

Short Answer Questions-I (PYQ)

[2 Marks]

Q.1. How are productivity, gross productivity, net primary productivity and secondary productivity interrelated?

Ans. Productivity is the rate of biomass production.

$$GPP - R = NPP = 1$$

Where NPP is biomass available to consumers for secondary productivity.

Q.2. “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. For example, sparrow is an omnivore. When it eats seeds, fruits or any other plant product, it occupies the primary trophic level. Whereas, when it eats worms and any other insect, it occupies the secondary trophic level. Thus, it occupies more than one trophic level in the same ecosystem.

Q.3. Justify the importance of decomposers in an ecosystem.

Ans. Decomposers which are heterotrophic organisms, mainly fungi and bacteria break down complex organic matter into inorganic substances like carbon dioxide, water and nutrients. They meet their energy and nutrient requirements by degrading dead organic matter or detritus. 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.

Q.4. Why is earthworm considered a farmer’s friend? Explain humification and mineralisation occurring in a decomposition cycle.

Ans. Earthworms help in breakdown of complex organic matter as well as loosening of the soil. This helps in the proper growth of the crops. Therefore, they are considered farmer’s friend.

- **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.
- **Mineralisation:** The process by which humus is further degraded by some microbes to release inorganic nutrients is called mineralisation.

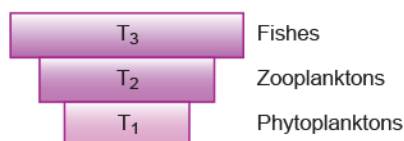
Q.5. Differentiate between two different types of pyramids of biomass with the help of one example of each.

Ans.

S. No.	Upright pyramid of biomass	Inverted pyramid of biomass
(i)	The biomass of producers is more than that of consumers.	The biomass of the producers (phytoplankton) is less than that of consumers (fish).
(ii)	For example, forest ecosystem.	For example, aquatic ecosystem.

Q.6. Construct a pyramid of biomass starting with phytoplanktons. Label three trophic levels. Is the pyramid upright or inverted? Why?

Ans.



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

Q.7. “In a food-chain, a trophic level represents 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 chains) at the given time. If the function of the mode of nutrition of species changes, its position shall change in the trophic levels. 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.

Q.8.



Identify the type of the given ecological pyramid and give one example each of pyramid of number and pyramid of biomass in such cases.

Ans. The given ecological pyramid is the inverted pyramid.

Inverted pyramid of biomass in a lake: Phytoplankton → Zooplankton → fishes.

Inverted pyramid of number: Tree → insects → birds.

Q.9. State the difference between the first trophic levels of detritus food chain and grazing food chain.

Ans.

S. No.	First trophic level of detritus food chain	First trophic level of grazing food chain
(i)	Decomposers are the first trophic level.	Producers are the first trophic level.
(ii)	They break down the complex organic matter into simpler form by secreting enzymes.	They prepare complex organic molecules from simple inorganic material with the help of sunlight.

Q.10. Differentiate between a detritivore and a decomposer giving an example of each.

Ans.

Detritivore	Decomposer
They are organisms which feed on detritus and break them into smaller particles, e.g., earthworm.	They are organisms which by secreting enzymes break down complex organic matter into inorganic substances, e.g., some bacteria and fungi.

Q.11. Construct a grazing food chain and detritus food chain using the following, with 5 links each: Earthworm, bird, snake, vulture, grass, grasshopper, frog, decaying plant matter.

Ans. Grazing food chain:

Grass → Grasshopper → Frog → Snake → Vulture

OR

Grass → Grasshopper → Bird → Snake → Vulture

Detritus food chain:

Decaying plant matter → Earthworm → Bird → Snake → Vulture

Q.12. Apart from being part of the food chain, predators play other important roles. Mention any two such roles supported by examples.

Ans.

- Keeps prey population under control, for example the invasive prickly pear cactus in Australia was brought under control only after a cactus feeding predator (a moth) was introduced in the country.

- Maintains species diversity by reducing intensity of competition among prey species. For example, when the *Starfish Pisaster* was removed from its community of American Pacific coast, more than 10 species of invertebrates become extinct.

Q.13. Explain with the help of two examples, how the pyramid of number and the pyramid of biomass can look inverted.

Ans. The pyramid of biomass in sea is generally inverted because the biomass of fishes far exceeds that of phytoplankton and the number of big fishes eating the small fishes is also greater than the small ones. Also in pyramid of number, the number of insects feeding on a big tree is far greater than the tree. Now the number of small birds depending on the insects and the number of larger birds eating the smaller ones also increases in the order.

Q.14. How does primary succession start in water and lead to the climax community? Explain.

