOLLOWING :

1. A-s; B-r; C-q; D-t; E-p
2. A-r; B-s; C-t; D-p; E-q

VSAQ VERY SHORT ANSWER QUESTION :

1. A cell is the smallest unit of life which has a definite structure and a specific function.
2. Anton Van Leeuwenhoek
3. Cytoplasm
4. Unicellular organisms are organism made up of single cell that can perform all basic life activities whereas multicellular organisms are organisms that have many specialised cells, that carries different functions.
5. Cell membrane
6. A jelly like substance that makes up most of the inside of a cell.
11. Anton Van Leeuwenhoek
12. White blood cells
13. Xylem transports water and minerals absorbed by the roots to the leaves while phloem transports the food made by the leaves to other parts of the plant.
14. Rough endoplasmic reticulum has ribosome attached to its surface, while smooth ER has no ribosomes attached.
15. Stroma
16. The nucleus and the cytoplasm together make up the protoplasm
17. Centrosome
18. *Euglena*
19. Endoplasmic reticulum
20. The process by which cells are formed.

SAQ SHORT ANSWER QUESTION :

4. Muscle cells bring about the movement of body parts by contraction and relaxation. The contraction of muscle cells moves the body part (to which they are attached), and when these contracted muscle cells relax, they expand and increase in length, so that the body part comes back to its original position.
11. The cell wall protects the plant cell. It gives a fixed shape to the cell and makes it strong.
12. Vacuoles are large in plant cell, but in animal cell it is small in size.

LAQ LONG ANSWER QUESTION :

1. The main components of a cell are cell membrane, cytoplasm and nucleus.

   Cell membrane is also called as plasma membrane. This membrane separates the inside contents of the cell from the surrounding medium and from the other. This membrane is porous and allows the movement of materials both inward and outward of the cell.

   Cytoplasm is the jelly like substances present between the cell membrane and nucleus. Various organelles are present in the cytoplasm. These are mitochondria, golgi bodies, ribosome, endoplasmic reticulum etc.

   Nucleus is an important component of living cell. It is spherical in shape and located in the centre of the cell. Nucleus is separated from the cytoplasm by a membrane called nuclear membrane. This membrane is porous and allows the movement of materials between the cytoplasm and the inside of nucleus.

2. In plant cells the cytoplasm is composed of many living and non-living parts called cell organelles. The important organelles are mitochondria, golgi apparatus, endoplasmic reticulum, vacuoles, ribosome, chloroplast etc.

Mitochondria are tiny, spherical or rod like bodies. They are the sites of energy production, therefore also called as powerhouse of the cell. The energy production process is called cellular respiration. The energy is stored in the form of ATP.

Golgi apparatus, also called golgi bodies, are made up of tubules and vesicles. They are responsible for secretion of chemical substances like enzymes, hormones and proteins.

Endoplasmic reticulum is a network of tubules and channels. It is involved in the synthesis, storage and transport of cell products.

Ribosomes are small granules scattered all over the cytoplasm. These granules act as a site for protein synthesis.

Vacuoles are fluid-filled spaces enclosed in a membrane. They store excess water, useful minerals, pigments and many other substances. The size of vacuole is larger in plant cells.

Plastids are present in plant cells only. The plastids contains certain pigments. i.e. chloroplast, chromoplast and leucoplast. Chloroplast contains chlorophyll, which helps in photosynthesis.

MCQ MULTIPLE CHOICE QUESTIONS :

1.	(a)	2.	(c)	3.	(c)	4.	(d)
5.	(a)	6.	(a)	7.	(d)	8.	(d)
9.	(a)	10.	(a)	11.	(a)	12.	(c)
13.	(d)	14.	(c)	15.	(b)	16.	(b)
17.	(b)	18.	(c)				

PBQ PASSAGE BASED QUESTIONS

(i) Cardiac muscles are found in heart
(ii) Zymogen cells secrete a proenzyme of protein
(iii) Mucous cells secretes mucus for lubricating food.
(iv) Lysosome cleans the waste substance found in cell.

FIP FILL IN THE PASSAGE

1. Cytology
2. Cell biology
3. Basic
4. Robert Hooke
5. Cell wall
6. Micrographia
7. Viruses
8. Obligate
9. Living chemicals

A&R ASSERTION & REASON :

1. (c) 2. (d) 3. (a) 4. (a) 5. (a) 6. (c)

MMQ MULTIPLE MATCHING QUESTIONS

1. (A) – p,q; (B) – p, s; (C) – t; (D) – r

HSQ HOTS SUBJECTIVE QUESTIONS :

2. Yes, the cells of ant and elephant are same. All organisms are made up of cells that have different body designs, shapes and sizes. It is not the size of cells which makes such a big difference between an ant and an elephant but it is the number of cells which makes such difference in their body size.
3. Each organ in the system performs different functions such as digestion, assimilation and absorption. Different plant organs also perform specific functions.
Each organ is further made up of smaller parts called tissues. A tissue is a group of similar cells performing specific function. Hence "cell is the structural and functional unit of life".
7. Prokaryotic cell
8. 1. IV (Lysosome)
2. VI (Ribosome)
3. VII (Nucleolus)
4. III (Mitochondria)
5. I (Cell membrane)
9. (i) Endosmosis; (ii) Diffusion; (iii) Exosmosis; (iv) Deplasmolysis.

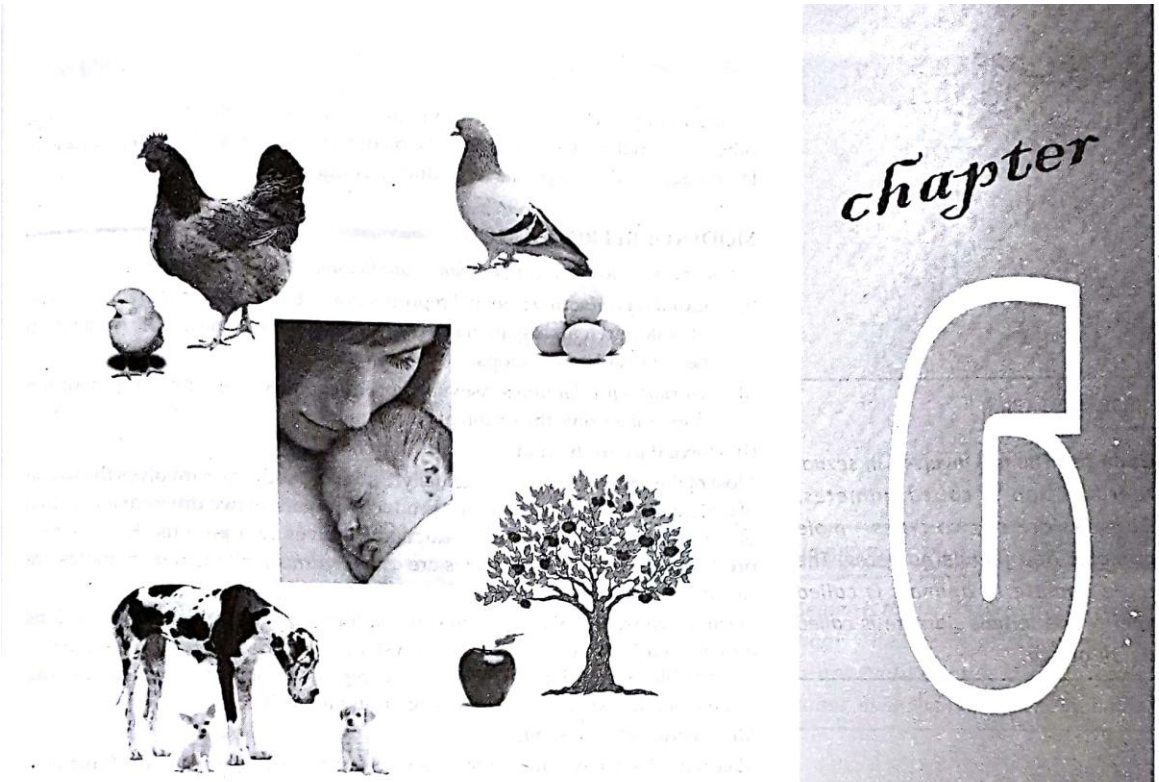
PBQ PICTURE BASED QUESTIONS

(i) Nerve cell (ii) Plant cell (iii) Onion cells

ABQ ACTIVITY BASED QUESTIONS :

1. 1. Cell membrane
2. Lysosome
3. Nucleus
4. Vacuole
5. Mitochondrion
6. Golgi Body
7. Ribosomes
8. ER
9. Cytoplasm
10. Centrosome

2. (a) (i) Glucose, (ii) Oxygen, (iii) Carbon dioxide, (iv) Water, (v) Energy
(b) (i) Carbon dioxide, (ii) Water, (iii) Energy, (iv) Glucose, (v) Oxygen
3. I. (i) Hypotonic; (ii) Hypertonic; (iii) Isotonic
II. (i) Hypertonic; (ii) Isotonic; (iii) Hypotonic



chapter 6

Reproduction in Animals

You all must have studied in your previous classes about processes like digestion, circulation, excretion and respiration. These all are considered to be important for the survival of all living organisms. But, then what about reproduction in animals. *Do they have any important role in survival of animals*? Certainly not !! Then imagine *what would happen if organisms does not reproduce* ***OR*** *if an organism did not produce offspring.*

Living organisms reproduce to maintain their number and for ensuring the continuance of their own kind, generation after generation. It replaces old and dying ones by young ones. Later these young ones feeds, grows and reproduces again to sustain their number. Hence, reproduction is the fundamental feature of all living organisms. It is the means by which life goes on. Life would not exist if organism did not reproduce. Hence, *Reproduction is the biological process through which a living organism produces offspring that are similar to themselves. We will be discussing in this chapter about sexual and asexual reproduction in humans. Let us first discuss about different types of reproduction.*

Living beings reproduce by various means. For example, human beings and other mammal reproduce by giving birth to babies, most birds reproduce by laying eggs and most plants reproduce through seeds.

