

CBSE Class 12
Biology
Ch 14 – ECOSYSTEM

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 _____.

Ans. (a) Producers

(b) Upright

(c) Availability of sunlight

(d) Bacteria, fungi and earthworm

(e) 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**

Ans. (d) Decomposers

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.

3. The second trophic level in a lake is-

- (a) Phytoplankton**
 - (b) Zooplankton**
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(c) Benthos

(d) Fishes

Ans. (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

Ans. (d) None of the above

Plants are the only producers. Thus, they are called primary producers. There are no other producers in a 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%

Ans. (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

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

Grazing Food Chain	Detritus Food Chain
i. Energy for the food chain comes from the Sun.	i. Energy comes from detritus (organic matter).
ii. First trophic level organisms are producers.	ii. First trophic level organisms are detritivores and decomposers.

(b) Production and decomposition

Production	Decomposition
i. It refers to the process of synthesis of organic compounds from inorganic substances utilising sunlight.	i. It is the phenomenon of degradation of waste biomass.
ii. Example: Plants perform the function of production of food.	ii. Example: Bacteria and fungi decompose dead organic matter.

(c) Upright pyramid and inverted pyramid

Upright Pyramid	Inverted Pyramid
When the number of producers or their biomass is maximum in an ecosystem and it decreases progressively at each trophic level in a food chain, an upright pyramid is formed.	When the number of individuals or their biomass at the producer level is minimum and it increases progressively at each trophic level in a food chain, an inverted pyramid is formed.

(d) Food chain and food web

Food Chain	Food Web
i. A food chain is a single pathway where energy is transferred from producers to successive orders of consumers.	i. A food web is a network of various food chains which are interconnected with each other like an interlocking pattern.
ii. All food chains start with green plants which are the original source of all food.	ii. It has many linkages and intercrosses among producers and consumers.

(e) Litter and detritus

Litter	Detritus
The dead remains of plants (leaves, flowers etc.) and animals and animal excreta which falls on the surface of the Earth in terrestrial ecosystems is called litter.	The dead remains of plants and animals constitute detritus. It is differentiated into litter fall (above ground detritus) and below ground detritus.

(f) Primary and secondary productivity

Primary Productivity	Secondary Productivity
i. It is the rate at which organic matter is built up by producers.	i. It is the rate of synthesis of organic matter by consumers.
ii. It is due to photosynthesis.	ii. It is due to herbivory and predation.

7. Describe the components of an ecosystem.

Ans. 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 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. 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.

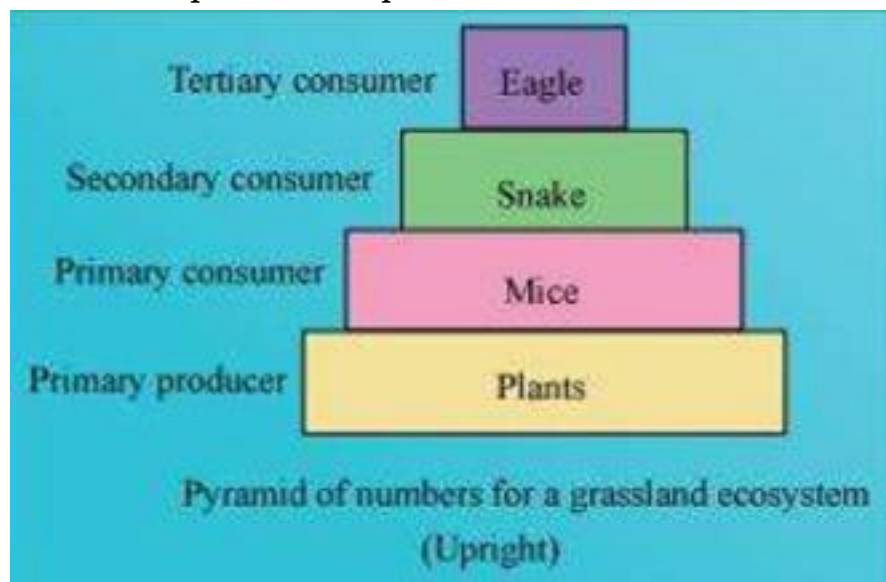
(b) Abiotic component: They are the non-living component of an ecosystem such as light, temperature, water, soil, air, inorganic nutrients, etc.

