

**Our Environment****1. Environment:-**

The biotic and abiotic factors which surrounds any living organism is considered as its environment. The abiotic factors are the physical or climatic factors such as temperature, light, wind, humidity, water, soil texture, substratum, rocks and minerals etc. The biotic factors include all the living organisms with which an organism interacts.

2. Impact of population, consumption and technology to the environment:-

The organisms and its environment together constitute an ecosystem. Both the components of ecosystem maintain a balance. Smaller or to some extent larger changes in the environment get adjusted by reciprocal changes in one or the other component. However very large changes destroy the balance of environmental. The control of one component of environment over the other gets test. Environmental resistance to these changes fails to work and thus a state of disturbance is produced.

Disturbances in the environment are mostly the results of excessive use, misuse and mismanagement of biosphere resources. The human activities such as rapid population growth, industrialization modern technology aimed at development are responsible for disturbances and thus are major causes of environmental degradation (deterioration)

Solid wastes:- The solid waste materials which get accumulated in the environment for a shorter or longer period of time are known as solid wastes. The solid wastes are the main sources of pollution and are often termed as environmental pollutants.

Classification of solid wastes:- The solid wastes are broadly classified in to two main types: (i) Biodegradable waste (ii) Non- Biodegradable wastes.

Biodegradable wastes: Those substances which can be decomposed or decayed or degraded by decomposers like bacteria and fungi are known as biodegradable substances. Domestic sewage; paper, wood, clothes etc. are common examples of biodegradable substances.

Non – Biodegradable wastes:- Those substances which can not be decomposed or decayed or degraded by decomposers are known as non-biodegradable substances. Aluminium cans, plastic, components of mercury, DDT, glass, etc, are non-biodegradable waste materials. These are neither decomposed by micro-organisms nor do these materials breakdown by physical and chemical agents present in the environment. There is no treatment in nature for their recycling. Therefore, these continue to accumulate and occupy large useful space on the earth.

Harmful effects of biodegradable wastes:- Following are the harmful effects of biodegradable wastes:

- (i) Biodegradable wastes attract flies and other disease carrying insects. They become the ideal breeding grounds for the housefly, different bacteria and many other kinds of germs.
- (ii) Biodegradable may also block the drains, creating pools of water which become the breeding sites of mosquitoes and help to spread diseases like malaria and dengue.
- (iii) Decomposition of biodegradable substances releases a very unpleasant or foul smell which spreads to surrounding areas and creates difficulty in breathing.

3 Harmful effects of non-biodegradable wastes:-

- (i) The various non-biodegradable substances like pesticides (DDT), industrial chemicals, heavy metals, and radioactive substances are very harmful. The biomagnification or accumulation of harmful non-biodegradable substances in the bodies of organisms through the food chains and biogeochemical cycle cause various serious diseases like cancer, tumor, kidney trouble, etc.
- (ii) The over exploitation of non –biodegradable substances such as fertilizers, pesticides and dumping of industrial wastes decreases the soil fertility and reduces the crop yield.
- (iii) These greatly affect the environment and become the main source of air, water and soil pollution.

Q.4 Explain in detail ecosystem and its components?

Ecosystem:- The term ecosystem is defined as interactions between physical environment and biotic community. The term ecosystem was first defined by A.G. Tansley in 1935, as the living



world and its habitat. The importance of ecosystem lies in the flow of energy and cycling of matter between living and non-living components of system. The living and non-living components of ecosystem are known as biotic and abiotic components respectively.

Components of Ecosystem: The main components of ecosystem are: (i) Biotic components (ii) Abiotic components

Biotic Components:- The biotic components of an ecosystem include all the living organisms such as plants, animals including human beings and microorganisms. The biotic components are broadly classified into three main types (i) Producers (ii) Consumers (iii) Decomposers or reducers.

Producers:- Producers are those green plants which prepare food or organic substances with the help of light energy, CO₂ and water. These also include the prokaryotes like blue-green algae. The food or organic substances prepared by these producers fulfill the nutritional requirements of other biotic components (the heterotrophs). Thus producers are also known as the photosynthetic organisms and serve as the hosts for all other living beings.

