



ST. MARY'S CO-ED SCHOOL, HARDA

CLASS-X SUB-BIOLOGY

CHAPTER-15

OUR ENVIRONMENT

NOTES OF OUR ENVIRONMENT

Things around us is known as **Environment**. It consists of living component also known as biotic component and non-living component also known as **Abiotic Component**.

Ecosystem

The interaction between abiotic and biotic components is defined as ecosystem. It is a self-sustaining and functional unit of biosphere. The term ecosystem was coined by Sir Arthur Tansley (OLYMPIAD)

Types of Ecosystem

There are two types of ecosystem- natural ecosystem and artificial ecosystem. The ecosystem present naturally is known as **Natural Ecosystem**. Example of Natural Ecosystem are forests, grasslands, deserts, ponds, lakes, rivers, estuaries, sea. The ecosystem which is man-made is known as **Artificial Ecosystem**. For Example, Gardens, Aquariums and Agro ecosystem which is the largest manmade ecosystem.

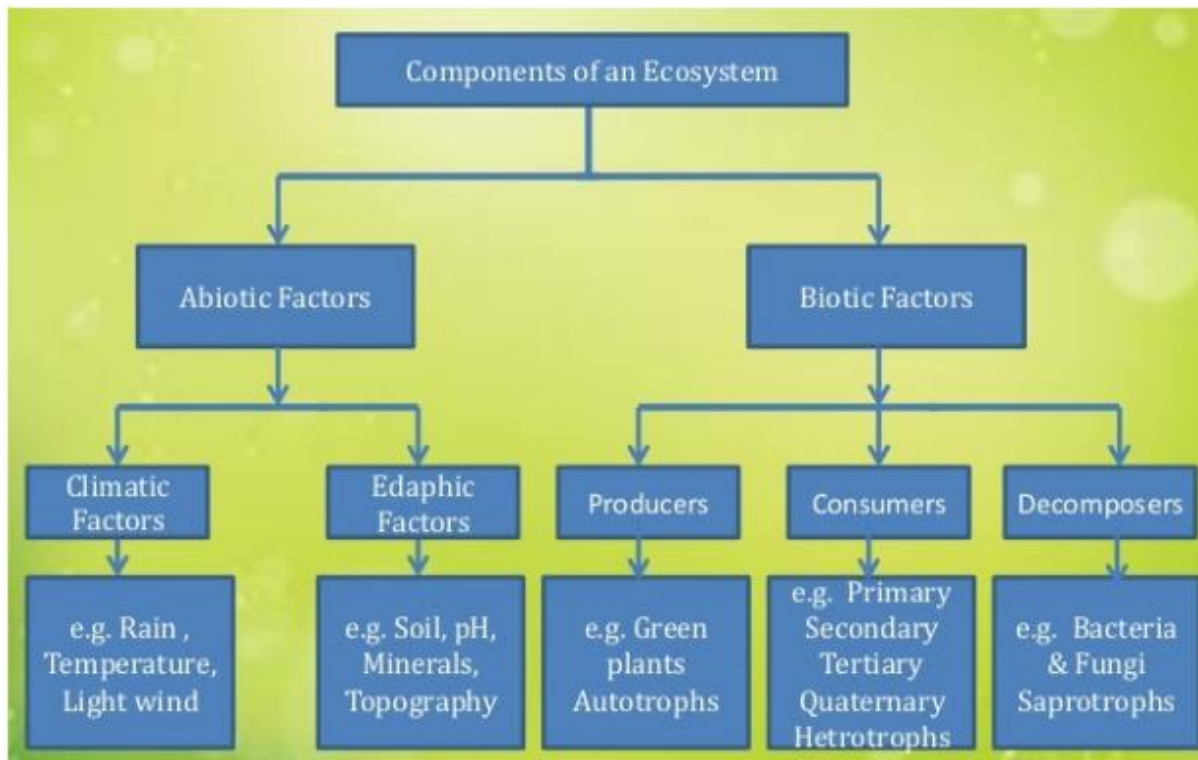


Fig.1. Components of ecosystem

Abiotic Factors Include - Climatic factors such as rain, temperature, wind etc. Another abiotic factor is edaphic factors such as soil, pH, minerals etc.

