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**CBSE Class 12 Biology**  
**NCERT Exemplar Solutions**  
**CHAPTER 14**  
**ECOSYSTEM**

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**Multiple Choice Questions (MCQs)**

**1. Decomposers like fungi and bacteria are:**

- (i) autotrophs**
- (ii) heterotrophs**
- (iii) saprotrophs**
- (iv) chemo-autotrophs.**

**Choose the correct answer:**

- (a) (i) and (iii)**
- (b) (i) and (iv)**
- (c) (ii) and (iii)**
- (d) (i) and (ii)**

**Ans.** (c) (ii) and (iii)

**Explanation:** Decomposers depend on other organisms for food, hence they are heterotrophs. They obtain nutrients by decomposing the detritus and hence are called saprotrophs.

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**2. The process of mineralisation by microorganisms helps in the release of:**

- (a) inorganic nutrients from humus**
- (b) both organic and inorganic nutrients from detritus**

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**(c) organic nutrients from humus**

**(d) inorganic nutrients from detritus and formation of humus.**

**Ans.** (a) inorganic nutrients from humus

**Explanation:** The term mineralisation means formation of inorganic minerals. Here the process is being carried out by micro organisms instead of laboratory methods.

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

**(i)  $(\text{kcal m}^{-3}) \text{ yr}^{-1}$**

**(ii)  $\text{g}^{-2} \text{ yr}^{-1}$**

**(iii)  $\text{g}^{-1} \text{ yr}^{-1}$**

**(iv)  $(\text{kcal m}^{-2}) \text{ yr}^{-1}$**

**(a) (ii)**

**(b) (iii)**

**(c) (ii) and (iv)**

**(d) (i) and (iii)**

**Ans.** (c) (ii) and (iv)

**Explanation:** (c) (ii) and (iv)

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

**(a) Forest**

**(b) Marine**

**(c) Grass land**

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**(d) Tundra**

**Ans.** (b) Marine

**Explanation:** In marine environment, the size of fish is much bigger than phytoplankton. Hence, we get an inverted biomass pyramid in marine ecosystem.

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**5. Which of the following is not a producer?**

**(a) *Spirogyra***

**(b) *Agaricus***

**(c) *Volvox***

**(d) *Nostoc***

**Ans.** (b) *Agaricus*

**Explanation:** *Agaricus* belongs to fungi and hence are saprotrophs, while others belong to algae which are autotrophs.

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

**(a) Deserts**

**(b) Tropical rain forests**

**(c) Oceans**

**(d) Estuaries**

**Ans.** (b) Tropical rain forests

**Explanations:** Tropical rain forests have high population density of green plants. Hence, net primary productions are maximum in such conditions.

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**7. Pyramid of numbers is:**

- 
- (a) Always upright**
  - (b) Always inverted**
  - (c) Either upright or inverted**
  - (d) Neither upright nor inverted.**

**Ans.** (c) Either upright or inverted

**Explanation:** Number of predators can be more than number of producers; as in case of insects taking food from a tree. This will show an inverted number pyramid. Small number of herbivores feeding on large number of plants will give an upright number pyramid.

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**8. Approximately how much of the solar energy that falls on the leaves of a plant is converted to chemical energy by photosynthesis?**

- (a) Less than 1%**
- (b) 2-10%**
- (c) 30%**
- (d) 50%**

**Ans.** (b) 2-10%

**Explanation:** (b) 2-10%

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**9. Among the following, where do you think the process of decomposition would be the fastest?**

- (a) Tropical rain forest**
- (b) Antarctic**
- (c) Dry arid region**

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**(d) Alpine region**

**Ans.** (a) Tropical rain forest

**Explanation:** In tropical rain forest, there is ambient temperature, good moisture and plenty of sugar in detritus. Due to this, rate of decomposition would be fast.

