Chapter-15

Natural Resources and Agriculture

We know that earth is the only planet where life exists. Temperature, water and food are required for life. To fulfil the basic needs of all living forms on the earth, energy from the sun and the resources available on earth are required. We fulfil our needs from air, water, soil, plants, animals etc. present in the nature. Man uses these gifts of nature in the form of resources. Actually, even man is a resource because develops other resources using his knowledge. Any physical substance becomes a resource when man considers it to be of some importance and some value is added to it. The value may be economic, moral or aesthetic. All the substances obtained from nature which used by other organisms, along with humans, are known as natural resources. They include air, water, soil, minerals, fossil fuel, plants and animals.

15.1 Significance of Air, Water and Soil :

There is a thick cover of atmosphere all around the earth. It stretches for a height of 300km from the earth's surface. 92% of its air, however, is present upto the height of 20 km.

Various gases are present in it in different proportions. 78.09% of the atmosphere by volume consists of Nitrogen, 20.95% of oxygen, 0.03% of carbon-di-oxide and 0.00006% of Hydrogen. Apart from these gases Argon, Neon,Helium etc. are the other gases present in the atmosphere.

The gases present in the atmosphere are very essential for plants and animals. In nature cycles of oxygen, nitrogen, carbon-di-oxide etc. operate between the atmosphere, soil and living beings and maintains a balance. Evay living organism uses oxygen. Plants use the carbon-di-oxide from atmosphere in the process of photosynthesis to prepare food. Similarly even nitrogen is essential for photosynthesis. The bacteria and blue-green algae present in soil and plant tissue fix the atmospheric nitrogen and increases the fertility of the soil. Atmosphere is a bad conductor of heat and covers the earth like a blanket. Thus keeping the earth's average temperature constant.

Of all the substances present on the earth's surface water is most abundant. More than 70% of the earth's surface is submerged with water. Most of the water of the earth's surface is present in the oceans and seas. This water is saline. Non-saline, i.e. fresh water is present on the poles, as underground water, in the rivers, lakes, ponds etc. Water is an essential component of the protoplasm of the living cells. Water is a universal solvent in which various nutrients dissolve and enter the plant body. All the metabolic reactions occurring in the cell take place in the aqueous media. Thus all the life-processes of organisms depend on water. Apart from this growth, types of plant communities and their distribution are also controlled, to a large extent, by water.

Soil is the upper fertile layer of land. It is formed by the weathering of rocks. The organic substances formed by the decay of remains of plants and animals by microorganisms mix with these particles of rocks and form the actual soil. The black coloured organic substances produced by the decay of dead parts of plants and animals by the microorganisms are termed as **Humus**. Humus is the store-house of the plant nutrients. Plants obtain nitrogen (N), phosphorus (P), potassium (K), calcium (Ca) and other minerals and salts from the soil.

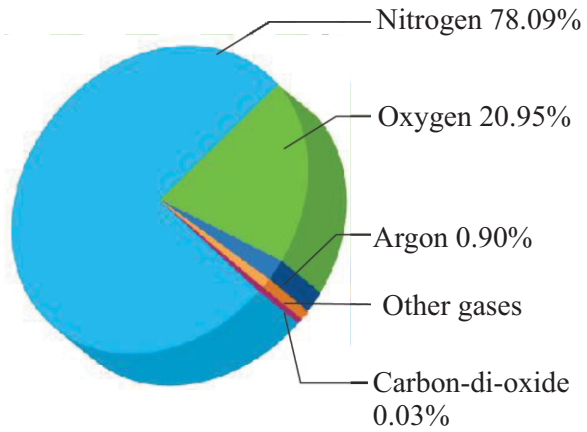

Fig. 15.1 Composition of Air

15.2 Movement of Air :

Of the various atmospheric factors, wind is an important factor which affects organisms, especially in the plains, sea-shores and high-mountains. Due to difference in air pressure on the earth surface movement is produced in the air which is termed as the **wind**. The reason for difference in air pressure is unequal heating. Equatorial regions produce more heat as compared to the northern and southern regions. This results in low air pressure in the Equatorial Regions, and the wind blows from the poles to the equator. According to the location the movement of air depends on various factors like geographical position, topography, height and distance from the sea, density of vegetation etc. Wind affects the plant life directly and indirectly.

The branches of trees fall off due to the fast blowing winds. Flow of winds in the same direction for long durations brings about permanent changes in the basic shape of the plants. Fast blowing winds blow away the top soil from the ground and make it barren. **Anemometer** is used to measure the velocity of wind.

15.3 Pollution :

Environmental pollution is a much talked about topic on social media like television, newspaper and seminars, science magazines, other magazines and periodicals etc. In the contemporary era it is a very serious and alarming problem created by modern civilization. It has turned out to be a global problem.

The dictionary meaning of pollution is "to make impure or dirty" "desecrate (i.e. spoil something that is valued or respected)" "to pollute" etc. According to a simple definition, "pollution is the unwanted-for or undesired change in the chemical or biological properties of air, water and soil, which is very harmful for the human life, ecology and natural resources.

Substances made by humans and thrown away after use, in nature, are the pollutants. Card-boards, metal, polythene bags, stones, pebbles, lime etc. left after construction of buildings, the fibers, wood shavings, iron-fitings, various herbicides and pesticides, exhaust of automated vehicles, industrial wastes etc. - all are the by-products of anthropogenic activities and are the pollutants.

Pollution are of the following types :

15.3.1 Air Pollution :

Sufficient amount of oxygen in the air is the result of photosynthetic activity of the nature. In dry air there is approximately 79% nitrogen, 20.9% oxygen, 0.03% carbon-di-oxide and rest part is of gases like neon, helium, krypton etc. The main source of oxygen required for respiration and the carbon-di-oxide for photosynthesis, is the atmosphere. Man is the main cause of atmospheric pollution. The chief air pollutants include carbon-mono-oxide, sulphur-di-oxide, hydrocarbon mixture, the suspended particulate matter present in the air, smoke and dust particles. The source of all these pollutants are coal burnt in industries and household, petrol, gas ovens, automated vehicles etc.

Fig. 15.2 Air Pollution

(a) Smoke : The smoke released on burning of coal and other natural fuels contain many oxides of sulphur. Sulphur-di-oxide is a harmful pollutant. It affects the mucous membrane of eyes, lungs and throat and causes many diseases. SO_2 enter the plants through stomata and forms sulphuric acid (H_2SO_4). This acid degrades chlorophyll. Lichens and Bryophytes are more affected by sulpher-di-oxide pollution. This gas kills them. Lichens are considered to be the **indicator** of this pollutant.

Smoke combines with fog and forms **smog**. In it the sulphur-di-oxide reacts with oxygen and forms higher oxides of sulphur which form sulphuric acid with

water. This acid corrodes the stones and walls of buildings. The acid formed by the pollutants released from the petroleum refinery at Mathura has increased the fear of corrosion of the marble of Taj Mahal.

Nitrogen-di-oxide (NO_2) released from the burning of fossil fuels oxidises to form Nitrate (NO_3) which forms nitric acid with water (HNO_3). The nitric acid thus formed comes down to the earth along with rain water. The rain containing nitric and sulphuric acids dissolved in its water is known as the **Acid Rain**. Acid rain increases the acidity of soil and thus destroy its fertility. It harms buildings, rail-roads, monuments, statues etc. by corroding them. Carbon-mono-oxide (CO) is formed by incomplete combustion of fuel. Approximately 50% of the total air pollutants is the carbon-mono-oxide. This gas enters the human body and combines with the haemoglobin in the blood. The rate of this combination is 210 times faster than the combination of oxygen with haemoglobin, therefore there is lack of oxygen in human body in the presence of carbon-mono-oxide. Other particulate contents of smoke like soot, tar, dust particles etc. reduces light. They gradually deposit on the earth, enters the animal body during respiration causing various diseases of respiratory tract including lungs. They also harm metal, painted surfaces, clothes, paper, leather etc.