Biotic Factors Include-

Producers which can make their own food, such as plants, blue green algae etc.

Consumers feed on producers. Such as herbivores. In consumers there are- primary consumers, secondary consumers, tertiary consumers etc.

Carnivores are flesh eating animals.

Omnivores consume both plants and animals.

Parasites live inside and depend upon living host.

Saprophytes feed on dead remains of plants and animals.

Food Chain is defined as series of organisms in order in which organisms feeds on another organism. There are various steps in food chain in which energy is transferred, each level is known as trophic level. Energy is always transferred unidirectionally.

Characteristics of food chain

- There is a unidirectional flow of energy from producers to consumers.
- There are generally 3 to 4 trophic levels.



- It is always straight
- Organism can occupy different trophic levels in different food chain.

A 10 percent law is followed in energy transfer which was given by Raymond Lindeman. This law states that “only 10 percent of energy is transferred from one trophic level to another trophic level”. The remaining 90 percent will be used by the present trophic level in different processes. Therefore there are usually 3-4 trophic levels in a food chain.

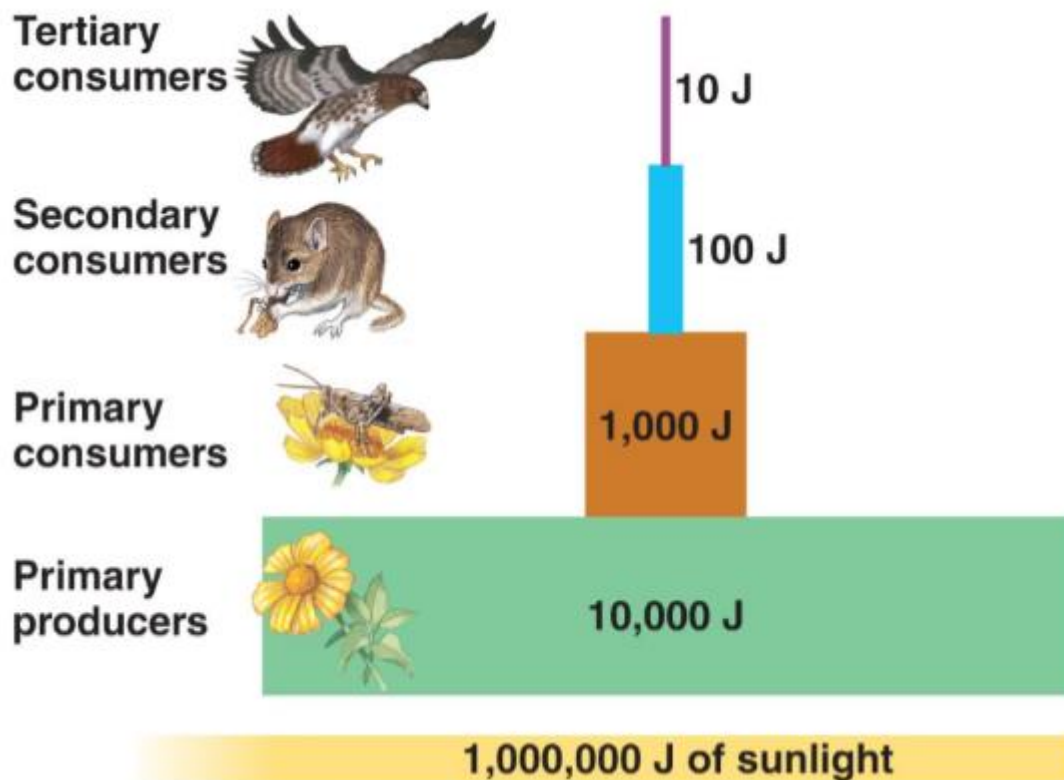


Fig.2. Energy transfer in trophic level

Food web

Interconnection of food chain is known as **Food Web**. It shows how food chain are interdependent.

Characteristic of Food Web

- Food webs are never straight as they are formed by interlinking of food chains.
- Food web provides alternative pathways of food availability. If a particular species is destroyed, the predator can feed on an alternative species.
- Food webs increase ecosystem stability.

