

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 pass 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 blow 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:

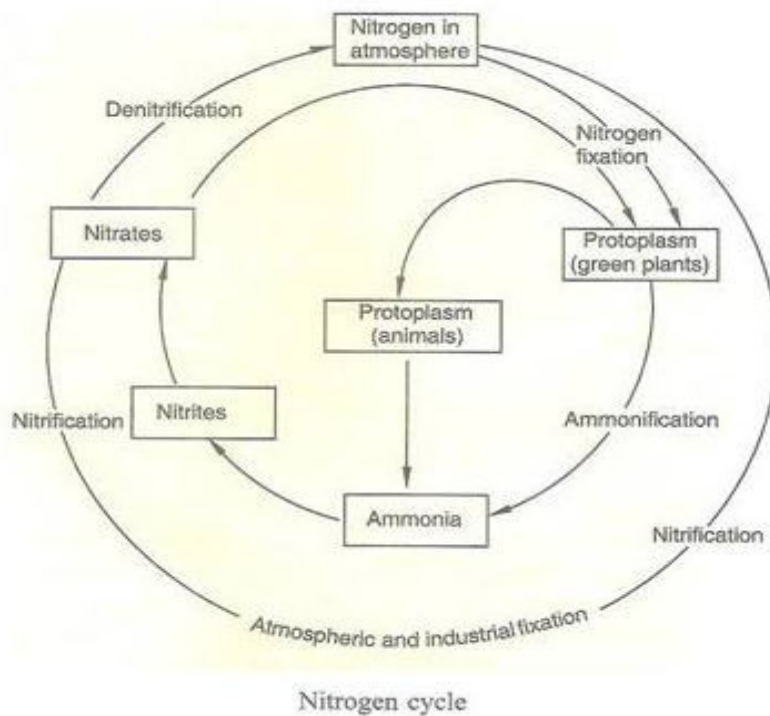
- (i) Skin cancer.
- (ii) Damage of eyes.
- (iii) Damage of immune system.
- (iv) Decreased crop yields.

Solution SAQ – 37

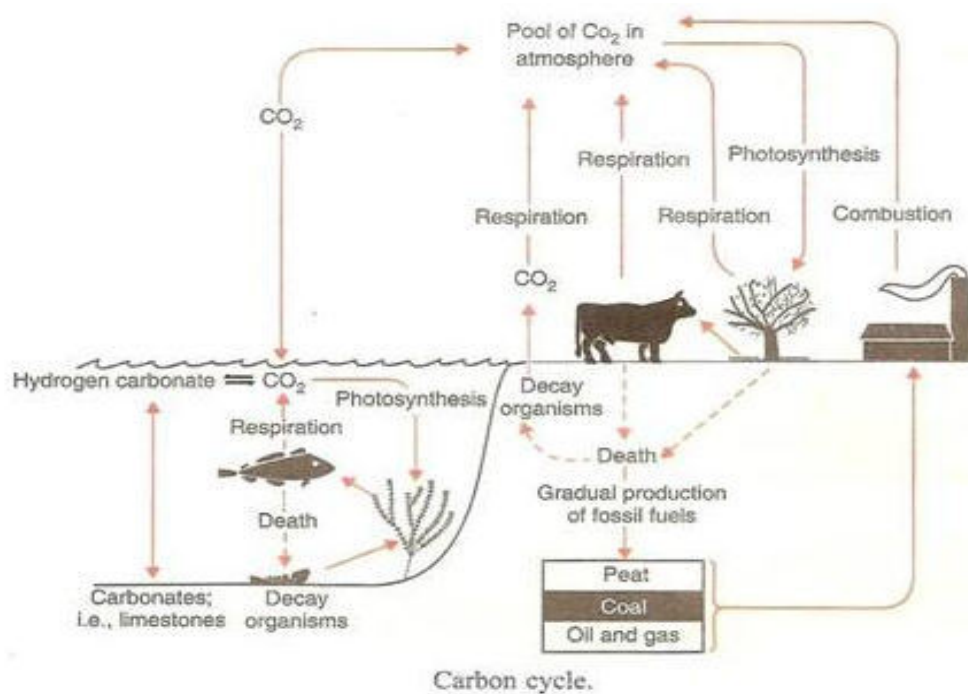
Water is one of the most important physical components which is essential for the survival of life on earth. Ocean is the biggest storehouse of water. Water on evaporation forms clouds and which after condensation falls down as rain. After rain, it passes through rivers and gets collected again in the 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



