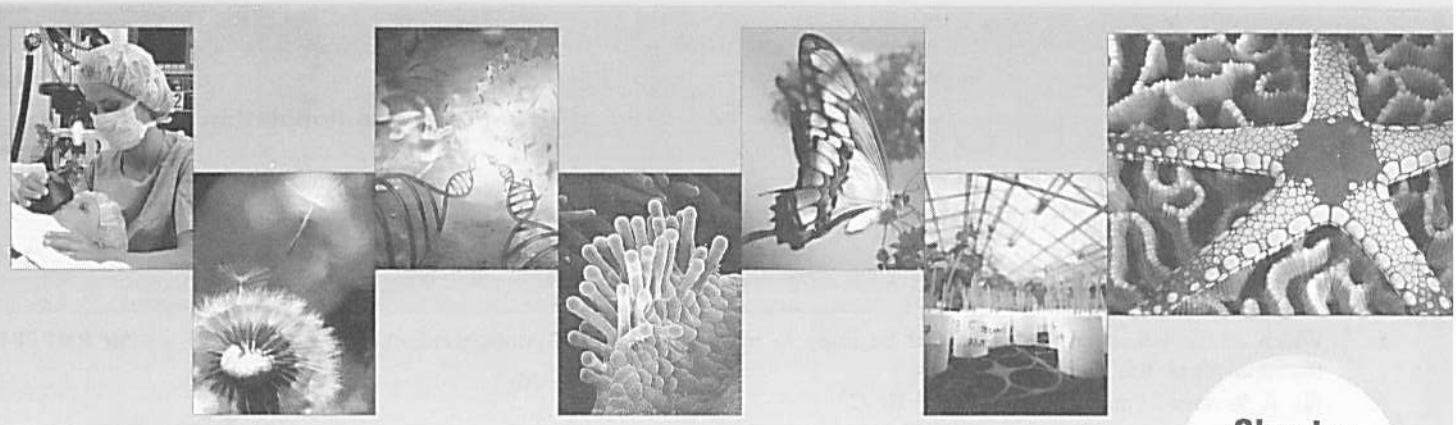


Chapter

10.2

Ecosystem : Structure and Function

The word ecosystem was coined by A.G. Tansley in 1935. According to Odum an ecosystem is the basic fundamental unit of ecology which includes both the organisms and the non–living environment each influencing the properties of the other and each is necessary for the maintenance of life.

Ecosystem is normally an open system because there is a continuous and variable entry and loss of energy and materials. Ecosystem is known by different terms *i.e.*, biogeocoenosis or geobiocoenosis or microcosm or ecosom or biosystem etc., the whole earth can be called biosphere or ecosphere.

Structure : The structure of any ecosystem is formed of two components, namely :

(1) **Abiotic factors :** The abiotic factors of an ecosystem include the non–living substances of the environment. *e.g.*, Water, soil, air, light, temperature, minerals, climate, pressure etc. The biotic factors of the ecosystem depend on the abiotic factors for their survival.

(2) **Biotic factors :** The biotic factor include the living organisms of the environment. *e.g.*, Plants, animals, bacteria, viruses etc. The biotic factors of an ecosystem are classified into three main groups, namely :

(i) **Producers :** The organisms which carry out photosynthesis constitute the producers of an ecosystem. *e.g.*, Plants algae and bacteria.

(ii) **Consumers :** Consumers are organisms which eat or devour other organisms. The consumers are further divided into three or more types. They are primary consumers, secondary consumers and tertiary consumers.

(a) **Primary consumers :** They eat the products like plants, algae and bacteria. The primary consumers are also called herbivores.

(b) **Secondary consumers :** They kill and eat the herbivores. They are also called carnivores. As these carnivores directly depend on herbivores, they are specifically called primary carnivores. Fox, wolf, etc. are the secondary consumers in a terrestrial ecosystem.

(c) **Tertiary consumers :** They kill and eat the secondary consumers. They are also called secondary carnivores. *e.g.*, Lion, tiger, etc.

(iii) **Reducers or Decomposers or Microconsumers :** The decomposers are heterotroph organisms that break up the dead bodies of plants and their waste products. They include fungi and certain bacteria. They secrete enzymes. The enzymes digest the dead organisms and the debris into smaller bits or molecules. These molecules are absorbed by the reducers. After taking energy, the reducers release molecules to the environment as chemicals to be used again by the producers. Microorganism acts as nature's scavenger.

(iv) **Other heterotrophs**

(a) **Scavengers or Detrivores :** They feed on corpses, *e.g.*, Vulture, Carrion Beetle. They help in quick disposal of dead bodies. In the process they also leave small fragments for decomposers.

(b) **Parasites :** They obtain nourishment from a living host without capturing or killing the same. Parasites obtain food from all categories of organisms. Common parasites are bacteria, fungi some worm and some insects.

Types of ecosystem

The ecosystem may be large, as large as the world or small, as small as a cow dung ecosystem. The biosphere (The total life content of the world) is the major ecosystem. It comprises all other ecosystems.

(1) **Mega ecosystem :** The biosphere is formed of four mega ecosystems. They are as follows :

(i) **Marine ecosystem :** It is the largest ecosystem of earth. Fresh water ecosystem are two types :

(a) **Lotic :** Running water ecosystem as river.

(b) **Lentic :** Still water ecosystem such as pond or lake. It includes saline-water ecosystems like oceans, seas, estuaries, brackish waters, etc.

(ii) **Limnic ecosystem :** It includes all fresh water ecosystems like ponds, pools, lakes, rivers, streams, etc.

(iii) **Terrestrial ecosystem :** It includes the ecosystems of air, forests, grasslands, deserts, etc.

(iv) **Industrial or Artificial ecosystems :** These are man made ecosystems. *e.g.*, Crop land, city, town, etc.

(2) **Macro ecosystems :** The four mega ecosystems are further divided into sub units called macro ecosystems. *e.g.*, Forests. The terrestrial macro ecosystem is formed of many forest ecosystems.

(3) **Meso ecosystem :** The macro ecosystem is further divided into meso ecosystem. For example, the forest ecosystem is formed of many meso ecosystems like deciduous forest, coniferous forests, etc.

(4) **Micro ecosystem :** The meso ecosystem is further divided into micro ecosystems, *e.g.*, A low land in a forest, a mountain in a forest, etc.

(5) **Natural ecosystems :** These are self–regulating systems without much direct human interference and manipulations. *e.g.*, Ponds, lakes, rivers, seas, oceans, grasslands, deserts, etc.

Forest ecosystem : Forests are natural plant communities with dominance of phanerogams. In India forests occupy approx. 1/10 of the land area. Indian forests can be divided into the 4 broad categories.

(i) Tropical (wet evergreen, semi-evergreen, moist deciduous and dry deciduous).

(ii) Subtropical

(iii) Temperate

(iv) Alpine

(1) **Abiotic components :** This includes inorganic and organic substances present in the atmosphere and soil. The climate (temperature, light, rainfall etc.) and soil (minerals) vary from forest to forest. In addition to minerals the occurrence of litter is the characteristic feature of majority of forests. Through litter decomposition approx. 90% energy trapped in the ecosystem by autotrophs dissipates into space as heat energy. The litter fall increases with decreasing latitudes.

(2) **Biotic components**

(i) **Producers :** They are represented mainly by trees but shrubs and ground flora are also found. Depending upon the kinds of forest the flora varies.

(ii) **Consumers**

(a) **Primary consumers** (herbivores) are small animals feeding on tree leaves, include ants, beetles, flies, bugs, spiders, leaf hoppers etc. neelgai, deer, elephants, moles, squirrels and fruit bats are large animals which feed upon shoots and/or fruits.

(b) **Secondary consumers** are different kinds of birds, snakes, lizards, feeding on primary consumers.

(c) **Tertiary consumers** like tiger and lion are the top carnivores.

(iii) **Decomposers :** *Streptomyces* (sps. of *Angiococus, Bacillus* and *Pseudomonas*) and Fungi (*Aspergillus, Polyporus, Alternaria, Fusarium, Trichonderma*) are helpful in decomposing the litter. Further litter decomposition is found to be slow in cooler and drier areas, therefore, sometimes its accumulation on the soil surface makes a thick layer.

Fresh water pond ecosystem : A pond is a suitable example for ecosystem. It is a lentic fresh–water ecosystem. It contains shallow standing water. On the global basis the maximum productivity is shown by aquatic ecosystem. The pond ecosystem is formed of abiotic factors and biotic factors.

(1) **Abiotic factors :** The abiotic factors of the pond ecosystem are water, CO_2, O_2 inorganic compounds, organic compounds, light, temperature, pressure, *pH* etc.

(2) **Biotic factors :** The biotic factors of the pond ecosystem are producers, consumers and reducers.

(i) **Producers :** The producers synthesize the energy from abiotic substances. The producers of a pond include phytoplankton like diatoms, blue green algae (*Oscillatoria*), green algae, green flagellates (*Volvox, Euglena, Chlamydomonas*), rooted plants, submerged plants and floating plants.

(ii) **Consumers :** Consumers eat other organisms. The organisms which depend on producers are called primary consumers or herbivores. *e.g.*, Zooplankton (*Cyclops, Daphnia*, larvae of *Chironomus* etc), *Dysticus* (insect), *Lymnaea* (snail) etc. The primary consumers are eaten by the secondary consumers or carnivores. These carnivores are called primary carnivores because they are the first carnivores in the food chain. *e.g.*, Small fishes, frogs etc. The secondary consumers are eaten by the tertiary consumers or secondary carnivores. *e.g.*, large fish.

(iii) **Reducers or Decomposers :** Several bacteria, fungi and actinomycetes represent this group *e.g.*, *Aspergillus, Saprolegnia.*

Dynamics of ecosystem : The various components of the ecosystem constitute an interacting system. They are connected by energy, nutrients and minerals. The continuous survival of the ecosystem depends on the flow of energy and the circulation of nutrients and minerals in the ecosystem. Thus the dynamics (functions) of the ecosystem includes the following :

(1) **Energy :** Energy is the ability to do work. The flow of energy is unidirectional in the ecosystem. The main source of energy for an ecosystem is the radiant energy or light energy derived from the sun. The amount of solar radiation reaching the surface of the earth is 2 cals/sq.cm/min. It is more or less constant and is called solar constant or solar flux. About 95 to 99% of the energy is lost by reflection. Plants utilize only 0.02% of the energy reaching earth. The light energy is converted into chemical energy in the form of sugar by photosynthesis.

$$6H_2O + 6CO_2 + \text{Light} \rightarrow C_6H_{12}O_6 + 6O_2$$

(2) **Primary production :** Plants convert light energy into chemical energy in the form of sugar by photosynthesis. The total amount of sugar and other organic materials produced in plants per unit area per unit time is called gross primary production. During photosynthesis respiration is also going on side by side. During respiration some amount of sugar is oxidised. Hence it is not easy to measure gross primary production. The total organic material actually present (biomass) in plants is called net primary production.

Net primary production = Gross primary production – Respiration. *i.e.*,

$$Pn = Pg - R$$

$$\therefore Pg = Pn + R$$

Where, Pg = Gross primary production

Pn = Net primary production

R = Respiration

Thus the amount of organic material produced during a given period of time per unit area is called primary production. The productivity is generally expressed in terms of grams or kilocalories per square meter per day or per year.

(3) **Secondary production :** The energy trapped by the producers (primary production) is utilized by the consumers. The producers are directly consumed by the herbivores that are eaten by the primary carnivores that in turn are consumed by the secondary carnivores. The consumers store some amount of energy in their tissues. This energy, stored by the consumers, is called secondary production. Only about 10 to 20% of the primary production is converted into secondary production. The remaining 80 to 90% is lost by the consumers in the form of faeces.

(4) **Food chain :** The biotic factors of the ecosystem are linked together by food. For example, the producers form the food for the herbivores. The herbivores form the food for the carnivores. The sequence of the eaters being eaten is called food chain.

Producers → Herbivores → Carnivores

The various steps in a food chain are called trophic levels. Owing to repeated eating being eaten, the energy is transferred from one trophic level to another.

This transfer of energy from one trophic level to another is called energy flow. A typical food chain can be seen in a pond ecosystem. The algae and phytoplakton are eaten by the zooplankton. The zooplankton are eaten by fishes which are eaten by snakes.

Types of food chains : The food chains are of two types, namely :

(i) **Grazing food chain :** This food chain starts from plants, goes through herbivores and ends in carnivores.

Plants→ Herbivores → Primary Carnivores → Sec. Carnivores

This type of food chain depends on the autotrophs which capture the energy from solar radiation. A few chains are given below :

Grass → Grasshopper → Lizard → Hawk

Grass → Mouse → Snake → Hawk

Phytoplankton → Zooplankton → Fish → Snake.

The grazing food chain is further divided into two types, namely : (a) Predator (b) Parasitic.

(ii) **Detritus food chain :** It starts from dead organic matter and ends in inorganic compounds. There are certain groups of organisms which feed exclusively on the dead bodies of animals and plants. These organisms are called detritivores. The detritivores include algae, bacteria, fungi, protozoans, insects, millipedes, centipedes, crustaceans, mussels, clams, annelid worms, nematodes, ducks, etc.

(5) **Food web :** In an ecosystem the various food chains are interconnected with each other to form a network called food web. The interlocking of many food chains is called food web. Simple food chains are very rare in nature. This is because each organism may obtain food from more than one tropic level. In other words, one organism forms food for more than one organisms of the higher trophic level.

Food webs are very important in maintaining equilibrium (homeostasis) of ecosystem.

Example : In a grassland ecosystem

- Grass → Grasshopper → Hawk
- Grass → Grasshopper → Lizard → Hawk
- Grass → Rabbit → Hawk
- Grass → Mouse → Hawk
- Grass → Mouse → Snake → Hawk

Significance of food web : Food webs are very important in maintaining the stability of an ecosystem. For example, the deleterious growth of grasses is controlled by the herbivores. When one type of herbivores increase in number and control the vegetation.

Similarly, when one type of herbivorous animal becomes extinct, the carnivore predating on this type may eat another type of herbivore.

