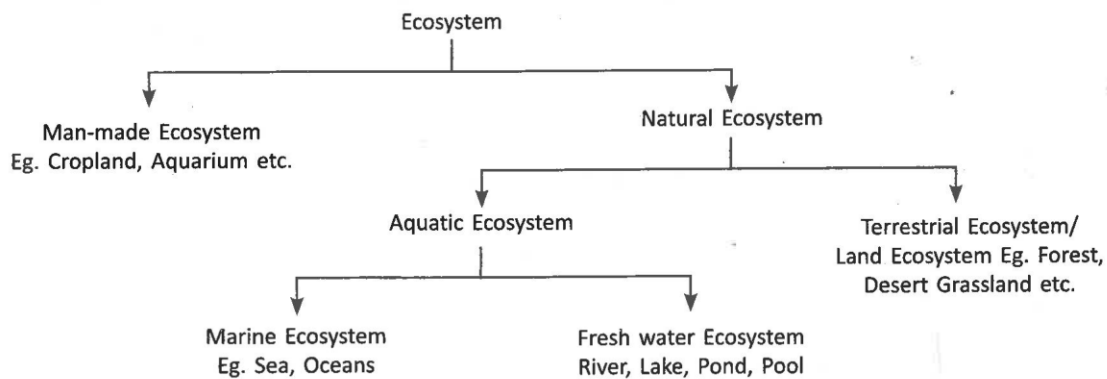


ECOSYSTEM

STUDY-NOTES

ECOSYSTEM-STRUCTURE AND FUNCTION

- An ecosystem is a functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment.
- The size of ecosystem varies significantly from a small pond to a large forest or a sea.
- The natural ecosystem is divided into two basic categories: terrestrial and the aquatic.



- Interaction of biotic and abiotic components result in a physical structure that is characteristic for each type of ecosystem. Identification and inventory of plant and animal species of an ecosystem gives its species composition.

Stratification

- Vertical distribution of different species occupying different levels is called stratification. For example, trees occupy top vertical strata or layer of a forest, shrubs the second, and herbs and grasses occupy the bottom layers.
- The components of the ecosystem function as a unit when we consider the following aspects:
 - (a) Productivity
 - (b) Decomposition
 - (c) Energy flow
 - (d) Nutrient cycling

PRODUCTIVITY

(i) Primary productivity

- The amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis.
- It is divided into:
 - (i) **Gross primary productivity** of an ecosystem is the rate of production of organic matter during photosynthesis. A considerable amount of GPP is utilised by plants in respiration.
 - (ii) **Net primary productivity (NPP)** refers to the rate of accumulation of energy in the form of biomass. Gross primary productivity minus respiration losses (R), is the net primary productivity (NPP).

$$GPP - R = NPP$$
 - (iii) Net primary productivity is the available biomass for the consumption to heterotrophs (herbivores and decomposers).

- Primary productivity depends on
 - (i) the plant species inhabiting a particular area
 - (ii) a variety of environmental factors
 - (iii) availability of nutrients
 - (iv) photosynthetic capacity of plants

Therefore, primary productivity varies in different types of ecosystems.

(ii) **Secondary productivity** is defined as the rate of formation of new organic matter by consumers.

DECOMPOSITION

- Decomposition is the breakdown of complex organic matter into inorganic substances like carbon dioxide, water and nutrients.
- Decomposition is essentially an oxygen-requiring process.
- **Detritus** is the dead plants' residue like leaves, bark, flowers, etc. and dead remains of animals.
- Decomposition involves various steps such as - fragmentation, leaching, catabolism, humification and mineralization.
 - (i) **Fragmentation of Detritus:** Detritivores feed on detritus. The breakdown increases the surface area of detritus particles for microbial action.
 - (ii) **Leaching:** Soluble inorganic nutrients dissolve in water and penetrate through the soil. Then they are removed due to leaching action.
 - (iii) **Catabolism:** Decomposers such as bacteria and fungi release enzymes that decompose detritus into simpler inorganic compounds.
 - (iv) **Humification:** Simplified detritus is converted to humus.
 - (v) **Mineralisation:** The humus is further degraded by some microbes and release of inorganic nutrients occur by the process known as mineralisation.

