CHAPTER 12

ECOSYSTEM

(A) NCERT QUESTIONS & SOLUTIONS

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)** Inverted **(c)** Light

(d) Earthworm, ants and mites **(e)** Oceans (71% dissolved carbon)

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. **(a) Producers (decomposers can be maximum but they are excluded from the food chain)**

3. The second trophic level in a lake is

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

Ans. **(b) Zooplankton**

4. Secondary producers are

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

Ans. **(a) Herbivores**

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%**

6. Distinguish between **[IMP.]**

(a) Grazing food chain and detritus food chain

(b) Production and decomposition

(c) Litter and detritus

(d) Upright and inverted pyramid

(e) Food chain and food web

(f) Primary and secondary productivity

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

S.No.	Grazing food chain	Detritus food chain
(i)	It start with green plants called producers as first trophic level.	It begins with dead organic matter and decomposers called saprophytes as first trophic level.
(ii)	A much less fraction of energy flows through this type of food chain.	A much large fraction of energy flows through this type of food chain.
(iii)	Energy for food chain comes from sun.	Energy for the food chain comes from organic remains or detrirus

(b) Production and decomposition

S.No.	Production	Decomposition
(i)	It is the process of formation of fresh biomass from inorganic matter by producers using sunlight.	It is the process of degradation of waste biomass into its constituents by decomposers.
(ii)	It is anabolic process which traps energy.	Its catabolic process and release energy.

(c) Litter and detritus

S.No.	Litter	Detritus
(i)	It is made of dried fallen plant matter.	The base bas comprises producers in smallest numbers.
(ii)	It is found above the ground.	It is found both above and below the ground.

(d) Upright and inverted pyramid

S.No.	Upright pyramid	Inverted pyramid
(i)	The base bar comprises of producers in large numbers.	The base bar comprises producers in smallest numbers.
(ii)	The numbers of consumers decrease and become least in top consumer level. e.g. Pyramid of energy is always upright.	The numbers of consumers increase and become largest in top consumers level. e.g. Pyramid of number and biomass may be inverted.

(e) Food chain and food web

S.No.	Food chain	Food web
(i)	The transfer of energy from producers to top consumers through a series of organisms is called as food chain.	The numbers of food chain are inter connected with each other forming a web like pattern is called food web.
(ii)	One organism hold only one position of trophic level.	One organism can hold more than one position of trophic level.
(iii)	The flow of energy can be easily calculated.	The flow of energy is very difficult to calculate.
(iv)	It is always straight and proceed in a progressive straight line.	Instead of straight line it is a series of branching lines.

(f) Primary and secondary productivity

S.No.	Primary productivity	Secondary productivity
(i)	It is the rate at which organic matter is build up by produces.	It is the rate at which organic matter is build up by consumers.
(ii)	It is the result of synthesis of fresh organic matter from inorganic materials.	It is the result of synthesis of organic matter from plant organic matter.

7. Describe the components of an ecosystem.

Ans. An ecosystem consists of two types of components, ie., biotic or living and abiotic or non-living. There are three main types of biotic components on the basis of mode of obtaining their food- producers, consumers and decomposers.

(a) **Producers (autotrophs)**: They are photosynthetic or autotrophic plants that synthesise their own organic food from inorganic raw materials with the help of solar radiations. Common producers are algae, plants and photosynthetic bacteria. Phytoplanktons are the producers of aquatic ecosystems.

(b) **Consumers (heterotrophs)**: They are animals which feed on other organisms or producers for obtaining their nourishment. Common consumers are deer, goat, etc.

(c) **Decomposers**: They are saprotrophs which obtain nourishment from organic remains. They release digestive enzymes to digest the organic matter. Common decomposers are detritivores, e.g. earthworm.

Abiotic components of ecosystem consists of non-living substances and factors which are as follow:

(a) Temperature (b) Light (c) Wind (d) Humidity

ation (f) Water

8. Define ecological pyramids and describe with examples, pyramids d biomass.

Ans. The relationship between producers and consumers at different trophic levels in an ecosystem can be graphically represented in the form of a pyramid called ecological pyramid.

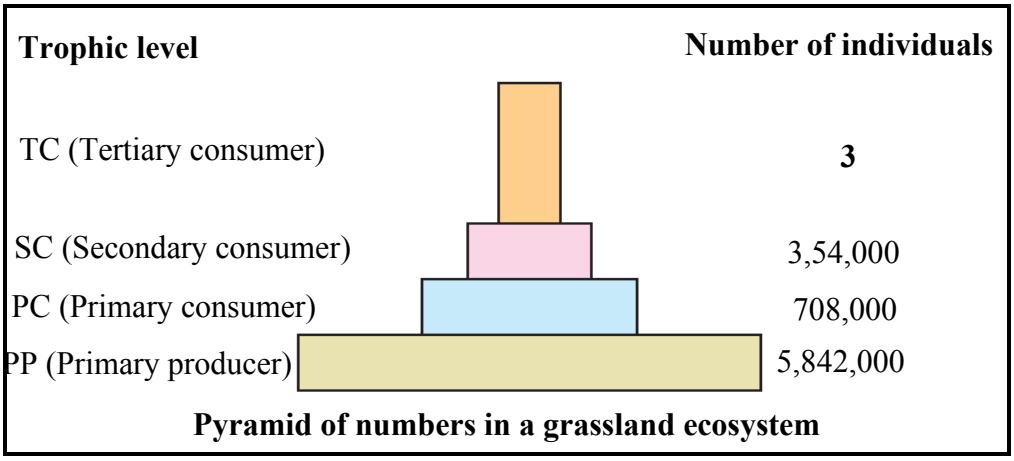
Structure: The base always represents the producers or the first trophic level and the apex represents top level consumer or the last trophic level.

