UNIT IX : PLANT ECOLOGY

CHAPTER 6

PRINCIPLES OF ECOLOGY

POINTS TO REMEMBER

- Ecology is a division of biology which deals with the study of environment in relation to organisms.
- The term "ecology" is derived from two Greek words.
- The term "ecology" was first proposed by **Reiter** (1868).
- The most widely accepted definition of ecology was given by **Ernest Haeckel** (1869).
- **Alexander von Humbolt** - Father of Ecology.
- **Eugene P. Odum** - Father of modern Ecology.
- **R. Misra** - Father of Indian Ecology.
- The basic unit of ecological hierarchy is an individual organism.
- Ecology is divided into autecology and synecology.
- **Autecology** is the ecology of an individual species and is also called species ecology.
- **Synecology** is the ecology of a population or community and also called as community ecology.
- The environment of any community is called **Biotope**.
- The habitat and niche of any organism is called **Ecotope.**
- The climatic factors includes light, temperature, water, wind and fire.
- The rate of photosynthesis is maximum at **blue** (400 – 500 nm) and **red** (600 – 700 nm).
- The **green** (500 – 600 nm) wave length of spectrum is less strongly absorbed by plants.
- Heliophytes - Light loving plants. Example: Angiosperms.
- **Sciophytes** - Shade loving plants. Example: Bryophytes and Pteridophytes
- Eurythermal: Organisms which can tolerate a wide range of temperature fluctuations.
- Stenothermal: Organisms which can tolerate only small range of temperature variations.
- **Latitude:** Latitude is an angle which ranges from 0^0 at the equator to 90^0 at the poles.
- **Altitude:** How high a place is located above the sea level is called the altitude of the place.
- Water covers more than 70% of the earth's surface.
- **Euryhaline:** Organisms which can live in water with wide range of salinity.
- **Stenohaline:** Organisms which can withstand only small range of salinity.
- **Anemometer** is the instrument used to measure the speed of wind.
- Some fungi which grow in soil of burnt areas called pyrophilous.
- The study of soils is called **Pedology.**
- The best pH range of the soil for cultivation of crop plants is **5.5 to 6.8.**
- Capillary water only available to the plants.
- A–Horizon (Leached horizon) Topsoil - Often rich in humus and minerals.
- Organic horizon usually absent in agriculture and reserts.
- The surface features of earth are called **topography**.
- Topographic factors include latitude, altitude, direction of mountain, steepness of mountain etc.
- The interactions among living organisms such as plants and animals are called **biotic factors,**
- In mutualism the both species are benefitted.
- In commensalism one species is benefitted and the other is neither benefitted nor harmed.
- In predation one species is benefitted while the other is harmed.
- In parasite one species is benefited while the host species is harmed.
- In competition the both the organisms or species are harmed.

- In amensalism one species is inhibited while the other species is neither benefitted nor harmed.
- **Mimicry–**organism modifies its form,appearance,structure or behavior and looks like another living organism.
- The plants which are living in water or wet places are called hydrophytes.
- Lotus seeds showing highest longevity in plant kingdom.
- The root caps are replaced by **root pockets** in *Eichhornia*.
- In emergent forms, the leaves show **heterophylly.**
- The plants which are living in dry or xeric condition are known as **Xerophytes**.
- Stem are modified into a fleshy leaf structure called **phylloclades.**
- Single or occasionally two internodes modified into fleshy green structure called **cladode.**
- The petiole is modified into a fleshy leaf like structure called **phyllode.**
- Scotoactive type of stomata found in succulent plants.
- The plants which are living in moderate conditions (neither too wet nor too dry) are known as **mesophytes**.
- Epiphytes are plants which grow perched on other plants.
- **Halophytic plants** which grow on soils with high concentration of salts.
- A special type of negatively geotropic roots called **pneumatophores.**
- Vivipary mode of seed germination is found in halophytes.
- The seed consists of an embryo, stored food material and a protective covering called **seed coat**.

PART – A

TEXTUAL QUESTIONS (1 MARK)

Book Evaluation

1. Arrange the correct sequence of ecological hierarchy starting from lower to higher level.

a. Individual organism ☐ Population Landscape ☐ Ecosystem

b. Landscape ☐ Ecosystem ☐ Biome ☐ Biosphere

c. community ☐ Ecosystem ☐ Landscape ☐ Biome

d. Population ☐ organism ☐ Biome ☐ Landscape

Ans: c

2. Ecology is the study of an individual species is called

i. Community ecology ii. Autecology

iii. Species ecology iv. Synecology

a. i only b. ii only

c. i and iv only d. ii and iii only **Ans: d**

3. A specific place in an ecosystem, where an organism lives and performs its functions is

a. habitat b. niche

c. landscape d. biome **Ans: b**

4. Read the given statements and select the correct option.

i. Hydrophytes possess aerenchyma to support themselves in water.

ii. Seeds of *Viscum* are positively photoblastic as they germinate only in presence of light.

iii. Hygroscopic water is the only soil water available to roots of plant growing in soil as it is present inside the micropores.

iv. High temperature reduces use of water and solute absorption by roots.

a. i, ii, and iii only b. ii, iii and iv

c. ii and iii only d. i and ii only **Ans: d**

5. Which of the given plant produces cardiac glycosides?

a. *Calotropis* b. *Acacia*

c. *Nepenthes* d. *Utricularia* **Ans: a**

6. Read the given statements and select the correct option.

i. Loamy soil is best suited for plant growth as it contains a mixture of silt, sand and clay.

ii. The process of humification is slow in case of organic remains containing a large amount of lignin and cellulose.

iii. Capillary water is the only water available to plant roots as it is present inside the micropores.

iv. Leaves of shade plant have more total chlorophyll per reaction centre, low ratio of chl *a* and chl *b* are usually thinner leaves.

a. i, ii and iii only b. ii, iii and iv only

c. i, ii and iv only d. ii and iii only **Ans: c**

7. Read the given statements and select the correct option.

Statement A : Cattle do not graze on weeds of *Calotropis*.

Statement B : *Calotropis* have thorns and spines, as defense against herbivores.

a. Both statements A and B are incorrect.

b. Statement A is correct but statement B is incorrect.

c. Both statements A and B are correct but statement B is not the correct explanation of statement A.

d. Both statements A and B are correct and statement B is the correct explanation of statement A. **Ans: b**

8. In soil water available for plants is

a. gravitational water

b. chemically bound water

c. capillary water

d. hygroscopic water **Ans: c**

9. Read the following statements and fill up the blanks with correct option.

i. Total soil water content in soil is called _____

ii. Soil water not available to plants is called _____

iii. Soil water available to plants is called _____

	(i)	(ii)	(iii)
(a)	Holard	Echard	Chresard
(b)	Echard	Holard	Chresard
(c)	Chresard	Echard	Holard
(d)	Holard	Chresard	Echard

Ans: a

10. Column I represent the size of the soil particles and Column II represents type of soil components. Which of the following is correct match for the Column I and Column IL

Column - I	Column - II
I. 0.2 to 2.00 mm	i. Slit soil
II. Less than 0.002 mm	ii. Clayey soil
III. 0.002 to 0.02 mm	iii. Sandy soil
IV. 0.002 to 0.2 mm	iv. Loamy soil

	I	II	III	IV
a)	ii	iii	iv	i
b)	iv	i	iii	ii
c)	iii	ii	i	iv
d)	None of the above			

Ans: c

11. The plant of this group are adapted to live partly in water and partly above substratum and free from water

a. Xerophytes b. Mesophytes

c. Hydrophytes d. Halophytes **Ans: d**

12. Identify the A, B, C and D in the given table

Interaction	Effects on species X	Effects on species Y
Mutualism	A	(+)
B	(+)	(-)
Competition	(-)	C
D	(-)	0

	A	B	C	D
a)	(+)	Parasitism	(-)	Amensalism
b)	(-)	Mutalism	(+)	Competition
c)	(+)	Competition	(0)	Mutalism
d)	(0)	Amensalism	(+)	Parasitism

Ans: a

13. Ophrys an orchid resembling the female of an insect so as to able to get pollinated is due to phenomenon of

a. Myrmecophily b. Ecological equivalents

c. Mimicry d. None of these **Ans: c**

14. A free living nitrogen fixing cyanobacterium which can also form symbiotic association with the water fern Azolla

a. *Nostoc* b. *Anabaena*
c. *chlorella* d. *Rhizobium* **Ans: b**

15. Pedogenesis refers to

a. Fossils b. Water
c. Population d. Soil **Ans: d**

16. Mycorrhiza promotes plant growth by

a. Serving as a plant growth regulators
b. Absorbing inorganic ions from soil
c. Helping the plant in utilizing atmospheric nitrogen
d. Protecting the plant from infection **Ans: b**

17. Which of the following plant has a non-succulent xerophytic and thick leathery leaves with waxy coating

a. *Bryophyllum* b. *Ruscus*
c. *Nerium* d. *Calotropis* **Ans: b**

18. In a fresh water environment like pond, rooted autotrophs are

a. *Nymphaea and typha*
b. *Ceratophyllum* and *Utricularia*
c. *Wolffia* and *pistia*
d. *Azolla* and *lemna* **Ans: a**

19. Match the following and choose the correct combination from the options given below:

Column I (Interaction)	Column II (Examples)
I. Mutualism	i. *Trichoderma* and *Penicillium*
II. Commensalism	ii. *Balanophora*, *Orobanche*
III.Parasitism	iii. *Orchids* and *Ferns*
IV. Predation	iv. *Lichen* and *Mycorrhiza*
V. Amensalism	v. *Nepenthes* and *Diaonaea*

	I	II	III	IV	V
a)	i	ii	iii	iv	v
b)	ii	iii	iv	v	i
c)	iii	iv	v	i	ii
d)	iv	iii	ii	v	i

Ans: d

20. Strong, sharp spines that get attached to animal's feet are found in the fruits of

a. *Argemone* b. Ecballium
c. *Heritier* d. *Crossandra* **Ans: b**

21. Sticky glands of Boerhaavia and Cleome support

a. Anemochory b. Zoochory
c. Autochory d. Hydrochory **Ans: b**

PART – B,C AND D

TEXTUAL QUESTIONS (2,3 AND 5 MARKS)

22. Define ecology.

- A division of biology which deals with the study of environment in relation to organisms is called Ecology.

23. What is ecological hierarchy? Name the levels of ecological hierarchy.

- The interaction of organisms with their environment results in the establishment of grouping of organisms is called ecological hierarchy.
- The levels of ecological hierarchy are as follows

Individual organism → Population → Community → Ecosystem → Landscape → Biome → Biosphere

24. What are ecological equivalents? Give one example.

- Taxonomically different species occupying similar habitats (Niches.
  in different geographical regions are called ecological equivalents.

Examples:

- Certain species of epiphytic orchids of Western Ghats of India differ from the epiphytic orchids of South America. But they are epiphytes.
- Species of the grass lands of Western Ghats of India differ from the grass species of temperate grass lands of Steppe in North America. But they are all ecologically primary producers and fulfilling similar roles in their respective communities.

25. Distinguish habitat and niche

	Habitat	Niche
1.	A specific physical space occupied by an organism (species)	A functional space occupied by an organism in the same eco-system
2.	Same habitat may be shared by many organisms (species)	A single niche is occupied by a single species
3.	Habitat specificity is exhibited by organism.	Organisms may change their niche with time and season.

26. Why are some organisms called as eurythermals and some others as stenohaline?

- Eurythermals are organisms can live in a wide range of temperature , whereas stenohaline can withstand only small range of salinity

27. 'Green algae are not likely to be found in the deepest strata of the ocean'. Give at least one reason.

- Green algae or plants are not found beyond a certain depth, as light (not all colour components of visible spectrum.can reach only till a certain depth in sea and oceans.

28. What is Phytoremediation ?

- The plants soya bean ,tomato, rice and *Eichhornia* can be used to remove cadmium from contaminated soil, and this make suitable for cultivation is known as Phytoremediation.

29. What is Albedo effect and write their effects? What is albedo effect ? Write its effects

- Aerosols with small particles is reflecting the solar radiation entering the atmosphere.
- This is known as albedo effect.
- It reduces the temperature (cooling. limits, photosynthesis and respiration

30. The organic horizon is generally absent from agricultural soils because tilling, e.g., plowing, buries organic matter. Why is an organic horizon generally absent in desert soils ?

- A desert has little or no plants.
- Without plants ,there is no organic material in the soil.
- So there is no organic horizon.