MODES OF REPRODUCTION :

On the basis of modes of reproduction, reproduction is divided into two types :-

(I) ***Sexual reproduction :-*** Sexual reproduction is the process that involves fusion of male and female gametes to produce zygote. It is the zygote from which new individual develops.

(II) ***Asexual reproduction :-*** Asexual reproduction requires only one parent and does not involve the fusion of gametes.

(I) Sexual Reproduction

Most of the animal reproduces sexually. Sexual reproduction involves the fusion of male and female gametes from reproductive organs of two different individual of different sexes. Sexual reproduction involves two parents. Each parent produces gametes. Male gametes are called *sperms* while female gametes are called *eggs*.

During fertilization, these gametes fuse to form a zygote which later develops into new individual. A special organ system called the reproductive system is responsible for carrying out the process of reproduction in humans. Let us now discuss about sexual reproductive organs in human beings.

Male reproductive system

Male reproductive system consists of several organs that have two major functions. *First*, production of male gamete called sperm. *Second*, transfer of male gametes to female body.

The male reproductive organs are.

1. A pair of testes (singular, testis)
2. Epididymis
3. Vas deferens
4. Urethra
5. Penis
6. Accessory sex glands – Seminal vesicles, Prostate gland

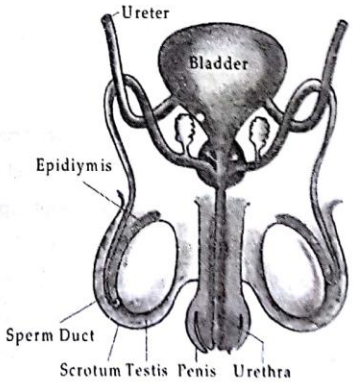


Fig. 6.1 : *Male reproductive system*

(1) Testes :- Testes are located outside the abdominal cavity within a sac called scrotal sac or scrotum. Scrotum keeps the testes temperature at 2°C, lower than body temperature. The lower temperature is required for the normal development of sperms.

IMPORTANT TERM

Gamete : *The cell involved in sexual reproduction is called gametes. Gametes are of two types - male gametes and female gametes. The male gamete in animals is called* sperm *and female gamete is called* ovum *or* egg.

do you know?

In sex cell (male or female), the nucleus carries half of the information needed for reproduction.

Functions of testes :

(a) They produce millions of tiny sperm cells.
Look at the structure of a sperm. *Is sperm a single cell?* Yes, each sperm is a single cell with a head, middle piece and a tail region.

(i) **Head :** The shape of head is oval and flat. It is the essential part of sperm as it contains nucleus. Nucleus carries information about the cell-reproduction.

(ii) **Middle piece :** The middle piece of a sperm is formed of numerous mitochondria. Mitochondria provide energy for the movement of sperm.

(iii) **Tail :** It is the longest region of a sperm. It helps in the movement of sperm in the fallopian tube during the fertilization process.

(b) When a boy reaches puberty, the testes produce a hormone called testosterone. Testosterone is male sex hormone that controls the development of male secondary sexual characters.

(2) **Epididymis :** It is a long coiled tube that collects and store sperms temporarily. It helps in storage, nutrition and maturation of sperms.

(3) **Vas deferens :** It is a tube like structure that transfers sperm from epididymis to the urethra.

(4) **Urethra :** Urethra extends from penis to external opening. It helps in conduction of sperms, secretion of glands and carries urine to urinary bladder. The urethra, at different times carries both urine and sperms.

(5) **Penis :** Penis is a cylindrical, erectile organ. Its function is to transfer sperm into vagina of female reproductive system.

(6) **Accessory or secondary sex glands :** The accessory gland includes seminal vesicles and prostate gland. The glands secrete fluid that lubricates the duct system and sperms. The sperm get dispersed in the fluid that makes their transportation into the female body easier. The fluid also provide nutrients in the form of fructose.

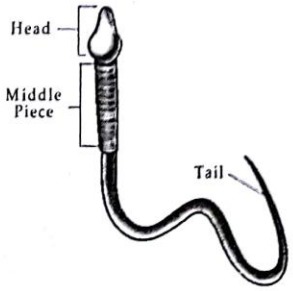


Fig. 6.2 : *Structure of sperm*

IMPORTANT TERM

Semen is the fluid in which sperm cells float. The sperm produced by the testes mature inside a set of coiled tubes, epididymis and float in semen.

Female Reproductive System

Female reproductive system consists of organs that play an important role in, *First* , production of female gametes called egg cells. *Second*, receive sperm for fertilization, implantation and development of foetus.

The female reproductive system includes-

(1) A pair of ovaries
(2) A pair of oviducts
(3) Uterus
(4) Vagina

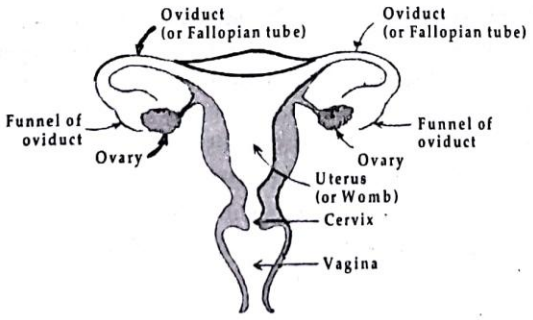


Fig. 6.3 : *Human female reproductive system*

do you know?

Human egg is about 50 times wider than a sperm cell.

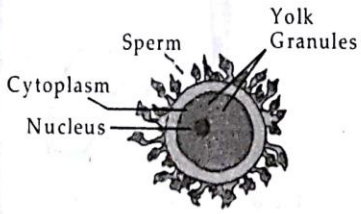


Fig. 6.4 : *Human ovum*

(1) Ovary : Ovaries are oval shaped organs, located in the lower part of abdominal cavity.

Functions of ovary :

(a) Each ovary contains thousand of eggs called ovum. Like sperms, an egg (ovum) is also a single cell. Egg is bigger in size than sperms because, egg contains a large amount of food inside it. The food present in egg is called yolk. The yolk acts like a source of energy for the developing embryo.

Structure of ovum : An ovum contains a single nucleus. The nucleus is surrounded by the cytoplasm that contains yolk.

(b) When a girl reaches puberty it produces a hormone called oestrogen. Oestrogen causes the development of secondary sexual characters in female body.

(2) Oviduct (also known as fallopian tube) : It is a tube like structure that carries egg from the ovary to the uterus.

(3) Uterus : It is a hollow muscular organ that contains developing foetus. It is connected to the uterus by ligaments. The uterus opens into vagina.

(4) Vagina : It is the lowermost part of female reproductive part. It receives penis during sexual intercourse and is the site where sperms are deposited. The vagina is connected to the uterus at the cervix. *Cervix* is the neck like opening to the uterus.

CHECK Point

1. How sperm is different from ovum?

CHECK YOUR ANSWERS

1. Sperm is microscope, motile and flagellated cell whereas ovum is larger, non-motile, spherical and food laden cell.

FERTILIZATION

Fertilization is the process where sperm (male gamete) fuses with ovum (female gametes) to form a single cell called zygote. During sexual intercourse, sperm cells enter the woman's vagina, swim through the womb and enters into the two oviducts where a ripe egg may be present. Basically, the journey begins inside the man's body where millions of sperm cell pass from testes and epididymis, along the tubes known as vas deferens, to another tube called urethra. In this way millions of sperms from the male are transferred into the female body. The sperms swim in the oviduct with the help of their tails and reaches the egg. When they reach egg, one of the sperms may fuse with it to form a single nucleus. Such fusion of female egg and sperm is called *fertilization*. This results in the formation of a fertilized egg or *zygote*. The zygote undergoes division and specific changes to grow into a new individual.

