

ECOSYSTEM

1 MARK QUESTIONS

1. Define ecosystem.

An ecosystem can be visualized as a functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment.

2. Mention the two categories of ecosystem.

Terrestrial and the aquatic

3. Give an example for manmade ecosystem.

Crop fields and an aquarium is considered as man-made ecosystems.

4. Define primary production.

Primary production is defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis.

5. What is the unit for measuring primary production?

It is expressed in terms of weight ($g\ m^{-2}$) or energy ($kcal\ m^{-2}$)

6. Define the term "productivity".

The rate of biomass production is called productivity.

7. What is the unit of measurement for productivity?

It is expressed in terms of $g\ m^{-2}\ yr^{-1}$ or $(kcal\ m^{-2})\ yr^{-1}$ to compare the productivity of different ecosystems.

8. Define Gross Primary Productivity.

Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis.

9. Why GPP is not equal to NPP?

A considerable amount of GPP is utilized by plants in respiration.

10. Define Net primary productivity.

Gross primary productivity minus respiration losses (R), is the net primary productivity (NPP)

11. What is secondary productivity?

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

12. What is the annual net primary productivity of whole biosphere?

The annual net primary productivity of the whole biosphere is approximately 170 billion tons (dry weight) of organic matter.

13. What is the productivity of oceans?

The productivity of the oceans is only 55 billion tons. Rest of course, is on land.

14. What is decomposition?

The process by which decomposers break down complex organic matter into inorganic substances like carbon dioxide, water and nutrients and the process is called decomposition.

15. What is detritus?

Dead plant remains such as leaves, bark, flowers and dead remains of animals, including fecal matter, constitute detritus,

16. What is the raw material for decomposition?

Detritus is the raw material for decomposition.

17. What are producers in an ecosystem?

The green plant in the ecosystem-terminology are called producers

18. What are consumers in an ecosystem?

All animals depend on plants (directly or indirectly) for their food needs. They are hence called consumers and also heterotrophs

19. With what the detritus food chain begins?

The detritus food chain (DFC) begins with dead organic matter.

20. What is standing crop?

Each trophic level has a certain mass of living material at a particular time called as the standing crop

21. How the standing crop is measured?

The standing crop is measured as the mass of living organisms (biomass) or the number in a unit area

22. What is 10% law?

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

23. Which pyramid is always upright?

Pyramid of energy is always upright, can never be inverted, because when energy flows from a particular trophic level to the next trophic level.

24. Why pyramid of energy cannot be inverted?

Because, when the energy flows from a particular trophic level to the next trophic level.

25. The pyramid of biomass in sea is also inverted, why?

The pyramid of biomass in sea is also generally inverted because the biomass of fishes far exceeds that of phytoplankton.

26. What is food web?

The natural interconnection of food chains forms a food web.

27. Detritus contribute to the biogeochemical cycles, how?

By the decomposition of detritus, the simple minerals are released into the atmosphere & from there it comes back to the earth.

28. Can temperature regulate the rate of decomposition how?

High temperature favors decomposition and low temperature inhibits decomposition.

29. The detritus food chain and grazing food chain differ. How?

Detritus food chain begins from the dead and decaying matter while grazing food chain starts from the green plants (Producers).

30. As succession proceeds the numbers and types of animals and decomposers also change. How?

Vegetation changes in turn change the food and shelter for various types of animals. As a result the foresaid changes happen.

31. In burnt out Forests and flooded lands succession takes place faster. Why?

In burnt out forests and flooded lands some soil or sediment is present. There is no need for soil to be formed.

32. Sedimentary cycle is quite different from a gaseous cycle with respect to its reservoir. Bring out the difference.

The reservoir of gaseous cycle exists in the atmosphere and for the sedimentary cycle it is located in earth's crust

33. Decomposition is faster if detritus is rich in nitrogen and water soluble substance like sugars. When is the decomposition process slower?

Its slower if detritus is rich in lignin and chitin.

34. If we count the number of insects on a tree and number of small birds depending on those insects as also the number of larger birds eating the smaller, what kind of pyramid of number would we get?

Inverted Pyramid of Number.

35. Differentiate between Sere and Seral communities.

Sere: Entire sequence of communities that successively change in a given area.

Seral community: Individual transitional community.

36. Who are generally the pioneer species in a Xerarch succession and in a Hydrarch succession?

Pioneer species in Hydrarch succession are usually the small phytoplanktons and that in Xerarch succession are usually lichens.

37. What percentage of photosynthetically active radiation is captured by plants?

10%

38. Name the pioners of primary succession in water.

Phytoplanktons

39. Why an earth worm is called a detrivore?

Earthworm breaks down detritus into smaller particles.

40. When is the structure and composition of a community expected to remain unchanged?

When the environment remains unchanged.

41. What is the starting point of a detritus food chain?

Death of an organism is the starting point of detritus food chain.

42. Give an example to show how the same species can occupy more than one trophic level in the same ecosystem.

Sparrow is primary consumer when eats seeds and secondary consumer when it eats worms.

43. What is a climax community?

A community that is in near equilibrium with the environment.

44. What is ecological succession?

The gradual and fairly predictable change in the species composition of a given area is called ecological succession.

45. What are sere(s)?

The entire sequence of communities that successively change in a given area are called sere(s).

46. What are seral communities?

During succession, the individual transitional communities are termed seral stages or seral communities.

47. What is the characteristic feature that is observed in seral communities during different stages succession?

In the successive seral stages there is a change in the diversity of species of organisms, increase in the number of species and organisms as well as an increase in the total biomass.

48. What is primary succession?

Succession is hence a process that starts where no living organisms are there.

49. Give an example for an area where the primary succession begins.

Newly cooled lava, bare rock, newly created pond or reservoir.

50. What is secondary succession?

Succession that occurs in areas that somehow, lost all the living organisms that existed there.

51. Give an example for an area where secondary succession begins.

Secondary succession begins in areas where natural biotic communities have been destroyed such as in abandoned farm lands, burned or cut forests, lands that have been flooded.

52. Why secondary succession is faster than primary succession?

Since some soil or sediment is present, succession is faster than primary succession.

53. Based on the nature of the habitat, what are the types of succession is present?

Two types-hydarch or xerarch

54. What is hydrarch succession?

Hydrarch succession takes place in wetter areas and the successional series progress from hydric to the mesic conditions

55. What is xerarch succession?

Xerarch succession takes place in dry areas and the series progress from xeric to mesic conditions.