31. Soil formation can be initiated by biological organisms. Explain how?

- The organisms like bacteria, fungi, lichens and plants acids produce certain chemical substances. It helps in the breakdown of rocks and originates the soil.

32. Sandy soil is not suitable for cultivation. Explain why?

- Sandy soil contains 85% sand and 15% of clay and stilt. The soil particles are larger, low water holding capacity and poor organic content.So this soil is not suitable for cultivation.

33. Describe the mutual relationship between the fig and wasp and comment on the phenomenon that operates in this relationship.

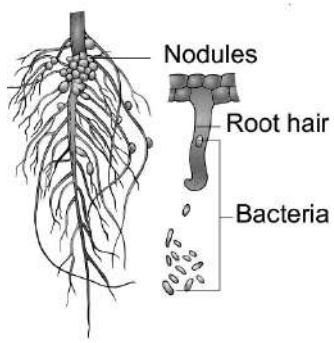
- The relationship between fig tree and wasp shows mutualism.
- The wasp while searching for sits to lay its egg, pollinates the fig's inflorescence.
- On the other hand, the fig not only provides shelter (fruit. for ovi position but allows wasp's larva to feed on its seeds.

34. Lichen is considered as a good example of obligate mutualism. Explain.

- It is an interaction between two species of organisms in which both are benefitted from the obligate association.
- The algae and fungi closely associate to form lichen where algae performs photosynthesis and provide food to fungi and fungi helps algae to absorb water and minerals.

35. What is mutualism? Mention any two example where the organisms involved are commercially exploited in modern agriculture.

- It is an interaction between two species of organisms in which both are benefitted from the obligate association.
- Examples of the organisms involved are commercially exploited in modern agriculture are as follows.



Rhizobium:

- It is a mutual relationship between bacteria and leguminous plant is used as a bio fertilizer.
- These enrich the nutrients quality of the soil by fixing atmospheric nitrogen into organic forms.

Mycorhiza :

- It is an association of the fungus and the roots of higher plants.
- It improves the soil quality ,plant growth and development ,reduce the soil erosion and helps to absorb minerals from the soil.

36. List any two adaptive features evolved in parasites enabling them to live successfully on their host?

- Presence of adhesive organs to cling onto the host.
- Produce houstorial roots to absorbs nutrients from the vascular tissues of host plants

37. Mention any two significant roles of predation plays in nature.

- *Calotropis* produces highly poisonous cardiac glycosides,
- Tobacco produces nicotine,
- Coffee plants produce caffeine,
- *Cinchona* plant produces quinine.
- Thorns of *Bougainvillea*, spines of *Opuntia*, and
- latex of cacti are the many defense mechanisms are evolved by plants. (Any two)

38. How does an orchid *ophrys* ensures its pollination by bees ?

- *Ophrys* an orchid, the flower looks like a female insect to attract the male insect to get pollinated by the male insect
- It is otherwise called 'floral mimicry '.

39. Water is very essential for life. Write any three features for plants which enable them to survive in water scarce environment.

The adaptations of plants to water scarcity are as follows:

- Xenopytic plants have hick cutile on their leaf surface.
- Stomata is small shaped, it minimize water loss through transpiration.
- Leaves re reduced to spines.

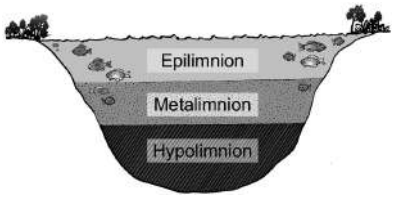
40. Why do submerged plants receive weak illumination than exposed floating plants in a lake?

Submerged plants receive weaker illumination than exposed floating plants in a lake because all colours of the visible components of the spectrum of light does not enter or penetrate in the depth of water.

41. What is vivipary? Name a plant group which exhibits vivipary.

Seeds germinate in the fruits of mother plant itself are called Vivipary. It is exhibited in halophytes.

42. What is thermal stratification? Mention their types.



Thermal stratification of point

- It is usually found in aquatic habitat.
- The change in the temperature profile with increasing depth in a water body is called **thermal stratification**.
- The three kinds of thermal stratifications are

1. Epilimniotn – The upper layer of warmer water.
2. Metalimnion – The middle layer with a zone of gradual decrease in temperature.
3. Hypolimnion - The bottom layer of colder water.

43. How is rhytidome act as the structural defence by plants against fire?

- Rhytidome is the structural defense by plants against fire.
- The outer bark of trees which extends to the last formed periderm is called Rhytidome.
- It is composed of multiple layers of suberized periderm, cortical and phloem tissues.
- It protects the stem against fire , water loss, invasion of insects and prevents infections by microorganisms.

44. What is myrmecophily?

- Sometimes, ants take their shelter on some trees such as Mango, Litchi, Jamun, *Acacia* etc.

- These ants act as body guards of the plants against any disturbing agent.
- The plants in turn provide food and shelter to these ants.
- This phenomenon is known as Myrmecophily.
- Example: Acacia and acacia ants.

45. What is seed ball?

SEED BALL

- Seed ball is an ancient Japanese technique.
- Encasing seeds in a mixture of clay and soil humus (also in cow dung).
- These are scattering on to suitable ground, not planting of trees manually.
- This method is suitable for barren and degraded lands for tree regeneration.
- This vegetation before monsoon period where the suitable dispersal agents become rare.

46. How is anemochory differ from zoochory?

Anemochory	Zoochory
• The dispersal fruit or seed by wind.	• The dispersal fruit or seed by animals.
• Minute seeds, wings, feathery appendages and censor mechanisms are devices found	• Hooked fruit ,sticky fruits and seeds and fleshy fruits are devices found
• Ex. *Gyrocarpus, Vernonia, Asclepias* and *Aristolochia*	• Ex. *Xanthium*, *Andropogon*, *Cleome* and *Alangium*

47. What is co evolution?

- The interaction between organisms, when continues for generations, involves reciprocal changes in genetic and morphological characters of both organisms.
- This type of evolution is called Co-evolution.

48. Explain Raunkiaer classification in the world's vegetation based on the temperature.

Raunkiaer classification in the world's vegetation based on the temperature are four types.

1. Megatherms, 2. Mesotherms, 3. Microtherms and 4. Hekistotherms.

49. List out the effects of fire to plants.

- Fire has a direct lethal effect on plants
- Burning scars are the suitable places for the entry of parasitic fungi and insects
- It brings out the alteration of light, rainfall, nutrient cycle, fertility of soil, pH, soil flora and fauna
- Some fungi which grow in soil of burnt areas called pyrophilous.

Example: *Pyronema confluens*.

50. What is soil profile? Explain the characters of different soil horizons.

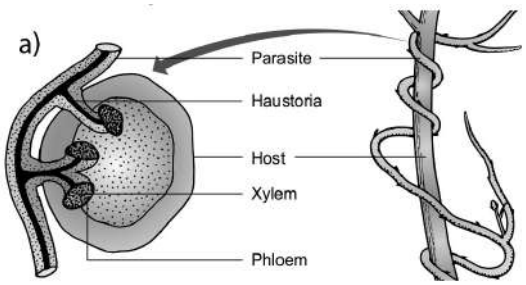
Horizon	Description
O–Horizon (Organic horizon) Humus	It consists of fresh or partially decomposed organic matter. O1 – Freshly fallen leaves, twigs, flowers and fruits O2 – Dead plants, animals and their excreta decomposed by micro-organisms. Usually absent in agricultural and deserts.
A–Horizon (Leached horizon) Topsoil - Often rich in humus and minerals.	It consists of top soil with humus, living creatures and in-organic minerals. A1 – Dark and rich in organic matter because of mixture of organic and mineral matters. A2 – Light coloured layer with large sized mineral particles.
B-Horizon (Accumulation horizon)(Subsoil-Poor in humus, rich in minerals)	It consists of iron, aluminium and silica rich clay organic compounds.
C - Horizon (Partially weathered horizon) Weathered rock Fragments - Little or no plant or animal life.	It consists of parent materials of soil, composed of little amount of organic matters without life forms.
R – Horizon (Parent material. Bedrock	It is a parent bed rock upon which underground water is found.

51. Give an account of various types of parasitism with examples.

- Parasitism is an interaction between two different species in which the **smaller partner** (parasite. obtains food from the **larger partner** (host or plant).
- So the parasitic species is benefited while the host species is harmed.
- Prasitism is classified into two types. They are holoparasite and hemiparasite.

Holoparasites

- The organisms which are dependent upon the host plants for their entire nutrition are called **Holoparasites**. They are also called **total parasites**.



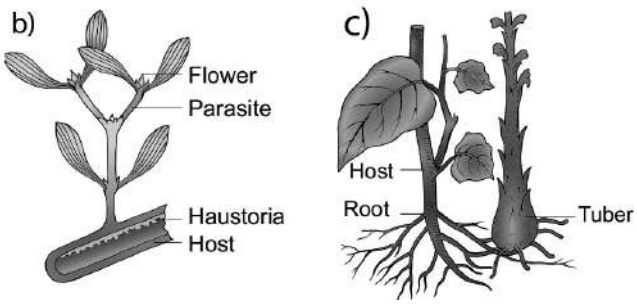
Holoparasites - *Cuscuta*

Examples:

- *Cuscuta* is a total stem parasite of the host plant *Acacia*, *Duranta.*
- *Balanophora, orobanche* and *Refflesia* are the total root parasites on higher plants.

Hemiparasites

- The organisms which derive only water and minerals from their host plant.
- The organisms synthesizing their own food by photosynthesis are called **Hemiparasites**.
- They are also called **partial parasites**.



b) A Partial stem parasite - Viscum
c) Root parasite on the brinjal root Orobanche spp.

Examples:

- *Viscum* and *Loranthus* are **partial stem parasites**.
- *Santalum* (Sandal Wood. is a **partial root parasite**.

52. Explain different types of hydrophytes with examples.

i. Free floating hydrophytes:

- These plants float freely on the surface of water.
- They remain in contact with water and air, but not with soil.
- Examples: *Eichhornia, Pistia and Wolffia* (smallest flowering plant).

ii. Rooted floating hydrophytes:

- In these plants, the roots are fixed in mud, but their leaves and flowers are floating on the surface of water.
- These plants are in contact with soil, water and air.
- Examples: *Nelumbo, Nymphaea, Potomogeton* and *Marsilea.*

iii. Submerged floating hydrophytes:

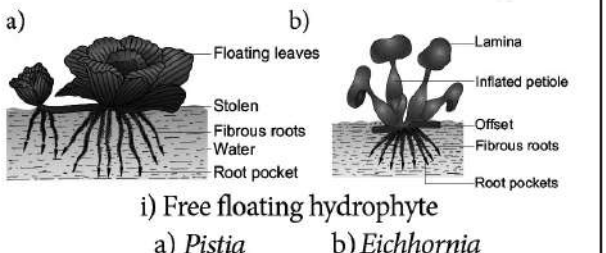
- These plants are completely submerged in water and not in contact with soil and air.
- Examples: *Ceratophyllum* and *Utricularia.*

iv. Rooted- submerged hydrophytes:

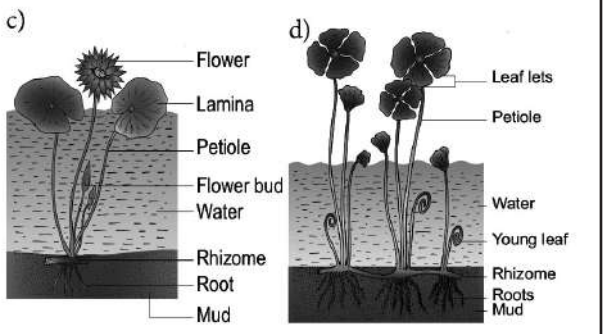
- These plants are completely submerged in water and rooted in soil and not in contact with air.
- Examples: *Hydrilla*, *Vallisneria* and *Isoetes*.

v. Amphibious hydrophytes (Rooted emergent hydrophytes):

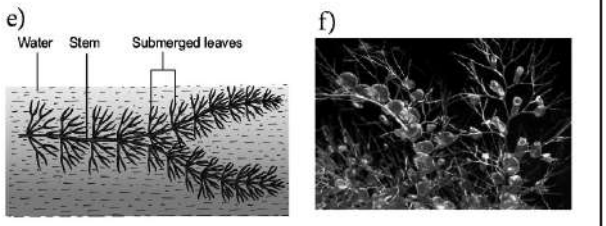
- These plants are adapted to both aquatic and terrestrial modes of life.
- They grow in shallow water.
- Examples: *Ranunculus*, *Typha* and *Sagittaria*.