(b) Automobile exhaust : Automobile exhaust consists of all the air pollutants about which we have studied in the preceeding paragraph i.e. smoke. This exhaust is responsible for 60% of the air pollution in today's world. On burning of 1000 gallon petrol approximately 3200 pound CO, 200-400 pound carbonic vapour, 20.75 pound oxides of nitrogen, 2 pound carbonic acids 2 pound ammonia and 0.3 pound solid carbon particles are released. 3-4, benzepyrene formed by incomplete combustion of hydrocarbons cause cancer. Oxides of nitrogen causes irritation in nose and the respiratory tract.

15.3.2 Water Pollution :

Water reservoirs, large fresh water lakes, ponds and rivers are the main sources of drinking water for man and animals. Most of the towns, big cities, and industrial townships are also settled near these water sources. The domestic and industrial affluents are released directly in these water bodies. Now water pollution is a big problem in developing and developed nations. These sources of water are polluted by various pollutants like sewage, detergents, herbicides and insecticides dissolved in water, industrial affluents containing dissolved organic and inorganic chemicals, harmful micro-organisms, soil sediments of rivers and rivulets deposited on the banks etc.

(a) Sewage : Mostly it contains the organic substances which are oxidized to carbon-di-oxide and water by micro-organisms. So if the quantity of sewage released in water bodies is not much, it will not get polluted. Most of the wastes are oxidized by bio-degradation. But if the quantity of sewage released is more, the population of micro-organisms will increase and the dissolved oxygen present in the water will not be enough for their respiration. Moreover the amount of dissolved carbon-di-oxide

Fig. 15.3 Water pollution

will increase. Fishes and other aquatic plants and animals will die because of lack of oxygen and the river or lake will gradually convert into a stinking pond or puddle.

By calculating the amount of oxygen used in unit volume of water in the given time, the quantity of organic pollutants can be inferred upon. This measurement is known as the **Biological Oxygen Demand (BOD)**.

The sewage released from leather industries, animal slaughter-houses, passenger-ships and boats etc. contains many infections micro-organisms which results in various diseases among human population like - Cholera, typhoid, jaundice etc. Sewage is a good source of nutrients for the aquatic organisms and make the water bodies eutrophic. This results in the rapid increase in the population of algae and the water reservoir, lake, river etc. get filled with the dense growth of these algae. This is known as the **algal-bloom**. As these algae die the bacteria decomposes them so that there is lack of dissolved oxygen in the water-body. This also increases the pollution. Many aquatic fishes and other animals and plants die under these anaerobic conditions.

(b) Release of liquid affluents by various industries : The liquid affluents of various industries like petro-chemical, fertilizers, oil-refinery, medicines, fibers, rubber, plastic etc. are hazardous pollutants. The affluents from these sources contain many toxic chemicals and acids in dissolved conditions. They pollute water and also pollute the ground water by perecolating down through the soil. The lake water gets polluted by these liquid affluents and the animals and plants present in such water bodies are also killed. Many severe diseases occur in animals and man consuming this polluted water. Many of these toxic substances are deposited in the body and are then passed on from one trophic level to the next in the food chain. Mercury and other toxic metals from chemical industries and the mining activities reach the rivers and then the oceans. Corrosion of automated boats also leads to the dissolution of mercury and lead in the water-body. It forms the toxic methyl-mercury which affects the nervous system of aquatic animals. The other metal-pollutant of water is lead (Pb). It reaches the water bodies by lead mining and corrosion of automated water boats and exhibits toxic effects by percolating down the food chain.

(c) Chemical fertilizers in the form of pollutants : Chemical fertilizers like urea, potash, diammonium phosphate etc. are used to increase the agricultural production. These fertilizers flow down to the water bodies and results in the formation of Algal blooms.

(d) Insecticides and fungicides : To destroy the insects and pathogens that harm the crop, various insecticides and fungicides are used on a large scale. DDT, an insecticide, is widely used in agriculture to destroy the harmful insects etc. Its excessive use over the years has proved to be a hazardous water and soil pollutant.

All these are non-degradable organic compounds. Their continuous use over the passage of time increases their concentration in soil and water. These chemicals also exhibit **bio-magnification**. Their concentration gradually increases in the organisms of higher trophic levels. When the concentration of DDT increases in the plant body their consumption by herbivorous organisms like insects, fishes etc. introduces them into the food chain. The more the consumption of these infested plants the higher will be the deposition of the chemicals in the herbivores from where they will be passed on to the next trophic level on

being consumed. This how is the concentration of these chemicals like DDT reaches toxic levels and becomes lethal. If these top carnivores, like the big fishes in an aquatic food chain, are consumed by humans they show harmful effects on the health. The polluted water is non-consumable and have a bad-smell. It at times, is not even fit for washing clothes or having bath etc. It has the pathogens of may diseases like typhoid, cholera, jaundice etc. These diseases are transmitted by polluted water.

15.3.3 Noise Pollution :

Sound is produced in many of the works performed by us. Conversation and music are good to listen to and we enjoy them. When the sound is undesirable and annoying it is termed as noise. When the sound intensity reaches levels that irritates us, we call it noise pollution. It is the intensity that differs between a whisper and the loud sound produced by the engines of an air craft. The intensity of sound is measured in terms of a unit called **Decibel**. This unit was proposed by the famous scientist Graham Bell. It is expressed by db. Sound at quiet places like libraries, radio-sound, recording room etc. ranges from 0 to 30 db. In the quiet study rooms and in our homes this sound is upto 50 db. In normal conversation also it is 50 db. The sound produced by trucks, buses etc. is of the range of 90 db. Machines at the industries produce 100 db sound while that produced by jet planes is 180 db.

The sound of intensity more than 80 db is a pollutant which is harmful for our hearing. We feel restless and disturbed by sound of 100 db intensity and that of 120 db or more produces severe headache. Intense sound destroy our physical environment. The supersonic jet which moves at a speed faster than sound leaves a trial of sound waves as it moves ahead. This is known as the **Sonic boom**. Sonic boom when collides with the earth surface weakend the buildings.

Noise hinders with the smooth conversation. It reduces our hearing power and disturbs our mental peace. The citizens, residing in over populated cities and industrial townships,

Fig. 15.4 Noise Pollution

where noise pollution is intense, loose their ability to listen at a very young age. Noise increases mental tension and the heart beat. Excessive noise is bad for liver and brain functioning. The sudden loud noise is all the more harmful for our health. It hampers the hearing ability and at times the person may even faint.

Noise is the cause of many harmful physiological effects to our body. The pupil expands by intense noise, the yellowing of skin may be observed, voluntary muscles may contract, secretion of digestive enzymes may be hampered, blood pressure increases, the quantity of adrenalin in the blood increases which results in increased tension in nerves and increases restlessness.

15.3.4 Soil Pollution :

The upper layer of land which is known as soil is affected by soil pollution. Mineral substances, organic substances, soil water and micro-organisms together make the soil. The ratio of these components is different in different types of soils. The physical, chemical and biological characters of each type of soil are definite. Hence unwanted change in the properties of soil is known as soil pollution.

Sources of Soil Pollution :

1. **Industry :** Various industries like the paper and pulp industry, oil refinery, industries preparing various chemicals, vanaspati ghee, sugar, liquor various power plants etc., are the main sources of soil pollution. Most of the industrial furnaces produce ash which pollutes the soil.