56. What is a pioneer species?

The species that invade a bare area are called pioneer species.

57. Define 'standing state'

The amount of nutrients, such as carbon, nitrogen, phosphorus, calcium, etc., present in the soil at any given time, is referred to as the standing state

58. What is nutrient cycling?

The movement of nutrient elements through the various components of an ecosystem is called nutrient cycling.

59. What is the other name for nutrient cycling?

Another name of nutrient cycling is biogeochemical cycles.

60. What is the reservoir for the carbon cycle?

Atmosphere

61. What is the reservoir for the phosphorus cycle?

Earth's crust

62. What is the function of reservoir in nutrient cycling?

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

63. Write one difference between net primary productivity and gross productivity.

Gross productivity - Rate of production of organic matter during photosynthesis

Net primary productivity - Available biomass for the consumption to heterotrophs /

GPP - R = NPP

64. Name the dominant producers in a aquatic ecosystem. What other name could you give to primary consumers?

Plants, Herbivores.

65. What is meant by saying that the energy flow in an ecosystem is unidirectional?

The energy flow in an ecosystem is unidirectional means energy flows in one direction only from producer to consumers and does not come back to source.

66. Name the ecological pyramid that can be inverted in a tree eco-system.

Pyramid of Number

67. What are the starting points of grazing food chain and detritus food chain?

Grass and Detirus respectively.

68. What is meant by species composition of any ecosystem?

Species composition means all the plant, animal and microbial species present in an ecosystem

69. What is the approximate value of net primary productivity of the Biosphere?

170 billion tons (Dry Weight)

70. What % of Productivity is contributed by Oceans?

55 billion tons

71. What is meant by Humification?

It is the process of formation of humus.

72. What is meant by PAR?

Photosynthetically Active Radiation

73. What are producers in an Eco System?

Green Plants

74. Why is food chain formed in a nature?

Food chain is formed because one organism depends on other for food.

75. What are consumers in an eco system?

Animals

76. Name the trophic level occupied by a secondary & tertiary consumers.

Primary Carnivores and Secondary Carnivores

77. Why is measurement of bio-mass in terms of dry weight more accurate than fresh weight?

Measurement of bio-mass in terms of dry weight more accurate than fresh weight because fresh weight contains a large amount of water which decreases due to drying.

78. Name the ecological pyramid that is always upright.

Pyramid of Energy

79. Why is pyramid of biomass inverted in a water body?

Pyramid of Biomass is inverted in a water body because the biomass possessed by fish (Consumer) is larger than the phytoplanktons (producers)

80. Mention one similarity between hydrach & xerarch succession

Both type of succession leads to medium water conditions or mesic conditions i.e. neither too dry nor too wet.

81. Name any two factors on which the type of pioneer species if plant develops in secondary succession.

Condition of Soil
Availability of water

82. How much of carbon is fixed in the biosphere through photosynthesis annually?

4x10¹³ kg

83. How much carbon is dissolved in the Ocean?

71% of global carbon.

84. Which metabolic process causes a reduction in the Gross Primary Productivity?

Respiration

2 MARKS QUESTIONS

1. Why the primary productivity differs in different ecosystems?

Primary productivity depends on the plant species inhabiting a particular area. It also depends on a variety of environmental factors, availability of nutrients and photosynthetic capacity of plants. Therefore, it varies in different types of ecosystems.

2. Depict a simple grazing food chain.

A simple grazing food chain (GFC) is depicted below:

Grass → Goat → Man

(Producer) → (Primary Consumer) → (Secondary consumer)

3. Write a note on detritus food chain.

Detritus food chain: Begins with dead organic matter (detritus) and pass through detritus feeding organism in soil to organisms feeding on detritus-feeders.

In aquatic ecosystem GFC is the major conduit for energy flow.

In terrestrial ecosystems a much larger fraction of energy flows through the detritus food chain than through GFC.

4. Cite an example of an inverted ecological pyramid. What kind of pyramid of energy would it have?

Pyramid of biomass of sea.

Always upright.

5. List the two types of nutrient cycles.

Nutrient cycles are of two types: (a) gaseous and (b) sedimentary.

6. Explain the impact of human activity of carbon cycle.

Human activities have significantly influenced the carbon cycle.

Rapid deforestation and massive burning of fossil fuel for energy and transport have significantly increased the rate of release of carbon dioxide into the atmosphere

7. What are decomposers? Write their function.

a) Saprotrophs feed on dead bodies of organisms,

b) Decomposition and mineralization.

8. What is the difference between gaseous and sedimentary cycle?

a) Gaseous-Reservoir in atmosphere, Carbon/Nitrogen cycle

b) Sedimentary-Soil, eg-phosphorus.

9. Why is the length of a food chain in an ecosystem generally limited to 3-4 trophic levels?

As 90% energy is lost in the form of heat from one trophic level to another, residual energy decreases drastically within 2-3 trophic levels.

10. What are the differences between detritus and grazing food chains?

Ans-a) Begins with Detritus-dead and decaying organic matter. **b)** Grazing-Begins with living green plants.

11. What are the two basic categories of ecosystem? Give example.

Ans-a) Terrestrial-Forest, grassland, desert. **b)** Aquatic-Pond, lake, sea, ocean

12. Mention two factors by which productivity is limited in an aquatic ecosystem.

Ans-a) Light-decreases with increasing water depth. **b)** Nutrient –Limiting factor in Deep Ocean.

13. What is food chain? Give an example.

Ans-a) Food and feeding relation among organisms makes a chain like structure **b)** Grass—Deer—Lion

14. "Flow of energy is unidirectional but nutrient flow is in a cycle" Give reason

Energy flow is always from the sun to 'producers' and to the different trophic levels. so it is unidirectional. But the nutrients are moving from the living to non-living and vice-versa.

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

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

16. Some organisms are called top carnivores. Why? Give some examples.

Top carnivores do not have direct predators. so they are referred to as top carnivores eg: Man, Lion, Tiger etc.

17. Given below is the primary hydrarch succession. Bring out the missing sere stages in the process.

A-Submerged plant stage, B-Reed swamp stage C-scrub stage, D-Forest

18. Given below is a simplified model of phosphorus cycle. Write down the natural reservoir of phosphorus and also the processes that put in phosphorus to the soil.