Note

The process of fertilization take place in fallopian tube.

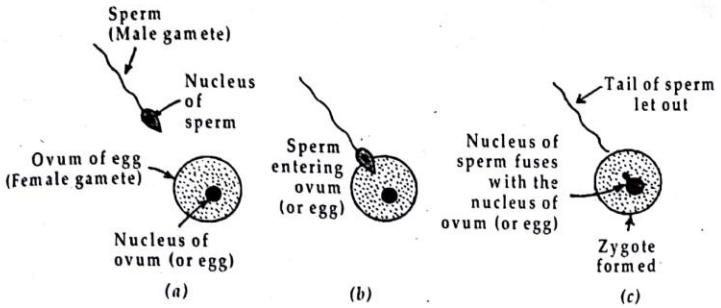


Fig. 6.5 : *Zygote formation and development of an embryo from the zygote*

do you know?

The zygote is a "fertilized ovum" or "fertilized egg". It is the beginning of a new individual.

The path that sperm travel	The path that egg travels
Testes	Ovary
↓	↓
Epididymis	Fallopian tube
↓	↓
Vas Deferens	Uterus or womb
↓	↓
Urethra	Vagina

The new individual inherits some characteristics from the mother and some from the father. This is why child have some characteristics like father and some like mother.

CHECK Point

1. **When is a baby's genetic make up decided?**
2. **Which phenomenon brings about variations in offspring?**

CHECK YOUR ANSWERS

1. A baby's genetic make up is decided right from the time when the egg is fertilized. A very important part of cell division involves the nucleus. Each nucleus contains two sets of genes. One come originally from the individual's father and one from mother. So before a cell divides, both sets of genes are copied. This is known as DNA replication. As a result of this process, each new offspring cell receives a full double set of genes, one from father and one from mother.
2. Sexual reproduction brings variation in offsprings. All organisms including humans transfers their certain characteristics to the next generation through genes. Genes contain information that is necessary for transfer of characters from parents to offspring. These genes come from the father's sperm and the mother's egg. During fertilization, gametes fuse with each other to form a unique combination of genetic material in the offspring. Hence, sexually reproduction brings about variations in offspring.

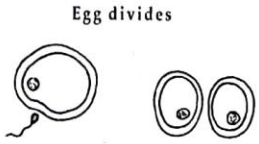


Fig. 6.6 : *Identical Twins*

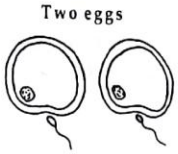
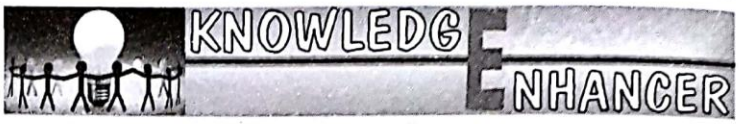


Fig. 6.7 : *Fraternal Twins*

do you know?

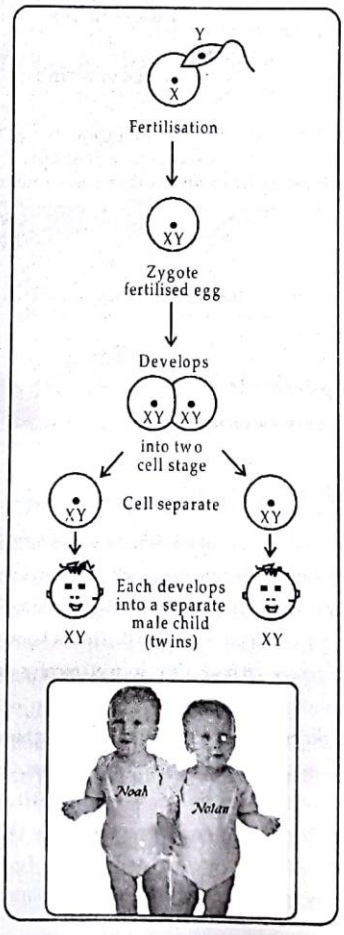
Conjoined twins joined at the hip, chest, back, face etc. are called Siamese twins.

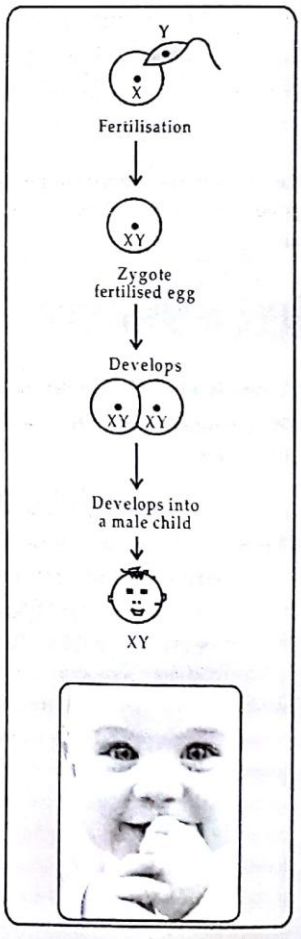


HOW ARE TWINS FORMED ?

The zygote or fertilized egg is a single cell. Sometimes, a single fertilized egg splits into two, each half developing into an embryo. This results in *identical twins*. If the fertilized egg splits into three or more parts, each of which develops into an embryo, then all the offspring produced will be identical.

If two eggs are fertilized by two sperms, this result in *fraternal twins*. They are also known as non-identical twins. *Fraternal offspring* may look alike, but they are genetically different and may not be all of same sex. On the contrary, *identical offspring*, are genetically same and are always of same sex.





IDEA BOX

Now find out twins in your locality and find out whether they are identical or non-identical twins.

CHECK Point

1. **Why all kinds of characteristics, run in families?**

CHECK YOUR ANSWERS

1. Every human body gets half of its genes from each parent, therefore it inherits some of the features of both the mother and the father. That is why, all kind of characteristics, for example, height, run in families.

The process of fertilization might take place either outside the female body or inside the female body. *On the basis of this, fertilization is divided into two types –*

(i) External fertilization. (ii) Internal fertilization

(i) **External fertilization :** The fertilization that takes place outside the female body is called *external fertilization. Have you ever been to ponds or slow flowing streams during spring or rainy season*? If yes, you must have seen a jelly like substance with round brownish black structure floating in water. *Have you ever thought what are these* ?

These are actually the eggs of frog. During rainy season, the female frog lays hundred and thousand of eggs in water. As the eggs are laid by females, the male frog releases sperms close to it. The sperm swims close to the eggs and fertilizes them. This type of fertilization is known as external fertilization. It is very common in aquatic animals such as fish, starfish etc.

(ii) **Internal fertilization :** The fertilization that takes place inside the female body is called *internal fertilization*. In this sperm meets the egg while it is still attached to the female body. Humans, cows, hens etc are examples of internal fertilization.

The number of eggs that an individual produce for successful reproduction depends on two factors–

(i) Chances of fertilization (ii) Level of parental care

Hence, if there is low chance of fertilization and less care, the large number of eggs are produced. This is because some of eggs and sperms may get exposed to water movement, wind and rainfall. These factors prevent the sperms from reaching the eggs. Thus, production of large numbers of eggs and sperms is necessary to ensure fertilization of at least a few of them.

Now, you have learnt that humans give rise to young baby while chicken lays egg that eventually develops into young ones. *What such animals are called as*? The animals that give birth to young ones are called *viviparous* animals. The example includes dog, cat or man. The animals that lay eggs are called viviparous. Frog, butterfly and chicken lay eggs and hence, are called *viviparous* animals.

do you know?

- Snakes reproduce by producing eggs as well as young ones!!
- The animals that undergo external fertilization such as fish and frog lays egg in hundreds while a hen lays only one egg at a time.

Difference table between internal fertilization and external fertilization.

S. No.	Internal fertilization	External fertilization
1	Fertilization that takes place inside the female body is called internal fertilization	Fertilization that takes place outside the female body is called external fertilization
2	Small number of eggs are produced.	Large number of eggs are produced
3	Chance of survival of offsprings are more.	Chances of survival of offsprings are less.
4	Examples : Humans, cows, hens etc.	Examples : Fish, frog, starfish etc.

Difference table between viviparous and oviparous animals.

S. No.	Oviparous animals (Egg bearing animals)	Viviparous animals (Live – bearers)
1	Animals that lays egg outside their body.	Animals that give birth to young ones.
2	Development of embryo does not takes place within the mother's body.	Embryos develop inside the mother's body from which it gains nourishment.
3	*Examples*, Chicken, frogs and butterfly.	*Examples*, Human beings, certain fishes etc.

