ENVIRONMENTAL STUDIES

Question Bank

Two Marks Questions

1. Ecosystem

An ecosystem is a structural and functional unit of ecology where the living organisms interact with each other and the surrounding environment. In other words, an ecosystem is a chain of interactions between organisms and their environment. The term “Ecosystem” was first coined by A.G.Tansley, an English botanist, in 1935.

2.Trophic Level :

Every stage or link in the food chain which consist of a specific type of organisms is called a trophic level. Trophic means feeding, so trophic levels are the levels or positions at which species feed. . A food web starts at trophic level 1 with primary producers such as plants, can move to herbivores at level 2, carnivores at level 3 or higher, and typically finish with apex predators at level 4 or 5.

3.Wildlife (Protection) Act : The Indian Parliament enacted the Wildlife (Protection) Act in 1972, which provides for the safeguard and protection of the wildlife (flora and fauna) in the country. This Act provides for the protection of the country’s wild animals, birds, and plant species, in order to ensure environmental and ecological security. Among other things, the Act lays down restrictions on hunting many animal species.

4.The Forest (Conservation) Act of 1980 The Forest (Conservation) Act of 1980 (FCA, 1980) is an Act by the Parliament of India which ensures conservation of forest and its resources. It was enacted by the Parliament of India in order to control the ongoing deforestation of the forests of India.

Objectives of the Forest Conservation Act 1980

1. Protect the forest along with its flora, fauna and other diverse ecological components while preserving the integrity and territory of the forests.
2. Arrest the loss of forest biodiversity
3. Prevent forest lands being converted into agricultural, grazing or for any other commercial purposes and intentions.

5.The Montreal Protocol on Substances that Deplete the Ozone Layer is an important Multilateral Agreement regulating the production, consumption, and emissions of ozone-depleting substances (ODSs). It is an important part of international environmental conventions and protocols. The Protocol was signed in 1987 and entered into force in January 1989. The protocol gives provisions to reduce the production and consumption of ODSs to protect the ozone layer.

6.Mining : It is the extraction (removal) of minerals and metals from earth. Manganese, tantalum, cassiterite, copper, tin, nickel, bauxite (aluminum ore), iron ore, gold, silver, and diamonds are just some examples of what is mined.

7.Global Warming :*“Global warming is a gradual increase in the earth’s temperature generally due to the greenhouse effect caused by increased levels of carbon dioxide, CFCs, and other pollutants.”*

Global warming is the phenomenon of a gradual increase in the temperature near the earth’s surface. This phenomenon has been observed over the past one or two centuries. This change has disturbed the climatic pattern of the earth.

8. Desertification – Degradation of Fertile Land

Desertification is the degradation process by which a fertile land changes itself into a desert by losing its flora and fauna, this can be caused by drought, deforestation, climate change, human activities or improper agriculture. Desertification is a process of degradation of the land. It occurs because of man-made activities and climate change. Desertification takes place when a particular type of biome converts into a desert biome.

9. Biodiversity hotspots of India :

Following the criteria must for an area to be declared as Biodiversity Hotspot, there are major four biodiversity hotspots in India:

1.The Himalayas (North-East India, Bhutan, Central and Eastern parts of Nepal.)

2.Indo-Burma Region (North-Eastern India (to the south of the Brahmaputra River), Myanmar, and China's Yunnan provinces, Lao People's Democratic Republic, Vietnam, Cambodia, and Thailand.)

3.The Western Ghats (The Western Ghats are present along the western edge of peninsular India and covers most of the deciduous forests and rain forests.)

4.Sundaland This region lies in South-East Asia and includes Thailand, Singapore, Indonesia, Brunei, and Malaysia.**Nicobar region represents India in this hotspot**.

10. Biological Invasion

Biological invasions take place when species are deliberately or accidentally introduced and become established in environments that they have not previously occupied. These so-called 'invasive species' may set in, spread and ecologically alter the invaded community. Biological invasions by animals, plants, pathogens or vectors are one of the greatest environmental and economic challenges and, along with habitat destruction, a leading cause of global biodiversity loss.

11. In –situ and Ex- situ Conservation

In-situ Conservation :In-situ conservation refers to the preservation of animals in its native environment. Using a network of protected areas, such as biosphere reserves, national parks, and animal sanctuaries, this strategy aims to safeguard the natural habitat.
Ex-situ Conservation :Ex-situ conservation is the relocation of endangered or rare species from their natural habitats to protected areas equipped for their protection and preservation., such as a Botanical Garden, Seed Bank, Zoological Garden, or Gene Bank, among other places. The primary purpose of this strategy is to provide appropriate support for conservation initiatives by ensuring the survival of vanishing and threatened species as well as their associated genetic diversity.

12. Types of Soil Erosion

One of the most important things that we can do to ensure the health of our crops and nearby ecosystems is to reduce soil erosion. The different soil erosion types are explained below.

Rain Drop or Splash Erosion

The erosion due to the impact of falling raindrops on the soil surface leading to the destruction of the crumb structure is known as raindrop or splash erosion.

Sheet Erosion

It is the uniform removal of soil in thin layers from the land surface caused by the wind. Land areas with loose, shallow topsoil overlying compact soil are most prone to sheet erosion.

Rill Erosion

Rill erosion is a form of water erosion in which the erosion takes place through numerous narrow and more or not so straight channels called streamlets or head cuts. Rill is the most common form of erosion, which you can also observe during heavy rain.

Gully Erosion

Gully erosion occurs due to the runoff of surface water, causing the removal of soil with drainage lines. Gullies when started once, will move by headward erosion or even by slumping of side walls unless and un-till proper steps will be taken in order to stabilize the disturbance.

13. Ecological Succession

“Ecological succession is a series of changes that occur in an ecological community over time.”

Ecological succession is the successive replacement of communities in an area over a period of time is known as ecological succession. Both biotic and abiotic components are involved in this change.

14. Pioneers :

“Pioneer species are entities which are particularly adapted to colonise the lifeless, barren regions and start an ecological community”.

Such entities alter their surroundings as they inhabit, survive and produce conditions for other entities to come there and start a livelihood in the area. Consequently, it has an effect on other entities. Some of these changes could be a change in the abiotic state such as in the temperature, soil etc. along with changes in the biotic state.

There are some lichens growing on the rocks in the absence of soil, hence can be from the first of the life forms, breaking down the rocks into the soil for plants.

15. Xerophytes

A xerophyte (xero meaning dry, phyte meaning plant) is a plant which is able to survive in an environment with little availability of water or moisture. Plants like the cacti and other succulents are typically found in deserts where low rainfall is the normal phenomen, but few xerophytes can also be found in moist habitats such as tropical forests, exploiting niches where water supplies are limited or too intermittent for mesophytic plants.