Consumers: Consumers are the heterotrophic components of the ecosystem consumers can not manufacture their own food material and therefore depend up on producers (green plants)

Decomposers or Reducers:- These are mainly bacteria and fungi that convert dead matter into gases such as carbon dioxide and nitrogen and other simple substances to be released back into the air, soil or water. Bacteria and fungi which break down dead organic matter are known as saprotrophs. Without decomposers, the earth would be covered with trash. Decomposers, therefore, are essential components of ecosystem.

ii. Abiotic components:- These are non-living components and include physio-chemical factors of the environment such as temperature, rainfall, wind, soil and minerals.

The abiotic components are classified into three main categories:

1. Inorganic substances.
2. Organic compounds
3. Climatic factors.

1. Inorganic substances:- These include elements like carbon, oxygen, nitrogen, calcium, phosphorus etc. and their compounds (water, CO₂, etc.) These inorganic substances are present either in the form of compounds dissolved in water, in the soil or in free state in air.

2 Organic Substances:

The major organic substances which occur in the ecosystem include carbohydrates, proteins and lipids. Inorganic substances are taken in by the plants and are converted into organic substances during metabolism. These are added to environment on the death of the organisms. The organic materials are now broken down or decomposed to inorganic substances and are made available to the plants. The organic substances thus link biotic and abiotic components of the ecosystem.

3 Climatic factors:- The entire ecosystem functions under the influence of many environmental factors. These included light, rainfall, humidity, temperature etc.

Q.7 Explain the concept of food chain?

Ans. Food chain is the representation of a single energy pathway where food is passed from the producers to the successive orders of consumers and at each stage, it is released as heat (energy) e.g., Food chain in a forest is schematically represented as:

Grass → Dear → Lion.
Producer consumer I consumer II

The number of steps in a food chain is usually limited to four or five. In an aquatic ecosystem, the food chain operating in ponds are represented as:

- (i) Algae → small animals → small fish → Big fish
- (ii) Phytoplankton → zooplankton → small fish → large fish

Each step in the food chain represents a trophic level. At each step (trophic level) in the transfer of energy from one organism to another (from herbivours to carnivores) a large portion of energy is used for its own maintenance and lost as heat. As a result, organism in each trophic level pass on less and less energy than they receive.

8 Components of a food chain:-

The various components of a food chain include:

1. Plants. (producers). 2. Herbivores (primary consumers.) 3. Primary carnivores (secondary consumers), 4. Secondary carnivores (tertiary consumers) and 5. Tertiary carnivores (quaternary consumers). Each of these is placed in different trophic levels. In ecosystems, different food chains may have two, three, four or maximum five trophic levels.

Characteristics of food chain:-

1. It involves a nutritive interaction between the living organisms.
2. It is always straight and proceeds in a progressive straight-line.
3. There is unidirectional flow of energy in food chains i.e. from sun to producers and from producers to different types of consumers.
4. There are 3 to 4 trophic levels in a food chain. However, in few chains, the number of trophic levels extends up to 5
5. According to 2nd law of thermodynamics, 80-90% of energy is lost during the transfer of food energy from one trophic level to another.

Trophic levels:- The various biotic levels of consumption in a food chain are called trophic levels. Fore example, in any food chain plants form the first trophic level, herbivores form the second trophic level and carnivores form the third trophic level. The amount of available energy in a food chain successively gets decreased at each trophic level as a result of waste of energy.

This phenomenon restricts the size of food chain in an ecosystem to maximum of 4 or 5 steps.

Food web:- It is a network of food chains in which each organism is generally eaten by two or more kinds of organisms which, in turn, are eaten by several other organisms. So the relation becomes quite complex and instead of straight line food chain, the relationship between organisms forms a sort of interlocking pattern This interlocking pattern of relationship of organisms is called the food web.