Ecological pyramids are of three types :

(i) Pyramid of number (ii) Pyramid of biomass (iii) Pyramid of Energy

(i) Pyramid of number: The relationship between producers and consumers in an ecosystem can be represented in the form of a pyramid in terms of number of organisms at different trophic levels called pyramid of number.

Note: It is inverted, when you count number of insects feeding on a big tree.

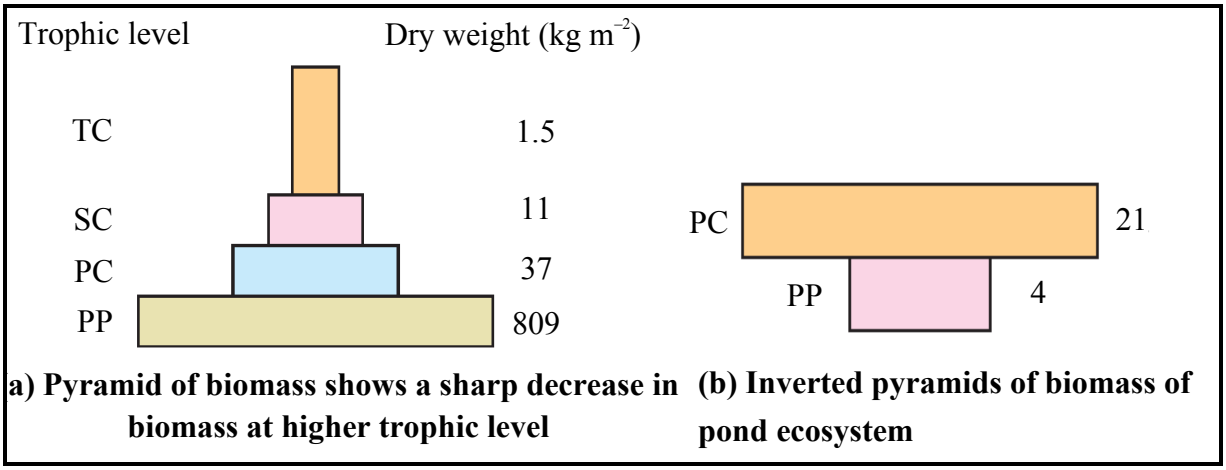


Pyramid of numbers in a grassland ecosystem

(ii) Pyramid of biomass: The relationship between producers and consumers in an ecosystem can be represented in the form of a pyramid in terms of biomass called pyramid of biomass. It can be

(a) Upright, e.g. in case of grassland ecosystem;

(b) Inverted, e.g. in case of pond ecosystem as biomass of fishes for exceeds that of phytoplankton



a) Pyramid of biomass shows a sharp decrease in biomass at higher trophic level

(b) Inverted pyramids of biomass of pond ecosystem

9. What is primary productivity? Give brief description of factors th y productivity. [IMP.]

Ans. Primary productivity is the rate of synthesis of biomass by producers, per unit time, per unit area through the process of photosynthesis.

The factors affecting primary productivity are following :-

- Plant species inhabiting a particular area.
- Environmental factors:

(i) Sunlight : The sunlight directly regulates the primary productivity because the plants perform photosynthesis with the help of sunlight. As tropical region receives maximum sunlight so it exhibits higher productivity.

(ii) Temperature: Temperature regulates the activity of enzyme. So, optimum temperature is required for proper functioning of enzyme.

(iii) Moisture: Rain (humidity) is required for higher primary productivity. Deserts have the lowest primary productivity as the soil is deficient in moisture.

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

Ans. The process of breaking down complex organic matter into inorganic substances like CO, water and nutrients is called decomposition. The raw materials for decomposition including dead plant remains like leaves, bark, flowers, and animal remains and their faecal matter are called detritus.