A. Rock minerals B. Weathering C. Decomposition

19. What is the shape of pyramid of biomass in sea? Why?

Inverted, because biomass of fishes far exceeds that of phytoplankton.

20. Give an example of an ecological pyramid which is always upright. Justify your answer.

Pyramid of energy is always upright and can never be inverted, because when energy flows from a trophic level to the next trophic level some energy is always lost as heat at each step.

21. Differentiate between primary succession and secondary succession. Which one occurs faster?

Primary Succession: A process that starts where no living organisms are there.

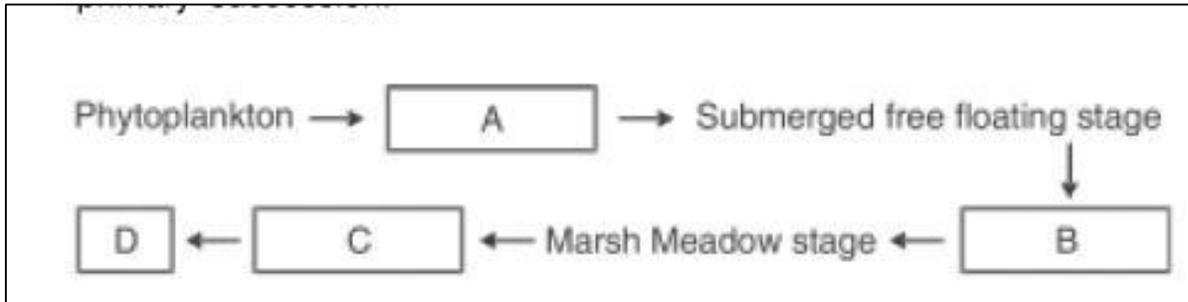
Secondary succession : A process that starts in areas which have lost all the living organisms that existed there.

22. Gaseous nutrient cycle and sedimentary nutrient cycles have the reservoir. Name them. Why is a reservoir necessary?

Reservoir for Gaseous nutrient cycle: Atmosphere; for sedimentary

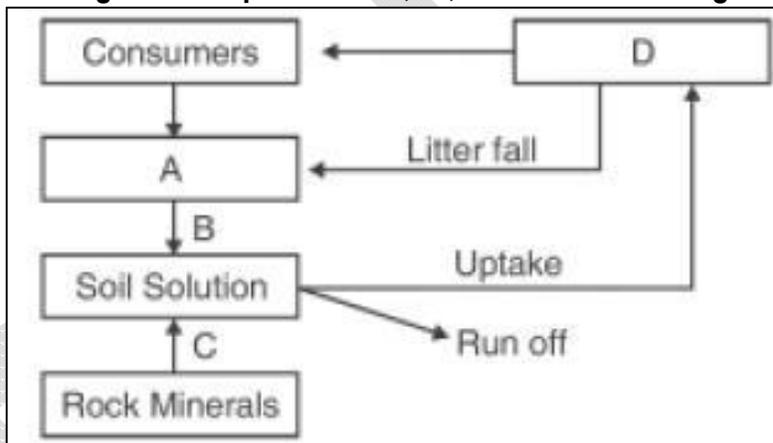
Nutrient cycle: Earth's crust. Reservoir is needed to meet with the deficit which occurs due to imbalance in the rate of influx and efflux.

23. Fill up the missing links depicted as A, B, C and D in the given model of primary succession.



A = Submerged plant stage B = Reed Swamp Stage C = Scrub stage D = Forest stage

24. Fill up the missing links depicted as A, B, C and D in the given nutrient cycle.



A = Detritus B = Decomposition C = Weathering D = Producers.

25. Differentiate between Hydrarch and a xerarch succession.

Hydrarch Succession : Starts in water proceeds from hydric (aquatic) to mesic (neither dry nor wet) situations.

Xerarch succession: Starts on barren rock Proceeds from Xeric (dry) conditions.

26. What is the effect on decomposition rate if:-

a) Detritus is rich in lignin and chitin

Decomposition rate is slower

b) Detritus is rich is nitrogen and sugars

Decomposition rate is faster.

27. What are the limitations of ecological pyramids?

(i) Does not take into account same species belonging to two or more trophic levels.

(ii) Assumes simple food chain, does not accommodate food web.

(iii) Saprophytes have not been given any place in ecological pyramids.

28. Name any four ecosystem services. Who gave the price tags on nature's life support services? Which is the most important ecosystem service provider?

Forest (ecosystem) purifies water and air.

1. Mitigate Droughts and floods

2. Nutrient cycling
3. Generate fertile soil
4. Provide habitat for wildlife
5. Pollinate flower
6. Maintain Biodiversity
7. Provide aesthetic, cultural & spiritual values

Robert Constanza gave price tags to ecosystem services.

Most important ecosystem services provider: Soil formation.

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

DFC-Dead and decaying organic matter/ Dead remains of plants and animals

GFC-Living green plants/producers

30. Cite an example for inverted ecological pyramid. What kind of pyramid of energy would it have?

Sea/ forest large tree. Upright.

31. When is the structure and composition of a community remain unchanged?

When the environment remains unchanged

32. a) Compare detritus food chain and grazing food chain in terms of their origin.

b) Which among the two is the major contributor to energy flow in aquatic ecosystem?

Detritus food chain begins from the dead and decaying matter while grazing food chain starts from the green plants (Producers).

Major contributor to energy flow: Grazing food chain.

33. 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.

Aquatic ecosystem - Grazing Food Chain / GFC.

Terrestrial ecosystem - Detritus Food Chain / DFC.

Difference: GFC begins with phytoplanktons / producers whereas DFC begins with dead organisms/ detritus.

34. How are standing crop and biomass related to each other?

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.

35. Differentiate between a detrivore and a decomposer giving an example of each.

Detrivore feeds on dead plants and animals / detritus

Example: Earthworm / Nematodes

Decomposer breaks down complex (organic) matter into simpler (inorganic) matter

Example: Fungus / Bacteria.

36. The gradual and predictable change in the species composition of a given area is called ecological succession. What do you understand with the pioneer and climax community in this context?