Factors affecting rate of decomposition

(i) Chemical composition of detritus

- The rate of decomposition is controlled by chemical composition of detritus.
- Rate of decomposition is slower if detritus is rich in lignin and chitin.
- However, it is faster in nitrogen and water-soluble rich detritus. For example, sugars.

(ii) Climatic factors

- Temperature and soil moisture are the most important climatic factors that regulate decomposition. These affect the activities of soil microbes.
- Warm and moist environment favour decomposition whereas low temperature and anaerobiosis inhibit decomposition resulting in buildup of organic materials.

ENERGY FLOW

- The Sun is the only source of energy for all ecosystems on the Earth.
- Of the total incident solar radiation less than 50 per cent of it is **photosynthetically active radiation (PAR)**.
- Plants capture only 2-10 per cent of the PAR and this small amount of energy sustains the entire living world.
- All organisms depend for their food on producers, either directly or indirectly.
- Therefore, it is a unidirectional flow of energy from the sun to producers and then to consumers.
 - (i) **Producers**
 - All green plant in the ecosystem are called producers.
 - Herbaceous and woody plants are major producers in a terrestrial ecosystem.
 - Phytoplankton algae and higher plants are producers in an aquatic ecosystem.
 - (ii) **Consumers**
 - All animals depend on plants (directly or indirectly) for their food needs.
 - They are called consumers and also heterotrophs.

(a) **Herbivores or Primary Consumers**

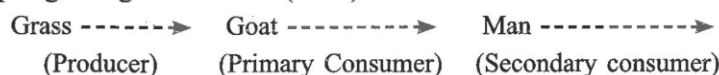
- Animals that feed on producers are called primary consumers.
- For example, in terrestrial ecosystem: insects, birds and mammals; in aquatic ecosystem, molluscs.

(b) **Primary Carnivores or Secondary Consumers**

- Primary consumers that eat other animals are called secondary consumers.

(c) **Secondary Carnivores or Tertiary Consumers**

- A simple grazing food chain (GFC) is shown below:



(iii) **Decomposers**

- These are important constituent of detritus food chain.
- The detritus food chain commences with dead organic matter.
- It is made up of decomposers which are heterotrophic organisms such as fungi and bacteria.
- They fulfil their energy and nutrient requirements by degrading dead organic matter or detritus. These are also known as saprotrophs.
- Decomposers secrete digestive enzymes that helps in breakdown of dead and waste materials into simple, inorganic materials, which are then absorbed by them.
- **Food web:** An aquatic ecosystem, terrestrial ecosystem and detritus food chain may be connected at some levels. The natural interconnection of various food chains forms a food web.
- **Trophic level:** Based on the source of nutrition, organisms occupy a specific place in the food chain. This is known as the trophic level.
- The amount of energy decreases at successive trophic levels. Organisms at each trophic level depend on those at the lower trophic level for their energy demands.
- **Standing crop:** The mass of living material at a particular time at each trophic level is called the standing crop. It 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.
- **10 per cent law:** In any ecosystem, the transfer of energy follows 10 per cent law i.e., only 10 per cent of the energy is transferred to each trophic level from the lower trophic level.

ECOLOGICAL PYRAMIDS

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

(a) **Pyramid of numbers**

- It shows the number of individuals per unit area at various trophic levels. The producers are at base and various consumers at successively higher levels. It is generally upright.
- A pyramid of number in case of a big tree is generally inverted as the number of insects feeding on that tree generally exceeds than the tree itself.

(b) **Pyramid of Biomass**

- A pyramid of biomass in sea is generally inverted as the biomass of fishes usually exceeds that of microscopic phytoplanktons.

(c) **Pyramid of Energy**

- Pyramid of energy is always upright.
- When energy flows from any trophic level to the next trophic level, some energy is always lost as heat at each step.

Limitations of Ecological Pyramids

- (a) It does not take into account the same species belonging to two or more trophic levels.
- (b) It assumes a simple food chain, which never exists in nature.

- (c) It does not accommodate a food web.
- (d) Saprophytes are not given any place in ecological pyramids even though they play a vital role in the ecosystem.

ECOLOGICAL SUCCESSION

- The gradual and equally expected change in species composition of a given area is called **ecological succession**.
- During succession some species colonise an area. Their population becomes abundant whereas population of some other species decline and even disappear.
- **Climax community**: Orderly and sequential changes that leads to a community which is near equilibrium is called climax community.
- **Sere**: The entire sequence of communities that successively change in a given area are called sere(s). The individual transitional communities are termed **seral stage or seral communities**.
- In the successive seral stages, the diversity of species changes, and number of species as well as the total biomass increases.
- **Pioneer species**: The species that invade a bare area are called Pioneer species.

