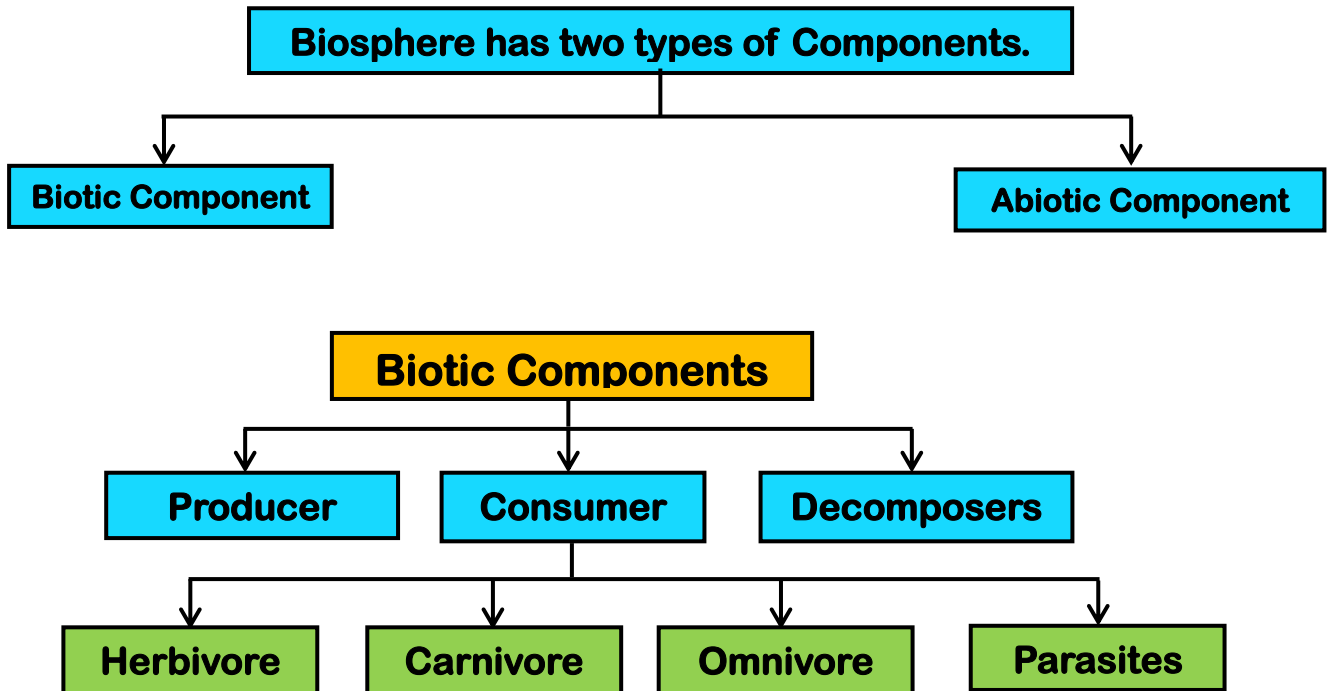


OUR ENVIRONMENT



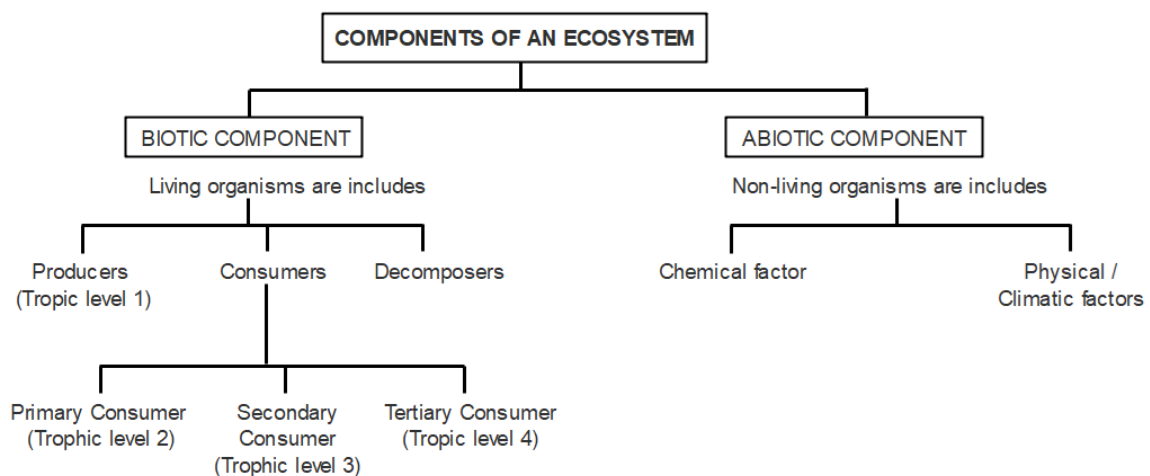
OUR ENVIRONMENT



ECOSYSTEM

It is a system of interaction between living and non-living components of environment.

It is of two types	
Natural Ecosystem	Artificial Ecosystem
<ul style="list-style-type: none">❖ It is governed by natural conditions❖ Terrestrial Natural Ecosystem : eg. Forest, grassland and desert.❖ Aquatic Natural Ecosystem : eg. Freshwater (Pond, Pool, River, stream and Marine water Ocean and sea.)	<ul style="list-style-type: none">❖ It is governed by man.❖ Also known as man made ecosystem.❖ eg. Cropland ecosystem and aquarium.

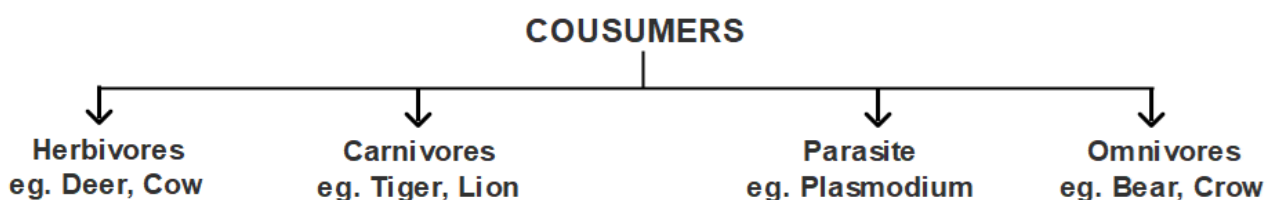


PRODUCERS

- ❖ All green Plants that can prepare their own food and are called Producers.
- ❖ Also called as Autotrophs.

CONSUMERS

- ❖ They are organisms which consume other organisms or their products.
- ❖ They depend on producers for their food directly or indirectly.



HERBIVORES

- ❖ These are primary consumers
- ❖ They get their food by eating the producers directly.
- ❖ They are at 2nd trophic level.

CARNIVORES

- ❖ These are Secondary or Tertiary consumers.
- ❖ They eat the flesh of herbivores.
- ❖ Eg → Owl, Peacock, Tiger, Lion etc.
- ❖ The Carnivores which are not preyed upon further are called top carnivores eg. Lion.

