

Chapter-14
Ecosystem
Class – XII
Subject –Biology

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 1.

- (a) Autotrophs
(b) Inverted
(c) Light
(d) Earthworms
(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

Answer 2.

- (d) Decomposers

Bacteria and fungi are the main components of decomposer. They form the largest population in a food chain and depend on the dead plants and animals for the nutrients

3. The second trophic level in the lake is

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

Answer 3.

Zooplankton

Zooplankton feed upon phytoplankton as they are primary consumers in aquatic food. 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

Answer 3.

Herbivores

Plants are the only producers. Thus, they are called primary producers. Herbivores depends on the plants, so they are the secondary producer in 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%

Answer 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

Answer 6.

(a) Grazing food chain and detritus food chain

Grazing food chain	Detritus food chain
Energy is derived from sun	Energy comes from organic matter(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	Usually smaller as compare to grazing food chain

(b) Production and decomposition

Production	Decomposition
It can be defined as the rate of producing organic matter by producer	It occurs with the help of producer
Depends on photosynthetic capacity of the producer.	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.
Sun light is required by plants for primary production	Sun light is not required

(c) Upright and inverted pyramid

Upright Pyramid	Inverted Pyramid
The pyramid of energy is always upright	The pyramid of biomass and pyramid of number 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 kept on increasing at each trophic level.

(d) Food chain and Food web

Food chain	Food web
It is a single linear sequence of organisms	More than one interconnected food chains
Members are present at high trophic levels feed on single types of organisms	One organism has alternate food sources

(e) Litter and detritus

Litter	Detritus
Contains all kinds of waste generated above the ground	Detritus is composed of the remains of dead plants and animals.
Consist of both biodegradable and non biodegradable matter	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.

7. Describe the components of an ecosystem

Answer 7.

An interaction which includes both the biological community as well as the non-living components of an area is collectively known as ecosystem. The living and the non-living components interact amongst themselves and form 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:

1) Biotic component: Biotic component means living component of an ecosystem that includes biotic factors such as producers, consumers, decomposers, etc. Plants and algae come under producer level. They perform photosynthesis by the help of chlorophyll pigment in the presence of light. Thus, they are also called convertors or transducers. Consumers or heterotrophs are organisms that are directly (primary consumers) or indirectly (secondary and tertiary consumers) dependent on producers for their food. Bacteria and fungi are the main components of decomposer. They form the largest population in a food chain and depend on the dead plants and animals for the nutrients