Primary Succession and Secondary Succession

- **Primary succession** starts in bare area, where no organism is present. For example, bare rocks, cooled volcano or newly created pond etc.
- **Secondary succession** occurs in the area where the natural biotic communities and living organisms are destroyed due to some reasons such as forest fire, earthquake etc. For example, abandoned farm lands, burned or cut forests, lands that have been flooded come under secondary succession.
- Secondary succession begins in areas where some soil or sediment is present, hence secondary succession is faster than primary succession.

Succession of Plants

- On the basis of nature of habitat, succession of plants can be grouped as
 - (i) **Hydrarch succession** takes place in wet areas and the successional series progress from hydric to the mesic conditions.
 - (ii) **Xerarch succession** takes place in dry areas and series progress from xeric to mesic conditions.
Therefore, both hydrarch and xerarch successions lead to medium water conditions (mesic) which is neither too dry (xeric) nor too wet (hydric).

Primary Succession on Rocks

- Lichens secrete acids and dissolve rock. This helps in weathering of rocks and soil formation. As a result, some very small plants like bryophytes may grow in such soil. In due course of time, small plants are succeeded by higher plants, and after several seral stages, eventually a stable climax forest community is formed. It is stable as long as the environment remains unchanged. With time the xerophytic habitat is changed into a mesophytic one.

Primary Succession in Water

- Phytoplanktons are pioneer species in a hydrarch succession. These are replaced with by rooted-submerged plants, rooted-floating angiosperms followed by free-floating plants, then reedswamp, marsh-meadow, scrub and finally the trees. The climax community is again will be a forest. With time the water body is converted into land.
- In secondary succession the species that invade depends on
 - (i) the condition of the soil
 - (ii) availability of water
 - (iii) the environment
 - (iv) the seeds or other propagules

Due to the presence of soil from the beginning the rate of succession is much faster and hence, climax is also reached more quickly.

- All succession either in water or on land, proceeds to a similar climax community – the mesic community.

NUTRIENT CYCLING

- 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. It varies in different kinds of ecosystems and also on a seasonal basis.
- Nutrients are never lost from the ecosystems. However, they are recycled in nature.
- The movement of nutrient elements through the various components of an ecosystem is called **nutrient cycling** or **biogeochemical cycling**.

Types of Nutrient Cycles

- (i) **Gaseous:** Nitrogen and carbon cycle; reservoir is atmosphere
- (ii) **Sedimentary:** Sulphur and phosphorus cycle, reservoir is the earth crust.
 - Environmental factors, e.g., soil, moisture, pH, temperature, etc., regulate the rate of release of nutrients into the atmosphere.
 - The function of the reservoir is to compensate the deficiency due to imbalance in the rate of influx and efflux.

Carbon Cycle

- It occurs through atmosphere, ocean and living and dead organisms.
- Most of the carbon is fixed by plants during photosynthesis and returns to atmosphere in form of CO₂ during respiration.
- Burning of wood, forest fire and combustion of organic matter, fossil fuel, and volcanic activity are sources of CO₂ in the atmosphere.
- During processing of waste materials and dead organic matter decomposers also release CO₂.
- Some amount of the fixed carbon is lost to sediments and removed from circulation.
- Human activities such as deforestation and massive burning of fossil fuel have affected the carbon cycle. It significantly increased the rate of release of carbon dioxide into the atmosphere.

Phosphorus Cycle

- Rock is the natural reservoir of phosphorus which contains phosphorus in the form of phosphates.
- On weathering, minute amount of phosphates dissolve in soil solution and absorbed by the roots of the plants.
- The waste products of dead organisms are decomposed by bacteria to release phosphorus. Gaseous exchange between organism and environment is negligible as compared to carbon cycle.

ECOSYSTEM SERVICES

- The products of ecosystem processes are called ecosystem services. It includes-
 - (i) The healthy forest ecosystem purifies air and water
 - (ii) Mitigates floods and droughts
 - (iii) Cycle nutrients
 - (iv) Generate fertile soil
 - (v) Provide wildlife habitat
 - (vi) Maintain biodiversity etc.
- Scientists have put an average price tag of US \$33 trillion a year on these fundamental ecosystems services which are taken granted because they are free although its value is twice the total global gross national product (GNP).