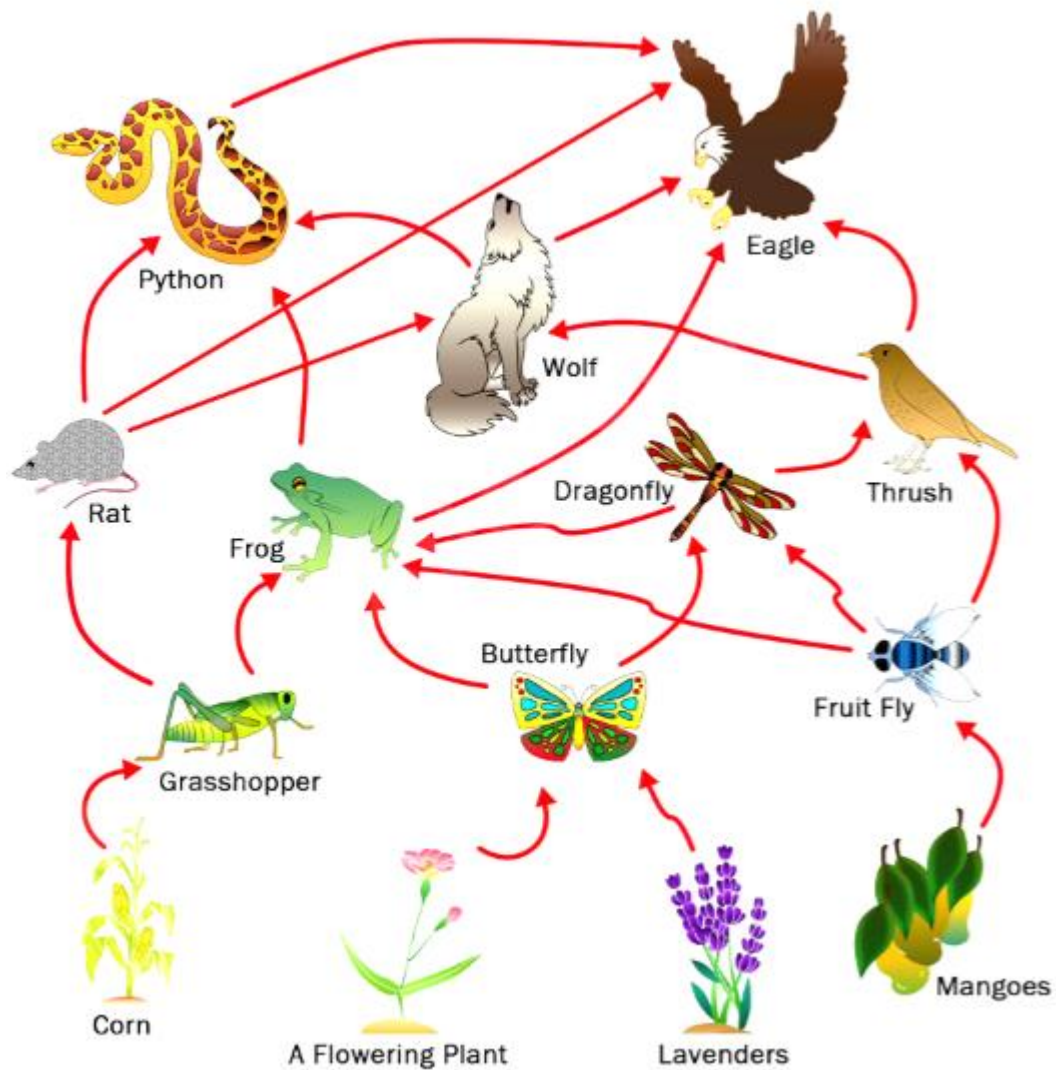


Fig.3. Food web

Ecological Pyramids

Ecological Pyramid is a graphical representation to show biomass or bioproductivity. There are different ecological pyramids such as pyramid of biomass, pyramid of number and pyramid of energy. Pyramid of number indicates number of individuals at different trophic levels. Pyramid of biomass indicates biomass of the members of the food chain present at different trophic levels. Pyramid of energy indicates energy at different trophic levels.