2. **Mining :** During various mining processes the topsoil and subsoil are removed forming deep pits. This is also accompanied by surface pollution of the nearby land.
3. **Agriculture :** Agriculture is directly influenced by the revolution in the field of chemistry. To increase the agricultural production the use of advanced seeds and better irrigation facilities is accompanied with use of fertilizers, insecticides, pesticides, weedicides etc. These chemicals pollute the soil to a large extent.
4. **Garbage :** Garbage includes domestic wastes such as paper, glass, cloth, iron and aluminium containers, plastic containers, polythene bags, pieces of rubber, leather, animal compost, wastes of building material etc. The garbage disposal is a big source of soil pollution.
5. **Radioactive substance :** Alpha and gamma radiations are emitted from the degradation of radioactive substances. The radioactive elements released during atomic tests enter the soil and pollute it.
6. **Dead organisms :** Soil is also polluted by the carpses of birds and other organisms thrown out in the open.

Effects of Soil Pollution :

1. To meet the ever growing demand of food of the ever growing population more production from crop-lands is required. To achieve this chemical fertilizers along with various fungicides, insecticides, weedicides etc. are used. These toxic chemicals kill even the beneficial microorganisms, as a result the process of natural soil formation (pedogenesis) stops.
2. The rate of photosynthesis slows down because of the insecticides, weedicides, fungicides etc. sprayed on the plants.
3. Regular irrigation and use of fertilizers increase the soil salinity and some of the unwanted elements increase in the soil. This disturbs the balance of various nutrients in the soil and reduces its fertility. In other words the land becomes barren.
4. Chlorine containing hydrocarbons like DDT; 2, 4-D; 2, 4, 5-T etc. are not degraded and hence accumulates in the soil. Along with water and minerals even these pollutants are absorbed by the plants and thus enter the food chain where they make various trophic levels poisonous.
5. Garbage not only reduces the aesthetic sense of the landscape but also results in pollution of the soil as well as atmosphere.
6. Explosions carried out during mining processes reduces the agricultural productivity of the adjoining areas.
7. Radioactive elements accumulate in the upper layer of atmosphere after the conduction of nuclear test. These come down to earth with rain water and pollute the soil and water bodies.

Management of Pollution :

Pollution is undoubtedly increasing in the atmosphere day by day. Following measures can be taken to reduce and regulate the atmospheric pollution :

1. The masses at different levels of the society will have to be made vigilant towards this problem by educating and making them aware of the methods of conservation using interesting media, picture books, posters, movies, videos, articles, T.V. programmes, dance-drama depicting environmental pollution and conservation strategies etc. For the purpose various seminars and functions should be organized. The youth of the country should come forward for the purpose and make important contributions in the direction.
2. Various pollution regulation systems and curriculum based on conservation of natural resources should be made compulsory for all the classes at school and college level.
3. Every country should take controlled care of various aspects of atmosphere so that even the new pollutants can be

known, timely, and controlled immediately.

4. The inflammable solid wastes should be burnt in large furnaces made for the purpose. The gases released on burning them should be well treated to reduce their polluting effect before letting them escape in the environment.
5. Solid pollutants like sewage, dung, remains of plants and animals etc. should be buried deep under soil in large pits, away from the residential areas. After some time they will degrade and will convert into humus which can be used for agricultural purpose.
6. Non-flamable solid wastes like ash, glass, PVC metal etc. should be broken down into pieces and should be used to fill pits in barran lands.
7. Automated vehicles which are not based on fossil fuels should be encouraged. Catalytic converters should be used in vehicles using fossil fuels like petrol, diesel etc. Special devices should be used in the fire-place and chimneys of industries to purify the escaping gases to some extent for example - scruber, cyclone separators, electro-static precipitators etc.
8. Unmindful use of fertilizers, insecticides, weedicides etc. should be banned.
9. Use of wood as a fuel should be completely banned. Heavy penalties should be imposed against cutting of trees.
10. Use of paper disposables and card board cartons should be banned.
11. Use of detergents should be discouraged and use of soap for cleaning clothes should be promoted.
12. Use of plastic disposables and polythene bags should be banned and the plastic containers, bottles etc. should be recycled and reused.
13. The affluents from cities and industries should not be released in water bodies.
14. Unnecessary use of horns in vehicles should be avoided. The devices used to amplify sound intensity and to transmit it to distances should be banned. Sound absorbers should be used in auditoriums and use of ear-plugs should be compulsory for workers in the industries.

15.4 Light and Radiation :

Light is essential for living organisms. It affects many physiological processes in the plants, directly (for example transpiration, photosynthesis, plant movements etc.) and indirectly (respiration, absorption, growth, plant hormones etc.). Light plays an important role in development and expansion of vegetation and controlling the species composition. Sun light is the main source of energy in nature. Green plants synthesize food with the help of light by the process of photosynthesis. This food is the basis of bio-energy in the bio-sphere.

The part of radiant energy or electromagnetic rays of the sun which forms the visible spectrum is known as the visible light. The radiations reaching the earth from the sun are of the wavelength range 300nm to 1000 nm. Of these only the radiations in the ranging from of 390 nm to 760 nm are visible to eyes i.e. the radiations of wavelength 390 nm to 760 nm are known as the visible light. On passing through a prism the visible light scatters into light of different wavelengths for example violet (390 nm-430 nm) indigo (430nm-470 nm) blue (470 nm- 500 nm), green (500 nm- 580 nm) yellow (580 nm- 600 nm), orange (600 nm- 650 nm) and red (650 nm- 760 nm). The radiations of wavelength less than violet color are known as the **ultra-voilet** rays while those having wavelength more than red are the **infra-red** radiations. The light radiations having lower wave length have more quantum energy while those with bigger

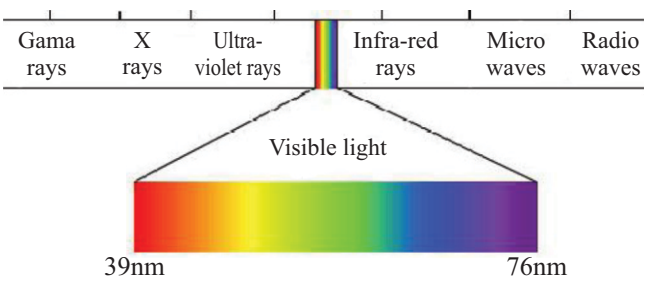

Fig. 15.5 Light Radiations

wavelengths have lesser energy.

15.5 Manure and Fertilizer

Like food is essential for the development, growth and health of human being, so are the nutrient substances essential for the growth of plants. Plants obtain their nutritive substances from the air, water and soil. 16 nutritive elements are essential for plants. Carbon and oxygen are obtained from the atmosphere, water provides for the hydrogen and oxygen and the remaining 13 elements are obtained from the soil. Out of these 13 elements, 6 nutrients are required in greater quantity and are known as the **macro nutrients** while the remaining seven are required in very small amount and are known as the **micro nutrients**. Deficiency of these elements affects various physical processes of the plant including reproduction, growth and resistance towards various diseases. To increase production these elements are to be added to the soil in the form of manure and fertilizers. Various elements obtained from air, water and soil are as under :

Air - Carbon and oxygen

Water - Hydrogen and oxygen

Soil- (i) **Macro nutrients** : Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur

Micro nutrients : Iron, Manganese, Boron, Zinc, Copper, Molybdenum, Chlorine.