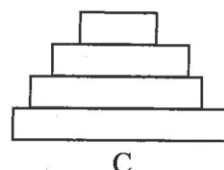
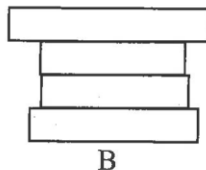
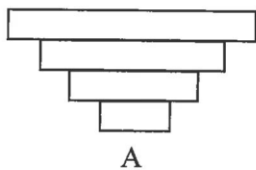
QUESTION BANK

MULTIPLE CHOICE QUESTIONS

- The primary consumers are**
 - Insects and cattle
 - Eagle and snakes
 - Water insects
 - Snakes and frogs
- Maximum productivity is found in**
 - Grassland
 - Desert
 - Ocean
 - Tropical rain forest
- If CO₂ is not present in the earth's atmosphere, the temperature of the earth's surface would be**
 - Same as the present
 - Less than the present
 - Higher than the present
 - Depends on the amount of other gases in the atmosphere
- What do secondary carnivores refer to?**
 - Animals at second trophic level.
 - Animals depend on the herbivores for food.
 - Animals depend on the primary carnivores for food.
 - Animals depend on the secondary herbivores for food.
- Which of the following is a detritivore?**
 - Animal feeding on decaying organic matter.
 - Animal feeding on a plants
 - Plant feeding on animals (insectivores)
 - Animal feeding on another animal
- Which of the following can have the highest value (gm/m²/yr) in a grassland ecosystem?**
 - Primary production
 - Secondary production
 - Tertiary production
 - Gross production
- In an ecosystem, the concentration of nitrogen remains constant by**
 - Action of microorganisms
 - Thundering and lightning
 - Soil
 - Both (a) and (b)
- During the process of ecological succession, the changes that take place in communities are**
 - Orderly and sequential
 - Random
 - Very quick
 - Not influenced by the physical environment
- In an ecosystem, energy transferred from one trophic level to another is**
 - 5%
 - 10%
 - 15%
 - 20%
- Plants capture approximately _____ percent of the Sun's energy while other trophic levels capture about _____ percent of the energy available to them in their food.**
 - 1, 10
 - 10, 60
 - 10, 1,
 - 60, 10
- Which of the following type of ecosystem is expected in an area where evaporation exceeds precipitation, and mean annual rainfall is below 100 mm**
 - Grassland
 - Shrubby forest
 - Desert
 - Mangrove
- What is the percentage of photosynthetically active, radiation (PAR), in the incident solar radiation?**
 - 100%
 - 50 %
 - 1-5%
 - 10%