Ans. Primary succession in water

- The pioneer species are phytoplanktons.
- The phytoplanktons are replaced by free-floating angiosperms.
- Then, rooted angiosperms invade sedges, grasses and finally the trees.
- At last, a stable climax forest is formed.
- An aquatic habitat is converted into mesic habitat.

Q.15. Name the pioneer and the climax species in a water body. Mention the changes observed in the biomass and the biodiversity of the successive seral communities developing in the water body.

Ans. Pioneer species — Phytoplanktons

Climax species — Forest or trees

Biomass will be gradually increased and phytoplanktons are replaced by free-floating angiosperms then by rooted hydrophytes followed by different seral communities thus, biodiversity also increases.

Q.16. Explain the function of 'reservoir' in a nutrient cycle. List the two types of nutrient cycles in nature.

Ans. The function of the reservoir is to meet the deficit which occurs due to imbalance in the rate of influx and efflux.

The two types of nutrient cycles are:

- i. Gaseous, and
- ii. Sedimentary

Short Answer Questions-I (OIQ)

[2 Mark]

Q.1. Name the four functional aspects of an ecosystem.

Ans. Functional aspects of an ecosystem are:

- i. Productivity
- ii. Decomposition
- iii. Energy flow
- iv. Nutrient cycle

Q.2. What is an incomplete ecosystem? Explain with the help of a suitable example.

Ans. An ecosystem is a functional unit with biotic and abiotic factors interacting with one another resulting in a physical structure. Absence of any component will make an ecosystem incomplete as it will hinder the functioning of the ecosystem. Examples of such an ecosystem can be a fish tank or deep aphotic zone of the oceans where producers are absent.

Q.3. What is stratification in an ecosystem? Explain with an example.

Ans. The vertical distribution of different species occupying different levels in an ecosystem is called stratification. Trees occupy the topmost vertical layer of a forest, shrubs occupy the second layer and herbs and grasses occupy the bottom most or base layers.

Q.4. Expand GPP and NPP. Differentiate between the two.

Ans. GPP stands for Gross Primary Productivity. It is the rate of production of organic matter during photosynthesis in an ecosystem.

NPP stands for Net Primary Productivity. It is defined as $GPP - \text{Respiratory loss}$.

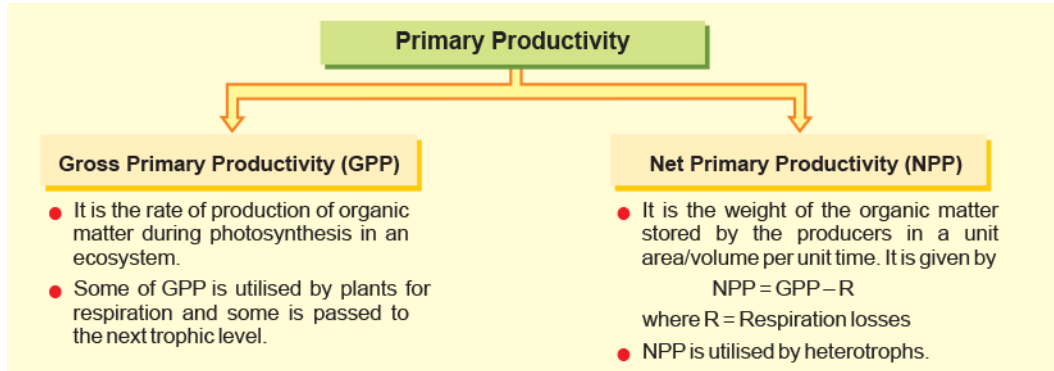
Q.5.

- i. **What is primary productivity? In what units could you express productivity?**
- ii. **Explain the differences between net primary productivity and gross primary productivity.**

Ans.

- i. The rate at which solar radiation is trapped by producers for the synthesis of organic compound through photosynthesis is called primary productivity. It is expressed as $\text{g m}^{-2} \text{y}^{-1}$ or $\text{kcal m}^{-2} \text{year}^{-1}$.

ii.



Q.6. What does secondary productivity in an ecosystem indicate? List any two factors by which productivity is limited in an aquatic ecosystem.

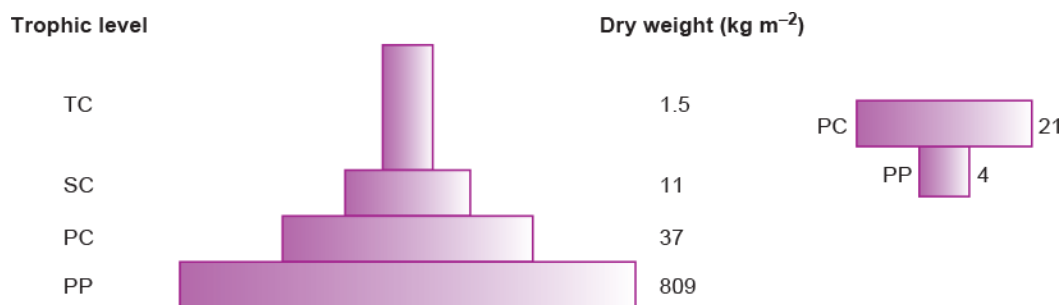
Ans. The rate of assimilation and formation of new organic matter by consumers is called secondary productivity. The factors which affect productivity in an aquatic ecosystem are:

- Nitrogen in marine ecosystem.
- Light, which decreases with increasing depth of water.