16.Energy Resource

Energy is scientifically called as the capacity to do any work.Population explosion, Luxurious life, Industries, Agriculture, mining, transportation, lighting, cooling, heating, building all need energy. Fossil fuels like coal, oil, natural gas produce 95% of energy Sources of energy

Primary- Renewable energy-resources which can be generated continuously in nature and are in exhaustible and can be used again endlessly. wood, Tidal, Solar, wind, hydropower, biomass, biofuel, geothermal, hydrogen .

Non – renewable energy- Resources which have accumulated in nature over along span of time and cannot be quickly replenished when exhausted. coal, petroleum, natural gas .

17. Natural resources

Natural resources can be defined as the resources that exist (on the planet) independent of human actions. These are the resources that are found in the environment and are developed without the intervention of humans. Common examples of natural resources include air, sunlight, water, soil, stone, plants, animals and fossil fuels.

18.Gasohol

Gasohol is a mixture of gasoline and ethanol. It can be used in place of gasoline, and it is becoming more popular as people learn about its benefits.The oxygen in ethanol allows for a more complete burn of fuel, which in turn reduces emissions. Ethanol also has a high octane rating, which helps to prevent knocking and pinging during combustion.

19. **Climax Community** : The terminal stage of succession is represented by the climax community .A climax community is the final stage of years long ecological succession, where the biota develops an indefinite stability with its environment, until an external change disrupts this equilibrium and leads to another succession. If a climax community is once developed, it remains as such until the environment is suddenly changed. This change can be caused by a natural disaster like volcanic eruption, landslides or by human interference like deforestation or fires.

20.

5 Marks Question

1.Write a note on overutilization of of surface and ground water.

WATER RESOURCES: Water is the most abundant, inexhaustible renewable resource. It covers 70% of the globe in the form of oceans, rivers, lakes, etc. Of this 70%, only 3% is available as freshwater. From this 3%, roughly 2% is frozen in polar icecaps and only a fraction of the remaining 1% is used as drinking water (potable). 90% of the water is utilized for agricultural purposes in India.

OVER-UTILIZATION OF SURFACE & GROUND WATER

The rapid increase in population and industrial growth led to severe demand on water resources. After using all available surface water resources to the maximum, human beings began using groundwater to meet their needs.

1. The increased extraction of groundwater far in excess of the natural recharge led to decreased groundwater level. The erratic and inadequate rainfall caused reduction in storage of water in reservoirs. This also led to decrease of groundwater.

2. Building construction activities seal permeable soil zone and reduce the area for percolation of rainwater thereby increasing surface runoff.

3. If groundwater withdrawal rate is higher than recharge rate, sediments in aquifers get compacted resulting in sinking of overlaying land surface. This is called land subsidence which leads to structural damage in buildings, fracture in pipes and reverses the flow of canals leading to tidal flooding.

4. Over-utilization of groundwater in arid and semi-arid regions for agriculture disturbs equilibrium of reservoir in the region causing problems like lowering of water table and decreased pressure in aquifers coupled with changes in speed and direction of water flow.

5. Over utilization of groundwater in coastal areas leads to rapid intrusion of salt water from the sea thereby rendering it unusable for drinking and agriculture.

6. Over-utilization of groundwater leads to decrease in water level thereby causing earthquake, landslides and famine.

7. Over-utilization of groundwater leads to drying-up of dug wells as well as bore wells.

8. Due to excess use of groundwater near agricultural fields, agricultural water that contains nitrogen as a fertilizer percolates rapidly and pollutes the groundwater thereby rendering the water unfit for potable use by infants. (Nitrate concentration exceeding 45 mg/L).

2.Explain the causes ,effects and prevention of droughts

Drought Water is a very basic necessity for the survival of life on earth. Imagine life with insufficient amount of water, it will be impossible to do the daily activities of cleaning, cooking, drinking etc. Life will turn out to be a miserable chaos. Water cycle has helped in maintaining the quantity of water on the surface of earth. About 50 liters of water is needed per day per person in order to sustain a healthy life. . Droughts are also often caused by the activity of humans and can have devastating effects. Drought conditions result from a lack of precipitation and this has many effects on the surrounding land and weather conditions. Drought conditions can worsen after prolonged periods of no rainfall, especially in areas where the water supply is short.

What causes drought?

Lack of rainfall (or precipitation): Droughts can occur when there is the lack of 'expected' precipitation (rain and snow) Some regions can go for months without any rain, and that would be 'normal' for them. Farmers plant in anticipation of rains and so when the rains do not come, and irrigation infrastructure is absent, agricultural drought occur.

Surface water flow: Some regions are also well distributed with surface water (streams and rivers) that have their sources from far away mountains and watersheds. These surface waters may dry out if the flow from their sources upstream is affected. Hydroelectric dams and irrigation systems are some of the economic activities that can reduce the amount of water flowing to other areas downstream.

Human factors: Forests (trees) play a key role in the water cycle, as they help reduce evaporation, store water and also contribute to atmospheric moisture in the form of transpiration. This means, cutting down trees (deforestation) in the name of economics, will expose surface water to more evaporation. It will also reduce the ability of the ground to hold water and make it easier for desertification to occur. It can set off drying conditions, especially for smaller water bodies. Cutting down trees is known to reduce a forest's watershed potential.

Global Warming: Even though some people do not accept that the average temperature of the earth has risen, it is on record that human actions have contributed to more greenhouse gasses in the atmosphere. As a result, there are warmer temperatures, often resulting in more dryness and bush fires. These conditions also tend to speed up drought conditions.

Effects of Drought

Economic: Farmers will have to spend more money to irrigate the crops and provide water for livestock on animal farms and ranches. They have to spend money to drill new wells or buy water in tankers from far away places.

Environment: Drought also affects the environment in many different ways. Plants and animals depend on water, just like people. When a drought occurs, their food supply can shrink and their habitat can be damaged. Plants, animals, climate, soils, rocks and many others are all affected by drought conditions. Some biotic and abiotic factors recover when the droughts are over. Others never recover again.

People and animals: Hunger, malnutrition, anaemia and mortality impacts of droughts are indirect in nature. Droughts cause low food production (crops and livestock), and particularly in poorer regions, people have less to eat. Food nutrition also is a problem, and that leads to vulnerability, diseases/illness and deaths. This is particularly so in remote communities of poorer countries, where communication and accessibility is usually poor.

Other Effects:

1. Dust bowls, themselves a sign of erosion, which further erode the landscape.
2. Dust storms, when drought hits an area suffering from desertification and erosion.
3. Famine due to lack of water for irrigation.