CHECK Point

1. A baby chick hatches out of an egg laid by a hen. What type of fertilization is seen in chicken?

CHECK YOUR ANSWERS

1. Development of chicken's embryo takes place inside the female body. This type of fertilization is known as internal fertilization. The male and female gamete fuses inside the female body to form zygote. The zygote divides repeatedly and move down to fallopian tube to form embryo. During development, embryo forms several protective layers around it. As a result a white colour hard shell is formed around developing embryo. After this, the hen lays a fertilized egg. The parent hen then sits and warms the eggs or keeps them safely in the warm place till they hatch. After three weeks, the chick is completely developed and it bursts open the egg shell.

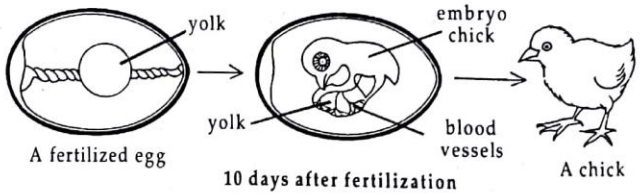


Fig. 6.8 : *Stages of development in hen*

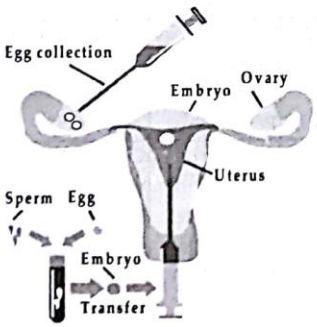


Fig. 6.9

IN-VITRO FERTILIZATION (IVF)

In-vitro fertilization is a process where fertilization of egg occurs outside the female body. It involves the removal of eggs from female ovaries. This egg is then allowed to fertilize with sperm in a fluid medium in a test tube. The fertilized egg cell (called an embryo) then grows in the laboratory until it divides into eight cells. Then it is introduced into the mother's womb (uterus) so that it can develop normally. A baby conceived by fertilization that occurs outside mother's body is called *test tube baby*.

DEVELOPMENT OF EMBRYO :

Fertilization results in the formation of zygote that begins to develop into an embryo. The zygote divides repeatedly to give rise to a ball of cells. The cells then begin to form group that develop into different tissues and organs of the body. This developing structure is called an *embryo*. The embryo gets embedded in the wall of uterus for further development. The close attachment of the embryo with the uterus is called *implantation* and it results in pregnancy. The embryo continues to develop in the uterus. An unborn baby develops 'head first', starting from the brain and head, then the main body, then the arms and legs. Life begins when the fertilized egg divides into two cells, then four, eight and so on. After a few days there are hundred of cells and after a few weeks, millions. These cells build up the various body parts. The unborn baby's heart begin to beat after only four weeks, although it has not yet taken on its full shape. Infact, by eight weeks all the main parts have formed, even the fingers and toes - yet the tiny body is only the size of grape. The stage of embryo in which our body parts can be distinguished easily is called a *foetus*. The embryo / foetus grows in the mother's uterus for about nine months.

After nine months, the baby is ready to give birth to young one. The birth of the fully developed foetus is termed as *parturition*. At birth, the baby is pushed and squeezed into the fresh air, lights and sounds of the outside world. The baby takes it first gasps of air, often crying as it does so. This is a good sign, since it opens up the baby's airways, lungs. Lungs were not used in the womb, but now the baby must breathe to get oxygen for itself. It also needs food and soon the baby takes a first meal of its mother's milk. The milk provides all the nourishment it needs for the first month of its life.

GESTATION PERIOD :

It is the period from fertilization to birth. In human beings, the gestation period is about nine mor

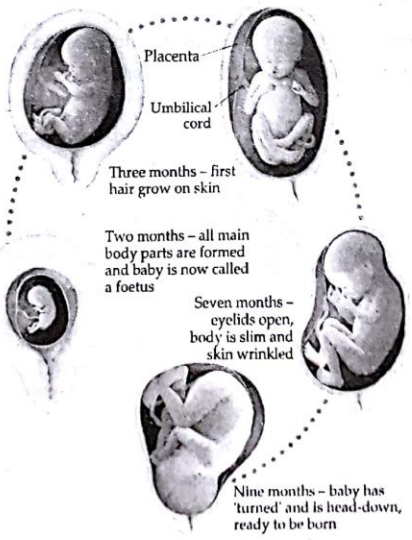


Fig. 6.11 : *Gestation period*

do you know?

A foetus develops the sense of vision around the 26th week. At this time, the eyes open and even begin to blink.

3-week-old embryo

4-week-old embryo

8-week-old embryo

The baby is ready to be born

Fig. 6.10 : *Development of embryo*

IDEA BOX

Look at your parents. Can you make out some characters that are similar to you. Try to find out with whom you resemble the most – the mother or your father?

You must be wondering, *what is the source of nourishment for developing embryo in mother's body*? Foetus requires following things for its development –

(i) Nutrients

(ii) Oxygen

(iii) Protection

It also needs to remove waste materials such as carbon dioxide, metabolic wastes from its body. The embryo receives nutrition and oxygen from the mother's blood via placenta. *Placenta* is a vascular tissue that is present in the inner lining of uterus. It is connected to foetus by the *umbilical cord*. Umbilical cord is a duct that connects foetus with placenta.

Function of placenta :-

(i) It protects embryo / foetus from entry of pathogen from mother's body.

(ii) It supplies oxygen from the mother to foetus and excretes CO_2 from foetus to the mother's blood.

(iii) It provides nutrients such as glucose, amino acids, lipid, vitamin etc to the foetus from mother's blood.

(iv) It helps in excretion of metabolic wastes, CO_2 and urea from embryo into mother's blood.

The developing foetus is protected by the uterus and a liquid called amniotic fluid. Amniotic fluid is present inside a bag called amnion.

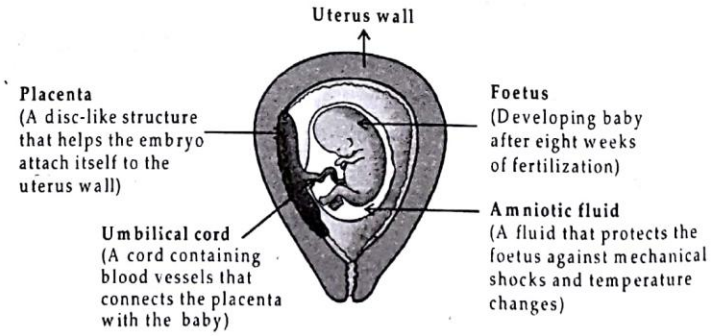


Fig. 6.12 : *Baby inside the womb*

So far you have learnt what happens if the egg inside a female body gets fertilized. But have you ever thought, *what happens to the egg if it does not get fertilized*. An ovary releases an egg every month. The process of release of an egg by an ovary is called *ovulation* and the cycle of producing and releasing mature eggs or ova is called the *menstrual cycle*. In a normal, healthy girl, ovulation takes place on the 14th day of the beginning of menstrual cycle of 28 days. This means that ovulation takes place in the middle of menstrual cycle because 14th day is the middle of 28 days. We have learnt that uterus prepare itself to receive the fertilized egg. During this, the inner lining of uterus get thickened and is supplied with blood from which growing embryo draws nutrition for its development. However, if an egg does not get fertilized, the inner lining of uterus breaks down slowly and is released out in the form of blood and mucous from the vagina. This process of releasing blood and mucous every month through the vagina is called *menstruation*. This is usually a 28 day cycle.

BIRTH CONTROL

The population of our country is increasing day by day. Although our country has sufficient food resources, but still many people do not get sufficient food for their large family due to poverty. It is therefore, very important for the couples who are in the reproductive stage of their lives to control the size of their families by practising family planning through birth control measures. A small family is always a happy family. Family planning can be done by practising birth control measures.

Birth control measures

Birth control can be done by preventing pregnancy in females. This prevention of pregnancy in females by preventing the process of fertilization is called contraception and the devices used are called *contraceptives*.

Birth control methods can be divided into four categories –

1. Barrier Methods
2. Chemical Methods
3. Intra-uterine Contraceptive Methods (IUDS)
4. Surgical Methods

1. **Barrier Methods –** In this method, physical devices such as condoms and diaphragm are used. Condoms are used by males while diaphragm is used by females. This prevents the sperms (male gametes) from meeting the ovum (female gamete) by acting a barrier between them. The use of condom protects a person from the sexually transmitted diseases such as gonorrhoea, syphilis and AIDS.

