

CHAPTER 12

ECOSYSTEM

VEDA
ACADEMY

CLASS 12TH

NCERT EXERCISE AND SOLUTIONS - BIOLOGY

Q. 1. Fill in the blanks.

- (a) Plants are called as _____ because they fix carbon dioxide.
- (b) In an ecosystem dominated by trees, the pyramid (of numbers) is _____ type.
- (c) In aquatic ecosystems, the limiting factor for the productivity is _____.
- (d) Common detritivores in our ecosystem are _____.
- (e) The major reservoir of carbon on earth is _____.

ANSWER:-

- (a) autotrophs
- (b) an inverted shape.
- (c) light
- (d) Earthworms
- (e) Oceans

Q. 2. Which one of the following has the largest population in a food chain?

- (a) Producers
- (b) Primary consumers
- (c) Secondary consumers
- (d) Decomposers

ANSWER:-

- (d) **Decomposers:** Such as bacteria and fungi, are microorganisms that make up the largest population in a food chain. They acquire nutrients by breaking down the remains of dead plants and animals.

Q. 3. The second trophic level in a lake is

- (a) Phytoplankton
- (b) Zooplankton
- (c) Benthos
- (d) Fishes

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ANSWER:-

(b) Zooplankton: Primary consumers in aquatic food chains, feeding on phytoplankton. As a result, they occupy the second trophic level in a lake.

Q. 4. Secondary producers are

- (a) Herbivores
- (b) Producers
- (c) Carnivores
- (d) None of the above

ANSWER:-

(d) None of the above

Plants are the sole producers and are referred to as primary producers. No other organisms act as producers in a food chain.

Q. 5. What is the percentage of photosynthetically active radiation (PAR) in the incident solar radiation?

- (a) 100%
- (b) 50 %
- (c) 1-5%
- (d) 2-10%

ANSWER:-

(b) 50%

Approximately fifty percent of the total incident solar radiation is converted into photosynthetically active radiation (PAR).

Q. 6. Distinguish between

- (a) Grazing food chain and detritus food chain
- (b) Production and decomposition
- (c) Upright and inverted pyramid
- (d) Food chain and Food web
- (e) Litter and detritus
- (f) Primary and secondary productivity



ANSWER:-

(a) Grazing food chain and detritus food chain

Grazing Food Chain	Detritus Food Chain
1. In this food chain, the energy originates from the Sun.	1. In this food chain, the energy comes from organic matter (detritus) produced in the trophic levels of the grazing food chain.
2. It starts with producers at the first trophic level. The plant biomass is consumed by herbivores, which are then eaten by various carnivores.	2. It begins with detritus, such as dead animal bodies or fallen leaves, which are consumed by decomposers or detritivores. These detritivores are later eaten by their predators.
3. This food chain is typically larger.	3. It tends to be smaller compared to the grazing food chain.

(b) Production and decomposition

Production	Decomposition
1. It is the rate of producing organic matter (food) by producers.	1. It is the process of breaking down of complex organic matter or biomass from the body of dead plants and animals with the help of decomposers into organic raw material such as CO_2 , H_2O , and other nutrients.
2. It depends on the photosynthetic capacity of the producers.	2. It occurs with the help of decomposers.
3. Sunlight is required by plants for primary production.	3. Sunlight is not required for decomposition by decomposers

(c) Upright and inverted pyramid

Upright pyramid	Inverted pyramid
1. The energy pyramid is always upright.	1. Both the biomass and number pyramids can be inverted.
2. In an upright pyramid, the producer level has the highest number and biomass of organisms, which decrease at each successive trophic level in the food chain.	2. In an inverted pyramid, the producer level has the lowest number and biomass of organisms, which increase at each successive trophic level.

(d) Food chain and Food web

Food chain	Food web
1. A linear sequence of organisms, with each organism feeding on the one before it.	1. It consists of several interconnected food chains.
2. Organisms at higher trophic levels feed on specific types of organisms.	2. An organism may have multiple food sources.

(e) Litter and detritus

Litter	Detritus
1. Litter consists of all types of waste found on the surface of the ground.	1. Detritus is made up of the remains of dead plants and animals.
2. Litter includes both biodegradable and non-biodegradable materials.	2. Detritus contains only biodegradable substances.



(f) Primary and secondary productivity

Primary productivity	Secondary productivity
1. Refers to the amount of organic matter produced by producers per unit area over a given time period.	1. Refers to the rate at which organic matter is produced by consumers over a certain period of time.