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**10. How much of the net primary productivity of a terrestrial ecosystem is eaten and digested by herbivores?**

**(a) 1%**

**(b) 10%**

**(c) 40%**

**(d) 90%**

**Ans.** (b) 10%

**Explanation:** This obeys the law of 10%

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**11. During the process of ecological succession the changes that take place in communities are:**

**(a) Orderly and sequential**

**(b) Random**

**(c) Very quick**

**(d) Not influenced by the physical environment.**

**Ans.** (a) Orderly and sequential

**Explanation:** (a) Orderly and sequential

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**12. Climax community is in a state of:**

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**(a) non-equilibrium**

**(b) equilibrium**

**(c) disorder**

**(d) constant change.**

**Ans. (b) equilibrium**

**Explanation:** (b) equilibrium

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**13. Among the following biogeochemical cycles which one does not have losses due to respiration?**

**(a) Phosphorus**

**(b) Nitrogen**

**(c) Sulphur**

**(d) All of the above**

**Ans. (d) All of the above**

**Explanation:** Losses due to respiration is seen in case of carbon cycle.

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**14. The sequence of communities of primary succession in water is:**

**(a) phytoplankton, sedges, free-floating hydrophytes, rooted hydrophytes, grasses and trees.**

**(b) phytoplankton, free-floating hydrophytes, rooted hydrophytes, sedges, grasses and trees.**

**(c) free-floating hydrophytes, sedges, phytoplankton, rooted hydrophytes, grasses and trees.**

**(d) phytoplankton, rooted submerged hydrophytes, floating hydrophytes, reed swamp,**

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**sedges, meadow and trees.**

**Ans.** (d) phytoplankton, rooted submerged hydrophytes, floating hydrophytes, reed swamp, sedges, meadow and trees.

**Explanation:** (d) phytoplankton, rooted submerged hydrophytes, floating hydrophytes, reed swamp, sedges, meadow and trees.

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**15. The reservoir for the gaseous type of biogeochemical cycle exists in**

**(a) stratosphere**

**(b) atmosphere**

**(c) ionosphere**

**(d) lithosphere**

**Ans.** (b) atmosphere

**Explanation:** (b) atmosphere

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

**(a) scavenger**

**(b) tertiary producer**

**(c) tertiary consumer**

**(d) secondary consumer**

**Ans.** (c) tertiary consumer

**Explanation:** The three species in sequence are; primary consumer, secondary consumer and tertiary consumer.

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**17. Which of the following type of ecosystem is expected in an area where evaporation**

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**exceeds precipitation, and mean annual rainfall is below 100mm.**

- (a) Grassland**
- (b) Shrubby forest**
- (c) Desert**
- (d) Mangrove**

**Ans. (c) Desert**

**Explanation:** (c) Desert

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

- (a) Pelagic zone**
- (b) Benthic zone**
- (c) Lentic one**
- (d) Littoral zone**

**Ans. (d) Littoral zone**

**Explanation:** (d) Littoral zone

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**19. Edaphic factor refers to:**

- (a) Water**
- (b) Soil**
- (c) Relative humidity**
- (d) Altitude**

**Ans. (b) Soil**



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**Explanation:** (b) Soil

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

**(a) Cycling of nutrients**

**(b) Prevention of soil erosion**

**(c) Pollutant absorption and reduction of the threat of global warming**

**(d) All of the above**

**Ans.** (d) All of the above

**Explanation:** (d) All of the above are habitats provided by nature and natural ecosystem.

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**Very Short Answer Type Questions**

**1. Name an organism found as secondary carnivore in an aquatic ecosystem.**

**Ans.** Shark

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**2. What does the base tier of the ecological pyramid represent?**

**Ans.** Producers

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**3. Under what conditions would a particular stage in the process of succession revert back to an earlier stage?**

**Ans.** Under natural or human-induced disturbances, a particular stage in process of succession would revert back to an earlier stage.

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**4. Arrange the following as observed in vertical stratification of a forest:**

**Grass, Shrubby plants, Teak, Amaranths.**

**Ans.** Teak → Amaranths → Shrubby plants → Grass

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

**Ans.** Crow

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**6. Justify the pitcher plant as a producer.**

**Ans.** Pitcher plant contains chlorophyll and carries out photosynthesis. It feeds on insect

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only to obtain nitrogen from them. Hence, a pitcher plant is a producer.

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**7. Name any two organisms which can occupy more than one trophic level in an ecosystem.**

**Ans. Sparrow:** It is a primary consumer when it feeds on grains but becomes a secondary consumer when it feeds on worms and insects.

