

Improvements In Food Resources

Solution 01:

Micronutrients

- (i) They are required in very small quantities.
- (ii) They are involved in enzyme activity and electron transport.

Example – Iron, Zinc

Macronutrients

- (i) They are required in large quantities.
- (ii) They have no significant role in enzyme activity and electron transport.

Example – Nitrogen, Calcium

Solution 02:

Source: (i) Air –

Nutrients:

Carbon (C)

Oxygen (O)

Hydrogen (H)

Source: (ii) Water

Nutrients:

Nitrogen (N)

Phosphorus (P)

Potassium (K)

Calcium (Ca)

Magnesium (Mg)

Source: (iii) Soil

Nutrients:

Iron (Fe)

Manganese (Mn)

Boron (B)

Zinc (Zn)

Copper (Cu)

Molybdenum (Mo)

Chlorine (Cl)

Sulphur (S)

Solution 03: Plants get nutrients through air, water and soil.

Solution 04: Nitrogen, phosphorus and potassium.

Solution 05:

Iron – Micronutrients.

Chlorine – Micronutrients.

Sulphur – Macronutrients.

Copper – Micronutrients.

Nitrogen- Macronutrients.

Calcium- Macronutrients.

Manganese- Micronutrients.

Potassium- Macronutrients.

Zinc- Micronutrients.

Magnesium- Macronutrients.

Molybdenum- Micronutrients.

Phosphorus- Macronutrients.

Solution 06:

Advantages of manures are:

(i) Manures are natural fertilizers.

(ii) Manures are bulky sources of organic matter which supply nutrients in small quantity and organic matter in large quantities.

Solution 07:

Limitations of using manures are:

(i) Manures are not nutrient specific.

(ii) Manures are not able to fulfill the high and rapid demand of nutrients required by improved high-yielding hybrid varieties of crops.

Solution 08;

Manure contains many organic substances of biological origin which can be easily degraded and absorbed by plants. It helps in recycling of biological waste. Manures increase the fertility of soil for long duration without causing any harm. However, the chemical fertilizers (e.g. urea) improve soil fertility for short duration but cause environmental hazard. Continuous use of fertilizers in a particular area / crop field causes destruction of soil fertility.

Solution 09:

Advantages of fertilizer over manure:

(i) Fertilizers are very rich in plant nutrient whereas manure contains small amounts of essential plant nutrients.

(ii) Fertilizers are soluble in water whereas manure is not soluble in water.

Solution 10:

As a result of this, the pond water would acquire a high concentration of nitrates and phosphates which would result in the excessive growth of algae and phytoplankton in the pond.

Solution 11:

Eutrophication is a process whereby water bodies, such as lakes or slow-moving streams receive excess nutrients that stimulate excessive plant growth (algae, phytoplankton's and nuisance plants weeds). This enhanced plant growth is also termed as an algal bloom.

Example: During rains the nutrients from the fields are washed away and get accumulated in nearby water bodies.

Solution 12:

The continuous use of chemical fertilizers in a particular area or crop field leads to loss of soil fertility.

Solution 13:

There are three methods of fertilizer applications in practice:

- (i) Broadcasting: Uniform distribution over the whole cropped field.
- (ii) Placement: Application in bands or in pockets near the plants or plant rows.
- (iii) Foliar application: Using low or high volume sprayers, the fertilizers are sprayed covering the plants.

Solution 14:

Farmyard Manure : It is the decomposed mixture of cattle excreta, dung, urine, litter and left over organism matter such as roughage and Fodder.

Compost Manure : It is prepared from farm and town refuse such as vegetable and animal refuse.

Solution 15:

Manure – Manures are natural fertilizers. They are bulky sources of organic matter which supply nutrients in small quantities, and organic matter in large quantities. There are different types of manures: Farmyard manure (FYM), Compost, Green manures and Vermicompost. Manures affect the soil in following three ways:

- (i) Manures enrich the soil with nutrients. They replenish the general deficiency of nutrients in the soil. Since manure contains fewer nutrients they need to be used in large quantities.
- (ii) Manures add organic matter (called humus) to the soil which restores the soil texture, for better retention of water and aeration of soil.
- (iii) The organic matter in manures provides food for the soil organisms, (decomposers such as bacteria, fungi, etc. which help in providing nutrients to plants.

Solution 16:

Green manuring is the practice which includes growing, mulching by ploughing and mixing of green crops with soil, to improve physical structure and soil fertility.

Example – Sunn hemp (*Crotalaria juncea*).

Solution 17:

Fertilizers – Fertilizers are one of the major components for obtaining higher yields especially in expensive farming practices. Fertilizers are divided into following four groups:

(i) Nitrogenous fertilizers – These fertilizers supply the macronutrient nitrogen.

Example – Urea, $\text{CO}(\text{NH}_2)_2$

(ii) Potassic fertilizers – These fertilizers supply potassium which is one of the essential macronutrient of the plants.

Example – Potassium sulphate, K_2SO_4 .

(iii) Complex fertilizers – These fertilizers contains two or more nutrients.

Example – Nitrophosphate

Solution 18:

Biofertilisers – Organisms which enrich the soil with nutrients are called biofertilisers. Biofertilisers are used for the specific crop plants such as pulses, legumes, oil seeds and rice. They are renewable and non-pollutant sources of plant nutrient such as nitrogen. Nitrogen fixing microorganisms, i.e., non-symbiotic and symbiotic cyanobacteria and phosphate-solubilising microorganism are the main type of biofertilisers.

Solution 19:

A legume crop does not require nitrogenous fertilizers because its roots have root nodules which have nitrogenous bacteria called *Rhizobium*. This bacteria fixes atmospheric nitrogen and the plants converts nitrogen into various nitrogenous compounds.

Solution 20:

Irrigation is essential for the absorption of nutrient elements by the crop plants from the soil. The irrigation water tends to dissolve the nutrients present in the soil of a crop field to form a Solution. This Solution of nutrients is then absorbed by the roots of crops for the development of the plants.

Solution 21:

Excessive irrigation causes water logging and increases surface salinity which leads to soil salinity.

Solution 22:

Effects of excessive irrigation:

(i) It causes water logging.

- (ii) It increases salinity in the soil.
- (iii) The roots do not get proper aeration due to which they die.

Solution 23:

Water should be used judiciously because:

- (i) It helps in the cultivation of crops.
- (ii) In desert areas where there is scarcity of water, it is supplied through irrigation practices to prevent drought.

Solution 24:

Advantages of irrigation:

- (i) It is necessary to provide sufficient moisture for the germination of seeds.
- (ii) Irrigation of crop plants is essential for the growth and elongation of roots of the crop plants.
- (iii) It is necessary to increase the number of aerial branches in crop plants.
- (iv) It is essential for the absorption of nutrient elements by the crop plants from the soil.

Solution 25:

The efficiency of irrigation can be increased by:

- (i) Drip and sprinkler system – It increases the efficiency of irrigation as it sprays water through pipes and a sprinkler.
- (ii) River lift system – It is useful in those areas where canal flow is insufficient or irregular due to inadequate water release. The water is directly drawn from the rivers for supplement irrigation.

Solution 26:

There are two main factors responsible for loss of grains during storage:

- (i) Biotic factors – Insects, rodents, birds, mites and bacteria.
- (ii) Abiotic factors – They include moisture, temperature and other non-living environmental factors.

Solution 27:

Biotic and abiotic factors which cause destruction of grains during storage can be prevented by the following methods:

- (i) Drying – The harvested food grains should be dried by spreading them over plastic sheets or cemented floors. All the sun dried food grains are allowed to cool to room temperature before storing them.
- (ii) Cleaning – The grains should be properly cleaned before storage. They should be filled in new gunny bags before keeping in godowns, warehouses or stores.

Solution 28:

Drying – The harvested food grains is dried by spreading them over plastic sheets or cemented

floors. All the sun dried food grains are then allowed to cool to room temperature before storing them.

Solution 29:

For the storage of grains, grain silos are used. The silos are big and tall cylindrical structures. They are provided with outlets at different levels to withdraw the desired stock of grains. They have built in arrangement for aeration, temperature control, protection from insects, rats, birds etc.

Solution 30:

Field crops are infested with a variety of pests. There are various methods by which insects and diseases can be controlled. One of the most common and effective methods is the use of pesticides or biocides which include insecticides (for killing the insects), weedicides (for killing the weeds) and fungicides (for killing the fungi). Thus chemicals used to kill the pests, e.g. weeds; insects, mites, rodents and fungi are called pesticides. These chemicals are sprayed on crop plants or used for treating seeds and soil.

Solution 31:

During the grain storage, if the loss is due to the biotic factors which includes insects, rodents, birds, mites, fungi and bacteria, then it shows the presence of pests in the grain stores.

Solution 32:

Spraying:

- (i) Spraying requires mechanical devices such as manual sprayer or mechanical sprayer.
- (ii) It is less effective than fumigation.

Fumigation:

- (i) It does not require any mechanical device.
- (ii) It is more effective than spraying.

Solution 33;

Milk is rich in fat, tocopherol, proteins, calcium, and phosphorus and contains low sodium, potassium and cholesterol. It is ideal for making milk products like ghee, curd etc. Milk in comparison to other food products such as egg and meat contain all the major food constituents such as carbohydrates, proteins, fats, minerals, water and vitamins such as A and D.

Solution 34:

The animals which provide us food are cow, buffalo, hen and fish.

Solution 35:

Animal products used as food are: Milk, egg, meat, honey.

Solution 36:

Roughage:

- (i) Roughage contains fibres such as green fodder, silage, hay and legumes.
- (ii) It is high in fibre.

Concentrates:

- (i) Concentrates are a mixture of substances which are rich in one or more nutrients.
- (ii) It is low in fibre.

Solution 37:

The daily average feed of a cow is given below:

- (i) Green fodder and dry grasses (roughage) = 15 to 20 Kg.
- (ii) Grain mixture (Concentrates) = 4 to 5 Kg.
- (iii) Water = 30 to 35 litres.

Solution 38:

The sources of concentrates are cotton seeds, oil seeds, grains of maize, oats, barley, jowar, bajra, gram and their by products such as wheat bran, rice bran, gram husk, oil seed cakes and molasses.

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Solution 39:

- (i) The shelters should have roofed sheds which protects them from rain, heat, direct sunlight and cold.
- (ii) The floor of cattle shed is made brick-lined and sloping for facilitating cleaning and keeping their sitting place dry.
- (iii) The sheds or shelters should be provided with cross ventilation with sufficient number of inlets and outlets.
- (iv) The shelters are provided with feeding passage and feeding trough.

Solution 40:

Artificial insemination; It generally gives improved breeds. This method is widely used to improve the qualities of cow, buffaloes, poultry, horse, sheep, goats and pigs. This method is economical, reliable and hygienic.

Solution 41:

(a) Cows are classified as draught, diary and dual purpose breeds.

(i) Draught breeds – Their meat is tough and gives little milk. They are used in agricultural practices.

(ii) Diary breeds – They have large digestive systems and gives large amount of milk.

(iii) Dual breeds – These breeds provide milk as well as help in agricultural tasks.

(b) Breeds of buffaloes – There are ten breeds of buffalo in our country. The important breeds of buffalo with high yield of milk are – Murrah, Mehsana and Surti.

Solution 42:

Steps involved in artificial insemination are:

(i) The semen of healthy and tough animal of high milk yielding breed is collected.

(ii) It is preserved by freezing or chemical methods.

(iii) The preserved semen is then injected into the genital tract of the female animal.

(iv) The preserved semen is injected during fertility period.

Solution 43:

Artificial insemination is the process of injecting the semen obtained from a desired male bull of high milk yielding breed into the genital or reproductive tract of female animal during heat period.

Advantages:

(i) It is economical because semen from a single bull can be used to impregnate several thousand cows.

(ii) It gives high rate of successful fertilization.

Solution 44:

Symptoms of sick animals:

(i) Fever

(ii) Constipation followed by severe diarrhea.

(iii) Restlessness

(iv) Irritation

Solution 45:

(a) Symptoms of Mastitis: Fever, udder becomes swollen, milk is watery.

(b) Symptoms of Foot-and-mouth: Blisters appear on the mouth and foot resulting in extreme soreness of the parts. Loss of appetite, excessive salivation, high fever accompanied by shivering and inability to work.

Solution 46:

The high yielding breeds of poultry are advantageous over indigenous breeds as:

- (i) Improved quality and quantity of chicks.
- (ii) Low maintenance requirement.
- (iii) Improvement in egg production and reduction in the size of the layer.
- (iv) Tolerance to high temperature.

Solution 47:

Advantages of fishery:

- (i) Economically important desired fishes are raised in a small area.
- (ii) Fishes are made to breed in different seasons.
- (iii) There is little mortality in the younger stages of the fishes.
- (iv) Through selective hybridization, yield and quality of fishes are improved.

Solution 48:

Poultry diseases can be prevented by giving good management practices. The growers require enough space as overcrowding tends to suppress their growth. Adequate lighting should be there. They should be provided with proper feed. Clean and hygienic conditions are must to keep them in good health and prevent them from diseases.

Solution 49:

Bee keeping is the rearing of honey bees which provide us with useful products such as honey, wax, propolis, royal jelly and bee venom.

Solution 50 :

Composite fish culture is advantageous and economical. It yields about 8-9 times more production than monoculture. All the species of fish live in distinct zone inside the pond and have distinct feeding habits.

Solution SAQ – 1:

Plants as food are gift of nature to humans and most animals. Different parts of plants, such as root, stem, leaf, flower and fruit are consumed by humans in the form of cereals, vegetables, spices and fruits. Animals produce milk, egg, meat, etc. which also supplement our food requirements.

Solution SAQ – 2:

Green revolution is the high production of food grains. The objectives of crop improvement are:

- (i) Crop production management.
- (ii) Crop variety improvement.
- (iii) Crop protection management.

Solution SAQ – 3:

The cereals provide us with carbohydrates. The pulses provide us with proteins. Fruits and vegetables give us carbohydrates, protein, fat, vitamins, minerals and lots of fibers.

Solution SAQ – 4:

The basic objective of mixed cropping is to minimize the risk and insure against the crop failure due to abnormal conditions.

Criteria for the selection of crops for mixed cropping:

- (i) The different crops to be grown together are so selected that the products and waste materials from one crop stimulates the growth of the other crop.
- (ii) Care is taken to select crops that do not compete with each other for light, nutrients and water.

Solution SAQ – 5 :

Mixed Cropping:

- (i) It aims to minimize the risk of crop failure.
- (ii) Seeds of two crops are mixed before sowing.
- (iii) It involves no set pattern of rows of crops.

Intercropping:

- (i) It aims to increase the productivity per unit area.
- (ii) Seeds of two crops are not mixed.
- (iii) It involves set pattern of rows of crops.

Solution SAQ – 6:

Advantages of mixed cropping:

- (i) The risk of total crop failure due to uncertain monsoon is reduced.
- (ii) Chances of pest infestation are greatly reduced.
- (iii) Fertility of the soil is improved by growing two crops simultaneously.

Disadvantages of mixed cropping:

- (i) Seeds of two crops are mixed before sowing and there is no definite pattern for sowing the seeds.
- (ii) Products of different crops are harvested, threshed, marketed and consumed in mixed form.

Solution SAQ – 7:

Intercropping is the practice of growing two or more crops simultaneously in a same field in definite row patterns with the objective of increasing productivity per unit area.

Mixed Cropping:

- (i) It aims to minimize the risk of crop failure.
- (ii) Seeds of two crops are mixed before sowing.
- (iii) It involves no set pattern of rows of crops.

Intercropping:

- (i) It aims to increase the productivity per unit area.

- (ii) Seeds of two crops are not mixed.
- (iii) It involves set pattern of rows of crops.

Solution SAQ – 8:

Disadvantages of crop rotation: Crops of the same family should not be repeatedly grown in the same field. This practice will promote build up of diseases and insect pests and decrease the similar nutrients from the soil.

Solution SAQ – 9:

Criteria for the selection of crops for crop rotation:

- (i) Availability of moisture through rain or irrigation.
- (ii) Status of nutrients in the soil.
- (iii) Duration of crop – short or long.

Solution SAQ – 10:

Leguminous crops are required in crop rotation as they are used to increase the soil fertility. Those crops which require high fertility level may be grown after growing legumes. They also replenish the soil with nitrogen content.

Solution SAQ – 11:

The three steps involved in hybridization are:

- (i) Introduction – This refers to the transportation of crop plants from the place of cultivation to the place where they were grown earlier.
- (ii) Selection – This process involves the selection of most desirable offspring of a variety of plant for controlled propagation.
- (iii) Hybridisation – It involves the crossing between genetically dissimilar plants to produce a new kind. Crossing may be between two different varieties (intervarietal cross – breeding) or between the two different species of the same genus (inter specific cross – breeding) and between different genera (intergeneric cross – breeding).

Solution SAQ – 12:

Plant breeding means production of new varieties or strains by a programme of artificial selection spanning several generations of the organism concerned.
It involves hybridization and mutation breeding.

- (i) Hybridisation – It involves the crossing between genetically dissimilar plants to produce a new kind. Crossing may be between two different varieties (intervarietal cross – breeding) or between the two different species of the same genus (inter specific cross – breeding) and between different genera (intergeneric cross – breeding).
- (ii) Mutation breeding – The breeding that takes place through various mutagens.

Solution SAQ – 13:

Biological method of weed control involves the deliberate use of insects or some other organisms which consume and specifically destroy the weed plants.

Example – Opuntia can be controlled by using cochineal insects in Maharashtra.

Solution SAQ – 14:

Plant disease Occurrence Transmission

- (i) Blast Rice Air-borne
- (ii) Rust Wheat Air-borne
- (iii) Wilt Chick pea Soil-borne
- (iv) Stem rot Pigeon pea Water-borne
- (v) White rust Rice Mustard Air-borne

Solution SAQ – 15:

The ways by which the insects attack the crop plants are:

- (i) The chewing insects destroy all sorts of crop plants. They cut the root, stem and leaf of the crop plants by the help of their chewing mouth parts.
- (ii) Sucking insects suck the cell sap from various parts of the plant. They make fine punctures in the skin of plants with their needle – like, hollow beaks and suck the sap.
- (iii) The internal feeders live inside the plant parts. They make holes in the developing grains.

Solution SAQ – 16:

Controlling insect pests:

- (i) Root cutting type of insects is controlled by mixing insecticides in the soil.

Example – Chloropyrifos.

- (ii) Stem and leaf cutting type of insects can be controlled by dusting or spraying the contact insecticides.

Example – Malathion, lindane and thiodan.

- (iii) All sap sucking insects can be controlled by spraying systematic insecticides.

Example – Dimethoate and metasystox.

Solution SAQ – 17:

(a) Example of narrow leaved rabi season weeds are – Cyperus rotundas and Wild sorghum.

(b) Example of broad leaved kharif season weeds are – Amaranthus viridis and Trianthema.

Solution SAQ – 18:

The various methods of weed control are:

(i) Mechanical methods – These include uprooting, weeding with trowel or khurpi, hand hoeing, interculture, ploughing, burning and flooding.

(ii) Cultural methods – This includes the proper bed preparation, timely sowing of crops, intercropping and crop rotation.

(iii) Chemical methods – Herbicides and weedicides are sprayed on weeds to destroy weeds like – 2, 4 – D.

(iv) Biological methods – Biological method of weed control involves the deliberate use of insects or some other organisms which consume and specifically destroy the weed plants. Example – Opuntia can be controlled by using cochineal insects in Maharashtra.

Solution SAQ – 19:

Effect of weeds on crop plants:

(i) The growth of weeds in the crop fields is harmful because they compete with the crops for nutrients, water, space and light.

(ii) The weeds spread crop pests and diseases by acting as alternate host to insects and microorganisms.

(iii) Some weeds may produce toxic substances which may interfere with the growth of crop plants.