PARASITE

- ❖ They live and feed on the host body.
- ❖ They depend on its host for survival and often harms it.
- ❖ Eg. Plasmodium, Tapeworm, etc.

OMNIVORES

- ❖ They feed on both plants and animals' flesh.
- ❖ Eg. Humans, Crow, Bear, etc.

DECOMPOSERS

- ❖ They are also known as Saprotrophs.
- ❖ They feed on dead and decaying food.
- ❖ Fore eg. Microorganisms like fungi and bacteria which break down or decompose the dead plants & animals.

Importance of Decomposers

- ❖ They clean up the environment
- ❖ They add nutrients back to soil or water, so that producers can use them to grow and reproduce.
- ❖ They fix the nitrogen in the soil.
- ❖ They are 'housekeepers of an ecosystem.

FOOD CHAIN

The chain of organisms which involves transfer of energy from one trophic level to next trophic level is called food chain. The flow of food or energy in an ecosystem is called food chain.

Trophic levels

- Those organisms which join the food chain are termed as Trophic levels.
- There are four trophic levels present in the ecosystem because level of energy decreases during the flow of energy from one trophic level to another trophic level.
- First trophic level [T₁] → Producers
- Second trophic level [T₂] → Primary Consumers.
- Third trophic level [T₃] → Secondary Consumers.
- Fourth trophic level [T₄] → Top Consumers.