**Human:** It is a primary consumer when it feeds on grains and pulses but becomes a secondary consumer when it feeds on lamb.

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**8. In the North East region of India, during the process of jhum cultivation, forests are cleared by burning and left for regrowth after a year of cultivation. How would you explain the regrowth of forest in ecological term?**

**Ans.** In this case, regrowth of forests is an example of ecological succession. After clearing of forests, the conditions become xerarch which proceeds to mesarch condition after the growth of forests.

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**9. Climax stage is achieved quickly in secondary succession as compared to primary succession. Why?**

**Ans.** After primary succession, soil becomes available. It provides ideal condition for growth of bigger plants. Secondary succession is achieved quickly as compared to primary succession. Hence, climax is also reached more quickly.

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**10. Among bryophytes, lichens and fern which one is a pioneer species in a xeric succession?**

**Ans.** Lichens

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**11. What is the ultimate source of energy for the ecosystems?**

**Ans.** Sun

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**12. Is the common edible mushroom an autotroph or a heterotroph?**

**Ans.** Heterotroph

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**13. Why are oceans least productive?**

**Ans.** Availability of solar radiation is least in oceans; especially in deep oceans. Due to this, oceans are least productive.

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**14. Why is the rate of assimilation of energy at the herbivore level called secondary productivity?**

**Ans.** Rate of formation of new organic matter by consumers is called secondary productivity. The consumers get raw materials for this purpose from producers; which is made possible through assimilation. Due to this, the rate assimilation of energy at the herbivore level is called secondary productivity.

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**15. Why are nutrient cycles in nature called biogeochemical cycles?**

**Ans.** Nutrients are cycles through biotic components as well as through abiotic components. The term 'bio' shows biotic components while 'geo' shows abiotic components. Hence, nutrient cycles in nature are called biogeochemical cycles.

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**16. Give any two examples of xerarch succession.**

**Ans.** Lichen → Bryophytes → Pteridophytes → Gymnosperms and Angiosperms

Lichen → Moss → Ferns → Cycas → Grasses

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**17. Define self-sustainability.**

**Ans.** A system which is sustainable without relying on any external input is called a self-sustainable system. This ability of the system is called self-sustainability. Natural ecosystems are self-sustainable.

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**18. Given below is a figure of an ecosystem. Answer the following questions.**



**(a) What type of ecosystem is shown in the figure.**

**(b) Name any plant that is characteristic of such ecosystem.**

**Ans.** (a) Desert ecosystem

(b) Bushes, acacia, etc.

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**19. What is common to earthworm, mushroom, soil mites and dung beetle in an ecosystem.**

**Ans.** All of them are part of the detritus food chain.

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**Short Answer Type Questions**

**1. Organisms at a higher trophic level have less energy available. Comment.**

**Ans.** As per the law of 10% just 10% of the total energy consumed by an organism at a particular trophic level is available for the organism at next trophic level. So, whatever energy is converted into biomass by a producer; just 10% of it is available for the primary consumer. Similarly, just 10% of the energy consumed by the primary consumer is available for secondary consumer. Due to this, organisms at a higher trophic level less energy available.

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**2. The number of trophic levels in an ecosystem are limited. Comment.**

**Ans.** In any ecosystem, the number of trophic levels can go up to a maximum of five and in that case the food chain will look like following:

Producer → Primary Consumer → Secondary Consumer → Tertiary consumer → Quaternary Consumer

Let us assume that producer captures 100 units of energy. Out of this, 90 units will be utilized by the producer and 10 units will be available for the primary consumer. Finally, just 0.001 unit will be available for the quaternary consumer; which is a negligible amount of energy. Hence, more trophic levels are not possible in any ecosystem.

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**3. Is an aquarium a complete ecosystem?**

**Ans.** Aquarium is man-made ecosystem and it has its own limitations. The confined space of aquarium cannot have endless supply of inorganic materials for producers. For supporting even a small number of consumers, there is a need for a large number of producers which is not possible in a small space of aquarium. One needs to provides food for the fish in the

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aquarium and regular cleaning of aquarium is also necessary. This shows that an aquarium is not a complete ecosystem because it is not self-sustainable.