4. Habitat damage, affecting both terrestrial and aquatic wildlife
5. Hunger, drought provides too little water to support food crops.
6. Malnutrition, dehydration and related diseases.
7. Mass migration, resulting in internal displacement and international refugees.
8. Social unrest.
9. War over natural resources, including water and food.
10. Wildfires are more common during times of drought and even death of people.

Prevention of Drought
1. Dams – many dams and their associated reservoirs supply additional water in times of drought.
2. Cloud seeding – a form of intentional weather modification to induce rainfall. This remains a hotly debated topic, as the United States National Research Council released a report in 2004 stating that to date, there is still no convincing scientific proof of the efficacy of intentional weather modification.
3. Desalination – of sea water for irrigation or consumption.
4. Drought monitoring – Continuous observation of rainfall levels and comparisons with current usage levels can help prevent man-made drought. Careful monitoring of moisture levels can also help predict increased risk for wildfires, using such metrics as the KeetchByram Drought Index or Palmer Drought Index.
5. Land use – Carefully planned crop rotation can help to minimize erosion and allow farmers to plant less water-dependent crops in drier years.
6. Outdoor water-use restriction – Regulating the use of sprinklers, hoses or buckets on outdoor plants, filling pools, and other water-intensive home maintenance tasks. Xeriscaping yards can significantly reduce unnecessary water use by residents of towns and cities.
7. Rainwater harvesting – Collection and storage of rainwater from roofs or other suitable catchments.
8. Recycled water – Former wastewater (sewage) that has been treated and purified for reuse.

3.Explain the causes effects and prevention of floods

FLOOD What is flooding: Flooding is an overflowing of water onto land that is normally dry. Floods can happen during heavy rains, when ocean waves come on shore, when snow melts too fast, or when dams break. Flooding may happen with only a few inches of water, or it may cover a house to the rooftop. They can occur quickly or over a long period and may last days, weeks, or longer. Floods are the most common and widespread of all weather-related natural disasters. Flash floods are the most dangerous kind of floods, because they combine the destructive power of a flood with incredible speed and unpredictability. Flash floods occur when excessive water fills normally dry creeks or river beds along with currently flowing creeks and rivers, causing rapid rises of water in a short amount of time. They can happen with little or no warning.

Reasons of Flood

Rains: Each time there are more rains than the drainage system can take, there can be floods. Sometimes, there is heavy rain for a very short period that result in floods. In other times, there may be light rain for many days and weeks and can also result in floods.

River overflow: Rivers can overflow their banks to cause flooding. This happens when there is more water upstream than usual, and as it flows downstream to the adjacent lowlying areas (also called a floodplain), there is a burst and water gets into the land.

Strong winds in coastal areas: Sea water can be carried by massive winds and hurricanes onto dry coastal lands and cause flooding. Sometimes this is made worse if the winds carry rains them. Sometimes water from the sea resulting from a tsunami can flow inland to cause damage

Dam breaking (Dams are built along the side of a river and are used to prevent high water from flooding bordering land). Sometimes, too much water held up in the dam can cause it to break and overflow the area. Excess water can also be intentionally released from the dam to prevent it from breaking and that can also cause floods.

Snow-melts: In many cold regions, heavy snow over the winter usually stays un-melted for sometime. There are also mountains that have ice on top of them. Sometimes the ice suddenly melts when the temperature rises, resulting in massive movement of water into places that are usually dry. This is usually called a snowmelt flood. A flood occurs when water overflows or inundates land that's normally dry. This can happen in a multitude of ways. Most common is when rivers or streams overflow their banks. ... Coastal flooding occurs when a large storm or tsunami causes the sea to surge inland.

Effects of Floods
Floods can have devastating consequences and can have effects on the economy, environment and people. During floods (especially flash floods), roads, bridges, farms, houses and automobiles are destroyed. People become homeless. Floods can have devastating consequences and can have effects on the economy, environment and people.

Economic: During floods (especially flash floods), roads, bridges, farms, houses and automobiles are destroyed. People become homeless. Additionally, the government deploys firemen, police and other emergency apparatuses to help the affected. All these come at a heavy cost to people and the government. It usually takes years for affected communities to be re-built and business to come back to normalcy.

Environment: The environment also suffers when floods happen. Chemicals and other hazardous substances end up in the water and eventually contaminate the water bodies that floods end up in. In 2011, a huge tsunami hit Japan, and sea water flooded a part of the coastline. The flooding caused massive leakage in nuclear plants and has since caused high radiation in that area. Authorities in Japan fear that Fukushima radiation levels are 18 times higher than even thought.

People and animals: Many people and animals have died in flash floods. Many more are injured and others made homeless. Water supply and electricity are disrupted and people struggle and suffer as a result. In addition to this, flooding brings a lot of diseases and infections including military fever, pneumonic plague, dermatopathia and dysentery. Sometimes insects and snakes make their ways to the area and cause a lot of havoc.

4.Give an account on air pollution its effect and control measures

Air Pollution Definition

Air pollution means contamination of air, water, or soil by any substance that is harmful to live organisms. It's like an introduction or release of a toxic substance into the environment, that can harm the elements in the environment. The pollution can take place because of natural (such as volcanic eruption), and man-made reasons. But nowadays, it's man-made reasons that are causing more pollution than natural ones. From the increasing number of vehicles to ever-growing industrial wastages in the form of air or water, each contributes to air pollution in some way.

What is Air Pollution?

The air pollution definition says that when any physical, chemical, or biological change takes place in the air and contaminates it, then it is called air pollution. The contamination of air can be caused due to many factors such as poisonous or harmful gases, smoke, fog, smog, dust, etc. air pollution affects both plants as well as animals.

Types of Air Pollutants

The air pollutants are divided into primary and secondary pollutants. Pollutants are those substances that cause air pollution.

Primary Pollutants:

The primary pollutants responsible for air pollution are the ones that directly cause air pollution. These include harmful gases such as sulfur dioxide coming from the factories. Primary pollutants are those that are produced as a direct result of the process. Sulfur dioxide, generated by factories, is a classic example of a primary pollutant.

Secondary Pollutants:

The secondary pollutants are formed by the process of intermixing or intermingling of primary pollutants. Smog, which is a combination of fog and smoke, is a secondary pollutant.

Effects of Air Pollution:

The air pollution information shows that increasing air pollution can have an adverse effect on plants, animals, and humans.

Global warming

Air Pollution can increase the amount of global warming as the temperature of the earth will keep rising with the emission of harmful gases. With rising global temperatures, rising sea levels, melting ice from colder places and icebergs, relocation, and habitat loss, an imminent crisis has already been signaled if preservation and normalization measures are not done soon.