Terrestrial Food chains :

- ❖ Plants → Rat → Snake → Hawk
- ❖ Plants → Frog → Snake → Peacock

Aquatic food chains :

- ❖ Phyto planktons → Zooplanktons → Small fish → Large fish
- ❖ Algae → Small fish → Large fish → Crocodile.

Difference between Food chain and Food Web

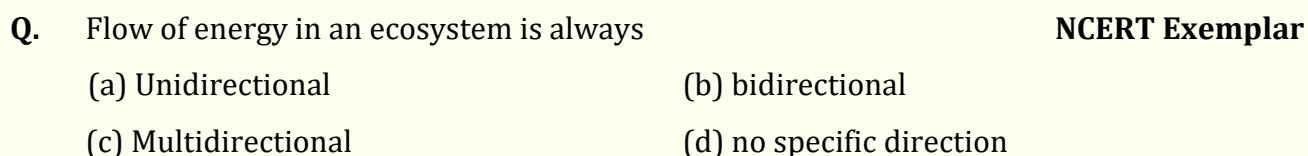
Food Chain	Food Web
❖ A straight single path of transfer of food energy in the ecosystem.	❖ It consists of a large number of interconnected food chains
❖ Consists of 3-4 trophic levels.	❖ Consists of numerous trophic levels.
❖ Does not improve the adaptability and competitiveness of organisms.	❖ Improve the adaptability and competitiveness of organisms.

Q. Organisms of a higher trophic level which feed on several types of organisms belonging to a lower trophic level constitute the **NCERT Exemplar**

- (a) Food web (b) ecological pyramid (c) ecosystem (d) food chain

Ans. (a) Food web

- Energy is used and then transferred to next trophic level in a food chain. This is called flow of energy.
- Only 1% of the solar energy is captured by green plants and they use some of it to perform photosynthesis and some is released as heat into the atmosphere.
- The remaining energy is chemical energy which is stored in the plants as 'Carbohydrates.
- This stored energy is transferred to next trophic level when plants are eaten up by herbivores.
- Herbivores also store some of this energy, which will be transferred to carnivores.



Because the energy that is captured by the autotrophs cannot revert back to the solar input and the energy which passes to herbivores cannot come back to autotrophs.

Q. In a food chain, the third trophic level is always occupied by

(a) carnivores (b) herbivores
(c) decomposers (d) producers

NCERT Exemplar

Plants (producers or autotrophs) occupy the first trophic level, herbivores constitute the second trophic level, carnivores constitute the third trophic level and higher carnivores occupy the fourth trophic level.

Ten percent Law

According to Ten percent law, 90% of the captured energy is lost as heat. And only 10% is available for the next level.

Suppose 1000 J of solar energy is received by green plants then only 1% of solar energy available on earth is utilized by plants.

$$\left[1000 \text{ J} \times \frac{1}{100}\right] = 10 \text{ J}$$

- ❖ Plants will utilize only 10 J of energy and rest 990 J of energy will be lost to the environment.
- ❖ According to 10% law, only 10% of 10 J of energy will be transferred to 2nd trophic level.

i.e. 10% of 10 J

$$\frac{10}{100} \times 10 = 1 \text{ J}$$

- ❖ 1 J of energy is now, available at 2nd trophic level. (10% of 1J) i.e. 0.1J of energy will be available for 3rd trophic level following 10% law.

Q. In the given food chain, suppose the amount of energy at fourth trophic level is 5 kJ, what will be the energy available at the producer level? **NCERT Exemplar**

Grass → Grasshopper → Frog → Snake → Hawk

(a) 5 kJ (b) 50 kJ (c) 500 kJ (d) 5000 kJ

Ans. (d) 5000 kJ

According to 10% law, only 10% of the energy entering a particular trophic level organisms is available for transfer to the next higher trophic level. In this food chain, at the 4th trophic level, only 5kJ energy is available to the snake. So, the energy available at the producer level will be 5000 kJ. It can be shown as

Grass $\xrightarrow{10\% \text{ of } 5000\text{kJ}}$ Grasshopper $\xrightarrow{10\% \text{ of } 500\text{kJ}}$ Frog $\xrightarrow{10\% \text{ of } 50\text{kJ}}$ Snake $\xrightarrow{10\% \text{ of } 5\text{kJ}}$ Hawk

ENVIRONMENTAL PROBLEMS

Pollution:

Pollution is one of the major environmental problem these days. The term 'Pollution' means an undesirable change in the physical, chemical or biological characteristics of our air, land & water that will harm fully affect the human life.