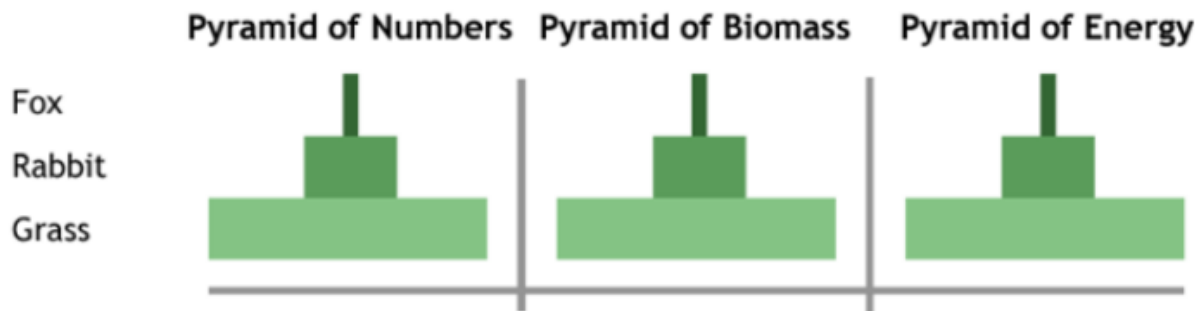


Fig.4. Upright Pyramids

Pyramid of number and pyramid of biomass can be inverted also. In aquatic ecosystem pyramid of biomass is inverted.

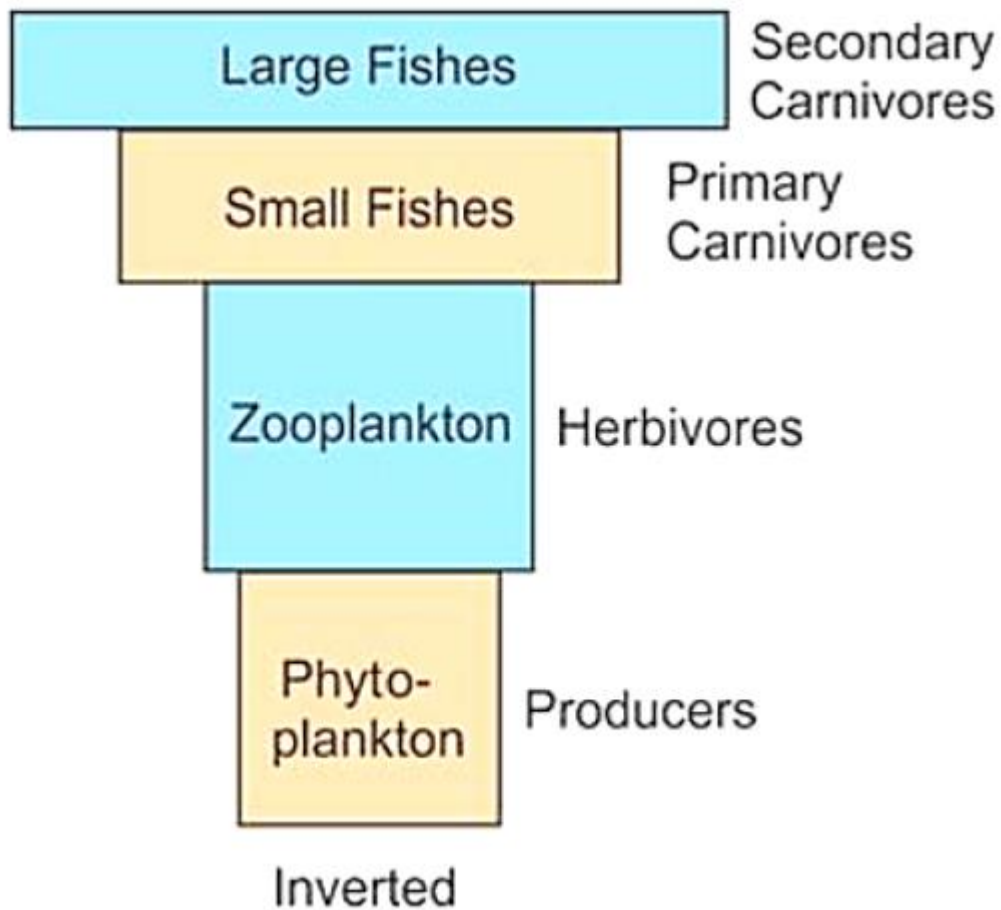


Fig.5. Inverted pyramid



Impact of Human Activities

Biological Magnification

The concentration of harmful substances increases with every trophic level. This is known as **Biomagnification**. Addition of pesticides in one trophic level increases the concentration of pesticides in other trophic level.