Q. 7. Describe the components of an ecosystem.

ANSWER:-

An ecosystem is an interactive unit comprising both the biological community and the non-living elements of a given area. The living and non-living components interact with each other and function as a cohesive unit, which becomes evident through processes like nutrient cycling, energy flow, decomposition, and productivity. Examples of ecosystems include ponds, forests, and grasslands.

An ecosystem consists of two main components:

- **Biotic Component:** This includes the living organisms within an ecosystem, such as producers, consumers, and decomposers. Producers, like plants and algae, contain chlorophyll, enabling them to perform photosynthesis in the presence of light, making them essential energy converters. Consumers (heterotrophs) rely on producers for food, with primary consumers directly feeding on them, while secondary and tertiary consumers depend on them indirectly. Decomposers, like bacteria and fungi, break down dead plants and animals, obtaining nutrients and forming the largest population in a food chain.
- **Abiotic Component:** These are the non-living elements in an ecosystem, including light, temperature, water, soil, air, and inorganic nutrients.

Q. 8. Define ecological pyramids and describe with examples, pyramids of number and biomass.

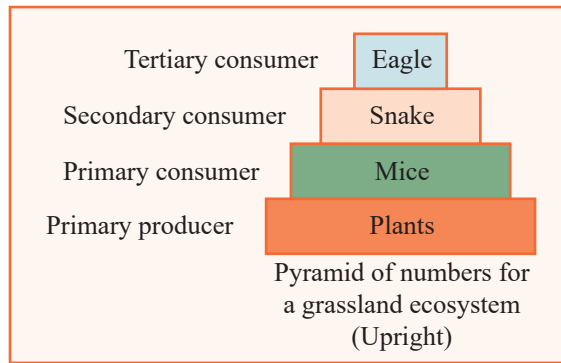
ANSWER:-

An ecological pyramid is a graphical representation that illustrates various ecological parameters, such as the number of individuals, energy, or biomass at each trophic level in an ecosystem. The pyramid typically places producers at the base, with the apex representing the top consumers. There are three main types of ecological pyramids:

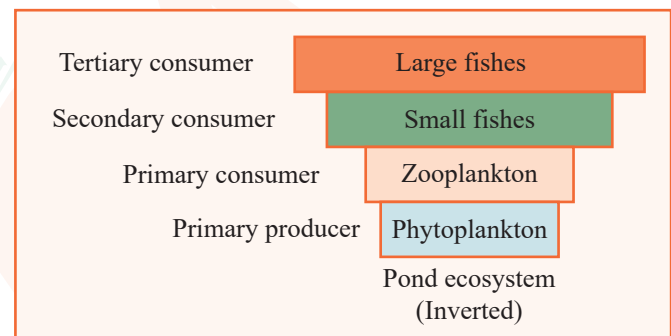
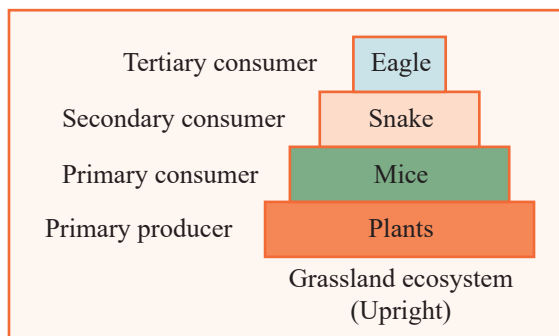
- **Pyramid of Numbers**
- **Pyramid of Energy**
- **Pyramid of Biomass**
 - **Pyramid of Numbers:** This pyramid depicts the number of individuals at each trophic level in a food chain. The shape of the pyramid can be either upright or inverted, depending on the number of producers. In a grassland ecosystem, for example, the pyramid is upright, with the number of producers (plants) at the base, followed by herbivores (mice), secondary consumers (snakes), and tertiary consumers (eagles) at the top. In this case, the number of individuals is greatest at the producer level and decreases at higher trophic levels. In contrast, in a parasitic food chain, the pyramid of numbers is inverted, with a single tree (the producer) supporting numerous fruit-eating birds, which in turn support various insect species.

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- Pyramid of Biomass:** This pyramid represents the total living biomass at each trophic level in an ecosystem. It can also be upright or inverted. In grassland and forest ecosystems, the pyramid is typically upright, with the biomass at the producer level being higher than at the top carnivore level. In a pond ecosystem, however, the pyramid of biomass may be inverted, as the biomass of fish far exceeds that of the zooplankton they feed on.



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Q. 9. What is primary productivity? Give brief description of factors that affect primary productivity.