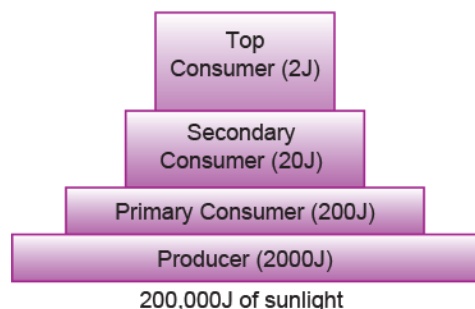
Q.7. Primary productivity varies from ecosystem to ecosystem. Explain.

Ans. Primary productivity varies from ecosystem to ecosystem because it depends on the plant species inhabiting the area and their photosynthetic activity. It also depends on various environmental factors, which vary in different ecosystems.

Q.8. Compare the two ecological pyramids of biomass given below and explain the situations in which this is possible. Also, construct an ideal pyramid of energy, if 200,000 joules of sunlight is available.



Ans. The first pyramid of biomass corresponds to a terrestrial ecosystem. Second pyramid refers to a small standing crop of phytoplankton supporting a large standing crop of zooplankton or an aquatic ecosystem.



Q.9. List the three parameters used for constructing ecological pyramids. Describe any one instance where the pyramid may look inverted.

Ans. The three parameters used are:

- i. Number of individuals in a trophic level.
- ii. Biomass of individuals in a trophic level.
- iii. Rate of flow of energy in a trophic level.

The pyramid may look inverted in a tree ecosystem where the number of consumers are numerous depending on a single producer.

Q.10. Due to uncontrolled excessive hunting, the population of tiger in a forest becomes zero. Discuss the long-term effects of this situation in the population of deer in that forest.

Ans. The reduction in population of tiger (predator) will result in an increase in deer (prey) population. The increased deer population will give more pressure on vegetation due to overgrazing. As a result, the plant population will decrease and lead to decreased deer population due to starvation, death and migration. As a result, the ecological balance will be disturbed, but in the long run these relationships stabilise the prey and predator population in a community.

Q.11. Apart from plants and animals, microbes form a permanent biotic component in an ecosystem. While plants have been referred to as autotrophs and animals as heterotrophs, what are microbes referred to as? How do these microbes fulfil their energy requirements?

Ans. Microbes are referred to as heterotrophs and saprotrophs. They fulfil their energy requirement by feeding on dead remains of plants and animals through the process of decomposition.

Q.12. Why is secondary succession faster than the primary succession?

Ans. Secondary succession is faster than the primary succession because of presence of

- i. soil for growth, which also results in quick attainment of climax.

- ii. water, the environment and the seeds or other propagules which are easily available.

Q.13. What could be the reason for the faster rate of decomposition in the tropics?

Ans. The rate of decomposition is regulated by climatic factors like temperature and soil moisture as they have an effect on the activities of soil microbes. The tropics with its hot and humid climatic condition provides an environment which is ideal for the microbes to speed up the process of decomposition.

Q.14. “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.

Q.15. What would happen to the successive trophic levels in the pyramid of energy, if the rate of reproduction of phytoplanktons was slowed down? Suggest two factors which could cause such a reduction in phytoplankton reproduction.

Ans. If the rate of reproduction of phytoplanktons slows down then the net primary productivity decrease. As a result, flow of energy will also decrease in the successive trophic level.

The following two factors cause reduction in phytoplankton reproduction:

- i. Less water availability
- ii. Less nutrient availability

Q.16. What are the shortcomings of ecological pyramids in the study of ecosystem?

Ans. The ecological pyramid assumes a simple food chain and does not accommodate food webs. Thereby, it does not take into account the fact that species may belong to two or more trophic levels at a time. Also saprophytes despite their vital role in ecosystem are given no place in the ecological pyramids.

Q.17. Sometimes due to biotic/abiotic factor the climax remain in a particular seral stage (preclimax) without reaching the climax. Do you agree with this statement. If yes, give a suitable example.

Ans. It is true that any change in the abiotic/biotic factor will arrest a particular seral stage leading to a pre-climax condition before the climax stage is achieved. This can happen in cases of forest fires, landslide, change in soil characteristics, increase in herbivore population leading to overgrazing.