NCERT Solutions for Class-XII Biology

Chapter -12

NCERT Biology Class 12

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_____.

1. (a) Plants are called as autotrophs because they fix carbon dioxide.
(b) In an ecosystem dominated by trees, the pyramid (of numbers) is of inverted type.
(c) In aquatic ecosystems, the limiting factor for productivity is light.
(d) Common detritivores in our ecosystem are earthworms.
(e) A major reservoir of carbon on Earth is oceans.

2. Which one of the following has the largest population in a food chain?
(a) Producers
(b) Primary consumers
(c) Secondary consumers
(d) Decomposers

2. Decomposers are the organisms which obtain nutrients by breaking down the organic matter. It includes micro-organisms such as bacteria, fungi.

3. The second trophic level in a lake is
(a) Phytoplankton
(b) Zooplankton
(c) Benthos
(d) Fishes

3. (b) Zooplankton
Zooplankton are primary consumers in aquatic food chains that feed upon phytoplankton. Therefore, they are present at the second trophic level in a lake.

4. Secondary producers are
(a) Herbivores
(b) Producers
(c) Carnivores
(d) None of the above

4. (d) None of the above

Plants are considered as the primary producers as they entrap the solar energy through the process of photosynthesis and convert inorganic carbon di-oxide into organic compounds. This energy is then transferred to the second tropic level i.e. primary consumer. So there are no secondary producers in the food chain.

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%

5. (b) 50%

Out of total incident solar radiation, about fifty percent of it forms photosynthetically active radiation or PAR.

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

6. (a) Grazing food chain and detritus food chain

Grazing food chain	Detritus food chain
It starts from the living green plants i.e. producers occupying the first trophic level.	It starts from the dead organic matter and decomposers called detritivores as the first trophic level.
A much less fraction of energy flows through this type of food chain.	A much larger fraction of energy flows through this type of food chain.
It binds to inorganic nutrients.	It releases the inorganic nutrients bound in organic matter
It is directly dependent on the influx of solar radiation.	Energy for the food chain comes from the organic wastes, exudates and dead matter termed as detritus.

(b) Production and decomposition

Production	Decomposition
It is performed by autotrophs or plants	It is performed by detrivore and saprophytes

It can be defined as the rate of producing organic matter by producers.	It can be defined as the process of breaking down of complex organic matter with the help of decomposers into smaller inorganic raw material such as CO_2, H_2O, and other nutrients.
It is directly dependent on sunlight	It is not directly dependent on sunlight

(c) Upright and inverted pyramid

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

(d) Food chain and Food web

Food chain	Food web
Food chain is a linear sequential chain through which food energy and nutrients travels in the ecosystem	Food web is the interconnection of many food chains through which energy and nutrients travels in the ecosystem.
Usually member of high trophic level feed upon a single type of organism of lower trophic level	Members of higher trophic level feed upon many organisms of lower trophic level.
No effect on improving the adaptability and competitiveness of the organisms	More complex food webs improves the adaptability and competitiveness of the organisms.

(e) Litter and detritus

Litter	Detritus
Litter consists of all kinds of wastes generated by human activity above the ground.	Detritus is consisting of the remains of dead organisms.
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.
It is comparatively quite high.	It is small and decreases with rise of trophic level.

7. Describe the components of an ecosystem.

7. 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 non-living 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:

- 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 micro-organisms 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.
- Abiotic component: They are the non-living component of an ecosystem such as light, temperature, water, soil, air, inorganic nutrients, etc.

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

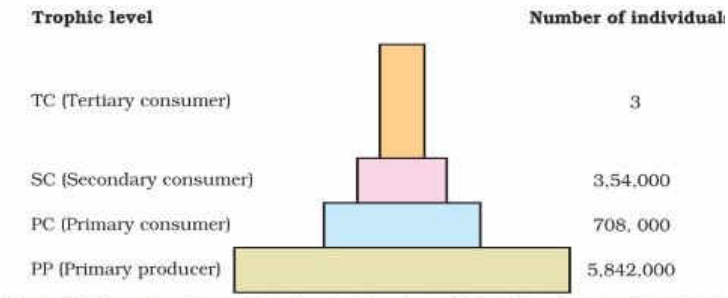
8. An ecological pyramid is defined as a graphical representation of various ecological parameters present at each trophic level. Ecological pyramids represent producers which are placed at the base, while the apex represents the consumers. There are three types of pyramids:

1. pyramid of number
2. pyramid of biomass
3. pyramid of energy

PYRAMID OF NUMBER: The pyramid of numbers deals with the relationship between the numbers of primary producers and consumers of different orders. In all cases, the base of such a pyramid always represents the numbers of primary producers and the subsequent structures on this base are represented by the number of consumers of successive levels, the top representing the number of top carnivores in that ecosystem. In the ecological pyramid so formed, the higher the step in the pyramid, the lower the number of individuals and the larger their size.