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**4. What could be the reason for the faster rate of decomposition in the tropics?**

**Ans.** Decomposition is largely a oxygen-requiring process. Moreover, ambient temperature and moisture are also required for this. If detritus is rich in nitrogen and water-soluble substances then decomposition is faster. All these conditions are available in the tropical climate. Hence, there is a faster rate of decomposition in the tropics.

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**5. Human activities interfere with carbon cycle. List any two such activities.**

**Ans.** Following are the two activities which interfere with carbon cycle:

(a) Clearing of forests: Reduced green cover hampers carbonification and thus interferes with carbon cycle.

(b) Burning of Fossil Fuels: Burning of fossil fuels adds carbon to the atmosphere and increases the percentage of carbon dioxide in the atmosphere. It also interferes with the carbon cycle.

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**6. Flow of energy through various trophic levels in an ecosystem is unidirectional and non-cyclic. Explain.**

**Ans.** About 90% of the energy consumed by an organism at a particular trophic level is dissipated in the form of heat energy. This leaves just 10% for the organism at the next trophic level. By the time, it reaches the topmost trophic level; the available energy is a minuscule portion of the energy which was originally converted by the producer. Due to this, energy flow is unidirectional through various trophic levels and is non-cyclic.

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**7. A part 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 the microbes fulfil their energy requirements?**

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**Ans.** Productivity, decomposition, energy flow and nutrient cycling are integral features of any ecosystem. Plants and animals play important roles in productivity. While some microbes play the role in productivity; as some of them microbes are autotrophs, e.g. some algae and some chemosynthetic bacteria. Most of the microbes are heterotrophs. Parasitic microbes get nutrition from the host on which they depend. Many microbes are saprotrophs. They get nutrition from detritus, i.e. they are important part of detritus food chain.

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**8. Poaching of tiger is a burning issue in today's world. What implication would this activity have on the functioning of the ecosystem of which the tigers are an integral part?**

**Ans.** Tigers are tertiary consumers and are at the top of the food pyramid in the forest ecosystem. A tertiary consumer helps in checking the uncontrolled population growth of secondary and primary consumers. If all tigers are killed then no animal will be left to control the population of herbivores. This will result in quick exhaustion of producers. Finally, in the absence of producers, the herbivores will die because of starvation. This will destroy the whole ecosystem.

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**9. In relation to energy transfer in ecosystem, explain the statement "10kg of deer's meat is equivalent to 1 kg of lion's flesh".**

**Ans.** We know that just 10% of energy consumed at a trophic level is available for the next trophic level. Here; 10 kg of deer's meat means 10kg of biomass at the level of primary consumer. Out of this, 90% is utilized by the deer for its own needs. Rest 10%, i.e. just 1 kg is available for the lion. Hence, it is correct to say that 10 kg of deer's meat is equivalent to 1 kg of lion's flesh.

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**10. Primary productivity varies from ecosystem to ecosystem. Explain?**

**Ans.** Primary productivity is the biomass produced per unit area over a time period by photosynthesis. In simple terms, it is the amount of biomass produced by green plants in a particular ecosystem. Plant population varies from one ecosystem to another. Number of plants is higher in tropical rainforests compared to in deserts. So, primary productivity would be much higher in tropical rainforests than in deserts. This shows that primary



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productivity varies from ecosystem to ecosystem.

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

**Ans.** This entire sequence of communities that successively change in a given area are called sere (s). All the biotic and abiotic factors play crucial role in this transition process and thus enable a community to reach the climax. If biotic and abiotic factors are not supportive enough for climax then the community may remain in a particular seral stage without reaching the climax. Presence of sparse vegetation at table top mountain can be one example of a community in seral stage. The community at the table top mountain may be in a stage in which only ferns and mosses may be present. In due course of time, it would pave way for higher plants.

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**12. What is an incomplete ecosystem? Explain with the help of suitable example.**

**Ans.** An ecosystem which is devoid of certain biotic or abiotic factors is called an incomplete ecosystem. An incomplete ecosystem cannot be a self-sustaining ecosystem. Aquarium is a good example of an incomplete ecosystem. The aquarium may be having producers and consumers but it does not have decomposers. Lack of decomposers necessitates frequent cleaning of the aquarium.