(iv) During harvesting weeds get mixed with crop's produce to downgrade its quality.

Solution SAQ – 20:

Crop's pest is any destructive organism which causes great economic loss by destroying crop plants or products obtained from them.

These can be controlled by the use of pesticides or biocides which includes insecticides, weedicides and fungicides. These chemicals are sprayed on crop plants or used for treating seeds and soil.

Solution SAQ – 21:

Insect resistant varieties are advantageous as they do not get infested with pests. Their genes are modified so pests cannot harm them. Therefore, pesticides are not used to protect them diseases which are toxic in nature and cause environmental pollution.

The Fundamental Unit Of Life – Cell

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Solution SAQ – 1:

Prokaryotic Cell:

1. Cell size is generally small.
2. Only a single chromosome is present.
3. Nucleolus is absent.
4. Cell division takes place by fission or budding.

Eukaryotic Cell:

1. Cell is generally large.
2. More than one chromosome is present.
3. Nucleolus is present.
4. Cell division takes place by mitotic or meiotic.

Solution SAQ – 2:

Organs:

1. They are found in multicellular organisms.
2. They are large sized.
3. They may be external or internal to the body of organisms.
4. Organs coordinate to form organ systems, while organ systems form the body of an organism.

Organelles:

1. They are found in all eukaryotic cells.
2. They are very small sized.
3. They are mostly internal.
4. Organelles coordinate to produce the cell.

Solution SAQ – 4:

Light microscope:

1. It uses glass lenses.
2. It uses a beam of light to illuminate the object.
3. Internal vacuum is not required.

Electron microscope:

1. It uses electromagnets.
2. It uses a beam of electrons instead of light.
3. Internal vacuum is essential.

Solution SAQ – 5:

Robert Hooke examined a thin slice of cork under a self-designed crude microscope and observed that the cork resembled the structure of a honey comb. The latter consisted of many tiny compartments. Hooke called them cellulae (Singular cellula), now termed cells. Cellula is a Latin name which means a 'little room'. Such rooms were also present in monasteries.

Solution SAQ – 6:

There are two types of protein molecules: Intrinsic proteins, which completely covers the lipid bilayer and extrinsic proteins, which occur either on the outer surface or on the inner surface of the lipid membrane.

Solution SAQ – 7:

Its major function is to hold cellular contents and control passage of materials in and out of the cell.

Solution SAQ – 8:

In amoeba, oxygen (O₂) enters the cell by the process of diffusion when the level or concentration of O₂ inside the cell decreases.

Solution SAQ – 9:

Put dried raisins and apricots in pure water and leave them for some time. Then place them into a concentrated Solution of sugar or salt. Each one of them gains water and swells when placed in pure water due to endosmosis. When such swollen raisins/apricots are placed in the concentrated Solution, each of them loses, water, and consequently shrinks again (due to exosmosis).

Solution SAQ – 10:

Diffusion:

1. Diffusion can occur in any medium.
2. The diffusing molecules may be solids, liquids or gases.
3. Semipermeable membrane is not required.
4. An equilibrium in the free energy of diffusion molecules is achieved in the system.

Osmosis:

1. It occurs only in liquid medium.

2. It involves movement of solvent molecules only.
3. Semipermeable membrane is required.
4. Equilibrium in the free energy of solvent molecules is never achieved.

Solution SAQ – 11:

Endocytosis is the ingestion of material by the cells through the plasma membrane. It is a collective term that describes three similar processes: phagocytosis (cell eating), potocytosis (cell drinking) and receptor-mediated endocytosis. These processes are pathways to specifically internalize solid particles, small molecules ion, and macromolecules, respectively. All of them require energy, so they may be regarded as different forms of active transport.

Solution SAQ – 12:

(i) When eukaryotic cells are placed in hypotonic Solution, the water molecules will enter into the cell and the cell will swell up.

(ii) If eukaryotic cells are placed in hypertonic Solution, the water molecules will come out of the cell and the cell with shrink.

(iii) If the eukaryotic cell is placed in isotonic Solution, the amount of water molecule will remain the same; it will neither move out nor will go inside. The cell will remain same sized.

Solution SAQ – 13:

- (a) Ribosome.
- (b) Plastid in plants and Mitochondria in animals.
- (c) Rough endoplasmic reticulum.
- (d) Genes.

Solution SAQ – 14:

- (a) Chloroplasts:
1. They are green plastids.
 2. They contain chlorophylls and carotenoids.
 3. Lamellae are present.
 4. Chloroplasts are sites of photosynthesis.

Chromoplasts

1. They are non-green coloured plastids.
2. Chlorophylls are absent. Only carotenoids are present.
3. Lamellae are absent.
4. They add colour to the organs for attracting animals to perform pollination and fruit dispersal.

(b) Ribosome:

1. It is found in both animal cell and plant cell.
2. These are dense, spherical and granular particles which occur freely in the matrix or remain attached to the endoplasmic reticulum.

Centrosome:

1. Centrosome is found only in animal cells.
2. It consists of two granules like centrioles.

Solution SAQ – 15:

Animal Cell:

1. Animal cells are generally small in size.
2. Cell wall is absent.
3. Animal cells have a single highly complex and prominent Golgi apparatus.
4. Animals cells have centrosome and centrioles.

Plant Cell:

1. Plant cells are larger than animal cells.
2. The plasma membrane of plant cell is surrounded by a rigid cell wall made up of cellulose.
3. Plant cells have many simpler units of Golgi apparatus, called dictyosomes.
4. Plant cells lack centrosome and centrioles.

Solution SAQ – 16:

If nucleus is removed from a cell, the protoplasm will ultimately dry up and the cell will die because the nucleus controls all the metabolic activities of a cell.

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Solution SAQ – 17:

Spinach looks green due to the presence of chloroplasts, papaya is yellow and edible part of watermelon is red due to the presence chromoplasts.

Solution SAQ – 18:

(a) Functions of endoplasmic reticulum:

- (i) It forms supporting skeletal framework of the cell.
- (ii) ER provides a pathway for the distribution of nuclear material from one cell to the other.

(b) Functions of lysosomes:

- (i) Lysosomes serve as intracellular digestive system. They destroy any foreign material which

enters the cells such as bacteria and virus.

(ii) Lysosomes also remove the worn out and poorly working cellular organelles by digesting them to make way for their new replacements.

Solution SAQ – 19:

- (a) Ribosome.
- (b) Leucoplasts.

Solution SAQ – 20:

Lysosomes contain digestive enzymes for almost all types of organic materials. If their covering membrane breaks as it happens during injury to cell, the digestive enzymes will spill over the cell contents and digest the same. As Lysosomes are organelles which on bursting can kill cells possessing them, they are called suicide bags.

Solution SAQ – 21:

- (a) Cell Inclusions – Cell inclusions are non-living materials present in the cytoplasm.
- (b) Cytosol – It is the soluble part of cytoplasm and is located between cell organelles.
- (c) Protoplasm – Nucleus and cytoplasm together are called protoplasm.
- (d) Nucleoplasm – It is the liquid ground substance present in the nucleus.

Solution SAQ – 22:

Ribosomes get synthesized in the nucleolus.

Solution SAQ – 23:

(a) The mitochondria are tiny bodies of varying shapes and size. Each mitochondria is bounded by a double membrane envelope. Outer membrane is porous. The inner membrane is thrown into folds. These folds are called cristae and are studded with small rounded bodies known as F1 particles or oxysomes. The interior cavity of the mitochondria is filled with a proteinaceous matrix which contains a few small-sized ribosomes, a circular DNA molecule and phosphate granules. Mitochondria are sites of cellular respiration.

(b) Plastids occur in most plant cells and are absent in animal cells. They have their own genome and ribosomes. There are three types of plastids: chromoplasts, chloroplasts and leucoplasts.

Solution SAQ – 24:

The cell organelles are – Endoplasmic Reticulum, Ribosomes, Golgi apparatus, Lysosomes, Mitochondria, Plastids, Vacuoles, Peroxisomes and Centrosome.

Solution SAQ – 25:

The three main functional regions of the cell are: Plasma membrane, Nucleus and the cytoplasm.

Solution SAQ – 26:

- (a) Nucleus.
- (b) Nucleus.
- (c) Vacuoles.
- (d) Nucleus.

Solution SAQ – 27:

Genes are the functional units of chromosomes which transmit the heredity information from parents to offsprings. These are located on chromosomes.

Solution SAQ – 28:

Lysosomes are called digestive bags because they digest any foreign material which enters the cell such as bacteria and virus.

Solution SAQ – 29:

Mitochondria is called the power plant of eukaryotic cell because it contains enzymes that are needed for the step wise oxidation of food stuffs present in the cells to carbon dioxide and water and energy is released.

Solution SAQ – 30:

Centrioles – Centrioles are hollow and cylindrical structures which are made up of microtubules.

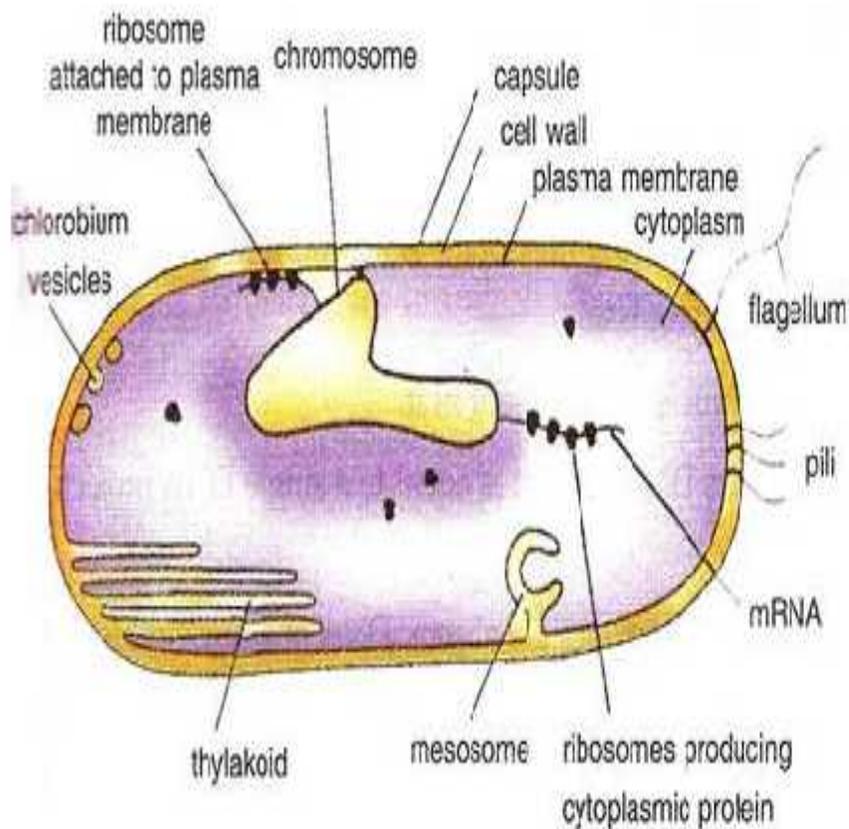
Functions: (i) It migrates to the poles of animal cells and is involved in the formation of the spindle.

(ii) In plant cells, cell division involves polar caps for the spindle formation.

Solution SAQ – 31:

Lipids gets synthesised in the smooth endoplasmic reticulum and proteins gets synthesised in the ribosomes and rough endoplasmic reticulum.

Solution SAQ – 32:



Solution SAQ – 33:

Plasmolysed cell means the cell in which the water crosses the plasma membrane in both directions but more water leaves the cell than enters it and the cell will shrink.

Solution LAQ – 1:

According to fluid mosaic model, plasma membrane is made up of a bilayer of phospholipids. There are two types of protein molecules: Intrinsic Proteins, which completely covers the lipid bilayer and Extrinsic Proteins, which occur either on the outer surface or on the inner surface of the lipid membrane.

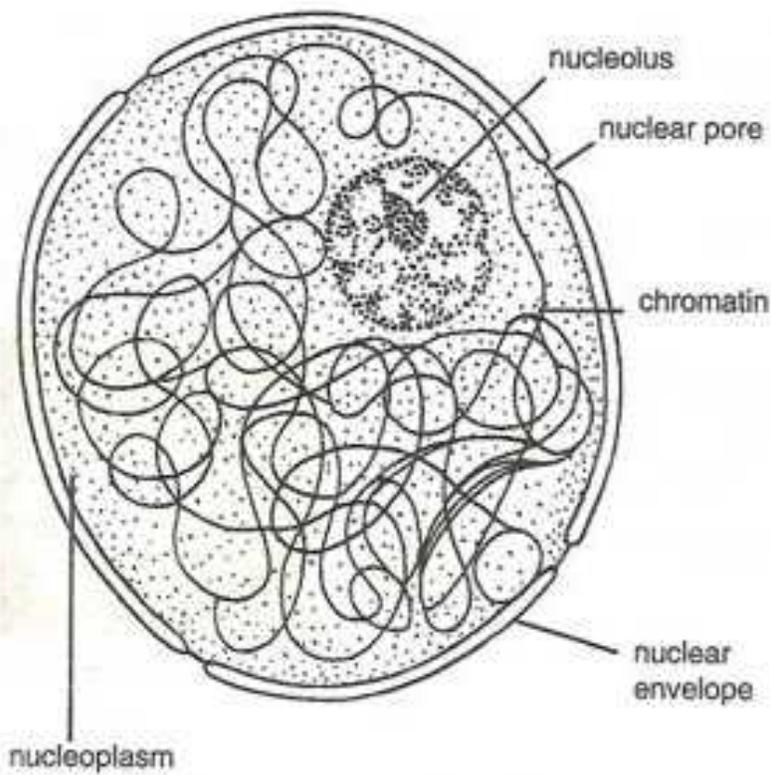
The fluid mosaic membrane has been described as “a number of protein icebergs floating in the sea of lipids”.

Functions of cell organelles:

- (i) Endoplasmic Reticulum – It forms the supporting skeletal framework of the cell.
- (ii) Ribosomes – It synthesises proteins.
- (iii) Golgi Apparatus – It produces vacuoles which contain cellular secretion.
- (iv) Lysosomes – It serves as intracellular digestive system as it digests the foreign materials which enter the cell.
- (v) Mitochondria – These are the sites of cellular respirations
- (vi) Plastids – These are present only in plants and trap solar energy to manufacture food for plants.
- (vii) Vacuoles – They help to maintain the osmotic pressure in a cell.
- (viii) Peroxisomes – They carry out some oxidative reactions.
- (ix) Centrosome – It helps in cell division in the animal cell.

Solution LAQ – 3:

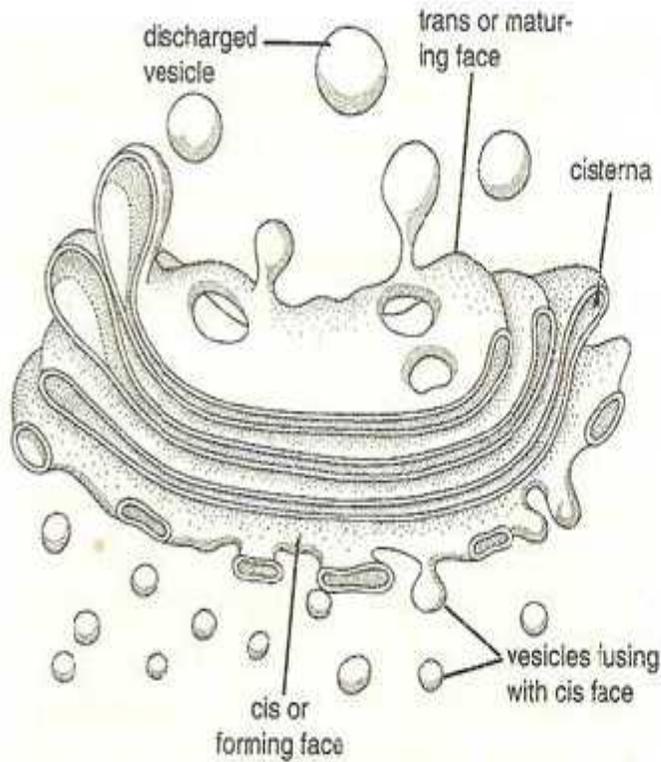
Nucleus – The nucleus is a large, centrally located spherical cellular component. It is bounded by two nuclear membranes, both forming a nuclear envelope. The nuclear envelope separates the nucleus from the cytoplasm. Within nucleoplasm two types of nuclear structures are embedded – the nucleolus and chromatin material. The nucleolus may be one or more in number and is not bounded by any membrane. It is rich in protein and RNA molecules and acts as the site for ribosome formation.



Solution LAQ – 4:

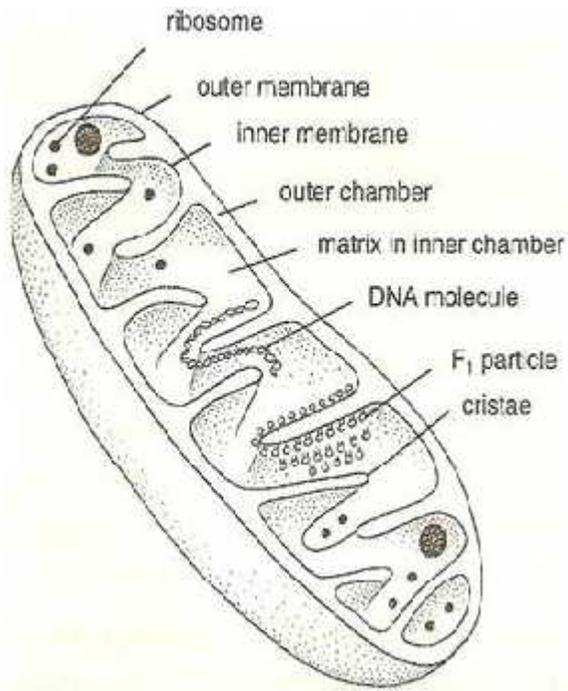
(a) Golgi apparatus consists of a set of membrane-bounded, fluid filled vesicles, vacuoles and flattened cisternae. Cisternae are usually stacked together (placed one above the other) in parallel rows. Golgi apparatus exists as an extensive network near the nucleus in the animal cells. However, the plant cells contain many freely distributed subunits of Golgi apparatus, called dictyosomes.

The Golgi apparatus arises from the membrane of the smooth endoplasmic reticulum, which in turn originates from the rough endoplasmic reticulum.



(b) The mitochondria are tiny bodies of varying shapes and size. Each mitochondria is bounded by a double membrane envelope. Outer membrane is porous. The inner membrane is thrown into folds. These folds are called cristae and are studded with small rounded bodies known as F1 particles or oxysomes. The interior cavity of the mitochondria is filled with a proteinaceous matrix which contains a few small-sized ribosomes, a circular DNA molecule and phosphate

granules. Mitochondria are sites of cellular respiration.



Tissues

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Solution 1:

Importance of tissues-

- (i) Formations of tissues have brought about a division of labour in multicellular organisms.
- (ii) Tissues become organised to form organs and organs organise into organ system.

Solution 2:

Plants are autotrophic organisms, so prepare their own food by photosynthesis. Moreover plants are stationary or fixed organisms; they do not have to move from place to place in the search of their food. Since they do not consume or need much energy, so most of the plant tissues are supportive, which provide them with structural strength. Animals are heterotrophic organisms. They have to move in search of food, mate and find shelter, so they need more energy as compared to plants. Most of the tissues they contain are living.

Solution 3:

Plant Tissues

- 1. They require less maintenance energy.
- 2. There is a differentiation of meristematic and permanent tissues.

Animal Tissues:

- 1. They require more maintenance energy.
- 2. Such a differentiation is absent in them.

Solution 4:

They are located at the base of leaves or internodes, e.g., stems of grasses and other monocots. Such tissues also occur below the nodes. It produces an increase in the length of an organ such as leaves and internodes.