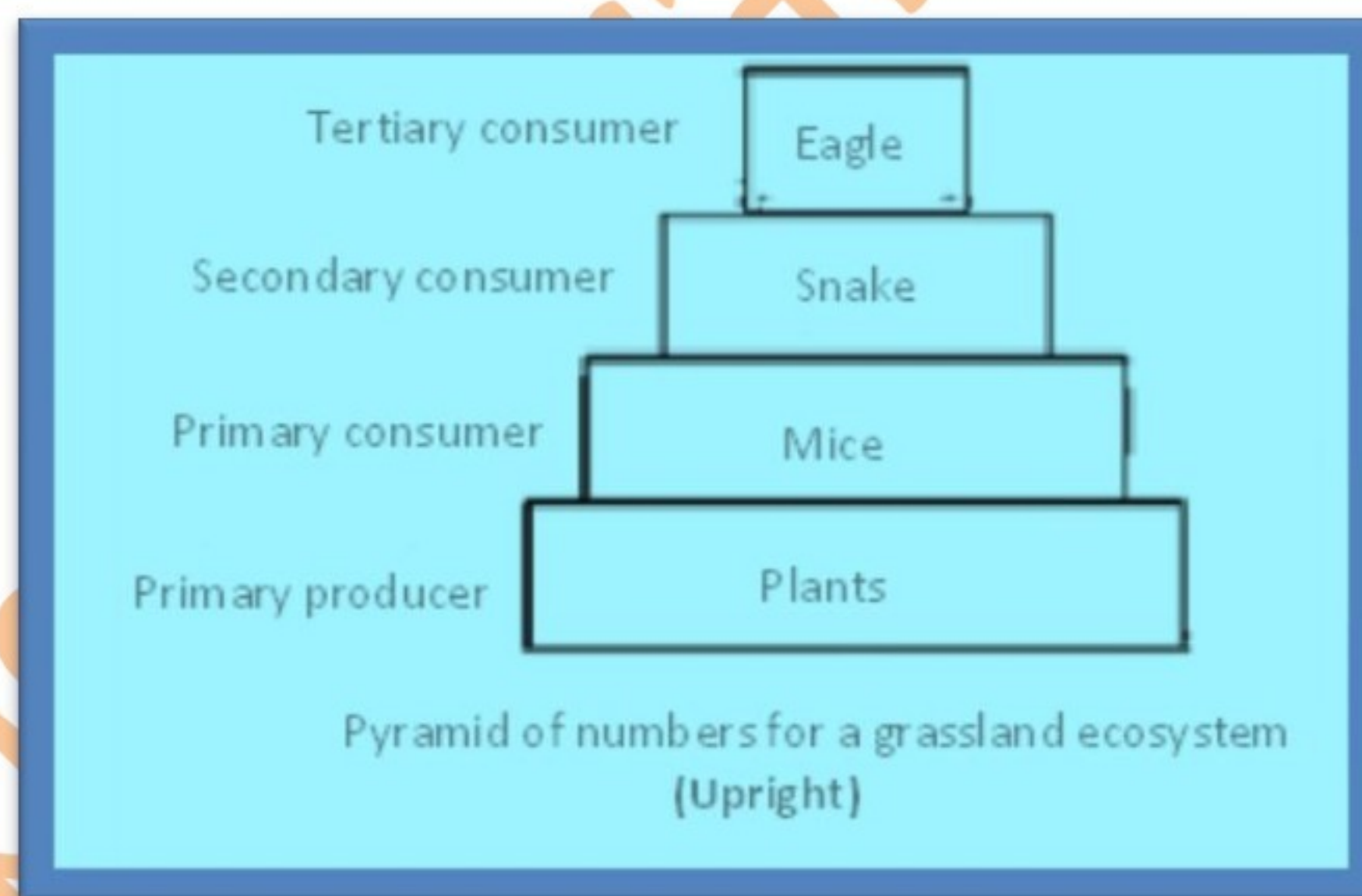
2) Abiotic component: Abiotic component means non-living component of an ecosystem such as inorganic nutrients, water, soil, air, light, temperature, etc.

8. Define ecological pyramids and describes with examples, pyramids of numbers and biomass

Answer 8.

The quantitative representation of the numbers of organisms, energy relationships, and biomass of an ecosystem in a pyramid-shaped diagram is termed as ecological pyramids. Here numbers are high for the plants (lowest trophic levels) and low for the (carnivores) highest trophic level.