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**13. What are the shortcomings of ecological pyramids in the study of ecosystem?**

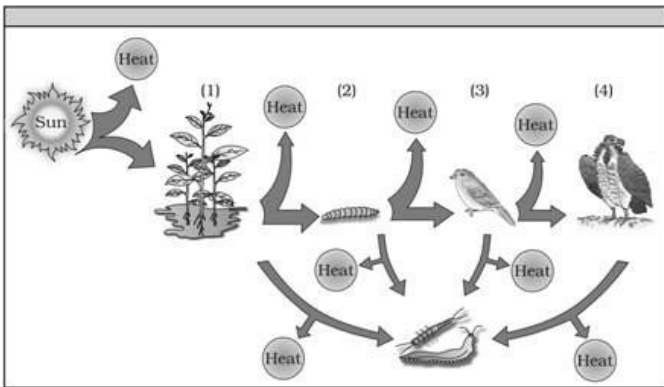
**Ans.** Following are the shortcomings of ecological pyramids:

- It does not take into account the same species belonging to two or more trophic levels.
  - It is based on the assumption of simple food chain. However, simple food chain never exists in nature. It is the complex food web which exists in nature.
  - A food pyramid does not take into account the decomposers. But the fact is, decomposers play important role in nutrient cycle.
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**14. How do you distinguish between humification and mineralisation?**

**Ans.** Both humification and mineralization are important aspects of detritus food chain. Humification leads to formation of dark coloured amorphous substance called humus, while decomposition leads to formation of inorganic compounds from organic matter. Mineralisation results in complete breakdown of organic compounds into inorganic compounds, which is not the case with humifaction.

**15. Fill in the trophic levels (1, 2, 3 and 4) in the boxes provided in the figure.**



**Ans.** 1: Producer, 2: Primary Consumer, 3: Secondary Consumer, 4: Tertiary Consumer.

**16. The rate of decomposition of detritus is affected by the abiotic factors like availability of oxygen, pH of the soil substratum, temperature etc. Discuss.**

**Ans.** Decomposition is carried out by living beings but several abiotic factors also affect the rate of decomposition. This is a oxygen-intensive process and hence availability of oxygen governs the rate of decomposition. In case of plenty of oxygen, the rate of decomposition will be faster. Rate of decomposition is faster in warm conditions than in cold conditions. pH also affects the rate of decomposition. Rate of decomposition is faster in neutral soil than in acidic soil.

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**Long Answer Type Questions**

**1. A farmer harvests his crop and expresses his harvest in three different ways.**

**(a) I have harvested 10 quintals of wheat.**

**(b) I have harvested 10 quintals of wheat today in one acre of land.**

**(c) I have harvested 10 quintals of wheat in one acre of land, 6 months after sowing.**

**Do the above statements mean one and the same thing. If your answer is yes, give reasons. And if your answer is 'no' explain the meaning of each expression.**

**Ans.** Different statements mean different things.

The first statement shows only the quantity of biomass produced but it does not show the duration and area in which it was produced.

The second statement shows quantity and area but it does not show the duration in which it was produced.

The third statement is a complete as it shows the quantity, area and duration. Information from the third statement can be used to calculate primary productivity in the farm: in term of biomass produced.

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**2. Justify the following statement in terms of ecosystem dynamics. "Nature tends to increase the gross primary productivity, while man tends to increase the net primary productivity".**

**Ans.** Rate of production of organic matter in an ecosystem is called Gross Primary Productivity (GPP). When we subtract the respiratory losses (R) from GPP, we get Net Primary Productivity (NPP).

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Nature provides various biotic and abiotic factors to enhance the rate of Gross Primary Productivity. Hence, it can be said that nature tends to increase the gross primary productivity.

But human beings need to make optimum utilization of the biomass produced. This is achieved in various ways; like harvesting the crop at the right time and plucking the fruits at the right time. If fruits will be left on the tree for a longer time, it will result in higher respiratory losses. A higher respiratory loss will reduce NPP. By plucking the fruits at the right time, man tries to increase the net primary productivity.