Steps of Decomposition

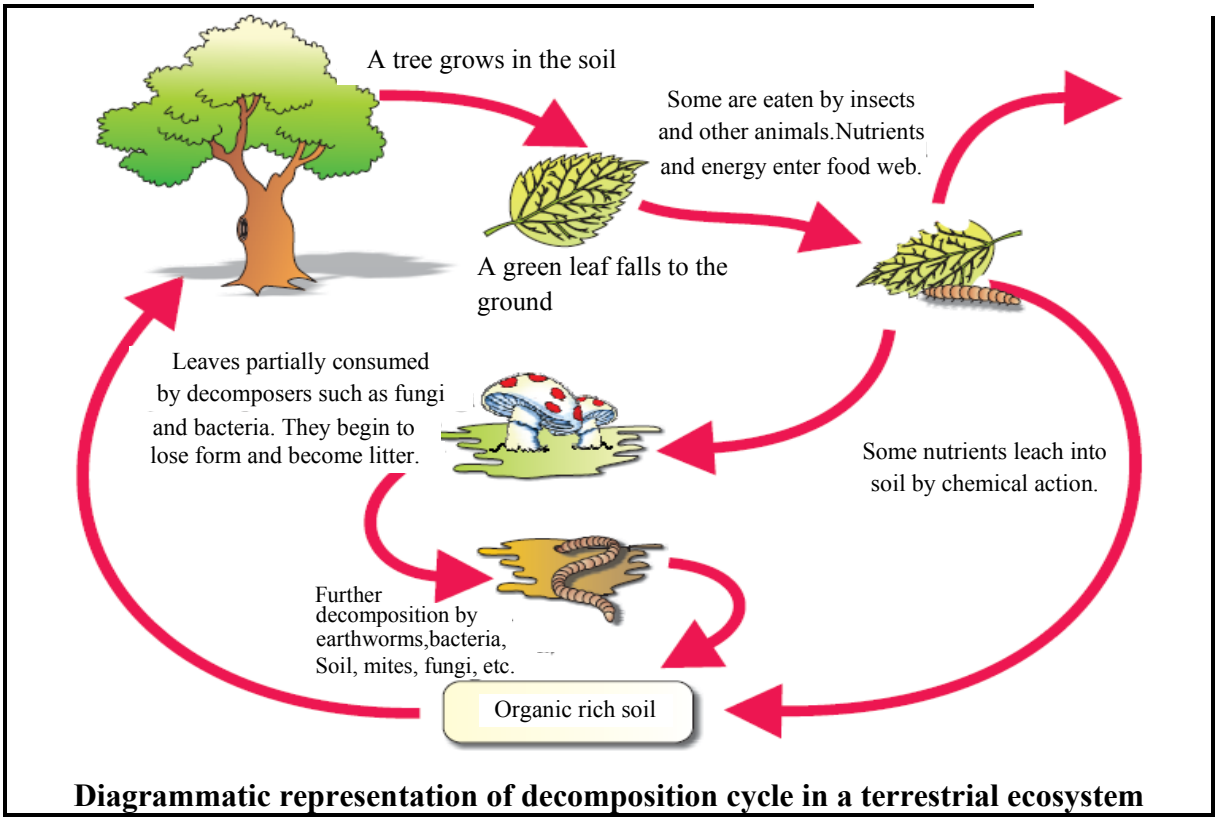
(1) Fragmentation: The process of breaking down of detritus into smaller particle is called fragmentation, eg., as done by earthworm (farmer's friend).

(2) Leaching: The process by which water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts is called leaching.

(3) Catabolism: The enzymatic process by which bacterial and fungal enzymes degrade detritus to simpler inorganic substances is called catabolism.

(4) Humification: The process of accumulation of a dark coloured amorphous substance, called humus, that is highly resistant to microbial action and undergoes decomposition at an extremely slow rate is called humification. Humus being colloidal is reservoir of nutrients.

(5) Mineralisation: The process by which humus is further degraded by some microbes to release inorganic nutrients is called mineralisation.



Diagrammatic representation of decomposition cycle in a terrestrial ecosystem

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

Ans. The sun is the only source of energy for all ecosystems on earth. Of the total incident solar radiation, only 50% of it is photosynthetic active radiation (PAR).

- Plant capture only 2-10 % of the PAR and this small amount of energy sustains the entire living world. So, there is unidirectional flow of energy from the sun to producers and then to consumers
- The energy is transferred in an ecosystem, in the form of food which is degraded and lose major part of food energy as heat during metabolic activities and only a very small fraction becomes stored as biomass
- This is correlated to second law of thermodynamics, i.e., ecosystems need a constant supply of energy to synthesize molecules they require, to counteract universal tendency towards increasing disorderliness.
- The green plants in the ecosystem which can trap solar energy to convert it into chemical bond energy are called producers.
- All the animals that depend for food on plants are called consumers or heterotrophs.
- Consumers are divided into the following categories:
  (i) Primary consumers: Animals which feed directly on plants, i.e., herbivores.
  (ii) Secondary consumers: Consumers that feed on primary consumers, i.e.. carnivores.
  (iii) Tertiary consumers: Consumers that feed on secondary consumers
- Lindeman's 10 per cent law: At each step of food chain, when food energy is transferred from one trophic level to the next higher trophic level, only about 10 per cent of energy is passed on to the next trophic level. This is known as Lindeman's 10 per cent law given by Lindeman in 1942.