Solution 5:

- (i) Apical meristem – It brings about the elongation of the root and stem.
- (ii) Lateral meristem – It causes the organ (stem or root) to increase in diameter and girth.

Solution 6:

Simple permanent tissues – These tissues are composed of cells which are structurally and

functionally similar.

There are three types of simple permanent tissues:

(i) Parenchyma – Parenchyma cells are living and possess the power of division. The cell wall is thin and encloses a dense cytoplasm which contains a small nucleus and surrounds a large central vacuole.

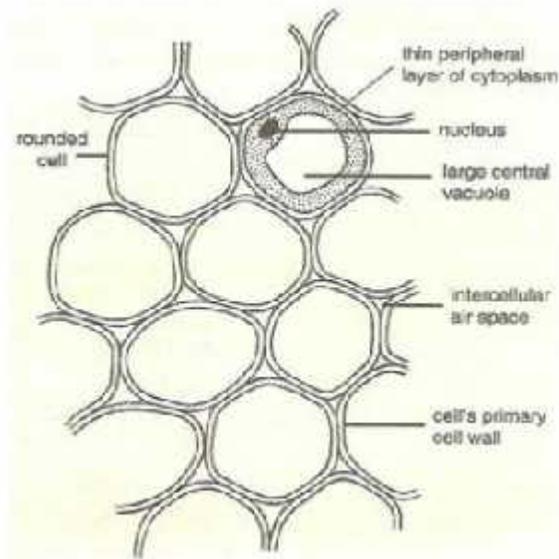
(ii) Collenchyma – Its tissues consist of living cells. It is characterized by the deposition of extra cellulose at the corners of the cells. In collenchymas, intercellular spaces are generally absent. Collenchyma cells are elongated in shape. They often contain a few chloroplasts.

(iii) Sclerenchyma – Sclerenchyma cells are dead cells and they are devoid of protoplasm. The cell walls of Sclerenchyma are greatly thickened of lignin. The cells of Sclerenchyma are closely packed without intercellular spaces.

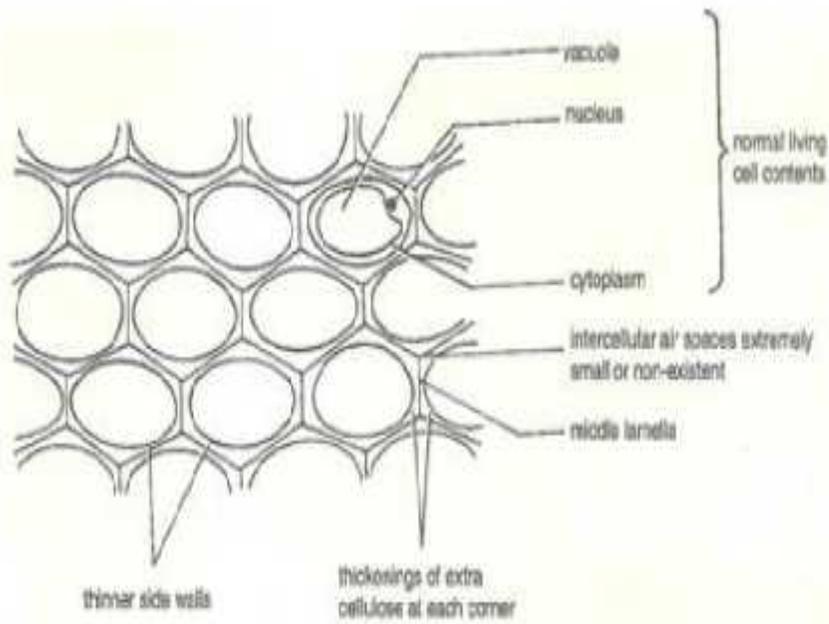
PS Verma and V.K. Agarwal Biology Class 9 Page No – 165.

Solution 7:

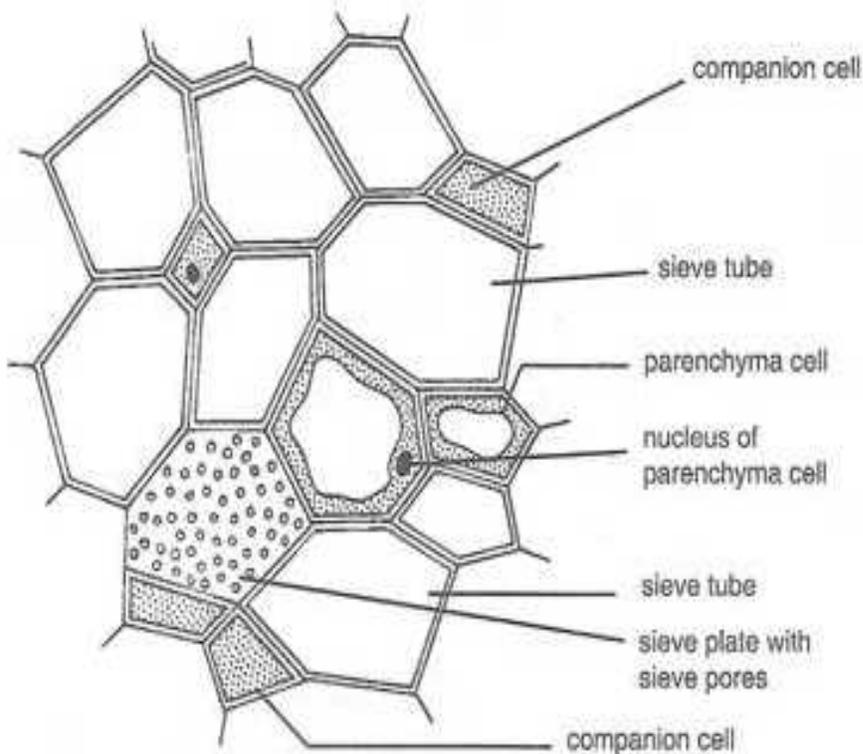
(a) Parenchyma



(b) Collenchyma



Solution 8:

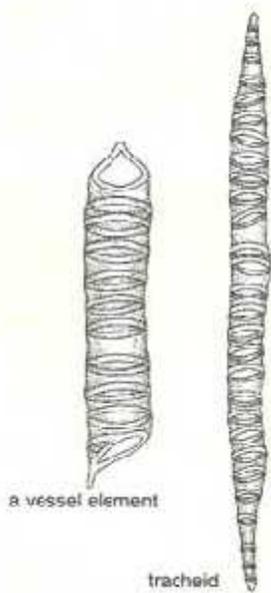


Phloem Tissue

Solution 9:

Xylem Tissue

Xylem Tissue



Solution 10:

Functions of Collenchyma:

- (i) It provides mechanical support and elasticity.
- (ii) It provides tensile strength to the plants.

Solution 11:

Sclerenchyma cells are dead cells and they are devoid of protoplasm. The cells walls of sclerenchyma are greatly thickened by lignin. The cells of sclerenchyma are closely packed without intercellular spaces.

Solution 12:

Xylem:

1. It conducts water and minerals.
2. Conducting channels or tracheary elements are tracheids and vessels.

Phloem:

1. It conducts organic solutes and food materials.
2. Conducting channels are sieve tubes.

Solution 13:

Tracheids:

1. Single celled.
2. The end walls remain intact.

Vessels:

1. Made up of a row of cells.
2. End walls get dissolved and become perforated.

Solution SAQ – 1:

The different types of elements present in the phloem are:

- (i) Sieve tubes – Sieve tubes are slender, tube-like structures composed of elongated thin-walled cells, placed end to end. Their end walls are perforated by numerous pores and are called sieve plates.
- (ii) Companion Cells – It is a small thin-walled cell containing dense and very active cytoplasm and large elongated nucleus.
- (iii) Phloem parenchyma – These are thin-walled, living cells of parenchyma of phloem. They have two functions, storage and slow lateral conduction of food.
- (iv) Phloem Fibre – These are thick-walled, elongated spindle shaped dead cells which possess narrow lumen. They provide mechanical strength to the tissue.

Solution SAQ – 2

Tracheary elements are the elements of xylem. Their function is to carry water and mineral salts in upward direction from the roots to different part of shoots.

Solution SAQ – 3

(i) Parenchyma Functions:

- (a) The main function of parenchyma is to store and assimilate food.
- (b) Transport of materials occurs through cells or cell walls of parenchyma cells.

(ii) Collenchyma Functions:

- (a) It provides mechanical support and elasticity.
- (b) It provides tensile strength to the plants.

(iii) Sclerenchyma Functions:

- (a) It is mainly mechanical and protective in function.
- (b) It gives strength, rigidity, flexibility and elasticity to the plant body.

Solution SAQ – 4

Parenchyma:

1. The tissue consists of thin-walled living cells.
2. It is distributed in almost all the parts of the plant body.
3. The living cells of parenchyma assimilate and store food. They also store waste products.

Collenchyma:

1. The tissue consists of cells having localised thickening in their cell walls.
2. It occurs mostly in the aerial parts of the plants and is restricted to the outer layers.
3. Collenchyma is the chief mechanical tissue in parts of a young plant particularly in the young dicotyledonous stems.

Solution SAQ – 5:

Collenchyma:

1. It consists of living cells.
2. Its cells contain cytoplasm.
3. Its cell walls are cellulose.

Sclerenchyma:

1. It consists of dead cells.
2. Its cells are empty.
3. Its cell walls are lignified.

Solution SAQ – 6

Xylem is composed of cells of four different types: 1. Tracheids; 2. Vessels or tracheae; 3. Xylem parenchyma and 4. Xylem Sclerenchyma. Except xylem parenchyma, all other xylem elements are dead and bounded by thick lignified walls. Vessels are shorter and wider than tracheids. Vessels are very long tube-like structures formed by a row of cells placed end to end. Tracheids are elongated cells with tapering ends. They also conduct water.

Solution SAQ – 7

Functions of Xylem:

- (i) The main function of xylem is to carry water and mineral salts upward from the root to different parts of shoots.
- (ii) Since walls of tracheids, vessels and sclerenchyma of xylem are lignified, they give mechanical strength to the plant body.

Solution SAQ – 8

Functions of Phloem:

Phloem transports photosynthetically prepared food materials from the leaves to the storage organs and later from storage organs to the growing regions of the plant body.

Solution SAQ – 9

The different types of plant tissues are:

1. Meristematic tissues – It is of three types: Apical, Lateral and Intercalary.
2. Permanent Tissue – It of two types: Simple and Complex tissues. Simple tissues are of three types – Parenchyma, Collenchyma and Sclerenchyma. Complex tissues are of two types – Xylem and Phloem.

Solution SAQ – 10

Sieve tube elements do not have nuclei but have cytoplasm. They are dependent on adjacent companion cells which contains dense and very active cytoplasm and a large elongated nucleus.

Solution SAQ – 11

Functions of Epithelial tissues are:

- (i) The cells of the body surface form the outer layer of skin. These cells protect the underlying cells from drying, injury, and chemical effects.
- (ii) Inside the body, epithelial cells form lining of mouth and alimentary canal and protect these organs.
- (iii) Epithelial tissues help in absorption of water and nutrients in small intestine.
- (iv) Some epithelial tissues perform secretory function such as sweat, saliva in skin and mouth cavity.

Solution SAQ – 12

- (i) Striated Muscles – It occur in the muscles of limbs, body wall, face, neck, etc. Striated muscles present in tongue, pharynx, diaphragm and upper part of oesophagus are called visceral straited muscles.
- (ii) Smooth Muscles – Smooth muscles are found in the walls of the hollow (tubular) visceral organs except that of the heart. They occur in the wall of alimentary canal and internal organs, ducts of glands, urogenital ducts and blood vessels.
- (iii) Cardiac Muscles – The cardiac muscles occur in the heart.

Solution SAQ – 13:

- (a) Neuron – Nervous Tissue
- (b) Dendrite – Nervous Tissue
- (c) Cilia – Ciliated Epithelium
- (d) Collagen fibres – Connective Tissue
- (e) Elastin fibre – Connective Tissue

Solution SAQ – 14

- (a) Osteoblast – It provides shape to the body.
- (b) Chondroblast – It provided support and flexibility to the body parts.
- (c) Goblet Cells – It is a mucus secreting epithelial cell which secretes mucus.
- (d) Neuron – The dendrites receive impulses and the axon takes impulses away from the cell body.
- (e) Muscle Cell – They undergo rapid contraction for locomotion.

Solution SAQ – 15

Two characteristics of nerve cells are:

- (i) They are highly specialised unit cells.
- (ii) Neurons have the ability to receive stimuli from within or outside the body and to conduct (send) impulses (signals) to different parts of the body.

Solution SAQ – 16

Bone – It provides skeletal support to the body.

Cartilage – It provides support and flexibility to the body parts.

Ligament – It connects bones to bones.

Solution SAQ – 17:

- (a) Adipose tissues.
- (b) Ciliated epithelium.

Solution SAQ – 18

Functions:

- (i) It transports nutrients, hormones and vitamins to the tissues and transports excretory products from the tissues to the liver and kidney.
- (ii) The RBCs carry oxygen to the tissues for the oxidation of food stuff.
- (iii) WBCs fight disease by engulfing and destroying foreign bodies.

Solution SAQ – 19

The different tissues in animals are:

- (i) Epithelial Tissues – These are the protective tissues of the animal body. Depending upon the shape and function of the cells, the epithelial tissues are classified as follows:
 - a. Squamous epithelium.
 - b. Cuboidal epithelium.
 - c. Columnar epithelium.
 - d. Glandular epithelium.
 - e. Ciliated epithelium.

(ii) Muscular Tissues – The muscular tissues form the contractile tissues and are made up of muscle cells. On the basis of their location, structure and function, there are three types of muscular tissues:

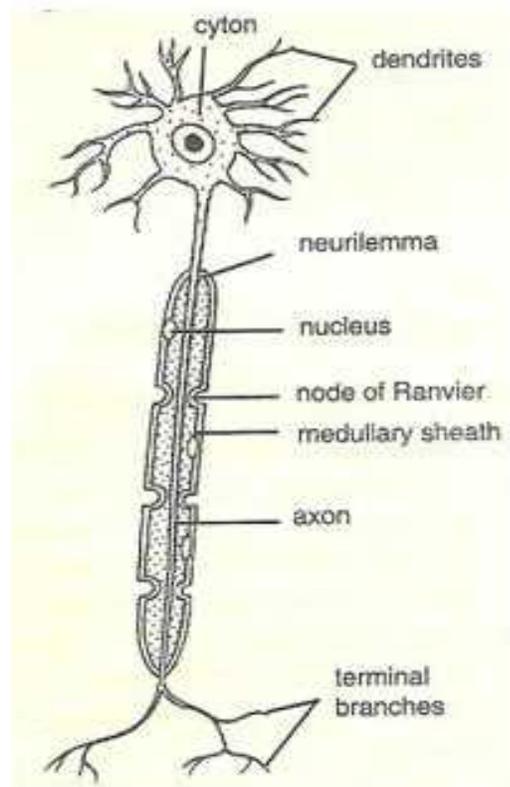
- a. Striated muscles.
- b. Smooth muscles.
- c. Cardiac muscles.

(iii) Connective Tissues – The connective tissues are specialised to connect and anchor various body organs. They are of five types:

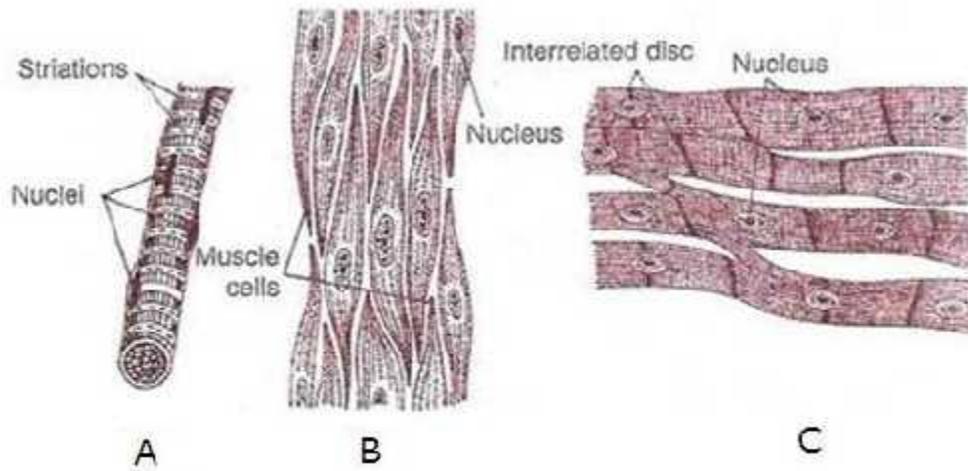
- a. Aerolar connective tissue.
- b. Dense regular connective tissue.
- c. Adipose tissues.
- d. Skeletal tissues.
- e. Fluid connective tissues.

(iv) Nervous Tissues – These tissues are specialised to transmit messages within our body. Brain, spinal cord and nerves are all composed of nervous tissues.

Solution SAQ – 20:



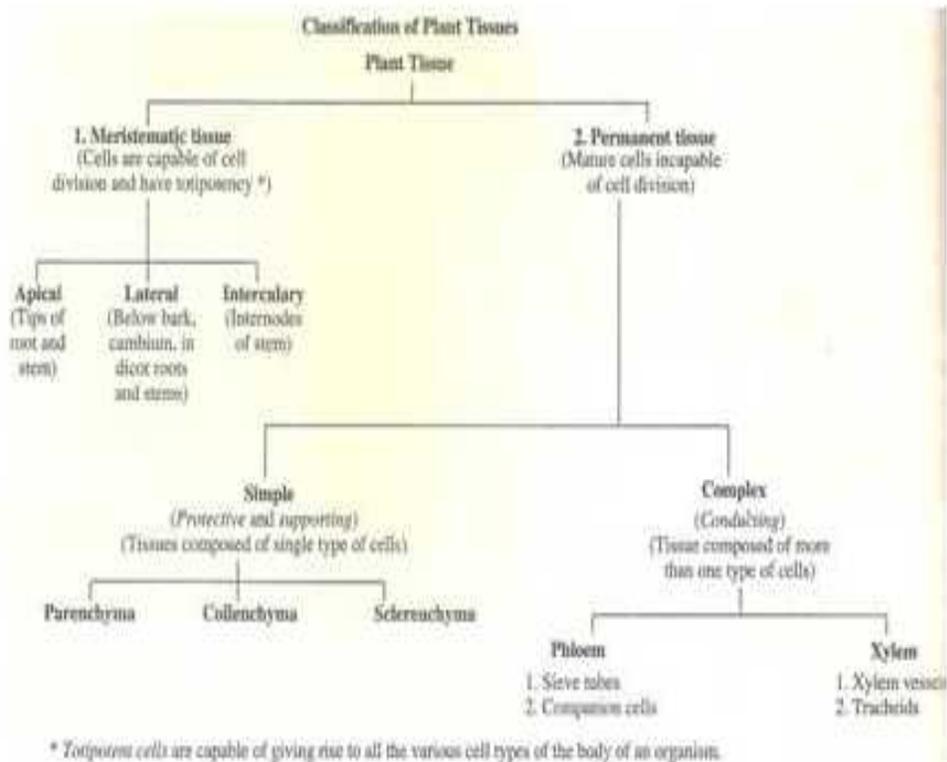
Solution SAQ – 21:



- A – Striated muscle
- B – Smooth muscle
- C – Cardiac muscle

Solution LAQ – 1:

Simple tissues – These tissues are composed of cells which are structurally and functionally similar.



