

## Short Answer Questions-II (PYQ)

[3 Marks]

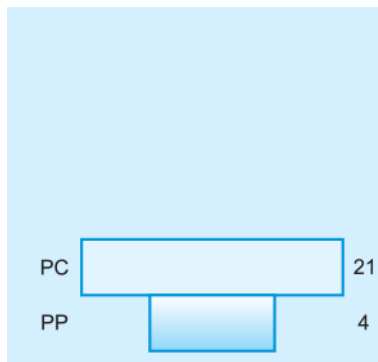
**Q.1. Describe the inter-relationship between productivity, gross primary productivity and net productivity.**

**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.

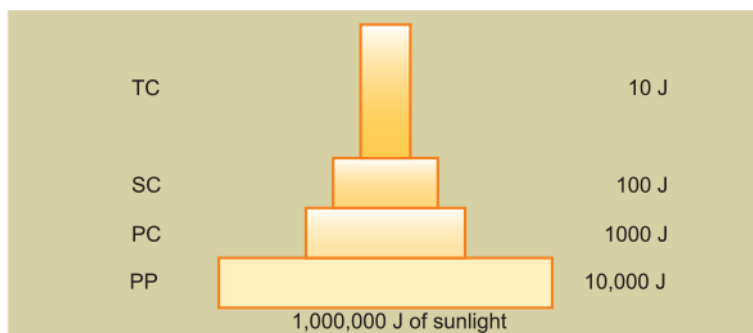
Net productivity is the gross primary productivity minus respiration losses.

**Q.2. Draw a pyramid of biomass and pyramid of energy in sea. Give your comments on the type of pyramids drawn.**

**Ans.**



Inverted pyramid of biomass: Small standing crop of phytoplankton supports large standing crop of zooplankton



An ideal pyramid of energy

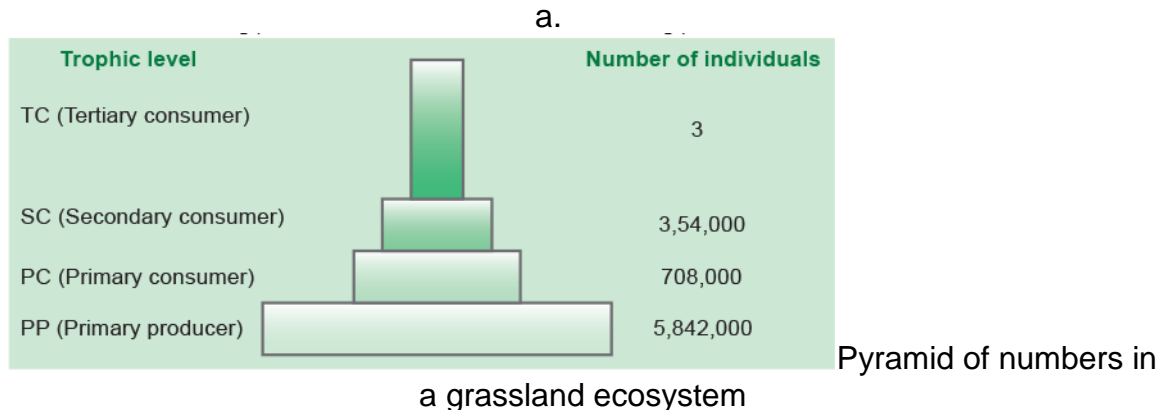
The pyramid of biomass in sea is inverted.

The pyramid of energy in sea is upright.

**Q.3.**

- a. Construct a pyramid of numbers by taking suitable examples for each trophic level in an ecosystem.
- b. Explain why a progressive decline is seen in the population size from the first to the fourth trophic level in the above pyramid.

**Ans.**



- b. Amount of energy decreases at successive trophic levels resulting into decreasing in number of organisms.