(6) **Trophic levels :** Each food chain contains many steps like producers, herbivores, primary carnivores and so on. Each step of the food chain is called trophic level. The number of trophic levels in a food chain in restricted to 5 or 6. Green plants make first trophic level.

T_1 → Producers – (Trees, Plants, Grass)

C_1 or T_2 – Herbivorous – (Cow, Grass hopper, Zooplankton)

C_2 or T_3 – Primary carnivorous (Dog, Frog, Lizard)

C_3 or T_4 – Secondary carnivorous (Hawk, Fox, Snake)

C_4 or T_5 – Tertiary carnivorous or Top carnivorous (Tiger, Lion, Man)

Phytoplankton → Zooplankton → Fishes → Snakes

Tr. L_1 Tr. L_2 Tr. L_3 Tr. L_4

(7) **Energy flow :** The transfer of energy from one trophic level to another trophic level is called energy flow. The flow of energy in an ecosystem is unidirectional. That is, it flows from the producer level to the consumer level and never in the reverse direction. Hence energy can be used only once in the ecosystem. But the minerals circulate and recirculate many times in the ecosystem. A large amount of energy is lost at each trophic level. It is estimated that 90% of the energy is lost when it is transferred from one trophic level to another.

Hence the amount of energy available decreases from step to step. Only about 10% of the biomass is transferred from one trophic level to the next one is a food chain. And only about 10% chemical energy is retained at each trophic level. This is called 10% law of Lindeman (1942). When the food chain is short, the final consumers may get a large amount of energy. But when the food chain is long, the final consumer may get a lesser amount of energy.

(8) **Ecological pyramids :** The number, biomass and energy of organisms gradually decrease from the producer level to the consumer level. This can be represented in the form of a pyramid called ecological pyramid. Ecological pyramid is the graphic representation of the number, biomass, and energy of the successive trophic levels of an ecosystem. The use of ecological pyramid was first described by Charles Elton in 1927. In the ecological pyramid, the producer forms the base and the final consumer occupies the apex. There are three types of ecological pyramids, namely :

(i) **The pyramid of number :** The number of individuals at the trophic level decreases from the producer level to the consumer level. That is, in an ecosystem the number of producers is far high. The number of herbivores is lesser than the producers. Similarly, the number of carnivores is lesser than the herbivores. Number of producers per unit area is more in pond ecosystem than grassland ecosystem. In forest ecosystem the pyramid of number is intermediate. Here the number of primary consumers is more than producers as well as top consumers.

In a cropland ecosystem : In croplands the crops are more in numbers. The grasshoppers feeding on crop plants are lesser in number. The frogs feeding on grasshopper are still lesser in number. The snakes feeding on frogs are fewer in number.

Crop → Grasshopper → Frogs → Snakes → Hawks

In a grassland ecosystem : In a grassland the grasses are there in large numbers. The consumers decrease in the following order.

Grass → Grasshopper → Lizard → Hawk

Grass → Rabbit → Fox → Lion

In a pond ecosystem : The number in a pond ecosystem decreases in the following order.

Phytoplankton → Zooplankton → Fishes → Snakes

(ii) **The pyramid of biomass :** Biomass refers to the total weight of living matter per unit area. In an ecosystem the biomass decreases from the producer level to the consumer level.

In a grassland : In a grassland the biomass of grasses is the maximum, and it gradually decreases towards the consumer level in the following order.

Grass → Mouse → Snake → Hawk

Grass → Grasshopper → Lizard → Hawk

In a forest : In a forest the biomass of trees is the maximum and the biomass of the top consumer is the minimum. The decrease in weight occurs in the following order :

Plants → Deer → Fox → Tiger

Plants → Rabbit → Fox → Lion

(iii) **Pyramid of energy :** The energy flow in an ecosystem is from the producer level to the consumer level. At each trophic level 80 to 90% of energy is lost. Hence the amount of energy decreases from the producer level to the consumer level.

In a grassland : In a grassland green plants trap the maximum light energy. The energy gradually decreases towards the top consumer level.

Grass → Grasshopper → Lizard → Hawk

Grass → Rabbit → Fox → Lion

Grass → Mouse → Snake → Hawk

In a pond : In a pond maximum energy is trapped by the phytoplankton. Then the amount of energy decreases towards the top–consumer level.

Phytoplankton → Zooplankton → Fish → Snake

Phytoplankton → Zooplankton → Small fish → Large fish

❑ **Inverted pyramids :** In most of the ecosystems the number and biomass of producers are more and those of consumers are less. This type of ecosystem has a pyramid where the apex is pointed upwards. This type of pyramid is called upright pyramid. In some ecosystems the number and the biomass of the producers are less and those of consumers are more. This type of ecosystem produces a pyramid where the apex is directed downwards. This type of pyramid is called inverted pyramid. Inverted pyramid occurs in number and biomass. The pyramid of energy is always upright.

Inverted pyramid of numbers : When the ecosystem contains lesser number of producers and more number of consumers, the pyramid will be inverted in shape. Inverted pyramid occurs in a tree ecosystem. A single tree (producer) contains many fruit eating birds (primary consumers). The birds contain numerous parasites (secondary consumers).

Inverted pyramid of biomass : When the biomass of producers is less and that of consumers is more the pyramid will have inverted shape. It occurs in a pond or lake ecosystem. Here the biomass of diatoms and phytoplankton are negligible as compared to that of crustaceans and small fishes.

Importance of ecosystem

(1) **Energy :** Study of ecosystems provides information about amount of energy flowing into them, its harvesting and availability at various levels.

(2) **Biogeochemical cycling :** Density of ecosystem is governed by degree of biogeochemical cycling and the amount of inorganic nutrients entering the ecosystem from outside.

(3) **Food webs :** Each ecosystem has a number of food webs. The knowledge of food webs is helpful to restore a degraded ecosystem and prevent unscientific exploitation of different ecosystems.

(4) **Protection :** Each ecosystem whether natural or man-made requires protection from pollutants and pests.

(5) **Inter-relationships :** Study of ecosystems gives information about inter-relationships amongst various types of organisms as well as between organisms and their abiotic environment.

(6) **Carrying capacity :** By knowing the carrying capacity of an ecosystem, it can be known as to what is the number of producers and consumers which can be supported by that ecosystem.

(7) **Inputs :** The shortage of inputs can be known and corrected.

Biotic or Ecological Succession

The term ecological succession was first given by Hult (1885). Community are never stable but keep on changing. This relatively definite sequence of communities over a period of time in the same area is called ecological succession. Biotic succession is caused by adaptive ability to environmental changes.

Types : Succession is of two types :

(1) **Primary succession :** It includes changes which occur when living things become established on a previously uninhabited area such as a newly exposed sea floor, lake sediments or sand dunes.

(2) **Secondary succession :** It occurs where early communities have been damaged, leaving a few organisms and considerable organic matter. These remnant species, along with some new ones, regenerate a new community.

❑ According to another classification, the succession is of following types :

(1) **Autogenic succession :** When the succession has begun, the vegetation itself is responsible for replacing itself by changing existing environmental conditions.

(2) **Allogenic succession :** When in succession other conditions (not vegetation itself) are responsible for replacing communities, then it is called allogenic succession.

❑ **Depending upon the substratum,** succession are divided into three types :

(1) **Hydrosere or Hydrarch :** Succession beginning in fresh water, *e.g.*, ponds, lakes, streams, etc.

(2) **Xerosere or Xerarch :** Succession beginning in dry conditions. It is further classified into three types :

(i) **Lithosere :** When succession starts on bare rocks.

(ii) **Psammosere :** When succession begins on sand.

(iii) **Halosere :** When succession starts in saline conditions.

(3) **Mesarch :** When succession begins in mesic conditions.

General processes of succession

Succession is completed in following steps :

(1) **Nudation :** Formation of bare area without any form of life is called nudation. The cause of nudation may be climatic, topographic or biotic.

(2) **Invasion :** Successful establishment of a species in this bare area is called invasion. It has three steps :

(i) Migration (ii) Ecesis or establishment (iii) Aggregation

(3) **Competetion and coaction :** Competetion may be interspecific or intraspecific.

Intraspecific competetion is called coaction.

(4) **Reaction :** Modification of environment due to organisms in it is called reaction.

(5) **Stabilization :** The terminal community becomes stabilized in the prevailing conditions.

Biotic succession on bare rock (Lithosere, Xerosere).

The sequence of successional stages that occur on bare rocks is called lithosere. Because the bare rock is deficient in water, the lithosere is also called xerosere.

The various seral stages are as follows :

(1) **Lichen stage :** Lichens are the early settlers on a barren area because they can tolerate desiccation, heating during summer noon or excessive cooling during winter nights. Bare rock is invaded first by crustose lichens (*e.g.*, Graphis). They corrode the rock at places causing foliose lichens to invade, eliminate crustose lichens and creating conditions for invasion by mosses. In tropics, blue green algae are pioneers instead of lichens.

(2) **Moss stage :** Mosses are of larger size, have gregareous habit and their rhizoids penetrate deeper in the rocks. They shade the lichens and hence replace the same. Mosses accumulate more soil and organic matter.

(3) **Annual grass stage :** Annual hardy grasses and herbs invade the humus rich moss dominated rock surface, *e.g.*, *Aristida, Poa*. Their roots cause fragmentation of the rock, creating more soil, humus and moisture.

This increases moisture and soil. The soil becomes favourable for growth of longer living annual grasses. The process of soil accumulation continues.

(4) **Perennial grass stage :** Annual grasses are replaced by perennial grasses due to increased moisture and soil in the rock crevices. The perennial grasses have runners and rhizomes which rapidly spread the grasses, *e.g.*, *Cymbopogon, Heteropogon*, Shade, moisture, soil, perennial vegetation and seeds invite several small animals.

(5) **Shrub stage :** Shrubs begin to grow in area occupied by perennial grasses, *e.g.*, *Zizyphus, Capparis, Rhus, Rubus*. Shrubs are larger and their roots reach greater depth causing further cracks in the rock substratum and hence helping in more soil formation. The shrubs shade the area, make it more moist and invite hardy trees and several types of animals.

(6) **Climax community :** Initially hardy light demanding small trees invade the area. They make the habitat shadier and more moist. Ultimately, trees shrubs and herbs representing the climax community begin to grow in the area.

Biotic succession in newly formed pond/lake (Hydrosere) : Seres of biotic communities that develop in a newly formed pond or lake is called hydrosere. It starts as soon as the muddy water becomes clear. The various successional or seral stages of hydrosere are :

(1) **Plankton stage :** Phytoplanktons (diatoms, flagellates, blue green and green algae) are the pioneers in a freshly formed water body. They are almost immediately followed by zooplanktons that feed on phytoplanktons.

(2) **Submerged stage :** The bottom lined by soft mud having organic matter is favourable for growth of submerged plants like *Hydrilla* and *Najas*. They are rooted in the mud and form dense growth. As a result sand and silt get deposited around the plants. The bottom level, therefore, rises slowly. The older plants and buried parts of other plants form humus on their death and decay.

(3) **Floating stage :** In the shallower regions appear plants with tuberous rhizomatous and creeping stems and leaves floating on the surface of water, *e.g., Nymphaea, Nelumbo*. At places, free floating plants also appear (*e.g., Azolla, Wolffia, Lemna*) to cover the water surface. Humus rich bottom begins to rise making water shallower.

(4) **Reed swamp stage :** Amphibious plants grow where the water body becomes shallow (0.3-1.0*m*), *e.g., Phragmites, Typha, Scirpus, Sagittaria*. The plants of swamp stage transpire huge quantities of water. They also produce abundant organic matter. Their tangled growth accumulates silt.

(5) **Sedge/Marsh meadow stage :** On newly built up shores, *Carex* (Sedge), *Juncus, Cyperus*, some grasses and herbs (*Themeda, Caltha, Polygonum*) grow rapidly and lower the water table. The plants transpire rapidly and add abundant humus. Therefore, soil is build upto invite next stage.

(6) **Woodland stage :** Rhizome bearing shrubs and small trees capable of tolerating excessive light and water logged conditions appear on the edges of sedge/marsh meadow, *e.g., Cornus, Cephalanthus, Populus, Alnus*.

The shrubs shade away the plants of sedge meadow stage. They invite invasion by trees capable of bearing bright sunlight and water logging, *e.g., Populus* (Cottonwood), *Alnus* (Alder). The plants of woodland stage lower the water lable by their transpiration. They also built up more soil. Shade loving plants come to grow below them.

(7) **Climax forest :** New trees, shrubs and herbs appear which are in perfect harmony with the climate of the area.

Importance of biotic succession

(1) Sequence of biotic succession is usually fixed. Ecologists can immediately recognise the seral stage of a biotic community found in an area.

(2) It tells us how a biotic seral stage like grasses and herbs of a pasture can be maintained by not allowing the biotic succession to proceed further through interference like grazing and fire.

(3) Information gained through biotic succession is used in having controlled growth of one or more species by preventing their superiors to invade the area, *e.g.,* maintenance of teak forest.

(4) Dams are protected by preventing siltation and biotic succession to occur.

Tips & Tricks

- Producers are also referred to as transducers as they change light energy into chemical energy.
- Food webs are very important in maintaining the stability of an ecosystem. According to Wilson and Bossert (1971) the stability of the ecosystem is directly proportional to the number of such food links.
- The open seal pelagic part is differentiated into photic zone (upto 200 *m* depth, light penetrates the zone), aphotic zone (200 – 2000*m* depth, little light abyssal zone (dark zone)
- The shallow water region of the shore is called neritic zone, it extends to a width of 16 to 240 *kms* and to a depth of 200 *m*.
- Coral reefs are highly productive ecosystem. According to Johannes (1970) corals are the most productive, taxanomically diverse and aesthetically celebrated of all the communities.
- Eutrophic water body having good quantity of minerals and hence supra optimum growth of plants.
- Oligotrophic : Water body deficient in minerals and organic growth.
- Coral reef ecosystem has the highest gross primary productivity.
- Estuary is the ecotone of marine habitat and fresh water habitat.
- Epilimnion : Upper stratum of (lake) water exposed to solar radiations–warm in summer and cooler in winter circulates.
- Hypolimnion : Basal stratum of (lake) water which is always cool.
- In detritus ecosystem, producers are absent.
- Ecotone : The zone of transition between two nearby ecosystems is called as ecotone.
- Energy content are determined by igniting the plant contents in O_2 bomb calorimeter.
- The first group or community in succession is called as pioneer community.
- Plant succession is a definite process.
- The last community in succession is called climax community.
- In ecological succession from pioneer to climax community the biomass increases continuously.
- Climax community is always mesophytic.
- Different stages of succession are called seral stages and all these seral stages constitute a sere.
- In succession, complexities in structure are slowly increasing.
- Retrogressive succession is in which continuous biotic influences have some degenerating influence on the process *e.g.*, change of forest to shrubby or grassland community.
- Serule or microsere is the succession of micro organisms within microhabitat.