There are three types of simple tissues:

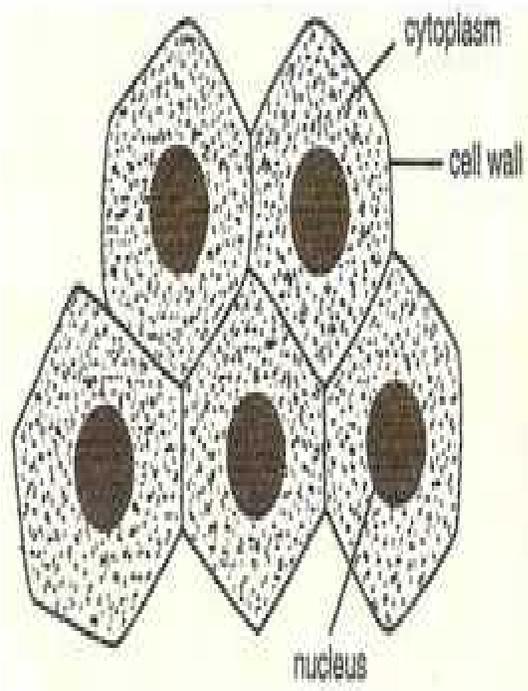
(i) Parenchyma – Parenchyma cells are living and possess the power of division. The cell wall is thin and encloses a dense cytoplasm which contains a small nucleus and surrounds a large central vacuole.

(ii) Collenchyma – Its tissues also consist of living cells. It is characterized by the deposition of extra cellulose at the corners of the cells. In collenchymas, intercellular spaces are generally absent. Collenchyma cells are elongated in shape. They often contain a few chloroplasts.

(iii) Sclerenchyma – Sclerenchyma cells are dead cells and they are devoid of protoplasm. The cell walls of Sclerenchyma are greatly thickened by the deposition of lignin. The cells of sclerenchyma are closely packed without intercellular spaces.

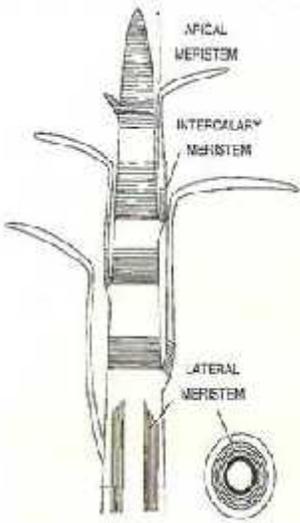
Solution LAQ – 2:

Meristematic tissues are the tissues in which the cells divide continuously and help in increasing the length and girth of the plant.



According to their position in the plant, meristems are of three types:

- a) Apical Meristems – These are situated at the growing tip of the stems and roots and increase the height of the plant.
- b) Lateral Meristems – These are found beneath the bark and in vascular bundles of dicot roots and stems. These are responsible for the growth of cambium and hence increases the girth of the plant.
- c) Intercalary Meristems – They are located at the base of leaves or internodes or below the nodes. It increases the length of the plant.

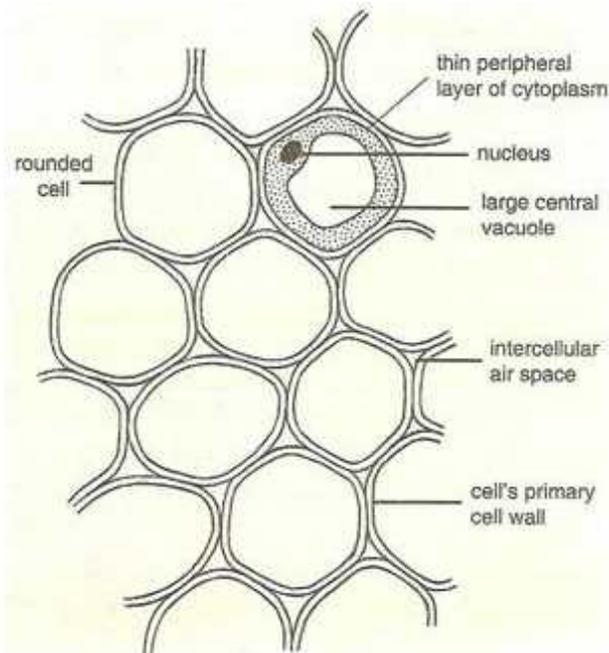


Solution LAQ – 3:

Simple tissues – These tissues are composed of cells which are structurally and functionally similar.

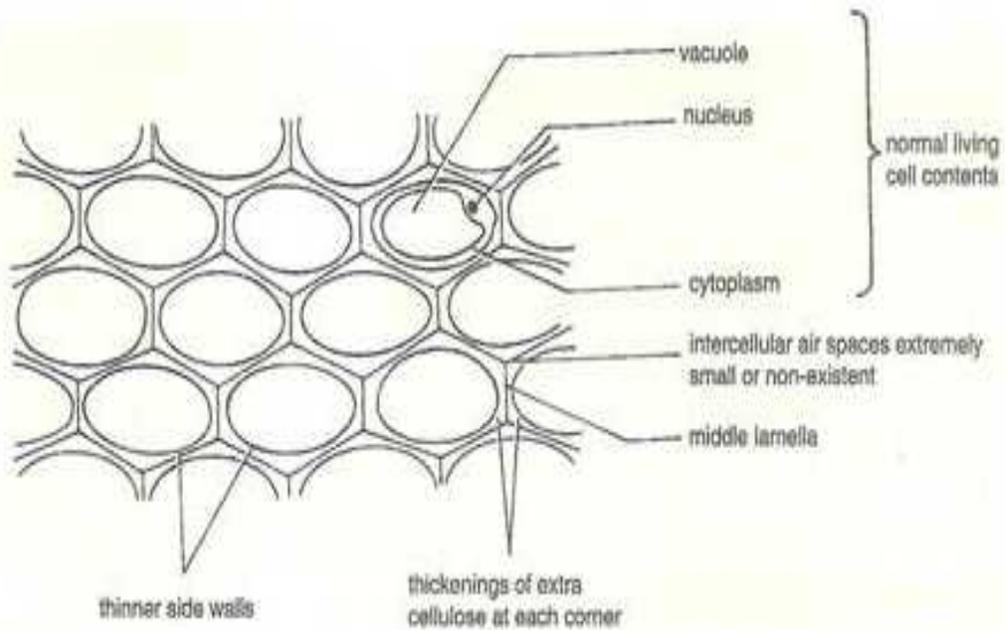
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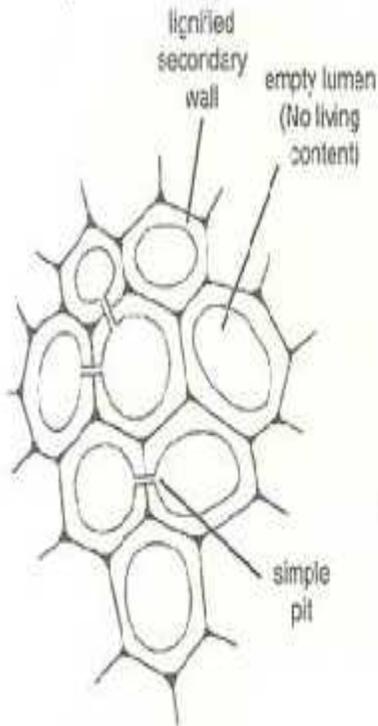


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(iii) Sclerenchyma – Sclerenchyma cells are dead cells and they are devoid of protoplasm. The cells walls of sclerenchyma are greatly thickened by the deposition of lignin. The cells of sclerenchyma are closely packed without intercellular spaces.



Diversity In Living Organisms

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Solution SAQ – 1

- (a) Point Diversity – This is a diversity present on the smallest scale.
- (b) Alpha Diversity – Also known as local diversity and includes variety of organisms local to a particular habitat.
- (c) Gamma Diversity – It represents the diversity of a larger unit such as an island or a landscape.
- (d) Epsilon Diversity – It is also called regional diversity and includes total diversity of a group of gamma diversity areas.

Solution SAQ – 2

A single plant may be considered as a unit of alpha diversity; a leaf as an area of point diversity; a group of plants occurring together as an area of gamma diversity and the forest within which the plants are located as an area of epsilon diversity.

Solution SAQ – 3

Classification is essential to understand the inter-relationship among different groups of organisms.

Solution SAQ – 4

The basis of classification is to study the diversity among living organisms in an effective way.

Solution SAQ – 5

There are two broad categories of cell structure: Prokaryotic and Eukaryotic. Thus, two broad groups can be formed – one having prokaryotic cell structure and the other having eukaryotic cell structure.

Solution SAQ – 6

Seven categories of hierarchical classification are: Kingdom, Phylum, Class, Order, Family, Genus and Species.

Solution SAQ – 7

Features of plants:

- (a) The growth of plant body is often unlimited and continues till death.
- (b) The asexual reproduction or vegetative reproduction is common in the plants.

Features of animals:

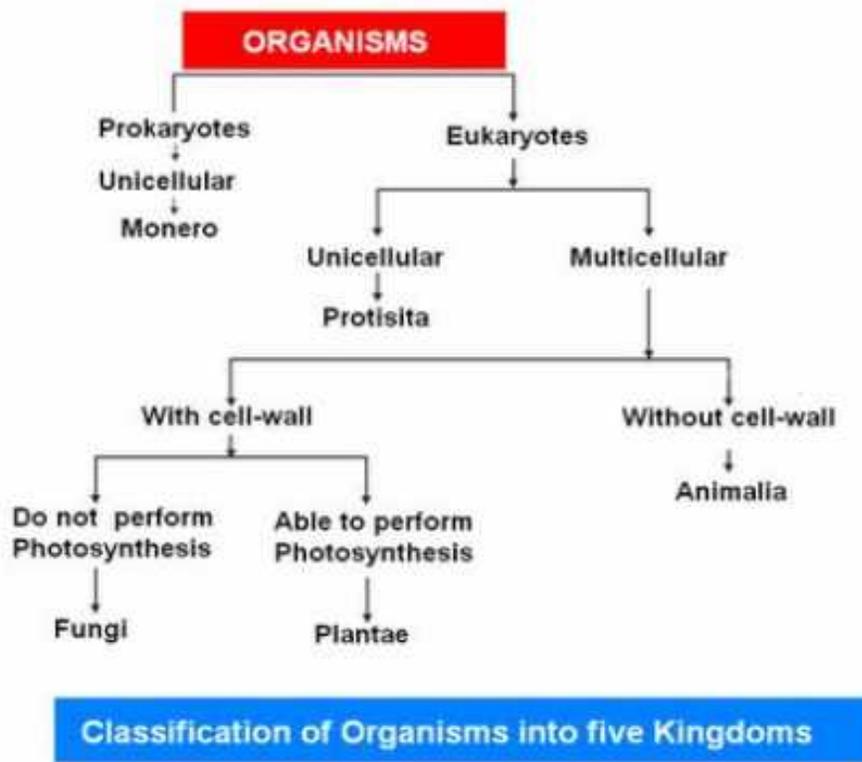
- (a) They have definite shape and size.
- (b) Animals have distinct excretory organs.

Solution SAQ – 8

The two kingdom system of classification was not found to be suitable to many scientists due to large diversity among the organisms and many other limitations. The main demerits of the system are –

- (i) Many protozoans possess characters of both plants and animals. For example, Euglena has animal characters but it contains chlorophyll.
- (ii) Bacteria and Cyanobacteria (blue-green algae) have many similarities between them and are quite different from other organisms. Thus, it is difficult to place them in their plant or animal kingdom.

Solution SAQ – 9:



Solution SAQ – 10:

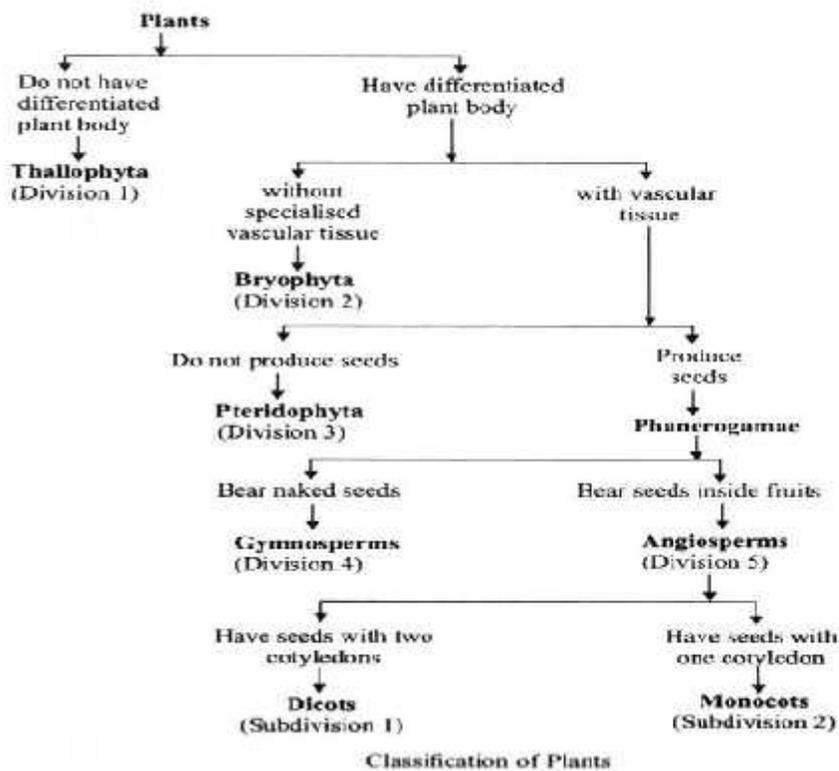
Two characteristics of Kingdom Protista are:

- (i) Some of the organisms use appendages, such as hair-like cilia or whip-like flagellum.
- (ii) Their mode of nutrition can be autotrophic or heterotrophic.

Solution SAQ – 11:

Lichens occur in hostile habitats such as barren rocks, walls, tree trunks and icy regions where they can be seen as slow growing large coloured patches. They are a source of essences, dhup, havan samagri, some medicines and dyes.

Solution SAQ – 12:



Solution SAQ – 13:

Four General characters of Thallophyta are:

- (i) It includes most primitive and simple plants.
- (ii) There is no vascular system.
- (iii) The reproductive organs are simple, single-celled.
- (iv) There is no embryo formation after fertilization.

Solution SAQ – 14:

Algae:

- (i) They contain photosynthetic pigments.
- (ii) Algae are autotrophic.
- (iii) The cell wall is made of cellulose

Fungi:

- (i) Photosynthetic pigments are absent in them.
- (ii) Fungi are heterotrophic.
- (iii) The cell wall is made of chitin

Solution SAQ – 16:

Dicots:

- (i) Leaves of these plants have reticulate venation.
- (ii) Secondary growth occurs.
- (iii) The plants have tap root system.

Monocots:

- (i) Leaves of these plants have parallel venation.
- (ii) Secondary growth does not occur.
- (iii) The plants have adventitious root system.

Solution SAQ – 17

Bryophyta:

- (i) Plant body is gametophytic.
- (ii) Real stem and leaves are always absent.
- (iii) Fixation of plant body is carried out by rhizoids.
- (iv) Bryophytes are non-vascular in nature.

Pteridophyta:

- (i) Plant body is sporophytic.
- (ii) Real stem and leaves are present.
- (iii) Fixation of plant body is carried out by roots.
- (iv) Pteridophytes are vascular plants.

Solution SAQ – 18:

- (i) Bryophytes are small multicellular green land plants. These simple land plants are confined to shady damp places.

- (ii) A true vascular system is absent in them.
- (iii) The sex organs are multicellular.
- (iv) An embryo is formed upon fertilisation.

Example: Riccia and Marchantia.

Solution SAQ – 19

- (i) They are found mainly in shady or damp places.
- (ii) The plant body is made up of root, stem and leaves.
- (iii) They have well developed vascular system (xylem and phloem) for the conduction of water and other substances, from one part of the plant body to another.
- (iv) These plants have no flowers and do not produce seeds.

Example: Club mosses – Selaginella and Ferns – Marselia.

Solution SAQ – 20

- (i) They are most primitive and simple seed plants.
- (ii) The seeds produced by these plants are naked and are not enclosed within fruits.
- (iii) They are usually perennial, evergreen and woody plants.
- (iv) Sporophylls are aggregated to form cones.

Solution SAQ – 21

- (i) Angiosperms are highly evolved plants.
- (ii) They produce seeds that are enclosed within the fruit.
- (iii) The reproductive organs (sporophylls) are aggregated in flower.
- (iv) Microspores and megaspores are produced in the same or two different types of plants.

Solution SAQ – 22:

Nonchordates:

- (i) Notochord is absent in them.
- (ii) Their central nervous system is solid and ventral.
- (iii) Their circulatory system is of open or closed type.
- (iv) Heart, if present in them, is dorsal in position.

Chordates:

- (i) Notochord is present in them at some of their developmental stage.
- (ii) Their central nervous system is hollow and dorsal.
- (iii) Their circulatory system is of closed type.
- (iv) Heart is always present and is ventral in position.

Solution SAQ – 23

Porifera differs from Cnidaria in following characters:

Porifera:

- (i) Cellular level of organisation.
- (ii) Digestion is intracellular.
- (iii) Appendages are absent in poriferans.
- (iv) They contain special cells called collar cells or choanocytes.

Cnidaria:

- (i) Tissue level of organisation.
- (ii) Digestion is both extracellular and intracellular.
- (iii) They have appendages in the form of tentacles.
- (iv) They contain special cells called cnidoblasts which contain nematocysts.

Solution SAQ – 24

A polyp is a cylinder with tentacles at the top. The Hydra looks like a tin can with slender arms coming from the top of its body. This body form does not move and the animals are trappers. The medusa is an umbrella shaped structure with tentacles hanging down from it. The jellyfish is an example. These animals move. During the reproductive stages of the jellyfish there is a time when they take on the polyp form. Then they bud off and become medusa.

Solution SAQ – 25

- (i) Sessile, sedentary, and marine except one group that lives in fresh water. These are non-motile animals attached to some solid support.
- (ii) Simplest multicellular, diploblastic animals.
- (iii) The body design involves minimal differentiation and division into tissues.
- (iv) Asymmetrical or radially symmetrical.

Example: Sponges and Sycon.

Solution SAQ – 26

- (i) Cnidarians or coelenterates are multicellular, diploblastic animals with tissue grade of organisation. A gelatinous layer called mesoglea persists between the ectoderm and endoderm.
- (ii) Body shows radial symmetry.
- (iii) Respiratory, circulatory and excretory organs are absent.
- (iv) Nervous system is primitive, has only network of nerve cells.

Example: Hydra and Aurelia (jelly-fish)

Solution SAQ – 27:

Bilateral symmetry:

- (i) Limbs and organs are paired.
- (ii) Cephalization is present.
- (iii) The animal body can be divided into two equal halves by one plane called mid-sagittal plane.

Radial symmetry:

- (i) Limbs and organs occur all around the central axis.
- (ii) Cephalization is absent.
- (iii) The animal's body can be divided into two equal halves by any vertical plane passing through the central axis.

Solution SAQ – 28:

- (i) Transparent body with biradial symmetry.
- (ii) Two tentacles and eight longitudinal rows of ciliary comb-plates for locomotion are present.
- (iii) Marine, solitary and free-swimming.
- (iv) No polymorphism or dimorphism occurs.

Example: Pleurobrachia and Cestum.

Solution SAQ – 29

- (i) Bilaterally symmetrical and dorsoventrally flattened animals.
- (ii) Body thin, soft, leaf-like or ribbon-like.
- (iii) Digestive cavity (when present) with a single opening, the mouth (anus is absent).
- (iii) Suckers and hooks are usually present.
- (iv) Circulatory and respiratory systems and skeleton are absent.

Example: Fasciola (liver-fluke) and Taenia solium (pork tape-worm)

Solution SAQ – 30

- (i) Bilaterally symmetrical, triploblastic, pseudocoelomate and unsegmented animals.
- (ii) Body is worm-like, cylindrical or flattened.
- (iii) Body is covered with a tough, resistant cuticle; cilia absent.
- (iv) Sexes are separate.

Example: Ascaris (round-worm) and Ancylostoma (hook-worm).