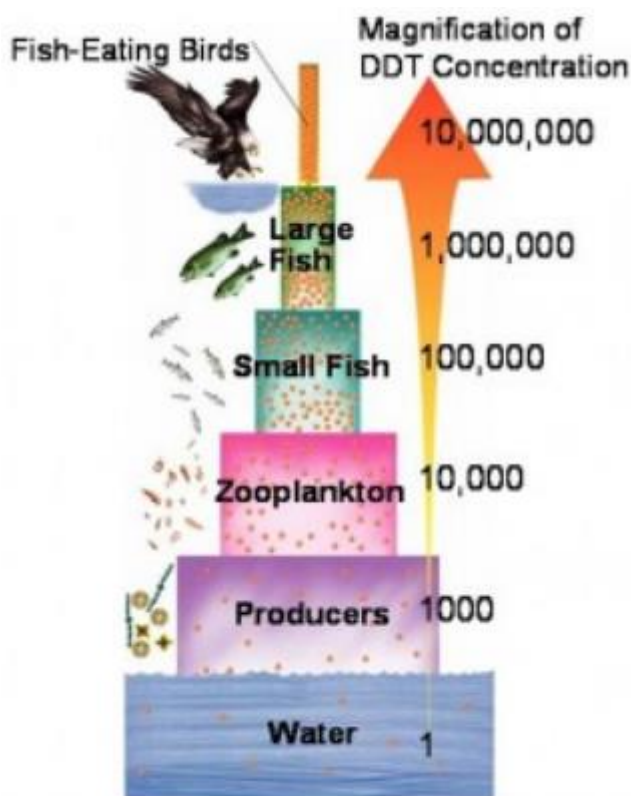


Fig.6. Biomagnification

Ozone Layer

High UV radiation break down oxygen into oxygen atoms. These oxygen atoms when combine with oxygen, they form ozone.

Depletion of Ozone Layer

The thickness of the ozone layer over Antarctica was found to be decreased in the year 1985. This is defined as ozone depletion. This is due to excessive use of chlorofluorocarbons in refrigerators, ACs, aerosols, etc. Thinning of ozone would allow penetration of Ultraviolet rays into earth's atmosphere causing blindness, skin cancers and mutations.

In 1987 **United Nations Environment Programme (UNEP)** signed an agreement to limit the usage of CFCS. This is known as **Montreal Protocol**.