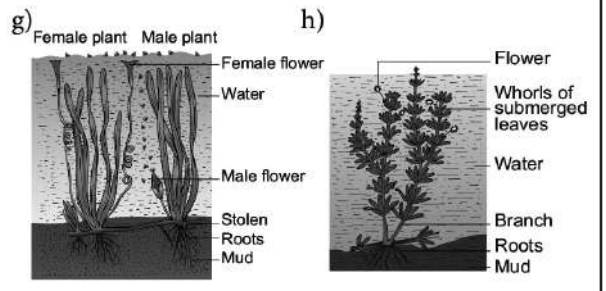
i) Free floating hydrophyte
a) *Pistia* b) *Eichhornia*



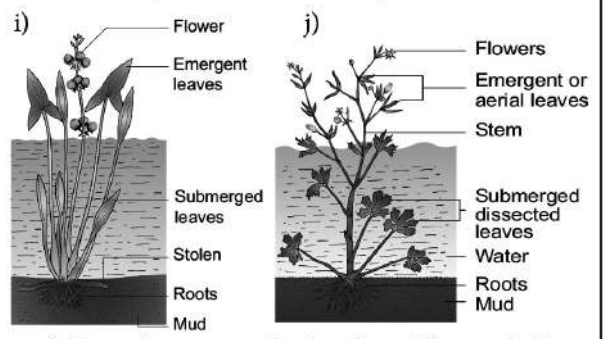
ii) Rooted floating hydrophyte
c) *Nymphaea* d) *Marsilea*



iii) Submerged floating hydrophyte
e) *Ceratophyllum* f) *Utricularia*



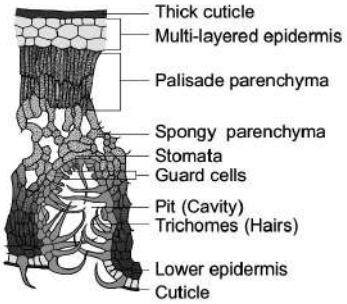
iv) Rooted - sumerged hydrophyte
g) *Vallisneria* h) *Hydrilla*



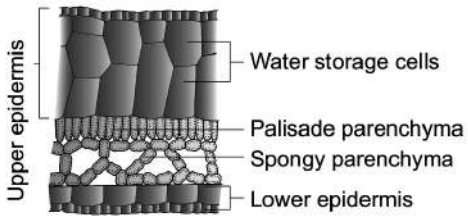
v) Rooted emergent hydrophyte-Heterophylly
i) *Sagittaria* j) *Ranunculus*

53. Enumerate the anatomical adaptations of xerophytes.

- Presence of multilayered epidermis with heavy cuticle to prevent water loss due to transpiration.
- Hypodermis is well developed with sclerenchymatous tissues.
- Sunken shaped stomata are present only in the lower epidermis with hairs in the sunken pits.
- Scotoactive type of stomata found in succulent plants.
- Vascular bundles are well developed with several layered bundle sheath.
- Mesophyll is well differentiated into palisade and spongy parenchyma.
- In succulents the stem possesses a water storage region



T.S. of Nerium leaf

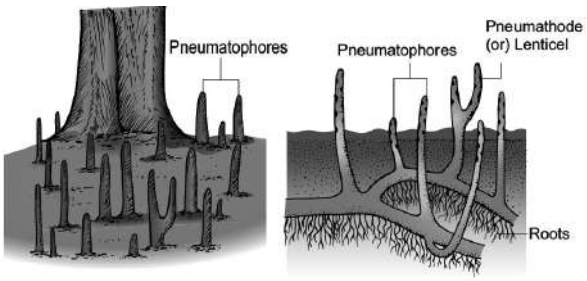


A Succulent leaf of *Pepromia* (T.S.)
(lateral wing portion only)

54. List out any five morphological adaptations of halophytes.

- The temperate halophytes are herbaceous but the tropical halophytes are mostly bushy
- In addition to the normal roots, many stilt roots are developed
- A special type of negatively geotropic roots called **pneumatophores** with **pneumathodes** to get sufficient aeration.
- They are called breathing roots. Example: *Avicennia*

- Presence of thick cuticle on the aerial parts of the plant body
- Leaves are thick, entire, succulent and glossy. Some species are **aphyllous** (without leaves).
- Vivipary mode of seed germination is found in halophytes



Pneumatophores of mangrove plant

Succulent halophyte - *Salicornia*

55. What are the advantages of seed dispersal?

- Seeds escape from mortality near the parent plants due to predation by animals and getting diseases and also avoiding competition.
- Dispersal also gives a chance to occupy favourable sites for growth.
- This is the only method available for self-fertilized flowers and maternally transmitted genes in out crossing plants.
- Seed dispersal by animals help in conservation of many species even in human altered ecosystems.
- It acts as a key for proper functioning and establishment of many ecosystems from deserts to evergreen forests
- The maintenance of biodiversity conservation and restoration of ecosystems.

56. Describe dispersal of fruit and seeds by animals.

- Birds and mammals, including human beings play an efficient and important role in the dispersal of fruit and seeds.
- They have the following devices.

Hooked fruit:

- The surface of the fruit or seeds have hooks,(*Xanthium*), barbs (*Andropogon*), spines (*Aristida*. by means of which they adhere to the body of animals or clothes of human beings and get dispersed.

Sticky fruits and seeds:

- Some fruits have sticky glandular hairs by which they adhere to the fur of grazing animals. Example: *Boerhaavi*a and *Cleome*.
- Some fruits have viscid layer which adhere to the beak of the bird which eat them and when they rub them on to the branch of the tree, they disperse and germinate. Example: *Cordia* and *Alangium*

Fleshy fruits:

- Some fleshy fruits with conspicuous colours are dispersed by human beings to distant places after consumption. Example: Mango and *Diplocyclos*

PART – A

ADDITIONAL QUESTIONS (1 MARK)

1. A mutually beneficial association necessary for survival of both partners is

a. amensalism
b. mutualism/symbiosis
c. both A and B
d. commensalism

Ans: b

2. Competition for light, nutrients and space is most severe between

a. distantly related organisms growing in the same habitat
b. closely related organism growing in different niches
c. distantly related organisms growing in different niches
d. closely related organisms growing in the same area/niche

Ans: d

3. Soil particles determine its

a. water holding capacity b. texture
c. soil flora d. field capacity

Ans: b

4. A fertile agricultural soil appears deep coloured at the surface as compared to soil one metre down. The reason for colour of top soil is

a. rich in iron, calcium and magnesium
b. more moisture
c. recent formation
d. rich in organic matter **Ans: d**

5. Which one is true?

a. Symbiosis when neither populations affects each other
b. Commensalism when none of the interacting populations affect each other
c. Commensalism when the interaction is useful to both the populations
d. Symbiosis when the interaction is useful to both the populations **Ans: d**

6. Deep black soil is productive due to high proportion of

a. clay and humus b. sand and zinc
c. silt and earthworm d. gravel and calcium **Ans: a**

7. Animals that can tolerate a narrow range of salinity are

a. anadromous b. stenohaline
c. catadromous d. euryhaline **Ans: b**

8. Xeric environment is characterised by

a. extremes of temperature
b. precipitation
c. high rate of vapourisation
d. low atmospheric humidity **Ans: d**

9. Association of animals when both partners are benefitted

a. commensalism b. colony
c. amensalism d. mutualism **Ans: d**

10. Soil best suited for plant growth is

a. sandy b. clay
c. grave• d. loam **Ans: d**

11. The sum total of the populations of the same kind of organisms constitute

a. community b. colony
c. species d. genus **Ans: c**

12. Sunken stomata is the characteristic feature of

a. xerophyte b. hydrophyte
c. halophyte d. mesophyte **Ans: a**

13. In increasing order of organizational complexity, which one of the following is the correct sequence?

a. Population, ecosystem, species, community
b. Population, species, community, ecosystem
c. Species, variety, ecosystem, community
d. Population, variety, species, ecosystem **Ans: b**

14. An interesting modification of flower shape for insect pollination occurs in some orchids in which a male insect mistakes the pattern on the orchid flower for the female of his species and tries to copulate with it, thereby pollinating the flower. This phenomenon is called

a. pseudocopulation b. mimicry
c. pseudoparthenocarpy d. pseudopollination **Ans: b**

15. Niche overlap indicates

a. mutualism between two species
b. two different parasites on the same host
c. active cooperation between two species
d. sharing of one or more resources between the two species **Ans: d**

16. Which one of the following pairs is mismatched?

a. Prairie - epiphytes
b. Tundra - permafrost
c. Coniferous forest - evergreen trees
d. Savanna - acacia trees **Ans: a**

17. Cuscuta is an example of

a. predation b. ectoparasitism
c. endoparasitism d. brood parasitism **Ans: b**

18. Which one of the following is not a parasitic adaptation?

a. Loss of digestive organs
b. Loss of unnecessary sense organs

c. Loss of reproductive capacity
d. Development of adhesive organs **Ans: c**

19. Study of inter-relationships between organisms and their environment is
a. phytogeography b. ecology
c. ethology d. ecosystem **Ans: b**

20. River water deposits
a. laterite soi• b. loamy soil
c. sandy soi• d. alluvial soi• **Ans: d**

21. Pedology is science of
a. diseases b. earth
c. pollution d. soi• **Ans: d**

22. Which of the following does not have stomata?
a. xerophytes
b. hydrophytes
c. submerged hydrophytes
d. mesophytes **Ans: c**

23. Pneumatophores are characteristic of plants growing in
a. marshy places and salt lakes
b. saline soils
c. dryland regions
d. sandy soils **Ans: a**

24. More than 70% of world's freshwater is contained in:
a. antarctica b. polar ice
c. greenland d. glaciers and mountains
Ans: b

25. Niche overlap indicates
a. mutualism between two species
b. two different parasites on the same host
c. active cooperation between two species
d. sharing of one or more resources between the two species
Ans: d

Directions: In the following questions, a statement of assertion is followed by a statement of reason.

Mark the correct choice as:

a. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
b. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
c. If Assertion is true but Reason is false.
d. If both Assertion and Reason are false.

16. Assertion : Ecological equivalents possess similar types of adaptations.

Reason : Ecological niche is the total interaction of a species with environment. **Ans: b**

27. Assertion : Heliophytes, generally have low photosynthetic, respiratory and metabolic activities.

Reason : This is an adaptation of heliophytes to high intensity of light. **Ans: d**

28. Assertion : Leaf butterfly and stick insect show mimicry to dodge their enemies.

Reason : Mimicry is a method to acquire body colour blending with the surroundings. **Ans: a**

29. Assertion : No two species can occupy the same ecological niche in a habitat.

Reason: A habitat can contain only on ecological niche. **Ans: c**

30. Assertion: Aerenchyma is present in the leaves and petioles of hydrophytes.

Reason: It imparts buoyancy to the hydrophytes.
Ans: b

Read the following Statements of questions (1) and (2), more than one answer is correct. Select the correct answer according to the codes given below:

Codes

a) i, ii, iii and iv are correct
b) i and iii are correct
c) ii and iii are correct
d) iii and iv are correct

31. Select the correct answer according to the codes given above:

i) Mechanical tissues are well developed in hydrophytes
ii) O. horizon is well developed in forest and may be completely absent in the grass land

iii) Soil air has higher level of oxygen and lower level of carbon di oxide

iv) Biological activity is nil in C. horizon

Ans: c

32. Select the correct answer according to the codes given above:

Anatomical adaptions of xerophytes are

i) Stomata sunken and covered by hair

ii) Stomata absent on functionless

iii) Conducting and mechanical tissues well developed

iv) Aerenchyma is well developed **Ans: b**

33. Rhizobium fixes free N_2 into which form in root nodules?

a) Nitrous b) Nitrates

c) Nitries d) B & C

Ans: c

34.. Which of the following is a partial root parasite?