(B) PREVIOUS YEAR QUESTIONS

1. The primary productivity in an ecosystem is expressed as : **[CBSE 2023]**

(a) $gm^{-2}\ yr^{-1}$ (b) $gm^{-2}\ yr$ (c) K cal $m^{-2}\ yr^{-1}$ (d) K cal m^{-2}

Ans. (a) $gm^{-2}\ yr^{-1}$ and (c) K cal $m^{-2}\ yr^{-1}$

2. **Assertion (A) :** Decomposition process is slower if detritus is rich in lignin and cutin.

Reason (R) : Decomposition is làrgely an oxygen requiring process. **[CBSE 2023]**

Ans. (b) Both Assertion (A) and Reason (R) are true but Reason (R) is NOT the correct explanation of Assertion (A).

3. Mention four significant services that a healthy forest ecosystem provide. [CBSE 2019]

Ans. Purify air, Production of O_2, Purify water, Mitigate droughts and floods, Nutrients cycling, generate fertile soils, Provide wildlife habitat, Maintain biodiversity, Pollinate crops, Provide site for carbon storage, Provide aesthetic - cultural - spiritual values, economic benefits, from nature food, industrial products, products of medicinal importance.

5. Give the answer of following questions.

(a) What is a trophic level in an ecosystem ? What is 'standing crop' with reference to it ?

(b) Explain the role of the 'first trophic level' in an ecosystem.

(c) How is the detritus food chain connected with the grazing food chain in a natural ecosystem ? **[CBSE 2018]**

Ans. **(a)** Specific place of an organisms in a food chain, mass of living material (biomass) at each trophic level at a particular time.

(b) First trophic level has producers / autotrophs, which trap solar energy to produce food (photosynthesis).

(c) Organisms of the Detritus food chain (DFC) are the prey to the Grazing food chain (GFC) organism, the dead remains of GFC are decomposed into simple inorganic materials which are absorbed by DFC organisms.

6. Give the answer of following questions. **[CBSE 2018, 2019]**

(a) The pyramid of energy is always upright.' Explain.

(b) Explain with the help of labelled diagrams, the difference between an upright pyramid of biomass and an inverted pyramid of biomass.

Ans. (a) As the energy always flows from a particular trophic level to the next trophic level, some energy is always lost as heat at each step.

(b)

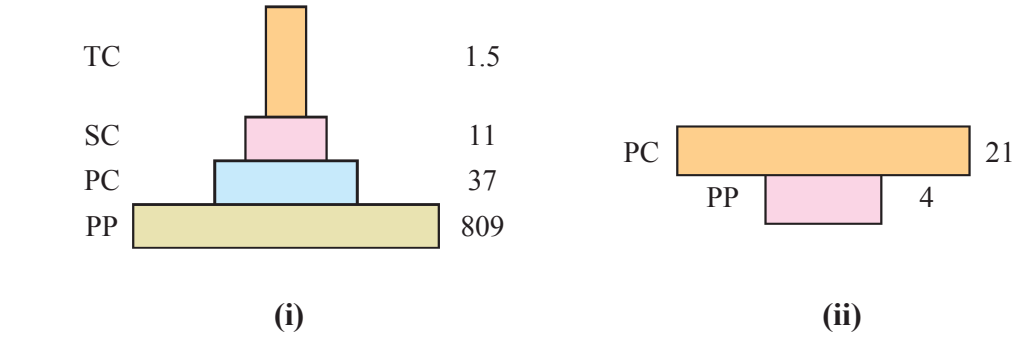


Fig. (i) Pyramid of biomass shows a sharp decrease in biomass at higher trophic level in most of the ecosystem.

(ii) Inverted Pyramid of biomass in sea ecosystem

Upright pyramid of biomass Inverted pyramid of biomass

Biomass of producer is more than In a sea consumer i .e fish has more the consumer of successive trophic biomass than the producers i.e level in most of the ecosystem phytoplanktons.

7. Describe the inter-relationship between productivity, gross primary productivity and net productivity. [CBSE 2017]

Ans. Productivity is the rate of biomass production per unit area over a period of time. Gross primary productivity is the rate of production of organic matter during photosynthesis in an ecosystem. Net productivity is the gross primary productivity minus respiration losses (R).

Net Productivity = GPP - R

(C) MULTIPLE CHOICE QUESTIONS

1. Decomposers like fungi and bacteria are

(a) Autotrophs (b) Heterotrophs (c) Saprotrophs (d) chemo-autotrophs

(1) (a) and (c) (2) (a) and (d) (3) (b) and (c) (4) (a) and (b)

Ans. (3) (b) and (c)

2. The process of mineralisation by microarganisms helps in the release of

(1) inorganic nutrients from humus

(2) both organic and inorganic nutrients from detritus

(3) organic mutrients from humus

(4) inorganic nutrients from detritus and formation of humus.