Cycle 1

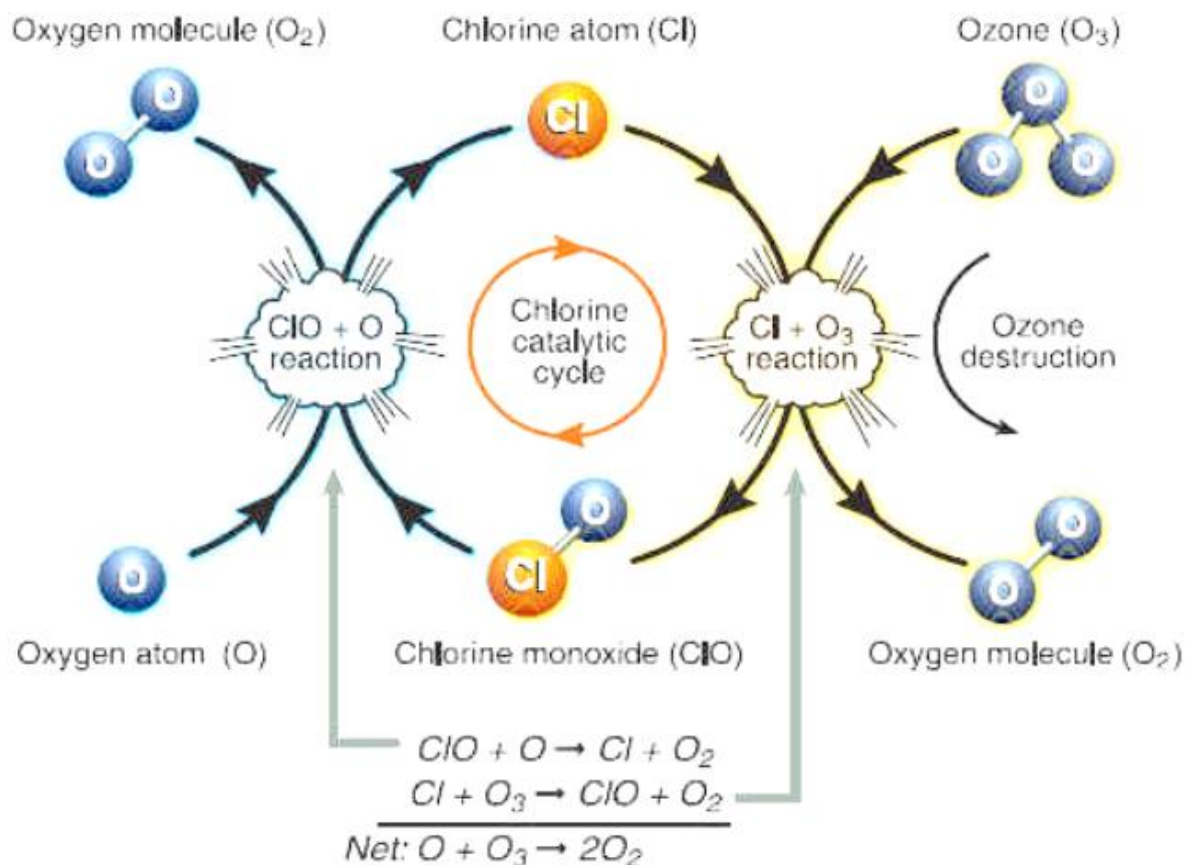


Fig.7. Reaction of CFC with ozone

Consequences of Ozone Depletion

Exposure of UV rays causes skin cancer. UV-rays damage the eyes also. It affects humans, plants as well as animals.

Garbage Disposal

Waste materials are known as garbage. There are two types garbage - Biodegradable Garbage and Non-biodegradable Garbage.

Garbage that can be completely decomposed by the microorganism are called **Biodegradable Garbage**., such as fruit and vegetable peel, sewage.

Substances which cannot be decomposed through microorganisms are known as **Non-biodegradable Garbage**, For Example, Plastic, Glass, Pesticide, Metals, Radioactive Elements etc.



Methods of Waste Management

Waste disposal is a very important part of day to day life. There are different methods of waste disposal management- sewage treatment plant, biogas plant, land fillings, recycling, incineration, composting and reuse.

Our Environment Class 10

IMPORTANT TERMS OF THE CHAPTER OUR ENVIRONMENT

1. Environment: Everything which surrounds us is environment. It may include living (biotic) and non-living (abiotic) components.
 2. Biodegradable substances: Substances that can be slowly destroyed and broken down into very small parts by natural processes with the help of bacteria, fungi, etc. Example: Organic wastes like vegetable and fruit peels, dead plants and animals, etc.
 3. Non-biodegradable substances: Substances which cannot be broken down or decomposed into the soil by natural agents are called non-biodegradable. Example: Plastics, polystyrene, metals, aluminium cans, toxic chemicals, paints, etc.
 4. Problem due to Non-biodegradable substances: The non-biodegradable substances persist in the environment for a long time as they are usually unreactive (inert) and may be harmful for the members of the ecosystem.
 5. Same enzyme does not break-down everything (Reason for pollution by plastic): Enzymes are highly specific in their action. Due to this specificity of the enzymes to act on a particular substrate only, many human-made materials like plastics are not broken down by the action of enzymes of bacteria or other saprophytes. These materials are acted upon by physical processes like heat and pressure which makes them persistent for several thousand years.
 6. Ecosystem: All the interacting organisms in an area together with non-living components form an ecosystem.
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Types of Ecosystem

	Natural Ecosystem	Man-made Ecosystem
Terrestrial [on land]	Forest, Desert, Grassland	Cropland, Garden
Aquatic [in water]	Fresh water: River, Lake, Pond Marine: Sea, Oceans	Aquarium

On the basis of their position or role in the ecosystem, the organisms are classified as:

1. Producers: The organisms which can synthesise their own food by the process of photosynthesis in presence of sunlight, i.e., all green plants, blue green algae, some photosynthetic bacteria, etc.
2. Consumers: Consumers feed on producers or other consumers to survive. They directly or indirectly depend on producers for their food.