Ordinary Thinking

Objective Questions

Ecosystem

1. Which most often limits the primary productivity of the ecosystem **[Odisha JEE 2009]**
(a) Solar radiation/light (b) Oxygen
(c) Consumers (d) Nitrogen

2. Which type of pyramid of energy is inverted **[Odisha JEE 2008]**
(a) Grass land (b) Tree
(c) Both of these (d) None of these

3. Which one of the following types of organisms occupy more than one trophic level in a pond ecosystem **[CBSE PMT 2009]**
(a) Phytoplankton (b) Fish
(c) Zooplankton (d) Frog

4. Pyramid of energy in a pond ecosystem is always **[AFMC 2008, 09; Odisha JEE 2012]**
(a) Inverted (b) Upright
(c) Irregular (d) Linear

5. Consider the following statements concerning food chains
A. Removal of 80% tigers from a area resulted in greatly increased growth of vegetation
B. Removal of most of the carnivores resulted in an increased population of deers
C. The length of food chains is generally limited to 3-4 trophic levels due to energy loss
D. The length of food chains may vary from 2 to 8 throphic levels
Which two of the above statements are correct **[CBSE PMT 2008]**
(a) A, D (b) A, B
(c) B, C (d) C, B

6. In an aquatic ecosystem, the trophic level equivalent to cows in grassland is **[DUMET 2009]**
(a) Phytopankton (b) Zooplankton
(c) Nekton (d) Benthos

7. Select the formula for ecological efficiency **[Kerala PMT 2009]**
(a) $\frac{\text{Gross primary productivity} \times 100}{\text{Incident total solar radiation}}$
(b) $\frac{\text{Food primary assimilated} \times 100}{\text{Food energy ingested}}$
(c) $\frac{\text{Net primary productivity} \times 100}{\text{Gross primary productivity}}$
(d) $\frac{\text{Energy in biomass production at a trophic level} \times 100}{\text{Energy in biomass production at previous trophic level}}$
(e) $\frac{\text{Volume of } CO_2 \text{ evolved}}{\text{Volume of } O_2 \text{ consumed}}$

8. Identify which one of the following is an e.g. of incomplete ecosystem **[WB JEE 2008]**
Or
Which of the following habitats is most unsuitable for primary productivity **[MP PMT 1999]**
(a) Grassland (b) Cave
(c) River (d) Wetland

9. Benthic organism are affected most by **[NEET (Karnataka) 2013]**
(a) Light reaching the forest floor
(b) Surface turbulence of water
(c) Sediment characteristics of aquatic ecosystems
(d) Water-holding capacity of soil

10. Identify the correct type of food chain
dead animal → blow fly maggots → common frog → snake **[WB JEE 2009]**
(a) Grazing food chain (b) Detrital food chain
(c) Decomposer food chain (d) Predator food chain

11. Energy and nutrients enter a community by **[CBSE PMT 2001; CPMT 2003; Odisha JEE 2009]**
(a) Primary consumer (b) Producer
(c) Decomposer (d) Sunlight

12. Which of the following is an example of man-made ecosystem **[WB JEE 2009]**
(a) Herbarium (b) Aquarium
(c) Tissue culture (d) Forest

13. The detritus food chain begins with **[J & K CET 2012]**
(a) Primary producers (b) Primary consumers
(c) Secondary consumers (d) Dead organic matter

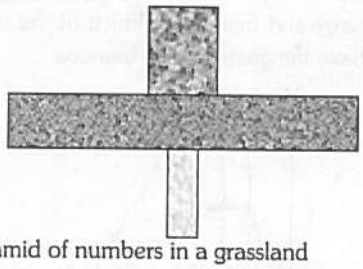
14. Bacteria and fungi in a forest ecosystem are generally **[CPMT 2003; Kerala PMT 2004; BHU 2004; AIIMS 2010]**
Or
Micro-organism are **[J & K CET 2008]**
Or
The bacteria that attack dead organic matter are **[MH CET 2001]**
(a) Producers (b) Decomposers
(c) Primary consumers (d) Secondary consumers
(e) Tertiary consumers

15. Energy flow and energy transformations in living systems strictly conform to the **[Kerala PMT 2004]**
Or
Flow of energy declines from low to higher trophic level in ecosystem, is mainly explained by **[MP PMT 1999]**
(a) Law of limiting factors
(b) Liebig's law of minimum
(c) Laws of thermodynamics (second)
(d) Shelford's law of tolerance
(e) Biogenetic law

16. An ecosystem which can be easily damaged but can recover after some time if damaging effect stops will be having **[CBSE PMT 2004]**
(a) Low stability and low resilience
(b) High stability and high resilience
(c) Low stability and high resilience
(d) High stability and low resilience

17. These belong to the catergory of primary consumers ..... **[KCET 2004]**
(a) Snakes and frogs (b) Water insects
(c) Eagle and snakes (d) Insects and cattle

18. Given below is one of the types of ecological pyramids This type represents **[AIIMS 2005]**



(a) Pyramid of numbers in a grassland
(b) Pyramid of biomass in a fallow land
(c) Pyramid of biomass in a lake
(d) Energy pyramid in a spring

19. A man-made ecosystem is **[BHU 2004]**
(a) Less in diversity
(b) More in diversity
(c) Man does not make ecosystem
(d) More stable than natural ecosystem

20. Which of the following supports a dense population of plankton and littoral vegetation **[BHU 2004]**
(a) Oligotrophic (b) Eutrophic
(c) Lithotrophic (d) Agroecotrophic

21. The pyramid of numbers of a parasitic food chain in a forest ecosystem is **[MP PMT 2012]**
(a) Always inverted
(b) Always upright
(c) Mixture of inverted and upright
(d) Sometimes inverted and sometime upright

22. Y-shaped energy flow model was given by
(a) H.T. Odum (b) E.P. Odum
(c) Tansley (d) Both (a) and (b)

23. Food chain is a series of population which starts with producers. Its is concerned with **[AFMC 2006]**
(a) Biotic components only
(b) Energy flow and transfer of nutrients
(c) Both (a) and (b)
(d) Biotic and decomposers

24. Which of the food chains directly depends on solar radiations **[MP PMT 2004]**
(a) Predator (b) Grazing
(c) Detritus (d) None of these

25. Inverted pyramid is found in **[MHCET 2003; Manipal 2005]**
(a) Biomass pyramid of aquatic system
(b) Energy pyramid of grassland
(c) Biomass pyramid of grassland
(d) Pyramid of number of aquatic system

26. Earthworm is a **[MHCET 2015]**
(a) Herbivore (b) Secondary consumer
(c) Tertiary consumer (d) Detrivore

27. The trophic level of *Cuscuta*, *Orobanche* and *Albugo* is
(a) Decomposer (b) Primary producer
(c) Primary consumer (d) Secondary consumer

28. In a particular climatic condition, decomposition rate is slower if **[Kerala PMT 2012]**
(a) Detritus is rich in nitrogen
(b) Detritus is rich in humus
(c) Detritus is rich in sugars
(d) Detritus is rich in lignin and chitin
(e) Detritus is rich in water soluble substances

29. The maximum biomass of living diatoms is to be found in **[AIEEE Pharmacy 2003]**
(a) Marine pelagic habitats (b) Moist soil and swamps
(c) Deep coastmines (d) Salt lakes

30. When spontaneous process occurs then free energy of system **[DPMT 2003]**
(a) Decrease
(b) Increase
(c) Remains same
(d) Either can increase or decrease

31. Which ecosystem shows maximum genetic diversity **[AIEEE Pharmacy 2003]**
(a) Coniferous forests (b) Tropical rain forests
(c) Subtropical forests (d) Temperate forests

32. Most animals that live in deep oceanic waters are **[AIPMT 2015]**
(a) Secondary consumers (b) Tertiary consumers
(c) Detritivores (d) Primary consumers

33. If bamboo plant is growing in a far forest then what will be its trophic level **[CBSE PMT 2002]**
(a) First (b) Second
(c) Third (d) Fourth

34. Which is an example of true pyramid in an ecosystem **[DPMT 2006]**

Or

The number of individuals at the trophic level decreases from the producer level to the consumer level in **[J & K CET 2010]**
(a) Pyramid of a biomass (b) Pyramid of number
(c) Pyramid of energy (d) None of the above

35. A food chain starts with **[BVP 2002; MP PMT 2004]**
(a) Nitrogen fixing organisms (b) Photosynthesis
(c) Respiration (d) Decomposers

36. Which of the following food chain may not be directly dependent upon solar energy **[CBSE PMT 2002]**
(a) Grazing (b) Detritus
(c) Soaking (d) Depleting

37. In a food web, each successive trophic level has **[BHU 2002]**
(a) Increased total energy
(b) Less total energy content
(c) More total energy content
(d) Non estimated energy content

38. In food chain initial organisms are **[MP PMT 2002]**
(a) Top consumers (b) Secondary consumers
(c) Primary consumers (d) Photosynthates

39. Maximum biomass and variable organism are found in **[Odisha PMT 2002]**

Or

The number of primary producer within a specified area would be maximum in **[MP PMT 1995]**
(a) River (b) Pond ecosystem
(c) Lake (d) Estuary

40. An inverted pyramid of number and an inverted pyramid of biomass are respectively seen in **[Kerala PMT 2012]**

(a) Grassland and tree ecosystem
(b) Sea and tree ecosystem
(c) Tree and sea ecosystem
(d) Sea and grassland ecosystem
(e) Tree and grassland ecosystem

41. Which of the following is not used for construction of ecological pyramids **[CBSE PMT 2006]**

(a) Rate of energy flow (b) Fresh weight
(c) Dry weight (d) Number of individuals

42. A pond is a **[RPMT 2002; MHCET 2003]**

(a) Biome
(b) Natural ecosystem
(c) Artificial ecosystem
(d) Community of plants and animals

43. When peacock eats snakes which eat insects thriving on green plants, the peacock is **[NCERT; CPMT 2002; RPMT 2005]**

(a) A primary consumer
(b) A primary decomposer
(c) Final decomposer
(d) The apex of food pyramid

44. A plant being eaten by a herbivorous which in turn is eaten by a carnivorous makes **[CBSE PMT 2002]**

Or

The transfer of energy from organism to organism in a natural community establishes **[MP PMT 1999]**

(a) Food chain (b) Food web
(c) Omnivorous (d) Interdependent

45. 10% law of flow of energy in ecosystem was proposed by **[CBSE PMT 1996; MHCET 2001]**

(a) Lindeman (b) Carl Mobius
(c) Tansley (d) Darwin

46. If 20 J of energy is trapped at producer level, then how much energy will be available to peacock as food in the following chain

Plant → Mice → Snake → Peacock **[CBSE PMT 2014; KCET 2015]**

(a) 0.2 J (b) 0.0002 J
(c) 0.02 J (d) 0.002 J

47. Which of the following is most important abiotic factor in pond ecosystem **[MHCET 2001]**

(a) Water (b) Phytoplankton
(c) Zooplankton (d) Temperature

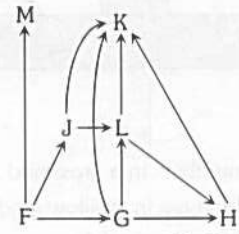
48. Which are the biotic components of forest ecosystem **[MP PMT 2001; BHU 2001]**

(a) Producers (b) Decomposers
(c) Consumers (d) All of the above

49. Which of the following is an artificial ecosystem **[MP PMT 2001]**

(a) Rice-field (b) Forest
(c) Grassland (d) Lake

50. The figure given below shows a particular food web. Each alphabet represents a different species. Arrows indicate the flow of energy and materials. Which of the following would probably have the greatest total biomass **[NCERT]**



(a) K+M (b) K
(c) J+ G (d) F

51. In a pyramid of biomass, if the total dry weight (kg/m^2) of primary producers is about 809 it will decrease at tertiary consumer level upto **[AMU (Med.) 2012]**

(a) $37 kg/m^2$ (b) $11 kg/m^2$
(c) $5 kg/m^2$ (d) $1.5 kg/m^2$

52. When the number of organisms at successive levels are plotted, they assume the shape of a pyramid. This is called the pyramid of **[CBSE PMT 2001; MHCET 2003]**

(a) Energy (b) Number
(c) Biomass (d) Both (a) and (c)

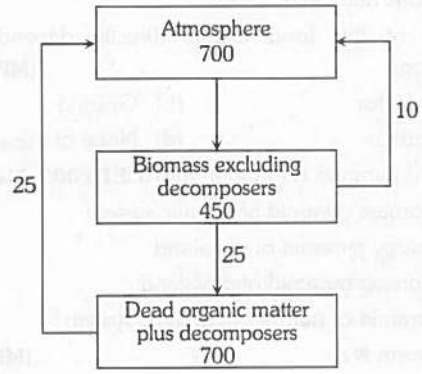
53. The loss of energy as one proceeds from one trophic level to the next higher level is approximately **[AMU (Med.) 2010]**

(a) 30% (b) 40%
(c) 60% (d) 90%

54. In a food chain, the total amount of living material is depicted by **[BHU 2001; Pb. PMT 2004]**

(a) Pyramid of biomass (b) Pyramid of energy
(c) Pyramid of number (d) Trophic levels

55. The figure given below shows estimated values for carbon fixation in a terrestrial ecosystem. Diagram refer to tones × 10^9, fixed or available for fixation



Which result can be drawn from the figure **[NCERT]**

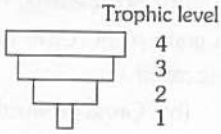
(a) There is a net loss to the decomposers
(b) There is a net loss to the atmosphere
(c) The system is in balance
(d) There is an net gain to the producers

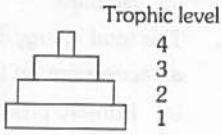
56. Two food chains are are given below

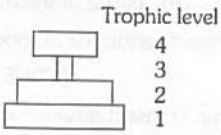
Tree → aphid → insectivorous bird → bird of prey.

