



NCERT SOLUTIONS

CHAPTER - 14

ECOSYSTEM

BIOLOGY CLASS 12

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Q1. 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 productivity is _____.
- (d) Common detritivores in our ecosystem are _____.
- (e) The major reservoir of carbon on earth is _____.

Answer:

- (a) Autotrophs
- (b) Spindle
- (c) Sunlight
- (d) Earthworm, bacteria & fungi of decay and vulture
- (e) Oceans

Q2. 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)

Q3. The second trophic level in a lake is-

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

Answer: (b)

Q4. Secondary producers are

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

Answer: (d)

Q5. What is the percentage of photosynthetically act., radiation (PAR), in the incident solar radiation?

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

Answer: (b)

Q6. 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
In this food chain, energy is derived from the Sun.	In this food chain, energy comes from organic matter (or detritus) generated in trophic levels of the grazing food chain.
It begins with producers, present at the first trophic level. The plant biomass is then eaten by herbivores, which in turn are consumed by a variety of carnivores.	It begins with detritus such as dead bodies of animals or fallen leaves, which are then eaten by decomposers or detritivores. These detritivores are in turn consumed by their predators.
This food chain is usually large.	It is usually smaller as compared to the grazing food chain.

- (b) Production and decomposition

Production	Decomposition
It is the rate of producing organic matter (food) by producers.	It is the process of breaking down 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 ₂ O, and other nutrients.
It depends on the photosynthetic capacity of the producers.	It occurs with the help of decomposers.
Sunlight is required by plants for primary production.	Sunlight is not required for decomposition by decomposers

(c) Upright and inverted pyramid

Upright pyramid	Inverted pyramid
The pyramid of energy is always upright.	The pyramid of biomass and the pyramid of numbers can be inverted.
In the upright pyramid, the number and biomass of organisms in the producer level of an ecosystem is the highest, which keeps on decreasing at each trophic level in a food chain.	In an inverted pyramid, the number and biomass of organisms in the producer level of an ecosystem is the lowest, which keeps on increasing at each trophic level.

(d) Food chain and Food web

Food chain	Food web
It is a single linear sequence of organisms.	It contains a number of interconnected food chains.
Members present at higher trophic levels feed on single types of organisms.	One organism has alternate food sources.

(e) Litter and detritus

Litter	Detritus
Litter contains all kinds of wastes generated above the ground.	Detritus is composed of the remains of dead plants and animals.
Litter contains both biodegradable and non-biodegradable matter.	Detritus contains only biodegradable matter.

(f) Primary and secondary productivity

Primary productivity	Secondary productivity
It is defined as the amount of organic matter produced by producers per unit area over a period of time.	It is defined as the rate of production of organic matter by consumers over a period of time.

Q7. Describe the components of an ecosystem.

Answer: An ecosystem is defined as an interacting unit that includes both the biological community as well as the non-living components of an area. The living and the nonliving components of an ecosystem interact amongst themselves and function as a unit, which gets evident during the processes of nutrient cycling, energy flow, decomposition, and productivity. There are many ecosystems such as ponds, forests, grasslands, etc.

The two components of an ecosystem are:

(a) Biotic component: It is the living component of an ecosystem that includes biotic factors such as producers, consumers, decomposers, etc. Producers include plants and algae. They contain chlorophyll pigment, which helps them carry out the process of photosynthesis in the presence of light. Thus, they are also called converters or transducers. Consumers or heterotrophs are organisms that are directly (primary consumers) or indirectly (secondary and tertiary consumers) dependent on producers for their food.

Decomposers include microorganisms such as bacteria and fungi. They form the largest population in a food chain and obtain nutrients by breaking down the remains of dead plants and animals.

(b) Abiotic component: They are the nonliving components of an ecosystem such as light, temperature, water, soil, air, inorganic nutrients, etc.

Q8. Define Ecological pyramids and describe with examples, pyramids of number and biomass.

Answer: Ecological pyramid is a graphical method to show the number of organisms or biomass or amount of energy present at different trophic levels. Pyramid of number: Number of individuals at each trophic level is shown in the pyramid. The pyramid of numbers (for example of a grassland) is upright. In this there is a decrease in the number of organisms starting from primary producers (plants) to top consumers (carnivores). Pyramid of biomass : Pyramid of biomass is a graphic representation of the amount of biomass per unit area sequence wise in rising trophic levels with producers at the base and top carnivores at the apex. Pyramids of biomass of a tree or the grassland ecosystems are upright and the pyramid of a pond ecosystem is inverted.

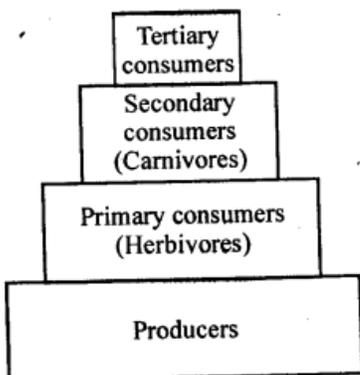


Fig. : Pyramid of number in a grassland ecosystem

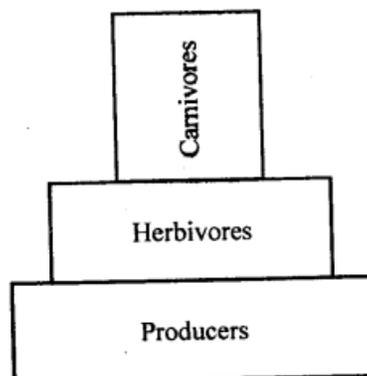


Fig. : Pyramid of biomass in a grassland ecosystem

Q9. What is primary productivity? Give a brief description of factors that affect primary productivity.