Types of Consumers

Herbivores	Carnivores	Omnivores	Parasites
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Feed on plant or plant parts.		Live on or inside the host to derive nourishment.	
Example: Rabbit, Goat, Deer, etc.		Example: Plasmodium, lice, tapeworm, etc.	
Eat flesh Example: Lion, Tiger, etc.		Feed on both plants and flesh. Example: Crow, Man, etc.	

3. Decomposers: The organisms which breakdown (decompose) the dead remains of plants and animals or convert complex compounds into simpler ones so that they go into the soil and are used up again by the plants are called decomposers. Example: Fungi and bacteria. Decomposers help in the replenishment of the natural resources.

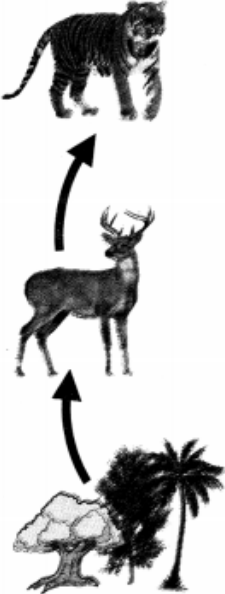
4. Role of Decomposers:

Decomposers breakdown the dead remains and waste products of organisms i.e., complex organic substances into simple inorganic substances that go into the soil and are used up once more by the plants.

5. Food Chain: Food chain refers to an arrangement of different biotic groups in a sequence of energy transfer. It consists of a series of organisms feeding on one



another.

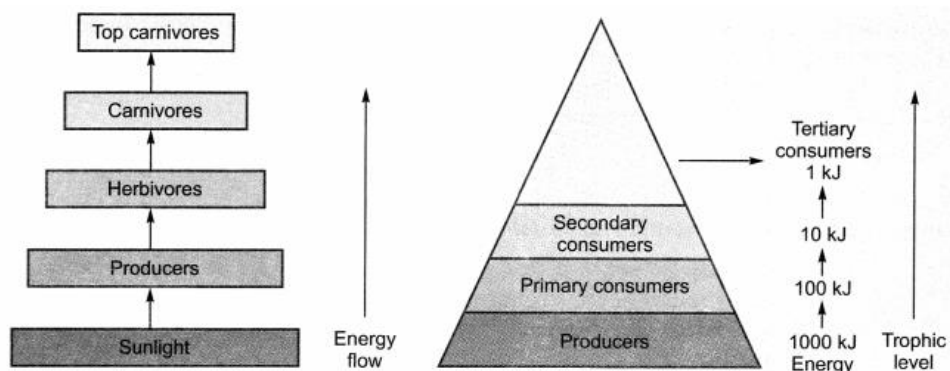
Examples of Food Chain		
Forest	Grassland	Pond
Plants → Deer → Lion	Plants → Grasshopper → Frog → Snake → Vulture	Aquatic plants → Scorpion → Fish → Crane (bird)
		

6. Food web: In nature, the food chains are interconnected with each other forming a web-like pattern. This network of food chains is called a food web.

- Trophic level: Each step or level of the food chain where transfer of energy takes place is called trophic level.
- First Trophic level: Autotrophs (Producers)
- Second trophic level: Primary consumers (Herbivores)
- Third Trophic level: Secondary consumers (Small carnivores)
- Fourth Trophic level: Tertiary consumers (Larger carnivores)

7. Flow of energy between various components of the environment

- Green plants capture 1% of the sunlight that falls on their leaves.
- The flow of energy is unidirectional in a food chain.
- Ten Percent Law: About 90% of energy is used by the present trophic level in its life processes like respiration, digestion, etc. and only 10% of energy is transferred to the next trophic level.