Pioneer Community (Species) – Community that invades a bare area

Climax community – Last sustainable community that is in near equilibrium with the environment

37. Give reasons why measurement of bio-mass in terms of dry weight is more accurate than fresh weight.

Dry weight is total amount of living (or) organic matter in a trophic level / organism after water is removed. Hence it is more accurate

38. How is a detritivore different from a decomposer? Give one example for each.

Detritivore breakdown detritus into smaller fragments called fragmentation. Eg., earthworm
Enzymes degrade detritus into simpler organic substances-eg., bacteria and fungi.

39. Which organisms are usually the pioneer species in a (i) Hydrarch and (ii) Xerarch succession?

Hydrarch Succession: Usually small phytoplanktons.

Xerarch Succession: Usually lichens.

40. What would happen to the successive trophic level in the pyramid of energy, if the rate of reproduction of phytoplankton slows down? Suggest two factors which could cause such a reduction in phytoplankton reproduction.

They will become narrow.

Because, the energy flow will decrease with each level of the trophic.

Energy flow is not dependent on the rate of reproduction.

Even if the rate of reproduction is low or high the energy will decrease on next trophic level.

The rate of reproduction in phytoplankton can be reduced either by lack of nutrients or by extremely high or low temperature. Phytoplankton reproduction is reduced due to:

- Pollution
- Eutrophication

41. Expand PAR, How much PAR is used in gross primary productivity?

Ans .Photosynthetically Active Radiation.

2-10%.

42. How does the man made ecosystem differ from the natural ecosystem?

1) Manmade ecosystem

Under regular control and monitored by man

1) Natural ecosystem

Not under the control of man

43. Name the basic requirements of any ecosystem to function and sustain?

Productivity

Decomposition

Energy Flow and

Nutrient Cycling

44. Among the ecosystem services are control of floods and soil erosion. How is this achieved by the biotic components of the ecosystem?

Plants – roots hold Soil Particles - explain

Litter and humus – retains water - explain

3 MARKS QUESTIONS

1. What are the limitations of ecological pyramids?

It does not take into account the same species belonging to two or more trophic levels.

It assumes a simple food chain, it never exists in nature.

It does not accommodate food web.

Saprophytes are not given place in ecological pyramids

2. How does phosphorus cycle differs from carbon cycle?

There is no respiratory release of phosphorus into atmosphere.

Atmospheric inputs of phosphorus through rainfall are much smaller.

Gaseous exchange of phosphorus between organism and environment are negligible.

3. Study the table given below and fill the blanks from 'A' to 'F'.

S.No	Component of the Ecosystem	Position of the trophic level	Organism present in the Food chain
1.	E	Fourth trophic level	F
2.	Secondary consumer	D	Bird, fish, wolf.
3.	B	Second trophic level	C
4.	Primary producer	A	Phytoplankton, grass, tree.

A = First trophic level

B = Primary consumer

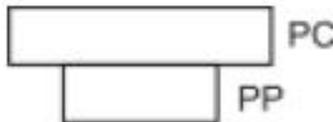
C = Zooplankton, Cow, Grass hopper

D = Third trophic level

E = Tertiary consumer

F = Man, Lion

4. In the pyramid of biomass drawn below, name the two crops (i) one which is supported (ii) one which supports in which ecosystem is such a pyramid found?



(i) Supported trophic level is founded by zooplanktons

(ii) Supporting trophic level is formed by phytoplanktons ecosystem

It is found in aquatic ecosystem.

5. Both carbon and phosphorus cycles are biogeochemical cycles but they differ in three aspects. List them.

1) CARBON CYCLE

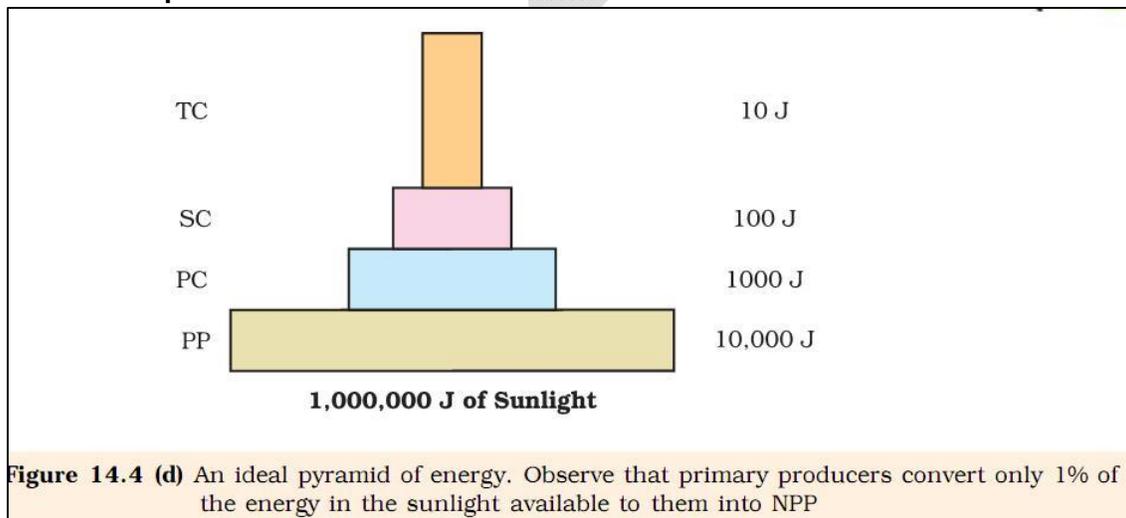
1. Reservoir exists in atmosphere

2. Considerable inputs of carbon through rainfall

3. Evident gaseous exchange between organism and environment takes place

PHOSPHORUS CYCLE

1. Reservoir exists in earth's crust
2. Negligible inputs of phosphorus through rain fall.
3. Gaseous exchange between Organism and environment is extremely negligible.
- 6. Ecosystems should carry a hefty price tag for its various services. Enlist six of them.**
 1. Purify air and water
 2. Mitigate droughts and floods
 3. Cycle nutrients
 4. Generate fertile soils
 5. Provide wide life habitat
 6. Pollinate flowers
 7. Provide aesthetic, cultural and spiritual values
- 7. Construct an ideal pyramid of energy when 1, 000, 000 joules of sunlight is available. Label all its trophic levels.**