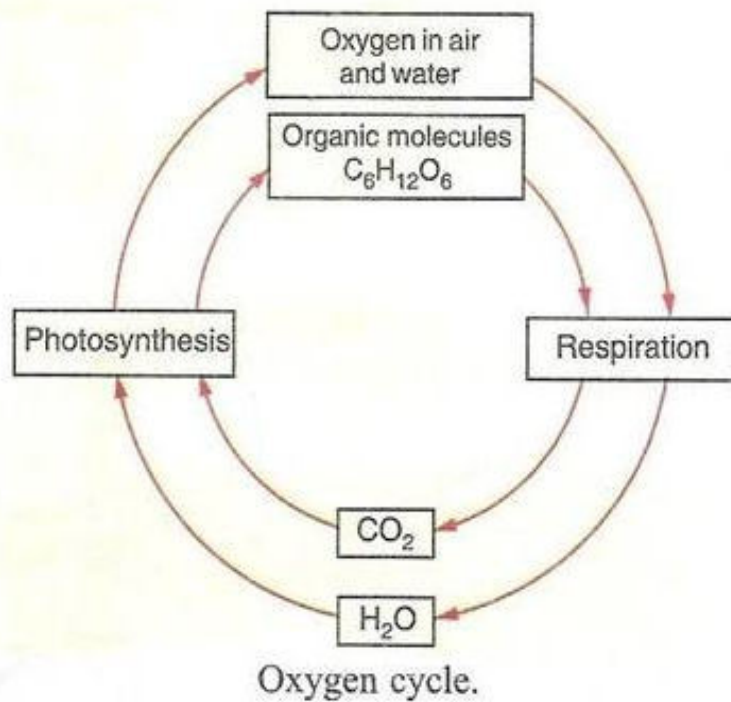
(ii) Carbon cycle



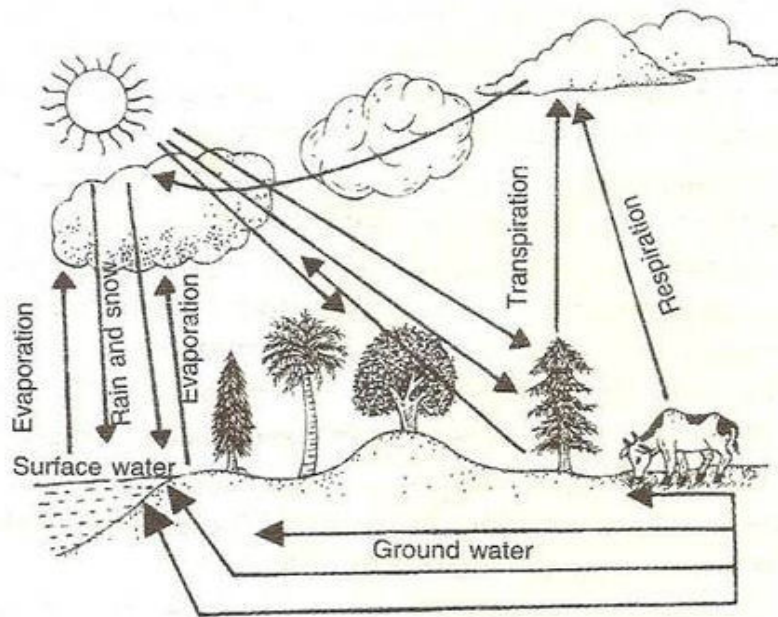
Solution SAQ – 39

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:



Solution SAQ – 41:



Water cycle.

Solution SAQ – 42

The three aspects of nutrient cycling are:

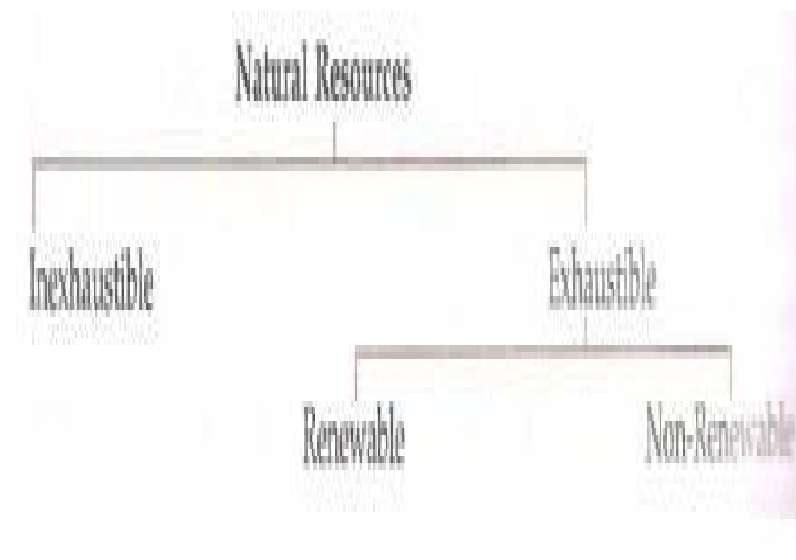
- (i) **Input of nutrients** – An ecosystem receives the nutrients from an external source. It stores them for further use through biological processes.
- (ii) **Output of nutrients** – Nutrients move out of an ecosystem and many of them become input to another ecosystem.
- (iii) **Internal nutrient 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 to 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 (O_2), which can then individually recombine with other oxygen molecules to form ozone (O_3).

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.