15.5.1 Manure :

The amount of organic substances is more in manure. It is prepared by the decomposition of dead plant parts and animal wastes. Manure replenish the soil with organic substances and nutrients and increases its fertility. More quantity of organic substances in manure improves the structure of soil. We use bio-waste to produce manure. Use of manure reduces the need of fertilizers and thus helps in environmental conservation. Manure may be of the following types on the basis of use of various bio-materials and the process of preparing it :

(i) **Compost and vermi-compost :** For composting, the agricultural wastes like the feaces of animals, dung etc., vegetable rind and trash, weeds etc. are filled in pits. These animal and agricultural wastes are decomposed using micro-organisms. This decomposed material is then used as manure. Compost is rich in organic matter as well as various nutrients. Vermi-compost is prepared from the plant and animal wastes by rapid degradation using earthworms.

(ii) **Green manure :** Pod bearing, leguminous plants like- sunhemp, moong, gwar etc. are grown in the fields before growing crops. After they attain sufficient height they are mixed with the soil by ploughing them down. These plants convert into green manure and replenish the nitrogen and phosphorus content of the soil.

15.5.2 Fertilizer :

Fertilizers are the plant nutrient prepared commercially. They provide nitrogen, phosphorus and potassium. They results in good vegetative growth of plants and keep them healthy. Fertilizers are used to increase the production. Fertilizer should be used carefully. Many-a-time the fertilizers are washed away due to over irrigation and plants are not able to absorb them properly. Use of excess of fertilizers leads to soil and water pollution continuous use of fertilizers reduces the soil fertility. It adversely affects the life cycle of various subterranean organisms and microorganisms. We can increase the agricultural production by using fertilizers in lesser time but after some time the soil fertility reduces rapidly. However the benefits of using manure persists over long period of time. **Organic farming** is the technique of farming in which chemical fertilizers, insecticides, weedicides etc. are not used at all or in case of intense need they are used only is very small quantities. In this technique organic manure recycled agricultural wastes and cattle wastes, biological agents like blue-green algal cultures, bio-fertilizers etc. are made use of. Neem leaves and turmeric powder are used as bio-insecticides during storage.

15.6 Crop :

Carbohydrate as source of energy is obtained from cereals like wheat, rice, maize, bajra and jowar, protein is obtained from pulses like pea, gram, black lentil, urd, moong, arhar etc. and the oil-seeds like soyabean, groundnut, til (sesamum), castor, mustard, alsi (flex) and sunflower provide us with the essential fats. Vegetables, spices and

condiments and fruits provide various vitamins and minerals along with some amount of proteins, fat and carbohydrates. Fodder crops like berseem, oat, grass etc. are cultivated to provide for the cattle feed. Hence, their regular production, proper management and distribution is essential to provide for the needs of the large population.

Bharat is a big country. Here climate conditions like temperature, humidity and rains vary from region to region. Hence different types of crops are cultivated in different parts of the country. Crops can be broadly categorized into two on the basis of season :

(i) Kharif crops : These are the crops which are sown during rainy season. In Bharat the rainy season is from June to September. It includes paddy, maize, soyabean, groundnut, moong etc.

(ii) Rabi crops : Crops grown in winter season are the rabi crops. Wheat, gram, pea, mustard and flex are some of the major rabi crops.

15.7 Varieties of Crops :

Good production of crops depend upon the selection of varieties for cultivation. Various useful qualities (like disease resistance, compatibility with fertilizers, quality of the produce and high production) of the crop varieties can be chosen by breeding. Desired traits can be introduced in the varieties by hybridizations. In the hybridization technique plants with different genetic properties are hybridized. Another method of crop improvement is introduction of the desired genes. This results in the production of genetically altered varieties. Before adopting any new variety it is essential to ensure that the variety can give sufficient produce in various environments at various places. Good quality seeds should be made available to the farmers. In other words the seeds should be of the quality which germinate properly in favourable conditions.

Crop production depends upon the weather, quality of soil and availability of water. Since weather prediction like drought, floods etc. is difficult, so crops which can grow under varied environmental conditions are more useful. Similarly varieties which can grow in saline soil have also been developed for some crops. The objective of improving crop varieties includes :

(1) High production : Increasing the production per hectare.

(2) Improved varieties : The quality of the crop produce is different for every crop. For example the quality of protein in pulses, quality of oil in oil crops, high quantity of vitamins and minerals in fruits and vegetables etc.

(3) Biotic and Abiotic resistance : The crop production may decrease due to various biotic (diseases, insects etc.) and abiotic (drought, salinity, water logging, heat, cold, frost etc.) factors. The varieties tolerant to these factors can increase the production under adverse conditions.

(4) Change in maturation period : Economically it is beneficial to use varieties with reduced duration, from sowing to reaping. The farmers, hence, may obtain more than one crop produce in his field per year. Reduction in time reduces the expenses of crop production. The loss of produce is reduced if the crop maturation is simultaneous.

(5) Broad compatibility : Production of varieties having broad compatibility will be helpful in stabilizing the produce in different environmental conditions. Some varietes may then be used for cultivation under varied environmental conditions.

(6) Optional qualities of the crop : Long and dense branching is the desired quality for fodder crops, so that there will be more production using less of is nutrients. In this way various improved varieties may be used to enhance production.

15.8 Crop Pattern :

The land becomes barren by continuous use of chemical fertilizers, insecticides and pesticides etc., therefore need was felt of techniques which could be used for crop cultivation, on a continuous basis, without harming natural resources. This is known as the **long term agriculture.**

Methods such as mixed farming, mixed

cropping and crop-rotations are used for long-term agriculture.

(a) Mixed farming : The needs of the farmer cannot be fulfilled by the produce of small patches of land. So the farmer adopts other methods to increase productivity. These include - animal husbandry, fisheries, horticulture and agriculture. This practice not only increases the farmer's income but also utilizes the land available to the maximum. **Mixed farming**, thus, is a system of farming which involves the growing of crops along with raising the livestock.

(b) Mixed cropping : When only one type of crop is grown in a field, the requirements of all the crop plants are alike. It will use some of the nutrients which will reduce in quantity over time while others will not be used at all. To avoid the imbalance of nutrients now-a-days two or more than two type of crops are grown together in the field. This type of cropping pattern is known as **mixed cropping**. For example, Wheat and gram; wheat and mustard; groundnut and sunflower etc. If due to adverse weather conditions or due to other reasons, one of the crop fails, at least the produce of the other will be available.

The following things should be kept in mind while selecting crops for mixed cropping.

1. One crop should be of long period while other of short period.
2. One crop should be long and other should be dwarf.
3. One crop should have deep root system while the other must have surface roots.

(c) Crop Rotation : The fertility of land reduces due to continuous cropping of the same crop over the years. The production of that crop reduces due to deficiency of certain nutrients in the crop land since they are the ones being used continuously. So to replenish the soil and maintain nutrient balance, crop rotation is adopted. **Crop rotation** is growing of different crops in succession in the field in a planned manner.

In crop rotation cultivation of cereals should be altered with the cultivation of pod-bearing leguminous plants so as to replenish the soil nitrogen.

15.9 Crop Protection :

In the fields crop is affected by weeds, insects, pests and various diseases. If the pests and weeds are not controlled in time, they can cause immense harm to the crop.

Weeds are the unnecessary plants that grow along with the crop plants. For example : Vilayati Gokhru (*Xanthium*), Carrot-grass (*Parthenium*), Motha (*Cyperus rotundus*). These weeds compete for food space and light and use various nutrients of the soil thus reducing the production. Therefore, for healthy growth of crop plants, the weeds should be removed from the fields right from the beginning.

Usually, insect-pests attack the plants in three ways (1) they cut the roots, stem and leaves of the plants i.e. they chew them (2) they suck the cellular juices from various parts of the plant (3) they bear the fruits and stem and enter it, i.e. they perforate it. Thus they damage the crop and reduces production.