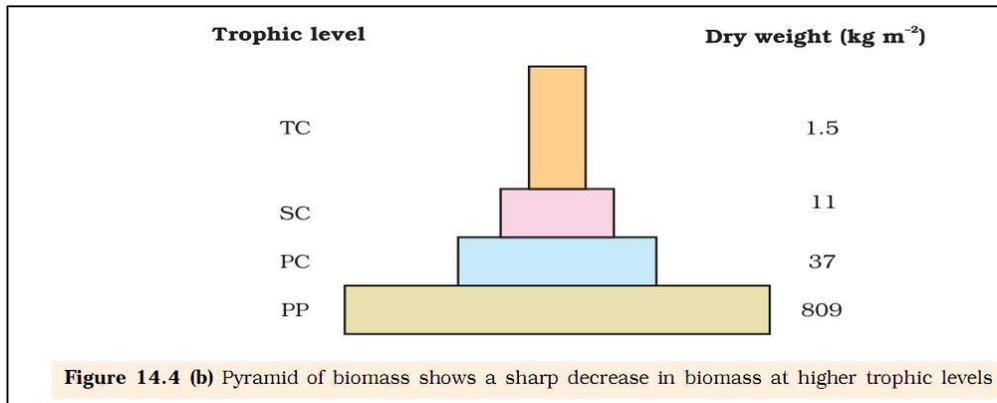
8. Name the pioneer species on a bare rock. How do they help in establishing the next type of vegetation? Mention the type of climax community that will ultimately get established.

Lichens

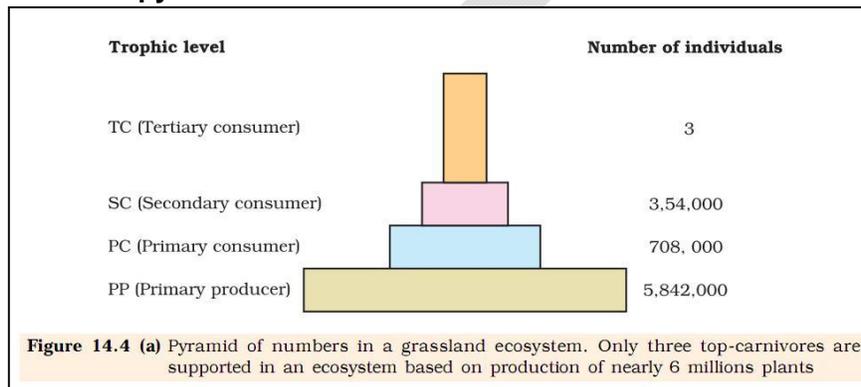
Lichens which are able to secrete acids to dissolve rock, helping in weathering and soil formation.

Climax community is forest community.

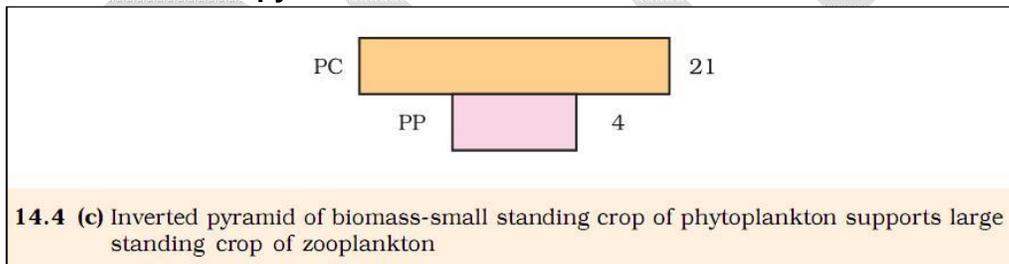
9. Construct an ideal pyramid of biomass



10. Construct an ideal pyramid of numbers



11. Construct an inverted pyramid of biomass.



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

The species that invade a bare area are called pioneer species. In primary succession on rocks these are usually lichens which are able to secrete acids to dissolve rock, helping in weathering and soil formation. These later pave way to some very small plants like bryophytes, which are able to take hold in the small amount of soil. They are, with time, succeeded by bigger plants, and after several more stages, ultimately a stable climax forest community is formed. The climax community remains stable as long as the environment remains unchanged. With time the xerophytic habitat gets converted into a mesophytic one.

13. Answer the following:

a) Explain primary productivity and the factors influence it.

b) Describe how oxygen and chemical composition of detritus control decomposition do.

a) Primary productivity depends on the plant species inhabiting a particular area. It also depends on a variety of environmental factors, availability of nutrients and photosynthetic

capacity of plants. Therefore, it varies in different types of ecosystems. The annual net primary productivity of the whole biosphere is approximately 170 billion tons (dry weight) of organic matter. Of this, despite occupying about 70 per cent of the surface, the productivity of the oceans is only 55 billion tons. Rest of course, is on land.

b) Decomposition is largely an oxygen-requiring process. The rate of decomposition is controlled by chemical composition of detritus and climatic factors. In a particular climatic condition, decomposition rate is slower if detritus is rich in lignin and chitin, and quicker, if detritus is rich in nitrogen and water-soluble substances like sugars. Temperature and soil moisture are the most important climatic factors that regulate decomposition through their effects on the activities of soil microbes. Warm and moist environment favor decomposition whereas low temperature and anaerobiosis inhibit decomposition resulting in buildup of organic materials.

14. Interspecific interactions of two species of any population may be beneficial, detrimental or neutral. Explain each of them with the help of suitable examples.

Species A	Species B	Name of interaction
+	+	Mutualism
-	-	Competition
+	-	Predation
+	-	Parasitism
+	0	Amensalism

- (i) + Beneficial- Both species benefit in Mutualism e.g. lichens
- (ii) - Detrimental – Both species lose in competition e.g. (detrimental)
- In Predation & Parasitism the predator and the parasite benefits but it is detrimental to the other species (host and prey respectively)
- (iii) Neutral – In commensalism one species is benefited but the other is neither harmed nor benefitted.

15. Water is very essential for life. List any three features that enable plants and animals to survive in water scarce environment.

Plants: Ephemeral mode (complete life cycle in short period) / Deep tap roots / Deciduous leaves / Waxy cuticle / sunken stomata / Succulence to store water / C 4 Pathway of Photosynthesis. (Any 3)

Animals: No sweating / uricotelic / deposition of fat in sub epidermal layer / burrowing nature / thick skin / body covered with

Scales. (Any 3)

16. Under what circumstances secondary succession does begins? Why does it proceed faster than primary succession?

Secondary succession begins in areas where natural biotic communities have been destroyed such as in abandoned farm lands, burned or cut forests, lands that have been flooded.