Ans. (1) inorganic nutrients from humus

3. Productivity is the rate of production of biomass expressed in terms of

(a) (kcal m^{-3}) yr^{-1}

(b) $g^{-2}yr^{-1}$

(c) $g^{-1}yr^{-1}$

(d) (kcal m^{-2}) yr^{-1}

(1) (b) (2) (c) (3) (b) and (d) (4) (a) and (c)

Ans. (3) (b) and (d)

4. An inverted pyramid of biomass can be found in which ecosystem?

(1) Forest (2) Marine (3) Grass land (4) Tundra

Ans. (2) Marine

5. What is the difference between a community or group of communities and an ecosystem?

(1) A community and the abiotic environment comprise an ecosystem.

(2) An ecosystem is a type to community.

(3) A biome includes only the plant community or commnunities present in an environment.

(4) An ecosystem includes only the abiotic aspects of a particular environment.

Ans. (1) A community and the abiotic environment comprise an ecosystem.

6. Which of the following ecosystems is most productive in terms of net primary production?

(1) Deserts (2) Tropical rain forests

(3) Oceans (4) Estuaries

Ans. (2) Tropical rain forests

7. Pyramid of numbers is

(1) always upright

(2) always inverted

(3) either upright or inverted

(4) neither upright nor inverted

Ans. (3) either upright or inverted

8. Of the total amount of energy that passes from one trophic level to another, a

(1) respired and becomes heat (2) passed out as faces or urine

(3) stored as body tissue (4) recycled to autotrophs

Ans. (3) stored as body tissue

9. During the process of ecological succession the changes that take place in communities are

(1) orderly and sequential (2) random

(3) very quick (4) not influenced by the physical environment.

Ans. (1) orderly and sequential

10. Climax community is in a state of

(1) non-equilibrium (2) equilibrium (3) disorder (4) constant change

Ans. (2) equilibrium

11. Trophic levels are formed by -

(1) Only plants (2) Only Carnivores

(3) Only animals (4) Organisms linked in food chain

Ans. (4) Organisms linked in food chain

12. Which one is not a functional aspect of ecosystem?

(1) Energy flow (2) Productivity (3) Decomposition (4) Stratification

Ans. (4) Stratification

13. A pond is a :-

(1) Biome (2) Natural ecosystem

(3) Artificial ecosystem (4) Community of plants and animals

Ans. (2) Natural ecosystem

14. If the carbon atoms fixed by producers already have passed through three species, the trophic level of the last species would be:

(1) Scavenger (2) tertiary producer

(3) tertiary consumer (4) secondary consumer

Ans. (3) tertiary consumer

15. Humans benefit from ecosystems because ecosystems provide

(1) bullers from natural disasters such as floods.

(2) maintenance of a clean water supply

(3) climate moderation.

(4) All of the above

Ans. (3) climate moderation

16. Which of the following type of ecosystem is expected in an area where e s precipitation, and mean annual rainfall is below 100 mm?

(1) Grassland (2) Shrubby forest (3) Desert (4) Mangrove

Ans. (3) Desert

17. The zone at the edge of a lake or ocean which is alternatively exposed to air and immersed in water is called:

(1) pelagic zone

(2) benthic zone

(3) lentic one

(4) littoral zone

Ans. (4) littoral zone

18. The source of energy in an ecosystem.

(1) Sunlight

(2) DNA

(3) ATP

(4) RNA

Ans. (1) Sunlight

19. Which of the following is an ecosystem service provided by a natural ecosystem?

(1) Cycling of nutrients

(2) Prevention of soil erosion

(3) Pollutant absorption and reduction of the threat of global warming

(4) All of the above

Ans. (4) All of the above

20. Which of the following ecosystem is most productive in terms of net primary productiion?

(1) Deserts

(2) Tropical rain forests

(3) Oceans

(4) Estuaries

Ans. (2) Tropical rain forests

(D) ASSERTION – REASON QUESTIONS

✍ **Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:**

(1)	If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(2)	If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(3)	If Assertion is true but Reason is false.
(4)	If both Assertion and Reason are false.

1. **Assertion** : Food web consists of several food chains.
Reason : Food web decreases the stability of an ecosystem.
Ans. **(3)**

2. **Assertion :** The conversion of productivity at next trophic level is 10%.
Reason : Energy is lost in the respiration process.
Ans . **(1)**

3. **Assertion** : Biomes are the major ecosystem of the world.
Reason : Tundra is an example of biome.
Ans. **(2)**

4. **Assertion** : Chaparral is also called "shrub forest".
Reason : Trees are totally absent in chaparral.
Ans. **(3)**

5. **Assertion** : A network of food chains existing together in an ecosystem is known as food web.
Reason : An animal like kite cannot be a part of a food web.
Ans. **(3)**

6. **Assertion** : Pyramid of energy may be upright or inverted.
Reason: Only 20% of energy goes to next trophic level.
Ans. **(4)**