a) Sandal wood b) Mistle toe

c) *Orobanche* d) *Genoderma*

Ans: c

35. Ecotone is

a) A biome

b) The upper part of a lake

c) A transition zone between two communities

d) A zone of developing community **Ans: c**

36. The study of inter relationship between the species and its environment is

a) Synecology b) Autecology

c) Ecosystem d) Ecology **Ans: b**

37. The study of inter relationship between an entire community and its environment is

a) Synecology b) Autecology

c) Ecosystem d) Ecology **Ans: a**

38. Which of the following forest plant Controls the light condition at the ground

a) Herbs b) Twinners

c) Tall Trees d) Lianas **Ans: c**

39. A Plant with roots in

a) *Wolffia* b) Vallisneria

c) *Hydrilla* d) *Azolla* **Ans: a**

40. Sunken Shaped stomata is found in

a) Helophytes b) Xerophytes

c) Hygrophytes d) Hydrophytes **Ans: b**

41. Scotoactive stomata is the characteristic of

a) Epimerals b) Non. Succulents

c) Succulents d) Hydrophytes **Ans: c**

42. Sub. merged hydrophytes have well developed

a) Vascular system b) Aerenchyma

c) Root system d) Stomatal System

Ans: b

43. *Typha* is an example for

a) Rooted emergent hydrophytes

b) Submerged hydrophytes

c) Free floating hydrophytes

d) Rooted floating hydrophytes **Ans: a**

44. Plants that can tolerate a small range of salinity are

a) Stenoheline b) Euryhaline

c) Stenotherma• d) Eurytherma• **Ans: a**

45. Sun loving Plants are

a) Halophytes b) Sciophytes

c) Heliophytes d) Hygrosphytes **Ans: c**

46. Preumatopores are the features of

a) Xerophytes b) Lithophytes

c) Epiphytes d) Halophytes **Ans: d**

47. Vivipary occurs in

a) Halophytes b) Lithophytes

c) Epiphytes a) Xerophytes **Ans: a**

48. Soil formed from rocky matter is called

a) Paedogenesis b) Pedology

c) Edaphic Factor d) Phytography Factor

Ans: a

49. The best PH of soil for cultivation is

a) 3.4 to 5.4 b) 4.5 to 5.5

c) 5.5 to 6.8 d) 6.5 to 7.5 **Ans c**

50. The animal which captures and feeds on other animals is called a

a) Predator b) Prey
c) Parasite d) Host **Ans a**

51. The interaction between two species with negative influences on both is called

a) Predation b) Parasitism
c) Ammensalism d) Competition **Ans: d**

52. These species are found in the ecotone areas are called

a) Edge effect b) Zonation
c) Pattern d) Frequency **Ans: a**

53. An association of fungus and higher plant root is refer as

a) Amensalism b) Mutualism
c) Parasitism d) Commensalism

Ans: b

54. Insectivorous plants are Present in

a) Rich in water b) Deficient in water
c) Rich is salt water d) Deficient in Nitrogenous Places

Ans: d

55. Mimicry is useful for

a) Pollination b) Protection
c) Predation d) All the above

Ans: d

56. The interdependent evolution of flowering plants and pollinating insects together is called as

a) Mimicry b) Co-operation
c) Proto Co-operation d) Co-evolution

Ans: d

57. One who get food at the coat of others is

a) Parasite b) Predation
c) Symbiosis d) Exploitation **Ans: b**

58. Which one of the following is a not matching pair of certain organism (s) and the kind of association

a) Lianas found in the forest – Commensalism
b) Algae and fungi in Lichen – Mutualism
c) Orchids growing on trees – Parasitism
d) Cuscuta growing on the other plants - Epi parasitism other plants

Ans: c

59. Lichens are well known combination of an algae and fungus, where fungus has a/am

a) Saprophytic relationship with the algae
b) Epiphytic relationship with the algae
c) Parasitic relationship with the algae
d) Symbiotic relationship with the algae **Ans: d**

60. Human is Present in

a) Horizon A b) Horizon B
c) Horizon C d) Horizon O **Ans: a**

61. Poor in humans and rich in minerals in

a) Horizon A b) Horizon B
c) Horizon C d) Horizon O **Ans: b**

62. The size of the clay particle is less than

a) 0.02 mm b) 0.002 mm
c) 0.2 mm d) 2.0 mm **Ans: b**

63. Maximum quantity of humus occurs in

a) Lower most layer of soil
b) Middle layer of soil
c) Upper layer of soil
d) Same every where **Ans: c**

64. Mycorrhiza helps in

a) Nutrition up taking
b) Food manufacturing
c) Disease resistance
d) Disease prevention **Ans: a**

65. Mangrove vegetation is found in

a) Western Ghats b) Kullu Valley
c) Green Valley d) Sundarbans **Ans: d**

66. Sub-merged hydrophytes have commonly dissected leaves for

a) Decreasing surface area
b) Increasing surface area
c) Reducing effect if water currents
d) Increasing Number of Stomata **Ans: c**

67. Halophytes are organism which are

a) Fire resistant b) Cold resistant
c) Salt resistant d) Sand-loving **Ans: c**

68. The environment of any community is called

a) Ecotope b) Biotope
c) Ecotope d) Epitope **Ans: b**

69. The Wave length of spectrum is less strongly absorbed by plants is

a) 400 nm - 700 nm b) 400 nm - 500 nm
c) 500 nm - 600 nm d) 600 nm - 700 nm

Ans: c

70. In Thermal springs and deep sea hydrothermal vents where average temperature exceed

a) 60ºC b) 70ºC c) 90ºC d) 100ºC

Ans: d

71. *Zostera* is a marine angiosperms is an example of

a) Eurythermal b) Euryhaline
c) Stenothermal d) Stenohaline **Ans: a**

72. The altitudinal limit of normal tree growth is about

a) 1000 – 2000 M b) 2000 – 3000 M
c) 3000 – 4000 M d) 4000 – 5000 M

Ans: c

73. The instrument used to measure the speed of wind

a) Hydrometer b) Anemometer
c) Lactometer d) Barometer **Ans: b**

74. The plants which are living in rocky crevices are

a) Litho phytes b) Chasmo phytes
c) Cryo phytes d) Calci phytes

Ans: b

75. The plants which are living in sandy soils are

a) Halo phytes b) Oxylo phytes
c) Prammo phytes d) Litho phytes

Ans: c

76. Height above the sea level forms the

a) Altitude
b) Latitudes
c) Both altitude and Latitudes
d) None of this **Ans: a**

77. Read the statements carefully and choose the correct statement given in the following codes.

i) *Anabaena* is a cyanobacterium it fixed the Nitrogen
ii) Cyanobacterium *Nostoc* found in the thallus of *Authoceros*
iii) *Paperomia* is the example for parasitic association
iv) *Calotropis* Produce thorns to protect them from Predations

Codes

a) i and ii only correct b) ii and iii only correct
c) iii and iv only correct d) all are correct

Ans: a

78. i. *Balanophona, Refflesia* and *Orobanche* are total root Parasites

ii. *Viscum* and *Loranthus* are Partial stem Partial Stem Parasite

iii. Santalum is a Partial root Parasite

iv. *Cuscutta* is a total Parasite

Codes

a) i, ii and iii only correct
b) ii, iii and iv only correct
c) All Statements are wrong
d) All Statements are correct **Ans: d**

79. Antibiosis is also called

a) Commensalism b) Mutualism
c) Amensalism d) Parasitism **Ans: c**

80. The binomial Name of Camel's foot climber is

a) *Barehinia Vahlii* *b) Heritiera littoralis*
c) Gyrocarpus sp. *d) Andropogon sp.*

Ans: a

81. World environment day is celebrated on

a) March 21 b) May 22

c) June 05 d) September 16

Ans: c

82. The terms Niche was coined by

a) Roswell Hill Johnson b) Grinel

c) Ernest Haecke• d) Reiter **Ans:**

PART – B

ADDITIONAL QUESTIONS (2 MARKS)

1. Write the meaning of two greek words of ecology

The term "ecology" (**oekologie**. is derived from two Greek words

Oikos meaning house or dwelling place and **logos** meaning study.

2. Who proposed the term ecology ?

The term ecology was first proposed by **Reiter** (1868).

3. Who given the most widely accepted definition of ecology ?

Ernest Haeckel (1869).

4. Who is the father of ecology ?

Alexander von Humbolt is the father of Ecology

5. Who is the father of modern ecology ?

Eugene P. Odum is the father of modern Ecology

6. Who is the father of Indian ecology?

R.Misra - Father of Indian ecology

7. Write the definition of ecology which is given by Reiter

"The study of living organisms, both plants and animals, in their natural habitats or homes."

8. Write the definition of ecology which is given by Earnest haeckel

"Ecology is the study of the reciprocal relationship between living organisms and their environment."

9. What is an ecological hierarchy? What is their other name ?

The interaction of organisms with their environment results in the establishment of grouping of organisms which is called **ecological hierarchy** It is also called ecological levels of organization.

10. What is the basic unit of ecological hierarchy ?

The basic unit of ecological hierarchy is an individual organism.

Individual organism → Population → Community → Ecosystem → Landscape → Biome → Biosphere

11. Illustrated the different hierarchy of ecological systems.

12. Name the two main branches of ecology

The two main branches of ecology are autecology and synecology.

13. Define autecology. What is their other name ?

The ecology of an individual species is called autecology. The other name is species ecology.

14. Define synecology. What is their other name ?

The ecology of a population or community with one or more species are called **synecology.**

The other name is community ecology.

15. Write some of the advances and developments in the field ecology.

Some of the advanced fields are Molecular ecology, Eco technology, Statistical ecology and Environmental toxicology.

16. Define habitat

A specific physical place or locality occupied by an organism or any species which has a particular combination of abiotic or environmental factors are called habitat.

17. What is biotope ?

The environment of any community is called **Biotope**.

18. Define ecological niche

An organism's place in the biotic environment and its functional role in an ecosystem are called ecological niche.

19. Who coined the term niche. Who first to use this term?

The term was coined by the naturalist Roswell Hill Johnson.

Grinell (1917. was first to use this term.

20. What is an Ecotope ?

The habitat and niche of any organism is called **Ecotope**

21. What is applied ecology or environmental technology ?

Application of the Science of ecology is otherwise called as Applied ecology or Environmental technology.

22. What are the components present in the environment ?

The environment contains physical, chemical and biological components.

23. Define environmental factors or ecological factors.

A component surrounding an organism affects the life of an organism is called factor.

All the factors together are called environmental factors or ecological factors.

24. Name the two types of factors.

Factors are two types. They are 1. Living (biotic. factors 2.Non-living (abiotic. factors.

25. Write the four classes the ecological factors.

1. Climatic factors
2. Edaphic factors
3. Topographic factors
4. Biotic factors

26. Write the diurnal rhythm of flowering

Flowers of poppy, chicory, dog rose and many other plants, blossom before the break of dawn (4 – 5 am), evening primrose open up with the onset of dusk (5 – 6 pm. due to diurnal rhythm.

27. Name the different climatic factors

The climatic factors are light, temperature, water, wind and fire.

28. Differentiate heliophytes and sciophytes

Heliophytes	Sciophytes
Light loving plants	Shade loving plants
Example: Angiosperms	Example: Bryophytes and Pteridophytes

29. Mango plant donot and cannot grow in temperate countries like Canada and Germany-Why ?

Mango plant adopted only to tropical weather In countries like Canada and Germany are temperate weather.so Mango plant donot and cannot grow in that region.

30. What is Latitude?

An angle which ranges from 0_0 at the equator to 90_0 at the poles are called latitude.

31. What is an altitude of the place?

How high a place is located above the sea level is called the altitude of the place.

32. What is evergreen forests ?

The forest found where heavy rainfall occurs throughout the year is called evergreen forests.

33. What is sclerophyllous forests ?

The forest found where heavy rainfall occurs during winter and low rainfall during summer is called sclerophyllous forests.

34. What are lagoons ?

The aquatic area contains more than 100% in hypersaline water is called **Lagoons**.

35. What is aerosols ?

The small solids or liquid particles in suspension in the atmosphereis called aerosols

36. Which of the compounds are responsible for acid rain ? Write their effects

The sulphur compounds are responsible for acid rain due to acidification of rain water. It destroy the ozone.

37. Name some of the gases let out to atmosphere is play an important role in disturbing the temperature level of any region.

Emission of dust and aerosols from industries, automobiles, forest fire, So_2 and DMS (dimethyl sulphur. play an important role in disturbing the temperature level of any region.

38. What is pyrophilous? Give an example

Some of the fungi which grow in soil of burnt areas are called pyrophilous.

Example: *Pyronema confluens*.

39. Which of the plants are called indicators of fire?

Pteris (fern. and *Pyronema* (fungus. indicates the burnt up and fire disturbed areas.