Since some soil or sediment is present, succession is faster than primary succession

17. Explain why ecological succession will be faster in a forest devastated by fire than on a bare rock? Also compare succession in case of an abandoned land after floods with that on a bare rock?

Since some soil or sediment is present, succession is faster in a forest devastated by fire than on a bare rock.

In secondary succession in an abandoned land after floods, the species that invade depend on the condition of the soil, availability of water, the environment as also the seeds or other propagules present. Since soil is already there, the rate of succession is much faster and hence, climax is also reached more quickly.

On a bare rock, the establishment of a new biotic community is generally slow. Before a biotic community of diverse organisms can become established, there must be soil. Depending mostly on the climate, it takes natural processes several hundred to several thousand years to produce fertile soil on bare rock

18. 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.

a. Reduction in Primary Productivity and biomass of producers. No biomass available for transfer to next higher tropic levels.

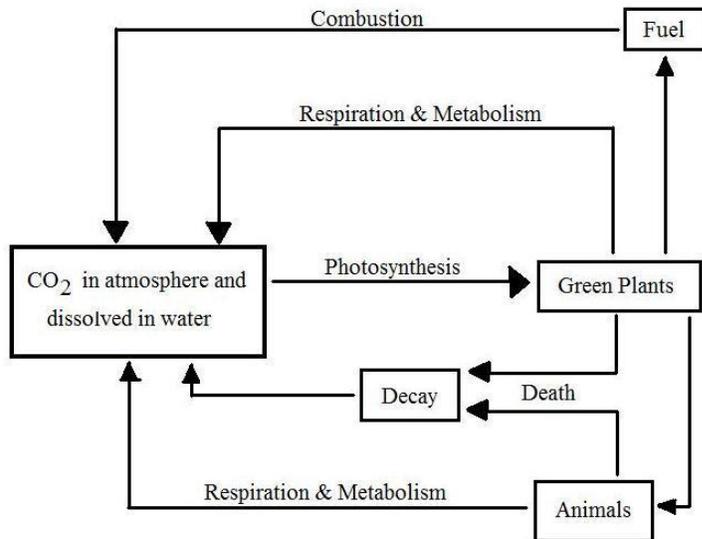
b. Increase in Primary productivity and biomass of producers. Carnivore population will dwindle.

c. Overgrazing leading to desertification

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

In primary succession in water, the pioneers are the small phytoplanktons, they are replaced with time by free-floating angiosperms, then by rooted hydrophytes, sedges, grasses and finally the trees. The climax again would be a forest. With time the water body is converted into land

21. Schematically represent simplified model of carbon cycle.



Basic Carbon Cycle Flow Diagram

22. Schematically represent simplified model of phosphorus cycle.

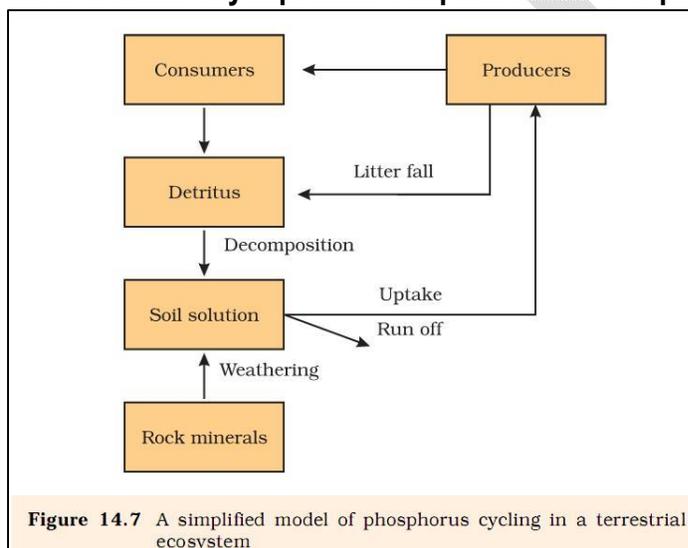


Figure 14.7 A simplified model of phosphorus cycling in a terrestrial ecosystem

23. Explain the function of reservoir in a nutrient cycle. List the two types of nutrient cycles in nature.

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

Gaseous cycle and Sedimentary cycle.

5 MARKS QUESTIONS

1. Describe pond ecosystem.

The abiotic components include all dissolved inorganic and organic substances and the rich soil deposit at the bottom of the pond.

The solar input, cycle of temperature, day length, regulates the rate of function of the entire pond.

The producer (autotrophic) includes phytoplankton, some algae and the floating, submerged and marginal plants found in edge of pond.

The consumers are represented by zooplankton, free swimming and bottom dwelling animals.

2. Describe the process of decomposition.

The decomposers are the fungi, bacteria especially abundant at the bottom of the pond.

Detritivores (e.g., earthworm) break down detritus into smaller particles. This process is called fragmentation.

By the process of leaching, water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts. Bacterial and fungal enzymes degrade detritus into simpler inorganic substances. This process is called as catabolism.

It is important to note that all the above steps in decomposition operate simultaneously on the Humification and mineralization occur during decomposition in the soil.

Humification leads to accumulation of a dark colored amorphous substance called humus that is highly resistant to microbial action and undergoes decomposition at an extremely slow rate.

Being colloidal in nature it serves as a reservoir of nutrients.

The humus is further degraded by some microbes and release of inorganic nutrients occurs by the process known as mineralization.

3. Explain the factors affecting the process of decomposition.

Decomposition is largely an oxygen-requiring process.

