# 14. Ecosystem

**Question 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) Plants are called as Autotrophs because they fix carbon dioxide and produces their own food.
(b) In an ecosystem dominated by trees, the pyramid (of numbers) is of Inverted type because it makes more biomass that leads to the large population of birds and insects as compared to the trees.
(c) In aquatic ecosystems, the limiting factor for productivity is light as plants and algae cannot grow in the absence of light.
(d) Common detritivores in our ecosystem are earthworms as they get nutrients from decaying organic matter.
(e) A major reservoir of carbon on earth is oceans.

**Question 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
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.

**Question 3. The second trophic level in a lake is**

**(a) Phytoplankton**

**(b) Zooplankton**

**(c) Benthos**

**(d) Fishes**

Answer: (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.

**Question 4. Secondary producers are**

**(a) Herbivores**

**(b) Producers**

**(c) Carnivores**

**(d) None of the above**

Answer: (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.

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

**Question 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 |
|---|---|
| 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 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. |

| | |
|---|---|
| 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 tropic 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. |

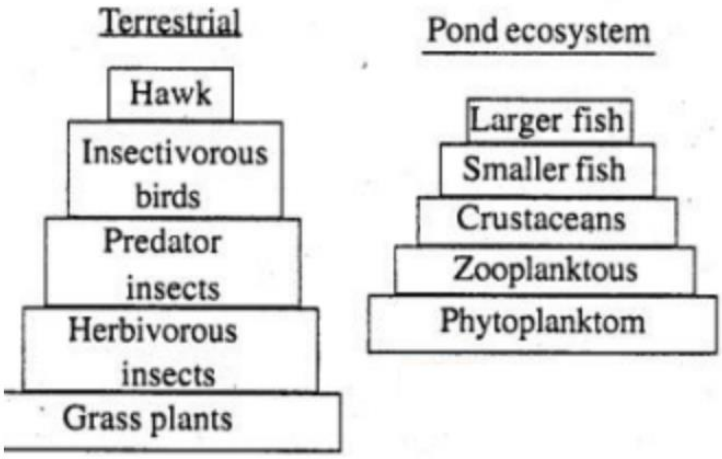
## Question 7. Describe the components of an ecosystem.

Answer: An ecosystem refers to be the functional unit of nature in which living organisms interact among themselves and also with their surrounding physical environment in order to perform nutrient cycling, energy flow, decomposition and productivity. There are many types of ecosystems such as pond ecosystem, forest ecosystem etc.

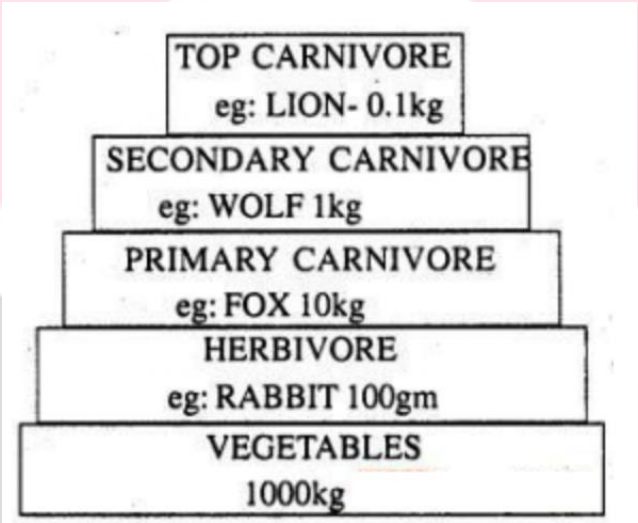
Components of ecosystem
The components of the ecosystem can be divided into abiotic components and biotic components
1. Abiotic components- These include the non-living components of nature such as light, temperature, water, soil, air, inorganic nutrients etc.
2. Biotic components- The biotic components of an ecosystem refer to the living organisms present in that ecosystem. The biotic components are divided as producers, consumers and decomposers. Producers are plants, consumers include animals which can be herbivores or carnivores and decomposers include microorganisms like fungi and bacteria.

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

Answer: Ecological pyramids They are the graphical representations of various ecological parameter at the successive trophic levels of food chains with producers at the base top carnivores at the apex and intermediate levels .in between. Quantity at each level is indicated by length of bar in the graph. The pyramids are therefore also called bar diagrams. Pyramids of number It is graphical representation of numerical strength of various populations in different trophic levels per unit area of an ecosystem with producers forming base intermediate levels forming intermediate tiers and apex formed by top carnivores length of bar at each trophic level is proportional to the number of individuals at this level.




Pyramid of biomass : Biomass is the amount of living matter measured in terms of fresh or dry weight. Dry weight is preferred as it avoids seasonal variations in moisture content of biomass. Pyramid of biomass is the graphical representation of amount of biomass per unit area sequence wise in rising trophic levels with producers at the base and top carnivores at the apex. Length of the bar indicates the comparative amount of biomass at that trophic level. Biomass, is maximum in producers. Only 10% to 20% biomass is passed from producer level to herbivore level.