7. **Assertion:** The pyramid of energy is always upright.
Reason: Maximum number of autotrophs is present in the pyramid of energy.
Ans. **(3)**

8. **Assertion :** The example of primary consumers includes herbivores.
Reason : The driving force of any ecosystem is its producers.
Ans. **(2)**

9. **Assertion** : A biotic community has higher position than population in ecological hierarchy.
Reason : Population of similar individuals remains isolated in the community.
Ans **(3)**

10. **Assertion** : Net primary productivity is gross primary productivity minus respiration.
Reason : Secondary productivity is produced by heterotrops.
Ans. **(2)**

(E) VERY SHORT ANSWER QUESTIONS

1. What is secondary productivity?

Ans. Secondary productivity is defined as the rate of formation of new organic matter by consumers.

2. State what does 'standing crop' of a trophic level represent.

Ans. Standing crop represents the mass of living material (biomass) at a particular time.

3. List any two ways of measuring the standing crop of a trophic level.

Ans. Standing crop is measured as the biomass or the number of plant in a unit area.

4. Differentiate between standing state and standing crop in an ecosystem.

Ans. In an ecosystem, standing crop is the mass of living material in each trophic level at a particular time. Whereas standing state refers to the amount of nutrients in the soil at any given time.

5. Why is a food web formed in nature?

Ans. Many organisms occupy positions in different food chains and several food chains become interconnected to form a food web.

6. Name an omnivore which occurs in both grazing food chain and the decomposer food chain.

Ans. Sparrow/crow.

7. Justify the pitcher plant as a producer.

Ans. Pitcher plant is chlorophyllous and is thus capable of photosynthesis and act as producer.

8. Name any two organisms which occupy more than one trophic level in an ecosystem?

Ans. Man and sparrow

9. What is common to earthworm, mushroom, soil mites and dung beetle in a ecosystem?

Ans. They are all detritivores, i.e., decomposing organisms which feed on dead remains of plants and animals.

10. Standing crop and biomass are related to each other, how?

Ans. The standing crop is measured as the mass of living organism or the number of plants in a unit area. The biomass of a species is expressed in terms of fresh or dry wright.

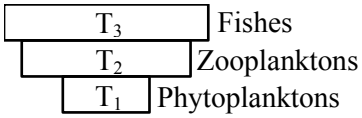
(F) SHORT ANSWER QUESTIONS

1. "In a food chain, a trophic level represent a functional level, not a species." Explain.

Ans. A given species may occupy more than one trophic level in the same ecosystem (in different food chai) at the given time. If the function of the mode of nutrition of species changes, its position shall changes in the trophic level .The same species can be at primary consumer level in one food chain and at secondary consumer level in another food chain in the same ecosystem at the given time.

2. Construct a pyramid of biomass starting with phy phytoplanktons. Lebel three the pyramid upright or inverted. Why?

Ans.



The pyramid is inverted because the biomass of fishes is much than that of the phytoplanktons.

3. Can you work out at how many trophic levels human beings functions in a food chain.

Or

"It is possible that a species may occupy more than one trophic level in the same ecosystem at the same time" explain with the help of one example.

Ans. Human beings can be placed at three trophic level in a food chain, if human being is vegetarian than included in primary consumer (herbivore) while in case of non-vegetarian this is secondary consumer (carnivore) ,in case both it is omnivore and placed at top consumer.

4. Name the type of food chain responsible for the flow of large fraction of energy in an aquatic and a terrestrial ecosystem respectively. Mention one difference between the two food chains

Ans. Aquatic ecosystem- Grazing food chain / GFC. Terrestrial ecosystem - Detritus food chain / DFC

Difference: GFC begins with phytoplankton / producers whereas DFC begins with dead organism/detritus.

5. Which is more stable from food chain or food web. Justify your answer.

Ans. The food web is more stable than food chain. In food web more than one species are present at different tropic level while in food chain only one species is present at each tropic level. In food chain if a species is eliminated caused ecological imbalance but in food web no such type of imbalance can possible because the space of eliminated species fulfill by another species.

6. Justify the statement, "Pyramid of energy is always upright, and can never be inverted."

Ans. Energy flow is always in one direction / Energy is always more at the producer level / Energy is lost at each successive trophic level in the form of heat.

7. "Decomposition is an oxygen requiring process "comment.

Ans. Detritus is rich in nitrogen and sugars for oxidation of nitrogen and sugars oxygen is required by a class of aerobic microbes.

(G) LONG ANSWER QUESTIONS

1. Write the relationship between productivity, gross primary productivity, net primary productivity and secondary productivity.

Ans. The rate of production of biomass is **productivity,** whereas rate of formation of organic matter during photosynthesis is **Gross primary productivity.**

Gross primary productivity minus respiratory losses (NPP = GPP-R) is **net primary productivity,** formation of new organic matter by consumers is **secondary productivity.**

2. What are the limitations of ecological pyramide?

Ans. Limitation of ecological pyramids -

(i) It never takes into account the same species belonging to two or more trophic levels.