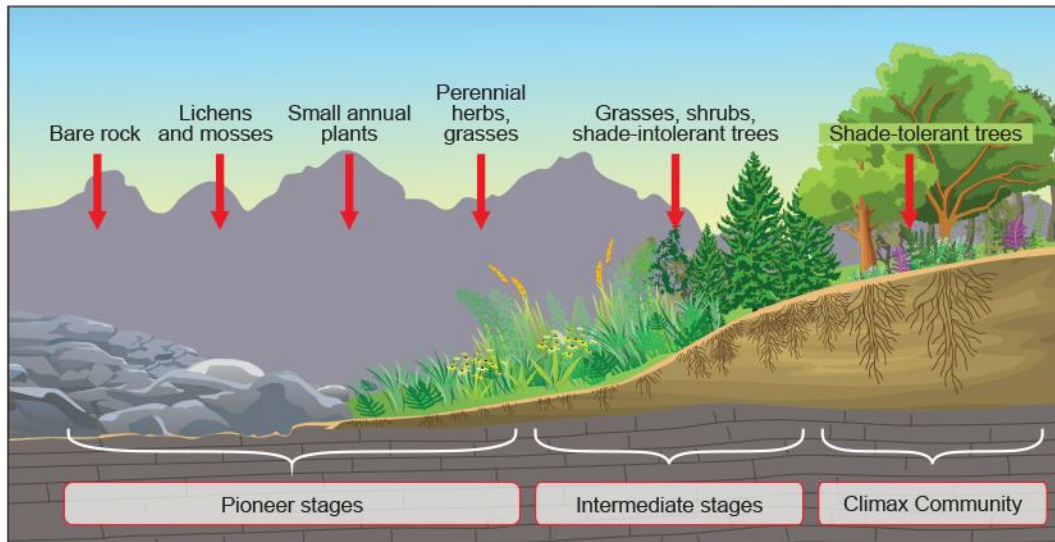
**Q.4. Name the pioneer species on a bare rock. How do they help in establishing the next type of vegetation? Mention the type of climax community that will ultimately get established.**

**OR**

**Explain how does a primary succession start on a bare rock and reach a climax community.**

**Ans. Primary succession on rocks**

- Lichens are the pioneer species on a bare area.
- The lichen secretes some acids to dissolve rock and help in weathering and soil formation.
- Later, some small bryophytes invade and hold the small amount of soil.
- The bryophytes are succeeded by herbs, shrubs and ultimately big trees.
- At last, a stable climax forest is formed.
- The xerophytic habitat gets converted into a mesophytic one.



Biotic succession on a bare rock

**Q.5.**

- Describe primary succession that occurs on bare rock.**
- Differentiate between xerarch and hydrarch successions.**

**Ans. (a) Primary succession on rocks**

- Lichens are the pioneer species on a bare area.
- The lichen secretes some acids to dissolve rock and help in weathering and soil formation.
- Later, some small bryophytes invade and hold the small amount of soil.
- The bryophytes are succeeded by herbs, shrubs and ultimately big trees.
- At last, a stable climax forest is formed.
- The xerophytic habitat gets converted into a mesophytic one.

**(b) The plant succession is of two types:**

- Hydrarch succession:** The plant succession which takes place in wet area or water, leading to a successional series progress from hydric to the mesic conditions.
- Xerarch succession:** The plant succession which takes place in dry area, leading to a successional series from xeric to mesic conditions.

**Q.6. Differentiate between primary and secondary succession. Provide one example of each.**

**Ans.**

Primary Succession	Secondary Succession
--------------------	----------------------

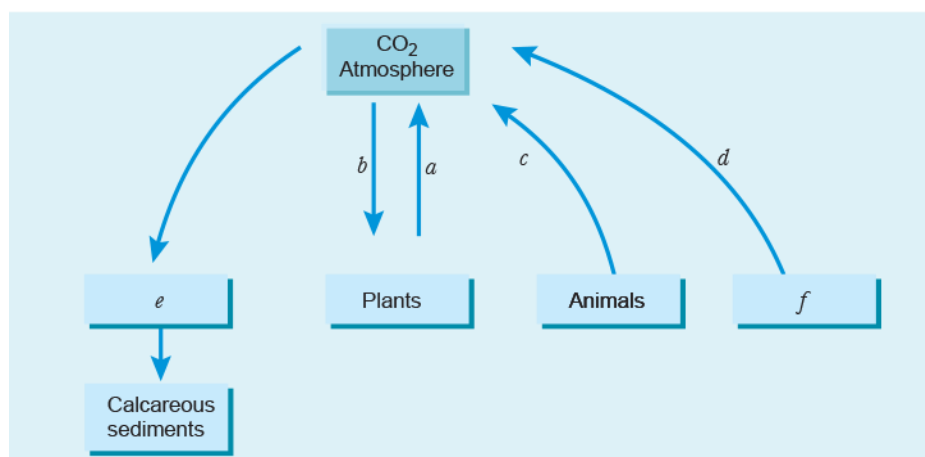
<ol style="list-style-type: none"> <li>1. It begins with areas where no living organisms ever existed.</li> <li>2. Establishment of a biotic community is very slow.</li> <li>3. <b>Example:</b> Newly cooled-lava/barerocks/newly created ponds or reservoir.</li> </ol>	<ol style="list-style-type: none"> <li>1. It begins in areas where natural biotic communities have been destroyed.</li> <li>2. Establishment of a biotic community is faster.</li> <li>3. <b>Example:</b> Abandoned farm lands/burnt or cut forests/ lands that have been flooded.</li> </ol>
---	---

**Q.7. Name the type of food chains responsible for the flow of larger fraction of energy in an aquatic and a terrestrial ecosystem, respectively. Mention one difference between the two food chains.**

**Ans.** In aquatic system, detritus food chain and in terrestrial ecosystem, grazing food chain are responsible for flow of larger fraction of energy.