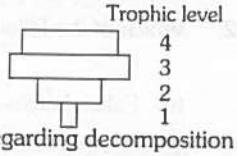
Phytoplankton → zooplankton → plankton - feeding fish → carnivorous fish.

Which diagram is a pyramid of energy representing both food chains **[NCERT]**

(a) 

(b) 

(c) 

(d) 

57. Which of the following statement regarding decomposition is false **[Kerala PMT 2010]**

(a) Warm and moist environment favours decomposition

(b) Decomposition rate is slower if detritus is rich in chitin and lignin

(c) Earthworm is a detritivore

(d) Precipitation of soluble inorganic nutrients into the soil horizon as unavailable salt is called mineralisation

(e) Detritus is the raw material for decomposition

58. Green plants constitute **[MP PMT 1999]**

(a) First trophic level (b) Second trophic level

(c) Third trophic level (d) Complete food chain

59. Which one of the following is a primary consumer in maize field ecosystem **[NEET (Karnataka) 2013]**

(a) Grasshopper (b) Wolf

(c) Phytoplankton (d) Lion

60. Which of the following is false **[Kerala PMT 2010]**

(a) Quantity of biomass in a trophic level at a particular period is called as standing crop

(b) The energy content in a trophic level is determined by considering a few individuals of a species in that trophic level

(c) The succession that occurs in newly cooled lava is called primary succession

(d) Rate of succession is faster in secondary succession

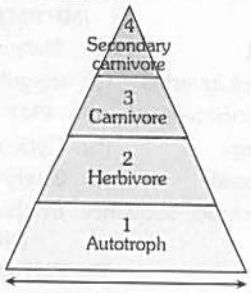
(e) Phytoplanktons are the pioneers in the aquatic ecosystem

61. Using the figure, determine which animals would be found in the same trophic level **[NCERT]**

A. Trophic level

Trophic level	Feeding strategy	Grazing food chain	Decomposer food chain
4	Secondary carnivore	Cooper's hawk	Owl
3	Carnivore	Robin	Shrew
2	Herbivore	Cricket	Earthworm
1	Autotroph	Maple tree leaves	Dead maple leaves

B. Pyramid of productivity



(a) Humans and horses

(b) Eagles and blue jays

(c) Pine trees and garden snakes

(d) Crickets and cows

62. Pyramid of energy is **[BVP 2000; RPMT 2005; AFMC 2010; AMU (Med.) 2010)]**

(a) Upright (b) Inverted

(c) Oblique (d) None of these

63. *Nepenthes* is a **[CPMT 1993; MP PMT 1995; BVP 2002]**

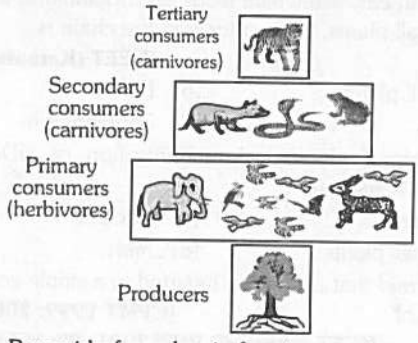
(a) Primary producer

(b) Consumer

(c) Primary producer and consumer

(d) None of the above

64. The following figure is best example of **[NCERT]**



(a) Pyramid of number in forest ecosystem

(b) Pyramid of number in grassland ecosystem

(c) Pyramid of biomass in forest ecosystem

(d) Pyramid of number in parasitic food chain

65. An ecosystem resist change because it is in a state of

(a) Imbalance (b) Homeostasis

(c) Shortage of components (d) Deficiency of light

66. In an ecosystem, the population of **[NCERT]**

(a) Primary producers are more than that of primary consumers

(b) Secondary consumers are largest because they are powerful

(c) Primary consumers out number primary producers

(d) Primary consumers are least dependent upon primary producers

67. On the global basis the maximum productivity is shown by **[CPMT 2000]**

(a) Aquatic ecosystem (b) Grasslands

(c) Forests (d) Deserts

68. Which of the following acts as "nature's scavengers" **[CBSE PMT 1997]**

(a) Man (b) Animals

(c) Insects (d) Micro-organisms

69. The pyramid of number in a grassland ecosystem is **[MP PMT 1998; BHU 2002]**
(a) Always erect (b) Always inverted
(c) Either erect or inverted (d) Irregular

70. Cyberviatic is associated with **[Pb. PMT 1999; RPMT 1999]**
(a) Flow of energy (b) Cycle of energy
(c) Energy released (d) Study of energy

71. Which is the correct sequence in the food chain in a grassland **[NCERT; AFMC 1999; Pb. PMT 2004; HP PMT 2005]**
(a) Grass → wolf → deer → buffalo
(b) Bacteria → grass → rabbit → wolf
(c) Grass → insect → birds → snakes
(d) Grass → snake → insect → deer

72. Generally the food chain has how many trophic levels **[MP PMT 2001, 02; BHU 2001]**
(a) One (b) Two
(c) Three or Four (d) Three

73. In an ecosystem which of the following are important components
(a) Energy flow and food chain
(b) Mineral recycling and energy flow
(c) Food chain and decomposers
(d) All the above

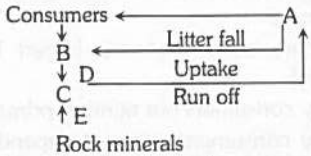
74. When man eats fish which feeds on zooplankton which have eaten small plants, the producer in the chain is **[NEET (Karnataka) 2013]**
(a) Small plants (b) Fish
(c) Man (d) Zooplankton

75. The maximum biological magnification of DDT through food web is seen in
(a) Algae (b) Bacteria
(c) Higher plants (d) Man

76. The pyramid that cannot be inverted in a stable ecosystem, is pyramid of **[CPMT 1999, 2001, 02, 10; KCET 2000; MP PMT 2001, 02; HP PMT 2005; Odisha JEE 2005; WB JEE 2011]**
(a) Number (b) Energy
(c) Biomass (d) All the above

77. Snake generally belongs to
(a) Saprophytes (b) Primary consumer
(c) Second trophic level (d) None of these

78. In the following simplified model of a nutrient cycle, identify A, B, C, D and E **[NCERT]**



	A	B	C	D	E
(a)	Producers	Soil solution	Detritus	Weathering	Decomposition
(b)	Producers	Soil solution	Detritus	Decomposition	Weathering
(c)	Producers	Detritus	Soil solution	Weathering	Decomposition
(d)	Producers	Detritus	Soil solution	Decomposition	Weathering

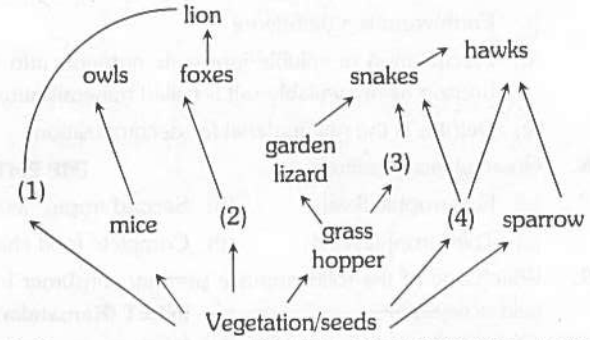
79. The flora and fauna in lakes or ponds are **[AIIMS 2000]**
(a) Lentic biota (b) Lotic biota
(c) Abiotic biota (d) Field layer

80. Driving force of an ecosystem is
(a) Producer (b) Carbohydrates in plants
(c) Biomass (d) Solar energy

81. The total energy fixed by a gram plant (*Cicer arietinum*) in an ecosystem on the whole is called
(a) Primary production (b) Gross production
(c) Secondary production (d) None of the above

82. Which of the following is correct sequence in food chain **[CBSE PMT 1991]**
(a) Fallen leaves → bacteria → insect larvae → birds
(b) Phytoplankton → zooplankton → fish
(c) Grasses → fox → rabbit
(d) Grasses → chameleon → insects → birds

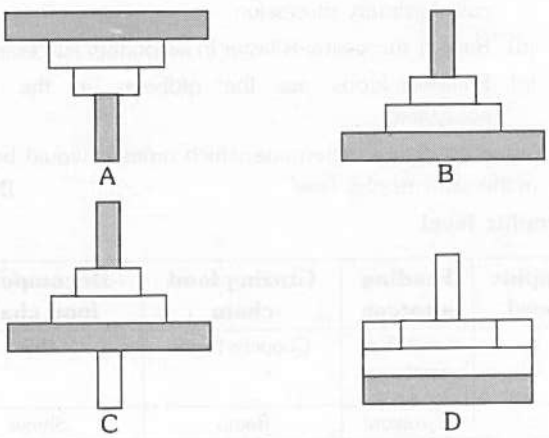
83. Identify the likely organisms (1), (2), (3) and (4) in the food web shown below



Options **[NCERT; CBSE PMT (Mains) 2012]**

	(1)	(2)	(3)	(4)
(a)	Deer	Rabbit	Frog	Rat
(b)	Dog	Squirrel	Bat	Deer
(c)	Rat	Dog	Tortoise	Crow
(d)	Squirrel	Cat	Rat	Pigeon

84. Which of the following representations shows the pyramid of numbers in a forest ecosystem **[CBSE PMT (Mains) 2010]**



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

85. Study the four statements $(A-D)$ given below and select the two correct ones out of them

(A) A lion eating a deer and a sparrow feeding on grain are ecologically similar in being consumers

(B) Predator star fish *Pisaster* helps in maintaining species diversity of some invertebrates

(C) Predators ultimately lead to the extinction of prey species

(D) Production of chemicals such as nicotine, strychnine by the plants are metabolic disorders

The two correct statements are **[CBSE PMT (Pre.) 2010]**

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

86. The biomass available for consumption by the herbivores and the decomposers is called **[CBSE PMT (Pre.) 2010; Kerala PMT 2012]**

(a) Gross primary productivity
(b) Net primary productivity
(c) Secondary productivity
(d) Standing crop

87. The word "ecosystem" was first coined by **[CPMT 1995, 2002; EAMCET 1996; MP PMT 1997, 2001; BHU 2002; RPMT 2005; NEET (Phase-I) 2016]**

(a) Weaver and Clements (b) A.G. Tansley
(c) E.P. Odum (d) By all the above

88. Trophic levels are formed by **[CPMT 2000; WB JEE 2009]**

(a) Organisms linked in food chain
(b) Only plants
(c) Only animals
(d) Only carnivores

89. In a food chain herbivores are **[NCERT; MHCET 2001; BVP 2001; Odisha JEE 2011]**

(a) Primary producers (b) Primary consumers
(c) Secondary consumers (d) Decomposers

90. Which one of the following statement for pyramid of energy is incorrect, whereas the remaining three are correct **[CBSE PMT (Pre.) 2011]**

(a) It is upright in shape
(b) Its base is broad
(c) It shows energy content of different trophic level organisms
(d) It is inverted in shape

91. The ecosystem consists of **[AIIMS 2001; BVP 2001]**

(a) Producers (b) Consumers
(c) Decomposers (d) All of these

92. In a tree ecosystem, the pyramid of number is **[RPMT 1997]**

(a) Upright (b) Inverted
(c) Both of the above (d) None of the above

93. Which of the following has the largest population in a food chain **[J & K CET 2012]**

(a) Producers (b) Primary consumers
(c) Secondary consumers (d) Decomposers

94. Which of the following relations is correct regarding GPP and NPP of an ecosystem **[BHU 2012]**

(a) NPP=GPP – Animal consumption
(b) NPP=GPP + Plant respiration
(c) NPP=GPP – Plant respiration
(d) NPP=GPP + Animal consumption

95. Ecosystem is **[MP PMT 2002; Odisha JEE 2005]**

(a) Open (b) Closed
(c) Both open and close (d) Neither open nor closed

96. What is maximum in a pond-ecosystem **[RPMT 1992]**

(a) Primary consumers (b) Secondary consumers
(c) Producers (d) Decomposers

97. The pyramid of number is based on **[CBSE PMT 1993]**

(a) Unit per area
(b) Food per individual
(c) Individuals in trophic level
(d) None of these

98. In a pyramid of numbers, in a grassland ecosystem, the largest population is that of **[Kerala PMT 2007]**

(a) Producers (b) Tertiary consumers
(c) Secondary consumers (d) Primary consumers
(e) Herbivores

99. The upright pyramid of number is absent in **[CBSE PMT (Pre.) 2012]**

(a) Pond (b) Forest
(c) Lake (d) Grassland

100. The character of an ecosystem is determined by the environmental factor which is shortest supply. This is the **[CBSE PMT 1994]**

(a) Law of minimum
(b) Law of diminishing returns
(c) Law of limiting factors
(d) Law of supply and demand

101. Which must be preserved in an ecosystem, if the system is to be maintained **[JIPMER 1994; Kerala PMT 2004]**

(a) Producers and carnivores
(b) Producers and decomposers
(c) Carnivores and decomposers
(d) Herbivores and carnivores

102. The importance of ecosystem lies in **[MP PMT 1993, 95, 98]**

(a) Cycling of materials (b) Flow of energy
(c) Both the above (d) None of the above

103. Ecosystem has two components **[NCERT; MP PMT 1993, 98, 99; BHU 2000]**

(a) Plants and animals (b) Weeds and trees
(c) Biotic and abiotic (d) Frog and men