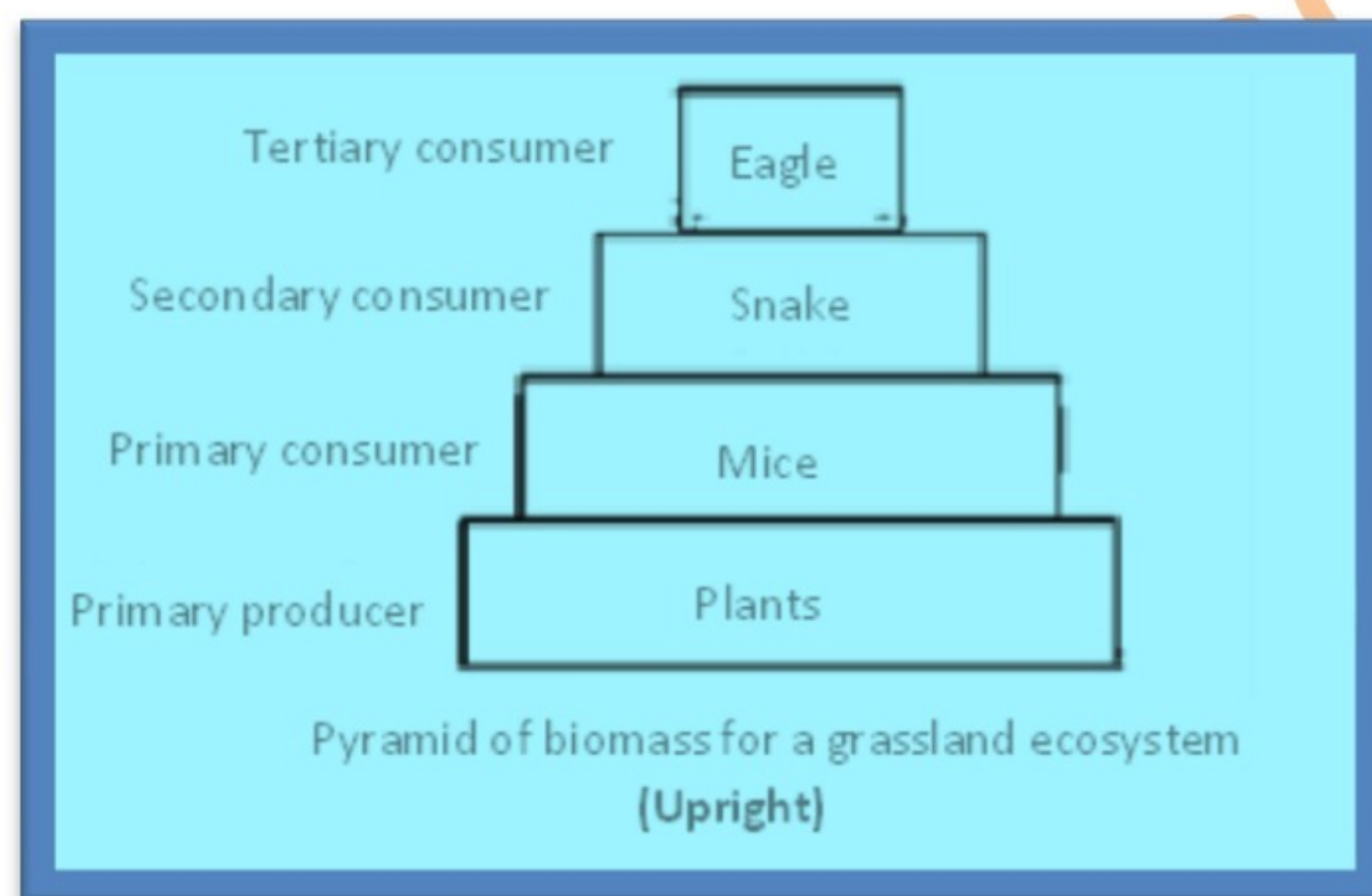
Pyramid of numbers: The number of individuals present at each trophic level in a food chain of an ecosystem is represented in the graphical form. The pyramid of numbers can be upright or inverted depending on the number of producers. For example, the pyramid of numbers is upright in a grassland ecosystem.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

Answer 9.

It is defined as the amount of biomass (organic matter) produced by producers per unit area over a period of time. Variety of environmental factors such as light, temperature, water, precipitation, etc affects primary productivity. 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.

Answer 10.

When a plant, animal, or insect dies, that plant, animal, or insect is broken into tiny pieces and those pieces become part of the soil. This is called decomposition. Bacteria, fungi, and some worms are what break down dead plants, animals, and insects. The bacteria, fungi, and worms are called decomposers. Decomposers need to eat some of the dead things so they can live and grow.

Common decomposers in an ecosystem are:

- Bacteria
- Fungus and
- Earthworm

Below are the various steps of decomposition:

(1) Fragmentation: It is the first step which 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: In this process fungi degrade detritus through various enzymes into smaller pieces.