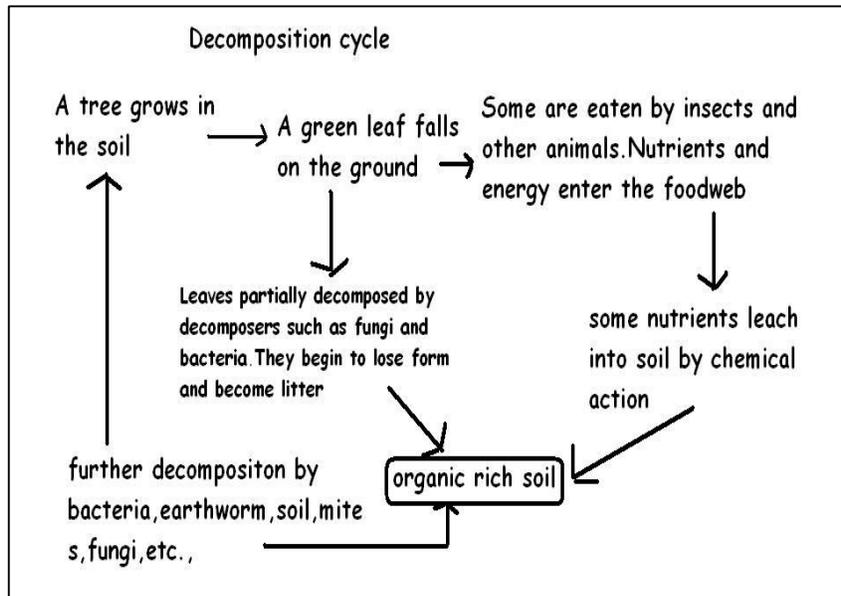
The rate of decomposition is controlled by chemical composition of detritus and climatic factors.

In a particular climatic condition, decomposition rate is slower if detritus is rich in lignin and chitin, and quicker, if detritus is rich in nitrogen and water-soluble substances like sugars.

Temperature and soil moisture are the most important climatic factors that regulate decomposition through their effects on the activities of soil microbes.

Warm and moist environment favor decomposition whereas low temperature and anaerobiosis inhibit decomposition resulting in buildup of organic materials

4. Schematically represent decomposition cycle with a simplified model.



5. Explain the characteristic features of ecological pyramids.

The base of the pyramid is broad and it narrows down at the apex. The similar shape is obtained when food or energy relationship between organisms at different trophic level.

The relationship can be expressed in terms of number, energy or biomass.

The base of the pyramid represented by producer and apex is the top consumer; other trophic levels are in between.

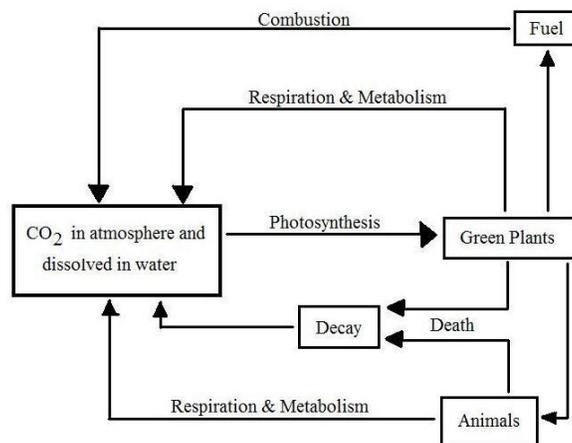
In most ecosystems, all the pyramids, of number, of energy and biomass are upright.

The pyramid of **number** in a tree ecosystem is **inverted**.

The pyramid of **biomass** in sea also **inverted** because the biomass of fishes is far exceeds that of phytoplankton.

Pyramid of **energy** is **always upright**, can never be inverted, because when energy flows from a particular trophic level to the next, some energy is always lost as heat at each step.

6. Explain the carbon cycle with a simplified model.



Basic Carbon Cycle Flow Diagram

Fossil fuel also represents a reservoir of carbon. Carbon cycling occurs through atmosphere, ocean and through living and dead organisms. According to one estimate 4×10^{13} kg of carbon is fixed in the biosphere through photosynthesis annually. A considerable amount of carbon returns to the atmosphere as CO_2 through respiratory activities of the producers and consumers. Decomposers also contribute substantially to CO_2 pool by their processing of waste materials and dead organic matter of land or oceans. Some amount of the fixed carbon is lost to sediments and removed from circulation. Burning of wood, forest fire and combustion of organic matter, fossil fuel, and volcanic activity are additional sources for releasing CO_2 in the atmosphere.

7. Detrivores like earthworm are involved in the process of decomposition of dead plants and animals. Describe the different steps involved in the process of decomposition.

The dead remains of plants and animals called detritus undergo decomposition and are converted into simpler substances. The steps of this process are:

- (i) Fragmentation : Breakdown of detritus into smaller pieces by detrivores like earthworm.
- (ii) Leaching : Water soluble inorganic nutrients go down into soil horizon and get precipitated as unavailable salts.
- (iii) Catabolism: Bacterial and fungal enzymes degrade detritus into simpler inorganic substances.
- (iv) Humification : It leads to accumulation of dark coloured amorphous substance called humus which is highly resistant to microbial action so decomposes at slow rate and is rich in nutrients.
- (v) Mineralization : Humus is further degraded by some microbes and release of inorganic nutrients occurs.

8. Answer the following:

(a) Trace the succession of plants on a dry bare rock.

(a) Primary succession - lichens, secrete acids to cause weathering of rock and soil formation, Small plants like bryophytes, to hold the soil, Herbs, scrubs, shrubs succeed in existence, Trees, forest, climax community.

(b) How does phosphorus cycle differ from carbon cycle?

(b) – No respiratory release of phosphorus unlike CO_2 . In carbon cycle / No gaseous exchange – Inputs of phosphorus through rainfall is less than carbon input.

9. Answer the following:

(a) Explain primary productivity and the factors that influence it.

Ans. (a) Primary productivity: amount of biomass / organic matter produced per unit area over a time period by the plant during photosynthesis.

Factors: availability of nutrients / quality of light available / availability of water / temperature of the given place / type of plant species of the area / photosynthetic capacity of the plants. (Any Four)

(b) Describe how oxygen and chemical composition of detritus control decomposition do.

(b) Oxygen increases rate of decomposition

Chemical: decomposition is slow when chitin and lignin are present

10. Answer the following:

(i) Define decomposition and describe the process of decomposition.

(ii) Draw schematically the phosphorus cycle in nature.

(i) The process by which decomposers break down complex organic matter into inorganic substances like carbon dioxide, water and nutrients and the process is called decomposition

The decomposers are the fungi, bacteria especially abundant at the bottom of the pond.

Detritivores (e.g., earthworm) break down detritus into smaller particles. This process is called fragmentation.

By the process of leaching, water- soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts. Bacterial and fungal enzymes degrade detritus into simpler inorganic substances. This process is called as catabolism.

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Humification leads to accumulation of a dark colored amorphous substance called humus that is highly resistant to microbial action and undergoes decomposition at an extremely slow rate.

Being colloidal in nature it serves as a reservoir of nutrients.