Green House Effect :

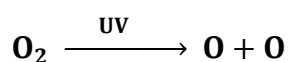
When there is increase in CO₂ concentration, the deposition of CO₂ gas presents the heat from radiating out from the earth. This is called Green house effect which leads to global warming. The average global temperature on earth has increased due to green house gases (CO₂ & CH₄).

OZONE LAYER DEPLETION

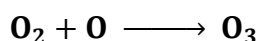
Ozone layer protects the earth from harmful UV rays. It is present in the stratosphere layer of atmosphere (15 to 30 km above the Earth's surface).

Formation of Ozone layer :

When UV radiations from sun strike the O₂ molecules, it causes splitting of O₂.



Oxygen molecules react with energy atoms in the upper atmosphere to form Ozone (O₃).



Most of ozone is formed at equator where there is maximum sunshine but with winds it travels at high altitude and gets accumulated in stratosphere.

Causes of Ozone layer Depletion

1. **Chlorofluorocarbon :** All ozone depleting chemicals contain chlorine and Bromine. CFCS are highly volatile and non combustible so they are very quickly evaporated can start depleting ozone layer.
2. **Global Warming :** Due to global warming and green house effect most of heat is trapped in troposphere.
3. **Nitrogenous Compound :** Nitrogenous compounds like NO, N₂O and NO₂ which are emitted by human activities are considered to be responsible for the depletion of Ozone layer.

Effects of Ozone layer depletion :

- UV radiations can severely damage eye lens and cornea of eye. It can cause cataract and Blindness.
- Exposure to UV radiations can also cause Skin Cancer.
- Exposure to UV radiations can cause Breast Cancer and Leukemia.
- It can also result in suppression of immune response.

In 1989, the United Nation Programme (UNEP) succeeded in forging an agreement to freeze CFC production at 1986 levels.

Ban on the usage of synthetic chemicals like CFCs, aerosols (which are used in refrigerants and in fire extinguisher) can helps in saving the ozone layer.

BIOLOGICAL MAGNIFICATION

- Gathering of various harmful substances like pesticides, DDT and biphenyls at different levels of a food chain is called Biological Magnification.
- It increases the concentration of toxic substances in organisms at higher trophic levels.
- For eg. DDT was a pesticide which was consumed by many organisms of the lower trophic level in aquatic ecosystem (fish). Birds accumulated sufficient amounts of DDT that ate those fish. This caused fragility in the egg shell of these birds. There was increased egg breakage during nesting, which adversely affected birds population. The use of DDT was banned in US in the 1970 s.
- Measures to control the changes in the environment include applying the R's (Reuse, Recycle and Reduce), afforestation and saving endangered animals.

Modes of waste Disposal

1. Recycling
2. Preparation of Compost
3. Incineration
4. Landfill
5. Sewage treatment

1. **Recycling** : It is the process of collecting waste materials and turning them into new products.

Example : Newspapers and paper towels, recovered plastic in carpentering and park benches.

2. **Preparation of Compost** : A pit is dug into the ground in which domestic or kitchen waste can be added and can be converted into compost.
3. **Incineration** : The burning of a substances at high temperature (more than 1000°C) to form ash is called incineration. It is used to destroy household waste, chemical waste and biological waste.
4. **Landfill** : The waste can also be disposed by putting it in low, lying areas of ground and covering it with earth is called landfill.
5. **Sewage Treatment** : The dirty drain water containing urine and feces which is carried from our homes by sewers or underground pipes is called sewage.

The treatment of sewage produces clean water which is discharged into the river.

MANAGING THE GARBAGE WE PRODUCE

Wastes from household is called Garbage. This garbage includes left over food, fruits and vegetable peels, fallen leaves of plotted plants waste paper, also unwanted plastic objects (such as plastic bottles, polythene bags, toys etc) glass articles like glass bottles, broken window panes etc) metal articles like aluminium foils, rusted iron grills etc.