Solution SAQ – 31

- (i) Body triploblastic, bilaterally symmetrical, soft, elongated, vermiform and cylindrical or dorsoventrally flattened.
- (ii) Exoskeleton absent; body is covered by a thin cuticle.

- (iii) Alimentary canal is tube-like, complete and extends straight from mouth to anus.
 - (iv) Reproduction is by sexual means. Sexes may be united (hermaphroditic) or separate.
- Example: Nereis (sand worm) and Hirudinaria (leech).

Solution SAQ – 32

An individual which has both type of sex organs is called a hermaphrodite.
Example: Liver fluke, tape-worm.

Solution SAQ – 33

Triploblastic animals are the ones with three germ layers (a mesoderm as well as ectoderm and endoderm). The mesoderm allows them to develop true organs.
Example: Flat worms and humans.

Solution SAQ – 34

A coelomate animal is the one which has a body cavity in which well developed organs can be accommodated.
Example: Earthworm and Hirudinaria.

Solution SAQ – 35

- (i) Triploblastic, bilaterally symmetrical and metamerically segmented animals.
 - (ii) Body segments are grouped into two regions – cephalothorax (head and thorax together) and abdomen, or three regions – head, thorax and abdomen. Anterior part of body forms a distinct head, bearing sense organs and brain.
 - (iii) Exoskeleton of cuticle, containing protein, lipid, chitin and often calcium carbonate is secreted by underlying epidermis and shed (moulted) at intervals.
 - (iv) Alimentary canal is complete; mouth and anus lie at opposite ends of the body.
- Example: Palaemon (prawn) and Peripatus

Solution SAQ – 36:

- (i) Body is soft, bilaterally symmetrical, with little segmentation and without appendages. The size of body varies from a microscopic to a giant form such as Octopus of upto 50 feet.
 - (ii) Body cavity is haemocoel. True coelom is reduced and restricted to the pericardial cavity and the lumen of gonads and nephridia.
 - (iii) Digestive tract has a simple structure.
 - (iv) Sexes are usually separate.
- Example: Octopus and Sepia.

Solution SAQ – 37

- (i) Simple animals may be a star like, spherical or elongated.
- (ii) Body is triploblastic, coelomate, unsegmented and radially symmetrical.
- (iii) Body lacks head but has oral and aboral surfaces. Oral surface of the body has five radial

areas called ambulacra.

(iv) Body wall is covered with spiny hard calcareous (calcium carbonate) plates (ossicles) that forms a rigid or flexible endoskeleton.

Example: Echinus (sea urchin) and Asterias (star fish).

Solution SAQ – 38

- (a) Palaemon.
- (b) Musca.
- (c) Asterias.
- (d) Loligo.
- (e) Pila.
- (f) Unio.

Solution SAQ – 39

Echinodermata; The ambulacral system is the locomotive apparatus of the Phylum Echinodermata (sea-urchins, star-fishes, etc), the most important feature of which is the protrusible tube-feet that the animals can dilate with water at will, and thus move forward.

Solution SAQ – 40

- (i) The body is boat shaped or stream lined.
- (ii) Head, body and tail are compressed to make it suitable for locomotion in water, so that it offers little or no resistance for swimming in water.
- (iii) The pelvic fins, pectoral fins, dorsal fin, anal and caudal fins act as paddles and control the direction of movement in water and provide balance.
- (iv) The gills are well developed and suited for gaseous exchange in water.
- (v) The lateral line receptors enable the fish to detect any changes caused by mechanical disturbances in the surrounding water.
- (vi) The presence of air bladders in many bony fishes acts as an accessory respiratory organ as well as an organ for buoyancy. Using these bladders the fishes are able to maintain themselves at desired depths.
- (vii) The body is covered with scales.
- (viii) The presence of a third membrane called the nictitating membrane in the eye.

Solution SAQ – 41

- (i) Marine fishes with completely cartilaginous endoskeleton are called chondrichthyes. They are generally large in size.
- (ii) Streamlined body is either laterally compressed or spindle-shaped or dorsoventrally flattened and disc shaped.

- (iii) Mouth is ventral in position.
 - (iv) Skin is tough and covered with minute placoid scales.
- Example: Scoliodon (dog fish) and Torpedo (electric ray)

Solution SAQ – 42

- (i) Osteichthyes are marine and fresh water fishes with partly or whole bony endoskeleton.
 - (ii) Body is generally spindle shaped.
 - (iii) Skin is either naked or covered with cycloid or ctenoid scales.
 - (iv) Heart is two chambered containing one auricle and one ventricle.
- Example: Labeo (Rohu) and Synchiropus splendidus (mandarin fish)

Solution SAQ – 43:

- (a) Cartilaginous fishes:
- (i) They have a cartilaginous endoskeleton.
 - (ii) They contain five to seven pairs of gill slits.
 - (iii) Their mouth is ventral in position.
 - (iv) Swim bladder is absent in them.

Bony fishes:

- (i) They have a bony endoskeleton.
- (ii) They contain four pairs of gill slits.
- (iii) Their mouth is terminal in position.
- (iv) Air bladder is usually present in them

(b) Amphibia:

- (i) Their skin is glandular, smooth and moist.
- (ii) Scales are not present in them.
- (iii) They have a three chambered heart.
- (iv) Fertilisation is external.

Reptilia:

- (i) Their skin is non-glandular, dry and keratinized.
- (ii) Horny scales are present over their body.
- (iii) Their heart is incompletely four chambered.
- (iv) Fertilisation is internal.

(c) Aves

- (i) Forelimbs are modified into wings.
- (ii) The body is covered with feathers and scales.

- (iii) Mammary glands are absent.
- (iv) A toothless beak is present.

Mammals:

- (i) Wings are absent except in bats.
- (ii) Feathers and scales are absent. Hair is present.
- (iii) Females have mammary glands.
- (iv) Teeth are present. Jaws do not form beak.

Solution SAQ – 44

- (i) Mammals are warm-blooded and the most evolved animals of the Animal kingdom.
 - (ii) Body is divisible into head, neck, trunk and tail. Moveable eyelids are present.
 - (iii) Females have milk-producing mammary glands which secrete milk for the nourishment of the young.
 - (iv) Respiration is through lungs only.
- Example: Human beings and Monkey.

Solution SAQ – 45

Flight adaptations of the birds are the following:

- (i) Forelimbs are modified into wings.
- (ii) Body is covered with exoskeleton of waterproof and lightweight feathers.
- (iii) Long bones of endoskeleton are pneumatic having air cavities.
- (iv) All birds are toothless; their jaws are modified into horny beaks.
- (v) Body is streamlined to reduce air resistance during its flight.
- (vi) Birds have air sacs helping in double respiration.
- (vii) Flight muscles are well developed.
- (viii) Tail feathers form a steering apparatus.
- (ix) Birds have an acute vision.

Solution SAQ – 46

- (i) Body is bilaterally symmetrical, metamerically segmented, triploblastic and coelomate.
- (ii) A post-anal tail present at some stage of life.
- (iii) Segmental muscles in an unsegmented trunk.
- (iv) Ventral heart, with dorsal and ventral blood vessels and closed blood vascular system.

Solution SAQ – 47

Protochordata is one of the groups of phylum chordata. Protochordata constitutes the marine, small, primitive, or lower chordates. The members of protochordates lack a head, skull or cranium, vertebral column and brain. About 2000 species are found in this group. This is further divided into three subphylum: Hemichordata (e.g. Balanoglossus), Urochordata (e.g. Herdmania) and Cephalochordata (e.g. Branchiostoma) based on the position of notochord.

Solution SAQ – 48

- (i) Urochordata: Herdmania.
- (ii) Cephalochordata: Branchiostoma.

Solution SAQ – 49

Notochord is a transient mesodermal rod in the most dorsal portion of the chordate embryo. In other words, notochord is an ensheathed flexible rod of turgid cells located along the back of chordate embryos and some primitive chordates ventral to nerve cord. It provides place for the attachment of muscles. Notochord has given rise to jointed axial skeleton of vertebral column. Nerve cord is a collection of nerve fibres that runs throughout the length of an animal. It is hollow and dorsal in chordates where it gets modified into central nervous system of brain and spinal cord. Nerve cord is solid and ventral in nonchordates.

Solution LAQ – 1

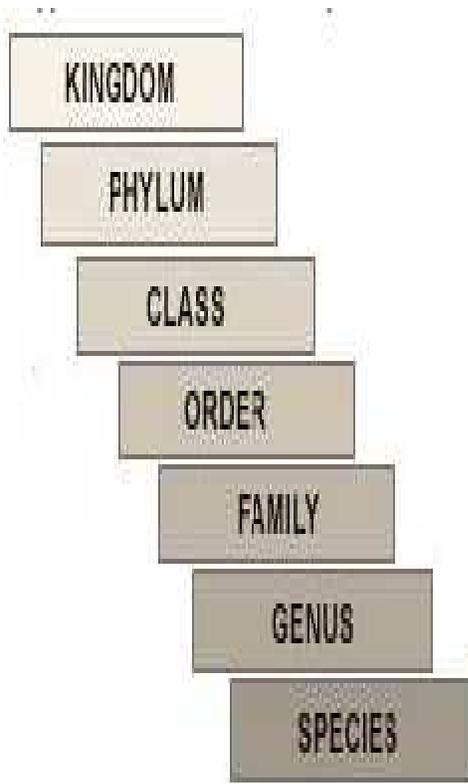
The Linnaean system of classification consists of a hierarchy of graded taxonomic (named) ranks that are called as taxa. Any given taxon (singular) may contain several lower taxa, which can be usually distinguished based on certain common characteristics. Such lower ranks may in turn be divided into a succession of progressively smaller ranks. The lower the rank of a group, the more similar are the organisms grouped in it. If any two given organisms can be grouped under the same lower rank or taxon, it implies that the two organisms are structurally, functionally, embryologically similar and that they have had a comparable evolutionary history.

Within the living world as a whole, the biggest taxonomic rank is Kingdom. The next higher rank within a kingdom is the Phylum or Division. It is customary to use the term phylum for major groups in the animal kingdom and the term division for major groups in the plant kingdom. The phylum or division is a broad grouping of more or less closely related organisms, sharing certain common characteristics.

Each phylum or division has the next taxon called Class. The members of each class exhibit certain distinguishing characters that are unique only to them.

In the same way, using comparable criteria of similarities and relationships, each class can be divided into orders, each order into families, each family into genera and each genus into species. Species is normally the basic or fundamental unit of classification. A species is therefore the narrowest taxonomic category and kingdom is the broadest category in the Linnaean hierarchy.

A typical Linnaean hierarchy has seven taxa represented as follows:



Solution LAQ – 2

Importance of classification:

- (i) It makes the study of such a wide variety of organisms easy.
- (ii) It projects before us a good picture of all life forms at a glance.
- (iii) It helps us understand the interrelationship among different groups of organisms.
- (iv) It serves as a base for the development of other biological sciences such as biogeography etc.
- (v) Various fields of applied biology such as agriculture, public health and environmental biology depends on classification of pests, disease vectors, pathogens and components of an ecosystem.

Solution LAQ – 3

Hierarchy is defined as sequence of categories in a decreasing or increasing order from kingdom to species and vice versa. Kingdom is the highest rank followed by division, class, order, family, genus and species. Species is the lowest rank in the hierarchy. The hierarchy has two categories which are obligate and intermediate. Obligate means they are followed strictly and range from kingdom to species as said above. Intermediate are not followed strictly and they are added in obligate list such as subdivision, super family, super class, suborder, subspecies etc.;

- (i) Species: Group of population which is similar in form, shape and reproductive features so that fertile sibling can be produced. Some siblings can be sterile when a hybrid is produced. A

hybrid can be product of female horse and male donkey (Mule). Sexual reproduction is present in eukaryotes. Species is followed by subspecies, varieties and races. These categories are inferior as compared to species.

(ii) Genus: It is defined as group of similar species. But it is not mandatory to have many species. Some genera have only one species known as monotypic. If there are more than one species it is known as polytypic. For example lion, tiger are quite similar species placed under the genus Panthera.

(iii) Family: It is defined as collection of similar genera. It can be separated from genera by reproductive and vegetative features. For example, cats and leopard are included in the family Felidae.

(iv) Order: One or more than one similar families constitute order. Family Felidae are included in the order Carnivora.

(v) Class: One or more than one order makes a class. Class Mammalia includes all mammals which are bats, rodents, kangaroos, whales, great apes and man.

(vi) Phylum: It is a term used for animals while its synonym division is used for plants. It is a collection of similar classes. Phylum chordata of animals has class Mammalia along with birds, reptiles and amphibians.

(vii) Kingdom: The top most taxonomic category. Example all animals are included in Kingdom Animalia. The unit in classification that denotes grouping of organism based on features which are observable is known as Taxon.

Solution LAQ – 4

Kingdom Monera is the first of the five kingdoms of biological classification. It comprised most organisms with a prokaryotic cell organization. For this reason the kingdom was sometimes called Prokaryota or Prokaryotae. Prior to its creation these were treated as two separate divisions of plants: the Schizomycetes (bacteria) were considered fungi, and the Cyanophyta were considered blue-green algae. The latter are now considered a group of bacteria, typically called the cyanobacteria.

Monera has been divided into Archaea and Bacteria, forming the more recent six-kingdom system and three-domain system. All new schemes abandon the Monera and now treat the Bacteria, Archaea and Eukarya as separate domains or kingdoms. To sum up:

(i) Kingdom Monera are one-celled without an organized nucleus. Examples: bacteria and blue-green “algae.”

- (ii) They have existed on earth longer and are more widely distributed than any other organisms.
- (iii) They are found in almost every imaginable habitat; in air, soil, and water and in extreme temperatures and harsh chemical environments.
- (iv) Their one distinguishing characteristic is that there are no membrane bound “organelles”.
- (v) Pre dominant mode of nutrition is absorption but some may be photosynthetic or chemosynthetic.
- (vi) Reproduction by asexual method.
- (vii) True mitotic cell division absent.

Solution LAQ – 5

Characteristics of Kingdom Protista:

- (i) They include many kinds of unicellular eukaryotic organisms such as unicellular algae, protozoans and unicellular fungi.
- (ii) They are found anywhere there is moisture.
- (iii) They are single celled, but many live in a colonial setting (more or less independently).
- (iv) Many are unicellular, but some are multicellular (Algae and fungus-like protists).
- (v) Some can live in very harsh environments.
- (vi) Reproduction can be sexual (conjugation), asexual (binary fission), or a combination of both.
- (vii) Some of these organisms use appendages, such as hair-like cilia (e.g. Paramecium) or whip-like flagellum (e.g. Euglena).
- (viii) Their mode of nutrition can be autotrophic or heterotrophic.

Examples: Paramecium and Amoeba.

Solution LAQ – 6

Characteristics of Kingdom Fungi:

- (i) Simple non-green plants which are not photosynthetic. They are heterotrophic and eukaryotic organisms. Some fungi, such as Puccinia, Albugo etc are parasites and draw their nutrients from living cells of their host plants. Some fungi, such as Mucor, Rhizopus etc are decomposers, deriving their nutrition from dead remains of plants and animals.
- (ii) They may be unicellular (yeast) or filamentous (most fungi). The body of a multicellular and filamentous fungus is called a mycelium and is composed of several thread like structures termed hyphae.
- (iii) Fungi have a cell wall containing a mixture of chitin and cellulose. Chitin is a tough complex sugar.
- (iv) Their reserve food material is glycogen.

Solution LAQ – 7

The division Spermatophyta (sperma = seed, phyton = plant), as the name suggests, includes all seed bearing plants. It has been divided into two sub divisions- Gymnosperms and Angiosperms. The sub-division Gymnosperms (gymno = naked, sperma = seed) includes simpler and primitive plants of the division Spermatophyta.

Gymnosperms: The gymnosperms are seed producing land plants. However, the seeds are not enclosed in fruits. Most of them have now become extinct and only about 900 species are known to be surviving. The living gymnosperms are widely distributed in the cold climates where snow, rather than rain, is the source of water. Only one group called cycads thrive in warmer regions. Example: Pinus.

Angiosperms: Angiosperms represent the most advanced group of vascular plants. They are commonly called 'Flowering plants'. They exceed all other major groups of living plants in number and diversity.

Example: Sunflower

Solution LAQ – 8

Any simple vascular plant that produces spores, but not seeds, and has the diploid stage of its life cycle as the dominant form is called a pteridophyte.

Ferns, Lycopodium, and Club mosses are all pteridophytes.

Bryophyta:

- (i) Plant body is gametophytic.
- (ii) Real stem and leaves are always absent.
- (iii) Fixation of plant body is carried out by rhizoids.
- (iv) Bryophytes are non-vascular in nature.

Pteridophyta:

- (i) Plant body is sporophytic.
- (ii) Real stem and leaves are present.
- (iii) Fixation of plant body is carried out by roots.
- (iv) Pteridophytes are vascular plants.

Solution LAQ – 9

(a) Characteristics of Platyhelminthes:

- (i) Bilaterally symmetrical and dorsoventrally flattened animals.
 - (ii) Body is thin, soft, leaf-like or ribbon-like.
 - (iii) Digestive cavity (when present) with a single opening, the mouth (anus is absent).
 - (iv) Suckers and hooks are usually present.
 - (v) Circulatory and respiratory systems and skeleton are absent
 - (vi) Hermaphrodite i.e. both male and female reproductive organs occur in the same individual.
- Example: Fasciola (liver-fluke) and Taenia solium (pork tape-worm).

(b) Characteristics of Nematoda:

- (i) Bilaterally symmetrical, triploblastic, pseudocoelomate and unsegmented animals.
 - (ii) Body is worm-like, cylindrical or flattened.
 - (iii) Body is covered with a tough, resistant cuticle; cilia absent.
 - (iv) Sexes are separate.
 - (v) Most forms are parasitic but some are free-living in soil or water.
- Example: *Ascaris* (round-worm) and *Ancylostoma* (hook-worm).

Solution LAQ – 10

Characteristics of Annelida:

- (i) Body triploblastic, bilaterally symmetrical, soft, elongated, vermiform and cylindrical or dorsoventrally flattened.
- (ii) Exoskeleton absent; body is covered by a thin cuticle.
- (iii) Alimentary canal is tube-like, complete and extends straight from mouth to anus.
- (iv) Reproduction is by sexual means. Sexes may be united (hermaphroditic) or separate.
- (v) True coelomate animals with closed blood vascular system. Coelom allows true organs to be packaged in the body structure.
- (vi) They live in a variety of habitats. Mostly aquatic, marine or fresh water. Some are terrestrial, burrowing in tubes while some are free-living forms.

Different classes and examples:

Class I: Polychaeta – *Nereis* (sand worm)

Class II: Oligochaeta – *Pheretima* (earthworm)

Class III: Hirudinea: *Hirudinaria* (Indian cattle leech)

Solution LAQ – 11

Characteristics of Mollusca:

- (i) Body is soft, bilaterally symmetrical, with little segmentation and without appendages. The size of body varies from a microscopic to a giant form such as Octopus of upto 50 feet.
- (ii) Body cavity is haemocoel. True coelom is reduced and restricted to the pericardial cavity and the lumen of gonads and nephridia.
- (iii) Digestive tract has a simple structure.
- (iv) Sexes are usually separate.
- (v) Respiration through gills, mantle or a “lung” of the mantle.
- (vi) Circulatory system is open except in cephalopods.
- (vii) Excretion by a pair of metanephridia or kidneys.