The humus is further degraded by some microbes and release of inorganic nutrients occurs by the process known as mineralization.

(ii)

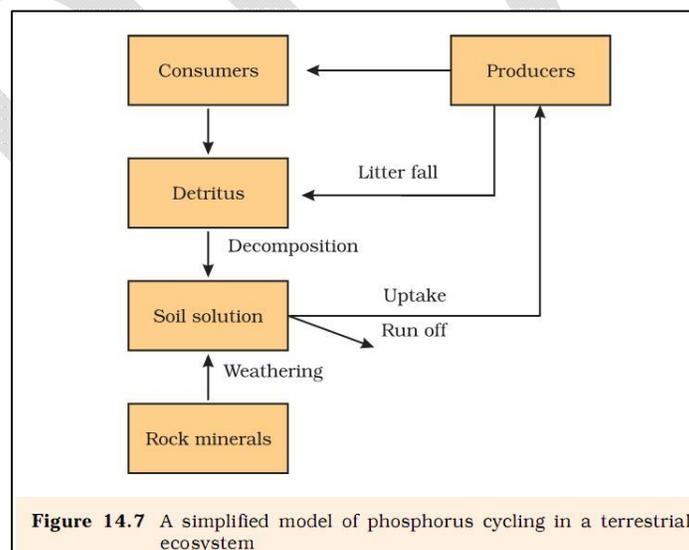


Figure 14.7 A simplified model of phosphorus cycling in a terrestrial ecosystem

11. Explain how does:

a. a primary succession start one bare rock and reach a climax community?

b. The phosphorus cycle operates.

The species that invade a bare area are called pioneer species. In primary succession on rocks these are usually lichens which are able to secrete acids to dissolve rock, helping in weathering and soil formation. These later pave way to some very small plants like bryophytes, which are

able to take hold in the small amount of soil. They are, with time, succeeded by bigger plants, and after several more stages, ultimately a stable climax forest community is formed. The climax community remains stable as long as the environment remains unchanged. With time the xerophytic habitat gets converted into a mesophytic one.

(ii) Phosphorus is a major constituent of biological membranes, nucleic acids and cellular energy transfer systems. Many animals also need large quantities of this element to make shells, bones and teeth. The natural reservoir of phosphorus is rock, which contains phosphorus in the form of phosphates. When rocks are weathered, minute amounts of these phosphates dissolve in soil solution and are absorbed by the roots of the plants. Herbivores and other animals obtain this element from plants. The waste products and the dead organisms are decomposed by phosphate-solubilising bacteria releasing phosphorus. Unlike carbon cycle, there is no respiratory release of phosphorus into atmosphere

12. Explain xerarch succession.

The species that invades bare area are called pioneer species.

In primary succession on bare rock the pioneer species is the lichen.

Lichen secretes acid to dissolve rock, helping in weathering and soil formation.

The little soil, leads to growth of bryophytes (mosses).

The mosses speed up the process of soil accumulation by trapping wind-blown particles.

Lichen moss carpet provides suitable substratum for the germination of seeds of herbaceous plants.

Gradually more soil is accumulated and herbaceous species make way for the invasion of shrubs followed by trees.

The climax community is generally dominated by trees.

13. Explain hydrarch succession.

In primary succession in water, the pioneers are the small phytoplanktons,

They are replaced with time by free-floating angiosperms,

Then by rooted hydrophytes, sedges, grasses and finally the trees.

The climax again would be a forest. With time the water body is converted into land

All the succession whether taking place in water or on land, proceeds to a similar climax community – the mesic.

14. Explain Carbon cycle.

Carbon constitutes 49 percent of dry weight of organism.

Out of total global carbon, 71 percent carbon found dissolved in ocean. About 1 percent in the atmosphere. 4×10^{13} kg of carbon is fixed in the biosphere by photosynthesis, annually.

Large amount of carbon returned to the atmosphere as CO_2 through respiration of producers and consumers.

Decomposers also return CO_2 to reservoir during decomposition process.

Some amount of Carbon is lost to sediments and removed from circulation.

Burning wood, forest fire, combustion of organic matter, fossil fuel, volcanic activities are additional sources for releasing CO_2 to atmosphere.

15. Explain phosphorus cycle.

Phosphorus is a major constituent of biological membranes, nucleic acids and cellular energy transfer system (ATP)

Animals need phosphorus to make shell, bones and teeth.

Reservoir pool of phosphorus is the rock, which contain phosphorus in the form of phosphates. During weathering of rock small amount of phosphates dissolved in soil solution and are absorbed by the roots of the plants.

Herbivore and other animals obtain organic form of phosphorus from plants.

The waste product and dead organisms are decomposed by phosphate-solubilising bacteria releasing phosphorus.

16. Describe ecosystem services.

Healthy ecosystems are the base for a wide range of economic, environmental and aesthetic goods and services.

The products of ecosystem processes are named as ecosystem services, for example, healthy forest ecosystems purify air and water, mitigate droughts and floods, cycle nutrients, generate fertile soils, provide wildlife habitat, maintain biodiversity, pollinate crops, provide storage site for carbon and also provide aesthetic, cultural and spiritual values. Though value of such services of biodiversity is difficult to determine, it seems reasonable to think that biodiversity should carry a hefty price tag.

Robert Constanza and his colleagues have very recently tried to put price tags on nature's life-support services.

Researchers have put an average price tag of US \$ 33 trillion a year on these fundamental ecosystems services, which is largely taken for granted because they are free. This is nearly twice the value of the global gross national product GNP which is (US \$ 18 trillion).

Out of the total cost of various ecosystem services, the soil formation accounts for about 50 per cent, and contributions of other services like recreation and nutrient cycling, are less than 10 percent each. The cost of climate regulation and habitat for wildlife are about 6 per cent each

17. Answer the following:

a) What is meant by ecological succession? How does it occur?

The gradual and fairly predictable change in the species composition of a given area.

During succession, some species colonies area and their population become more numerous whereas the population of other species decline and even disappear.

b) Differentiate between primary and secondary succession.

PRIMARY SUCCESSION	SECONDARY SUCCESSION
It occurs in an area which has been bare from the beginning.	It occurs in an area which has been denuded recently.
Soil is absent in the beginning of primary succession	Soil is present in the area where secondary succession begins.
Takes a long time for completion	Takes less time for completion