2. **Chemical Methods –** This involves the use of oral contraceptives. This is a very effective method of preventing pregnancy as long as the pills are taken at the right time. The female uses two types of pills.
   (i) Oral pills contain hormones that stop the ovaries from releasing ovum into oviduct.
   (ii) Vaginal pills contain chemicals called spermicides that kill the sperms.
3. **Intra-uterine Contraceptive Device (IUDS) –** It is very effective in preventing pregnancy. An example of Intra-uterine contraceptive device is a copper-T. It prevents the implantation of fertilized egg in the uterus.
4. **Surgical Methods –** This method is available for both males and females.
   (i) The surgical procedure carried out in males is called *vasectomy*. In this, a small portion of vas deferens is removed by surgical operation and both the cut ends are ligated properly. This method prevents the sperms from coming out.
   (ii) The surgical procedure carried out in females is called *tubectomy*. In this, a small portion of oviducts is removed by surgical operation and the cut ends are ligated. As a result, the ovum cannot enter into the oviducts.

CHECK Point

1. **A women is using copper-T for contraception. Will it protect her from sexually transmitted disease?**

CHECK YOUR ANSWERS

1. Copper-T cannot protect the women from acquiring sexually transmitted disease if her partner has such disease. It is a method of contraception for avoiding unwanted pregnancies and is placed inside the uterus by a doctor.

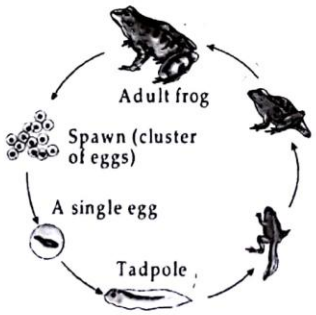


Fig. 6.13 : *Life cycle of a frog*

METAMORPHOSIS :

Look at the life cycle of a frog. The life cycle of a frog has three distinct stages.

Eggs ⟶ Tadpole ⟶ Frog

Does tadpole look like frog? What type of changes do tadpole undergo to form a frog?

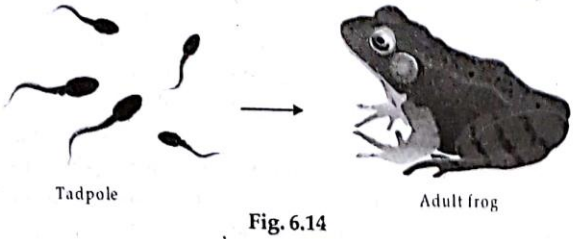


Fig. 6.14

Tadpoles look completely different from frog. The tadpole that emerges from the eggs contains gills, a tail and a small circular mouth. They can swim freely within the water. During its development, tadpole grows and undergo some abrupt changes in their structure and develops into mature frog. This process is known as *metamorphosis*. *Metamorphosis* is a biological process of transforming larva into an adult. The process involves relatively abrupt changes in the animal's structure through cell growth and development. The metamorphosis of tadpole begins with the development of limbs, lung development and finally the absorption of tail by the body. As a result of such changes, the tadpole gradually gets transformed into frogs.

In similar way, a beautiful butterfly emerges out of cocoon.

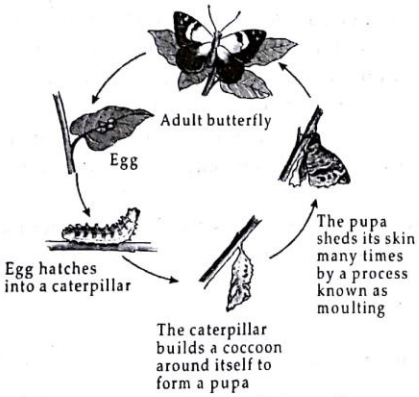


Fig. 6.15 : *Life cycle of a butterfly*

The caterpillar undergoes metamorphosis. It changes its colour and its body contract. As a result the tissues become fluid and begin forming organs of adult butterfly. Within few days, once the development is complete a beautiful butterfly emerges out of the pupal shell.

ASEXUAL REPRODUCTION :

Now, we have learnt reproduction in animals. *But what about small animals like Hydra and Amoeba? How do they reproduce?*

Animals such as *Hydra*, *Amoeba* etc. reproduces through asexual reproduction. Asexual reproduction does not involve fusion of male and female gamete. It requires only one parent. As a result, the offspring produced are genetically identical to each other and their parent. They are actually clones. *Clones* are group of genetically identical individual.

THINK IT OVER

What about the changes that we observe in our body as we grow? Do you think that we also undergo metamorphosis?

No, we humans do not undergo metamorphosis. In human beings, body parts similar to the adults are present from the time of the birth. There is no drastic and abrupt change. Therefore, one can say that metamorphosis does not happen in the humans.

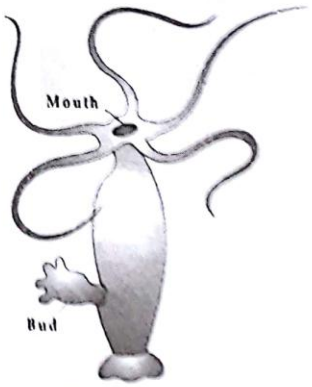


Fig. 6.16 : *Hydra*

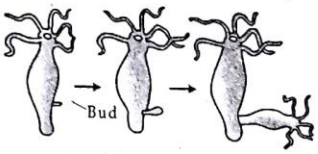


Fig. 6.17 : *Budding in Hydra*

Various mode of asexual reproduction in animals are –

1. **Budding :** *Look at the structure of Hydra. Can you see the bulges emerging from Hydra body? What are these bulges called?* These bulges are actually buds. In *Hydra*, the cells divide rapidly at a specific site and develop as an outgrowth called bud. These buds, while still attached to the parent body, develops into smaller individuals. When these individuals become mature enough, they detach from the parent body and develop as an independent individual. This type of asexual reproduction is known as *budding*. Hence, *Budding* involves the formation of new individual from the bulging of parent body. It is commonly seen in some plants, fungi and some animals such as yeast and *Hydra*.

   Yeast is a single-celled organisms that grows rapidly if sufficient nutrients are available to them. They reproduces through budding. When budding occurs in yeast cells, a small bulb like projections protrudes out. This projection is called bud. The bud grows and detaches from parent cell to form new yeast cell. The yeast cell grows and produces more yeast cells through the process of budding.

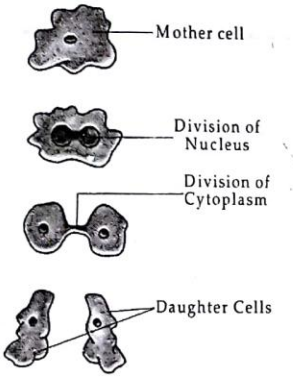


Fig. 6.18 : *Binary fission in Amoeba*

2. **Binary fission :** Binary fission is another type of asexual reproduction seen in bacteria and *Amoeba*.

   Amoeba is a single-celled organism. It begins the process of reproduction by the division of its nucleus into two nuclei. This is followed by the division of its body into two with each part receiving a nucleus. Finally, two *Amoebae* are produced from one *Amoeba*. The newly formed daughter *Amoeba* is genetically identical to each other and to the parent *Amoeba*.

   This type of asexual reproduction in which an animal reproduces by dividing into two individuals is called *binary fission*. (bi = two; fission = division).

   Apart from budding and binary fission there are other method of asexual reproduction that you will study in detail in your higher classes. Let us have a brief introduction of it.

Some common forms of asexual reproduction are –

(1) **Gemmules (Internal buds) –** In this form of asexual reproduction parent releases a specialised mass of cells that can develop into offspring. Sponges exhibit this type of reproduction.

(2) **Fragmentation –** In this type of reproduction, the body of the parent breaks into distinct pieces, each of which can produce an offspring. Planarians exhibit this type of reproduction.

Fig. 6.19 : *Gemmules in Sponges*

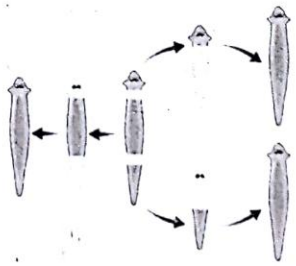


Fig. 6.20 : *Fragmentation in Planarians*

(3) **Regeneration** – In regeneration, piece from a parent gets detached, which grows and develop into a completely new individual. *Hydra* exhibit this type of reproduction.

(4) **Parthenogenesis** – This type of reproduction involves the development of an egg that has been fertilized into an individual. Animals like wasps, bees and ant reproduce by this process. If an egg gets fertilized, it will develop into a female. A non-fertilized egg may develop into a male.

Advantages of asexual reproduction

(1) Asexual reproduction is advantageous to certain animals that remains in one particular place like *Hydra*, Planaria and animals that are unable to look for mates.

(2) It also produces numerous offspring without costing the parent a great amount of energy or time.

Disadvantages of asexual reproduction :

Asexual reproduction lacks genetic variation. All of the organisms that reproduces asexually are genetically identical and therefore share the same weaknesses. If the stable environments changes, the consequences could be deadly to all of the individuals.