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

Ans. An ecological pyramid is a graphical representation of various ecological parameters such as the number of individuals present at each trophic level, the amount of energy, or the biomass present at each trophic level. Ecological pyramids represent producers at the base, while the apex represents the top level consumers present in the ecosystem. There are three types of pyramids:

- (a) Pyramid of numbers
- (b) Pyramid of energy
- (c) Pyramid of biomass

Pyramid of numbers: It is a graphical representation of the number of individuals present at each trophic level in a food chain of an ecosystem. The pyramid of numbers can be upright or inverted depending on the number of producers. For example, 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.

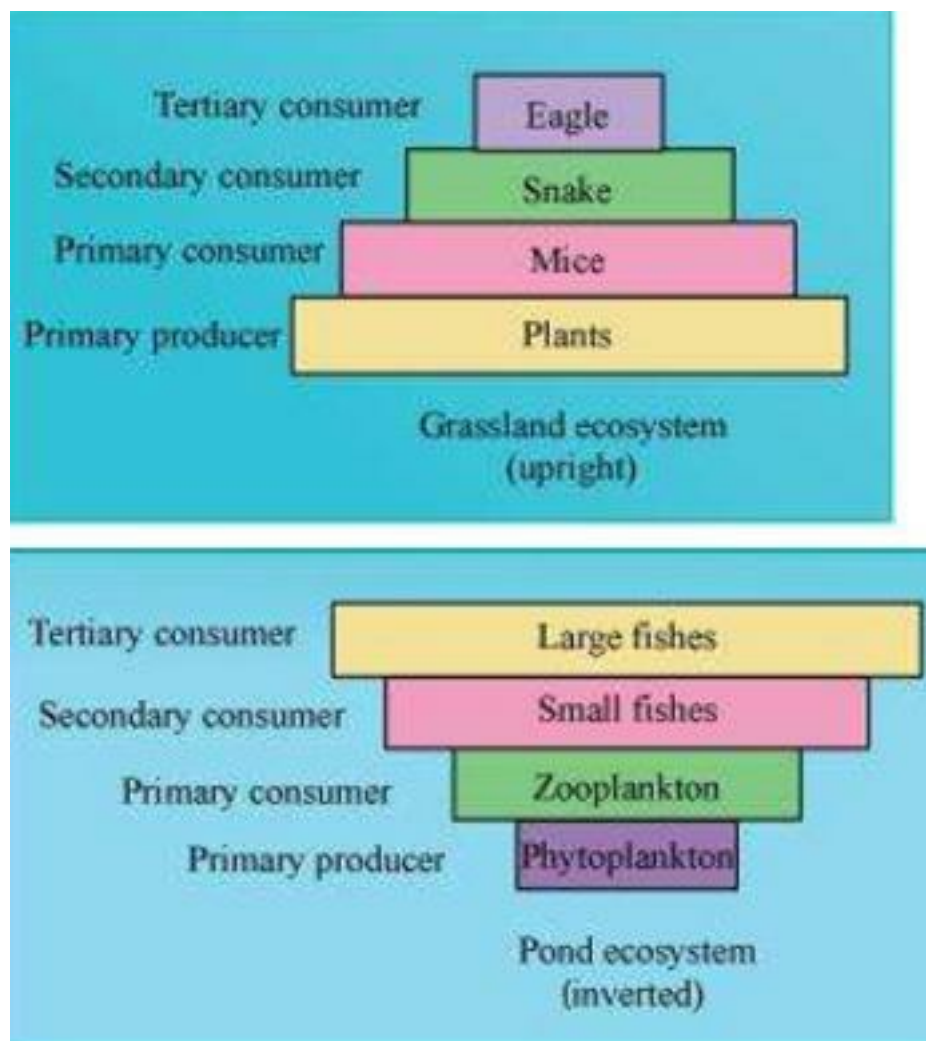


On the other hand, in a parasitic food chain, the pyramid of numbers is inverted. In this type of a food chain, a single tree (producer) provides food to several fruit eating birds, which in turn support several insect species.