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**3. Which of the following ecosystems will be more productive in terms of primary productivity? Justify your answer. A young forest, a natural old forest, a shallow polluted lake, alpine meadow.**

**Ans.** A young forest can be assumed as a community which is yet to reach climax. This means the density of trees is less in this forest. Less number of trees means a lower primary productivity.

A natural old forest can be assumed as a community which has reached its climax. Most of the plants must be big trees with thick foliage. This will result in a higher level of primary productivity.

A shallow polluted lake may not have much of producers. Pollution must have taken its toll on the ecosystem in this pond. Thus, this pond may be having very low primary productivity.

An alpine meadow is full of grasses with little or no tree. Less number of trees means low primary productivity.

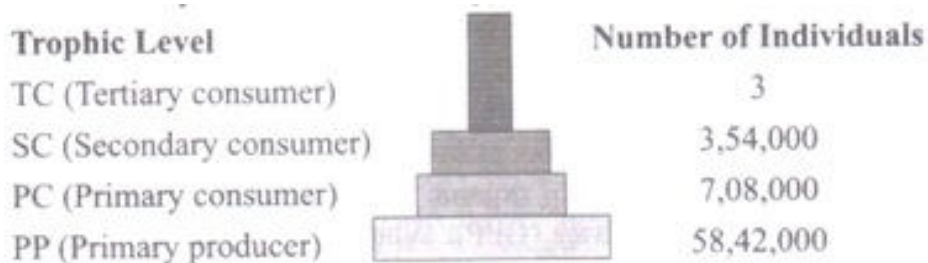
In the context of above discussions, it can be said that the natural old forest has the highest level of primary productivity.

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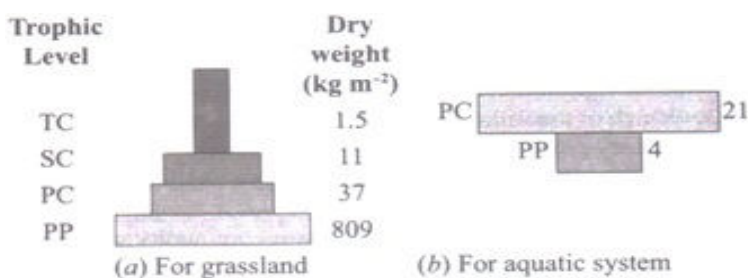
**4. What are the three types of ecological pyramids. What information is conveyed by each pyramid with regard to structure, function and energy in the ecosystem.**

**Ans.** Following are the three types of ecological pyramids:

(a) **Pyramid of Numbers:** This pyramid shows the number of individuals at different trophic levels. Producers are kept at the bottom of the pyramid; followed by primary consumers, secondary consumers and so on. In most of the cases, the shape of the pyramid bottom heavy. In some cases, this pyramid can be inverted in shape.

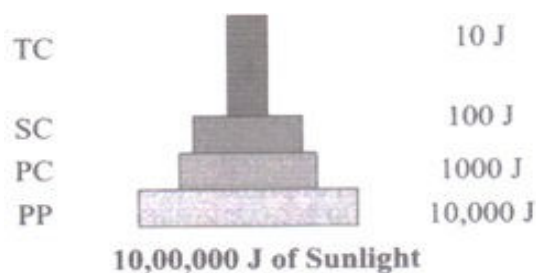


(b) **Pyramid of Biomass:** This pyramid shows the biomass (in terms of dry weight) at different trophic levels. Producers are kept at the bottom of the pyramid; followed by primary consumers, secondary consumers and so on. In most the cases, the shape of the pyramid bottom heavy. In some cases, this pyramid can be inverted in shape.



(c) **Pyramid of Energy:** This pyramid shows energy consumed at different trophic level.

Producers are kept at the bottom of the pyramid; followed by primary consumers, secondary consumers and so on. In most of the cases, the shape of the pyramid bottom heavy. This pyramid can never be of inverted shape.



In any type of pyramid, a particular trophic level shows a functional level. An organism may be present at more than one level. Flow of energy will always be from prey to predator.

Availability of energy reduces at subsequent levels.