In plants diseases are caused by casual organisms like bacteria, fungi, virus etc. They are present in soil, water and air and are transmitted to the plants through them. The weeds, insects and diseases can be controlled by various methods. The most common of all is use of chemical pesticides. Various insecticides, fungicides and weedicides belong to this category. These chemicals are sprayed on the crop and are used for seed and soil treatment. But their excessive use leads to many problems. These chemicals may be toxic for plants and animals and may cause environmental pollution. Mechanically removing the weeds is another method. Preventive measures include sowing the crop on time, preparing proper beds, inter cropping and crop rotation, for controlling the growth of weeds. The pests can be controlled by using resistant varieties and ploughing the land during summer months. Deep ploughing during summer months kill the pests and uproots the weeds

and exposes the seed of weeds to the heat, thus destroying them.

15.10 Methods of Irrigation :

All organisms needs water to remain alive. Water is of great importance for the growth and development of flowers, fruits and seeds. Water is absorbed, along with the dissolved minerals and fertilizers from the soil, by the roots. In plants there is approximately 90% water. Water is important because seeds cannot germinate in dry conditions. The nutrients dissolved in water are translocated to all parts of the plant. It protects the plant from frost and hot air. For healthy growth of crop plants, watering the fields on a regular basis is essential. Watering the fields at different time intervals is known as **irrigation**. The time and frequency of irrigation differs with the crop, soil type, season etc. The frequency of irrigating will be comparatively more during summer months.

Sources of Irrigation : Well, tube-well, lakes, ponds, rivers, dams and canals are the various sources of water. The methods of taking water to the fields from the sources differ from region to region.

In traditional methods cattle or workers are used. They are cheap but less efficient. They include (i) Pulley (ii) Chain pump (iii) Dhekli and (iv) Rahat (water lifting).

Water is lifted either manually or by using pumps. Diesel, biogas, electricity or solar energy is made use of to drive the pump.

Modern Methods of Irrigation : We can use water economically by using modern methods of irrigation. These methods include :

(i) Sprinkler System : This method is used for uneven land where water availability is less. Rotating nozzles are attached to the upper ends of vertical pipes, these pipes are at a definite distance from each other and are connected to the main pipe. When water is sent to the nozzles via the vertical pipes they rotate, sprinkling water over the crop plants in a manner similar to the rains irrigating the crop.

Fig. 15.6 Sprinkler Irrigation System

(ii) Drip System : In this method water reaches down directly to the roots, drop by drop. Therefore it is known as the drip system. This is the best method of irrigating the fruit trees, gardens and other plantations. Water is not wasted in this method and the plant receives continuous supply of water, drop-by-drop. This system is a boon for areas having scarcity of water.

Fig. 15.7 Drip System

15.11 Agriculture :

Contemporary agriculture is the combined effort of arts, science and technology. In it crops with desired characteristics can be obtained using principles of science and genetic engineering. Hence the basic need of food and cloth of the fast growing human population can be met .

Various stages of advanced agriculture

includes :

(1) **Improved seeds :** The quality of seed is improved for more production, disease resistance, uniformity in time of maturity, adaptation for various environmental conditions.

(2) **Mineral nutrition of the crops :** Crop plants need various nutrients for preparing food and for growth. Plants obtain their nutrients from air, water and soil. Different types of manure and fertilizers are used to supply nutritive elements to the soil. Dung manure, compost, vermi-compost and green manure are used as manure - Urea, di-ammonium phosphate, super phosphate, ammonium sulfate and calcium ammonium nitrate are used as fertilizers.

(3) **Weeds :** Farmer sow the seeds of the crop plant but many other seeds present in the soil germinate along with the crop seeds and produce plants. The undesired plants that grow along with crop plants in the field are known as **weeds**.

There is competition for water, mineral salts etc. between the crop plants and the weeds. This results in lack of availability of sufficient water and nutrients for the crop plants. The weed plants grow fast and cover the crop plant thus hindrance is generated for the sun light to reach the crop plants. Some weeds produce special chemicals from their root system and have adverse effect on the crop plants. Weeds are the shelter for various pests and pathogens and hence increases the chance of disease development. The cost of crop increases because of the cost of weeding. Weeds can be controlled physically i.e. uprooting them manually or by chemical and biological methods.

(4) **Plant diseases :** Dys-functioning of the plant or any part thereof is known as the plant disease. Disease develop in plants by virus, bacteria and fungi. To control disease in crop plants, disease resistant varieties are used and pesticides are sprayed.

15.12 Animal Husbandry :

Animal husbandry is the supplementary occupation of agriculture. From ancient times man has domesticated animals and have used them. In modern times due to mechanization, the dependence of man on animals has decreased, yet animal husbandry is generating employment for a large section of our population. As compared to other countries there are maximum number of domesticated animals in Bharat and it is number one in milk production. Animal husbandry includes caring and domesticating animals such as cows, buffaloes, camels, sheep, goats, horses etc. and obtaining milk, flesh, leather, dung etc. from them and using them for agriculture.

15.12.1 Milk production :

Milk production is an important part of the business of food products. Man has been using the milk produced by other mammals for their young ones, for his own use, since ancient times. The milk obtained from mammals, immediately after the birth of young ones is known as colostrum. In an average milk there is 87.3% water, 4.5% fat, 4.6% carbohydrate, 3.5% protein 0.75% minerals, 0.85% fat-less solid substances. The maximum protein (6.25%) is present in sheep milk and cows' milk has about 3.21% proteins. Various products like curd, cream, butter, mawa, ghee, milk powder etc. are obtained from milk.

Because of high nutritive value bacteria grow very rapidly in milk and spoils it. Milk can be stored for many days after pasteurization and cooling.

15.2.2 Cattle breed :

Cow, buffalo, goat etc. are domesticated for milk production. From milk production point of view the deshi varieties of cow includes Sahiwaal, Sindh, Gir, Devli, Hariyanawi etc. while the foreign breeds include Redden, Holstein, Jerry etc. The murrah, jafarabaadi, surti etc. are the varieties of buffalo preferred for more milk production. Similarly the breeds of goat are Jamanapaari, Barbery, Sirohi etc.

15.12.3 Animal feed :

Extra animal feed should be given to bovines and pregnant cattles along with the regular feed. Animals should be fed upon 2/3 part of hay and 1/3rd green fodder. Animal feed should consist of 40% grains, 40% pomace (Khali) and 20% left over of wheat flour straining (chokar). Apart from this 50 gm of salt and 30 gms mineral powder should also be given to the cattle.

15.12.4 Animal health :

The animal should remain healthy. Production reduces in sick and unhealthy animals. For prevention of diseases animals should be vaccinated from time to time and animal shelters should be kept neat and clean. Animals may suffer from diseases caused by virus, bacteria, fungi and worms. The main diseases of animals along with their vaccines and vaccination are listed in the table given below :

S.No.	Disease	Vaccine	Time
1.	Khurpka (paw festering) and Muhpka (festering of mouth)	Poly vaccine	Every year
2.	Diphtheria	H. S oil, Adjuvant vaccine	Every year
3.	Glandular disease (Gilte-rog)	Anthrax spore vaccine	Every year
4.	Tuberculosis	BCG vaccine	After every three years
5.	Small pox	RP Tissue vaccine	After every three years

15.13 Poultry Farming :

The main aim of poultry farming is to obtain eggs and meat. Apart from this, by products like feathers, manure blood etc. are also obtained. The poultry industry fulfils a major part of the demand of proteins in the country, in the form of eggs and meat.