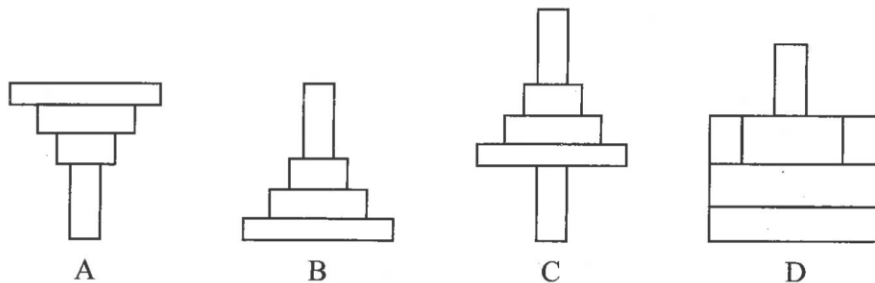
13. The detritus food chain (DFC) begins with _____. It is made up of decomposers which are _____ organisms, mainly _____. They meet their energy and nutrient requirements by degrading _____.
- (a) detritus, heterotrophic, earthworm and dead organic matter
 (b) dead organic matter, heterotrophic, fungi and bacteria, dead organic matter
 (c) dead organic matter, autotrophic, fungi and plants, dead organic matter
 (d) grass, heterotrophic, fungi and bacteria, dead organic matter
14. Climax community is in a state of
- (a) Non-equilibrium (b) Equilibrium (c) Disorder (d) Constant change
15. The major reservoir of phosphorus is
- (a) Aquifers (b) Soil and rocks (c) Atmosphere (d) Rainwater
16. The second trophic level in a lake is
- (a) Phytoplankton (b) Zooplankton (c) Benthos (d) Fishes
17. 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%
18. Nitrogen gas makes up nearly 80 % of the Earth's atmosphere, yet nitrogen is often a limiting factor for plant growth. The reason is
- (a) The atmospheric form of nitrogen cannot be used by plants.
 (b) Nitrifying bacteria remove usable nitrogen from the soil more rapidly than plants can absorb it.
 (c) Atmospheric nitrogen dissolves readily in the soil but is washed out with every rainfall.
 (d) Plants must absorb nitrogen through their roots, which are not in contact with the atmosphere.
19. In the phosphorus cycle, phosphate becomes available by weathering of rocks first to
- (a) Consumers (b) Producers (c) Decomposers (d) None of these
20. "Detritus food chain may be connected with the grazing food chain at some levels". This is evident from
- (i) Some of the organisms of DFC are prey to the GFC animals.
 (ii) A natural ecosystem, in which some animals like cockroaches, crows, etc., are omnivores.
 (iii) Some of the organisms of GFC are facultative decomposers.
- (a) (i) and (iii) (b) (i) and (ii) (c) (ii) and (iii) (d) (i) only
21. 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, sedges, meadow and trees
22. In deposition catabolism is performed by
- (a) Bacteria and earthworm (b) Fungi and earthworm
 (c) Bacteria and fungi (d) Fungi
23. The most abundant element present in the plants is
- (a) Nitrogen (b) Manganese (c) Iron (d) Carbon
24. What do you mean by the standing crop?
- (a) Crop in a field at a given time
 (b) Each trophic level has a certain mass of living material at a particular time.
 (c) Each trophic level has a certain mass of organic material at a particular time.
 (d) Top trophic level has a certain mass of organic material at a particular time.

25. Among the following biogeochemical cycles which one does not have losses due to respiration?
 (a) Phosphorus (b) Nitrogen (c) Sulphur (d) All of these
26. Which of the following is incorrect?
 (a) All the steps in decomposition operate simultaneously on the humus.
 (b) Humus is an accumulated dark coloured amorphous substance.
 (c) Humus is highly resistant to microbial action and undergoes decomposition at an extremely slow rate.
 (d) Being colloidal in nature humus serves as a reservoir of nutrients.
27. The standing crop is measured as the
 (a) Mass of living organism in a unit area (b) The number of living organism in a unit area
 (c) Calculated from the net primary productivity (d) Both (a) and (b)
28. Bacteria play an important role in carbon cycle in
 (a) Chemosynthesis (b) Photosynthesis
 (c) In breakdown of organic matter (d) In assimilation of nitrogen compound
29. Which of the following are decomposers?
 (a) Fungi (b) Bacteria (c) Flagellates (d) All of these
30. In a pond ecosystem, decomposers are found
 (a) On the water surface (b) In the shallow zone
 (c) In the bottom of the pond (d) In the middle zone of the water
31. The concentration of CO₂ in the atmosphere is about
 (a) 11% (b) 0.433% (c) 0.34% (d) 0.03%
32. Why does the number of trophic levels in the grazing food chain is restricted?
 (a) As the transfer of energy follows 10 percent law. (b) Food chains remains short.
 (c) There are few species in the community. (d) Transfer of energy could no more efficient.
33. Which of the following is not a producer?
 (a) *Spirogyra* (b) *Agaricus* (c) *Volvox* (d) *Nostoc*
34. The base of each pyramid represents the _____ or the _____ level while the apex represents _____
 (a) Consumers, first trophic and top trophic level (b) Producers, first trophic and top trophic level
 (c) Producers, second trophic and top trophic level (d) Consumers, second trophic and top trophic level
35. The pyramid of energy is always upright for any ecosystem. This situation indicates the fact that
 (a) Producers have lowest energy conversion efficiency
 (b) Carnivores have a better energy conversion efficiency
 (c) Energy, conversion efficiency is the same in all trophic levels
 (d) Herbivores have a better energy conversion efficiency than carnivores
36. An inverted pyramid of biomass can be found in which ecosystem?
 (a) Forest (b) Marine (c) Grassland (d) Tundra
37. Which of the following pyramid represents the pyramid of number in grassland?