Pyramid of biomass

A pyramid of biomass: It 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. 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. 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.

Ans. 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.

Ans. 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.

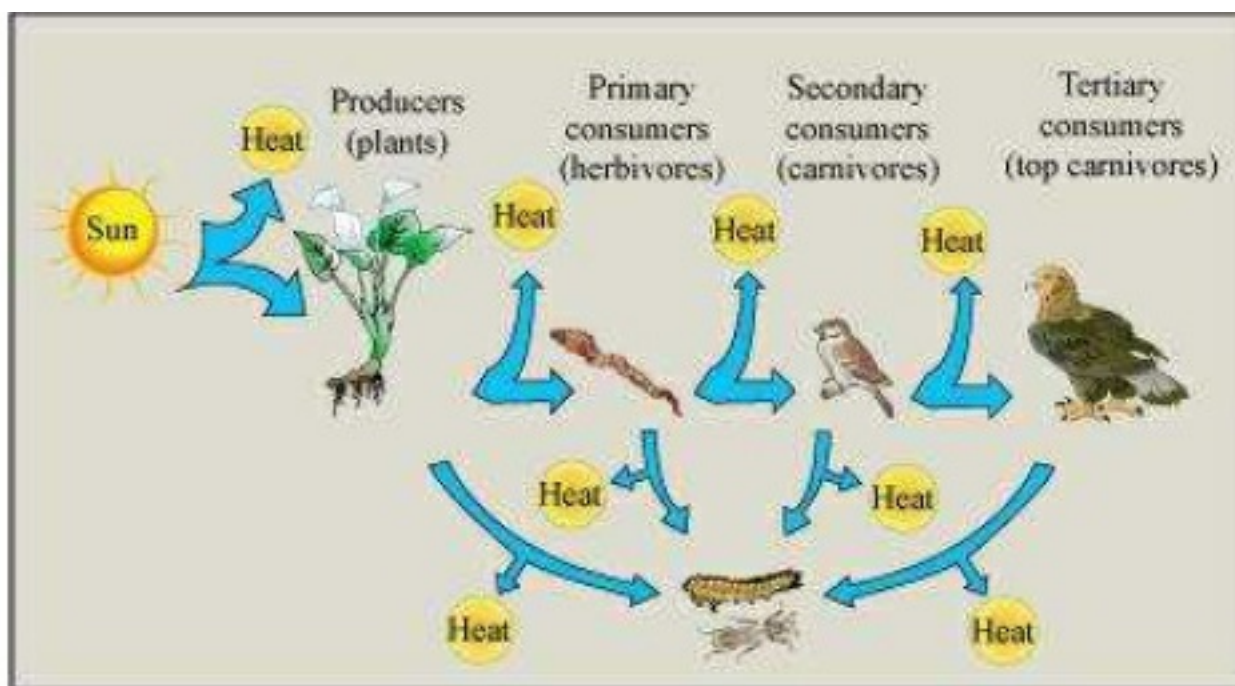
The various processes involved in decomposition are as follows:

- (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 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 nutrient in the soil.

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

Ans. Energy enters an ecosystem from the Sun. Solar 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 as '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.