15.13.1 : Poultry Breed :

The poultry breed of Bhartiya origin includes Red jungle fowl, Aseel, Chatgoan, Bustra etc. They are reared chiefly to obtain meat. Foreign breeds (Exotic strains) includes Rhode Island Red, Plymouth Rock chicken, Leghorn, white Leghorn etc. White Leghorn is the breed with maximum egg production.

15.13.2 : Dwelling and food :

Arrangement for safe dwelling and nutritive food is essential for good growth and healthy fowls. The dwelling should be at some height. No water should be puddled near the dwelling and it should be well aerated and ventilated.

Yellow maize, groundnut pomace, small wheat particles, meshed rice grains, jowar, fish powder, pebbles containing lime, salt etc. are used as food.

15.13.3 : Health :

Infectious bronchitis, Marek's disease, Ranikhet, Plague, Small pox etc. are the main viral diseases in poultry. Proper vaccination should be done to prevent these diseases.

15.14 Apiculture :

Man has been using honey obtained from honey-bee since ancient times. Honey is a high energy food stuff. It contains glucose, fructose, sucrose, minerals etc. It is used as a medicine and as a preservative. The wax obtained from bee hive is known as the bee-wax. It is used in cream, floor polish, shoe polish and sculpturing. Now-a-days, honey bee are reared to obtain honey.

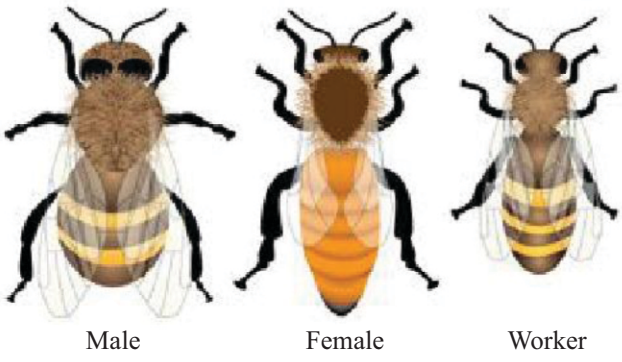

Fig. 15.7 Honey bees

15.14.1 Honeybee - a social insect :

The form and function of honey bee varies. There are three types of honey bee in a hive. Queen, Male and worker. Queen bee can be recognized by its elongated abdomen while males have very big

prominent eyes. The Queen bee dominates the hive, and controls it by secreting a substance with typical smell. The queen bee lives in the hive only. The male in their single coitus flight with the queen deposit sperms with the queen for the life-time. After this the male bees die spontaneously or they are expelled from the hive.

Queen bee lays two type of eggs. The generation of worker or queen from the fertilized eggs depends on their nourishment. The larvae which are fed upon the royal jelly develop into queen bee. The first formed queen bee kills the other developing queen bees. Thus there is a single queen bee in a hive. Males develop from the unfertilized eggs.

15.14.2 Artificial Apiculture :

The main species of honey-bee includes *Apis mellifera*, *Apis dorsata*, *Apis florea* and *Apis indica*. Of these, *Apis mellifera* is used for Apiculture. The hives of this species are large with more accumulation of honey and the number of honey-bee is also greater. *Apis dorsata* is the species with sting.

For artificial Apiculture, artificial hives of the shape of closed boxes are prepared. In the artificial hives there are larger egg chambers and plates of metal or plastic. There is a coating of wax on these plates and they form the support for the formation of hives. There are many perforations in the closed box, through which the honey bee can enter the hives.

The artificial hives are placed in gardens or near the fields from where they may get the nectar. The worker bees collect the nectar and converts it into honey. Honey is collected in the cells of the artificial hive and is obtained by removing the plates from the hive.

15.15 Fishery :

Fishery has been established as a profession because fishes are a good source of human nourishment. Fishes are used as a major food material. The by products of this industry includes oil rich in vitamins, protein, fins, skin scales etc. Fishery is a combined form of agriculture and animal husbandry because fishery is a type of animal husbandry while producing food from fishes in the water reservoir is agriculture.

Steps of Fish-culture :

15.15.1 Dwelling :

Fishes are cultured in natural water sources like sea, lakes, ponds and river but artificial water reservoirs are also used for the purpose. Places with clay-rich soil are considered good for constructing water reservoir.

15.15.2 Various species of fish :

Fishes are produced more in fresh water as compared to that in saline water. Rohu, Mrigla, katla etc. are the indegenous fishes cultured in fisheries and common carp, silver carp etc. are the exotic species of fishes which are also cultured.

15.15.3 Food for fishes :

In natural water bodies minute aquatic plants and micro-organisms are the food for fishes. In artificial water bodies rice husk, particles of cereals, wheat pieces, almond pomace, soyabean etc. are provided to the fishes as food.

15.15.4 Fish production :

The seeds of fish (i.e. spawn) are collected with the help of nets from the breeding places of the rivers. Fertilized eggs are obtained from these seeds. The small fishes which emerge from the eggs are known as the fry. After some time fry transform into fingerlings or parr. The fingerlings are then taken to the fish cultivation tanks. Fingerlings are treated with bactericidal substances like copper sulphate, formalin, Potassium permanganate or salt to kill the infectious bacteria present there.

15.15.5 Fish storage :

When sufficiently big, the fishes are caught using nets in the water reservoirs or by passing current in the water body.

15.15.6 Fish shielding :

To prevent rotting of the fish they are preserved by burying them in ice.

Important Questions

1. The substances which are obtained from nature and are used by man and other organisms are known as **natural resources**.
2. Living beings use oxygen for respiration and

carbon-di-oxide is used by plants for photosynthesis.

3. 70% of the earth is submerged under water.
4. The upper fertile layer of earth surface is known as the soil.
5. N, P, K are the important nutrients for the plants.
6. Movement in air is generated by the difference in air pressure on the surface of the earth.
7. Anemometer is used to measure the wind velocity.
8. Undesirable changes in the physical, chemical and biological characters of air, water and soil are known as pollution.
9. Carbon-mono-oxide, sulphur-di-oxide, hydro-carbons, smoke and dust are the main air pollutants.
10. The nitric acid and sulphuric acid formed in the atmosphere is washed down to earth surface with the rain water resulting in acid rain.
11. The rate of combining of carbon-mono-oxide with haemoglobin is far more as compared to that of oxygen.
12. Sewage, detergents, pesticides, insecticides, industrial affluents etc. are the main water pollutants.
13. Excessive growth of algae in water bodies is known as algal blooms.
14. Decibel is the unit of measuring sound.
15. The wavelength of visible light is 390 nm to 760 nm.
16. Cultivating same type of plants at a place on large scale is known as a crop.
17. The crops sown in rainy season are known as kharif crops while those sown in those sown in winters are the rabi crop.
18. Growing different crops in the field according to a planned programme is known as the crop-cycle.
19. Unwanted plants growing along with crop plants are known as weeds.
20. Maximum protein (6.25%) is present in the sheep milk (among the milk producing animals)
21. White leghorn breed of fowl produce maximum number of eggs.
22. Honey bee is a social insect.

Questions

Objective type Questions :

1. Growing different crops in a field in a planned manner is known as :
   (a) Mixed cropping (b) Mixed farming
   (c) Crop cycle (d) Intra cropping
2. According to the volume, the amount of carbon-di-oxide present in the atmosphere is :
   (a) 0.03% (b) 0.003%
   (c) 0.0003% (d) 0.3%
3. Acid rain results from :
   (a) Air pollution (b) Water pollution
   (c) Soil pollution (d) Sound pollution
4. Of the following which nutrient is obtained by the plants from the soil :
   (a) Carbon (b) Hydrogen
   (c) Oxygen (d) Nitrogen
5. Which of the following is a Kharif crop :
   (a) Soyabean (b) Wheat
   (c) Gram (d) Pea

Very short answer type questions :

6. Name the device used to measure the speed of wind.
7. What is pollution?
8. What are the natural resources?
9. What are algal blooms?
10. What is sonic boom?
11. What is mixed farming?
12. What is the name of the gas present in maximum amount in the atmosphere?
13. Which gas is used by plants during respiration?
14. What is the reason for wind movement?
15. Write the name of fowl with maximum production.