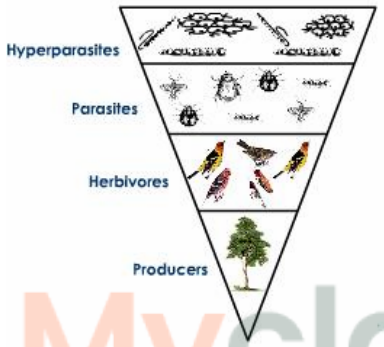
The shape of the pyramid of numbers may be upright or inverted.

EXAMPLE 1: UPRIGHT: In a grassland ecosystem, the pyramid of numbers is upright. In this type of a food chain, the number of producers (plants) is followed by the number of herbivores (mice), which in turn is followed by the number of secondary consumers (snakes) and tertiary carnivores (eagles). Hence, the number of individuals at the producer level will be the maximum, while the number of individuals present at top carnivores will be least.



Pyramid of numbers in a grassland ecosystem. Only three top-carnivores are supported in an ecosystem based on production of nearly 6 millions plants

EXAMPLE 2: INVERTED: In a parasitic food chain, the pyramid of numbers is inverted. In this type of a food chain, a single tree (producer) provides food to several fruit eating birds, which in turn support several insect species.



Inverted pyramid of number

PYRAMID OF BIOMASS: A pyramid of biomass takes into account, for a given unit area, the biomass of the producers, the biomass of the herbivores, the biomass of the first-level carnivores, and so on. SO, a pyramid of biomass is a graphical representation of the total amount of living matter present at each trophic level of an ecosystem.
It can be upright or inverted.
EXAMPLE 1: UPRIGHT: It is upright in grasslands and forest ecosystems as the amount of biomass present at the producer level is higher than at the top carnivore level.

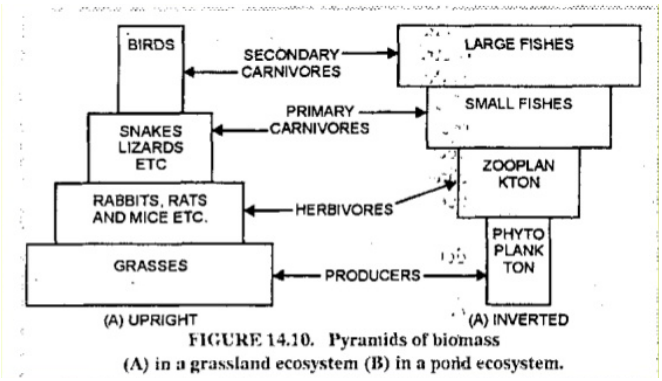


FIGURE 14.10. Pyramids of biomass
(A) in a grassland ecosystem (B) in a pond ecosystem.

EXAMPLE 2: INVERTED: The pyramid of biomass is inverted in a pond ecosystem as the biomass of fishes far exceeds the biomass of zooplankton (upon which they feed).

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

9. It is defined as the amount of organic matter or biomass produced by producers per unit area over a period of time. Primary productivity of an ecosystem depends on the variety of environmental factors such as light, temperature, water, precipitation, etc. It also depends on the availability of nutrients and the availability of plants to carry out photosynthesis.

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

10. Decomposition is the process of breaking down of complex organic matter with the help of decomposers into smaller inorganic raw material such as CO_2, H_2O, and other nutrients. It constitutes of various processes:

1. *Fragmentation: T*he breakdown of detritus (Organic matter) into smaller pieces by the action of detritivores (earthworms).
2. *Leaching:* The water-soluble nutrients move down into the layers of soil and get locked as unavailable salts.
3. *Catabolism:* Further the detritus is degraded into smaller pieces by bacteria and fungi through various enzymes.
4. *Humification: H*umification leads to the formation of a dark coloured colloidal substance called humus, which acts as reservoir of nutrients for plants.
5. *Mineralization:* The process of releasing inorganic nutrients from the humus in the soil is done by microbes and this process is known as mineralization

Decomposition thus leads to the production of a dark coloured, nutrient-rich substance called humus. Degradation of humus releases inorganic raw materials such as CO_2,water, and other nutrient in the soil.