Acid rain

When water droplets combine with harmful chemicals and pollutants, it will lead to acid rain. When fossil fuels are burned, harmful chemicals such as nitrogen oxides and sulfur oxides are emitted into the environment. When it rains, the water droplets interact with the contaminants in the air, becoming acidic and falling to the earth as acid rain. Acid rain has the potential to harm humans, animals, and agriculture.

Ozone layer Depletion

All this will eventually lead to depletion of the ozone layer that protects us from harmful UV sun rays. The presence of chlorofluorocarbons and hydrochlorofluorocarbons in the atmosphere is degrading the ozone layer on Earth.

As the ozone layer thins, damaging rays are emitted back to Earth, potentially causing skin and eye problems. UV rays have the power to harm crops as well.
Thus, we have to work on the prevention of air pollution.

Effects on Animals

Increasing air pollution affects animals and aquatic life, leading them to stray and wander for food. Many of the animals are on the verge of extinction because of this. Animals, sometimes known as wildlife, are particularly

vulnerable to the effects of air pollution. Acid rain, heavy metals, persistent organic pollutants (POPs), and other harmful compounds are all pollution concerns.

Insects, worms, clams, fish, birds, and mammals all have diverse ways of interacting with their surroundings. As a result, each animal's exposure to and vulnerability to the effects of air pollution is unique.

Air pollution has two major effects on wildlife.

It has an impact on the area or habitat in which they reside, as well as the food supply's availability and quality.

Air Pollution Control

It is not easy to control air pollution, but it will require some simple steps like:

- **Avoid Using Vehicles**

  Prefer using public transport as it will reduce the emission of CO into the air. The availability of carpools can help in the reduction of vehicles which in turn reduces pollution. Prefer walking or cycling to nearby places and many such.

- **Energy Conservation**

  Use energy-efficient electrical devices at the workplace and home place. You can keep your lights switched off when not in use. The electrical appliances should be checked on a regular notice period so that it won't affect the conservation.

- **Use of Clean Energy Resources**

  It will help to reduce the pollution level. Instead of using fossil fuels, we can use natural resources to produce energy like Solar Energy, Wind Energy, etc.

  By decreasing and eliminating the usage of fire and fire-related items.

  Because industrial emissions are one of the leading causes of air pollution, the pollutants can be reduced by controlling or treating them at the source. If a given raw material's reactions produce a pollutant, for example, the raw materials can be replaced with less harmful materials.

  Another method of reducing pollution is to use different fuels. CNG – Compressed Natural Gas–powered vehicles are replacing petrol and diesel vehicles in many parts of India. Vehicles that aren't fully equipped with optimal emission engines are the most likely to use these.

  Although India has a number of practices aimed at improving air quality, most of them have been forgotten or are not well implemented. There are still many automobiles on the road that haven't had their emissions tested.

5.Give an account on water pollution its effects and control measures.

Water pollution is described as the release of pollutants into bodies of water that render them unsafe to drink and harm aquatic ecosystems. Various contaminants, such as hazardous trash, gasoline, and pathogenic bacteria, can pollute water. Water, a renewable resource, is a vital compound for life on Earth. It is the only inorganic liquid that occurs on the Earth naturally.

Covering three-fourth of parts of the Earth, Water contains about (97.5\%) of the Earth in saline nature, and the rest (2.5\%) is freshwater. Water being available in such a large quantity is still unavailable for our daily use or is available in degraded quality. Have you ever wondered Why?

In this article, we will learn how the most precious resource of Earth is getting polluted. Continue reading to know more.

What is Water Pollution?

Definition: Water becomes polluted when there are any physical, chemical, or biological changes in its quality that makes water unsuitable for use as well as adversely affect the health of living organisms.

Pollutants

The unwanted particles that enter the water bodies and contaminate them are called pollutants. The water pollutants may include

1. Biological pollutants: These include pathogens, bacteria, viruses, protozoa, etc.
2. Chemical pollutants: These include heavy chemicals like mercury, arsenic, lead, etc., dyeing agents, untreated radioactive substances, etc.
3. Household pollutants: These include faecal matters, synthetic detergents, and soaps, etc.

Causes of Water Pollution

Water is a vulnerable liquid as it is a universal solvent and dissolves more substances than any other liquid can.

Sewage:

The sewage/ wastewater is produced in the household and industries is treated chemically and released into the water bodies like sea and river. This chemically treated water gets mixed with fresh water and pollutes it. The sewage water carries various pathogens (disease-causing microorganisms), which may cause serious health problems and diseases.

Industrial Wastes:

Industries produce tremendous waste containing harmful chemicals like lead, mercury, sulphur, nitrates, etc. Many industries drain wastewater directly into freshwater, which pollutes lakes and rivers, which further mix with seawater. These toxic substances change the colour of the water and increase the number of minerals in the water.

Agriculture:

Chemical fertilizers and pesticides are used in farms for crops and plants. When it rains, these chemicals get mixed with rainwater and flow down into rivers and lakes, which causes severe damage to water bodies.

Mining Activities:

Mining activities include crushing rocks and extracting coal and other minerals underground. These extracted elements contain harmful and toxic chemicals. Mining activities emit a large number of metal wastes and sulphides from rock harmful to water.

Oil Spills:

Accidental leakage of oil on water bodies pose a serious threat to marine life. Wildlife other than aquatic life also gets poisoned by oil waste.

Radioactive Wastes:

The element used in the production of nuclear energy is Uranium, which is a highly toxic chemical. Other toxic radioactive wastes include radium, thorium, and actinium. These contaminants may cause different types of biological damage to humans and marine life.

Effects of Water Pollution

Water pollution affects both plants and animals and leads to a severe impact on the aquatic ecosystem. The major effects of water pollution are as follows-

1. **Water-borne diseases**: Sewage results in the growth of pathogens in the water. These pathogens are responsible for many diseases that result from drinking or being in contact with contaminated water, such as diarrhoea, cholera, typhoid, dysentery, or skin infections.
2. **Eutrophication:** Microorganisms use oxygen in decomposing organic wastes causing deoxygenation of water which stimulates algal blooming. These algae grow and cover a layer on top of the water body that blocks the sunlight from reaching the marine plants, due to which plants are unable to perform photosynthesis. This results in the death of many organisms such as fish and plants.
3. **Contamination of the food chain:** Some algae even produce toxins. Various pollutants like cadmium and lead are consumed by aquatic animals (fishes and shellfish), which humans then consume can cause severe health problems.
4. **Environment:** The toxic chemicals can change the colour of water, generate a foul smell, and increase the number of minerals, which negatively impacts life in water. Thermal pollution contributes, and global warming causes a serious hazard to water organisms.
5. **Impurities of groundwater**: At many places, groundwater is threatened with contamination due to the seepage from industrial and municipal effluents. These contaminants can cause various health problems like blue baby syndrome, black foot disease, and lung/skin cancer.