- (a) A (b) B (c) C (d) B and C

38. Which of the following ecosystems is the most productive in terms of net primary production?
 (a) Deserts (b) Tropical rain forests (c) Oceans (d) Estuaries
39. How do lichens play a vital role in succession?
 (a) They grow in a pollution free area.
 (b) They secrete acids that dissolves rock help in weathering and soil formation.
 (c) They are symbiotic association between fungi and algae.
 (d) More than one options are correct.
40. 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
41. What would be the order of plants in a xerarch succession?
 (a) Lichens, bryophytes, small annual plants, perennial herbs, grasses.
 (b) Lichens, bryophytes, grasses, perennial herbs, small annual plants,
 (c) Grasses, Lichens, bryophytes, perennial herbs,
 (d) Small annual plants, perennial herbs, grasses, Lichens, bryophytes
42. Edaphic factor refers to
 (a) Water (b) Soil (c) Relative humidity (d) Altitude
43. Which of the following is incorrect?
 (a) Only three top carnivores are supported in an ecosystem based on the production of nearly 6 million plants.
 (b) Pyramid of biomass shows a sharp increase in biomass at higher trophic levels.
 (c) Pyramid of biomass is inverted if small standing crop of phytoplankton supports large standing crop of zooplanktons.
 (d) Pyramid of energy is always upright.
44. Which of the following representations shows the pyramid of number in a forest ecosystem?



- (a) A (b) B (c) C (d) D

45. In relation to gross primary productivity of an ecosystem, which one of the following is correct?
 (a) Gross Primary Productivity is always more than Net Primary Productivity.
 (b) Gross Primary Productivity and Net Primary Productivity.
 (c) There is no relationship between Gross Primary Productivity and Net Primary Productivity.
 (d) Gross Primary Productivity is always less than Net Primary Productivity.

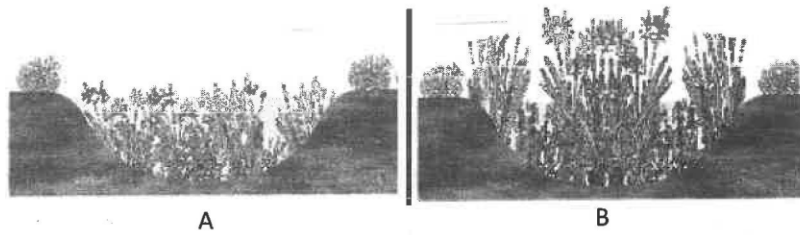
46. Match the trophic levels with their correct species example in the green land ecosystem

A. 4 th Trophic level	(i) Rat
B. 2 nd trophic level	(ii) Vulture
C. 1 st trophic level	(iii) Snake
D. 3 rd trophic level	(iv) Grass (Wheat crop)

Select the correct option.

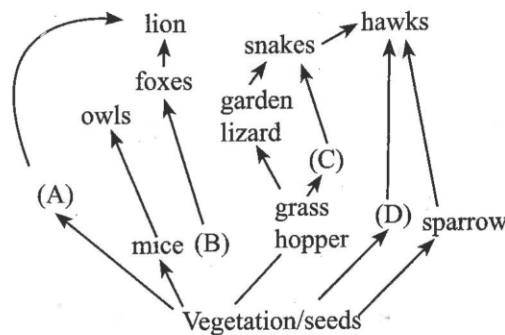
- (a) A-(iii), B-(ii), C-(i), D-(iv) (b) A-(iii), B-(ii), C-(iv), D-(i)
 (c) A-(iii), B-(iv), C-(ii), D-(i) (d) A-(ii), B-(i), C-(iv), D-(iii)

47. Identify the stages of hydrarch succession.



- (a) Reed swamp stage, marsh stage
- (b) Submerged plant stage, scrub stage
- (c) Reed swamp stage, Submerged plant stage
- (d) Scrub stage, Marsh meadow stage

48. Identify the likely organisms: A, B, C, D in the food web given below:



- (a) A = Deer, B = Rabbit, C = Frog, D = Rat
- (b) A = Rabbit, B = Deer, C = Frog, D = Rat
- (c) A = Deer, B = Rabbit, C = Rat, D = Frog
- (d) A = Deer, B = Rat, C = Frog, D = Rabbit

49. Which of the following statements is incorrect?

- (a) Ecosystems are exempted from the second law of thermodynamics.
- (b) An ecosystem has tendency towards increasing disorderliness.
- (c) Flow of energy is unidirectional from the sun to producers and then to consumers.
- (d) All organisms are dependent for their food on producers either directly or indirectly.