S. No.	Grazing food chain (GFC)	Detritus food chain (DFC)
(i)	It starts 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 remain or detritus.

**Q.8. Draw and complete the following model of carbon cycle filling a, b, c, d, e and f.**



**Ans.**

- a. Photosynthesis
- b. Respiration
- c. Respiration
- d. Combustion of fossil fuels
- e. Aquatic food chain
- f. Coal, oil.

**Q.9.**

- a. State any two differences between phosphorus and carbon cycles in nature.
- b. Write the importance of phosphorus in living organisms.

**Ans.**

a.

	<b>Phosphorus cycle</b>	<b>Carbon cycle</b>
(i)	It is a sedimentary cycle.	It is a gaseous cycle.
(ii)	Atmospheric inputs through rainfall are much smaller.	Atmospheric inputs through rainfall are more.
(iii)	Gaseous exchange of phosphorus between organism and environment is nil.	Gaseous exchange of carbon between organism and environment is much more

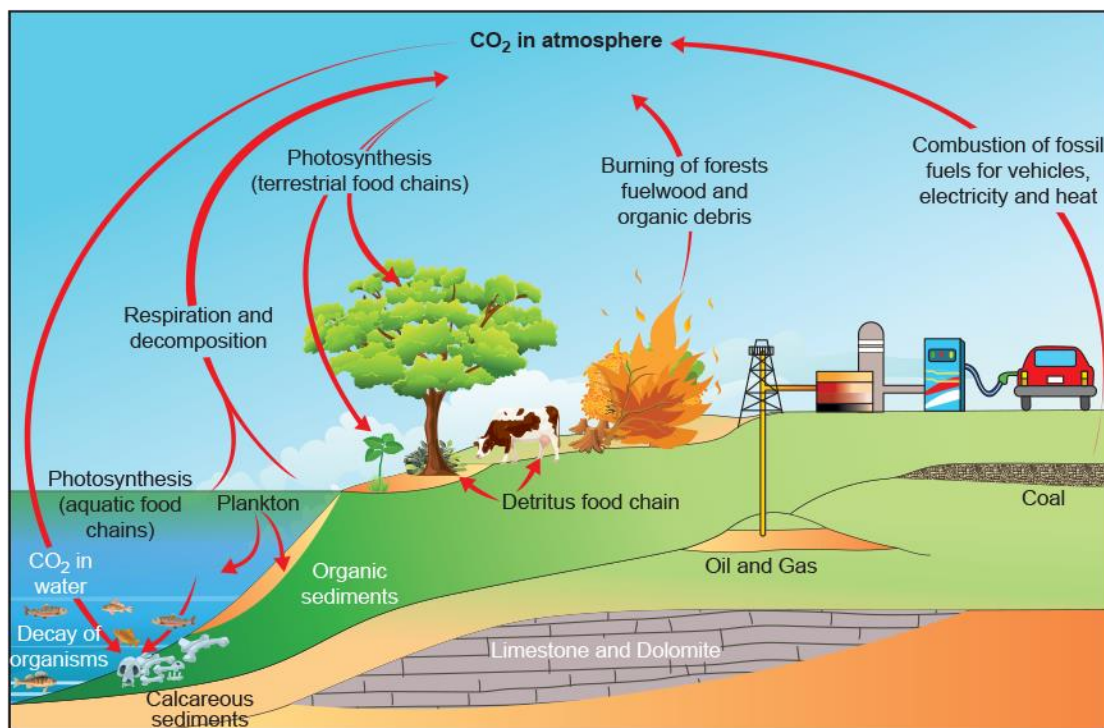
- b. Phosphorus is a major constituent of biological membranes, nucleic acids and cellular energy transfer

**Q.10. Describe the effects of human activities in influencing natural ecosystem cycles with special reference to carbon cycle.**

**Ans.** Human activities have significantly influenced the carbon cycle. Rapid deforestation and massive burning of fossil fuels for energy and transport have significantly increased the rate of release of carbon dioxide into the atmosphere. Carbon dioxide is a greenhouse gas which allows the solar radiations to enter but prevent the escape of heat radiations of longer wavelength. The absorbed radiations again come to earth's surface and heat it up. Thereby increasing the average temperature of surface of the earth, i.e., global warming.