Classes and their examples:

- (i) Gastropoda: *Pila* (apple snail)

- (ii) Pelecypoda: Unio (fresh water mussel)
- (iii) Cephalopoda: Loligo (squid)

Solution LAQ – 12

Characteristics of Arthropoda:

- (i) Triploblastic, bilaterally symmetrical and metamerically segmented animals.
- (ii) Body segments are grouped into two regions – cephalothorax (head and thorax together) and abdomen, or three regions – head, thorax and abdomen. Anterior part of body forms a distinct head, bearing sense organs and brain.
- (iii) Exoskeleton of cuticle, containing protein, lipid, chitin and often calcium carbonate is secreted by underlying epidermis and shed (moulted) at intervals.
- (iv) Alimentary canal is complete; mouth and anus lie at opposite ends of the body.
- (v) Respiration through general body surface, by gills, air tubes (tracheae) or book-lungs.
- (vi) True nephridia absent. Excretion by coelomoducts, malpighian tubules or green or coxal glands.
- (vii) Sexes are usually separate; sexual dimorphism is well marked in several forms.
- (viii) Fertilisation is usually internal, oviparous or ovoviviparous and often with metamorphosis.

Classes and their examples:

- (i) Crustacea: Palaemon (prawn)
- (ii) Myriapoda: Scolopendra (centipede)
- (iii) Insecta: Lepisma (Silver fish)
- (iv) Arachnida: Limulus (king crab)

Solution LAQ – 13

(1) Phylum Porifera – Sessile, sedentary, and marine except one group that lives in fresh water. These are non-motile animals attached to some solid support.

Example: Sponges

(2) Phylum Coelenterata – Cnidarians or coelenterates are multicellular, diploblastic animals with tissue grade of organisation. A gelatinous layer called mesoglea persists between the ectoderm and endoderm.

Example: Aurelia (jelly-fish)

(3) Phylum Platyhelminthes – Bilaterally symmetrical and dorsoventrally flattened animals with a soft, leaf-like or ribbon-like thin body.

Example: Taenia Solium (pork tape-worm)

(4) Phylum Nematoda – Bilaterally symmetrical, triploblastic, pseudocoelomate and

unsegmented animals. Body is worm-like, cylindrical or flattened.

Example: Ascaris (round-worm)

(5) Phylum Annelida – Body triploblastic, bilaterally symmetrical, soft, elongated, vermiform and cylindrical or dorsoventrally flattened, exoskeleton absent; body is covered by a thin cuticle.

Example: Hirudinaria (Indian cattle leech)

(6) Phylum Arthropoda – Body segments are grouped into two regions – cephalothorax (head and thorax together) and abdomen, or three regions – head, thorax and abdomen. Anterior part of body forms a distinct head, bearing sense organs and brain.

Example: Palaemon (prawn)

(7) Phylum Mollusca – Body is soft, bilaterally symmetrical, with little segmentation and without appendages. The size of body varies from a microscopic to a giant form such as Octopus of upto 50 feet.

Example: Octopus (devil fish)

(8) Phylum Echinodermata – Simple animals may be a star like, spherical or elongate with body triploblastic, coelomate, unsegmented and radially symmetrical.

Example: Echinus (sea urchin)

(9) Phylum Chordata – Chordates are characterised by the following three features: (a) a dorsal, hollow, tubular nerve cord; (b) a pliable rod called notochord that occurs ventral to nerve cord and is replaced by a bone or cartilage to form a vertebral column in vertebrates; and (c) paired gill-slits in the pharynx.

Example: Fishes

Solution LAQ – 14

Characters of birds:-

- (i) Forelimbs are modified into wings.
- (ii) The body is covered with feathers and scales.
- (iii) Mammary glands are absent.
- (iv) A toothless beak is present.
- (v) Skin is dry only, a single preen gland is present.
- (vi) A diaphragm is absent.
- (vii) Bones of birds are hollow or pneumatic.
- (viii) Larynx of birds is non-functional.
- (ix) Lungs contain external air sacs.
- (x) Birds are oviparous.

Example: Crow and peacock.

Characters of mammals:-

- (i) Wings are absent except in bats.
- (ii) Feathers and scales are absent. Hair is present.
- (iii) Females have mammary glands.
- (iv) Teeth are present. Jaws do not form beak.
- (v) Skin bears a number of sweat and oil glands.
- (vi) Diaphragm is present.
- (vii) Bones of mammals do not have air cavities.
- (viii) Larynx of mammals is functional.
- (ix) Lungs do not have external air sacs.
- (x) Mammals are viviparous.

Example: Human beings and monkeys.

Solution LAQ – 15

The subphylum 'Gnathostomata' is divided into six different classes. Out of the six two classes, Chondrichthyes and Osteichthyes combine together to form a super-class, called Pisces.

Chondrichthyes:

- (i) Marine fishes with completely cartilaginous endoskeleton. They are generally large in size.
- (ii) Streamlined body is either laterally compressed or spindle-shaped or dorsoventrally flattened and disc shaped.
- (iii) Mouth is ventral in position.
- (iv) Skin is tough and covered with minute placoid scales.
- (v) Heart is two chambered.
- (vi) Excrete urea (ureotelic animals).

Example: Scoliodon (dog fish) and Torpedo (electric ray)

Osteichthyes:

- (i) Marine and fresh water fishes with partly or whole bony endoskeleton.
- (ii) Body is generally spindle shaped.
- (iii) Mouth is usually terminal in position.
- (iv) Skin is either naked or covered with cycloid or ctenoid scales.
- (v) Heart is two chambered containing one auricle and one ventricle.
- (vi) Excrete ammonia (ammonotelic animals).

Example: Labeo (Rohu) and Synchiropus splendidus (mandarin fish)

Why Do We Fall Ill ?

PS Verma and V.K. Agarwal Biology Class 9 Page No – 300.

Solution SAQ – 1:

Healthy:

1. It is a state of complete physical, mental and social well being.
2. A healthy person will be disease free.

Disease Free:

1. It is a state of absence of discomfort or derangement in any part of body.
2. A disease free person can be healthy or unhealthy.

Solution SAQ – 2:

There are many types of health problems that can possibly arise after disaster such as victims of disaster might suffer from lack of nourishment due to inadequate food.

The immediate health problems after disaster includes suffering of trapped people, people may suffer from fractures, burns and asthma due to dust particles arising from buildings.

Contaminated water can also cause other health issues.

Solution SAQ – 3

The provisions made by local authorities was to allocate funds and guide investments, encourage research, develop human resources through training and other capacity-building efforts, promote water quality monitoring, provide guidelines for various programmes and ensure the implementation of the water supply programmes.

Solution SAQ – 4

There are many provisions provided by local authorities for solid waste management. These are followings:

- (i) Sweeping
- (ii) Collection
- (iii) Vermi-composting
- (iv) Recycling system
- (v) Transportation system
- (vi) Power generation and
- (vii) Dumping

Solution SAQ – 5:

Symptoms:

1. They indicate the presence of disease.
2. Symptoms are a collective indication of a number of diseases in a particular part or organ.

Signs:

1. They provide information about the presence of particular disease.
2. They are distinct for different diseases.

Solution SAQ – 6:

Casual organisms of the following diseases:

- (i) Tuberculosis – Mycobacterium tuberculosis
- (ii) Kala-azar – Leishmania (protozoa)
- (iii) Malaria – Plasmodium
- (iv) Measles – Virus
- (v) Athlete's foot – Fungi
- (vi) Cholera – Vibrio Cholerae

Solution SAQ – 7:

Two means of physical contacts by which AIDS does not spread are handshakes and hugs.

Solution SAQ – 8

A vector is a carrier (mosquito, tick) that takes the disease from an infected individual to an uninfected individual. They do not have the disease themselves; they carry the infected agent such as blood. A reservoir is anything (person, animal, arthropod, plant, soil or substance) in which a disease lives and can multiply. The disease needs the reservoir in order to survive. A vector must be living but a reservoir can be a living or a non living thing such as soil or water. Vectors or carriers are not pathogenic but are simply transmitters.

Solution SAQ – 9

Organ Specific Manifestation- These are the diseases caused in the same organ or organ system as the point of entry of the microbe. E.g. Tuberculosis which enters through the nose and affects the lungs. (Both are organs of the respiratory system)

Tissue Specific Manifestation- These are the diseases caused in a different organ as the point of entry. E.g. Japanese Encephalitis which enters through the blood but affects the brain.

Solution SAQ – 10

There are many possible areas, organs and tissues within our body where microbes may reside. However the severity of disease symptoms depends on the number of microbes in the body. For example, if the number of microbes is very small, then the symptoms of disease will be minor or unnoticed. However, if the numbers are large, the disease can be severe enough to be life-risking.

Solution SAQ – 11

Infection of HIV is found to have multiple dimensional effects. In case of HIV infection, the virus goes to immune system and ultimately damages its function. Thus many symptoms of HIV – AIDS infection are due to the fact that patients body no longer fight off many minor infections that he/she faces everyday.

Solution SAQ – 12

There are two ways to treat an infectious disease. One is to reduce the effects of the disease and the other way is to kill the cause of the disease.

For example, we can take the medicines that bring down the fever, reduce pain or loose motions. We can take bed rest so that we can conserve our energy. This exercise will enable us to focus on the healing. However it will not make the pathogen to go away, so the disease will not be cured. For that we have to kill the microbe.

Solution SAQ – 13

Prevention is better than cure as a disease always cause some damage to the body, loss of working days, besides expenditure on medication. The important precautions for preventing occurrence of diseases include (i) hygienic environment; (ii) personal hygiene; (iii) proper nutrition; (iv) clean food; (v) clean water; (vi) regular exercise and (vii) adequate relaxation. Everybody should also be aware of diseases and their mode of spreading (epidemic). A regular medical checkup is also earnestly required to stay healthy.

Solution SAQ – 14

Vaccines help a body's immune system prepare in advance to fight infectious illnesses and potentially deadly diseases caused by infectious agents or their by-products. Vaccines work on the principle of immunization. During vaccination, when the immune system first encounters an infectious microbe, it responds against it and then remembers it specifically. So the next time that particular microbe, or its close relatives enter the body, the immune system responds with greater vigour. This eliminates the infection even more quickly than the first occurrence of the disease.

Solution SAQ – 15

Three diseases caused by Bacteria are: Tuberculosis (T.B.), Cholera and Typhoid.

Three diseases caused by Virus are: – Influenza, Jaundice and AIDS.

Solution SAQ – 16

The diarrhoea spreads through infection by contaminated food, water, drinks, hands, clothes etc. During diarrhoea frequent loose motions and vomiting leads to dehydration.

To control the dehydration during diarrhoea; Saline drip may be given intravenously to maintain fluid and electrolytes in the body. Alternatively oral rehydration Solution (ORS) may be

given to the patient periodically.

Solution SAQ – 17

Stagnant water (of pools, ponds) in the locality is the habitat of larvae of many types of mosquitoes and they are the vector of a disease, called malaria.

Doctor confirms malaria if the patients have following symptoms: headache, nausea, muscular pain and high fever. Doctor also checks the presence of malarial parasite in the human body by blood test.

Solution SAQ – 18

Methods of prevention of Malaria:

- (i) Wire-gauze should be used on doors and windows of houses to prevent entry of mosquitoes.
- (ii) One should sleep under mosquito nets.
- (iii) Insect-repellents should be used to prevent mosquito-bite.
- (iv) Mosquito larvae can be killed by sprinkling kerosene oil on large-sized water bodies.

Solution SAQ – 19

The person having AIDS lose the power of fighting any infection. The disease of AIDS is caused by retrovirus (a RNA virus) known as Human Immunodeficiency Virus (HIV).

AIDS disease spreads among human beings in the following ways:

- (i) The AIDS usually spreads through unprotected sexual contacts with an infected person carrying AIDS virus.
- (ii) It also spreads through the transfusion of blood contaminated with an AIDS virus.
- (iii) It also spreads through the use of infected needles for injections.
- (iv) An AIDS infected mother can transmit the virus to her child during pregnancy or during birth.

Solution SAQ – 20

Diarrhoea is an abnormally frequent discharge of semisolid or fluid faeces. It spreads through infection by contaminated food, water, drinks, hands, clothes, bed sheets and utensils.

Symptoms of Diarrhoea:

- (i) Decreased appetite, nausea, vomiting and abdominal cramps.
- (ii) There may be blood and mucus in the stools.

Prevention:

- (i) Eatables should be covered to prevent their contamination.
- (ii) Fruits and vegetable should be properly washed before use.
- (iii) Stale food should not be consumed.

Control:

- (i) Complete bed rest should be ensured till the illness is fully controlled.
- (ii) For treating diarrhoea anti-microbial drugs and anti-diarrhoea agents should be used.

Solution SAQ – 21

In rabies, the patient feels restless, does excessive salivation, has a choking feeling and finds difficulty in the intake of even liquid food. Since patient develops fear of water, the disease is called hydrophobia.

Solution SAQ – 22

Pulse Polio Programme – Pulse polio immunization programme forms the largest single day public health project. Pulse means a dose of a substance (here polio vaccine) especially when applied for a short period of time. It was conducted for the first time in 1995. The program uses oral polio vaccine or OPV. As per the National Immunization Schedule (NIS), a dose of 3 drops is given orally to the child, i.e. one dose each at 1.5, 2.5 and 3.5 month's age. Finally a booster dose is given at the age of 1.5 years. After oral administration, virus particles in the vaccine begin to live in the intestine of the human body and multiply. It leads to production of protective molecules in the intestine and the blood.

Solution LAQ – 1

Human beings live in societies. Our social environment therefore plays an important role in our individual health. In villages, towns or cities, our physical environment is decided by our social environment. For example – if there are heaps of garbage and trash littered here and there, or if there is open drain water lying stagnant around where we live, the possibility of poor health increases. So, public cleanliness is an important contribution to an individual's health.

Some other community issues that influence health are:

Community issues like child marriage can affect the health of the girl the baby born to an underage girl.

Lack of education of the community to sex related issues can also cause sexually transmitted diseases.

Bad treatment with the underprivileged sections of the society can also cause mental problems.

Social equality and harmonious relationships among our population are necessary for the individual health. Thus, we see that there is an overlap of personal and community issues for health.

Solution LAQ – 2

Infectious diseases spread from one infected person to other normal person by various methods.

(a) Air-borne diseases – For example: common cold, pneumonia and tuberculosis. Such disease causing microbes are spread throughout the air. The transmission of these microbes occurs

through the little droplets coughed out by an infected person who sneezes or coughs. A person in the vicinity of such a person can inhale these disease causing microbes and may become infected.

(b) Water-borne diseases – For example: Cholera, Infectious diseases can also spread through water. These occur when a stool from someone suffering from an infectious gut disease, such as cholera or amoebiasis, gets mixed with the drinking water used by people living nearby. The cholera-infested bacteria can enter new hosts through the water they drink and can cause disease in them.

(c) Sexually-transmitted diseases – For example: Syphilis and AIDS. Both of these pathogens are transmitted by sexual contact from one partner to the other. However, such sexually transmitted diseases are not spread by casual physical contact.

(e) Fomite borne diseases – Articles coming in contact with the patients act as sources of infection. For example: door handles, taps, garments, utensils, crockery, etc.

(f) Spread of disease through vectors – Many animals which live with us may carry diseases. These animals can transfer infecting agents from a sick person to another potential host. Thus, these animals act as intermediaries or vectors. For example – female Anopheles mosquitos are vectors of disease, malaria.

Solution LAQ – 3

General ways of preventing infection are:

Public hygiene is one basic key to the prevention of infectious diseases.

In the method of prevention of diseases, following practices are adopted:

- (i) To avoid exposure to air-borne microbes, adopt living conditions that are not overcrowded.
- (ii) To prevent exposure to water-borne microbes, safe drinking water should be provided.
- (iii) To avoid vector-borne infections, we can provide clean environment as it would not allow mosquito breeding.

Solution LAQ – 4

Principle of Treatment:

There are two ways to treat an infectious disease. One is to reduce the effects of the disease and the other way is to kill the cause of the disease. For the first requirement, we can provide treatments that will reduce the symptoms. The symptoms are usually a result of inflammation. For example, we can take medicines that bring down fever, reduce pain or loose motions. We can take bed rest so that we can conserve our energy.

However such a kind of symptom-directed treatment by itself is inadequate. Since it will not make the pathogen go away, so the disease will not be cured. For that we have to kill the microbe itself.

Solution LAQ – 5

(a) AIDS – AIDS stands for Acquired Immuno Deficiency Syndrome. It is a fatal disease. The disease of AIDS is caused by retrovirus (a RNA virus) known as Human Immunodeficiency Virus (HIV). AIDS virus attacks white blood cells (WBCs) or lymphocytes of human beings and weakens the human body's immunity or self-defence mechanism.

Some important symptoms of AIDS are: Swollen lymph nodes, regular fever, sweating at night and weight loss. Its virus also cause severe damage to brain and may lead to loss of memory, ability to speak and of clear thinking.

(b) Malaria – Malaria is caused by a protozoan parasite Plasmodium. This disease spreads through the bite of an insect vector – the female Anopheles mosquito which feeds on human blood. Male Anopheles mosquito feeds upon plant juice. Main symptoms of malaria include headache, nausea, muscular pain and high fever. Malarial attack consists of three stages:

(i) Cold stage, feeling of extreme cold and shivers.

(ii) Hot stage, high fever, faster respiration and heart beat.

(iii) Sweating stage, due to profuse sweating, temperature of the body goes down to normal.

Solution LAQ – 6

Few diseases caused by bacteria are:

(i) Tuberculosis (T.B.) – T.B. is an infectious disease which is communicated from one person to another directly or indirectly. It is caused by the bacterium called Mycobacterium tuberculosis. T.B. can affect all parts of the body such as lungs, lymph glands, bones, intestine etc.

(ii) Cholera – Cholera is an acutely infectious, fatal disease and is more common during overcrowded fairs, festivals and after floods. Cholera is caused by the bacterium Vibrio Cholerae. It is transmitted by flies, contaminated water and food.

(iii) Typhoid – Typhoid is most common communicable disease in India. Typhoid fever is common in humans of the age 1 to 15 years age group. Typhoid is caused by a rod-shaped and motile bacterium, called Salmonella typhi which is commonly found in the intestine of human beings. Human infection is direct.

(iv) Diarrhoea – Diarrhoea is an abnormally frequent discharge of semisolid or fluid faeces. The diarrhoea spreads through infection by contaminated food, water, drinks, hands, clothes, etc. The causative agents of diarrhoea are mainly bacteria such as Escherichia coli, Clostridium botulinum, Shigella dysenteriae, Campylobacter jejuni and Salmonella.

Solution LAQ – 7

Important viral diseases of human beings are:

(i) Influenza – Influenza is commonly called flu. It is caused by an influenza virus (Myxovirus influenza). There exist three types of influenza viruses – A, B and C. A and B types of influenza viruses are important because these are responsible for causing of disease epidemics

throughout the world. The inhaled virus attacks the epithelial cells in the mucous membrane of nose, throat and upper respiratory tract. Influenza is spread mainly from person to person contact and by droplet infection via sneezing, coughing and talking.

(ii) Jaundice – Jaundice or hepatitis is the disease of liver. Since liver is a very important organ in the body, so its inflammation due to jaundice affects digestion adversely. Jaundice is caused by viral infection. The types of hepatitis are: Hepatitis A, Hepatitis B, Hepatitis C, Hepatitis D, Hepatitis E or Hepatitis G. Except for type B which is a DNA virus, all the other are RNA viruses. Hepatitis is spread mostly by food and water contaminated with hepatitis virus.

(iii) AIDS – AIDS stands for Acquired Immuno Deficiency Syndrome. It is a fatal disease. The disease of AIDS is caused by retrovirus (a RNA virus) known as Human Immunodeficiency Virus (HIV). AIDS virus attacks white blood cells (WBCs) or lymphocytes of human beings and weakens the human body's immunity or self-defence mechanism. AIDS becomes prone to many other infections or diseases.

(iv) Polio – Poliomyelitis or polio is a disease of the nervous system caused by one of the smallest known virus, called polio virus. The virus enters the body through the food and water and reaches the intestine and from there it enters the CNS or central nervous system via blood stream and lymphatic systems. Children between the age of 6 months to 3 years are most prone to polio infection. Polio is transmitted among children by the faeco-oral route and through the direct contact, dirty hands, contaminated food or milk and flies.