50. 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 the above

51. Which of the following is incorrect?

- (a) Any calculation of energy content biomass or numbers has to include all organisms at that trophic level.
- (b) The base of each pyramid represents the producers or the first trophic level while the apex represents tertiary or top level consumers.
- (c) The trophic level represents a functional level, not a species as such
- (d) A given species occupies only one trophic level in the same ecosystem at the same time.

52. Ultraviolet radiation from sunlight causes a reaction which produces

- (a) O₃
- (b) SO₂
- (c) CO₂
- (d) CH₄

53. The number of trophic levels in the grazing food chain is _____.

- (a) 8-10
- (b) 10-15
- (c) Restricted
- (d) Numerous

54. The transfer of energy follows

- (a) Allens rule (b) Bergmann rule (c) 10 percent law (d) 1 percent law

55. From secondary consumer to top consumer only _____ percent energy is transferred.

- (a) 1 (b) 10 (c) 100 (d) 1000

INPUT-TEXT BASED QUESTIONS

Read the following paragraphs and answer the following questions.

I. 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 higher 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.

1. The species that invade the bare area are also called

- (a) First species (b) Sere species (c) Last species (d) Invader species

2. The above para refers to the _____ succession.

- (a) Primary (b) Secondary (c) Tertiary (d) All of these

3. Some plants are able to secrete acids it refers to

- (a) Bryophytes (b) Algae (c) Fungi + Algae (d) Fungi

4. The entire sequence of communities that successively change in a given area are called

- (a) Sere (b) Seral stages (c) Pioneer organisms (d) Climax community

5. All the succession finally changes to

- (a) Xeric environment (b) Mesic environment
(c) Biotic environment (d) Hydrarch environment

II. The detritus food chain begins with dead organic matter. It is made up of decomposers which are heterotrophic organisms, mainly fungi and bacteria. They meet their energy and nutrient requirements by degrading dead organic matter or detritus. These are also known as saprotrophs. Decomposers secrete digestive enzymes that breakdown dead and waste materials into simple, inorganic materials, which are subsequently absorbed by them. In an aquatic ecosystem, GFC is the major conduit for energy flow. As against this, in a terrestrial ecosystem, a much larger fraction of energy flows through the detritus food chain than through the GFC. Detritus food chain may be connected with the grazing food chain at some levels: some of the organisms of DFC are prey to the GFC animals, and in a natural ecosystem, some animals like cockroaches, crows, etc., are omnivores.

1. The food chain that starts from dead organic matter include

- (a) Fungi and bacteria (b) Green plants
(c) Mammals (d) None

2. The organism that secrete digestive enzymes and break down dead organisms are

- (a) Producers (b) Decomposers (c) Consumers (d) Detritivore

3. Which of the following is/are decomposer?

- (a) Bacteria (b) Fungi (c) Both (a) and (b) (d) None

4. The network of food chains is known as

- (a) Food chain (b) Succession (c) Food web (d) None of these

5. In the detritus food chain the flow of energy _____ from decomposer to consumer.

- (a) Increases (b) Decreases
(c) Remains same through out (d) None

III. 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 favour decomposition whereas low temperature and anaerobiosis inhibit decomposition resulting in build up of organic materials.

1. Which of the following are detritivores?

- (i) Earthworms (ii) Dung flies (iii) Sea stars (iv) Honey bees

Select the correct option.

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

2. The correct sequence of the process of decomposition are

- (a) Fragmentation, humification, leaching, catabolism, and mineralisation
 (b) Humification, fragmentation, leaching, catabolism, and mineralisation
 (c) Leaching, fragmentation, mineralisation, humification and catabolism
 (d) Fragmentation, leaching, catabolism, humification and mineralisation

3. Humus formation is a step of decomposition process. Which of the following statement(s) is / are true about it?

- (i) Humus is colloidal in nature.
 (ii) Humus is highly resistant to microbial action.
 (iii) Humus formation is an anaerobic process.
 (iv) Humus release inorganic nutrients by process of mineralisation.

Select the correct option.