104. Ecosystem creates **[MP PMT 1993, 2011]**

(a) Food chain (b) Food web
(c) Both the above (d) None of the above

105. In lake ecosystem, pyramid biomass is **[MP PMT 1993; Bihar PMT 2005; MP PMT 2005]**

(a) Upright (b) Inverted
(c) Anything is possible (d) None is correct

106. In forest ecosystem, pyramid of number is **[MP PMT 1993]**

(a) Upright (b) Inverted
(c) Any of the two (d) None of the above

107. Which one of the following is not a functional unit of an ecosystem **[CBSE PMT (Pre.) 2012]**

(a) Energy flow (b) Decomposition
(c) Productivity (d) Stratification

108. Animals which live at the bottom of sea are **[BVP 2000]**

(a) Nekton (b) Diatom
(c) Benthos (d) Plankton

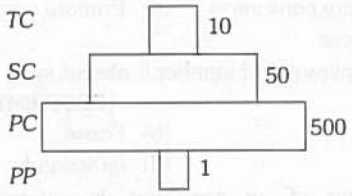
109. What energy percentage can be captured by the organisms of next trophic level **[CBSE PMT 1999; BHU 2005, 08; DUMET 2010]**

Or

Transfer of energy from one trophic level to other trophic level is according to the second law of thermodynamics. The efficiency of energy transfer from herbivorous to carnivorous is **[CBSE PMT 1996; AIEEE Pharmacy 2004]**

(a) 20% (b) 30%
(c) 90% (d) 10%

110. Given below is an imaginary pyramid of numbers. What could be one of the possibilities about certain organisms at some of the different levels **[NCERT; CBSE PMT (Pre.) 2012]**



(a) Level *PC* is "insects" and level *SC* is "small insectivorous birds"
(b) Level *PP* is "phytoplanktons" in sea and "Whale" on top level *TC*
(c) Level one *PP* is "pipal trees" and the level *SC* is "sheep"
(d) Level *PC* is "rats" and level *SC* is "cats"

111. Which of the following abundantly occurs in pond ecosystem **[RPMT 1995]**

Or

In a food chain, which of the following produces in the largest amount **[CBSE PMT 1996]**

(a) Producer (b) Consumer
(c) Top consumer (d) Decomposers

112. The rate of formation of new organic matter by rabbit in a grassland, is called **[MP PMT 2001; AFMC 2006; CBSE PMT (Mains) 2012; NEET 2013]**

(a) Net productivity
(b) Secondary productivity
(c) Net primary productivity
(d) Gross primary productivity

113. Which of the following is the most stable and largest ecosystem of the world **[CBSE PMT 1995; MHCET 2000; MP PMT 2000; BHU 2002]**

(a) Mountain (b) Desert
(c) Forest (d) Ocean

114. In a biotic community, primary consumers are **[CBSE PMT 1995; BVP 2001; MHCET 2001]**

(a) Omnivores (b) Carnivores
(c) Detritivores (d) Herbivores

115. Which of the following does not effect the forest ecosystem **[Bihar MDAT 1995]**

(a) Deforestation (b) Soil erosion
(c) Climatic variation (d) None of these

116. The pyramid of energy in a forest ecosystem is **[MP PMT 1994, 95, 97, 2002]**

(a) Always upright
(b) Always inverted
(c) Both upright and inverted
(d) None of the above

117. In an ecosystem, there is flow of energy at different trophic levels. This is as follows **[KCET 1994; MP PMT 1995, 2002]**

(a) Primary consumers — Tertiary consumers — Secondary consumers — Decomposers — Producers
(b) Producers — Primary consumers — Secondary consumers — Tertiary consumers — Decomposers
(c) Producers — Decomposers — Primary consumers — Tertiary consumers — Secondary consumers
(d) Producers — Primary consumers — Tertiary consumers — Secondary consumers — Decomposers

118. We refer to the following as the food chain **[KCET 1994]**

(a) Large number of animals near a source of food
(b) Transfer of food energy from the green plants through a series of consumer organisms
(c) Large number of human beings forming a human chain near a source of food
(d) None of these

119. In a food chain, lion is a **[EAMCET 1995; MHCET 2003]**

(a) Secondary consumer (b) Primary consumer
(c) Tertiary consumer (d) Secondary producer

120. In a pond ecosystem, benthos means **[EAMCET 1995; BHU 2000, 01; AFMC 2001; MHCET 2003]**

(a) Primary consumers in the depth of a pond
(b) Zooplankton on the water surface
(c) Periphyton
(d) Epineuston

121. Of the total incident solar radiation the proportion of PAR is **[NCERT; CBSE PMT (Pre.) 2011]**

(a) More than 80% (b) About 70%
(c) About 60% (d) Less then 50%

122. Identify the possible link "A" in the following food chain : Plant → insect – frog → "A" → Eagle **[CBSE PMT (Pre.) 2012]**

(a) Rabbit (b) Wolf
(c) Cobra (d) Parrot

123. If forest area is reduced to half, which one of the following will be a long term effect **[CBSE PMT 1996]**

(a) The natives (tribals) of that area will die on account of hunger
(b) Cattles of that area will die due to scarcity of fodder
(c) The diversity in germplasm will effect the crop breeding
(d) It will be converted into large desert

124. The first link in any food chain is always a green plant because **[MP PMT 1996, 99]**

(a) They are widely distributed
(b) They are firmly fixed to the soil
(c) They alone have a capacity to fix atmospheric CO_2 in the presence of sunlight
(d) All of the above

125. Food levels in an ecosystem are called **[MP PMT 1996]**
(a) Trophic levels (b) Consumer levels
(c) Producer levels (d) Herbivore levels

126. Which one of the following is a correct food chain **[MP PMT 1996]**
(a) Grasshopper → Grass → Snake → Frog → Eagle
(b) Grass → Grasshopper → Frog → Snake → Eagle
(c) Eagle → Snake → Grasshopper → Grass → Frog
(d) Frog → Snake → Eagle → Grasshopper → Grass

127. In a stable ecosystem, which of the following limits the number of trophic levels **[AIIMS 2010]**
(a) Biomass
(b) The number of nutrients
(c) Availability of nutrients
(d) Presence of contaminants that increase in concentration along the food chain

128. Which of the following ecosystem has the highest gross primary productivity **[CBSE PMT 1997, 2004]**
Or
Among the ecosystem mentioned below where can one find maximum biodiversity **[NCERT]**
(a) Grassland (b) Coral reef
(c) Mangroves (d) Rain forest

129. Biological equilibrium is found among the **[MP PMT 1994, 98; MHCET 2003]**
(a) Producer plants
(b) Consumers and producers
(c) Decomposers
(d) Producers, consumers and decomposers

130. The food chain in which microbes split energy rich compounds of the producer community is **[AIIMS 1999]**
(a) Parasitic food chain (b) Detritus food chain
(c) Predators food chain (d) Producer food chain

131. In an ecosystem bacteria are considered as **[MP PMT 1997]**
(a) Microconsumers (b) Macroconsumers
(c) Primary consumers (d) Secondary consumers

132. A lake ecosystem is **[MP PMT 1997]**
(a) Artificial (b) Abiotic
(c) Natural (d) Hydrological

133. Ecological pyramids are of **[MP PMT 1997]**
(a) Two types (b) Three types
(c) Four types (d) Five types

134. Which of the following statements regarding food chain is false **[Kerala PMT 2011]**
(a) In an aquatic ecosystem, grazing food chain is the major conduct for energy flow
(b) In terrestrial ecosystems, a large fraction of energy flows through detritus food chain
(c) The detritus food chain begins with dead organic matter
(d) Primary consumers belong to the first trophic level
(e) Animals like cockroaches and crows are omnivores

135. Which of the following ecosystems would be most stable **[RPMT 1997]**
(a) Man made forest (b) Fresh water lake
(c) Saline lake (d) Natural forest

136. The living organisms of all ecosystems collectively consitute **[RPMT 1997]**
(a) Producers (b) Decomposers
(c) Consumers (d) Biosphere

137. The number of individuals of a species in a particular ecosystem at a given time remains constant due to **[MP PMT 1998]**
(a) Man (b) Parasites
(c) Predators (d) Available food

138. Ecosystem may be defined as **[MP PMT 1999, 2006]**
(a) Group of plants which act as the energy suppliers
(b) Group of organisms which form population
(c) Functional unit for ecological studies
(d) None of these

139. In a grazing food chain carnivores may also be referred to as **[Kerala PMT 2011]**
(a) Primary producers (b) Secondary producers
(c) Primary consumers (d) Secondary consumers
(e) Decomposers

140. In an ecosystem in abiotic components which of the following occur **[MP PMT 1999]**
(a) Flow of energy
(b) Cycling of materials
(c) Consumers
(d) Flow of energy and cycling of materials

141. Transition zone between two ecosystems or vegetational regions is termed **[CPMT 2001; Kerala PMT 2004; HP PMT 2005; Kerala CET 2005; J & K CET 2010; MP PMT 2010; Odisha JEE 2010; WB JEE 2016]**
Or
Overlapping region between two ecosystems **[DPMT 2006; WB JEE 2011]**
(a) Ecocline (b) Ecotone
(c) Ecad (d) Barrier

142. The snakes are included under **[MP PMT 1999]**
(a) Saprophytes (b) Primary consumers
(c) Second trophic level (d) None of these

143. The zooplanktonic forms are **[MP PMT 1999]**
(a) Primary consumers (b) Secondary consumers
(c) Carnivores (d) Primary producers

144. Which one of the following regarding ecological pyramid is not correct **[Kerala PMT 2007]**
(a) In most ecosystems, the pyramid of numbers and biomass are upright
(b) In tree-dominated ecosystem the pyramid of numbers is inverted
(c) The pyramid of energy expresses mainly the rate of food production
(d) In deep water ecosystem, the pyramid of biomass is upright
(e) The total energy flow at successive trophic level always decreases

145. The maximum biomagnification would be in which of the following in case of aquatic ecosystem **[CBSE PMT 1999]**
(a) Fishes (b) Birds
(c) Zooplanktons (d) Phytoplanktons

146. During food chain the maximum energy is stored in **[MHCET 2001; Pb. PMT 2004; RPMT 2006]**
(a) Producers (b) Decomposers
(c) Herbivores (d) Carnivores

147. Which of the following cannot be recycled in an ecosystem **[BHU 2012]**
(a) Nitrogen (b) Oxygen
(c) Energy (d) Water

148. Ecosystem is defined as **[CPMT 1998]**
(a) Relation between plants and animals
(b) Relation between biotic and physical components
(c) Relation between producers and decomposers
(d) None of these

149. Decomposers are **[CPMT 1998; BHU 2001, 06; Pb. PMT 2004]**
(a) Autotrophs (b) Heterotrophs
(c) Autoheterotrophs (d) Organotrophs

150. In a terrestial ecosystem such as forest, maximum energy is in which trophic level **[CBSE PMT 1998]**
(a) T_1 (b) T_2
(c) T_3 (d) T_4

151. The rate at which light energy is converted into chemical energy of organic molecules is the ecosystem's **[CBSE PMT 1998; BHU 1999; Kerala CET 2003]**

Or

In an ecosystem the rate of production of organic matter during photosynthesis is termed as **[AIPMT (Cancelled) 2015]**
(a) Net primary productivity
(b) Gross secondary productivity
(c) Net secondary productivity
(d) Gross primary productivity

152. The relationship in an ecosystem can be depicted in **[AIIMS 1998]**
(a) Pyramid of energy (b) Pyramid of biomass
(c) Pyramid of numbers (d) All of these

153. Biomass pyramid of forest is **[Pb. PMT 1999; RPMT 1999]**
(a) Inverted (b) Upright
(c) Infinite (d) Finite

154. The Great Barrier Reef along the east coast of Australia can be categorised as **[AIIMS 2004, 08]**
(a) Population (b) Community
(c) Ecosystem (d) Biome

155. The dominant second trophic level, in a lake ecosystem, is **[BHU 1999]**
(a) Benthos (b) Plankton
(c) Zooplankton (d) Phytoplankton

156. A rat feeding upon potato tuber is **[KCET 1999]**
(a) Producer (b) Carnivore
(c) Decomposer (d) Primary consumer

157. Tip of ecological pyramid is occupied by **[MP PMT 1999; CBSE PMT 2001]**
(a) Herbivores (b) Carnivores
(c) Producers (d) Decomposers

158. The lentic ecosystem includes which of following water **[KCET 2000]**
(a) Rain (b) Running
(c) Standing (d) Gravitational

159. Which of the following is source of energy to an ecosystem **[NCERT; Bihar PMT 1995; MP PMT 2000; CPMT 2002; RPMT 2005; Odisha JEE 2011; J & K CET 2012]**
(a) Solar energy
(b) Sugar stored
(c) Heat liberated during respiration
(d) ATP

160. Food chain consists of **[MP PMT 2000, 03]**
(a) Producer, consumer and decomposer
(b) Producer, carnivore and decomposer
(c) Producer and primary consumer
(d) Producer, herbivore and carnivore

161. The primary producers of the deep-sea hydrothermal vent ecosystem are **[NEET (Phase-II) 2016]**
(a) Coral reefs (b) Green algae
(c) Chemosynthetic bacteria (d) Blue-green-algae

162. 'Edge effect' is observed in case of **[WB-JEE 2016]**
(a) Ecozone (b) Ecotone
(c) Biotope (d) Ecosphere

163. Which ecosystem has the maximum biomass **[NEET 2017]**
(a) Forest ecosystem (b) Grassland ecosystem
(c) Pond ecosystem (d) Lake ecosystem

Ecological Succession

1. Identify the plant belonging to the reed-swamp stage in hydrosere succession **[J & K CET 2008]**
(a) Juncus (b) Sagittaria
(c) Salix (d) Trapa