**5. Write a short note on pyramid of numbers and pyramid of biomass.**

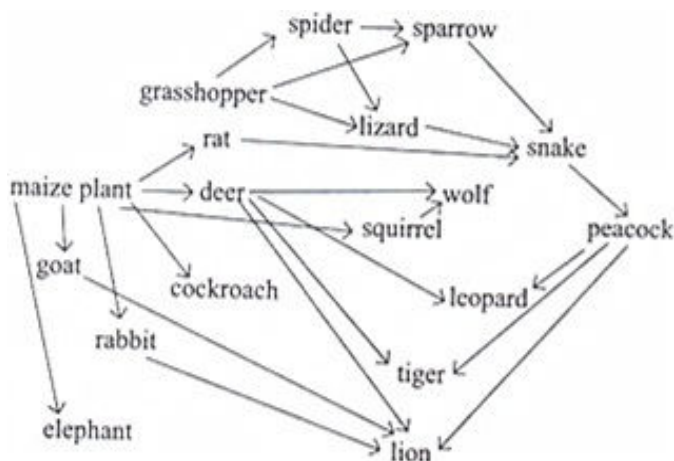
**Ans. Pyramid of Numbers:** This pyramid shows the number of individuals at different trophic levels. Producers are kept at the bottom of the pyramid; followed by primary consumers, secondary consumers and so on. In most of the cases, the shape of the pyramid bottom heavy. In some cases, this pyramid can be inverted in shape.

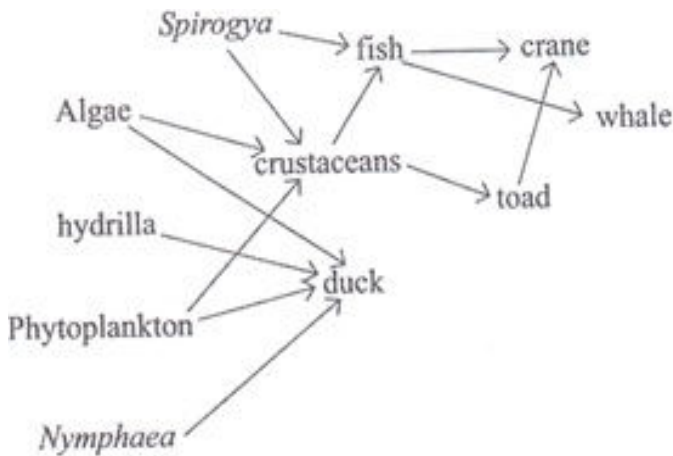
**Pyramid of Biomass:** This pyramid shows the biomass (in terms of dry weight) at different trophic levels. Producers are kept at the bottom of the pyramid; followed by primary consumers, secondary consumers and so on. In most of the cases, the shape of the pyramid bottom heavy. In some cases, this pyramid can be inverted in shape.

**6. Given below is a list of autotrophs and heterotrophs. With your knowledge about food chain, establish various linkages between the organisms on the principle of 'eating and being eaten'. What is this inter-linkage established known as?**

Algae, hydrilla, grasshopper, rat, squirrel, crow, maize plant, deer, rabbit, lizard, wolf, snake, peacock, phytoplankton, crustaceans, whale, tiger, lion, sparrow, duck, crane, cockroach, spider, toad, fish, leopard, elephant, goat, Nymphaea, Spirogyra.

**Ans.** This interlinkage of different organisms is called food web. Following two food webs are possible with the given list of organisms.





**7. “The energy flow in the ecosystem follows the second law of thermodynamics.” Explain.**

**Ans.** The second law of thermodynamics says that the entropy of an isolated system never decreases; such a system will spontaneously proceed towards thermodynamic equilibrium. The configuration with maximum entropy is in thermodynamic equilibrium.

An ecosystem needs a constant supply of energy to synthesize the molecules they require. In an ecosystem, the energy flows is always unidirectional because as per the law of thermodynamics; reverse flow of energy would put the system in non-equilibrium.

We have seen that energy from the sun is trapped by producers and producers function as conduit to supply energy to the next trophic levels. Energy never flows from a higher trophic level to a lower trophic level because it cannot be in tune with the law of thermodynamics.