Answer: Primary productivity of an ecosystem is the amount of energy fixed or biomass synthesized by primary producers or green plants per unit area per unit time during photosynthesis. Factors affecting primary productivity are –

- Plant species inhabiting a particular area
- Sunlight
- Temperature
- Soil water
- Nutrients

lit deserts, sunlight is abundant but water is scarce or nutrients are lacking. Therefore, in such areas, water & nutrients supply become the limiting factors.

Q10. Define decomposition and describe the processes and products of decomposition.

Answer: Decomposition is the process that involves the breakdown of complex organic matter or biomass from the body of dead plants and animals with the help of decomposers into inorganic raw materials such as carbon dioxide, water, and other nutrients. The various processes involved in decomposition are as follows:

(1) Fragmentation: It is the first step in the process of decomposition. It involves the breakdown of detritus into smaller pieces by the action of detritivores such as earthworms.

(2) Leaching: It is a process where the water soluble nutrients go down into the soil layers and get locked as unavailable salts.

(3) Catabolism: It is a process in which bacteria and fungi degrade detritus through various enzymes into smaller pieces.

(4) Humification: The next step is humification which leads to the formation of a dark-coloured colloidal substance called humus, which acts as a reservoir of nutrients for plants.

(5) Mineralization: The humus is further degraded by the action of microbes, which finally leads to the release of inorganic nutrients into the soil. This process of releasing inorganic nutrients from the humus is known as mineralization.

Decomposition produces a dark coloured, nutrient-rich substance called humus. Humus finally degrades and releases inorganic raw materials such as CO₂, water, and other nutrients in the soil.

Q11. Give an account of energy flow in an ecosystem.

Answer: Flow of energy in an ecosystem is unidirectional. The ultimate source of energy is the sun. The solar energy is captured by the green plants which utilize it in synthesizing their own food. The energy fixed by the green plants is transferred to herbivores which feed on them. The energy is then transferred to higher trophic levels (carnivores). At every step, a considerable amount of energy is lost. According to 10% law, only 10% of total energy stored in a trophic level is transferred to the next trophic level of a food chain.

Q12. Write important features of a sedimentary cycle in an ecosystem.

Answer: The movement of nutrient elements through various components of an ecosystem takes place by a biogeochemical cycle. It is of 2 types – gaseous and sedimentary. A nutrient that does not enter the

atmosphere easily is said to have a sedimentary cycle. Sedimentary cycles involve cycling of sulphur, phosphorus etc. which are located in earth's crust.

Phosphorus is a very important element as it is present in various substances found in living beings. The cycling of phosphorus in an ecosystem occurs in such a way that plants obtain it from soil or rocks. The animals or primary consumers obtain it from plants. Secondary consumers or carnivores take it from herbivores while omnivores (like man) receive it both from plants and animals. Phosphorus present in organisms is also released during decomposition.

Q13. Outline salient features of carbon cycling in an ecosystem.

Answer: Carbon is an important constituent of living matter. Green plants take it in the form of CO_2 from the atmosphere and fix it as carbohydrates. Carbon which is also present in proteins, fats etc. is transferred to the organisms of other trophic levels. Apart from being released in the atmosphere as CO_2 during respiration, carbon is also released in the atmosphere through burning of wood, fossil fuel and decomposition of organic matter by microbes.

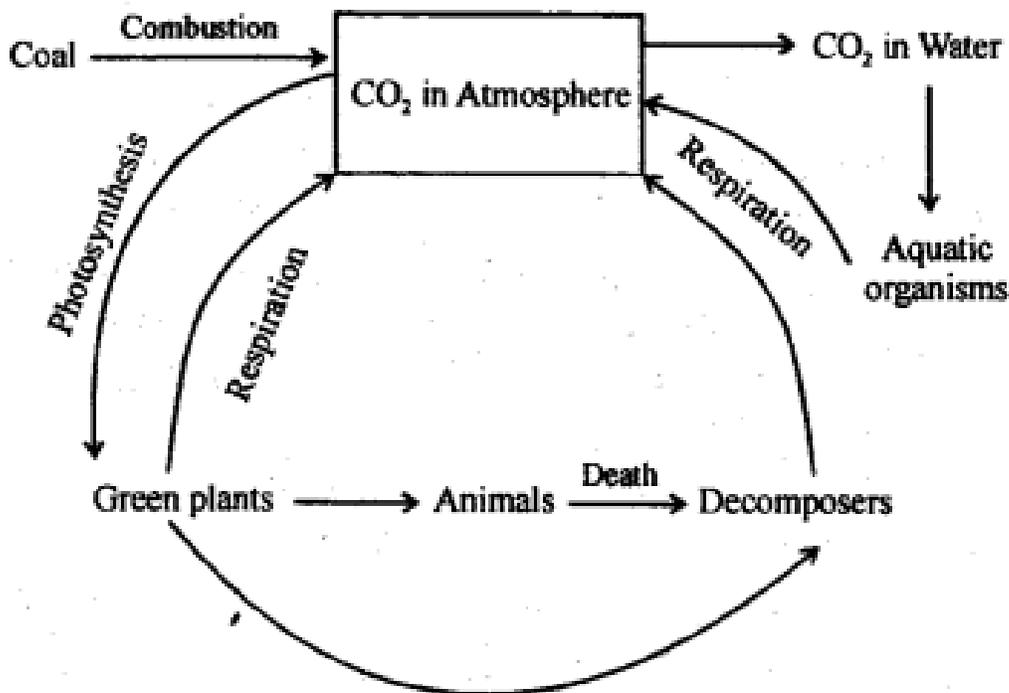


Fig. Carbon cycle

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