(ii) It assumes a simple food chain, which never exists in nature. It does not accummodate a food web.

(iii) In spite of the vital role played by Saprophytes/decomposers, they are not given any position in ecological pyramids.

3. (a) Name the type of deteritus that decomposes faster. list any two factor that enhance the rate of decomposition.

(b) Write the different step taken in humification and mineralisation during the process of decomposition.

Ans. (a) Detritus rich in nitrogen decomposes faster.

These are water - soluble substances like sugar - factors enhancing rate of decomposition warm - temperature, moist environment, availability of O_2.

(b) Humification :- Accumulation of dark coloured amorphous substance called humus which is resistant to microbial action and undergoes decomposition at a very slow rate.

Mineralisation - Humus is further degraded by microbes releasing inorganic nutrients.

4. (a) What is primary production?

(b) Explain energy flow in ecosystem.

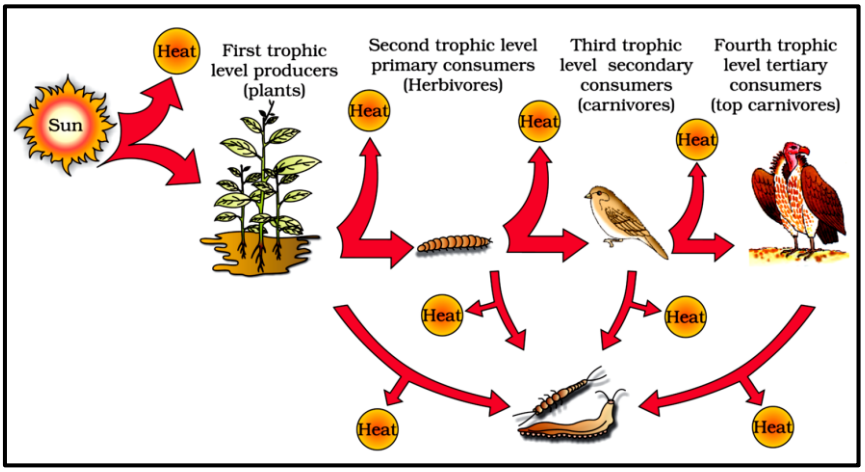
(c) Give a diagrammatic representation of energy flow through different trophic levels.

Ans. **(a) Primary production:** Primary production is defined as the amount of c matter produced per unit area over a time period by plants during photosynthesis. It is expressed in terms of weight (gm^{-2}) or energy ($kcal\ m^{-2}$).

(b) Energy flow in ecosystem:

- We know that plants and photosynthetic bacteria (autotrophs), fix suns' radiant energy to make food from simple inorganic materials. Plants capture only 2-10 per cent of the PAR and this small amount of energy sustains the entire living world.
- All organisms are dependent for their food on producers, either directly or indirectly. So we find unidirectional flow of energy from the sun to producers and then to consumers.
- The green plants in the ecosystem terminology are called producers.

(c) Diagrammatic representation of energy flow through different trophic levels:



(H) CASE-STUDY BASED QUESTIONS

1. Read the following and answer the questions given below:

Primary production is defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis. It is expressed in terms of weight (gm^{-2}) or energy (kcal m^{-2}). The rate of biomass production is called productivity. It is expressed in terms of gm^{-2} yr^{-1} or (kcal m^{-2}) yr^{-1} to compare the productivity of different ecosystems. It can be divided into gross primary productivity (GPP) and net primary productivity (NPP). Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis. A considerable amount of GPP is utilised by plants in respiration. Gross primary productivity minus respiration losses (R), is the net primary productivity (NPP).

(i) Write the full name of GPP.

Ans. Gross primary production.

(ii) Write the names of the factors on which the primary productivity depends.

Ans. (1) Environmental factor

(2) Photosynthetic capacity of plant

(3) Availability of nutrients

(iii) How are productivity, gross productivity, net primary productivity and secondary productivity inter related?

Ans. GPP - R = NPP = 1

(iv) What do you mean NPP?

Ans. Available biomass for the consumption of heterotrophs.

(v) What is NPP equal to?

Ans. NPP = GPP – R

2. Read the following and answer the questions given below:

Each trophic level has a certain mass of living material at a particular time called as the standing crop. The standing crop is measured as the mass of living organisms (biomass) or the number in a unit area. The biomass of a species is expressed in terms of fresh or dry weight. Measurement of biomass in terms of dry weight is more accurate. Why? The number of trophic levels in the grazing food chain is restricted as the transfer of energy follows 10 per cent law – only 10 per cent of the energy is transferred to each trophic level from the lower trophic level. In nature, it is possible to have so many levels – producer, herbivore, primary carnivore, secondary carnivore in the grazing food chain.

(i) State what does standing crop of a trophic level represent.

Ans. Standing crop of a trophic level represents the total mass of living material or energy content of all the organisms of a trophic level at a particular time and location.