Short answer type questions :

1. What is humus? What are its benefits?
2. How does acid rain occurs? Write the side effects of acid rain.
3. What is Biological Oxygen Demand (BOD)?
4. Describe the negative effects of air pollution.
5. What is bio magnification? Explain.
6. What is noise pollution? Explain the negative effects of noise pollution.
7. Write four reasons of soil pollution.
8. Write four methods to control air pollution.

9. What is the difference between manure and fertilizer.
10. How is vermi-compost prepared?
11. What is Organic Farming? Explain.
12. How is artificial apiculture done?
13. Write the name of the breeds of cow and buffalo. Which produce more milk?
14. Write the names of a few cattle diseases.
15. What is Mixed Cropping? What are its benefits?

Essay type answer question :

1. What is long term cultivation? Explain the various methods of long term cultivation.
2. Write the name of the products of fisheries and explain the various steps of culturing fishes.
3. What is irrigation? Explain the modern methods of irrigation.
4. Describe the aims of improvement in varieties of crop plants.
5. What is water pollution? Describe the causes and negative impacts of water pollution.

Answer Key

1. (c) 2. (a) 3. (a) 4. (d) 5. (a)

शब्दावली (Glossary)

अभिकेन्द्र बल	– Centrifugal force	वाहित मल	– Sewage
अनुसंधान	– Research	विकिरण	– Radiation
औसत वेग	– Average Velocity	वर्णीलवक	– Chromoplast
आकाश गंगा	– Galaxy	विदलन	– Cleavage
अपवर्तन	– Refraction	विषाणु	– Virus
अंश	– Degree	विभज्योतक	– Meristematic
अदिश	– Scalar	वाहिनिका	– Tracheid
अभिलक्षण	– Characteristics	वाहिका	– Vessel
आवृत्ति	– Frequency	वैज्ञानिक	– Scientist
आवर्तकाल	– Time Period	वायुमण्डल	– Atmosphere
आयाम	– Amplitude	वैद्युत अपघटन	– Electrolysis
अनुरणन	– Reverberation	विषाक्त	– Toxic
अपश्रव्य	– Infra	क्रांति पथ	– Revolution Path
अम्लीय वर्षा	– Acid Rain	कक्षा	– Orbit
अपमार्जक	– Detergent	कृत्रिम उपग्रह	– Artificial Satellite
अवरक्त	– Infra-red	क्वथनांक	– Boiling Point
आधात्री	– Matrix	कक्ष	– Orbit
आत्मघाती थैलिया	– Suicidal bags	कोश	– Shell
अन्तर्द्रव्यी जालिका	– Endoplasmic reticulum	कीटनाशी	– Insecticide
अन्तरावस्था	– Interphase	कवकनाशी	– Fungicide
अन्त्यावस्था	– Telophase	कोशिका	– Cell
आवृतबीजी	– Angiosperm	कोशिका विज्ञान	– Cytology
अनुकूलन	– Adaptation	कोशिका कला	– Cell Memberane
अजैविक	– Abiotic	कोशिका द्रव्य	– Cytoplasm
आर्द्रता	– Humidity	केन्द्रक	– Nucleus
अधिशोषण	– Adsorption	कोशिका भित्ति	– Cell Wall
अवशोषण	– Absorption	कशाभिका	– Flagella
अपघटक	– Decomposer	कोशिकारस	– Cell Sap
आपेक्षिक	– Relative	केन्द्रकद्रव्य	– Nucleoplasm
वृत्ताकार गति	– Circular Motion	केन्द्रिक	– Nucleolus
विषुवत रेखा	– The global line	कोशिका चक्र	– Cell Cycle
वायु प्रतिरोध	– Air Resistance	केन्द्रक विभाजन	– Karyokinesis
विस्थापन	– Displacement	कोशिका द्रव्य विभाजन	– Cyto Kinesis
वेग	– Velocity	क्लोम	– Gill
विरलन	– Rarefaction	खगोलविद्	– Astronomer
विदलन	– Cleavage	खगोल भौतिकी	– Astrophysics
विज्ञान	– Science	खरपतवार	– Weed
वैज्ञानिक विधि	– Scientific Method	गति के नियम	– Law of Motion
वर्णक्रम	– Spectrum	गुरूत्व	– Gravity
विद्युत विसर्जन नलिका	– Electric Discharge Tube	गुरूत्वीय बल	– Gravitational Force

ग्रह – Planets
गतिविधि – Activity
गति – Motion
गुणसूत्र – Chromosome
ज्वारभाटा – Tides
जड़त्व – Inertia
जैविक आवर्धन – Biological Magnification
जीवाणु – Bacteria
जल अपघटनी एन्जाइम – Hydrolytic Enzyme
जन्तु कोशिका – Animal Cell
जनन – Reproduction
जरायुज – Vivipary
जीवन चक्र – Life Cycle
जीवाणुभोजी – Bacteriophage
जीन विनिमय – Crossing Over
जैवविविधता – Biodiversity
जलोद्भिद – Hydrophyte
जैविक – Biotic
जीवाश्म – Fossil
जल मण्डल – Hydrosphere
जीव मण्डल – Biosphere
घर्षण बल – Friction Force
घर्षण – Friction
घरेलू कचरा – Garbage
घनत्व – Density
घटक – Component
द्रव्यमान – Mass
दूरी – Distance
दोलित्र – Oscillator
दाब – Pressure
द्वि बीजपत्री – Dicot
दृढ़ोतक – Sclerenchyma
भार – Weight
मात्रक – Unit
मृदूतक – Parenchyma
भारहीनता – Weight lessness
प्रतिक्रिया – Reaction
पाठ्यांक – Reading
पोष स्तर – Tropic level
प्राकृतिक विज्ञान – Natural Science
परावर्तन – Reflection
परावर्तित किरण – Reflected Rays
पादप कोशिका – Plant Cell
प्रकाश वर्ष – Light Year
पराबैंगनी – Ultraviolet
प्राकृतिक उपग्रह – Natural Satellite
प्रबलता – Loudness
परावर्तन कोण – Angle of Reflection
प्रतिध्वनि – Echo
पराश्रृव्य – Ultra
पक्ष्माभ – Cilia
पृष्ठवंशी – Chordata
पूर्णिमा – Full moon day
प्रणोद – Thrust
परमाणु सिद्धान्त – Atomic Theory
पुरावनस्पति शास्त्री – Paliobotanist
परखनली शिशु – Testtube Baby
परमाणुकता – Atomicity
परमाणु भार – Atomic weight
पर्यावरण – Environment
प्रदूषण – Pollution
प्रदूषक – Pollutant
पारिस्थितिक तंत्र – Ecosystem
परिस्थितिकी – Ecology
प्रक्षेपण – Launching
पीठिका – Stroma
पूर्व केन्द्रकीय कोशिका – Prokaryotic Cell
पश्चावस्था – Anaphase
तनाव – Tension
तारामण्डल – Constellations
तुल्यकालन – Synchronisation
तारे – Stars
त्वरण – Acceleration
तरंगदैर्ध्य – Wavelength
तारककाय – Centrosome
तारक केन्द्र – Centriole
तीव्रता – Intersity
तंत्रिका ऊतक – Nervous Tissue
मुक्त पतन – Free Fall
मधुमक्खी पालन – Apiculture
उल्काश्म – Bolide
उल्का – Meteors
ऊतक – Tissue
उल्कापिण्ड – Meteorites
उर्वरक – Fertilizer
उत्प्लावकता – Buoyancy