So they are called indicators of fire.

40. What is fire break ? Write their use

Fire break is a gap made in the vegetation.

It acts as a barrier to slow down or stop the progress of fire.

41. Name the natural fire break

Naturally a gap made in the vegetation is called natural fire break. The natural fire break such as River, lake and canyon

42. Define rhytidome.

The outer bark of trees which extends to the last formed periderm is called Rhytidome.

43. What is an edaphic factors ?

The abiotic factors related to soil, include the physical and chemical composition of the soil formed in a particular area are called edaphic factors.

44. What is pedology ?

The study of soils is called **Pedology.**

45. What is the best pH range of the soil for cultivation of crop plants?

The best pH range of the soil for cultivation of crop plants is **5.5 to 6.8.**

46. Classify four types of soil based on the relative proportion of soil particles.

Based on the relative proportion of soil particles there are four types of soil. They are

1.Clayey soil 2.Silt soil 3.Loamy soil 4.Sandy soil

47. What are halophytes ?

Plants which are living in saline soils are called halophytes.

48. What are psammophytes ?

Plants which are living in sandy soils are called **psammophytes**

49. What are lithophytes ?

Plants which are living on rocky surface are called **lithophytes**

50. What are chasmophytes ?

Plants which are living in rocky crevices are called **chasmophytes**

51. What are cryptophytes ?

Plants which are living below the soil surface are called **cryptophytes**

52. What are cryophytes ?

Plants which are living in ice surface are called **cryophytes**

53. What are oxylophytes ?

Plants which are living in acidic soil are called oxylophytes

54. What are calciphytes ?

Plants which are living in calcium rich alkaline soil are called **calciphytes**.

55. Define hollard

Total soil water content is called **hollard**

56. Define chresard

Water available to plants are called **chresard**

57. Define echard

Water not available to plants are called **echard**

58. Define topography

The surface features of earth are called **topography**.

59. What is an ecotone? Give an example.

The transition zone between two ecosystems. Example: The border between forest and grassland.

60. Define biotic factors.

The interactions among living organisms such as plants and animals are called biotic factors.

It may cause marked effects upon vegetation.

61. Describe positive interactions with examples.

One or both the participating species are benefited, it is positive interaction.

Examples; Mutualism and Commensalism.

62. Define mutualism with exampes.

It is an interaction between two species of organisms in which both are benefitted from the obligate association are called mutualism. Example: Rhizobium, Lichen and mycorrhiza.

63. Defind haustorial roots

The parasitic plants produce root like structure inside the host plant are called **haustorial roots.**

It absorbs nutrients from the vascular tissues of host plants.

64. Describe Soil formation

Soil originates from rocks and develops gradually at different rates, depending upon the ecological and climatic conditions. Soil formation is initiated by the weathering process.

65. Which one of the most important form water is available to the plants ? Define this water.

Capillary water is the most important form of water available to the plants.

The water held between pore spaces of soil particles and angles between them are called capillary water.

66. Describe velamen tissue.

The special type of spongy tissue which is present in the hygroscopic roots of epiphytes are called Velamen.

It gets nutrients and water from the atmosphere.

67. Describe proto cooperation with an example.

An interaction between organisms of different species in which both organisms benefit but neither is dependent on the relationship. Example: Soil bacteria / fungi and plants growing in the soil.

68. Describe negative interactions

One of the interacting species is benefitted and the other is harmed, it is called **negative interaction**.

Examples: predation, parasitism, competition and amensalism

69. Define adaptations.

The modfications in the structure of organisms to survive successfully in an environment are called **adaptations** of organisms.

70. Which of the plant seed showing highest longevity in plant kingdom ?

Lotus seeds showing highest longevity in plant kingdom.

71. What are hydrophytes ?

The plants which are living in water or wet places are called hydrophytes.

72. Define hygrophytes

The plants which can grow in moist damp and shady places are called hygrophytes.

Examples: *Habenaria* (Orchid), Mosses (Bryophytes), etc.

73. Write the physiological adaptations of Hydrophytes

Hydrophytes have the ability to withstand anaerobic conditions.

They possess special aerating organs.

74. Define xerophytes

The plants which are living in dry or xeric condition are known as **Xerophytes**.

75. Define trichophyllous plants and give an example.

In Xerophytic plants with the leaves and stem are covered with hairs are called **trichophyllous plants.**

Example: *Cucurbits* (*Melothria and Mukia*)

76. Define phylloclades and give an example.

All the internodes in the stem are modified into a fleshy leaf structure called phylloclades.

Example : *Opuntia*.

77. Define cladode and give an example.

The single or occasionally two internodes modified into fleshy green structure called cladode.

Example : *Asparagus*.

78. Define phyllode and give an example.

In some the petiole is modified into a fleshy leaf like structure called phyllode.

Example :*Acacia melanoxylon*.

79. Write the physiological adaptations of xerophytes

Most of the physiological processes are designed to reduce transpiration.

Life cycle is completed within a short period (Ephemerals).

80. Describe the mesophytes.

The plants which are living in moderate conditions (neither too wet nor too dry. are known as **mesophytes**.

These are common land plants. Example: Maize and *Hibiscus.*

81. Classify the xerophytes based on their adaptive characters.

Xerophytes are classified into three categories.

They are Ephemerals, Succulents and Non succulent plants.

82. Write the physiological adaptations of mesophytes.

All physiological processes are normal.

Temporary wilting takes place at room temperature when there is water scarcity.

83. What is meant by tropophytes ?

The plants which behave as xerophytes at summer and behave as mesophytes (or. hydrophytes during rainy season are called tropophytes.

84. Write the physiological adaptations of epiphytes.

Special absorption processes of water by velamen tissue.

85. What are halophytes ? Give examples.

The plants which grow on the soils with high concentration of salts are called **halophytes**.

Examples: *Rhizophora, Sonneratia* and *Avicennia*.

86. Define pneumatophores.

A special type of negatively geotropic roots present in halophytes are called pneumatophores.

87. What is meant by pneumathodes ? Write their use.

The pneumatophores of halophytes contains small openings called **pneumathodes.**

This get sufficient aeration to halophytes

88. Define mangrove forest and mangroves.

The halophytic vegetation is known as mangrove forest.

The plants in mangrove forest are called mangroves.

89. Give physiological adaptations of halophytes

High osmotic pressure exists in some plants.

Seeds germinate in the fruits of mother plant itself (**Vivipary).**

90. Muthupet, Thiruvarur district was less damaged by Gaja cyclone - Why ?

Muthupet, Thiruvarur district was less damaged by Gaja cyclone November 2018 due to the presence of mangrove forest.

91. Define seed and fruit dispersal.

The dissemination of seeds and fruits to various distances from the parent plant is called seed and fruit dispersal.

92. Write the mechanism found in the wind dispersal plants.

Minute seeds, wings ,feathery appendages and censor mechanisms are the mechanism found in the wind dispersal plants

93. What is an anemochory ? In which plants its common.

The dispersal fruit or seed by wind is called anemochory. It is quite common in tall trees.

94. Guess!! Who am I.....? I am dispersed by ant and I have caruncle.

Caruncle is a structure present in the micropylar region of euphorbiaceae seeds. This structure has the ecological function of promoting seed dispersal by ants.

95. What is hydrochory ? In which plants its common.

The dispersal fruit or seed by water is called anemochory. Usually occurs in or near water bodies

96. What is hydrochory ?

The dispersal fruit or seed by birds and mammals, including human beings are called anemochory.

97. What is Autochory ?

Some fruits burst suddenly with a force enabling to throw seeds to a little distance away from the plant.

This type of dispersal is called autochory.

98. Name the devices found in zoochory

Hooked fruit ,sticky fruits and seeds and fleshy fruits are devices found in zoochory

99. what is atelochory or Achory?

It is the avoidance of dispersal. It is also called Achory.

100. Define phytophagous

The insects feeds on plant sap and other parts of plant are known as phytophagous.

Nearly 25 percent of all insects are known as phytophagous.

PART – C

ADDITIONAL QUESTIONS (3 MARKS)

1. What is the use of applied ecology or environmental technology ?

- Applied ecology or environmental technology helps us to manage and conserve natural resources, particularly ecosystems, forest and wild life conservative and management.

2. Name the different types of environmental management and write their use.

- Environmental management involves Bio-diversity conservation, Ecosystem restoration, Habitat management, Invasive species management, Protected areas management.
- It help us plan landscapes and environmental impact designing for the futuristic ecology.

3. What is palaeoclimatology? Give an example.

- Palaeoclimatology is helps to reconstruct past climates of our planet and flora, fauna and ecosystem in which they lived.
- Example: Air bubbles trapped in ice for tens of thousands of years with fossilized pollen, coral, plant and animal debris.

4. Describe the three limits of temperature.

The three limits of temperature are

1. **Minimum temperature** - Physiological activities are lowest.
2. **Optimum temperature** - Physiological activities are maximum.
3. **Maximum temperature** - Physiological activities will stop.

5. Differentiate euryhaline and stenohaline

Euryhaline	Stenohaline
Organisms which can live in water with wide range of salinity	Organisms which can withstand only small range of salinity
Examples: Marine algae and marina angiosperms	Example: Plants of estuaries

6. Differentiate eurythermal and stenothermal

Eurythermal	Stenothermal
Organisms which can tolerate a wide range of temperature fluctuations	Organisms which can tolerate only small range of temperature variations
Example: *Zostera* (A marine Angiosperm and *Artemisia tridentata*.	Example: Mango and Palm (Terrestrial Angiosperms).

7. Descibe timber line / Tree line.

- Timber line is an imaginary line in a mountain.
- It marks the level above the trees do not grow.
- The altitudinal limit of normal tree growth is about **3000** to **4000m.**

8. Write the total amount of water salinity in different water bodies.

The total amount of water salinity in different water bodies are

- 5% in inland water (Fresh water.
- 30 – 35% in sea water and
- More than 100% in hypersaline water **(Lagoons.)**

9. Write two examples of tolerance to toxicity

i. Soyabean and tomato manage to tolerate presence of cadmium poisoning by isolating cadmium and storing into few group of cells and prevent cadmium affecting other cells.

ii. Rice and *Eichhornia* (water hyacinth. tolerate cadmium by binding it to their proteins.

10. Identify A,B,and C in the given table.

Terminology		Environmental factor
Small range	**Wide range**	
Stenothermal	Eurythermal	Temperature
Stenohaline	**A**	Salinity
Stenoecious	Euryoecious	Habitat selection (niche)
Stenohydric	Euryhydric	
Stenophagic	Euryphagic	**B**
C	Eurybathic	Food
		Depth of water / habitat

A. Euryhaline

b. Water

c. Stenobathic

11. Describe about fire

- Fire is an exothermic factor.
- It is caused due to the chemical process of combustion, releasing heat and light.
- It is mostly man-made and some-times develops naturally due to the friction between the tree surfaces.

12. Classify and describe the different types of fire.

Fire is generally divided into

1. Ground fire – Which is flameless and subterranean.
2. Surface fire – Which consumes the herbs and shrubs.
3. Crown fire – Which burns the forest canopy.

13. What is soil ? Write their constituents

- Soil is the weathered superficial layer of the earth in which plants can grow.
- It is a complex composite mass.
- It constituents soil water, soil air and soil organisms, etc.

14. Classify the soil based on pedogenesis and describe.

Based on **pedogenesis** ,the soils are two types. They are

1. Residual soils :These are soils formed by weathering and pedogenesis of the rock.
2. Transported soils: These are transported by various agencies.

15. Which of the soil solution determines the availability of plant nutrients. Describe

- pH value of the soil solution determines the availability of plant nutrients.
- Soil may be acidic or alkaline or neutral in their reaction.
- The best pH range of the soil for cultivation of crop plants is **5.5 to 6.8.**

16. Describe soil profile

- Soil is commonly stratified into horizons at different depth.
- These layers differ in their physical, chemical and biological properties.
- This succession of super-imposed horizons is called soil profile.

17. Loamy soil is ideal soil for cultivation-Justify your answer.

- Loamy soil consists of 70% sand and 30% clay or silt or both.
- It ensures good retention and proper drainage of water.
- The porosity of soil provides adequate aeration and allows the penetration of roots.
- So only loamy soil is ideal soil for cultivation

18. Describe direction of mountain

- North and south faces of mountain or hill possess different types of flora and fauna because they differ in their humidity, rainfall, light intensity, light duration and temperature regions.
- The two faces of the mountain or hill receive different amount of solar radiation, wind action and rain.
- Of these two faces, the windward region possesses good vegetation due to heavy rains and the leeward region possesses poor vegetation due to rain shadows (rain deficit).