ANSWER:-

Primary productivity is the amount of organic matter or biomass generated by producers in a specific area over a certain period. The primary productivity of an ecosystem is influenced by various environmental factors, including light, temperature, water, and precipitation. It also depends on the availability of nutrients and the presence of plants capable of performing photosynthesis.

Q. 10. Define decomposition and describe the processes and products of decomposition.

ANSWER:-

Decomposition is the process of breaking down complex organic matter or biomass from dead plants and animals into inorganic raw materials like carbon dioxide, water and other nutrients, with the help of decomposers. The steps involved in decomposition are as follows:

- Fragmentation:** This is the initial stage of decomposition, where detritus is broken down into smaller pieces by detritivores like earthworms.
- Leaching:** In this process, water-soluble nutrients are washed down into the soil layers, where they become locked as unavailable salts.



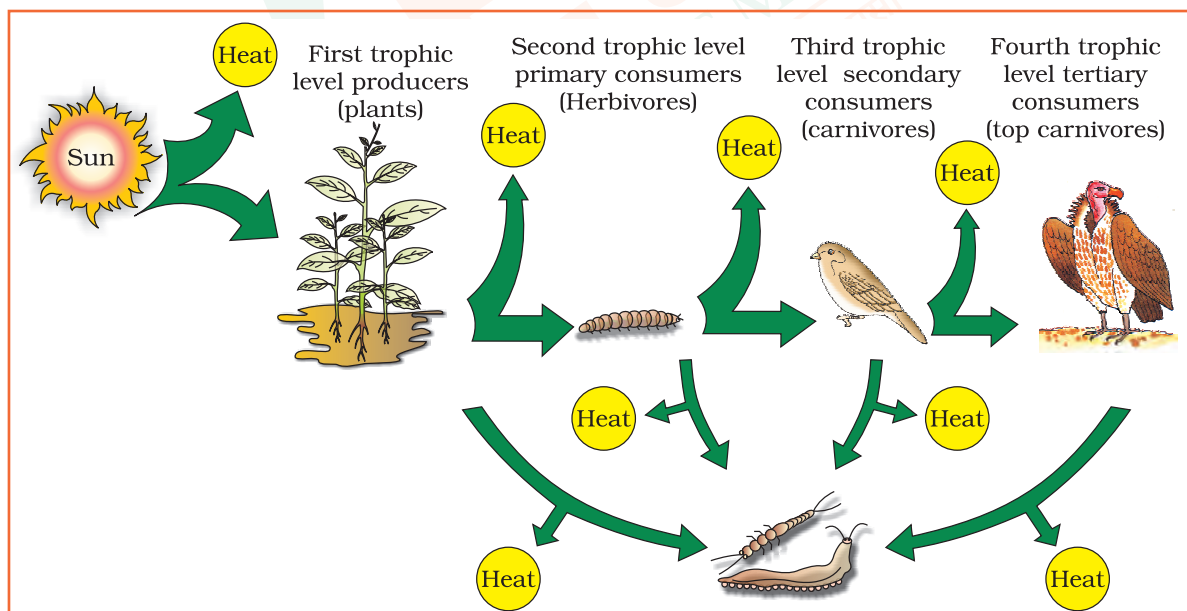
- **Catabolism:** During catabolism, bacteria and fungi break down detritus into smaller components using various enzymes.
- **Humification:** This step results in the formation of humus, a dark-colored colloidal substance that serves as a reservoir of nutrients for plants.
- **Mineralization:** Microbial activity further decomposes the humus, releasing inorganic nutrients back into the soil. This process is known as mineralization.

Decomposition produces humus, a nutrient-rich substance that eventually breaks down into inorganic materials such as CO₂, water, and other nutrients, enriching the soil.

Q. 11. Give an account of energy flow in an ecosystem.

ANSWER:-

Energy enters an ecosystem from the Sun. Solar radiation passes through the atmosphere and is absorbed by the Earth's surface, where it aids plants in photosynthesis and helps maintain the Earth's temperature, which is crucial for the survival of living organisms. Some of this solar radiation is reflected by the Earth's surface. Green plants (producers) capture only 2-10% of the solar energy during photosynthesis, converting it into food. The rate at which biomass is produced by plants through photosynthesis is called 'gross primary productivity'. When herbivores consume these plants, only 10% of the energy stored by the producers is transferred to the herbivores. The remaining 90% is used by plants for processes such as respiration, growth, and reproduction. Likewise, only 10% of the energy from herbivores is transferred to carnivores. This phenomenon is known as the "ten percent law" of energy flow.



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