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

Answer: 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.

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

Answer: Decomposition is the process of breaking down of complex organic matter with the help of decomposers into smaller inorganic raw material such as CO2, H2O, and other nutrients. It constitutes of various processes:
1. Fragmentation: The 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: Humification 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 CO2,water, and other nutrient in the soil.

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

Answer: Energy Flow in an ecosystem
All living organisms are dependent for their food on producers, directly or indirectly. There is a unidirectional flow of energy from the sun to producers and then to consumers. Photosynthetically active radiation (PAR) is responsible for the synthesis of food by plants. Animals obtain their food from plants, so they are called consumers. The process of eating and being eaten is called a food chain in which energy flows from producers to consumers. For example, in Grazing food chain, the grass is eaten by goats which are further eaten by man. Similarly, in the detritus food chain, the sequence begins with dead organic matter. It is made up of decomposers which are heterotrophic organisms (fungi and bacteria). These are also known as saprotrophs. Decomposers secrete digestive enzymes that

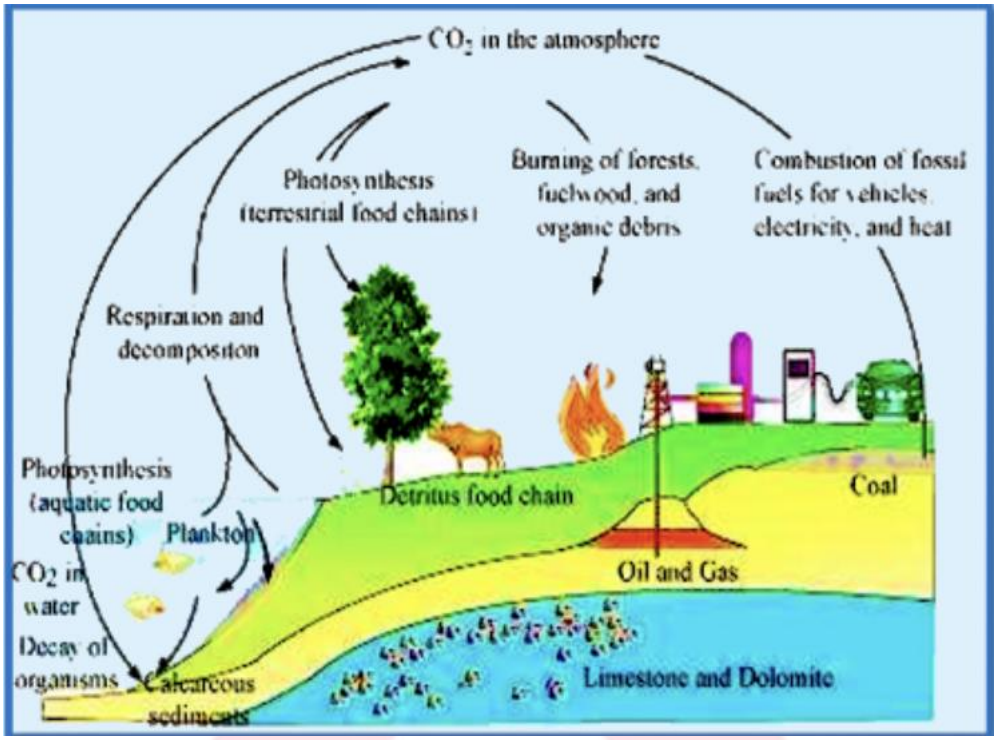
breakdown dead and waste materials into simple, inorganic materials, which are subsequently absorbed by them. Natural interconnection of food chain forms the food web. Thus, in an ecosystem, energy flow occurs through food chains and food webs.

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

Answer: **FEATURES OF A SEDIMENTARY CYCLE IN AN ECOSYSTEM:**
Sedimentary cycle pertain to Phosphorous (P), Calcium (Ca), Potassium (K), Sulphur (S) and Magnesium (Mg).
The reservoir for nutrient elements is in the sediments of the earth, i.e. the lithosphere.
Sedimentary cycle is very slow and takes a long time for completion.
It is a less perfect system when compared to gaseous cycles as elements get locked in the reservoir pool for long periods.

### Question 13. Outline salient features of carbon cycling in an ecosystem.

Answer: 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.


$CO_2$ in the atmosphere
Photosynthesis (terrestrial food chains)
Burning of forests, fuelwood, and organic debris
Combustion of fossil fuels for vehicles, electricity, and heat
Respiration and decomposition
Photosynthesis (aquatic food chains)
Plankton
$CO_2$ in water
Decay of organisms
Calcareous sediments
Detritus food chain
Coal
Oil and Gas
Limestone and Dolomite