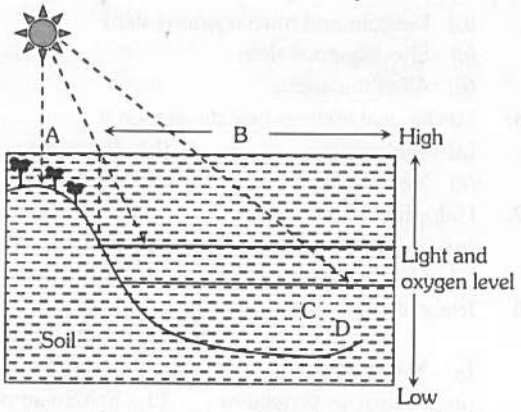
2. The correct sequence of plants in a hydrosere is **[CBSE PMT 2009]**
(a) *Oak – Lantana – Scirpus – Pistia – Hydrilla – Volvox*
(b) *Volvox – Hydrilla – Pistia – Scirpus – Lantana – Oak*
(c) *Pistia – Volvox – Scirpus – Hydrilla – Oak – Lantana*
(d) *Oak – Lantana – Volvox – Hydrilla – Pistia – Scirpus*

3. Which one of the following is considered as pioneer community in xerarch **[Kerala PMT 2008, 12]**
(a) Annual herb (b) Perennial herb
(c) Scrub stage (d) Forest stage
(e) Lichen

4. Mycorrhiza is found in **[DPMT 2007]**
(a) Oligotrophic soil (b) Eutrophic soil
(c) Both (a) and (b) (d) None of these

5. Mangrove forests are found in
(a) Uttar Pradesh (b) Madhya Pradesh
(c) West Bengal (d) Himachal Pradesh

6. Choose the correct combination of labelling of the zones in water in a lake **[Kerala PMT 2006]**



(a) A – Limnetic zone, B – Profundal zone, C – Littoral zone, D – Benthic zone

(b) A – Littoral zone, B – Benthic zone, C – Profundal zone, D – Limnetic zone

(c) A – Littoral zone, B – Limnetic zone, C – Profundal zone, D – Benthic zone

(d) A – Limnetic zone, B – Littoral zone, C – Benthic zone, D – Profundal zone

(e) A – Littoral zone, B – Profundal zone, C – Benthic zone, D – Limnetic zone

7. The early settlers on a barren area (rock) are **[Odisha JEE 2009; DUMET 2010]**

(a) Ferns (b) Mosses
(c) Lichens (d) Diatoms

8. A community which starts succession in a habitat is **[Manipal 1997; AMU (Med.) 1998]**

(a) Pioneer community (b) Seral community
(c) Biotic community (d) Ecosere

9. Mangrove vegetation is found in **[Haryana PMT 2005]**

(a) Dehradoon valley (b) Kullu valley
(c) Western ghats (d) Sundervans

10. Alpine plants which are commonly found at the top of mountains show

(a) Xerophytism (b) Hydrophytism
(c) Semitism (d) None of the above

11. The pioneer species in Xerarch and Hydrarch succession are respectively **[KCET 2015]**

(a) Lichens and phytoplanktons
(b) Lichens and sedges
(c) Phytoplanktons and lichens
(d) Lichens and rooted hydrophytes

12. Phytoplanktons are dominant in which of the following zone **[DPMT 2007]**

(a) Limnetic zone (b) Profound zone
(c) Littoral zone (d) Benthic zone

13. In xerophytes, photosynthesis occur in **[Bihar CECE 2006]**

(a) Root (b) Modified stem
(c) Scaly leaves (d) Stomata

14. *Casuarina equisetifolia* is a **[EAMCET 1995]**

(a) Mesophyte (b) Xerophyte
(c) Halophyte (d) Forest epiphyte

15. The plants in which vascular tissues are absent and well developed aerenchyma is present, are **[CPMT 1995; CBSE PMT 1999; JIPMER 2001; CPMT 2002; BVP 2003; Odisha JEE 2009, 11]**

(a) Xerophytes (b) Halophytes
(c) Hydrophytes (d) Mesophytes

16. *Eichhornia crassipes* is a **[MP PMT 1996]**

(a) Desert plant (b) Parasite
(c) Water plant (d) Terrestrial plant

17. During ecological succession **[AIPMT 2015]**

(a) The establishment of a new biotic community is very fast in its primary phase
(b) The numbers and types of animals remain constant
(c) The changes lead to a community that is in near equilibrium with the environment and is called pioneer community
(d) The gradual and predictable change in species composition occurs in a given area

18. Pneumatophores plants are found **[CPMT 1999; JIPMER 2001]**

(a) In desert (b) Near river banks
(c) In grasslands (d) On mountains

19. Mark the correct pair **[KCET 1998]**

(a) Plants growing in shady places – Heliophytes
(b) Plants growing in light – Sciophytes
(c) Plants growing in saline soil – Halophytes
(d) Roots are absent – Xerophytes

20. Which is adapted for aquatic habit **[Pb. PMT 1999; RPMT 1999]**

(a) *Aldrovenda* (b) *Vallisneria*
(c) *Sancatia* (d) All of these

21. The first plants to reappear in a badly burned forest area will most probably be

(a) Mosses (b) Liverworts
(c) Ferns (d) Grasses

22. Last stabilised community in a plant succession is known as **[RPMT 2000; DPMT 2004]**

Or

The final stable community in ecological succession is **[DUMET 2008]**

(a) Seral Community (b) Pioneer Community
(c) Ecosere (d) Climax Community

23. In ecological succession the climax community is best recognised by the following state **[AMU (Med.) 2010]**

(a) P=R (b) P>R
(c) P<R (d) P≠R

24. Primary succession is development of communities on **[CBSE PMT 1995; AMU (Med.) 2006]**

(a) Newly exposed habitat
(b) Cleared forest area
(c) Freshly harvested crop field
(d) Pond filled after a dry season

25. Series of natural changes in the dominance of a community developing on a previously barren / virgin area is known as **[MP PMT 2013]**

(a) Primary autotrophic succession
(b) Primary heterotrophic succession
(c) Secondary autotrophic succession
(d) Secondary heterotrophic succession

26. Which one lacks both roots and stomata **[RPMT 1996]**
(a) Hydrophytes (b) Mesophytes
(c) Hygrophytes (d) Halophytes

27. Submerged hydrophytes exchange gases through **[AIIMS 1997; Pb. PMT 2000; CPMT 2001, Bihar PMT 2001]**
(a) Stomata (b) Hydathodes
(c) Lenticels (d) General surface

28. Select the correct match

A.	Sedimentary nutrient cycle	-	Nitrogen cycle
B.	Pioneer species	-	Lichens
C.	Secondary succession	-	Burned forests
D.	Pyramid of biomass in sea	-	Upright

[Kerala PMT 2011]
(a) A, B and D only (b) A and C only
(c) B and C only (d) B and D only
(e) A, B and C only

29. One of them is a submerged hydrophyte **[CPMT 1998; Odisha JEE 2012]**
Or
Which of the following is/ are an angiospermic hydrophyte **[CPMT 2010]**
(a) *Ceratophyllum* (b) *Utricularia*
(c) *Vallisneria and Hydrilla* (d) *Lemna*

30. Plants growing on sandstone are **[RPMT 2000]**
(a) Psammophytes (b) Oxylophytes
(c) Lithophytes (d) Phanerophytes

31. Plants like *Rhizophora* and *Avecennia* grow on the sea shores under saline condition. For this they have special roots for respiration which are called **[CPMT 2000]**
(a) Prop roots (b) Climbing roots
(c) Floating roots (d) Pneumatophores

32. Both mimic and model are harmful to the predator **[DPMT 2006]**
(a) Botesian mimicry (b) Warning mimicry
(c) Concealing mimicry (d) Mullerian mimicry

33. Plants growing in acidic soils are known as **[JIPMER 2002]**
(a) Psammophytes (b) Oxalophytes
(c) Lithophytes (d) Halophytes

34. *Dunaliella*, a green alga is a halophyte, which stores **[DPMT 2007]**
(a) Proline (b) Sorbitol
(c) Glycerol (d) None of these

35. Plants growing in saline soil/high concentration of salts/seashore are **[NCERT; MP PMT 1996; CPMT 2002; RPMT 2002, 05, 09; Bihar PMT 2005]**
(a) Xerophytes (b) Halophytes
(c) Heliophytes (d) Hydrophytes

36. Which is not true of hydrophytes **[Odisha JEE 2002]**
(a) Poorly developed root system
(b) Thin membranous leaves
(c) Poorly developed large air spaces
(d) Poorly developed vascular bundles

37. Hydrophytes are characterised by **[MP PMT 2003]**
(a) Thick and large leaf
(b) Delicate and mucilagenous stem
(c) Short spinous stem
(d) All of the above

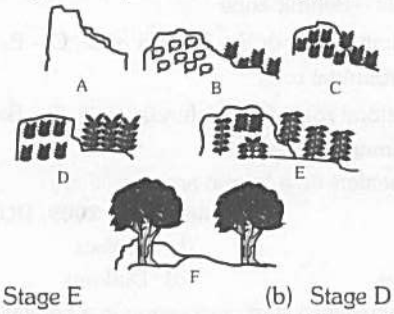
38. Mechanical tissue is best developed in **[CPMT 2003]**
(a) Hydrophytes (b) Halophytes
(c) Xerophytes (d) Mesophytes

39. Halophytes are **[Odisha JEE 2004]**
(a) Salt resistant (b) Fire resistant
(c) Cold resistant (d) Sand loving

40. *Rhizophora* is a characteristic component of **[MP PMT 2004; Odisha JEE 2004]**
(a) Marsh plants (b) Swamp forests
(c) Mangrove vegetation (d) Salt Swamp

41. Characteristic feature of mangrove plants is **[HP PMT 2005]**
(a) Vivipary (b) Heterospory
(c) Parthenocarpy (d) Apospory

42. The diagram refers the biotic succession on bare rock (lithosere). At which stage (s) (as labelled A, B, C, D, E and F) will you find plants like Solidago, Festuca **[NCERT]**



(a) Stage E (b) Stage D and E
(c) Stage D (d) Stage C

43. In succession complexities in structure are **[Haryana PMT 2005]**
(a) Drastically increasing (b) Slowly increasing
(c) Not increasing (d) Constant

44. Mangroves are **[MP PMT 2005]**
(a) Xerophytes (b) Hydrophytes
(c) Halophytes (d) Glycophytes

45. The waxy surface of the floating leaves of the hydrophytes prevents **[Odisha JEE 2005]**
(a) Respiration (b) Photosynthesis
(c) Transpiration (d) Clogging of stomata

46. Which of the following is correct trend of succession in Hydroseric succession **[Kerala PMT 2007; GUJCET 2015]**
(a) Phytoplankton → Rooted submerged → Reed swamp → Sedge meadow
(b) Phytoplankton → Reed swamp → Rooted submerged → Sedge meadow
(c) Phytoplankton → Sedge meadow → Reed swamp → Rooted submerged
(d) Rooted submerged → Phytoplankton → Reed swamp → Sedge meadow

47. One of the following is not true for hydrophytes **[AMU (Med.) 2010]**
(a) Vessels are usually absent
(b) Tracheids are absent
(c) Cuticle is poorly developed
(d) Air chambers are well developed

48. Both, hydrarch and xerarch successions lead to **[CBSE PMT (Mains) 2011]**
(a) Highly dry conditions
(b) Excessive wet conditions
(c) Medium water conditions
(d) Xeric conditions

49. Which one of the following statements is correct for secondary succession **[CBSE PMT (Pre.) 2011]**
(a) It is similar to primary succession except that it has a relatively fast pace
(b) It begins on a bare rock
(c) It occurs on a deforested site
(d) It follows primary succession

50. Community dynamics is related to **[WB-JEE 2016]**
(a) Population growth in an ecosystem
(b) Recycling of nutrients in an ecosystem
(c) Flow of energy in an acosystem
(d) Ecological succession

NCERT Exemplar Questions

1. Decomposers like fungi and bacteria are
(i) Autotrophs (ii) Heterotrophs
(iii) Saprotrophs (iv) Chemo-autotrophs
Choose the correct answer **[NCERT]**
(a) (i) and (iii) (b) (i) and (iv)
(c) (ii) and (iii) (d) (i) and (ii)

2. The process of mineralization by microorganisms helps in the release of **[NCERT]**
(a) Inorganic nutrients from humus
(b) Both organic and inorganic nutrients from detritus
(c) Organic nutrients from humus
(d) Inorganic nutrients from detritus and formation of humus

3. Productivity is the rate of production of biomass expressed in term of
(i) $(kcal\ m^{-3})yr^{-1}$ (ii) $g^{-2}\ yr^{-1}$
(iii) $g^{-1}\ yr^{-1}$ (iv) $(kcal\ m^{-2})yr^{-1}$
Choose the correct answer **[NCERT]**
(a) (ii) (b) (iii)
(c) (ii) and (iv) (d) (i) and (iii)

4. An inverted pyramid of biomass can be found in which ecosystem **[NCERT]**
(a) Forest (b) Marine
(c) Grass land (d) Tundra

5. Which of the following is not a producer **[NCERT]**
(a) Spirogyra (b) Agaricus
(c) Volvox (d) Nostoc

6. Which of the following is an ecosystem service provided by a natural ecosystem **[NCERT]**
(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

7. Pyramid of numbers is **[NCERT]**
(a) Always upright
(b) Always inverted
(c) Either upright or inverted
(d) Neither upright nor inverted

8. Approximately how much of the solar energy that falls on the leaves of a plants is converted to chemical energy by photosynthesis **[NCERT]**
(a) Less than 1% (b) 2-10%
(c) 30% (d) 50%

9. Among the following, where do you think the process of decomposition would be the fastest **[NCERT]**
(a) Tropical rain forest (b) Antarctic
(c) Dry and region (d) Alpine region

10. How much of the net primary productivity of a terrestrial ecosystem is eaten and digested by herbivores **[NCERT]**
(a) 1% (b) 10%
(c) 40% (d) 90%

11. During the process of ecological succession the changes that take place in communities are **[NCERT]**
(a) Orderly and sequential
(b) Random
(c) Very quick
(d) Not influenced by the physical environment

12. Climax community is in a state of **[NCERT]**
(a) Non-equilibrium (b) Equilibrium
(c) Disorder (d) Constant change

13. The sequence of communities of primary succession in water is **[NCERT]**
(a) Phytoplankton, sedges, free-floating hydrophytes, rooted hydrophytes, grasses and tress
(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