BIODEGRADABLE WASTE	NON BIODEGRADABLE WASTE
<ul style="list-style-type: none">❖ These can be broken into simple substances by the action of microorganisms in nature.❖ They can be recycled naturally as well as by man.❖ They do not pollute the environment❖ They do not disturb the ecological balance in nature.❖ Bacteria and Fungi can bring the decomposition.❖ Example:- Paper, Cow dung, wood crumbles, dead remains of plants and animals.	<ul style="list-style-type: none">❖ These cannot be broken into simple non substances by the action of microorganisms in nature.❖ They cannot be recycled naturally.❖ They pollute the environment❖ They disturb the ecological balance in nature.❖ They are decomposed by the action of heat, water & pressure etc.❖ Example:- Plastic bags, synthetic fibres, cans etc.

Notes End

Important NCERT Questions

Q. Why is a lake considered to be a natural ecosystem? (Delhi 2017)

Ans. Lake is an ecosystem where living organisms grow, reproduce and interact among each other as well as with abiotic components and carry out other activities in nature by themselves without any human interference, therefore it is referred to as a natural ecosystem.

Q. In the following food chain, plants provide 500 J of energy to rats. How much energy will be available to hawks from snakes?

Plants → Rats → Snakes → Hawks

(AI 2017)

Ans. In an ecosystem, only 10% of energy is transferred from one trophic level to next, i.e. 10 percent law and rest is dissipated into the environment. Therefore, if plants (being producers-1st trophic level)-transfer 500 J of energy to rats (2nd trophic level) then rats would transfer 50 J of energy to snakes (3rd trophic level) which in turn will transfer only 5 J of energy to hawks (4th or last trophic level) in a food chain.

Plants → Rats → Snakes → Hawks

5000J 500J 50J 5J

Q. In the following food chain, 100 J of energy is available to the lion. How much energy was available to the producers?

Plants → Deer → Lion

(AI 2017)

Ans. As per 10% law of flow of energy in an ecosystem only 10% of energy is received by the next trophic level. Hence, in the given food chain : If 100 J of energy is available to lion, the plants or producers have 10,000 J of energy available to them.

Plants → Deer → Lion

10,000J 1000J 100J

Q. List two biotic components of a biosphere.

(Delhi 2016)

Ans. Two biotic components of a biosphere are:

(i) Producers – Include organisms which can produce their food using simple inorganic compounds, e.g., all green plants, blue green algae (cyanobacteria).

(ii) Consumers – Include organisms which are unable to synthesise their food, therefore, utilise materials and energy stored by the producers or eat other organisms, e.g., all the animals.

Q. Why are green plants called producers?

(Delhi 2016)

Ans. Green plants are called producers because they manufacture their own food with the help of CO₂ and H₂O in the presence of sunlight and chlorophyll.

Q. In a food chain of frog, grass, insect and snake, assign trophic level to frog. (AI 2016)

Ans. In the given food chain, frog belongs to the third trophic level as shown here :

Grass → Insect → Frog → Snake

T₁ T₂ T₃ T₄

Q. Why do producers always occupy the first trophic level in every food chain? (Foreign 2016)

Ans. Producers are the green plants that can manufacture food using CO₂ and H₂O in the presence of sunlight, i.e., they are autotrophs. They serve as a source of food for all non-

producers or consumers directly or indirectly. Hence, producers occupy the first trophic level in a food chain.

Q. We often use the word environment. What does it mean? **(Foreign 2016)**

Ans. Environment can be defined as the physical or biological world where an organism lives. Literally speaking, an organisms immediate surrounding constitutes its environment which includes both biotic and abiotic components around him.

Q. Which of the following are always at the second trophic level of food chains? Carnivores, Autotrophs, Herbivores **(AI 2015)**

Ans. Herbivores always occupy the second trophic level of food chains.

Q. Bacteria and fungi are called decomposers. Why? **(Delhi 2012, Foreign 2011)**

Ans. Bacteria and fungi are called decomposers because these microorganisms break down the complex organic matter present in dead plants and animals into simpler substances.