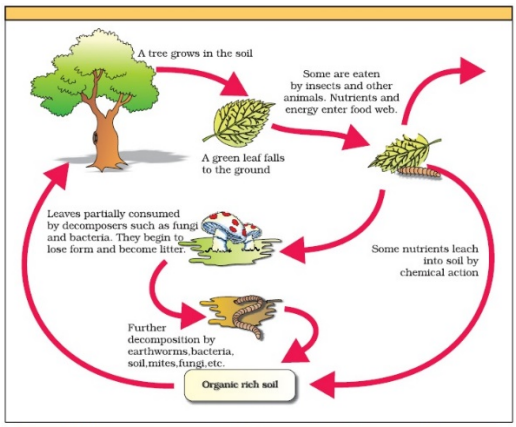
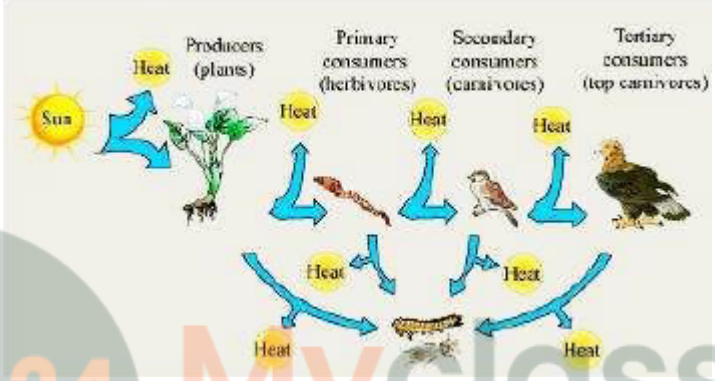


Figure 14.1 Diagrammatic representation of decomposition cycle in a terrestrial ecosystem

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

11. Energy enters an ecosystem from the Sun. Solar radiations pass through the atmosphere and are absorbed by the Earth's surface. These radiations help plants in carrying out the

process of photosynthesis. Also, they help maintain the Earth's temperature for the survival of living organisms. Some solar radiations are reflected by the Earth's surface. Only 2-10 percent of solar energy is captured by green plants (producers) during photosynthesis to be converted into food. The rate at which the biomass is produced by plants during photosynthesis is termed a 'gross primary productivity'. When these green plants are consumed by herbivores, only 10% of the stored energy from producers is transferred to herbivores. The remaining 90 % of this energy is used by plants for various processes such as respiration, growth, and reproduction. Similarly, only 10% of the energy of herbivores is transferred to carnivores. This is known as ten percent law of energy flow.



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

12. The important features of a sedimentary cycle in an ecosystem are following:

1. Elements such as sulphur, phosphorus, potassium, and calcium have sedimentary cycles and their reservoirs is in the Earth's crust or rocks..

2. Sedimentary cycles are very slow as they take a long time to complete their circulation. During recycling the nutrient elements get locked in the reservoir pool, thereby taking a long time to come out and continue circulation.

3. Rock minerals once released into the soil solution do not return to the rock itself.

13. Outline salient features of carbon cycling in an ecosystem

13. The carbon cycle is an important gaseous cycle which has its reservoir pool in the atmosphere. All living organisms contain carbon as a major body constituent. Carbon is a fundamental element found in all living forms. All biomolecules such as carbohydrates, lipids, and proteins required for life processes are made of carbon. Carbon is incorporated into living forms through a fundamental process called 'photosynthesis'. Photosynthesis uses sunlight and atmospheric carbon dioxide to produce a carbon compound called 'glucose'. This glucose molecule is utilized by other living organisms. Thus, atmospheric carbon is incorporated in living forms. Now, it is necessary to recycle this absorbed carbon dioxide back into the atmosphere to complete the cycle. There are various

processes by which carbon is recycled back into the atmosphere in the form of carbon dioxide gas. The process of respiration breaks down glucose molecules to produce carbon dioxide gas. The process of decomposition also releases carbon dioxide from dead bodies of plants and animals into the atmosphere. Combustion of fuels, industrialization, deforestation, volcanic eruptions, and forest fires act as other major sources of carbon dioxide.