14. If the carbon atoms fixed by producers already have passed through three species, the trophic level of the last species would be **[NCERT]**
(a) Scavenger (b) Tertiary producer
(c) Tertiary consumer (d) Secondary consumer

15. Which of the following type of ecosystem is expected in an area where evaporation exceeds precipitation and mean annual rainfall is below 100mm **[NCERT]**
(a) Grassland (b) Shrubby forest
(c) Desert (d) Mangrove

16. The zone at the edge of a lake or ocean which is alternatively exposed to air and immersed in water is called **[NCERT]**
(a) Pelagic zone (b) Benthic zone
(c) Lentic zone (d) Littoral zone

17. Edaphic factor refers to **[NCERT]**
(a) Water (b) Soil
(c) Relative humidity (d) Altitude

Critical Thinking

Objective Questions

1. The important steps in the process of decomposition are **[AMU (Med.) 2012]**
(a) Fragmentation and mineralization
(b) Leaching and catabolism
(c) Humification and mineralization
(d) All of these

2. Mr. X is eating curd/yoghurt. For this food intake in a food chain he should be considered as occupying **[AIIMS 2003]**
(a) First trophic level (b) Second trophic level
(c) Third trophic level (d) Fourth trophic level

3. An ecosystem may be defined as **[MP PMT 1999]**
(a) A localised association of several plants and animals
(b) Different communities of plants, animals and microbes together with their physico-chemical environments
(c) Different communities of plants and microbesplus their physicochemical environments
(d) None of these

4. If we completely remove the decomposers from an ecosystem, the ecosystem functioning will be adversely affected because **[CBSE PMT 1995; RPMT 1995; BHU 2003]**
(a) Mineral movement will be blocked
(b) Herbivores will not receive solar energy
(c) Energy flow will be blocked
(d) Rate of decomposition of other components will be very high

5. Which of the following word is related to *Homo sapiens* **[MP PMT 1994]**
(a) Herbivore (b) Carnivore
(c) Autotroph (d) Omnivore

6. Abyssal zone of oceans is characterized by
(a) Presence of sunlight and producers
(b) Absence of sunlight and all living organisms
(c) Absence of sunlight but presence of producers
(d) Absence of sunlight and presence of consumers and decomposers

7. The hypersaline waters are found in
(a) Lakes located in the alpine regions
(b) Lakes located in the arid and semiarid regions
(c) Lakes located in the tropical regions
(d) Estuaries

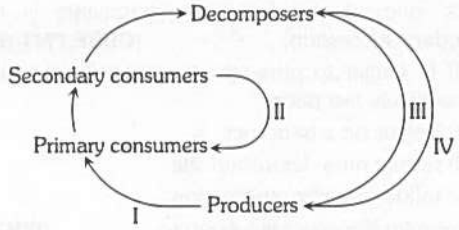
8. Which one of the following animals may occupy more than one trophic levels in the same ecosystem at the same time **[CBSE PMT (Mains) 2011]**
(a) Goat (b) Frog
(c) Sparrow (d) Lion

9. The second trophic level of longer food chains in a lake is **[J & K CET 2012]**
(a) Phytoplankton (b) Zooplankton
(c) Benthos (d) Fishes

10. Secondary succession takes place on/in **[AIPMT (Cancelled) 2015]**
(a) Degraded forest (b) Newly created pond
(c) Newly cooled lava (d) Bare rock

11. Among the plants listed, point out one that does not fit into ecological group represented by other plants **[BHU 1999]**
(a) *Acacia* (b) *Rhizophora/Vallisneria*
(c) *Euphorbia* (d) *Aloe*

12. The figure given below represents the flow of materials between trophic levels. Which arrow is not correct **[NCERT]**



(a) IV (b) III
(c) II (d) I

13. Ecological succession on sand is **[Chd. CET 2000, 02; Odisha JEE 2012]**
(a) Psammosere (b) Xerosere
(c) Halosere (d) Hydrosere

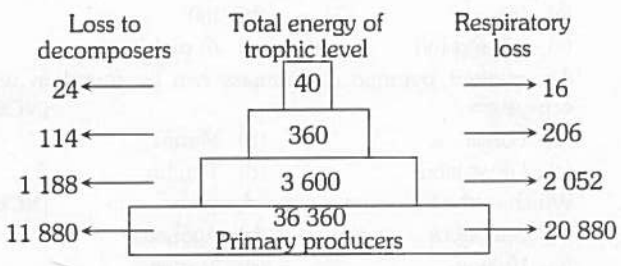
14. Hydrophyte with both hydrophytic and xerophytic traits is **[CPMT 2001]**
(a) *Agave* (b) *Nerium*
(c) *Vallisneria* (d) None of the above

15. Biotic succession is caused by **[AIEEE Pharmacy 2003]**
(a) Competition amongst species
(b) Occurrence of diseases
(c) Changes is grazing habits
(d) Adaptive ability to environmental changes

16. Submerged hydrophytes have commonly dissected leaves for **[Haryana PMT 2003]**
(a) Decreasing surface area
(b) Increasing surface area
(c) Reducing effect of water currents
(d) Increasing number of stomata

17. Microscopic aquatic organisms lacking locomotory ability and drifting with the water currents are **[AMU (Med.) 2010]**
(a) Plankton (b) Nekton
(c) Pleuston (d) Seston

18. The figure shows a pyramid of energy which represents energy loss from a food chain to decomposers, upward transfer of energy to the next trophic level and energy loss through respiration. All diagram are in $kKm^{-2}\ Y^{-1}$



What is illustrated from this figure **[NCERT]**
(a) The energy of the final trophic level is not used
(b) Food chain efficiency is about 10%
(c) Energy loss to decomposers is higher than respiratory loss
(d) A pyramid of energy shows the nutrient transfer less clearly than a pyramid of numbers

19. Which of the following is correct for *r*-selected species **[NEET (Phase-II) 2016]**

(a) Small number of progeny with large size
(b) Large number of progeny with small size
(c) Large number of progeny with large size
(d) Small number of progeny with small size

A R Assertion & Reason

Read the assertion and reason carefully to mark the correct option out of the options given below :

(a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion
(b) If both the assertion and reason are true but the reason is not a correct explanation of the assertion
(c) If the assertion is true but the reason is false
(d) If both the assertion and reason are false
(e) If the assertion is false but reason is true

1. Assertion : In a food chain members of successive higher levels are fewer in number.
Reason : Number of organisms at any trophic level depends upon the availability of organisms which serve as food at the lower level. **[AIIMS 2003]**

2. Assertion : Ecotone shows more diversity.
Reason : Ecotone is a sharp transition zone between two or more diverse communities.

3. Assertion : The rate of decomposition of detritus is reduced in the regions of high altitude.
Reason : It happens due to immobilisation of nutrients **[AIIMS 2010]**

4. Assertion : A network of food chains existing together in an ecosystem is known as a food web.
Reason : An animal like kite cannot be a part of a food web. **[AIIMS 2008]**

5. Assertion : Ecological pyramids are also called Eltonian pyramids.
Reason : An ecological pyramid is always upright.

6. Assertion : Thermocline exists between hypolimnion and epilimnion.
Reason : Thermocline acts as a barrier between the two layers.

7. Assertion : Lichens and mosses are said to form the pioneer community in xerarch succession.
Reason : It is because these species get established later, during the course of succession.

Answers

Ecosystem

1	a	2	d	3	b	4	b	5	c
6	b	7	d	8	b	9	c	10	b
11	b	12	b	13	d	14	b	15	c
16	c	17	d	18	c	19	a	20	b
21	a	22	d	23	c	24	b	25	a
26	d	27	c	28	d	29	a	30	a
31	b	32	c	33	a	34	c	35	b
36	b	37	b	38	d	39	b	40	c
41	b	42	b	43	d	44	a	45	a
46	c	47	a	48	d	49	a	50	d
51	d	52	b	53	d	54	a	55	c
56	b	57	d	58	a	59	a	60	b
61	d	62	a	63	c	64	a	65	b
66	a	67	a	68	d	69	a	70	a
71	c	72	c	73	d	74	a	75	d
76	b	77	d	78	d	79	a	80	d
81	b	82	b	83	a	84	c	85	a
86	b	87	b	88	a	89	b	90	d
91	d	92	c	93	d	94	c	95	a
96	c	97	c	98	a	99	c	100	a
101	b	102	c	103	c	104	c	105	b
106	d	107	d	108	c	109	d	110	a
111	a	112	b	113	d	114	d	115	d
116	a	117	b	118	b	119	c	120	a
121	d	122	c	123	c	124	c	125	a
126	b	127	c	128	b	129	d	130	b
131	a	132	c	133	b	134	d	135	d
136	d	137	c	138	c	139	d	140	d
141	b	142	d	143	a	144	d	145	a
146	a	147	c	148	b	149	b	150	a
151	d	152	d	153	b	154	c	155	c
156	d	157	b	158	c	159	a	160	a
161	c	162	b	163	a				

Ecological Succession

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

NCERT Exemplar Questions

1	c	2	a	3	c	4	b	5	b
6	d	7	c	8	b	9	a	10	b
11	a	12	b	13	d	14	c	15	c
16	d	17	b						

Critical Thinking Questions

1	d	2	d	3	b	4	a	5	d
6	d	7	b	8	c	9	b	10	a
11	b	12	b	13	a	14	d	15	d
16	c	17	a	18	b	19	b		

Assertion and Reason

1	a	2	a	3	c	4	c	5	c
6	a	7	c						

AS Answers and Solutions

Ecosystem

9. (c) The sediment characteristics often determine the type of benthic animals that can thrive there.

11. (b) Producers are mainly photosynthetic plants, and they can convert light energy to kinetic energy and this energy passes in all trophic levels.

14. (b) Decomposers are usually bacterium or fungus that breaks down dead organic matter (cells of dead plants and animals) into simple substances.

15. (c) In ecosystem energy transfers from one form to another and some energy loss in the form of heat, it follows the IInd law of thermodynamics. The second law of thermodynamics states that, "Process involving energy transformation will not occur spontaneously unless there is degradation of energy from non random to a random form".

19. (a) Man-made ecosystem or artificial ecosystem have low diversity and is more vulnerable to sudden changes. Crop ecosystems are man made ecosystems.

23. (c) Transfer of food energy from the producers through a series of organisms with repeated eating and being eaten is known as food chain. Producers utilise the solar energy and transformed it to chemical form (*ATP*) during photosynthesis.

25. (a) In this case the biomass of producers (algae etc.) is minimum which increases at herbivore (rotifers, insects, etc) level and further at carnivore (small fishes etc) level. The biomass of top carnivores (large fishes) is maximum. Thus the pyramid of biomass in aquatic system is inverted.

27. (c) Because these plants are parasitic in nature.

33. (a) Bamboo is a plant, which can produce their food. It is a first trophic level.

35. (b) The food chain always begins from green plants which synthesize organic food by photosynthesis using solar energy.

37. (b) In food web, each successive trophic level has less total energy content as per law of Lindeman. Some energy is lost in transfer from one another level.

43. (d) Because peacock is the top consumer.

44. (a) The transfer of food energy from the producers through a series of organisms (herbivores $\rightarrow$ carnivores $\rightarrow$ decomposers) with repeated eating and being eaten is known as a food chain.

45. (a) Lindeman proposed the 10% law of flow of energy in ecosystem. According to this law only 10% energy passed from one trophic level to other in a food chain.

46. (c) Plant $\rightarrow$ $20J$

Mice $\rightarrow$ $20\times10\% = 2J$

Snake $\rightarrow$ $2\times10\% = 0.2J$

Peacock $\rightarrow$ $0.2\times10\% = 0.02J$.

49. (a) Artificial ecosystem are man made ecosystem *e.g.*, crop land, orchard, urban.

52. (b) In the pyramid of number, the number of individual organisms at each trophic level is shown.

54. (a) The concept of biomass refers to organismal mass or the living material.

58. (a) Because plants have the capacity of synthesizing food (Producers).

63. (c) *Nepenthes* is a chlorophyll containing plant so it synthesizes food by the process of photosynthesis thus it is a primary producer and because of being an insectivorous plant it consumes insects like grasshopper and other small insects, so it is also a consumer.

65. (b) An ecosystem resist changes because it is in a state of greater stability. It is called as homeostasis or an ecosystem maintains a functional balance or relatively stable state of equilibrium amongst its different components. This phenomenon is called balance of nature or homeostasis.

67. (a) Because 90% of total photosynthesis occurs in oceans and lakes by algae.

68. (d) The detrivores together with the decomposers (bacteria, actinomycetes & fungi) are sometimes referred to as reducers. The two are also called scavengers because they clean the earth.

69. (a) In a grassland food chain the number of individuals decrease at the successive higher levels.

72. (c) Plants represents the first trophic level and the herbivores make the second trophic level. The primary carnivores constitute the third trophic level, and the secondary carnivores, such as large fish, man etc. constitute the fourth trophic level of an ecosystem)

77. (d) Because snakes are the secondary consumers.

80. (d) In any ecosystem the basic or ultimate source of energy is sunlight.

81. (b) Gross productivity is the total amount of chemical energy stored in plants per unit area and per unit time.

82. (b) Because phytoplankton is eaten by zooplankton which in turn is eaten by fishes.

84. (c) Pyramid of number is inverted in single tree ecosystem only.

88. (a) The trophic structure in any ecosystem is a kind of producer consumer arrangement. Here each food level is called trophic level.

89. (b) Primary consumers or herbivores of first order are depend upon producers or green plants for their food.

90. (d) It is never inverted.

92. (c) In tree ecosystem the pyramid of number is intermediate. Here the number of primary consumers is more than producers as well as top consumers.

96. (c) Because phytoplanktons (producer) are largest in number in an aquatic system and pond-ecosystem is an aquatic ecosystem.

97. (c) Pyramid of number in which number of individuals at each trophic level is shown in pyramid.