MEASURES TO CINTROL WATER POLLUTION

1. Avoid the wastage of water.
2. Laws for industrial units should be implemented strictly so that polluted water is not disposed of directly into rivers and lakes.
3. Industrial effluents should be treated chemically before disposing them off in water bodies.
4. Over utilisation of pesticides and fertilizers should be avoided.
5. Sewage should be treated before discharging it into water bodies.
6. Throwing of garbage like plastics, wrappers, faecal matter, etc., should be avoided.
7. Cleaning of utensils and clothes, bathing of animals and humans near rivers and lakes should strictly be avoided.
8. Rivers and lakes should be cleaned from time to time.

6. Describe India as a mega biodiversity nation

Environmental services from species and ecosystems are essential at global, regional and local levels. India is a megadiverse nation and land of around 10% of world's species. It also has a rich cultural heritage traced back to thousands of years. Much of Indian biodiversity is intricately related to the socio-cultural practices of the land. Unfortunately, due to population explosion, climate change and lax implementation of environmental policies, several species are facing the threat of extinction. A complete summary on the Biodiversity in India is discussed below:

Flora and Fauna of India
According to the International Union for Conservation of Nature (IUCN): India is a megadiverse country with only 2.4% of the world's land area, accounts for 7-8% of all recorded species, including species of plants and species of animals.

1. There are about **45,000 species of plants**, which is about 7% of world's total. About 33% of these are endemic.

2. There are **15,000 flowering plants**, which is 6% of world's total. Roughly, 1,500 plant species are endangered.

3. There are **91,000 animal species**, representing about 6.5% of world's fauna. These include 60,000 insect species, 2,456 fish species, 1,230 bird species, 372 mammals, over 440 reptiles and 200 amphibians with largest concentration in Western Ghats and 500 molluscs.
4. Livestock diversity is high. There are **400 breeds of sheep, 27 of cattle and 22 of goats** found in India.

5. It has also globally important populations of some of **Asia's rarest animals**, such as the Bengal Fox, Asiatic Cheetah, Marbled Cat, Asiatic Lion, Indian Elephant, Asiatic Wild Ass, Indian Rhinoceros, Markhor, Gaur, Wild Asiatic Water Buffalo etc.

Classification of Biodiversity in India
1. Malayan Biodiversity
It is along the densely forested areas of the Eastern Himalayas and along the coastal areas.

2. Ethiopian Biodiversity
The arid and semi-arid regions of Rajasthan are characterised by this kind of biodiversity.

3. European Biodiversity
This kind of biodiversity is found in the areas of upper Himalayas where the climatic characteristics are mostly temperate in nature.

4. Indian Biodiversity
The dense forest areas of Indian plain are characterised by this kind of biodiversity

7. Explain the megabiodiversity hotspots in India

Biodiversity is referred to as the variation of plant and animal species in a particular habitat. Species evenness and species richness form the major components of biodiversity.

India is known for its rich biodiversity and has around 24.46% of the geographical area covered by forests and trees.

Coined by Norman Myers, the term “Biodiversity hotspots” can be defined as the regions which are known for their high species richness and endemism.

Biodiversity Hotspots – 2 Main Qualifying Criteria

According to Conservation International, a region must fulfill the following two criteria to qualify as a hotspot:

The region should have at least 1500 species of vascular plants i.e., it should have a high degree of endemism.

It must contain 30% (or less) of its original habitat, i.e. it must be threatened.

Following the criteria must for an area to be declared as Biodiversity Hotspot, there are major four biodiversity hotspots in India:

1. The Himalayas
2. Indo-Burma Region
3. The Western Ghats
4. Sundaland

1.The Himalayas

Considered the highest in the world, the Himalayas (overall) comprises North-East India, Bhutan, Central and Eastern parts of Nepal. This region (NE Himalayas) holds a record of having 163 endangered species which includes the Wild Asian Water Buffalo, One-horned Rhino; and as many as 10,000 plant species, of which 3160 are endemic. This mountain range covers nearly 750,000 km^2.

2.Indo – Burma Region

The Indo-Burma Region is stretched over a distance of 2,373,000 km^2. In the last 12 years, 6 large mammal species have been discovered in this region: the Large-antlered Muntjac, the Annamite Muntjac, the Grey-shanked Douc, the Annamite Striped Rabbit, the Leaf Deer, and the Saola.

This hotspot is also known for the endemic freshwater turtle species, most of which are threatened with extinction, due to over-harvesting and extensive habitat loss. There are also 1,300 different bird species, including the threatened White-eared Night-heron, the Grey-crowned Crocias, and the Orange-necked Partridge.

3.The Western Ghats

The Western Ghats are present along the western edge of peninsular India and covers most of the deciduous forests and rain forests. As per UNESCO, it is home to at least 325 globally threatened flora, fauna, bird, amphibian, reptile and fish species. Originally, the vegetation in this region was spread over 190,000 km^2 but has been now reduced to 43,000 km^2. The region is also known for the globally threatened flora and fauna represented by 229 plant species, 31 mammal species, 15 bird species, 43 amphibian species, 5 reptile species and 1 fish species. UNESCO mentions that “Of the total 325 globally threatened species in the Western Ghats, 129 are classified as Vulnerable, 145 as Endangered and 51 as Critically Endangered.”

Knowing in detail about the Western Ghats will be helpful for the aspirants for the Geography preparation.

4.Sundaland

The Sundaland hotspot lies in South-East Asia and covers Singapore, Thailand, Indonesia, Brunei, and Malaysia. In the year 2013, the Sundaland was declared as a World Biosphere Reserve by the United Nations. This region is famous for its rich terrestrial and marine ecosystem. Sundaland is one of the biologically richest hotspots in the world which comprises 25,000 species of vascular plants, of which 15,000 are found only in this region.

8.Describe the causes of biodiversity loss

Factors of Biodiversity Loss

As already mentioned above the loss of biodiversity is caused due to human activities such as improper disposal and release of industrial waste and gases. The major causes of Biodiversity Loss are explained below.

1. **Habitat Loss and Fragmentation:** It is one of the major causes that drive the loss of diversity in an ecosystem. Habitat loss meaning is understood in simple terms as losing your own home. A very common cause or example of the reason for biodiversity depletion is reducing forest cover. The most drastic and dramatic example is the loss of tropical rainforests. They are being destroyed fast. Once they covered 14% of the earth's land surface and now they cover only around 6%. Loss of biodiversity definition is exemplified by the biodiversity decline in populations of migratory birds, mammals unique to a particular region, etc. because of human activities and pollution leading to habitat loss meaning destruction of their natural living conditions.