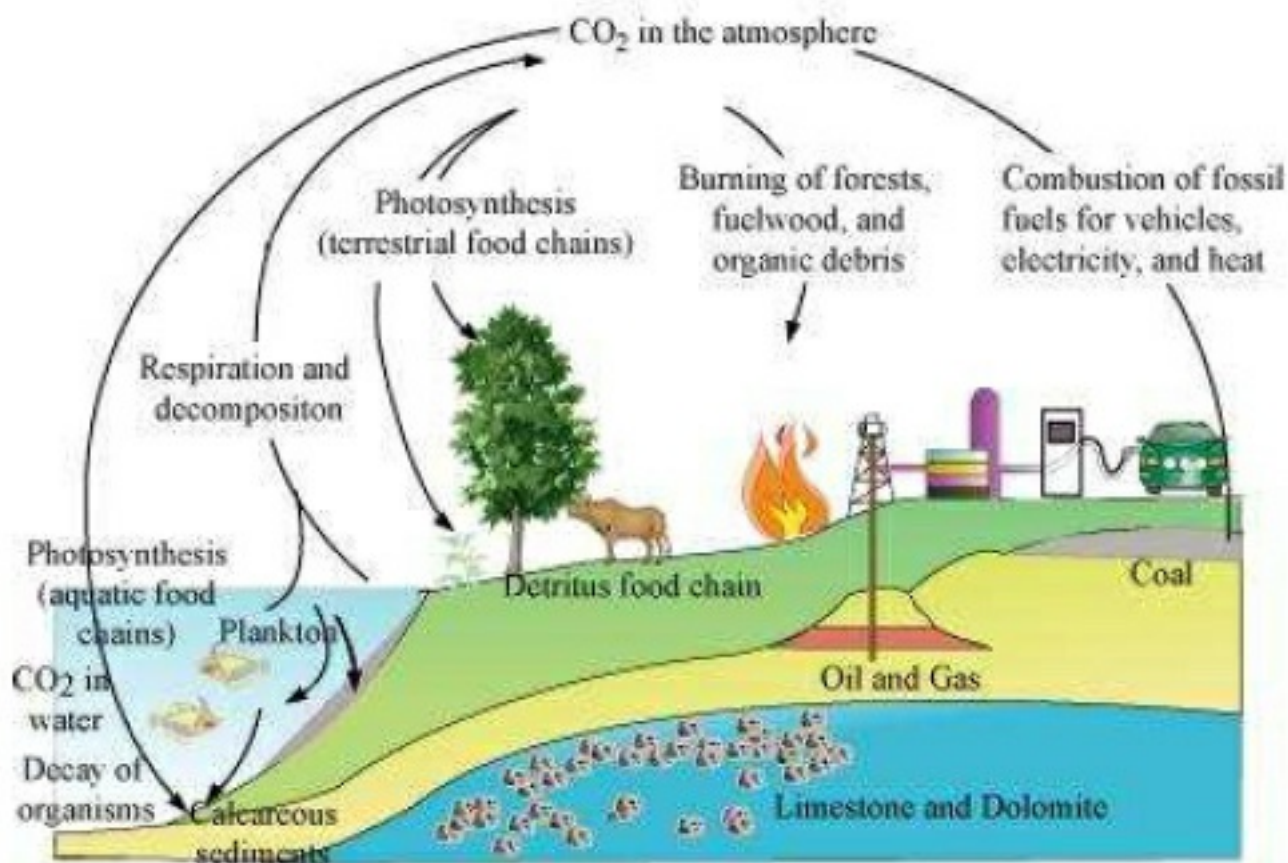
12. Write important features of a sedimentary cycle in an ecosystem.

Ans. Sedimentary cycles have their reservoirs in the Earth's crust or rocks. Nutrient elements are found in the sediments of the Earth. Elements such as sulphur, phosphorus, potassium, and calcium have sedimentary cycles.

Sedimentary cycles are very slow. They take a long time to complete their circulation and are considered as less perfect cycles. This is because during recycling, nutrient elements may get locked in the reservoir pool, thereby taking a very long time to come out and continue circulation. Thus, it usually goes out of circulation for a long time.

13. Outline salient features of carbon cycling in an ecosystem

Ans.



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.