102. (c) In any ecosystem, communities or living organisms interact with their physical environment in such a way that there is a well defined flow of energy forming clear trophic (food) levels and material cycles within this system.

103. (c) The ecosystem comprises abiotic and biotic components. The entire living community comprising plants and animals constitute the biotic component whereas the entire physical environment forms the abiotic component.

105. (b) In pond or lake ecosystem pyramid of biomass are of inverted type as biomass of producers is minimum and of top consumers is maximum.

106. (d) In forest ecosystem the pyramid of number is intermediate. Here the number of primary consumer is more than producers as well as top consumers.

109. (d) Lindeman gave the law of 10% for energy flow (10% energy transfer law), *i.e.*, only 10% of total energy received by one trophic level is transferred to next trophic level.

112. (b) The productivity at consumer level is called secondary productivity and Rabbit is consumer.

113. (d) 2/3 parts of earth is ocean here, various types of food chains form food webs. This ecosystem is most stable due to buffering action of water. Oceans have largest flora and fauna hence represent largest ecosystem of world.

119. (c) Lion is also called top consumer.

120. (a) Benthos are those animals which live at the bottom of a lake. They are primary consumers at the depth of pond.

121. (d) Plants capture 2-10% of PAR.

123. (c) Habitats of a large variety of organisms would be destroyed and food chains would be disturbed leading to population and ecological imbalance.

128. (b) Coral reef is the coastal region is the area of maximum productivity and diversity (every group of marine algae and every animal phylum is represented here).

129. (d) An ecosystem should always maintain a balance, if primary consumers in an ecosystem are absent, then producers will be increased in number and will create over crowding. It results in competition and consequently number of producers will decrease to near normal.

130. (b) Detritus food chain starts from dead organic matter acted upon by decomposers which in turn are eaten by detrivores consumers which are eaten by top consumers.

132. (c) It is lentic fresh water natural ecosystem.

133. (b) Three types *i.e.*, pyramid of number, pyramid of biomass and pyramid of energy.

139. (d) Because primary consumers are those who consume producer (i.e., green plants) so they are called herbivorous and the animals or consumer who consumes the herbivorous or primary carnivorous are called the secondary or tertiary consumers respectively.

140. (d) Abiotic components includes inorganic substances or minerals, organic substances and different climatic conditions.

141. (b) The zone of transition between two different communities presenting a situation of overlaping which is known as ecotone.

142. (d) Snakes are the secondary consumers.

145. (a) Non-degradable chemicals enter the food chain, and their concentration goes up as it moves up in the food chain. This phenomenon is called biomagnification. Naturally in food chain, Phytoplankton → Zooplankton → Fishes, it would be highest in fishes.

149. (b) Any heterotrophs, which break down organic matter into simpler organic or inorganic materials is called decomposer.

151. (d) Gross primary productivity is the total rate of photosynthesis. Light energy is converted into chemical energy including the organic matter used up in respiration during the measurement period.

153. (b) Biomass of producer is greater than the biomass of top consumers in forest ecosystem.

155. (c) Phytoplankton is the producer in lake ecosystem and zooplanktons found as consumers. It is a secondary trophic level in lake ecosystem.

156. (d) Potato is the producer, when rat eats potato then it becomes primary consumer.

158. (c) Standing water ecosystem is called lentic type *e.g.*, lake, ponds, pools, and running fresh water ecosystem is called lotic type. *e.g.*, rivers.

159. (a) Solar energy is the ultimate source of energy in any type of ecosystem.

162. (b) Edge effect is the increased biodiversity in ecotone.

Ecological Succession

4. (a) Soil with optimum nutrients are called eutrophic soils and soils having sub-optimum nutrients (lacking one or more minerals) is known as oligotrophic soil. Mycorrhiza is found is oligotrophic soil.

7. (c) Lichens are the early settlers on a barren area because they can tolerate desiccation, heating during summer noon or excessive cooling during winter nights. They secrete lichen acids and carbonic acid. The acids slowly corrode rock surface and release minerals required for proper growth of lichens.

8. (a) The first biotic community which develops in a bare area is called pioneer community. It has very little diversity. This stage takes the longest time to change the environment for invasion of the next community.

10. (a) Because they can not absorb water due to ice-formation.

15. (c) Aerenchyma helps in floating of hydrophyte plants.

18. (b) Pneumatophores are negatively geotropic specialised root branches produced in large numbers by some vascular plants growing in the water of tidal swamps (*e.g.*, mangroves).

22. (d) Climax community is the stable, self perpetuating and final biotic community that develops at the end of biotic succession and is in perfect harmony with the physical environment.

24. (a) Newly exposed sea floor, igneous rocks, sand dunes, lava sediments or newly submerged areas are some of the examples of primary bare area. It is quite hostile to first life or pioneer community. Primary succession takes a very long time.

26. (a) Roots of hydrophytes are poorly developed or completely absent in *Wolffia*. Stomata are absent in submerged plants. But floating hydrophytes have stomata on upper surface. *e.g.*, Lotus.

31. (d) Pneumatophores is aerial root found in these plants which grow in marshy places. Its main function is respiration.

32. (d) In mullerian mimicry, two or more unpalatable species resemble to each other. The mullerian mimicry is beneficial to both model as well as mimic because if a bird has learned not to eat wasp, it has automatically also learned not to touch the ctenuchid moth which mimics the wasp.

33. (b) Plants growing in soil which have acidic nature, rich amount of humus and lack of Ca^{++} ions are known as oxalophytes.

34. (c) A green halophytic alga Dunaliela, found in hypersaline lakes, accumulates glycerol in its cells to help in osmoregulation.

35. (b) Halophytes are special types of xerophilous plants which grow on saline soils and marshy conditions with high concentrations of salts like $NaCl, MgCl_2$ and $MgSO_4$. Halophytes are plants of saline habitats which have not only the ability to tolerate high conc. of salts in their rooting medium but are able to obtain their water supply from the same. Halophytes grow in saline soils, mangroves, coastal dunes and tidal marshes.

36. (c) All hydrophytes show presence of large air chambers. The tissue that forms air chambers is called aerenchyma.

37. (b) In hydrophytes stem is long. Slender spongy and flexible which often covered with mucilage.

38. (c) Mechanical tissues like collenchyma and sclerenchyma are well developed in xerophytes.

40. (c) A few mangrove plants secrete salts from their roots. Some have water storage tissues to dilute salt, *e.g.*, *Rhizophora* (Red Mangrove).

41. (a) Mangroves are halophytes and vivipary is its characteristic. Vivipary is the germination of seed inside the fruit while it is still attached to the plant. *e.g.*, *Avicennia*, *Rhizophora*, *Sonneratia*, *Salsola* etc.

49. (c) Secondary biotic succession occurs in abandoned farm lands, burned or cut forests and lands that have been flooded.

NCERT Exemplar Questions

13. (d) Seres of biotic communities that develop in a newly formed pond or lake is called hydrosere. It starts as soon as the muddy water becomes clear. Seral stages starts with the submerged plants and the climax community is represented by trees.

Critical Thinking Questions

5. (d) Because they can eat both plants and animals.

6. (d) Abyssal zone is a dark zone.

11. (b) *Acacia*, *Aloe* and *Euphorbia* are xerophytic plants while *Vallisneria* is hydrophyte and *Rhizophora* belongs to the halophyte plant group.

13. (a) When succession begins on sand is called Psammosere. Psammophilous plants growing in sandy swamps.

16. (c) Plants with both submerged and floating or emerged leaves show heterophylly or occurence of more than one type of leaves. The leaves below water are narrow and with cut or dissected margins to reduce effect of water current and leaves which are above water one broader and with entire margins.

Assertion and Reason

1. (a) Each food chain contains many steps like producers, herbivores, primary carnivores and so on. Each step of the food chain is called trophic level. Number of organisms at any trophic level depends upon the availability of food. In grassland ecosystem the maximum number of organisms are found in lower trophic level but in forest ecosystem and parasitic food chain it is reverse.

2. (a) A sharp transition between two or more diverse communities, for example, between forest and grassland, is known as ecotone. The ecotonal community commonly contains many of the organisms of each of the overlapping communities and in addition, organisms characteristic of and often restricted to ecotone. The tendency for increased variety and density at community junctions is known as the edge effect.

3. (c) At high altitude, the temperature becomes very low ($< 10^{\circ}$ C). It greatly reduces the activity of microbes, principal decomposers.

Nutrients immobilisation means tiding up of nutrients material with the biomass of microbes. This immobilisation prevents the nutrients from being washed out from the ecosystem.

4. (c)

5. (c) Ecological pyramids were developed by Charles Elton and are, therefore, also called Eltonian pyramids. An ecological pyramid can be upright, inverted or spindle shaped depending upon criteria of formation of pyramid(like energy, biomass or number) and the type of food chain involved parasitic, aquatic or terrestrial.

6. (a) The warmer upper part of the lake or epilimnion becomes temporarily isolated from the colder lower water or hypolimnion by a thermocline zone (temperature stratification) that acts as a barrier to exchange of materials. Consequently, the supply of oxygen in the hypolimnion and nutrients in the epilimnion may run short.

7. (c) The plants that invade the base land initially, are called pioneer community. Lichens and mosses form the pioneer community in xerarch succession species. The assemblage of pioneer species forms the pioneer. Lichens form a crust over the base rocks and begin to form soil from their organic remains and by stimulating chemical breakdown of the rocks. Lichens are normally followed by mosses, which speed up the process of soil accumulation by trapping wind blown particles. Mosses grow in bunch, and together with lichens, make a mat over the substratum. In this way, lichens and mosses get established on barren rock as pioneer species forming the pioneer community. Generally, the pioneer species show high rate of growth but short life span. In time, the pioneer community is replaced by another community with different species combination. This second community is replaced by a third community, and so on. The plant species which get established later, during the course of succession, are known as late successional species. These species are slow growing and long lived. The terminal stage of succession is represented by the climax community which is stable and does not show change in species composition, as long as the environmental conditions remain the same.

Ecosystem : Structure and Function

SET Self Evaluation Test

1. Which atom is limiting the primary productivity mostly **[Odisha JEE 2008]**
   (a) C (b) P
   (c) D (d) N
2. Y–shaped energy flow models have
   (a) Single channel (b) Two channels
   (c) Three channels (d) None of these
3. Find out the correct order of succession levels in Xerarch **[Kerala PMT 2006]**
   (a) Lichen moss stage, Annual herb stage, Perennial herb stage, Scrub stage, Forest
   (b) Annual herb stage, Perennial herb stage, Lichen moss stage, Scrub stage, Forest
   (c) Perennial herb stage, Annual herb stage, Perennial Scrub Stage, Lichen moss stage
   (d) Scrub stage, Forest, Annual herb stage, Lichen moss stage, scrub stage, forest
   (e) Forest, Scrub stage, Annual herb stage, Perennial herb stage, Lichen moss stage
4. Phytoplanktons are **[MP PMT 2007]**
   (a) Heterotrophs (b) Autotrophs
   (c) Saprotrophs (d) All of these
5. Animals which occupy the same trophic level
   (a) Tiger and bear (b) Deer and bees
   (c) Snake and earthworm (d) Crow and cow
6. Food chains are met with only in the **[MP PMT 1999; CBSE PMT 2001]**
   (a) Sea (b) Cities
   (c) Forests (d) In all the places
7. The ecosystem of a pond is referred as **[CPMT 2000]**
   (a) Lotic (b) Lentic
   (c) Xeric (d) Benthic
8. The idea of food chain was introduced by which one of the following ecologist
   (a) Tansley (b) Elton
   (c) Clements (d) Phillipson
9. Psammophytes are plants that grow where soil is **[MP PMT 2007; Odisha JEE 2010]**
   (a) Alkaline (b) Sandy
   (c) Acidic (d) Alluvial
10. The flow of energy among various trophic levels of an ecosystem is **[AIEEE Pharmacy 2004; J & K CET 2008; Odisha JEE 2011; BHU 2012]**
    (a) Unidirectional (b) Bidirectional
    (c) Multidirectional (d) Circular
11. Which of the following ecosystem has very little primary productivity **[Odisha JEE 2008]**
    (a) Forest (b) River
    (c) Sea (d) Grass Land
12. An organism contains carbon molecules which have passed through three levels of ecosystem. The organism is a **[Odisha JEE 2008]**
    (a) Primary consumer (b) Tertiary consumer
    (c) Predator (d) Producer
13. In ecological succession from pioneer to climax community, the biomass shall
    (a) Decrease
    (b) Increase and then decrease
    (c) No relation
    (d) Increase continuously
14. Aquatic photo diffraction is **[RPMT 2005]**
    (a) Euphotic, disphotic and aphotic
    (b) Aphotic, euphotic and disphotic
    (c) Euphotic, aphotic and disphotic
    (d) Euphotic, disphotic and euphotic
15. Lichen is the pioneer vegetation on which succession **[BHU 2006]**
    (a) Hydrosere (b) Lithosere
    (c) Psammosere (d) Xerosere
16. A place was rocky and barren but now there is a green forest; the sequence of origin is **[RPMT 2005]**
    (a) Lichen, moss, herbs, shrubs
    (b) Moss, lichen, herbs, shrubs
    (c) Lichen, moss, shrubs, herbs
    (d) Shrubs, herbs, moss, lichen
17. A progressive series of changes in plant and animal life of an area from initial colonization is known as **[AMU (Med.) 2009]**
    (a) Evolution (b) Succession
    (c) Specialisation (d) Selection

AS Answers and Solutions

1	a	2	b	3	a	4	b	5	b
6	d	7	b	8	b	9	b	10	a
11	b	12	b	13	d	14	a	15	b
16	a	17	b						

6. (d) The biotic factors (living organisms) of the ecosystem are linked together by food. Hence food chain are present in the cities, forests and seas.
7. (b) Lentic is the ecosystem of still water such as pond or lake.
8. (b) The idea of food chain was introduced by C. Elton (1927)
14. (a) Euphotic zone (where sufficient light penetrates) is responsible for main bulk of primary production. Below this is disphotic zone where no effective plant production occurs. The lightless region below the disphotic zone is termed aphotic zone.