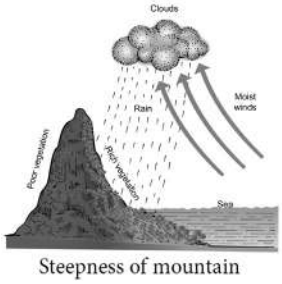
19. The soil of aquatic bodies different parts of the same area may possess different species of organisms.Why?

- In the soil of aquatic bodies like ponds the center and edge possess different depth of water due to soil slope and different wave actions in the water body.
- Therefore, different parts of the same area may possess different species of organisms.

20. Describe an edge effect

- Those species are found in the ecotone areas are due to the effect of environment of the two habitats.
- This is called edge effect.
- Example: Owl in the ecotone area between forest and grassland.

21. Steepness of the mountain



Steepness of mountain

- The steepness of the mountain or hill allows the rain to run off.
- As a result the loss of water causes water deficit and quick erosion of the top soil.
- So it resulting in **poor vegetation**.
- On the other hand, the plains and valley are rich in vegetation.
- It is due to the slow drain of surface water and better retention of water in the soil.

22.Nitrogen fixation is a symbiotic interaction. Explain your answer with suitable example.

- Rhizobium (Bacterium. forms nodules in the roots of leguminous plants and lives symbiotically.
- The *Rhizobium* obtains food from leguminous plant and in turn fixes atmospheric nitrogen into nitrate, making it available to host plants.

23. What are epiphytes.Give examples.

- The plants which are found growing on other plants without harming them are called epiphytes.
- Example:Many orchids, ferns, lianas ,hanging mosses etc.

24. Describe predation

- It is an interaction between two species, one of which captures, kills and eats up the other.
- The species which kills is called a predator.
- The species which is killed is called a **prey**.
- The predator is benefitted while the prey is harmed.

25. What is meant by an insectivorous plants

- Some of the plants which consume insects and other small animals for their food as a source of nitrogen.
- These plants are called as **insectivorous plants**.
- Example: *Drosera. Nepenthes, Diaonaea, Utricularia* and *Sarracenia*

26.Write the common names of the following.

a. Drosera b. Nepenthes

c. Diaonaea d. Utricularia

a. Drosera - Sun dew Plant

b. Nepenthes - Pitcher Plant

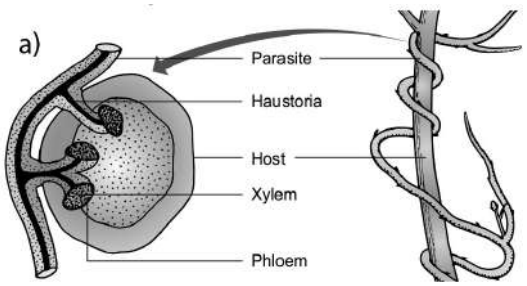
c. Diaonaea - Venus fly trap

d. Utricularia - Bladder wort.

27. Many defense mechanisms are evolved to avoid their predations by plants. Give some examples.

- *Calotropis* produces highly poisonous cardiac glycosides,
- Tobacco produces nicotine,
- Coffee plants produce caffeine,
- *Cinchona* plant produces quinine.
- Thorns of *Bougainvillea*, spines of *Opuntia*, and
- latex of cacti are the many defense mechanisms are evolved by plants.

28. Describe holoparasites / total parasites. Give examples for total stem parasites and total root parasites.



Holoparasites - *Cuscuta*

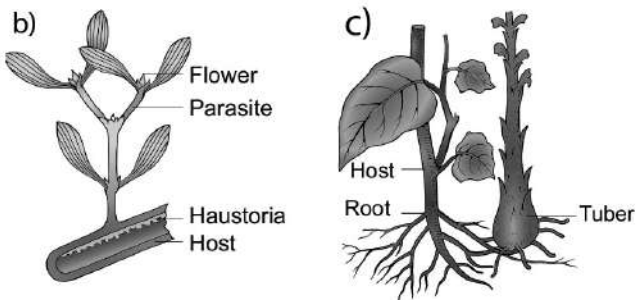
- The organisms which are dependent upon the host plants for their entire nutrition are called Holoparasites. They are also called total parasites.

Examples:

- *Cuscuta* is a total stem parasite of the host plant *Acacia*, *Duranta.*
- *Balanophora, orobanche* and *Refflesia* are the total root parasites on higher plants.

29. Describe hemiparasites/partial parasites.Give examples for partial stem parasites and partial root parasites.

- The organisms which derive only water and minerals from their host plant.
- The organisms synthesizing their own food by photosynthesis are called Hemiparasites.
- They are also called partial parasites.



b) A Partial stem parasite - Viscum

c) Root parasite on the brinjal root Orobanche spp.

Examples:

- *Viscum* and *Loranthus* are partial stem parasites.
- *Santalum* (Sandal Wood. is a partial root parasite.

30. Interspecific competition the different species of grass lands migrate to new areas-discuss

- In grassland, there is little competition when enough nutrients and water is available.
- During drought shortage of water occurs.
- A life and death competition starts among the different species of grass lands.
- Survival in both these competitions is determined by the quantity of nutrients, availability of water.
- So species migration to new areas.

31. What is meant by mimicry ?Give examples.

- The living organism modifies its form, appearance, structure or behavior and looks like another living organism are called mimicry.

Example:

- *Ophrys* an orchid. It is called 'floral mimicry.
- *Carausium morosus* – stick insect or walking stick. It is a protective mimicry.
- *Phyllium frondosum* – leaf insect, another example of protective mimicry.

32. Write the types of hydrophytes.

i. Free floating hydrophytes,
ii. Rooted- floating hydrophytes,
iii. Submerged floating hydrophytes,
iv. Rooted -submerged hydrophytes,
v. Amphibious hydrophytes.

33. What is heterophylly?

- In emergent forms, two types of the leaves are present in same plant.
- The submerged leaves are dissected and aerial leaves are entire.
- This is called heterophylly.
- Example: *Ranunculus, Limnophila heterophylla* and *Sagittaria*

34. Describe kairomone

- Kairomone released from Pieris rapae caterpillar exposed to wild Radish gets the capacity to transmit defence induced by predator to progeny of wild radish.
- Transmission capacity of defence induced by predator to progeny of wild radish.

35. Write the morphological adaptations of mesophytes.

- Root system is well developed with root caps and root hairs
- Stems are generally aerial, stout and highly branched.
- Leaves are generally large, broad, thin with different shapes.

36. Write the anatomical adaptations of mesophytes.

- Cuticle in aerial parts are moderately developed.
- Epidermis is well developed and stomata are generally present on both the epidermis.
- Mesophyll is well differentiated into palisade and spongy parenchyma.
- Vascular and mechanical tissues are fairly developed and well differentiated.

37. Describe epiphytes

- Epiphytes are plants which grow perched on other plants (Supporting plants).
- They use the supporting plants only as shelter and not for water or food supply.
- These epiphytes are commonly seen in tropical rain forests.
- Examples: Orchids, Lianas, Hanging Mosses and Money plant.

38. Describe two different types xerophytic habitat.

Xerophytic habitat can be of two different types. They are:

a. Physical dryness: In these habitats, soil has a little amount of water due to the inability of the soil to hold water because of low rainfall. Example: Xerophytes.
b. Physiological dryness: In these habitats, water is sufficiently present but plants are unable to absorb it because of the absence of capillary spaces.

Example: Plants in salty and acidic soil.

39. Describe two types of roots in epiphytic plant.

- Epiphytic plant roots are two types.
- They are Clinging roots and Aerial roots.
- **Clinging roots** fix the epiphytes firmly on the surface of the supporting objects.
- **Aerial roots** are green coloured roots which may hang downwardly.
- It absorbs moisture from the atmosphere with the help of a spongy tissue called **velamen**.

40. Give any three anatomical adaptations of epiphytes.

- Multilayered epidermis is present.
- Inner to the velamen tissue, the peculiar exodermis layer is present.
- Presence of thick cuticle and sunken stomata greatly reduces transpiration.
- Succulent epiphytes contain well developed parenchymatous cells to store water.

41. Describe halophytes.give examples

- Halophytes are usually found near the sea-shores and Estuaries.
- The soils are physically wet but physiologically dry.
- As plants cannot use salt water directly they require filtration of salt using physiological processes.
- This vegetation is also known as mangrove forest and the plants are called mangroves.

42. Describe breathing roots

- A special type of negatively geotropic roots present in halophytes are called pneumatophores.
- pneumatophores contains small openings called pneumathodes.
- This get sufficient aeration to halophytes.So they are called breathing roots.
- Example: *Avicennia*

43. Write the anatomical adaptations of halophytes

- Epidermal cells of stem is heavy cutinized, almost squarish and are filled with oil and tannins.
- **'Star' shaped** sclereids and **'H' shaped** heavy thickened spicules present in the cortex of stem.
- They provide mechanical strength to cortex.
- The leaves may be dorsiventral or isobilateral with **salt secreting glands**.

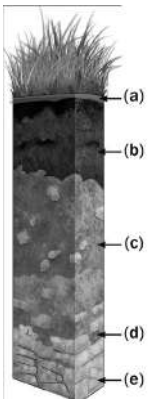
Diagram based questions

44. i. Name the following diagram

ii. Rearrange the given horizons and correctly match with a,b,c,d and e.

Accumilation horizon, Leached horizon, Organic horizon, parent material, Partially weathered horizon,

iii. Describe c.



i. Soil Profile

ii.

a. Organic horizon

b. Leached horizon

c. Accumilation horizon

d. Partially weathered horizon

e. parent material

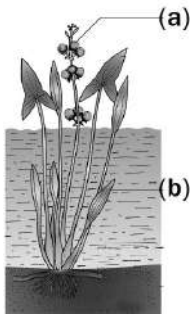
iii. It is a B horizon (Accumilation horizon). It consists of iron, aluminium and silica rich clay organic compounds.

45. Observe carefully the given diagram.

i. Identify the plant

ii. Label the parts a and b.

iii. Name this condition



i. It is a Rooted emergent hydrophyte.

The plant name is *Sagittaria*

ii. a. Aerial leaves

b. Submerged leaves

iii. Submerged leaves are dissected and aerial leaves are entire. This condition is called **heterophylly**

46. Observe carefully the given diagram. i. Identify the plant ii. Label the parts a and b. iii. Explain b

i. It is an epiphytic plant-*Vanda*

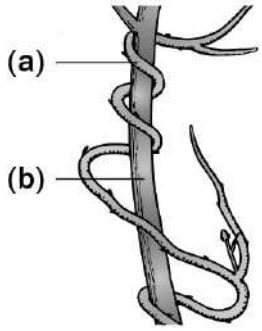
ii. a. Clinging root

b. Arial absorping root

iii. Aerial absorping roots are green coloured roots.

It may hang downwardly and absorb moisture from the atmosphere with the help of a spongy tissue called **velamen**.

47. Observe carefully the given diagram. i. Identify the plant ii. Label the parts a and b.

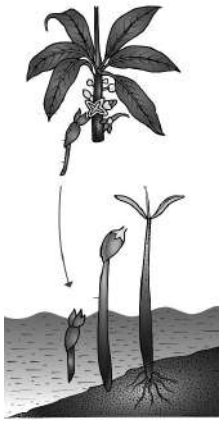


i. It is a holoparasite – *Cuscuta*

ii. a. Parasite

b. Host

48. Observe carefully the given diagram and identify the processes and define.



It is a vivipary germination of halophytes.

Seeds germinate in the fruits of mother plant itself is processes are called vivipary germination

49. Observe carefully the given diagram and identify the processes.

It is a *Carausium morosus* – stick insect or walking stick.

It is a protective mimicry.

It is a Mimicry

50. Observe carefully the given diagram. i) Identify the plant ii) Write the devices present for dispersal

i. The plant name is Gyrocarpus

ii. The devices present for dispersal is whole fruits are flattened to form a wing.