2.Over-Exploitation: Natural resources which seemed infinite some thousand years ago now seem very much limited owing to the increased population of human beings alone. Also, the greed of many human enterprises and endeavours over the past centuries has led to overexploitation of natural resources which in turn has led to the destruction of biodiversity. Species like Steller's sea cow and passenger pigeon have gone extinct in the last 500 years because of overexploitation. Land-use intensification has been one of the major causes of biodiversity and ecosystem loss. Thus, the above-mentioned habitat loss meaning is exemplified by the over-exploitation of the land resources. On an alarming note, humans are using natural resources at 25% more than the planet.

3.Alien Species Invasion: Alien species for a particular region can be defined as the species that originally didn't inhabit the particular habitat or have not evolved in that particular habitat. When a foreign species is introduced knowingly or unknowingly in a given region, it can turn invasive and cause biodiversity loss. Biodiversity depletion or biodiversity decline of more than 200 species of cichlid fish in Lake Victoria of east Africa was caused due to the introduction of Nile perch. Not only do the new species become invasive but also when they compete for the niche with the indigenous species and replace them, the entire ecosystem based upon and surrounding the indigenous ones suffers. It is not only the loss of biodiversity introduction in the local area but also the simultaneous biodiversity and ecosystem loss.

4.Co-Extinctions: Loss of biodiversity is caused due to human activities that increase the rate of factors of biodiversity loss such as habitat loss because of overexploitation of the resources and invasion by foreign species. Biodiversity loss meaning, in this regard, is characterized by the loss of diversity in the ecosystem and the food web that is dependent on the native species in a given region. Loss of biodiversity meaning in this scenario says that when a species becomes extinct, the plant and the animal species that were associated with it also become extinct. Loss of biodiversity meaning in this case implies co-extinction. When a host fish species goes extinct, the assemblage of the parasite species also faces the same fate. Thus, loss of biodiversity in a region may lead to not only the extinction of one species but also coextinction due to a combination of biodiversity and ecosystem loss.

The biodiversity loss meaning is clear in the above mentioned short note. The consequences of biodiversity loss are dire. Scientific studies have shown that biologically diverse ecosystems are more productive even for human beings. It is well known that the high rates of modern extinctions are because of overexploitation, pollution, and habitat loss due to human activities. Nature's ability to provide essential products such as food, clean water and a stable survivable climate is reduced gravely because of these rates of extinction. Therefore, it is important to preserve biodiversity and many steps are being taken by various organizations around the world with that regard.

9.Explain the structure and functions of EVS.

The word 'environment' is derived from the old French word 'environer' – which means to 'surround, enclose, and encircle'. Environment refers to an aggregate of conditions or surroundings in which living beings such as humans, animals, and plants live or survive and non-living things exist.

All living beings including man and their environment are mutually reactive, affecting each other in a number of ways. It is generally equated with nature wherein physical components of the planet earth such as earth, air, water, etc. support and affect life in the biosphere.

Environment represents the physical components of the earth, wherein man is an important factor affecting the environment.

Environment comprises interacting systems of physical, biological, and cultural elements, which are interlinked individually as well as collectively in various ways.

Constituents of Environment

Physical elements constitute space, landforms, water-bodies, climate, soils, rocks, and minerals. These elements determine the variable character of human habitat, and also its opportunities and limitations.

Biological elements include plants, animals, micro-organisms, and man.

Cultural elements include economic, social and political conditions which are largely man-made features.

Types of Environment

Since environment is a combination of physical and biological factors, it contains both living or biotic and non-living or abiotic components. On the basis of this basic structure, environment can be divided into physical or abiotic and living or biotic environment.

Physical or Abiotic Environment

Physical environment is made up of the following states - solid, liquid, and gas. These three elements signify lithosphere, hydrosphere, and atmosphere respectively. On the basis of spatial distribution, smaller units are termed as coastal environment, plateau environment, mountain environment, lake environment, river environment, maritime environment, etc.

Living or Biotic Environment

Biotic environment consists of plants (flora) and animals (fauna) including human beings as a significant factor. Thus, biotic environment can be of two types such as floral environment and faunal environment.

Man-Environment Relationship

Man and environment relationship is as old as the evolution of mankind. Since the evolution of man, the physical elements of the planet earth, such as terrain, soil, water, climate, flora and fauna formed man's environment. During that time man was a typically a 'physical man' because of his limited wants, requirements, and total dependence on nature.

With the growth in social and economic activities, advancement in technologies, man expanded his own environment through design and skill to have provisions for improved and better food, shelter, access, and comfort or luxuries. Man's ability to survive in a variety of ecosystem and his unique ability to adapt to a great variety of external conditions make man-environment relationship quite a fascinating area of study.

The environment in which man survives and to which he adapts himself and which he influences include physical, socio-cultural, and biological aspects. Man and environment has never been static and a great many factors are responsible for the shifts in man environment relationship.

10. Explain the structure and function of Ecosystem

Structure of the Ecosystem

The structure of an ecosystem refers to the explanation of living beings and the physical features of the environment in which the organisms live.

Components of the Ecosystem

The ecosystem has two components associated with it mentioned below:

1. Abiotic component
2. Biotic component

Abiotic Component

This basically involves inorganic minerals, calcium, phosphorus & iron. It also includes soil, water, land & solar radiation. It is further divided into climatic factors and edaphic factors which include rain, light, temperature, and wind, soil, pH, minerals, and topography.

Biotic Component

The biotic component consists of all the living organisms in the ecosystem. It can be classified as Autotrophic organisms that produce their own food and heterotrophic organisms which depend on other organisms for food. This classification is based on nutritional requirements of the organism.

- **Producers:** These are the organisms in the ecosystem that generate the food and energy with the help of sunlight, oxygen, and all other abiotic components. The main producers of the ecosystem are the plants.
- **Consumers:** These are the organisms that take their nutrition from the food that is made by the producers.
- **Primary Consumers:** These organisms feed directly from the producers. They are herbivorous animals like deer, rabbit, cow, buffalo, and giraffes.
- **Secondary Consumers:** These organisms feed on the primary consumers for their nutrition. These are carnivorous and omnivorous animals like crows, dogs, cats, snakes.
- **Tertiary Consumers:** These organisms feed on secondary consumers. These are only carnivores where they only consume meat usually by preying on prey. Eg., lion, tiger, cheetah
- **Quaternary Consumers:** These organisms feed on the tertiary consumers for their nutrition. Eg; Eagle, which consumes a snake that consumes a frog that consumes a fly.