ऊष्मागतिकी	–	Thermodynamics
उत्परिवर्तन	–	Mutation
उभयचर	–	Gill
उपापचयी	–	Metabolic
उत्पादक	–	Producer
उपभोक्ता	–	Consumer
राशिचक्र	–	Zodiac
राशि	–	Sign of Zodiac
चन्द्रमा की कलाएँ	–	Phases of moon
चालनी पट्टिका	–	Sieve plate
धूमकेतु	–	Comets
धातु कर्म	–	Metallurgy
ध्रुवतारा	–	Pole Star
धुआँ	–	Smoke
धूम–कुहरा	–	Smog
ध्वनि	–	Sound
ध्वनि बूम	–	Sonic boom
धात्विक त्रिज्या	–	Metallic radius
समस्थानिक	–	Isotope
सममारिक	–	Isobar
सप्तर्षि	–	Ursa Major
सौर परिवार	–	Solar System
सुपाषी	–	Eutrophic
सरीसृप	–	Reptile
सार्वत्रिक नियम	–	Univershal Law
सदिश	–	Vector
सम्पीड्यता	–	Compressibility
सापेक्षतावाद	–	Relativity
संवहन ऊतक	–	Vascular Tissue
सहजीविता	–	Symbiosis
सूचक	–	Indicator
संचरण	–	Propagation
सुकेन्द्रकीय कोशिका	–	Eukaryotic Cell
सहकोशिका	–	Comapanion Cell
संपीड़न	–	Compression
संवेग	–	Momentum
स्नेहक	–	Lubricant
स्थूलकोण ऊतक	–	Collenchyma
स्थल मण्डल	–	Lithosphere
स्थनधारी	–	Mammalia
स्फीत	–	Turgid
सूक्ष्मकाय	–	Microbody
सहसंयोजक त्रिज्या	–	Covalent Radius
सर्पी	–	Sliding
संसाधन	–	Resource
क्षुद्र ग्रह	–	Asteroids
बल	–	Force
बहुकोशिक जीव	–	Multi Cellular Ogranism
लोटनी	–	Rolling
लवक	–	Plastid
लवणमदोद्भिद	–	Halophyte
श्रव्य	–	Audible
राडार	–	Radar
रासायनिक संयोग	–	Chemical Combination
रिक्तिका	–	Vacuole
मांडुलटेर	–	Modulator
मण्ड	–	Starch
मातृ कोशिका	–	Mother Cell
मूलगोप	–	Root Cap
मूल रोम	–	Root hair
मृतजीवी	–	Saprophyte
मूलाभास	–	Rhizoido
मत्स्य	–	Pisces
निर्वात	–	Vaccum
शैवाल ब्लूम	–	Algal bloom
शीतोद्भिद	–	Cryophyte
शाकनाशी	–	Herbicide
श्वसन	–	Respiration
शक्ति गृह	–	Power House
एककोशिक जीव	–	Unicellular Organism
एक बीजी पत्री	–	Monocot
नीले–हरे शैवाल	–	Blue Green Algae
हरित लवक	–	Choroplast
युग्मनज	–	Zygote
युग्मक	–	Gamete
यांत्रिक ऊतक	–	Mechanical Tissue
जीव–विकास	–	Evolution
जीव–जनन वाद	–	Theory of Biogenesis
स्वतः जनन वाद	–	Theory of spontaneous generation
ब्रह्माण्ड	–	Universe
आकाशगंगाएं	–	Milky ways
ग्रह	–	Planet
बुध ग्रह	–	Mercury
शुक्र ग्रह	–	Venus
मंगल ग्रह	–	Mars

पोषण	–	Nutrition
पाचन	–	Digestion
कार्बोहाइड्रेट	–	Carbohydrate
वसा	–	Fat
प्रोटीन	–	Protein
खनिज लवण	–	Mineral
विटामिन	–	Vitamin
जल	–	Water
रूक्षांश	–	Roughage
मांसाहारी	–	Carnivores
मुखगुहा	–	Buccal cavity
स्वपोषी	–	Autotrophs
परपोषी	–	Heterotrophs
सर्वाहारी	–	Omnivorous
परजीवी	–	Parasites
अवायवीय श्वसन या अनॉक्सीश्वसन	–	Anaerobic respiration
अंतःपरजीवी	–	Endoparasite
आमाशय	–	Stomach
आहारनाल	–	Alimentary canal
जठर रस	–	Gastric juice
आंशिक परजीवी	–	Partial parasites
ऑक्सीश्वसन	–	Aerobic respiration
स्थायी परजीवी	–	Permanant parasite
बाह्य परजीवी	–	Ectoparasite
रसायन–संश्लेषी	–	Chemoautotrophs
प्राणीसमभोजीपोषी जन्तु	–	Holozoic organism
शाकाहारी	–	Herbivores
ग्रसनी	–	Oesophagus
मलाशय	–	Rectum
खमीरीकरण	–	Fermentation
समपोषी	–	Halophytic
नासाछिद्र	–	Nostril
नासामार्ग	–	Nasal passage
नासागुहा	–	Nasal chamber
श्वासनली	–	Trachea
स्वरयंत्र	–	Larynx
श्वसनी	–	Bronchi
श्वसनीकाएं	–	Bronchioles
परिसंचरण	–	Circulation
वायुकोष	–	Airsac or Alveoli
उच्छवास	–	Exhalation
फेफड़े	–	Lungs
लाल रूधिर कणिका	–	Red Blood Corpuscles or RBC
श्वेत रक्त कणिका	–	White Blood Corpuscles or WBC
रक्त क्षीणता	–	Anemia
आलिन्द	–	Auricle
धमनी	–	Arteries
शिराएं	–	Veins
रूधिर दाब	–	Blood Pressure
दोहरा परिसंचरण तंत्र	–	Double circulation system
हृदय	–	Heart
अर्न्तआलिन्दीय पट	–	Inter auricular septum
अन्तर्निलयी पट	–	Inter ventricular septum
अपघटनी या अपचयी	–	Catabolic
उपचयी या संश्लेषी	–	Anabolic
मूत्राशय	–	Urinary bladder
वृक्क	–	Kidney
मूत्रवाहिनियां	–	Ureter
परानिस्यंदन	–	Ultrafiltration
मूत्र नलिकायें	–	Uriferous tubules or Nephrons
जनन	–	Reproduction
पुनरुद्भवन	–	Regeneration
अलैंगिक जनन	–	Asexual reproduction
लैंगिक जनन	–	Sexual reproduction
द्विविखण्डन	–	Binary fission
तंत्रिका तंत्र	–	Nervous System
प्रतिवर्ती क्रिया	–	Reflex action
प्रतिवर्ती चाप	–	Reflex arch
नियमन	–	Regulation
तंत्रिकाक्ष	–	Axon
द्रुमाश्म	–	Dendrite
अन्तःस्त्रावी तंत्र	–	Endocrine System
अन्तःस्त्रावी ग्रंथियों	–	Endocrine glands
गलगण्ड	–	Goiter
स्वास्थ्य	–	Health
रोग	–	Disease
योग	–	Yoga
जैविक कारक	–	Biological agent
रोगजनक	–	Pathogen
हृदय रोग	–	Heart disease

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