PART – D

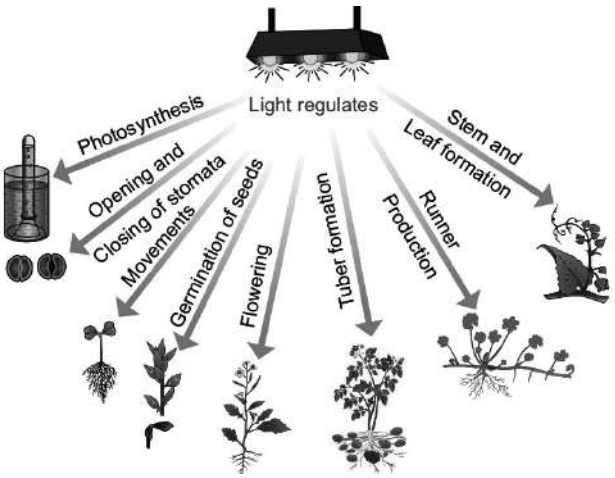
ADDITIONAL QUESTIONS (5 MARKS)

1. Describe the climatic factor light.

- Light is a well-known factor.
- It needed for photosynthesis, transpiration, seed germination and flowering.
- The portion of the sunlight which can be resolved by the human eye is called visible light.
- The visible part of light is made-up of wavelength from about 400 nm (**violet**. to 700 nm (**red**).

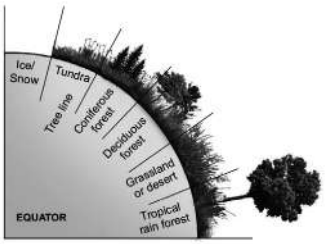
- The rate of photosynthesis is maximum at **blue** (400 – 500 nm. and **red** (600 – 700 nm).
- The **green** (500 – 600 nm. wave length of spectrum is less strongly absorbed by plants.

2. The diagrammatic representation of the effects of light on plants

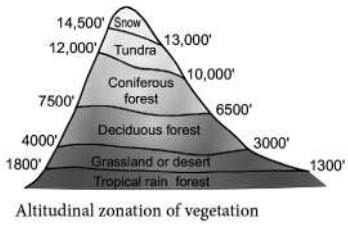


3. Describe the temperature based zonation with illustrations.

- Variations in **latitude** and **altitude** do affect the temperature and the vegetation on the earth surface. The latitudinal and altitudinal zonation of vegetation is illustrated below:



Latitudinal zonation of vegetation type



Altitudinal zonation of vegetation

4. Numerate the physiological processes are influenced by temperature.

The following physiological processes are influenced by temperature:

- It affects the enzymatic action of all the bio-chemical reactions in a plant body.
- It influences CO_2 and O_2 solubility in the biological systems.
- It increases respiration and stimulates growth of seedlings.
- Low temperature with high humidity can spread diseases to plants.
- The varying temperature with moisture determines the distribution of the vegetation types

5. Describe the climatic factor water.

- Water is one of the most important climatic factors.
- It affects the vital processes of all living organisms.
- It is believed that even life had originated only in water during the evolution of Earth.
- Water covers more than 70% of the earth's surface.
- In nature, water is available to plants in three ways.
- They are atmospheric moisture, precipitation and soil water.

6. Describe the climatic factor wind.

- Air in motion is called wind.
- It is also a vital ecological factor.
- The atmospheric air contains a number of gases, particles and other constituents.
- The composition of gases in atmosphere are Nitrogen -78% , Oxygen -21%, Carbon-di-oxide -0.03%, Argon and other gases - 0.93%.
- The other components of wind are water vapour, gaseous pollutants, dust, smoke particles, microorganisms, pollen grains, spores, etc.
- Anemometer is the instrument used to measure the speed of wind.

7. Explain the effects of wind

- Wind is an important factor for the formation of rain
- Causes wave formation in lakes and ocean, which promotes aeration of water
- Strong wind causes soil erosion and reduces soil fertility
- Increases the rate of transpiration

- Helps in pollination in anemophilous plants
- It also helps in dispersal of many fruits, seeds, spores, etc.
- Strong wind may cause up-rooting of big trees
- Unidirectional wind stimulates the development of **flag forms** in trees.

8. Explain the important edaphic factors which affect vegetation

The important edaphic factors which affect vegetation are as follows:

1. Soil moisture:

Plants absorbs rain water and moisture directly from the air

2. Soil water:

Soil water is more important than any other ecological factors affecting the distribution of plants. Rain is the main source of soil water. Capillary water held between pore spaces of soil particles and angles between them is the most important form of water available to the plants.

3. Soil reactions:

Soil may be **acidic** or **alkaline** or **neutral** in their reaction.

pH value of the soil solution determines the availability of plant nutrients.

The best pH range of the soil for cultivation of crop plants is **5.5 to 6.8.**

4. Soil nutrients:

Soil fertility and productivity is the ability of soil to provide all essential plant nutrients such as minerals and organic nutrients in the form of ions.

5. Soil temperature:

Soil temperature of an area plays an important role in determining the geographical distribution of plants. Low temperature reduces use of water and solute absorption by roots.

6. Soil atmosphere:

The spaces left between soil particles are called pore spaces which contains oxygen and carbon-di-oxide.

7. Soil organisms:

Many organisms existing in the soil like bacteria, fungi, algae, protozoans, nematodes, insects, earthworms, etc. are called soil organisms.

9. Tabulate the four types of soil types and write their size and relative proportion.

	Soil type	Size	Relative proportion
1	Clayey soil	Less than 0.002 mm	50% clay and 50% silt (cold / heavy soil)
2	Silt soil	0.002 to 0.02mm	90% silt and 10% sand
3	Loamy soil	0.002 to 2mm	70% sand and 30 % clay / silt or both (Garden soil)
4	Sandy soil	0.2 to 2 mm	85% sand and 15% clay (light soil)

10. Describe topographic factors

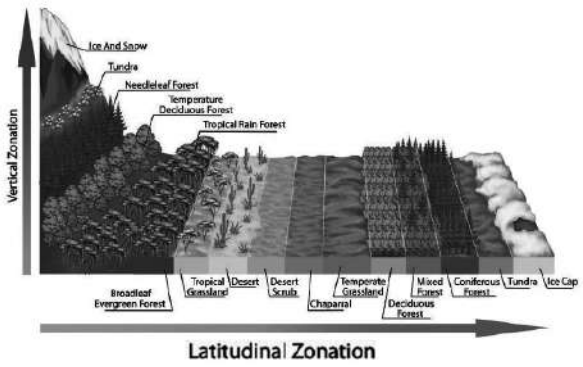
- The surface features of earth are called **topography**
- Topographic influence on the climate of any area is determined by the interaction of solar radiation, temperature, humidity, rainfall, latitude and altitude.
- It affects the vegetation through climatic variations in small areas (micro climate. and even changes the soil conditions.
- Topographic factors include latitude, altitude, direction of mountain, steepness of mountain etc.

11. Describe latitudes and altitudes Latitudes

- Latitudes represent distance from the equator.
- Temperature values are maximum at the equator and decrease gradually towards poles.
- Different types of vegetation occur from equator to poles which are illustrated below.

Altitudes

- Height above the sea level forms the **altitude**.
- At high altitudes, the velocity of wind remains high, temperature and air pressure decrease while humidity and intensity of light increases.
- Due to these factors, vegetation at different altitudes varies, showing distinct zonation.



12. Define mutualism with exampes.

It is an interaction between two species of organisms in which both are benefitted from the obligate association.

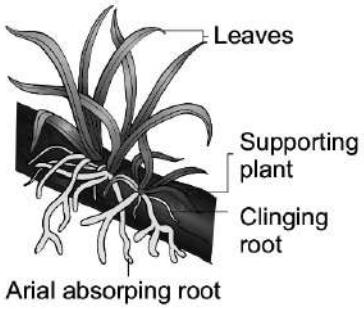
- Rhizobium (Bacterium. forms nodules in the roots of leguminous plants.
- Water fern (*Azolla*. and Nitrogen fixing Cyanobacterium *(Anabaena*).
- *Anabaena* present in coralloid roots of *Cycas*. (Gymnosperm)
- Cyanobacterium (*Nostoc*. found in the thalloid body of *Anthoceros.*(Bryophytes)
- Wasps present in fruits of fig.
- Lichen is a mutual association of an **alga** and **a fungus**.
- Roots of terrestrial plants and fungal hyphae- **Mycorrhiza**

13. Describe commensalism with examples.

- An interaction between two organisms in which one is benefitted and the other is neither benefitted nor harmed are called Commensalism.
- The species that derives benefit is called the **commensal,** while the other species is called the **host**.
- The common examples of commensalism are listed below
- Many orchids, ferns, lianas, hanging mosses, *Peperomia*, money plant and *Usnea* (Lichen. are some of the examples of epiphytes.
- Spanish Moss –*Tillandsia* grows on the bark of Oak and Pine trees.

14. Describe an epiphytes

- The plants which are found growing on other plants without harming them are called epiphytes.
- They are commonly found in tropical rain forest.
- The epiphytic higher plant (Orchids. gets its nutrients and water from the atmosphere with the help of their hygroscopic roots which contain special type of spongy tissue called Velamen.
- So it prepares its own food and does not depend on the host.
- They use the host plant only for support and does not harm it in any way.



Arial absorping root

15. Explain competition. write their types.

- Competition is an interaction between two organisms or species in which both the organisms or species are harmed.
- Competition is classified into intraspecific and interspecific.

Intraspecific competition:

- It is an interaction between individuals of the same species.
- This competition is very severe because all the members of species have similar requirements of food, habitat, pollination etc.
- They also have similar adaptations to fulfill their needs.

Interspecific competition:

- It is an interaction between individuals of different species.
- In grassland, many species of grasses grow well as there is little competition when enough nutrients and water is available.
- During drought shortage of water occurs.
- A life and death competition starts among the different species of grass lands.
- Survival in both these competitions is determined by the quantity of nutrients, availability of water and migration to new areas.
- Different species of herbivores, larvae and grass hopper competing for fodder or forage plants.
- Trees, shrubs and herbs in a forest struggle for sunlight, water and nutrients and also for pollination and dispersal of fruits and seeds.
- The *Utricularia* (Bladderwort. competes with tiny fishes for small crustaceans and insects.

16. Explain amensalism/ antibiosis with suitable examples.

- It is an interspecific interaction in which one species is inhibited while the other species is neither benefitted nor harmed.
- The inhibition is achieved by the secretion of certain chemicals called **allelopathic** substances.
- Amensalism is also called **antibiosis.**

Example:

- *Penicillium notatum* produces penicillin to inhibit the growth of a variety of bacteria especially *Staphylococcus*.
- *Trichoderma* inhibits the growth of fungus *Aspergillus*.
- Roots and hulls of Black Walnut *Juglans nigra* secretes an alkaloid **Junglone** which inhibits the growth of seedlings of Apple, Tomato and *Alfalfa* around it.

17. Describe mimicry

- It is a phenomenon in which living organism modifies its form, appearance, structure or behavior and looks like another living organism. So a self-defence and increases the chance of their survival.
- Floral mimicry is for usually inviting pollinators.
- Animal mimicry is often protective.
- Mimicry is a result of evolutionary significance due to shape and sudden heritable mutation and preservation of natural selection.

Example:

- *Ophrys* an orchid, the flower looks like a female insect to attract the male insect to get pollinated by the male insect and it is otherwise called 'floral mimicry '.
- *Carausium morosus* – stick insect or walking stick. It is a protective mimicry.
- *Phyllium frondosum* – leaf insect, another example of protective mimicry.

18. Explain co-evolution and give examples.

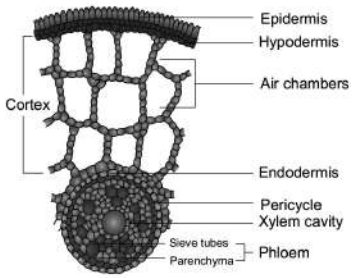
- The interaction between organisms, when continues for generations, involves reciprocal changes in genetic and morphological characters of both organisms.
- This type of evolution is called Co-evolution.
- It is a kind of co- adaptation and mutual change among interactive species.

Examples:

- Corolla length and proboscis length of butterflies and moths (*Habenaria* and Moth).
- Bird's beak shape and flower shape and size.
- Horn bills and birds of Scrub jungles ,Slit size of pollinia of Apocynaceae members and leg size of insects.

19. Enumerate the anatomical adaptations of hydrophytes.

- Cuticle is either completely absent or if present it is thin and poorly developed.
- Single layer of epidermis is present.
- Cortex is well developed with aerenchyma.
- Vascular tissues are poorly developed.
- In emergent forms vascular elements are well developed.
- Mechanical tissues are generally absent except in some emergent forms.
- Pith cells are sclerenchymatous.