**Q.11. State the function of a reservoir in a nutrient cycle. Explain the simplified model of carbon cycle in nature.**

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



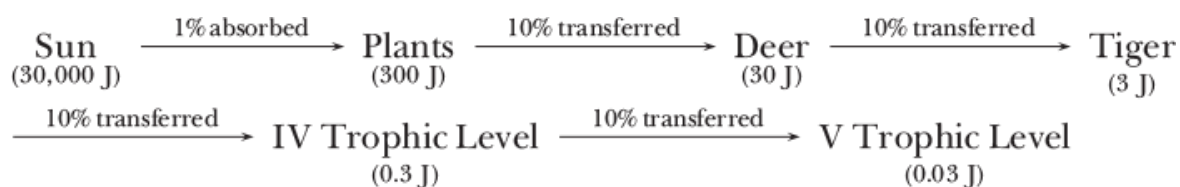
Simplified model of carbon cycle in the biosphere

## Short Answer Questions-II (OIQ)

[3 Marks]

**Q.1. Why is the length of a food chain in an ecosystem generally limited to 3–4 trophic levels? Explain with an example.**

**Ans.** The amount of energy flow decreases with successive trophic levels as only 10% of energy is transferred from one trophic level to the next successive level. The energy is lost in the form of respiration and other vital activities to maintain life. If more trophic levels are present, the residual energy will be limited and decreased to such an extent that it cannot further support any trophic level by the flow of energy. So, the food chain is generally limited to 3–4 trophic levels only. For, e.g.,



**Q.2. What are the limitations of ecological pyramids?**

**Ans.** Limitations 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.
- iii. In spite of the vital role played by saprophytes/decomposers, they are not given any position in ecological pyramids.

**Q.3. Explain xerarch succession highlighting the xeral communities.**

**Ans.** The series of development stages of biotic succession in an arid area is termed as xerosere while biological succession on an arid area is called xerarch.

**Primary succession on rocks**

- Lichens are the pioneer species on a bare area.
- The lichen secretes some acids to dissolve rock and help in weathering and soil formation.
- Later, some small bryophytes invade and hold the small amount of soil.
- The bryophytes are succeeded by herbs, shrubs and ultimately big trees.
- At last, a stable climax forest is formed.
- The xerophytic habitat gets converted into a mesophytic one.

**Q.4. Name the kind of organisms which constitute the pioneer community of xerarch and hydrarch succession, respectively.**

**Ans.**

Xerarch succession—Lichens.

Hydrarch succession—Phytoplanktons

**Q.5.**

- a. What is meant by ecological succession? Explain how it occurs.
- b. What properties distinguish a pioneer community from a climax community?

**Ans.**

- a. The sequential, gradual and predictable changes in the species composition in an area are called succession or ecological succession.

**Ecological succession is of two types:**

- i. Primary succession: It begins in areas where no living organisms ever existed. Therefore, the establishment of a biotic community is very slow, e.g., newly cooled lava, bare rock, newly created pond or reservoir.
  - ii. Secondary succession: It begins in areas where natural biotic communities have been destroyed, e.g., abandoned farm lands, buried or cut forests. Since soil is available, it is a faster process.
- b.

<b>S. No.</b>	<b>Pioneer community</b>	<b>Climax community</b>
(i)	The species which invade a bare area or land to initiate succession is called pioneer community.	The last or final stage in a succession constitute the climax community.
(ii)	The pioneer species have high reproductive rate.	The climax species have low reproductive rate.
(iii)	The pioneer species have short life span.	The climax species have long life span.
(iv)	They are replaceable.	They are stable and not replaced.

**Q.6. Fill in the missing stages in the given primary hydrarch succession.**

**Phytoplankton → (a) → (b) → (c) → Submerged free-floating → (d) → Forest plant stage**

**What is common between hydrarch and xerarch succession?**

**Ans.**

- a. Reed-swamp stage
- b. Submerged plant stage
- c. Marsh-meadow stage
- d. Scrub stage

Both the hydrarch and xerarch lead to mesic conditions of forest.

**Q.7. Where and how does the primary succession occur? Explain.**

**Ans.** Primary succession occurs on newly cooled lava or bare rocks or newly created pond or reservoir.

[Any two]

- i. **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.
- ii. **Primary succession on rocks**
  - Lichens are the pioneer species on a bare area.
  - The lichen secretes some acids to dissolve rock and help in weathering and soil formation.
  - Later, some small bryophytes invade and hold the small amount of soil.



- The bryophytes are succeeded by herbs, shrubs and ultimately big trees.
- At last, a stable climax forest is formed.
- The xerophytic habitat gets converted into a mesophytic one.

[Any one]

**Q.8. Define ecological succession. Give three differences between seral stages and climax community during succession.**

**Ans.** The sequential, gradual and predictable changes in the species composition in an area are called succession or ecological succession.

<b>S. No.</b>	<b>Seral stage</b>	<b>Climax community</b>
(i)	It is the sequential replacement and establishment of species in the process of succession.	It is the community which gets established at the terminal stage of succession.
(ii)	The species composition changes from time to time.	The species are stable and species composition do not change.
(iii)	Simple food chains and food webs are found.	Complex food chains and food webs are found.