Solution LAQ – 8

(a) Tuberculosis – T.B. is an infectious disease which is communicated from one person to another directly or indirectly. It is caused by the bacterium called *Mycobacterium tuberculosis*. T.B. can affect all parts of the body such as lungs, lymph glands, bones, intestine etc. The incubation period of T.B. includes a few weeks to a few years. The patient of tuberculosis feels sick and weak. There is a loss of appetite and weight. Typical fever pattern and night sweats are also common.

(b) Polio – Poliomyelitis or polio is a disease of the nervous system caused by one of the smallest known virus, called polio virus. The virus enters the body through the food and water and reaches the intestine and from there it enters the CNS or central nervous system via blood stream and lymphatic systems. Children between the age of 6 months to 3 years are most prone to polio infection. Polio is transmitted among children by the faeco-oral route and through the direct contact, dirty hands, contaminated food or milk and flies. The early symptoms of the polio disease are sore throat and headache.

Natural Resources

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Solution SAQ – 1

Air is composed of a mixture of gases such as nitrogen, oxygen and carbon dioxide. It also contains water vapours and suspended dust particles.

Solution SAQ – 2

Oxygen is required by all living beings for respiration and for burning materials. This is balanced by green plants. Green plants take in carbon dioxide and release oxygen during the process of photosynthesis.

Solution SAQ – 3

The atmosphere keeps the average temperature of the earth fairly steady during the day as the atmosphere prevents the sudden increase in temperature during the daylight hours and at night atmosphere slows down the escape of heat into the outer space.

Solution SAQ – 4

The movement of air from one region to another creates winds. When the solar radiations fall on the earth, some are absorbed and majority of these are reflected back by the land and water bodies. These reflected solar radiations heat up the atmosphere from below. As a result convection currents are set up in the air but since land gets heated faster than the water, the air above the land gets heated faster than the air over water bodies. During the day the air above the land gets heated and starts rising, creating a region of low pressure below. As a result the air over the sea moves into this region of low pressure and forms the wind.

Solution SAQ – 5

- (i) Take a beaker full of water, a beaker full of soil and a closed bottle containing a thermometer.
- (ii) Keep them in bright sunlight for three hours.
- (iii) Now, measure the temperature of all three vessels and also take the temperature reading in shade at the same time.
- (iv) You will observe that the temperature of the soil and sand is more than that of water in bright sunlight because sand and soil gets heated by solar radiations faster than the water.
- (v) Therefore, land would become hot faster than the sea.
- (vi) You will also observe that the temperature of air in shade is different from the temperature of soil, sand and water in bright sunlight because of the direct effect of radiations.

Solution SAQ – 6

When the solar radiations fall on the earth, some are absorbed and majority of these are reflected back or re-radiated by the land and water bodies. These reflected or re-radiated solar radiations heat the atmosphere from below. As a result convection currents are set up in the air.

Solution SAQ – 7

The factors that influence the movement of air are:

- (i) Uneven heating of land at different parts of the earth.
- (ii) Differences in heating and cooling of land and water bodies.
- (iii) Vapourisation and condensation of water vapours.
- (iv) Rotation of earth.
- (v) Presence of high mountain ranges in the paths of wind.
- (vi) Difference in topography over which the wind passes.

Solution SAQ – 8

When the water bodies get heated by solar radiations during the day, a large amount of water evaporates and goes in the air. The air carrying water vapours also gets heated. This hot air rises up carrying water vapours with it. As the air rises, it expands and cools. This cooling causes the water vapour in the air to condense as tiny droplets which slowly grow bigger by the condensation of more water droplets and forms clouds. When the droplets have grown big and heavy, they fall down in the form of rain.

Solution SAQ – 9

- (i) Take an empty plastic bottle.
- (ii) Pour 5-10 ml water into it and close the bottle tightly with a cap.
- (iii) Shake the bottle well and then place it in the sun for 10 minutes.
- (iv) Now, open the cap of the bottle and allow some smoke from the lighted incense stick to enter the bottle.
- (v) Quickly close the bottle tightly with the cap.
- (vi) Press the bottle hard between your hands as much as possible.
- (vii) After few seconds release the bottle. Press the bottle again as hard as you can.

This simple experiment replicates, on a very small scale, the happenings when air with a very high content of water vapour goes from a region of high pressure to a region of low pressure. When bottle containing water is kept in the sun, the water evaporates and air inside the bottle gets saturated with water vapour. When the bottle is pressed between your hands, the pressure inside becomes high and air inside the bottle moves in a region of low pressure. It expands and cools. The smoke particles act as 'nuclei' on which water vapours condense in the form of tiny droplets. When you release the pressure, the air inside the bottle becomes foggy. When bottle is again pressed, the fog will disappear. It is so because due to high pressure condensed water vapours will fall down and collect as water at the bottom of the bottle. When the experiment is repeated without smoke inside the bottle, one will not observe foggy air

inside the bottle as smoke particles are absent and nothing is available in air to act as 'nucleus' for water vapours to condense as tiny droplets.

Solution SAQ – 10

The major components of air pollution are soot, fly ash, dust particles, smoke and some gases like sulphur dioxide, carbon monoxide, nitrogen oxide, ammonia etc.

Solution SAQ – 11

When fossil fuels such as coal and petroleum products are burnt, they produce oxides of nitrogen and sulphur. On dissolving in rain these oxides form nitric acid and sulphuric acid respectively. This causes acid rain. These acids wash down into the soil and make it highly acidic, thus, affecting the growth of plants and ultimately the forest growth. It also affects the surface of buildings by eroding the stone and brick works.

Solution SAQ – 12

Smog is a photochemical haze caused by the action of solar ultra violet radiation on atmosphere polluted with primary pollutants such as hydrocarbons and oxides of nitrogen from automobile exhaust. It reduces visibility and is highly suffocating and toxic to humans, animals and plants.

Solution SAQ – 13

Effects of air pollution on human beings:

- (i) Suspended particulate matter causes asthma, bronchitis and allergic cold.
- (ii) Pollutant gases cause irritation in eyes, throat and lungs. Heart related diseases tend to increase.
- (iii) Hydrocarbon vapours not only damage the internal organs but also cause cancer.

Solution SAQ – 14

In coastal areas, during daytime, there is a regular flow of cool air from the sea towards the land. At night, there is a reverse flow of air from land to sea. This happens because during the daytime, land gets heated faster than water.

Solution SAQ – 15

The atmosphere keeps the average temperature of the earth fairly steady during the day as the atmosphere prevents the sudden increase in temperature during the daylight hours and at night atmosphere slows down the escape of heat into the outer space.

Solution SAQ – 16

Atmosphere is divided into five distinct layers: Troposphere, stratosphere, mesosphere, thermosphere and exosphere.

- i. Troposphere is the lowest region of atmosphere which contains air and is subject of

differential heating. It extends from the surface of the earth upto 8-20 kms. Many important climatic events such as cloud formation, lightning, thundering etc all takes place in the troposphere.

ii. The Stratosphere extends from the top of the troposphere up to around 31 miles (50 km) above the Earth's surface. In this region the temperature increases with height. Heat is produced due to the formation of ozone.

iii. The mesosphere extends from the top of the stratosphere to about 53 miles (85 km) above the earth. The gases, including the oxygen molecules, continue to become thinner and thinner with height.

iv. Above the mesosphere the thermosphere extends up to near 375 miles (600 km) above the earth. This layer is known as the upper atmosphere. As such, incoming high energy ultraviolet and x-ray radiation from the sun, absorbed by the molecules in this layer, causes a large temperature increase.

v. Exosphere exists above the thermosphere.

Solution SAQ – 17

Air pollution is of two main types:

Natural: It is the pollution caused by nature. It includes forest fires, dust storms, pollen etc.

Human made: It is the pollution caused by human activities. It includes burning of fossil fuels in industries, vehicles and thermoelectric plants, gaseous emission from industries, mining, processing and stone crushing.

Solution SAQ – 18

When the water bodies get heated by solar radiations during the day, a large amount of water evaporates and goes in the air. The air carrying water vapours also gets heated. This hot air rises up carrying water vapours with it. As the air rises it expands and cools. This cooling causes the water vapours in the air to condense as tiny droplets which slowly grow bigger by the condensation of more water droplets and forms clouds.

Solution SAQ – 19

Global warming: An increase in the carbon dioxide content in the atmosphere leads to global warming. The global warming is quite dangerous as it tends to melt polar ice and glaciers existing on mountains, rise in the water level of the oceans and submerge several coastal areas and islands. This could further lead to floods.

Solution SAQ – 20

Ozone depletion is caused by certain chemicals called ozone depleting substances. They include chlorofluoro carbons, methyl bromide, nitrogen oxides and chlorine.

Effects of ozone depletion:

(i) Skin cancer.

(ii) Damage of eyes.

- (iii) Damage of immune system.
- (iv) Decreased crop yields.

Solution SAQ – 21

When fossil fuels such as coal and petroleum products are burnt, they produce oxides of nitrogen and sulphur. On dissolving in rain these oxides form nitric acid and sulphuric acid respectively. This causes acid rain. These acids wash down into the soil and make it highly acidic, thus, affecting the growth of plants and ultimately the forest growth. It also affects the surface of buildings by eroding the stone and brick works.

Solution SAQ – 22

Rainwater harvesting is a technique used to capture and store rain water by making special water harvesting structures so that there is an increase in the recharge of underground water resources.

Solution SAQ – 23

Climate is the average weather of an area. It represents the general pattern of atmospheric or weather conditions, seasonal variations and weather extremes, in a region over an extended period, say 50 years or 100 years. For example, desert areas have a hot climate whereas snowbound mountains have a cold climate.

Solution SAQ – 24

The short term changes in the properties of the troposphere forms the weather. The weather changes take place everyday. It tells us about the temperature, rain, cloud and sunshine of an area.

Solution SAQ – 25

CFC's are chlorofluoro carbons which deplete the ozone layer. They are rich in chlorine, fluorine and carbon.

Effects of chlorofluoro carbons:

- (i) Skin cancer.
- (ii) Damage of eyes.
- (iii) Damage of immune system.
- (iv) Decreased crop yields.

Solution SAQ – 26

Break down of bigger rocks into smaller mineral particles is called weathering. It is of 3 types:

- (i) Physical weathering: Various climatic factors such as temperature, wind, rain water, ice, snow, glaciers and running water contribute to physical weathering. Water and high temperature cause corrosive humidity and bring about unequal expansion and contraction of rocks, facilitating their break down.

(ii) Chemical weathering: It involves a variety of chemical processes, such as hydrolysis, hydration, oxidation and reduction. The breakdown of complex compounds by the carbonic acids present in water and acidic substances derived from the decomposition of organic matter in soil, are examples of chemical weathering.

(iii) Biological weathering: Is done by living organisms such as lichens and bryophytes. They create small crevices which deepen to form cracks in the rocks. Cracks gradually widen and cause slow fragmentation and eventually pulverisation of rocks.

Solution SAQ – 27

The removal and transportation of the top layer of soil from its original position to another place, under the effect of strong winds and fast running rainwater is called soil erosion. Soil erosion can be prevented by :

- (i) Intensive cropping
- (ii) Sowing grasses and planting xerophytes.
- (iii) Terrace farming.
- (iv) Contour bunding.

Solution SAQ – 28

Biological weathering: Is done by living organisms such as lichens and bryophytes. Lichens growing on rock surface extract minerals from the rocks. This creates small crevices at places where a thin layer of soil builds up. Mosses grow over these crevices causing deepening of crevices and results in the buildup of more soil inside them. The roots of short lived herbs also passes into them and the cracks gradually widen and cause slow fragmentation and eventually pulverisation of rocks.

Solution SAQ – 29

Water is replenished in the seas by the means of water or hydrological cycle. We know that the oceans or seas are the largest global reservoir of water. Water evaporates from these reservoirs in large quantities and helps in the formation of clouds. The winds blows the clouds over to the lands where after getting cooled enough, the water in clouds falls on the earth or directly over the seas as rain and hail. Some water from rain and melting snow soaks into the ground, but most of it flows in rivers and returns directly to the seas.

Solution SAQ – 30

Nitrogen fixation is the process of fixing free nitrogen into compounds. This takes place by the following means:

- (a) Certain blue-green algae and bacteria can fix atmospheric nitrogen.
- (b) Nitrogen fixing bacteria found in the nodules of roots of legumes such as gram, bean, pulses etc. fix atmospheric nitrogen into nitrogen containing compounds.
- (c) Lightning also helps in the formation of nitrogen containing compounds.

Solution SAQ – 31

Nitrogen exists as free nitrogen in the atmosphere. This free nitrogen is fixed into compounds of ammonia and nitrates. Most of the organisms cannot utilise nitrogen as molecular nitrogen. Plants take compounds containing nitrogen from the soil. From plants nitrogen passes into the food web. Decay of dead plants, animals and excreta causes return of nitrogen compounds to the soil. Denitrifying bacteria cause liberation of free nitrogen in the atmosphere.

Solution SAQ – 32

Carbon is an important constituent of organic compounds found in all living beings in the form of carbohydrates, fats, proteins and nucleic acids. Carbon is trapped in the surrounding air and water in the form of carbon dioxide. The consumers devour the organic carbon compounds that producers manufacture. Through respiration, both consumers and producers return carbon to the non-living environment in the form of carbon dioxide. Some carbon accumulates in wood for many years and is eventually returned to the atmosphere by fires or through consumption and respiration by fungi, bacteria and other detritivores. Volcanic eruption also releases carbon dioxide to the atmosphere.

Solution SAQ – 33

The dangers of global warming are:

- (i) It leads to the melting of polar ice caps and rise in sea level.
- (ii) Increase in the temperature of the earth due to green house effect will cause a change in weather and precipitation patterns on the earth.
- (iii) It leads to methane burp which is caused by the melting of methane hydrates in permafrost and on sea floor.

Solution SAQ – 34

Carbon dioxide concentration in atmosphere is rising primarily because of two reasons: (i) Deforestation and (ii) Increased combustion of fossil fuels.

As trees take in carbon dioxide from air and release oxygen back into the air, it helps in maintaining the desired levels of oxygen and carbon dioxide in the atmosphere. But due to deforestation, trees are being cut down and this is leading to the increase in carbon dioxide levels.

The increased combustion of fossil fuels also leads to the release of enormous amounts of carbon dioxide in the atmosphere.

Solution SAQ – 35

Ozone layer is called ozone umbrella/shield because it filters out the harmful, high energy ultra violet radiations coming from the sun.

Solution SAQ – 36

In 1985, Farman found that ozone layer had thinned out over Antarctica. It was called an ozone

hole.

Effects of widening of ozone hole are:

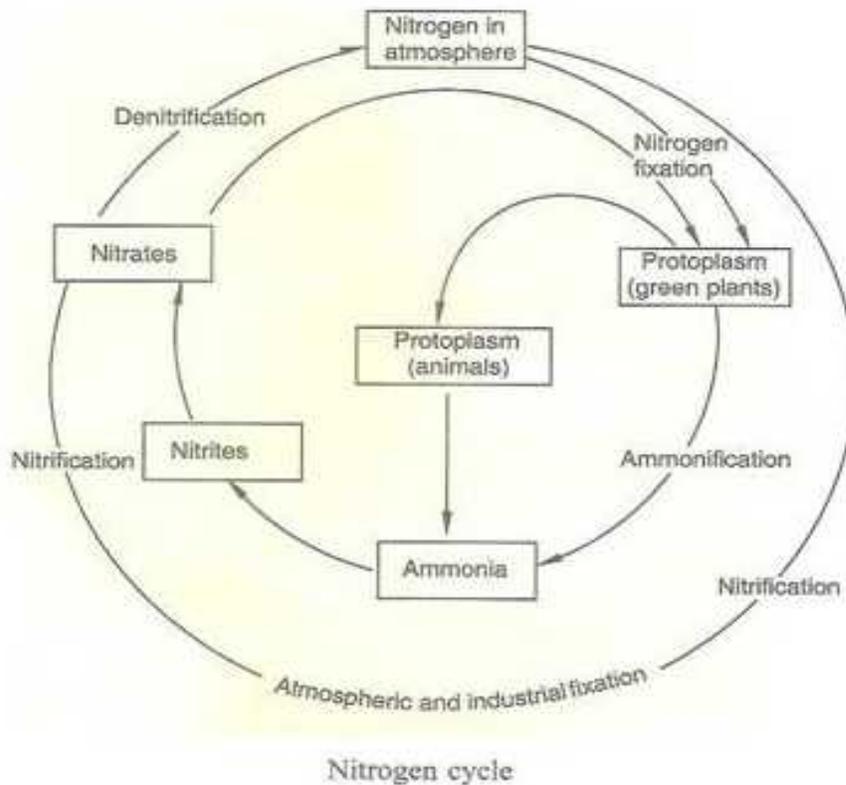
- (i) Skin cancer.
- (ii) Damage of eyes.
- (iii) Damage of immune system.
- (iv) Decreased crop yields.

Solution SAQ – 37

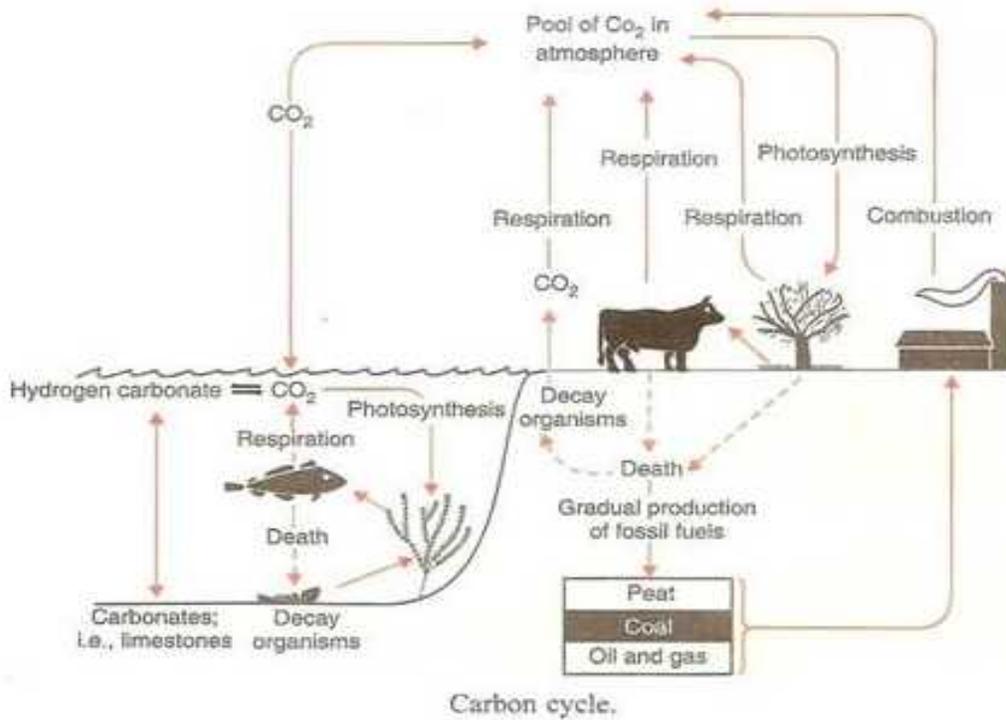
Water is one of the most important physical components which is essential for the survival of life on earth. Ocean is the biggest storehouse of water. Water on evaporation forms clouds and which after condensation falls down as rain. After rain, it passes through rivers and gets collected again in the ocean. The circulation of water in this manner is called water cycle. The cycle is also performed through living beings in the processes like absorption and transpiration of water by plants and drinking by animals. Animals lose water during respiration and evaporation, perspiration and excretion.