CHECK Point

1. **Why offspring are identical to one another and to their parent in asexual reproduction?**

CHECK YOUR ANSWERS

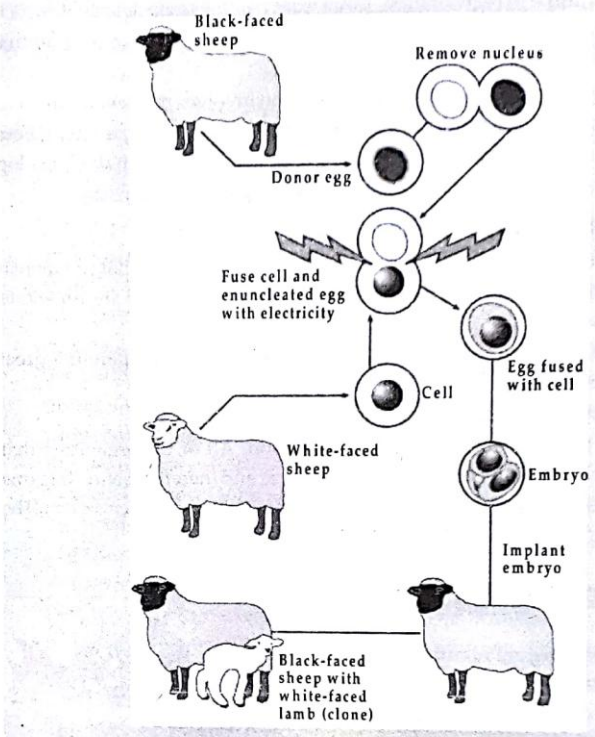
1. In asexual reproduction, the offspring come from the same parent. So they are identical to one another and to their parent.

KNOWLEDGE ENHANCER

CLONING

Cloning is the process that is used to create an identical (exact) copy of a cell, tissue or a complete organism. It was successfully performed for the first time by Ian Wilmut and his colleagues at the Roslin Institute in Edinburgh, Scotland. They successfully cloned a Scottish sheep named *Dolly*. Dolly was born on 5th July 1996 and was the first mammal to be cloned from adult somatic cell. During the process of cloning of Dolly, somatic cells was collected from the mammary gland of a female Finn Dorsett sheep. Simultaneously, an egg was obtained from a Scottish black face ewe. Then they transferred the nucleus from the cell from Finn Dorsett sheep to the egg of the Scottish black face ewe. After few days, the egg with new nucleus started behaving like a normal fertilized zygote, which gradually developed into an embryo. This embryo was then surgically implanted into the uterus of a surrogate mother, which finally gave birth to a lamb called Dolly.

Fig. 6.21 : *Cloning of Dolly*



Though Dolly was given birth by the Scottish black face eve, it was found to be identical to the Finn Dorsett sheep from which the nucleus was taken.

Dolly was a healthy lamb and produced several offspring of her own through sexual means. Unfortunately, Dolly died on 14th February 2003 due to certain lung disease.

- *Reproduction* is the biological process through which a living organism produces offspring that are similar to themselves.
- *There are two modes of reproduction* –
  - *Sexual reproduction* – Reproduction resulting from fusion of male and female gametes.
  - *Asexual reproduction* – Reproduction in which only a single parent is involved.
- The male reproductive organs include testes, epididymis, vas deferens, urethra, penis and accessory glands like seminal vesicle and prostate gland.
- The female reproductive organs include ovaries, oviducts, uterus and vagina.
- The testes produce male gametes called sperms while the ovary produces female gametes called ova.
- The process of fusion of male and female gamete is called fertilization.
- The fertilized egg is called zygote.
- *There are two types of fertilization* –
  - *Internal fertilization* – Fertilization that takes place inside the female body is called *internal fertilization*.
    Eg. – Human beings, hens, cows, dogs.
  - *External fertilization* – Fertilization that takes place outside the female body is called *external fertilization*.
    Eg. – Frogs, fish and starfish.
- Animals such as humans, cow, etc., which give birth to young ones are called *viviparous* animals.
- Animals such as hen, frog, lizard, etc., which lay eggs are called *oviparous* animals.
- Placenta is a vascular tissue that is present in the inner lining of uterus. It is connected to foetus by umbilical cord.
- *Umbilical cord* is a cord containing blood vessels that connects the placenta with the baby.
- The process of release of an egg by an ovary is called *ovulation*.
- The process of releasing blood and mucous every month through the vagina is called menstruation. It is usually a 28 day cycle.
- The transformation of the larva into adult through drastic changes is called *metamorphosis*.
- In asexual reproduction, the offspring come from the same parent. So they are identical to one another and to their parent.
- *Clones* are group of genetically identical organisms derived from a single individual by some kind of asexual reproduction.
- Budding in yeast and binary fission in *Amoebae* are two types of asexual reproduction.

exercise 1

FIB FILL IN THE BLANKS :

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

1. The type of reproduction in which only single parent is involved is called _____ reproduction.
2. Animals which give birth to young ones are called _____ animals.
3. Animals which lay eggs are called _____ animals.
4. The type of reproduction in which both male and female animals take part is called _____.
5. The fusion of ovum and sperm is called _____.
6. The fertilized egg is called a _____.
7. The male gamete is called _____.
8. The female gamete is called _____.
9. The zygote divides repeatedly to form an _____.
10. The embryo gets embedded in the wall of _____ for further development.
11. *Amoeba* reproduces by the process of _____.
12. In humans, fertilization occurs in _____.
13. An ovum is _____ celled.
13. The process in which a bud appears on the body wall of certain organism that grows into a full organism is called _____.

T/F TRUE & FALSE :

DIRECTIONS : *Read the following statements and write your answer as true or false.*

1. In frog fertilization occurs inside the body.
2. Fertilization is the product of fusion of egg nucleus and sperm nucleus.
3. In asexual reproduction the offsprings are not completely identical to the parent.
4. Fertilization of ova in human female occur in the vagina.
5. Placenta protects the embryo from entry of pathogen from mother's body.
6. In internal fertilization large number of eggs are produced.
7. Budding in *Hydra* in a process of asexual reproduction.
8. Umbilical cord connects to the placenta with the baby.
9. Head portion of human sperm carries genetic material for cell reproduction.
10. Binary fission is a type of sexual reproduction.

MTF MATCH THE FOLLOWING :

DIRECTIONS : *Each question contains statements given in two columns which have to be matched. Statements in column I have to be matched with statements in column II.*

1.

Column-I (Functions)	Column-II (Parts)
A. Testes	p. Produces tiny sperm cells
B. Epididymis	q. Transfer sperm to vagina of females
C. Vas deferens	r. Lubricates the sperm
D. Urethra	s. Storage and nourishes the sperm
E. Penis	t. Transfer sperm from epididymis to urethra
F. Prostate gland	u. Carries urine and sperm

2.

Column-I (Parts)	Column-II (Function)
A. Ovary	p. Produces ovum.
B. Oviduct	q. Carries ovary to uterus
C. Uterus	r. Contains developing foetus
D. Vagina	s. Receives penis during sexual intercourse.

VSAQ VERY SHORT ANSWER QUESTION :

DIRECTIONS : *Give answer in one word or one sentence.*

1. Define fertilization.
2. Where does internal fertilization occurs?
3. In which type of asexual reproduction, an animal reproduces by dividing into two individuals?
4. Write the name of the process by which a tadpole develops into an adult.
5. Name three reproductive organs found in females.

6. Name reproductive organs found in males.
7. What is zygote?
8. What is vasectomy?
9. What is ovulation?
10. What is a gestation period?
11. What is metamorphosis?
12. What is a test tube baby?
13. Expand IVF.
14. Define cloning.
15. Expand IUDS.
16. Name the methods of birth control.
17. What is the name of young one of frog?
18. Write the process by which planaria does reproduction.
19. Write the name of the process by which sponges reproduce.

SAQ SHORT ANSWER QUESTION :

DIRECTIONS : *Give answer in 2-3 sentences.*

1. What is parthenogenesis? Give example of pathenogenesis.
2. What is parturition?
3. What is budding? Give two example of budding.
4. What is the functions of testis?
5. What is implantation?
6. What do you understand by embryonic nutrition?
7. What are the disadvantages of asexual reproduction?
8. What is the barrier method of control birth?
9. What is the function of ovary?
10. Write about the development of butterfly.
11. What is cloning? Write the name of first cloned animal.
12. What do the sperms do after being released?
13. What is external fertilization? Give examples.
14. What is internal fertilization? Give examples.
15. Write difference between external and internal fertilization.
16. Write the functions of placenta?
17. Write the differences between viviparous and oviparous.
18. Write a short note on menstruation.
19. Describe the path that sperm take while leaving the body.
20. Describe two structural differences between a mature sperm and a mature egg.
21. What is the main advantage of sexual reproduction over asexual reproduction.