Decomposers

These organisms break down dead matter and gain their nutrition, and the decomposed material returns back to the land, which will again be utilized by the producers to produce more food.

The Function of the Ecosystem

The function of the ecosystem is to allow the flow of energy and cycling of materials which ensures the stability of the system and continuity of life. These two ecological processes include interaction between the abiotic environment and the communities. For the sake of convenience, the ecosystem dynamics may be analyzed in terms of the following:
(i) food chains,
(ii) food pyramids,
(iii) energy flow,
(iv) nutrient cycles,
(v) development and evolution of the ecosystem, and
(vi) homeostasis and stability of the ecosystem.

11. Explain the general process of succession.

The most widely accepted definition of ecological succession is as follows “ecological succession is a sequence of changes that occur in an ecological system over time.” In simpler terms, it can be defined as the sequence of colonization of species in an ecosystem from a barren or an unfertile region of land. The first species to inhabit an area are mosses and lichens. These make the region suitable for the growth of advanced species like grasses, shrubs, and trees. Ecological succession is a very necessary type of growth and development of a progressing ecosystem as a whole. It also ensures new areas are colonized, and deteriorated ecosystems are recolonized so that the organisms can easily adapt to the constant changes in the environment and continue to survive well.

The entire process of primary succession is accomplished through a series of progressive steps followed one after another. The different sequential steps may be outlined as below:

1.Nudation:

It is a process of formation of a bare area without any form of life for the arrival of new species. The causes of nudation may be:

Topographic: E

The existing community may fade away due to soil erosion, landslide, volcanic activity, etc.

- Climatic: The existing community may be demolished due to storm, fire, frost, drought.
- Biotic: The community may also be destroyed by anthropogenic activities like the destruction of the forest, the destruction of grassland, etc.

2.Invasion:

The successful establishment of a species in a vacant area is called invasion. This process of establishment is completed in three successive steps:

- Migration (dispersal): The seeds, spores of the species are carried to the unadorned area by the agents like air, water, etc.

- Establishment: The process of the successful establishment (germination and growth) of the species in the new area as a result of adjustment with the prevailing conditions is known as ecesis.
- Aggregation: After ecesis, the individuals of species increase their number by reproduction and thus, are aggregated in a particular area.

3.Competition and Coaction:

As the species aggregate within a restricted space, there happens competition for space and nutrition. Secondly, the life process of one individual is affected by the surrounding species in various ways which are known as coaction.

4.Reaction:

The species present in an environment constantly interact with it by causing its modification. The mechanism of the modification of the environment through the influence of living organisms on it is known as a reaction. Hence, the existing community may be replaced by another community.

5.Stabilization:

At last, a final or terminal community is established which can maintain equilibrium. This community is known as the climax community.

12.Give an account of forest ecosystem.

As per the forest ecosystem definition, the forest ecosystem is the study of the interdependent relations of flora and fauna in a forest. In the forest ecosystems, the whole interaction between the biotic and the abiotic components present in the forest happens naturally without human interference. The ecological potential of the species in the forest depends on the habitat requirements such as temperature, frugality, climate, reproducing capacity, and their lifespan.

Different Types of Forests

The forests can be divided into five categories depending on the types of trees that are found in them. The different types of forests with names are given below:

Mediterranean Forest: The temperature in these forests is most suitable for short oaks and pines, and thus they are also called scrublands. These forests contain a huge variety of wildflowers and insect-eating birds. These forests are also termed as ‘Maquis.’

Coniferous Forest: The major number of trees that are found in this type of forest mainly consists of the cone-bearing trees like the pine, spruce, fir, and hemlock. These forests are mostly found in the northern parts of North America, Asia, and Europe.

Deciduous Forest: The trees of such forests are found to have broad leaves that shed between the late summer to early autumn. The leaves are usually green, but with the change in the season, they acquire yellow, red, and orange colors later on. These forests are generally found in America, western and Central Europe, and Northeastern Asia where the summers are warm, and the winters are cold.

Tropical Rainforest: These forests are usually found in the areas where the temperature is generally hot. They are called tropical rainforests as they receive continuous rainfall throughout the year, and they are habitat to several insects and mammals. They are usually found in Asia, Africa, South America, and Australia.

Mixed Forest: Mixed forests are the ones that contain both types of coniferous and deciduous vegetation. They are usually present all around the world in the mountainous regions.

Uses of Forests

• Forests can be described as uncultivated and uninhabited pieces of land covered by trees and shrubs.
• Forests play a vital role in the life and culture of the people.
• They form an important renewable natural resource.
• India has about 63.5% million hectares of forests and forms 1/5th of the geographical area of the country.
• Forests are intimately linked with our culture and civilization. Forests are useful to us in many ways:
• Forests provides timber for the furniture and building
• Forests provides raw material for paper, board and plywood industry
• Forests provides fodder for cattle, sheep, goat and other animals
• Tropical deciduous forest contains animals like deer, elephants, sambars cheetahs, wild buffaloes tiger, leopard, Birds, reptiles, amphibians are also found in abundance.
• Coniferous forests consists of rich and varied animal life which includes mammals like mouse deer, musk, rat, porcupine, rabbit, squirrels etc;
• insectivorous birds like grouse, jay cross bill etc and reptiles like snakes and lizards
• Forests provides bamboo which is called poor man's timber
• Forests gives protection to wild life
• Forests helps in balancing the carbon dioxide and oxygen in the atmosphere. During photosynthesis, plants release O2 and use CO2 thus, they put check on the green house effect.
• Forests regulate the earth's temperature and weather cycle. They enhance local rainfall
• Forests check soil erosion, landslides and also prevent floods
• Forests protect wild life
• Forests also provide fruits, nuts, gums, rubber, dyes, fibre, medicines, camphor, essential oils etc.
• Forests are major sources of various animal products such as honey, wax, lac etc

13.Give an account of desert ecosystem.

DESERT ECOSYSTEM

Interactions between creatures, the temperature in which they live, and any other non-living factors on the habitat characterise a desert ecosystem. Deserts are dry environments with generally mild temperatures;

although, frigid deserts do exist. Each continent on the earth has a desert and its own ecology, which is referred to as the desert ecosystem. The term desert refers to a mainly barren, dry, and abandoned area of land with no flora or fauna in the sand. It could be both cold and hot. The Desert is the world's driest region, with only a trace of precipitation per year. Throughout the year, it receives less rainfall.

What is the Desert Ecosystem?

The word desert refers to a mostly barren, dry, and abandoned land that doesn't have any plants or animals in the sand. Cold and hot could happen. The Desert is the driest place on the planet that doesn't get much rain every year. It doesn't get a lot of rain all year.