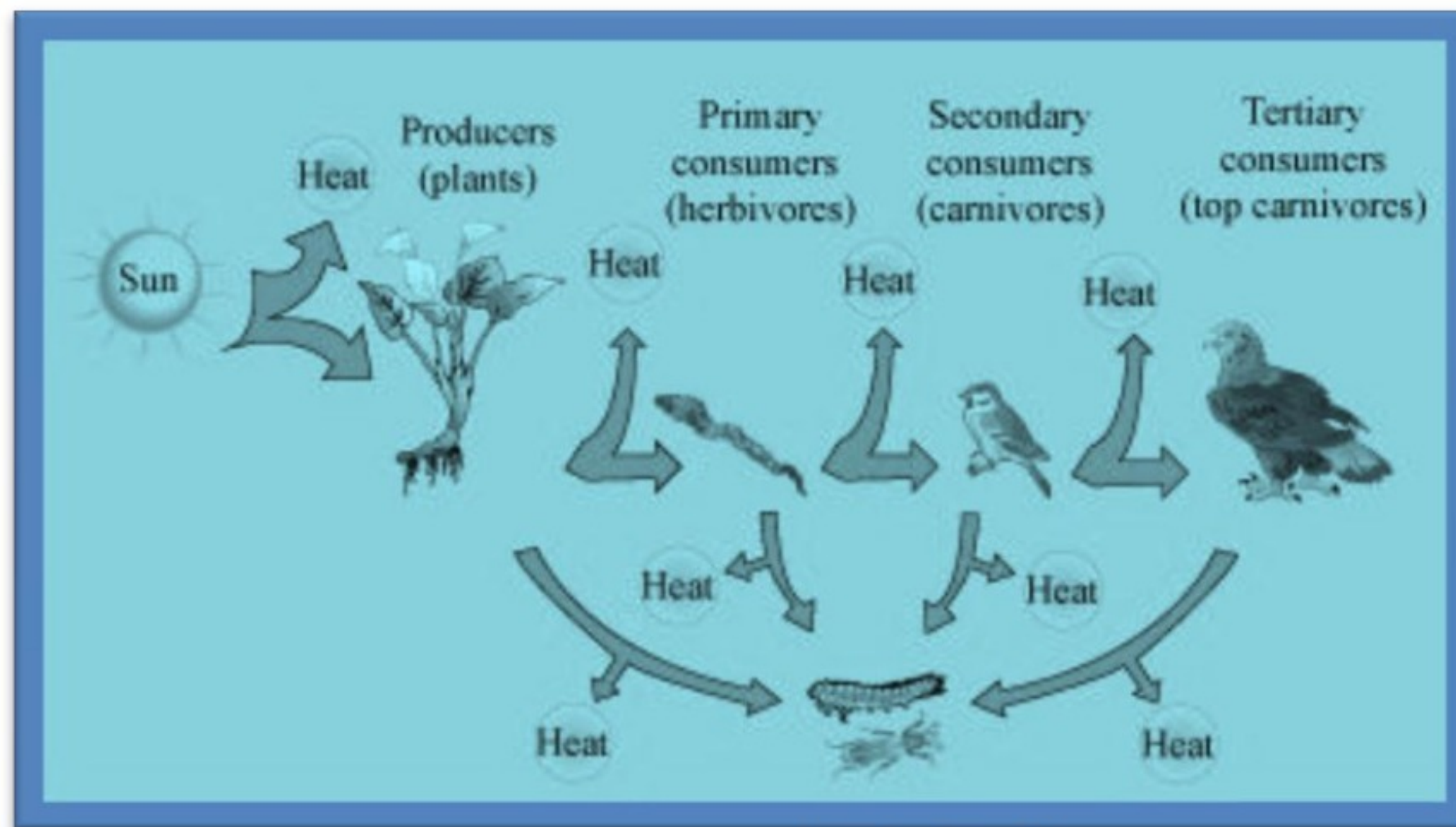
(4) Humification: Formation of a dark- coloured colloidal substance called humus, which acts as reservoir of nutrients for plants.

(5) Mineralization. In this process humus is further degraded by the action of microbes, which finally leads to the release of inorganic nutrients into the soil. Mineralization is defined as the process of releasing of inorganic nutrients from the 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.

Answer 11.

As sun is the ultimate source of energy. Earth's surface absorbs the solar radiation when it passes through atmosphere. 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 as 'gross primary productivity'. Energy flow in an ecosystem follows **ten percent law**. 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.



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

Answer 12.

The reservoir for sedimentary cycles exists in the earth's crust or rocks. 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.

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

Answer 13.

The carbon cycle is an important gaseous cycle which occurs through atmosphere. About 49% of dry weight of organisms is constituted by carbon. 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'. About 71% of global carbon is found dissolved in ocean and this oceanic reservoir regulates the amount of carbon dioxide in atmosphere. 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. Burning of fossil fuel or fuels wood, organic debris, forest fires, volcanic activity and the process of respiration breaks down glucose molecules to produce carbon dioxide gas