LAQ LONG ANSWER QUESTION :

DIRECTIONS : *Give answer in 4-5 sentences.*

1. Diagrammatically explain the development of embryo in uterus.
2. Describe the various types of asexual reproduction in animals.
3. Explain the life cycle of a frog with proper diagram.
4. Explain the process of fertilization in humans.

exercise 2

MCQ MULTIPLE CHOICE QUESTIONS :

DIRECTIONS : *This section contains* **24** *multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.*

1. Which of the following is hemaphrodite animal?
(a) Bear (b) Tiger
(c) Leech (d) Wolf

2. Which hormone is secreted by males?
(a) Oestrogen (b) Progesterone
(c) Testosterone (d) Pituitary

3. A sperm is a
(a) Multi celled (b) Single celled
(c) Multi layered (d) Single layered

4. Which organ releases sperm?
(a) Vas deferens (b) Testes
(c) Scrotum (d) Urethra

5. Parthenogenesis occurs in which of the following animals?
(a) Sheep (b) Sponges
(c) Ant (d) Hydra

6. Which is not a part of female reproductive system?
(a) Uterus (b) Vagina
(c) Urethra (d) A pair of ovaries

7. Which part of sperm gives or provides energy for movement of sperm?
(a) Head (b) Middle piece
(c) Tail (d) All the above

8. The genetic information is carried by which part of the sperm?
(a) Tail (b) Middle piece
(c) Head (d) None of these

9. An ovary is large due to presence of
(a) Yolk (b) Water
(c) Air (d) Minerals

10. Which hormone is responsible for secondary sexual character in females?
(a) Testosterone (b) Oestrogen
(c) Thyroxine (d) Pituitary

11. Another name for oviduct is
(a) Cervix (b) Seminal vesicles
(c) Prostate gland (d) Fallopian tube

12. Which of the following connects foetus with placenta?
(a) Umbilical cord (b) Amniotic fluid
(c) Wall of uterus (d) Fallopian tube

13. Which of the following is an unisexual animal?
(a) Tiger (b) Earthworm
(c) Leech (d) Tape worm

14. The function of copper T is to prevent
(a) Fertilization (b) Egg maturation
(c) Ovulation (d) Implantation of blastocyst

15. Where does fertilization occur in mammals?
(a) Uterus (b) Fallopian tube
(c) Vagina (d) Cervix

16. Which type of fertilization is found in frogs?
(a) External, in water (b) Internal, in abdomen
(c) External, in uterus (d) Internal, in epididymis

17. If an organism is a diploid (or $2n$) with 16 chromosomes, then how many chromosomes its sperm cells or egg cells will contain?
(a) 8 (b) 16
(c) 32 (d) 64

18. The vas deferens connects the epididymis to the
(a) Seminal vesicles (b) Urethra
(c) Testes (d) Prostate gland

19. After sperm move through the vas deferens, they enter the
(a) Seminal vesicles (b) Urethra
(c) Urinary bladder (d) All the above

20. A sperm tail consists of
(a) A nuclues (b) Mitochondria
(c) Flagellum (d) Golgi body

21. A zygote is a/an
(a) Implanted fertilized egg
(b) Fertilized egg
(c) Ovulated egg
(d) Blastocyst

22. How many chromosomes does a mature human sperm cell contain?
(a) 1 (b) 2
(c) 23 (d) 46

24. Which structure is cut and tied off in a vasectomy?
(a) Penis (b) Epididymis
(c) Urethra (d) Vas deferns

MTOC MORE THAN ONE CORRECT

DIRECTIONS : *This section contains* **5** *multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which MORE THAN ONE may be correct.*

1. The developing foetus is protected by the
   (a) Uterus (b) Vagina
   (c) Amniotic fluid (d) Umbilical cord
2. External fertilization occurs in
   (a) Star fish (b) Dog
   (c) Birds (d) Elephant
3. Which of the following statements is correct about asexual reproduction?
   (a) It involves uniparental reproduction
   (b) It involves generally biparental reproduction
   (c) Daughter produced are genetically identical to the parental cell
   (d) Daughter produced are genetically different from the parental cell
4. Which of the following statements is correct?
   (a) Ovaries secrete female sex hormones, estrogen.
   (b) Uterus is the site of foetal growth during pregnancy.
   (c) Oviduct is involved is conduction of ovum towards uterus
   (d) Epididymis is involved in storage, nutrition and maturation of ova
5. Sexually reproducing organism is
   (a) Monkey (b) *Hydra*
   (c) *Amoeba* (d) Cat

FTP FILL IN THE PASSAGE

DIRECTIONS : *Fill in the blank spaces in the given passage about reproduction of animals.*

Sexual reproduction involves the production of _____ and _____ gametes either by the same parent or by different parents. When the two opposite types of gametes are produced by the same individual, it is regarded as _____. When male gametes are produced from the male parent and the female gametes are produced from female parent, the parents are regarded as _____.

During the process of sexual reproduction the male and female gametes fuse together to form the _____, which develops into a new organisms. The process of sexual reproduction is _____ as compared to asexual reproduction. The offsprings produced by the fusion of male and female gametes are not exactly _____ to the parents or among themselves.

PBQ PASSAGE BASED QUESTIONS

DIRECTIONS : *Study the given paragraph and answer the following questions.*

Reproduction is defined as the production of individuals of same species, that is the next generation of the species. While it is one of the fundamental characteristics of living things, it is not an essential life process. An individual can live without reproducing but a species cannot survive without reproduction.

Reproduction is thus essential for continuation of the species. It ensures that the genetic material of one generation is transmitted to the next. Each generation also produces more offspring for the next generation. This is because many individuals die due to various reasons like disease, competition genetic factors, etc before reaching the reproductive age. Thus, reproduction ensures that there is competition and only the fittest and the best survive and reach the reproductive age. This ensures that the advantageous are transmitted to the next generation.

1. Why different species produce more offsprings?
2. What are the main reasons of death of different individuals?
3. Why reproduction is so important?
4. In reproduction which type of species will survive?

A&R ASSERTION & REASON:

DIRECTIONS : *Each of these questions contains an Assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) If both **Assertion** and **Reason** are **correct** and Reason is the **correct explanation** of Assertion.

(b) If both **Assertion** and **Reason** are correct, but Reason is **not the correct explanation** of Assertion.

(c) If **Assertion** is **correct** but **Reason** is **incorrect**.

(d) If **Assertion** is **incorrect** but **Reason** is **correct**.

1. **Assertion :** In asexual reproduction, only one parent is needed to produce a new organism.
   Reason : Regeneration is a type of asexual reproduction.
2. **Assertion :** Asexual reproduction takes place in some unicellular and multicellular organisms
   Reason : Binary fission in *Amoeba*, budding in *Hydra*, regeneration in *Hydra* are some examples of asexual reproduction.

3. **Assertion :** Gametes are formed in gonads.
   Reason : Gonads are haploid in nature.
4. **Assertion :** The honey bee queen copulates only once in her life time.
   Reason : The honey bee queen can lay fertilized as well as unfertilized eggs.
5. **Assertion :** Condom is used to prevent the sperms from meeting the ovum.
   Reason : Condom is an example of chemical method of birth control.

MMQ MULTIPLE MATCHING QUESTIONS

DIRECTIONS : *Each question has four statements (A, B, C and D) given in Column I and five statements (p, q, r, s and t) in Column II. Any given statement in Column I can have correct matching with one or more statement(s) given in Column II. Match the entries in column I with entries in coluran II.*

1.

Column I	*Column II*
(A) Budding	p. Wasps
(B) Parthenogenesis	q. *Planaria*
(C) Regeneration	r. *Hydra*
(D) Fragmentation	s. Yeast
	t. Ants

HSQ HOTS SUBIECTIVE QUESTIONS :

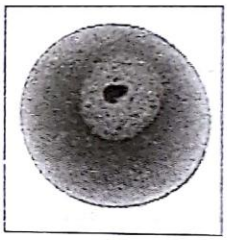
DIRECTIONS : *Answer the following questions.*

1. Collect information about first test tube baby of the world.
2. Why cows always produce one baby, whereas dog produces more than one puppies at a time?
3. Why most of the twins are similar?
4. Some twins are identical but some twins are non-identical. What is the reasons behind it?
5. Can you determine the sex of foetus while inside the mother's womb? Explain.
6. Visit a poultry farm near to your home and observe the steps of development of eggs to chick.
7. How does a leech do reproduction?
8. What is "parental care"? Give some idea about parental care with different examples?
9. Production of sperms requires low temperature. How is it accomplished in human body.
10. What is colostrum? Why is colostrum essential for an infant.
11. An ovum allows the entry of only one sperm at a time. Why?
12. Collect information about amniocentesis? Why it is necessary to ban amniocentesis.
13. Why umbilical cord is called as life line of developing baby?