So, the desert ecosystem is the driest ecosystem on the planet, which means there is less diversity of life and little vegetation in it because it doesn't get as much rain. There are animals and plants that can live in very bad weather in the Earth's ecosystem. The desert environment does not have any precipitation or rain.

So, the desert ecosystem is a group of living and non-living things that live together and interact with each other in a desert. It's the way that the Abiotic and Biotic Components of this environment work together.

It is important to know what the desert ecosystem is made up of
Here are some things you should know about desert ecosystems:

- **It doesn't get a lot of rain or snow.**

  Less rain is a desert feature and the reason why it is so dry. Deserts get seasonal rain that lasts for a short time (just around 25 to 30 centimetres).

- **Aridity**

  Aridity means there is not enough dry moisture. As it doesn't get as much rain, it becomes drier.

- **The speed of the wind**

  Wind speed is very high in this ecosystem. That's why deserts get dust storms or sandstorms that are more intense, which makes sand dunes.

- **Extremely hot weather**

  This type of ecosystem is very hot or very cold at night and day. The days are hot, but the nights are very cold.

- **Humidity**

  During the daytime, it has a low level of humidity. At night, it has a high level.

- **The population density**

  There aren't a lot of people living in the deserts. Also, there isn't enough food or water, so it's not a good place to live.

- **Scarcity of water**

As it doesn't get a lot of rain, there isn't enough water. This lack of water makes deserts go without water for more than six months!

- **Biodiversity**

It's hard to live in a desert ecosystem. But deserts have a lot of different animals and plants, even though they look like they don't. They have learned how to adapt their survival skills so that they can live in deserts that are very harsh and extreme.

There are different qualities of the soil

Deserts are dry, sandy, and rocky. Thus, it doesn't have a lot of vegetation. The soil is grey in colour because it doesn't have any organic materials like phosphorus and nitrogen, which are important for plants.

Desert Ecosystem Types are shown.

Desert ecosystems can also be found in arid, tropical, and very cold places. List of types:

1.Hot and dry

This ecosystem is made up of dry and hot weather, and it doesn't get a lot of rain every year. In places where the soil is rough and harsh, there are big changes in the temperature. It's best to look at the dry and hot desert ecosystems in South Asia, Central America, Africa, Australia, North America, and so on to see the best ones.

2.**Semi-Arid**

It's the same as the one before that. In this ecosystem, there is a lot of stable ground, hard rocks, and a lot less sand dunes. The temperature isn't very high. When it comes to deserts, the Great Basin is the best example of one. This area gets a lot of rain.

3.The Coastal area:

It's found on the coasts of large bodies of water, like seas and oceans, and it's moved by the waves of the ocean. Besides having winter fogs, the climate is friendly. Some places in Africa and Chile have deserts that are close to the coast.

4) **The cold desert ecosystem**

It has a lot of rain in the winter and less in the summer. It has cold winters and a lot of snowfall, short summers, and a moderately wet and hot climate. A lot of snow dunes cover the ecosystem. It's best to look at cold desert ecosystems in Antarctica, the Nearctic region, and Greenland to see how they work.

14.Give an account on Pond Ecosystem

The ecosystem is a basic unit in ecology, formed by the interaction of plants, animals and microorganisms forming biotic factors with their physical environment or the abiotic factors. A pond ecosystem refers to the freshwater ecosystem where there are communities of organisms that are dependent on each other and with the prevailing water environment for their nutrients and survival. Usually, ponds are shallow

(hardly 12 – 15 feet) water bodies in which sunlight can reach to its bottom, permitting the growth of the plants that grow there. On the basis of water depth and types of vegetation and animals there may be three zones in a lake or pond. The different zones are as follows:
I. Littoral
II. limnetic
III. pro-fundal

I. Littoral zone – It is the shallow water region which is usually occupied by rooted plants.

II. Limnetic-zone- ranges from the shallow to the depth of effective light penetration and associated organisms are small crustaceans, rotifers, insects, and their larvae and algae.
III. Pro-fundal zone- It is the deep-water parts where there is no effective light penetration. The associated organism are mussels, crab, worms etc.

The organisms inhabiting this freshwater ecosystem include algae, fungi, microorganisms, plants and fish. These organisms can be further classified as producers, consumers and decomposers, based on their mode of obtaining nutrition. The energy in an ecosystem flows from the producers to the consumers. Decomposers, on the other hand, get nutrients from the dead organisms by decomposing them.
Two main components of pond ecosystems are as followsI.
1.Biotic component 2.Abiotic component

Producers
The main producers in pond or lake ecosystem are algae and other aquatic plants, such as Azolla, Hydrilla, Potamogeton, Pistia, Wolffia, Lemna, Eichhornia, Nymphaea, Jussiaea, etc. These are either floating or suspended or rooted at the bottom. The green plants convert the radiant energy into chemical energy through photosynthesis. The chemical energy stored in the form of food is utilized by all the organisms. Oxygen evolved by producers in photosynthesis is utilized by all the living organisms in respiration.

Consumers
In a pond ecosystem, the primary consumers are tadpole larvae of frogs, fishes and other aquatic animals which consume green plants and algae as their food. These herbivorous aquatic animals are the food of secondary consumers. Frogs, big fishes, water snakes, crabs are secondary consumers. In the pond, besides the secondary consumers, there are consumers of highest order, such as water-birds, turtles, etc.

Decomposers and Transformers When aquatic plants and animals die, a large number of bacteria and fungi attack their dead bodies and convert the complex organic substances into simpler inorganic compounds and elements. These micro-organisms are called decomposers chemical elements liberated by decomposers are again utilized by green plants in their nutrition.

The freshwater pond ecosystem consists of the following:

- Pond bottom – there is very little oxygen or light at the bottom of the pond. Decomposers and scavengers live here where they feed on dead material.
- Midwater – fish are the main predators here. Food is found on the pond bottom or the pond surface. Animals here breathe through their skin or gills, eg stickleback fish, water fleas, and dragonfly nymphs.
- Pond surface – animals here breathe through their gills, skin, or lungs. There is plenty of oxygen and light here. Animals found here include ducks, water boatmen, midge larvae, and tadpoles.
- Pond margin – plants provide a sheltered habitat for insects and smalls animals such as frogs. There is lots of light and oxygen so plants such as marsh marigold thrive.
- Above the pond surface – birds such as kingfishers and insects like dragonflies are common here.

Pond Ecosystem has a great significance. They provide inhabitation to scarce species and support biodiversity much more than any other freshwater habitat. The ponds provide inhabitation to wetland plants and animals. Pond works with a combination of three food webs at a time. They are not just important for quenching thirst or

providing inhabitation but also to add beauty to the mother nature. It touches our heart and we feel calm and close to nature.