Flow of energy in an ecosystem

- Food chains generally consist of only three or four steps: Only 10% of energy is transferred to the next trophic level, so the loss of energy at each step is so great that very little usable energy remains after four trophic levels.
- There are generally a big population at lower trophic levels of an ecosystem. The population of the producers is the highest in a food chain.
- The relationship among organisms can be shown as a series of branching lines called a food web instead of a straight line as each organism is generally eaten by two or more other kinds of organisms which in turn are eaten by several other organisms.

8. Biological Magnification: The pesticides and other chemicals used to protect our crops from diseases and pests get either washed down into the soil or into the water bodies. They enter the food chain on being absorbed by the plants along with water and minerals from soil or on being taken up by aquatic plants and animals from the water bodies.

These get accumulated progressively at each trophic level as they are not degradable. The maximum concentration of these chemicals gets accumulated in human bodies as humans occupy the topmost trophic level in a food chain. This phenomenon is known as biological magnification. Due to this, our food grains, vegetables and fruits contain varying amounts of pesticide residues.

Ozone: Ozone (O_3) is a molecule formed by three atoms of oxygen.

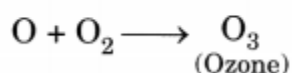
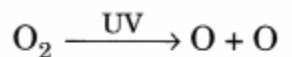
9. Bad Ozone: The ozone present in the troposphere (lower parts of atmosphere) is harmful for plants and animals.

10. Good Ozone: The ozone present in the stratosphere (higher levels of the atmosphere) is beneficial as it shields the surface of the Earth from ultraviolet (UV) radiation of the Sun which is highly damaging to organisms and can cause skin cancer in human beings.



11. Formation of Ozone:

High energy UV radiation act on oxygen (O_2) molecule and split apart some molecular oxygen (O_2) into free oxygen (O) atoms. These oxygen atoms then combine with the molecular oxygen to form ozone.



12. Reason of Ozone Depletion:

Excessive use of synthetic chemicals like chlorofluorocarbons (CFCs) used as refrigerants and in fire extinguishers, caused ozone depletion in the upper atmosphere. In 1987, UNEP (United Nation Environment Programme) forged an agreement to freeze CFCs production at 1986 levels by all countries.

13. Ozone Hole: The decline of ozone layer thickness in Antarctica was first discovered in 1985 and was termed as Ozone Hole (thinning of ozone layer).

14. Management of Garbage:

Rapid industrialisation and the rise in demand of consumer goods have led to excessive garbage generation and problems of their disposal.

15. The methods of solid waste disposal are:

- Recycle: Non-biodegradable solid wastes like plastic, metal can be recycled.
- Reuse: Paper can be reused for making greeting cards, decorative articles, etc.
- Composting: Organic wastes filled into a compost pit can be converted into organic manure.
- Landfill: Wastes dumped in low lying area are compacted by rolling with bulldozers.
- Incineration: Burning wastes in incinerators.

16. Use of Disposable Paper cups: Instead of plastic cups, use of disposable cups made of clay called kulhads were suggested as an alternative. The use of kulhads on large scale results in loss of the fertile top soil. So, now disposable paper cups are being used instead of kulhads.

Biodegradable substances: The substances which can be easily broken down into simpler substances by natural processes, e.g., wood, paper, etc.



Non-biodegradable substances: The substances which cannot be easily degraded into simpler substances by natural processes, e.g., plastics, DDT, etc.

Pollution: Any undesirable change in the physical, chemical or biological characteristics of air, water or soil is called pollution.

Ecosystem: The interaction of the living and non-living components of an area forms a unit called ecosystem.

Biotic: The living components of an ecosystem are called biotic. For example, predators, plants, parasites, etc.

Abiotic: The non-living components of an ecosystem are called abiotic. For example, temperature, humidity, etc.

Food chain: It is the sequence of organisms formed to transfer food energy by the act of eating or being eaten.

Food web: A network of food chains is called a food web.

Trophic level: Various steps in a food chain at which the transfer of energy takes place are called trophic levels.

Producers: The organisms which can synthesise their own food by the process of photosynthesis.

Consumers: The organisms which depend directly or indirectly on producers for their food requirements.

Decomposers: The organisms which break down the complex substances present in dead remains of plants and animals into simpler substances.

Biological magnification: The phenomenon in which the concentration of harmful toxicant goes on increasing at successive trophic levels, e.g., DDT.