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

4. The rate of decomposition is high and quicker when

- (a) temperature is low and the moisture content is low
 (b) temperature is high and the moisture content is high
 (c) temperature is low and the moisture content is high
 (d) temperature is high and the moisture content is low

5. During decomposition, bacterial and fungal enzymes degrade detritus into simpler inorganic substances. This process is called as

- (a) Humification (b) Leaching (c) Catabolism (d) Mineralisation

IV. In primary succession in water, the pioneers are the small phytoplanktons, which are replaced with time by rooted-submerged plants, rooted-floating angiosperms followed by free-floating plants, then reed swamp, marsh-meadow, scrub and finally the trees. The climax again would be a forest. With time the water body is converted into land.

1. The succession above discussed is called

- (a) Xerarch succession (b) Mesarch succession
 (c) Hydrarch succession (d) All of these

2. To which climax community does succession in water lead to?

- (a) Coenozoic (b) Mesic (c) Meso zoic (d) Pteridophytes

3. What is the marsh meadow replaced by in the above succession?

- (a) Free floating angiosperms (b) Rooted submerged plants
 (c) Scrub (d) Free floating plants

4. When there is an increase in the number of species, change in the diversity of species and an increase in the total biomass, how are seral stages?

- (a) Disordered (b) Random (c) Alternative (d) Successive

5. Two statements are given here.

I- Rooted submerged plants replaces phytoplankton in hydrarch succession.

II- The hydrarch succession finally leads to the formation of a mesic community.

Choose the correct option.

- (a) I-True, II-False (b) I-True, II-True (c) I-False, II-True (d) I-False, II-False

ANSWERS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (c) | 3. (b) | 4. (c) | 5. (a) | 6. (d) | 7. (d) | 8. (a) | 9. (b) | 10. (a) |
| 11. (c) | 12. (d) | 13. (b) | 14. (b) | 15. (b) | 16. (b) | 17. (b) | 18. (a) | 19. (b) | 20. (b) |
| 21. (b) | 22. (c) | 23. (d) | 24. (b) | 25. (d) | 26. (a) | 27. (d) | 28. (c) | 29. (d) | 30. (c) |
| 31. (d) | 32. (a) | 33. (b) | 34. (b) | 35. (d) | 36. (b) | 37. (c) | 38. (b) | 39. (b) | 40. (c) |
| 41. (b) | 42. (b) | 43. (b) | 44. (c) | 45. (a) | 46. (d) | 47. (a) | 48. (a) | 49. (a) | 50. (d) |
| 51. (d) | 52. (a) | 53. (c) | 54. (c) | 55. (b) | | | | | |

EXPLANATION

8. The gradual and fairly predictable change in the species composition of a given area is called ecological succession. An important characteristic of all the communities is that their composition and structure constantly change in response to the changing environmental conditions. These changes are orderly and sequential parallel with the changes in the physical environment.
11. Desert ecosystem is expected in an area where evaporation exceeds precipitation, and mean annual rainfall is below 100 mm.
17. Approximately 2-10% of the solar energy that falls on the leaves of a plant is converted into chemical energy by photosynthesis.
21. The sequence of communities of primary succession in water is phytoplankton, free-floating hydrophytes, rooted hydrophytes, grasses and trees.
25. Phosphorus, nitrogen and sulphur are the biogeochemical cycles which do not loss due to respiration.
33. *Agaricus* is a fungus.
36. In terrestrial ecosystem pyramid of biomass is generally upright. The pyramid of biomass in sea or lake is generally inverted because the biomass of fishes exceeds that of phytoplanktons.
38. Tropical rain forest ecosystem is the most productive in terms of net primary production.
42. Edaphic factor refers to soil.
50. Cycling of nutrients, prevention of soil erosion and pollutant absorption and reduction of the threat of global warming is an ecosystem service provided by a natural ecosystem.

Input-Text Based Answers

- | | | | | | |
|------|--------|--------|--------|--------|--------|
| I. | 1. (a) | 2. (a) | 3. (d) | 4. (a) | 5. (b) |
| II. | 1. (a) | 2. (b) | 3. (c) | 4. (c) | 5. (b) |
| III. | 1. (c) | 2. (d) | 3. (a) | 4. (b) | 5. (c) |
| IV. | 1. (c) | 2. (b) | 3. (c) | 4. (d) | 5. (b) |