PBQ PICTURE BASED QUESTIONS

DIRECTIONS : *Study the given picture(s) and answer the following questions.*

1. Identify the picture. Where it is found?



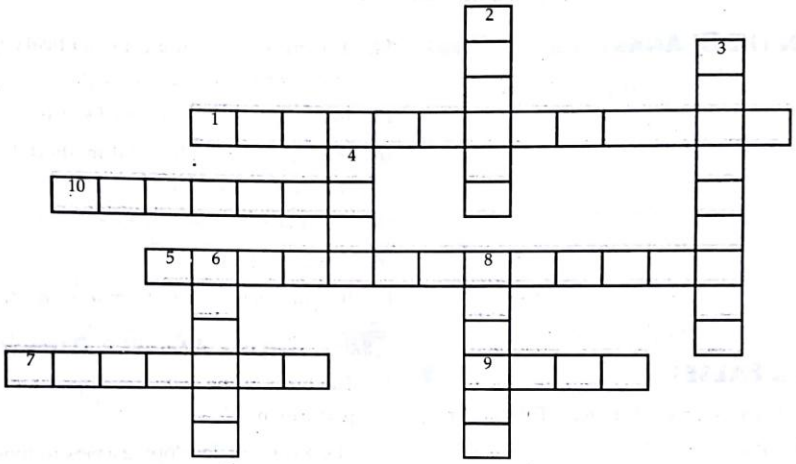
2. What is the importance of given figure in reproduction?

3. Write the name of organism and type of reproduction.

FUN TIME

CROSSWORD PUZZLE

DIRECTIONS : *Complete the crossword-puzzle on reproduction of animals.*



Across

1. Transformation of the larva into an adult through drastic changes.
5. The process of fusion of ovum and sperm.
7. Onset of sexual maturity
9. The female gamete produced by ovary
10. An organ which extends from penis to external opening

Down

2. An organ that contains developing foetus.
3. Animals that lays eggs
4. The part of female reproductive organ which receives penis
6. Developing structure formed by the division of zygote
8. Fertilized egg.

SOLUTIONS

BRIEF EXPLANATIONS OF SELECTED QUESTIONS

FIB FILL IN THE BLANKS :

1. Asexual
2. Viviparous
3. Oviparous
4. Sexual reproduction
5. Fertilization
6. Zygote
7. Sperm
8. Ovum
9. Embryo
10. Uterus
11. Binary fission
12. Fallopian tube
13. Single
14. Budding

T/F TRUE & FALSE :

1. False; 2. True; 3. False; 4. False; 5. True; 6. False; 7. True; 8. True; 9. True; 10. False.

MTF MATCH THE FOLLOWING :

1. A-p, B-s, C-t, D-u. E-q, F-r
2. A-p, B-q, C-r, D-s

VSAQ VERY SHORT ANSWER QUESTION :

1. The process by which sperm fuse with an ovum to form a single cell zygote is called fertilization.
2. Inside the female body.
3. Binary fission
4. Metamorphosis.
5. Ovary, Oviduct and Uterus.
6. Testes, Sperm duct and Penis.
8. The surgical procedure carried out in males.
9. The process of release of egg from ovary is called ovulation.
10. Duration of complete embryonic development starting from implantation up to the parturition.
11. The process of developing larva to adult.
13. In vitro fertilization.
14. The process of forming an identical copy of cell, tissue or organism, is called cloning.
15. Intra-uterine contraceptive Device.
16. Barrier method, chemical method, Surgical method, Intra-uterine contraceptive device.
17. Tadpole
18. Fragmentation
19. Budding or Gemmule formation inside the body.

SAQ SHORT ANSWER QUESTION :

2. The birth of the fully developed foetus is termed as parturition.
3. The process of developing a new individual from buds, is called budding. The examples are hydra and yeast.
6. The attachment of the embryo with the uterus is called implantation.
7. The foetus requires nutrients & oxygen for development.
9. Function of ovary is to produce ovum, and produce hormone called oestrogen.
10. The process is known as metamorphosis. First the colour and body structure changes. The tissues become fluid and then development of adult butterfly starts.
12. The sperms swim in the oviduct to rich the egg. When they rich the egg one of the sperm may fuse to egg to form zygote.
16. The main function of placenta is to protect the foetus and give nourishment to the child.
19. Testes → Epididymis → Vas deferens → Urethra → Vagina → Cervix → Uterus → Fallopian tube
20. Sperm is microscopic, motile and flagellated while ovum is larger, non-motile, spherical and food-laden cell.
21. Sexual reproduction brings about variation in individual. Also, it ensures survival of species in a population.

EXERCISE 2

MCQ MULTIPLE CHOICE QUESTIONS :

1. (c)	2. (c)	3. (b)	4. (b)
5. (c)	6. (c)	7. (b)	8. (c)
9. (a)	10. (b)	11. (d)	12. (a)
13. (a)	14. (d)	15. (b)	16. (b)
17. (a)	18. (a)	19. (b)	20. (c)
21. (b)	22. (c)	23. (d)	

MTOC MORE THAN ONE CORRECT

1. (a, c)	2. (a, c)	3. (a, c)	4. (a, b, c)
5. (a, d)			

FTP FILL IN THE PASSAGE

1. Male	2. Female gamete
3. Bisexual	4. Unisexual
5. Zygote	6. Slow
7. Identical	

PBQ PASSAGE BASED QUESTIONS

1. Because most of the individuals dies before reaching the mature age.
3. Reproduction is the fundamental characteristics of living organisms. Without reproduction no species will survive or appear on the earth.
4. Individuals which are fittest will survive in competition of reproduction.

A&R ASSERTION & REASON :

1. (b)	2. (a)	3. (c)	4. (b)
5. (c)			

MMQ MULTIPLE MATCHING QUESTIONS

1. (A) - (r) (s); (B) - (p), (t); (C) - (q), (r); (D) - (q)

HSQ HOTS SUBIECTIVE QUESTIONS :

1. Test tube baby was first seccessfully invented by the scientists of Great Britain.

   On July 25, 1978 first successful test tube baby was born. It was a girl child. Her name was Louise Brown.

4. The identical twins are produced when the embryo splits into two in the early stages of its development. This produces two identical children of the same sex. Some identical twins looks so alike that they can only be differentiated by their finger prints. Only one in 83 pregnancies results in twins.

   Non-identical twins are produced when the two eggs are released at the same time and both are fertilized. They can be of same sex or different sex.

6. The sex determination of foetus can be done by the process called sonography. It is also called ultrasound. Ultra-sound is cyclic sound pressure with a frequency greater than the upper limit of human hearing. This limit varies from person to person, it is approximately 20 kilohertz in healthy, young adult. The production of sound is used in many different fields, typically to penetrate a medium and measure the reflection signature or supply focused energy. The reflection signature can reveal details about the inner structure of the medium.

8. Leech has both male and female reproductive organ. It produces both testes and ovaries respectively. Leech produces by reciprocal fertilization and sperm transfer occurs during copulation. The leech excercising the role of male will grow a sperm sack near the end of its tail and the leech playing the female will bit off. Leech use a organ called clitellum to hold their eggs and secrete the cocoon.

9. Parental care is the process of caring childs from infancy to childhood.

   Parental care mostly persists in amphibians, reptiles birds and fishes.

   Parental care are 2 types

   – Internal parental care

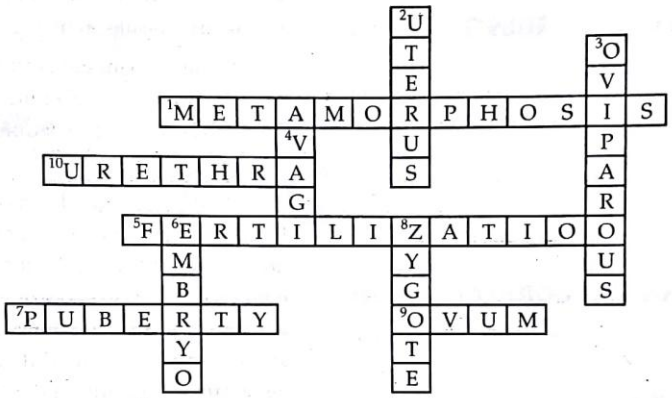
   – External parental care

   In most of the egg laying organisms the females give birth to eggs and male one looks after the eggs. The parental care typically involves guarding the eggs from predators, fanning the eggs with increase oxygen supply and clearing the eggs to eliminate fungus. Reptiles like crocodile, turtles build nest for caring their child.

PBQ PICTURE BASED QUESTIONS

1. Ovum; 2. Fertilization; 3. Budding in Hydra

Fun TIME



Across

1. Metamorphosis
5. Fertilization
7. Puberty
9. Ovum
10. Urethra

Down

2. Uterus
3. Oviparous
4. Vagina
6. Embryo
8. Zygote