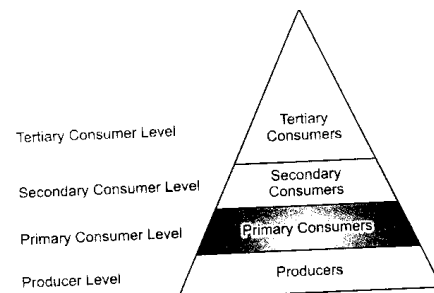


FIGURE 5.5. Trophic levels

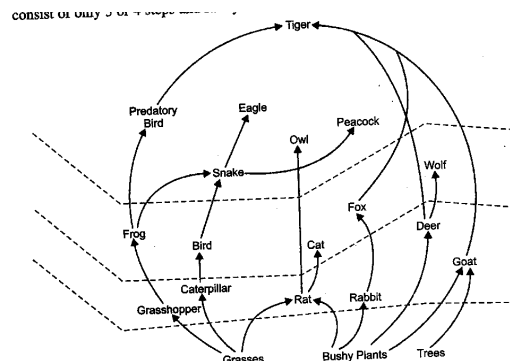


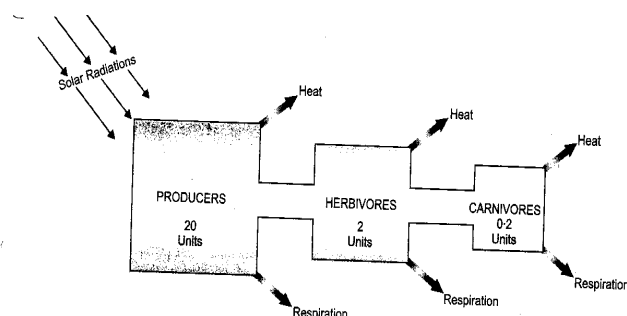
Fig. Foot web

Q. 9 Characteristics of food web:-

1. In food webs, several food chains overlap and interconnect with each other at various trophic levels.
2. Unlike food chains, food webs are never straight.
3. It provides alternative pathways of food availability e.g., if a particular species of producer vanishes, the herbivores of that area can feed on other species.
4. It increases the stability of the ecosystem as it provides more alternatives available in a food web.
5. It helps to check the overpopulations of highly aggressive pieces of plants and animals.

Flow of energy in an ecosystem:-

In an ecosystem, the ultimate source of energy used by living organisms is the sun. plants (producers) capture only 1% of the total sun's radiations fall on the earth and convert it into food energy by photosynthesis.





In a food chain, energy is transferred from producers to primary consumers (herbivores) but in this process about 90% energy is lost as heat to the environment. In accordance with the law of entropy or second law of thermodynamics. Only 10% of the food energy is turned into the body of herbivores and like wise, 10% of total energy available to the herbivores is made available to the next trophic level of consumers. This flow of 10% of energy in each trophic level is also known as **ten percent law or law of entropy**. Since, the amount of energy goes on decreasing at each trophic level and very little amount of energy is available for next level consumers. This limits the steps of trophic levels to maximum of 4 or 5 in food chains.

Managing the Garbage we produce:- Healthy living requires a clean surrounding hence it is very essential to dispose our garbage in a proper way. Proper managing of our garbage can keep us free from many communicable diseases. The garbage we produce can be managed by various scientific methods of waste disposal. The method of waste disposal depends on the nature of the waste.

Methods of waste Disposal:- The various methods of waste disposal are:-

- i. Land fills
- ii. Recycling of wastes.
- iii. Burning or Incineration.
- iv. Compost preparation.
- v. Production of biogas and manure.

i. **Land fills:-** In this method, the solid wastes are buried in low lying areas to level the uneven surface of land. This method is commonly used in urban areas.

ii. **Recycling of wastes:-** The solid wastes like paper, plastics, metals, etc. can be recycled by sending them to respective recycling units. For example, many waste metals and plastics are sent to specific metal and plastic industries for recycling, where these are melted, remoulded and then framed into desired shapes or equipments.

iii. **Burning or Incineration:-** In this process, substances are burned at very high temperature (usually more than 1000°C) and are converted into ashes. This process is carried out in a particular device called as incinerator. It is generally used to dispose the wastes of industries (chemical wastes), hospital wastes and house hold wastes.

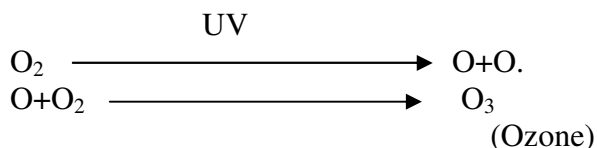
iv. **Compost preparation:-** The waste generated at home such as peeling of fruits and vegetables, left-over food, etc. can be stored in a compost pit where it decays and converts into compost. This compost is later used as manure in agricultural fields.

v. **Production of biogas and manure:-** The biodegradable wastes are also used in biogas plants to generate biogas and manure. These biogas plants are very lowcost and can be made at village level in rural areas.