**8. What will happen to an ecosystem if:**

- (a) All producers are removed;**
- (b) All organisms of herbivore level are eliminated; and**
- (c) All top carnivore population is removed**

**Ans. (a)** If all producers are removed from an ecosystem, then there will be no food for the primary consumers. All the primary consumers will be wiped out because of starvation. This will leave no food for secondary and tertiary consumers and they will also be finished in due course of time. This will be the end of the ecosystem.

(b) If all herbivores are eliminated from an ecosystem, there will be no food for the carnivores. Eventually, all the carnivores would be finished because of lack of food. Absence of herbivores will also result in exponential growth in plant population. But lack of other biotic factors will stop biogeochemical cycle. This will finally finish the ecosystem.

(c) If all the top carnivores are eliminated, then population of herbivores will become manifold. This will put the existence of green plants in danger because of overgrazing. Loss of green plants will force the herbivores to die because of starvation.

**9. Give two examples of artificial or man-made ecosystems. List the salient features by which they differ from natural ecosystems.**

**Ans.**

Natural Ecosystem	Man-made Ecosystem
(i) Develops without human intervention.	(i) Needs human intervention to develop.
(ii) Many natural ecosystems are spanned over huge areas.	(ii) Man-made ecosystems span limited area.
(iii) Nutrients are replenished through biogeochemical cycles.	(iii) Nutrients are replenished by humans, e.g. synthetic fertilizers, feed in aquarium, etc.
(iv) Populations of producers and consumers are in proper balance.	(iv) Populations of producers and consumers are not in proper balance.
(v) They are self-sustaining.	(v) They are not self-sustaining.

**10. The biodiversity increases when one moves from the pioneer to the climax stage. What could be the explanation?**



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**Ans.** Biodiversity of a community depends on the availability of food for consumers. If there is rich diversity in flora then more types of consumers can be supported in community.

When a community is at pioneer stage, lichens, bryophytes and pteridophytes are the main plants. These plants do not produce enough biomass which can sustain a diverse fauna. Hence, biodiversity would be limited at this stage.

When community reaches the climax; it is proliferated by gymnosperms and angiosperms. These plants produce enough biomass to sustain a diverse fauna. Hence, biodiversity increases at this stage.

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**11. What is a biogeochemical cycle. What is the role of the reservoir in a biogeochemical cycle. Give an example of a sedimentary cycle with reservoir located in earth's crust.**

**Ans.** The movement of nutrients through various elements of ecosystem is called nutrient cycling or biogeochemical cycle. Nutrient cycling ensures that nutrients are never lost from the ecosystem. They keep on getting replenished in the reservoirs in ecosystem.

**Role of Reservoir:** Whenever there is an imbalance between efflux and influx of a particular nutrient, there can be deficit of that nutrient. The reservoir counters this deficit by supplying the required nutrient.

**Phosphorus Cycle:** The reservoir of phosphorus is located in the earth's crust. Phosphorus cycle is one of the examples of sedimentary cycle. Rocks are the natural reservoirs of phosphorus. Phosphorus is present in rocks in the form of phosphates. During weathering of rocks, minute quantities of phosphates get dissolved in soil solution.

Phosphates in soil solution are absorbed by roots of plants. The primary and secondary consumers get phosphates from plants.

When dead organisms are decomposed by phosphates-solubilising bacteria, phosphorus is released back to the environment.

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**12. What will be the P/R ratio of a climax community and a pioneer community. What explanation could you offer for the changes seen in P/R ratio of a pioneer community**

**and the climax community.**

**Ans.** The ratio of gross production and community respiration is called P/R ratio of a community. This can be 1, less than 1 or more than 1.

The P/R ratio in a pioneer community can be less than or more than 1.

On the other hand, the P/R ratio of a climax community is 1.

In case of pioneer community, two situations can be present.

(a) When gross productivity is more and there are very few consumers then level of respiratory loss would be less. This will result in a P/R ratio more than 1.

(b) When rate of decomposition is more because of large population of decomposers, then gross productivity will be less than respiratory losses. In this case, the P/R ratio is less than 1.

In case of climax community, P/R ratio is equal to one. This happens because of stability in the community.

The following graph shows the P/R ratio at different stages of community succession.

Primary community is shown at the origin, while climax community is shown at extreme right.