(ii) List any two ways of measuring the standing crop of a trophic level.

Ans. Biomass of living organisms in a unit area.

Number of living organism in a unit area.

(iii) Man can be a primary as well as secondary Consumer? Justify this statement.

Ans. Man can be a primary as weel as secondary consumer because man eats plants of well secondary consumer because man eats plants as well as meat of other animals so man is herbivore as well as carnivore.

(iv) Difference between two different types of pyramids of biomass with the help of an example.

Ans. Pyramids refers to the relationship between producers and consumers in terms of biomass. It can be upright, eg.- ingrasslands ecosystem or inverted eg - in pond ecosystem.

3. Read the following and answer the questions given below:

The base of a pyramid is broad and it narrows towards the apex. One gets a similar shape, whether you express the food or energy relationship between organisms at different trophic levels. This, relationship is expressed in terms of number, biomass or energy. The base of each pyramid represents the producers or the first trophic level while the apex represents tertiary or top level consumer. The three types of ecological pyramids that are usually studied are (a) pyramid of number; (b) pyramid of biomass and (c) pyramid of energy.

(i) Differentiate between two different types of pyramids of biomass with the help of one example of each.

Ans. Pyramids of biomass are of both types, upright and inverted. Upright pyramid of biomass can be found in forest and grassland ecosystems, while inverted

(ii) Why are the pyramids referred to as 'upright' or 'inverted' ? Explain.

Ans. Pyramids can be upright or inverted. For e.g. Pyramid of energy is always upright as only 10% energy is transferred from one trophic level to the next while pyramid of biomass is inverted in pond ecosystem. Inverted pyramid shows less number / biomass of producers when compared to primary consumers

(iii) What is an ecological pyramid ?

Ans. Graphical representation of the relationship among the organisms at different trophic level.

(iv) Write any two limitations of ecological pyramids.

Ans **(a)** It does not take into account the same species belonging to two or more trophic levels.

(b) It assumes a simple food chain, something that almost never exists in nature.

(c) It does not accommodate a food web.

(d) Moreover, saprophytes are not given any place in ecological pyramids even though they play a vital role in the ecosystem.

(v) Explain the significance of ecological pyramids.

Ans Significance of ecological pyramids:

(a) Helps in comparing different ecosystems.

(b) Helps in studying seasonal variations and changes in ecosystem.

(c) Helps in studying amount of energy transfer, biomass production, number of organisms at each trophic level in ecosystems.

4. Read the following and answer the questions given below:

You may have heard of the earthworm being referred to as the farmer's 'friend'. This is so because they help in the breakdown of complex organic matter as well as in loosening of the soil. Similarly, decomposers break down complex organic matter into inorganic substances like carbon dioxide, water and nutrients and the process is called decomposition. Dead plant remains such as leaves, bark, flowers and dead remains of animals, including fecal matter, constitute detritus, which is the raw material for decomposition. The important steps in the process of decomposition are fragmentation, leaching, catabolism, humification and mineralisation.

(i) What is decomposition?

Ans. It is the process of breaking down of complex organic matter into inorganic substance. Like water carbon dioxide and nutrients by decomposers.

(ii) Write different stages involve in the process.

Ans. Fragmentation, leaching, catabolism, humification and mineralisation.

(iii) What is mineralisation?

Ans. It is process of degradation of humus by microbial action and release of inorganic nutrients.

(iv) Write the factors affecting the rate of this process.

Ans. **Chemical composition of detritus -** The rate of decomposition is slower, If detritus is rich in lignin and chitin.

Climiate factors - Temperature and soil moisture are the most important climatic factors that controls decomposition.

5. Read the following and answer the questions given below:

The consumers that feed on these herbivores are carnivores, or more correctly primary carnivores (though secondary consumers). Those animals that depend on the primary carnivores for food are labelled secondary carnivores. A simple grazing food chain (GFC) is depicted below:

Grass ⇢ Goat Man ⇢

(Producer) (Primary Consumer) (Secondary consumer)

The detritus food chain (DFC) begins with dead organic matter. It is made up of decomposers which are heterotrophic organisms, mainly fungi and bacteria. They meet their energy and nutrient requirements by degrading dead organic matter or detritus. These are also known as saprotrophs (sapro: to decompose). Decomposers secrete digestive enzymes that breakdown dead and waste materials into simple, inorganic materials, which are subsequently absorbed by them.

(i) Name two types of food chains.

Ans. Grazing food chain and Detritus food chain.

(ii) What is the role of plants, animals and bacteria in an ecosystem?

Ans. Producers, consumers and decomposers.

(iii) What are starting points of a grazing food chain and detritus food chain respectively?

Ans. Grazing food chain → producers

deteritus food chain → Detritus (dead organic matter)

(iv) If 20 J of energy's is traped at producer level, then

how much energy will be available to man as food in the following chain?

Grass ⇢ Goat Man ⇢

(Producer) (Primary Consumer) (Secondary consumer)

Ans 0.2 J