Ozone layer and how it is getting depleted:-

Ozone is a form of oxygen. Each ozone molecule is made of three oxygen atoms, so its chemical formula is O₃. But unlike oxygen, ozone is a poisonous gas, and an increase in its concentration at ground level is not something that we want. But in the stratosphere, where ozone exists naturally, it blocks out the Sun's ultraviolet rays and acts as a lifesaver.

At the higher levels of atmosphere (stratosphere), ozone is a product of UV radiation acting on oxygen (O₂) molecule. The higher energy UV radiation split apart some molecular oxygen (O₂) into free oxygen (O) atoms. These atoms then combine with the molecular oxygen to form ozone.



Ozone layer depletion:- Ozone is being depleted by the pollutants of air such as chlorofluorocarbons (CFCs), methane (CH₄) and oxides of nitrogen (NO_x).

Chlorofluorocarbons are mainly responsible for ozone depletion because when they are released in the air, they produce 'active chlorine' (Cl and ClO radicals) in the presence of UV radiations. These radicals, through chain reactions, then destroy the ozone by converting it into



oxygen. Due to this, the ozone layer in the stratosphere becomes thinner and cause ozone depletion.

Effects of ozone depletion:- The ozone depletion or thinning of ozone layer allows more UV radiations falling on the earth. These UV radiations are very harmful and cause skin cancer, damage to eyes and damage to immune system in human beings and animals.

Ozone Hole:- It is a decline in thickness of ozone layer over a restricted area. It was first discovered over Antarctica in 1985.

Dobson spectrometer:- It is a device, used to measure the amount of atmospheric ozone. The amount of atmospheric ozone is expressed in Dobson units (DU).

Chlorofluorocarbons (CFCs):- These are harmful, synthetic chemicals widely used in refrigerators and air conditioners as coolants, in fire extinguishers, in aerosol sprayers and as propellants.

Textual Questions

Q.1 Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage?

Ans. Ozone layer forms a protection cover over the earth by preventing the ultra violet rays entering the earth. If the UV rays strike the earth it will cause a great damage to all the living organisms posing serious effects like skin cancer.

The CFC liberated from refrigerators, fire extinguisher, air conditioners, etc; is now destroying the ozone layer.

Steps to limit the damage of ozone layer are:

1. Reduce the use CFC. 2. Usage of alternate form for CFC.

Q.2 If all the waste we generate is biodegradable, with this have no impact on the environment?

Ans. Biodegradable substances provide energy in the form of organic substances and also nutrients like carbonate, phosphate etc. The productivity of ecosystem continues to increase till the amount of such substances is moderate. When the amount reaches a critical limit, the activities in the ecosystem show severe fluctuations. If these substances are added to the ecosystem even beyond the critical limit, the balance is completely lost and it becomes disturbed.

Q.3 What are problems caused by the non-biodegradable wastes that we generate?

Ans. The non-degradable wastes cause major problem in the ecosystem as it gets accumulated in the soil. It prevents the water to seep through the soil. It forms a thick covering over the soil and does not allow the organisms present in the soil to thrive. It inhibits the leeching property of the soil and destroys the fertility of the soil.

Q.4 What will happen if we kill all the organisms in one trophic level?

Ans. Energy flows from one trophic level to another. If all the organisms in one trophic level are killed then the flow of energy will be arrested. The organisms in one trophic level predate on the organisms, which is on the lower trophic level and becomes the prey for the organisms in the higher trophic level. If we kill all the organisms in one trophic level then their prey will increase in population and their predators will be deprived of food.

Q.5 Will the impact of removing all the organisms in a trophic level be different for different trophic levels? Can the organisms of any trophic level be removed without causing any damage to the ecosystem?

Ans. The impact of removing of all the organisms in a trophic level will be different for different trophic levels. Removal of any organism in any trophic level will effect the ecosystem. For example, if all producers are killed. There will be no food available for herbivores present in the ecosystem. They will start to die or migrate and in the absence of herbivores, various categories of carnivores will be affected.



Q.6 What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem?

Ans. The phenomenon that involves progressive increase in concentration of harmful non-biodegradable chemicals at different trophic levels in a food chain is called biological magnification. Yes, the concentration of harmful chemicals such as pesticides and fertilizers will be different at different trophic levels.