Solution SAQ – 38

(i) Nitrogen cycle



(ii) Carbon cycle

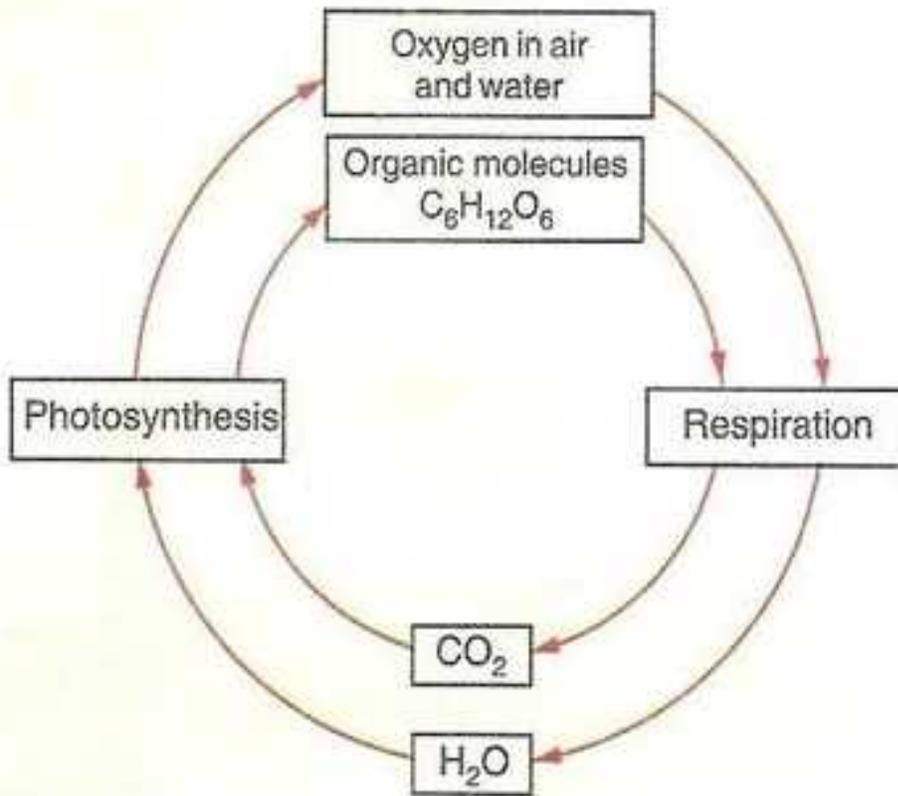


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Solution SAQ – 39

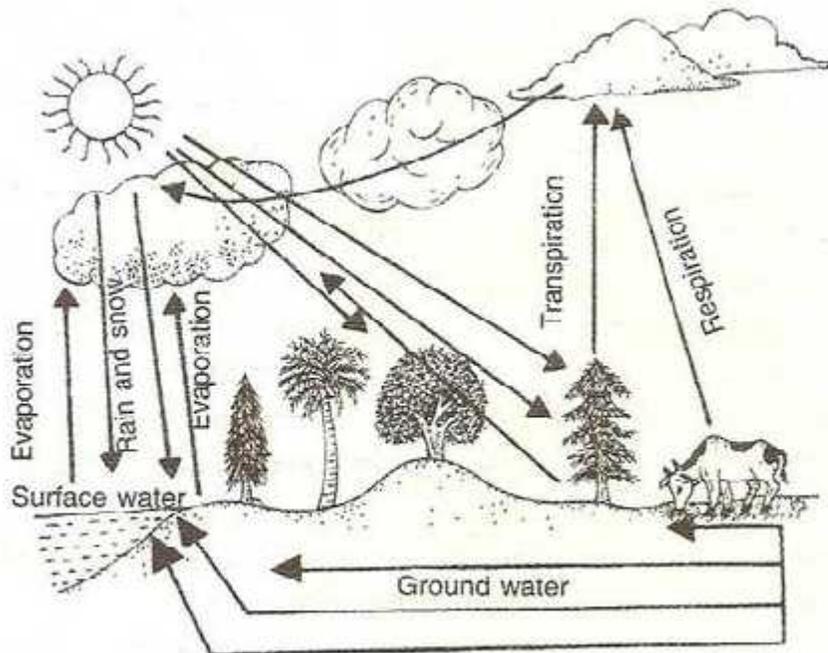
The bacteria which help in nitrogen fixation are Azotobacter and Rhizobium. Some bacteria help to convert ammonia into nitrates. These are Nitrosomonas and Nitrobacter.

Solution SAQ – 40:



Oxygen cycle.

Solution SAQ – 41:



Water cycle.

Solution SAQ – 42

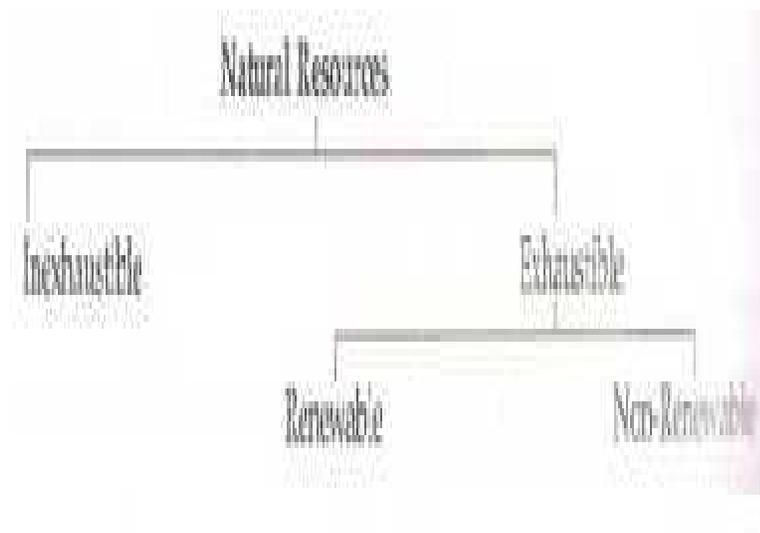
The three aspects of nutrient cycling are:

- (i) Input of nutrients – An ecosystem receives the nutrients from an external source. It stores them for further use through biological processes.
- (ii) Output of nutrients – Nutrients move out of an ecosystem and many of them become input to another ecosystem.
- (iii) Internal nutrient cycling – Nutrients are continuously regenerated and stored in soil in forms available to plants. This is done by decomposers by the process of decomposition of detritus.

Solution SAQ – 43

The organisms get water from and return it to the global water cycle. Plants absorb water from the soil or water reservoir and add it to the air in vapour form by a process called transpiration. Water transpired by trees cools the surrounding air. Animals take water from the water reservoir or with food and return it to the air and vapours by respiration or to the soil by excretion. Mammals also excrete water as sweat which evaporates from the water bodies. Water is added to the environment by the death and decay of organisms. Water vapour formed by transpiration and respiration form clouds and enters global water cycle. Rain adds water to the soil and reservoir for reuse by plants and animals. This completes the water cycle.

Solution LAQ – 1:



Natural resources are living and non-living components of nature which are used by humans to meet their requirements. Since natural resources are available only from the Earth, they are called Earth resources.

Based on their abundance, natural resources are of two main types, inexhaustible and exhaustible.

(a) Inexhaustible natural resources: They are natural resources which occur in such abundance that they are not likely to get exhausted despite continuous use, e.g., air, water, solar energy.

(b) Exhaustible natural resources: They are natural resources which are available in limited quantity. They may get depleted by continuous and indiscriminate human consumption. Exhaustible resources are of two kinds, renewable and non-renewable.

(i) Renewable resources: They are exhaustible resources which get replenished regularly. These are both living and non-living resources which can replenish themselves by quick recycling, e.g., forests, wildlife, soil and underground water. Renewable resources can last for ever if they are used responsibly.

(ii) Non-renewable resources: They are exhaustible resources which once used cannot be replenished. Thus, these resources are non-living and cannot replenish themselves by recycling and replacement. If not used carefully they will ultimately get exhausted. Their increased consumption results in quicker exhaustion, e.g., minerals, fossil fuels such as coal and petroleum.

Solution LAQ – 2

Air contains oxygen. The latter is needed by most organisms and plants for all respiration to go on. It is therefore rightly called the breath of life. Air is an inexhaustible natural resource. In a world without air, there would be no plant or animal life, no winds, clouds or rain, no fires and no protection against harmful solar radiations. This is because the atmosphere covers the Earth, like a blanket. Air is a bad conductor of heat. The atmosphere keeps the average temperature of the Earth fairly steady during the day and even during the course of whole year. The atmosphere prevents the sudden increase in temperature during the daylight hours. And at night, atmosphere slows down the escape of heat into outer space.

Solution LAQ – 3

The introduction of chemicals, particulate matter, or biological materials into the atmosphere that cause harm or irritate living organisms or damage the natural environment is known as air pollution.

The major causes of air pollution can be in the form of solid particles, liquid droplets, or gas. There are many different chemical substances that contribute to air pollution. These chemicals come from a variety of sources. Among the many types of air pollutants are nitrogen oxides, carbon monoxides, and organic compounds that can evaporate and enter the atmosphere. Air pollutants have sources that are both natural and human. Humans contribute substantially more to the air pollution problem. Forest fires, volcanic eruptions, wind erosion, pollen

dispersal, evaporation of organic compounds, and natural radioactivity are all among the natural causes of air pollution. Though some pollution comes from these natural sources, most pollution is the result of human activity. The biggest causes are the operation of fossil fuel-burning, power plants and automobiles that combust fuel.

Effects of air pollution on human beings:

- (i) SPM (suspended particulate matter) causes asthma, bronchitis and allergic cold.
- (ii) Pollutant gases cause irritation in eyes, throat and lungs. Heart related diseases tend to increase.
- (iii) Hydrocarbon vapours not only damage the internal organs but also cause cancer.

Solution LAQ – 4

The ozone layer is a deep layer in the stratosphere, encircling the Earth, which has large amounts of ozone in it. This layer shields the entire Earth from much of the harmful ultraviolet radiation that comes from the sun. Ozone is a special form of oxygen, made up of three oxygen atoms rather than the usual two oxygen atoms.

It is formed when some type of radiation or electrical discharge separates the two atoms in an oxygen molecule (O₂), which can then individually recombine with other oxygen molecules to form ozone (O₃).

Reduction in the concentration of ozone layer is called ozone depletion. Ozone depletion is caused by certain chemicals called ozone depleting substances. They include chlorofluoro carbons, methyl bromide, nitrogen oxides and chlorine.

Effects of ozone depletion: Depleting ozone layer allows more ultraviolet (UV) radiations to pass through it, which reach the earth's surface. These UV rays cause various harmful effects on human beings, animals, plants and environment such as:

- (i) Skin cancer.
- (ii) Damage of eyes.
- (iii) Damage of immune system.
- (iv) Decreased crop yields.

Solution LAQ – 5

Sources of water pollution:

- (i) Sewage – Organic wastes are contributed as domestic and commercial sewage by food processing plants, dairy farms, piggeries, poultry farms, slaughter houses, breweries, tanneries, etc. Animal excreta is discharged into fields or dumped into pits reaches water bodies through run off and leaching, particularly during the rainy season.
- (ii) Industrial wastes – Effluents of mills and industries such as paper mills, petroleum refineries, etc., contain large quantities of harmful chemicals including acids, alkalis and heavy metals (e.g., mercury salts from paper industries) that are discharged into water bodies (rivers and lakes).
- (iii) Synthetic soaps and detergents – Water containing soaps and detergents is discharged from

houses and certain factories.

(iv) Fertilizers and pesticides – Fertilizers and pesticides are being used excessively in the fields to increase crop production. These are washed by rainwater into water bodies and pollute them.

(v) Petroleum oil – Drilling and shipping operations are common in the oceans. Leakage of petroleum oil during such operations or due to accidents results in water pollution.

(vi) Solid particles – Rain erodes soil and carries silt to water. Tiny suspended particles of clay and dust also settle in water from air. These soil particles cause turbidity.

(vii) Thermal pollution – Discharge of hot water from industries and thermal plants into water body changes the normal temperature of the water. The content of oxygen decreases. Reduced oxygen content kills aquatic animals and reduces the rate of decomposition of organic matter which, therefore, accumulates.

Harmful effects of Water pollution:

(i) Human diseases – Diseases such as typhoid, cholera, dysentery, jaundice and hepatitis are caused due to water pollution.

(ii) Disturbance in ecological balance – All types of water pollutants affect the life forms living in the water. These pollutants can encourage the growth of some life forms and harm some other life forms hence affecting the balance between various organisms.

(iii) Removal of desirable substances from water bodies – With increase in the amount of organic wastes in water, bacteria multiply rapidly and use up the available oxygen. Lack of oxygen kills the fish and other animals.

Solution LAQ – 6

(i) Eutrophication is nutrient enrichment (i.e., addition of nitrates and phosphates) of water body that results in the growth of aquatic plants, especially algae causing colouration of water known as algal bloom. It leads to depletion of dissolved oxygen in water resulting in killing of aquatic organisms (e.g., fish).

(ii) The phenomenon of increase in the concentration of harmful non-biodegradable substances in the body of living organisms at each trophic level of the food chain is called biomagnification. Two heavy metals which are biomagnified are mercury and cadmium. Due to biomagnification fish-eating predatory birds such as kingfishers and loon become poisoned.

Solution LAQ – 7

Living organisms need water because it plays a vital role in the reactions taking place within organism's cells and body. Water acts as a universal solvent, providing a medium for the chemical reactions to occur. Substances are also transported from one part of body to the other in the dissolved state. Therefore, it is necessary for the organisms to maintain a distinct level of water within their bodies in order to stay alive. Terrestrial life forms require fresh water because their bodies cannot tolerate or get rid of the high amounts of the dissolved salts in saline water. So, water sources need to be easily accessible to animals and plants to survive on

land.

Thus, availability of water decides not only the number of individuals of each species that are able to survive in a particular area, but it also decides the diversity of life there.

Solution LAQ – 8

Soil is a mixture of small particles of rocks and humus (i.e., organic matter obtained from decaying of living organisms or their wastes). Temperature variations due to radiations of the sun, rain water, winds and living organisms influence the formation of soil from the rocks involving two processes: weathering and paedogenesis.

Breakdown of bigger rocks into small, fine soil particles is called weathering. It may occur due to physical, chemical or biological means. Under the influence of solar radiations, rocks heat up and expand. At night, these rocks cool down and contract. Since all the parts of rocks do not expand and contract at the same rate, cracks appear in the rocks and ultimately the large rocks breakdown into smaller pieces. Flow of water through or over the rocks makes the cracks bigger. Flowing/falling water also has an erasing effect on the rocks. On freezing the water expands in rock crevices and breaks the rocks. Similarly, strong winds continue to rub against hard rocks and erode them. Growth of lichens, mosses and other plants also influence the formation of soil by eroding the rocks over which they are growing.

Paedogenesis: This process concludes the decomposition by bacteria and fungi, during which organic materials are broken down, leading to humification and mineralization. Detritivores such as nematods, earthworms, etc., consume organic matter and add excretory nitrogen to it. Thus, addition of organic matter (humus) from dead and decomposed plants and animals, is the final stage in soil formation.

Solution LAQ – 9

Soil pollution is caused by solid wastes and chemicals. The slag heaps from mines spoil the beauty of sites of mines. Pulp and paper mills, sugar mills, oil refineries, power plants, chemicals fertilizer manufacturing units, iron and steel plants, plastic and rubber producing complexes are some major contributions to soil pollution. Most industrial furnaces and thermal power stations produce fly ash, which is a grey, powdery residue of unburnt material, and causes pollution. This fly ash hampers the growth of crop plants and also decreases crops of orchards. Domestic waste also adds a large amount of solid wastes. Modern farming practices involve the use of large amounts of fertilizers and pesticides. Use of these substances over long period of time can destroy the soil structure by killing the soil microorganisms that recycle nutrients in the soil. It also kills the earthworms which are helpful in making the rich humus. Fertile soils can quickly become barren if sustainable practices are not followed.

Solution LAQ – 10

The removal and transportation of top soil from its original position to another place with the help of certain agents such as strong winds and fast running waters, is called soil erosion.

Causes of Soil Erosion:

1. Strong winds: The soil which is uncovered and loose, is eroded, when it is exposed to strong winds. The winds carry away the fine soil particles to other places.
2. Heavy rains: When rain falls on the unprotected top soil, rain water washes it down into the streams and rivers, etc.
3. Human actions: Human activities such as expansion of urban areas has led to removal of vegetation from certain regions. The bare land is thus exposed to agencies (winds, rains) of soil erosion.

Effects of Soil Erosion:

1. Loss of fertility and desertification: Soil erosion results in the displacement of the top soil from one region to another, thus, reducing its fertility. When the top fertile soil is constantly removed from a region, only infertile sub-soil is left behind. In such a soil, only sparse vegetation can grow. This way, soil erosion gradually turns lush green areas into deserts.
2. Landslides in hilly areas: Barren hills or hills with sparse vegetation are constantly exposed to heavy rain fall that makes the top soils of hills loose. Due to soil erosion, rock pieces of various sizes and loose soil from hills, suddenly slide down the steep slopes of mountains/hills. This phenomenon is called landslides. When these rock pieces and soil block the narrow river bed they result in floods. Sometimes, landslides block the roads and disrupt hill-life.
3. Flash floods: Vegetation in the hilly regions absorb a lot of rain water and keep the top soil intact. Barren hills or hills with sparse vegetation cannot absorb much rain water and thus can not keep the soil intact. So, heavy rains result in rapid movement of water in the areas resulting in flash floods in lower areas causing enormous loss to life and property.

Prevention of soil erosion:

1. Intensive cropping: If the fields remain covered with crops throughout the year, their top soil will not be exposed to winds or rains. In such a condition, no soil erosion will occur.
2. Sowing grasses and planting xerophytes: Soil should not be left uncovered. Sowing grasses on barren soil or planting of xerophytes will bind the loose soil. The roots of grasses and xerophytes hold the soil in place. Vegetative cover on the ground also helps in percolating water into deeper layers of soil.
3. Terrace farming (terracing): In terracing the slopes are divided into a number of flat fields to slow down the flow of water. In hilly regions, small crop fields are thus formed in the form of steps on terraces for cultivation of crops. Such terrace farms reduced the flow of rain water down the slopes of hills. Moreover, eroded soil from upper regions of hills gets deposited in lower terraces.

Solution LAQ – 11

The continuous process by which nitrogen is exchanged between organisms and the environment is called nitrogen cycle. Nitrogen is an essential nutrient, needed to make amino

acids and other important organic compounds, but most organisms cannot use free nitrogen, which is abundant as a gas in the atmosphere.

Nitrogen cycle involves the following steps:

(i) Nitrogen fixation: This process involves the conversion of atmospheric nitrogen into nitrates, which are soluble in water. This is done by various nitrogen fixing bacteria. Example – Rhizobium, blue green algae and bacterium Azotobacter.

(ii) Ammonification: It is the process of decomposing complex, dead organic matter into ammonia. This is done by microorganisms living in the soil.

(iii) Nitrification: It is the process of conversion of ammonia into nitrites and then into nitrates. This is done by nitrifying bacteria. Example – Nitrosomonas and Nitrobacter.

(iv) Denitrification: It is the process of reducing nitrates present in the soil to release nitrogen back into the atmosphere. Example – Pseudomonas.

The decomposers help in decomposing the dead bodies of plants and animals, and hence act as cleansing agents of environment. The decomposers also help in putting back the various elements of which the dead plants and animals were made, back into the soil, air and water for reuse by the producers like crop-plants, e.g. the decomposers like purifying bacteria and fungi decompose the dead plants and animal bodies into ammonia. This ammonia is converted into nitrates by nitrifying bacteria present in soil. These nitrates act as fertilizer in the soil and are again absorbed by the plants for their growth. Thus, the nitrates act as fertilizer in the biosphere so that the process of life may go on and on like an unending chain.