T.s of *Hydrilla* stem

20. Explain the morphological adaptations of hydrophytes

In root

- Roots are totally absent in *Wolffia* and *Salvinia*
- poorly developed in *Hydrilla*
- well developed in *Ranunculus.*
- The root caps are replaced by **root pockets**.
- Example: *Eichhornia*

In stem

- The stem is long, slender, spongy and flexible in sub-merged forms.
- In free floating forms the stem is thick, short stoloniferous and spongy;

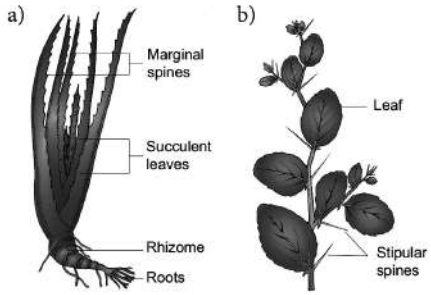
- In rooted floating forms, it is a rhizome.
- Vegetative propagation is through runners, stolon, stem and root cuttings , tubers, dormant apices and offsets.

In leaves

- The leaves are thin, long and ribbon shaped in *Vallisneria*
- long and linear in *Potamogeton*
- finely dissected in *Ceratophyllum*
- The floating leaves are large and flat as in *Nymphaea* and *Nelumbo*.
- In *Eichhornia* and *Trapa* petioles become swollen and spongy.
- In emergent forms, the leaves show **heterophylly**
- Example: *Ranunculus, Limnophila heterophylla* and *Sagittaria*

21. Explain three types of xerophytes.Give examples and diagrams for each.

- Xerophytes are classified into ephemerals, succulents and non-succulent plants



a)Succulent xerophyte – *Aloe*
b) Non succulent perennial - *Ziziphus*

Ephemerals:

- These are also called **drought escapers** or **drought evaders**.
- These plants complete their life cycle within a short period (**single season**).
- These are not true xerophytes.
- Examples: *Argemone, Mollugo, Tribulus* and *Tephrosia*.

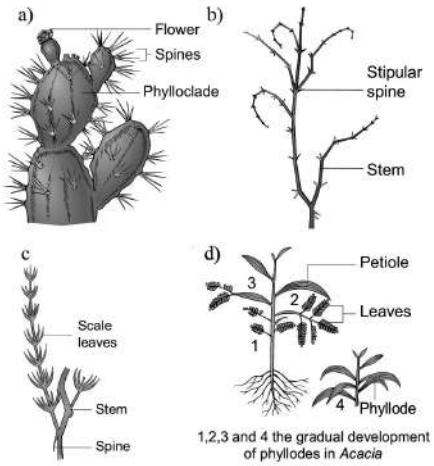
Succulents:

- These are also called drought **enduring plants**.
- These plants store water in their plant parts during the dry period.
- These plants develop certain adaptive characters to resist extreme drought conditions.
- Examples: *Opuntia, Aloe, Bryophyllum* and *Begonia*.

Non succulents:

- These are also called drought resistant plants (true xerophytes).
- They face both external and internal dryness.
- They have many adaptations to resist dry conditions.
- Examples: *Casuarina, Nerium, Zizyphus* and *Acacia.*

22. Write the morphological Adaptations of xerophytes.



a) A succulent xerophyte: Phylloclade – opuntia
b) Non succulent: Perennial - Capparis
c) Cladode of Asparagus
d) Phyllode – Acaciaa

In root

- Root system is well developed and is greater than that of shoot system.
- Root hairs and root caps are also well developed.

In stem

- Stems are mostly hard and woody.
- They may be aerial or underground
- The stems and leaves are covered with wax coating or covered with dense hairs.
- All the internodes in the stem are modified into a fleshy leaf structure called **phylloclades** (*Opuntia*. .
- The single or occasionally two internodes modified into fleshy green structure called

cladode (*Asparagus*).

- The petiole is modified into a fleshy leaf like structure called **phyllode** (*Acacia melanoxylon*).

In leaves

- Leaves are generally leathery and shiny to reflect light and heat.
- In some plants like *Euphorbia, Acacia, Ziziphus* and *Capparis*, the stipules are modified into spines.
- The entire leaves are modified into spines (*Opuntia.* or reduced to scales (*Asparagus*).

23. Write the morphological adaptations of epiphytes

- Root system is extensively developed.
- These roots may be of two types.
- They are Clinging roots and Aerial roots.
- **Clinging roots** fix the epiphytes firmly on the surface of the supporting objects.
- **Aerial roots** are green coloured roots which may hang downwardly.
- It absorbs moisture from the atmosphere with the help of a spongy tissue called **velamen**.
- Stem of some epiphytes are succulent and develop pseudo bulb or tuber.
- Generally the leaves are lesser in number and may be fleshy and leathery
- **Myrmecophily** is a common occurrence in the epiphytic vegetation to prevent the predators.
- The fruits and seeds are very small and usually dispersed by wind, insects and birds.

24. Write the adaptation of the wind dispersal plants.

The adaptation of the wind dispersal plants are

- **Minute seeds:** Seeds are minute, very small, light and with inflated covering.Example: Orchids.
- **Wings:** Seeds or whole fruits are flattened to form a wing. Examples: Maple, *Gyrocarpus, Dipterocarpus* and

Terminalia

- **Feathery Appendages:** Seeds or fruits may have feathery appendages which greatly increase their buoyancy to disperse to high altitudes. Examples: *Vernonia* and *Asclepias.*
- **Censor mechanisms:** The fruits of many plants open in such a way that the seeds can escape only when the fruit is violently shaken by a strong wind. Examples: *Aristolochia* and Poppy.

25. Write the adaptation of hydrochory plants.

Adaptation of hydrochory are

- Obconical receptacle with prominent air spaces. Example: *Nelumbo*.
- Presence of fibrous mesocarp and light pericarp. Example: Coconut.
- Seeds are light, small, provided with aril which encloses air.Example: *Nymphaea*.
- The fruit may be inflated. Examples: *Heritiera littoralis*.
- Seeds by themselves would not float may be carried by water current. Example: Coconut.

26. Explain fruit and seed dispersal by Explosive Mechanism (Autochory)

- Autochory shows the following adaptations.
- Mere touch the ripened fruit to explode suddenly and seeds are thrown out with great force.

Example: *Impatiens* (Balsam), *Hura*.

- Some fruits when they come in contact with water, burst suddenly with a noise and scatter the seeds.

Examples: *Ruellia* and *Crossandra.*

- Certain long pods explode with a loud noise like cracker, scattering the seeds in all directions.

Example: *Bauhinia vahlii* (Camel's foot climber)

- As the fruit matures, tissues around seeds are converted into a mucilaginous fluid, due to which a high turgor pressure develops inside the fruit which leads to the dispersal of seeds.

Example: *Ecballium elatrium* (Squirting cucumber. *Gyrocarpus* and *Dipterocarpus.*

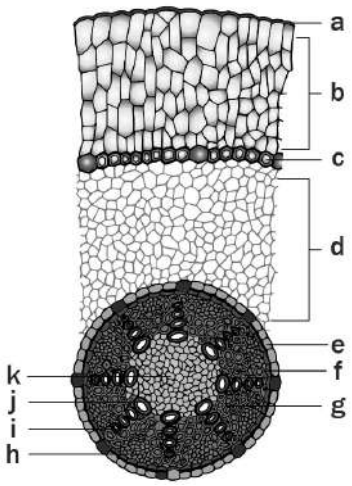
27. Ecologically important days

- March 21 - World forest day
- April 22 - Earth day
- May 22 - World bio diversity day
- September 16 - International Ozone day
- June 05 - World environment day
- July 07 - Van Mohostav day

28. Tabulate the biological interaction of biotic factor

	Interaction type	Combination		Effects	Examples
1.	**Positive interaction**				
	Mutualism	(+)	(+)	Both species benefitted	Lichen, *Mycorrhiza* etc.
2.	**Commensalism**	(+)	(0)	One species is benefitted and the other species is neither benefitted nor harmed	orchids, Lianas etc.
3.	**Negative interaction**				
4	**Predation**	(+)	(-)	One species benefitted, the other species are harmed	*Drosera, Nepenthes* etc.
5	**Parasitism**	(+)	(-)	One species benefitted, the other species are harmed	*Cuscuta, Duranta, Viscum* etc.
6	**Competition**	(-)	(-)	Harmful for both	Grassland species
7	**Amensalism**	(-)	(0)	Harmful for one, but the other species are unaffected	*Penicillium* and *Staphylo coccus*

29. Observe the given diagram



i. write the name of the given T.S

ii. Identify the marked parts of a,b,c,d.e,f,g,h,i,j and k.

iii. Explain the part "b".

i) The name of the given T.S. is an aerial root of orchid showing velamen tissue.

ii) a. Epidermis b. Velamen c. Exodermis d. Cortex
e. Endodermis f. Pericycle g. Conjuctive tissue h. Phloem
i. Protoxylem j. Metaxylem k. pith

iii) The part "b" is Velamen tissue. The special type of spongy tissue which is present in the hygroscopic roots of epiphytes are called Velamen. It gets nutrients and water from the atmosphere.

UNIT IX : PLANT ECOLOGY

CHAPTER 7

ECOSYSTEM

POINTS TO REMEMBER

- The term **'ecosystem'** was proposed by A.G. Tansley
- Odum (1962) defined ecosystem **'as the structural and functional unit of ecology'.**
- Ecosystem comprises **Abiotic (non-living) components** and **Biotic (living) components**:
- Abiotic components play vital role in any ecosystem
- Those organisms which consume the producers are called **consumers**
- **Macroconsumers** refer to herbivores, carnivores and omnivores
- **Microconsumers** are called decomposers.
- **Biomass** can be measured as fresh weight or dry weight or carbon weight of organisms.
- The amount of light available for photosynthesis is called **P**hotosynthetically **A**ctive **R**adiation (PAR)
- PAR values range from 0 to 3000 millimoles /square meter / second.
- The rate of biomass production per unit area in a unit time is called productivity.
- The difference between GPP and respiration is known as NPP.
- NPP of whole biosphere is estimated to be about 170 billion tons (dry weight) per year.
- Out of which NPP of oceanic producers is only 55 billion tons per year in unit time.
- NPP of oceanic producers is only 55 billion tons per year in unit time.
- NPP of whole biosphere is estimated to be about 170 billion tons (dry weight) per year.
- The green plants (producers) occupying the first trophic level (T1) are called **producers**.
- herbivores they are called **primary consumers** and occupies the second trophic level (T2).
- carnivores occupy the third trophic level (T3) and are also called **secondary consumers** or **primary carnivores**.
- Some organisms which eat both plants and animals are called as **omnivores** (Crow).
- The transfer of energy in an ecosystem between trophic levels can be termed as energy flow.
- Energy flow is always unidirectional in an ecosystem.
- Energy cannot be destroyed or created. But it can be transformed from one form to another.
- **Ten percent law** was proposed by Lindeman (1942).
- The movement of energy from producers up to top carnivores is known as food chain.
- Main source of energy for the grazing food chain is the Sun.
- Detritus food chain is present in all ecosystems.
- The inter-locking pattern of a number of food chain form a web like arrangement called **food web**.
- The concept of ecological pyramids was introduced by Charles Elton (1927).
- **pyramids of number in grassland and pond ecosystem are always upright.**
- The pyramid of number in forest ecosystem looks spindle shaped.
- **The pyramid of number in a parasite ecosystem is always inverted,**
- Circulation of nutrients within the ecosystem or biosphere is known as **biogeochemical cycles**
- The circulation of carbon between organisms and environment is known as the **carbon cycle**.
- A pond ecosystem consists of dissolved inorganic and organic substances formed from the dead organic matter.
- **Biotic components** constitute the producers, variety of consumers and decomposers
- Ecosystem protected for the welfare of posterity is called ecosystem management.
- successive replacement of one type of plant community by the other of the same area/ place is known as plant **succession**.
- The first invaded plants in a barren area are called **pioneers**.
- The succession in a freshwater ecosystem is also referred to as hydrosere.
- Plant succession is classified in to hydrosere (Initiating on a water bodies), Mesosere and xerosere.
- xerosere is subdivided in to Lithosere (Initiating on a barren rock), Halosere and Pasmmosere.

PART – A

(1 MARK)

Book Evaluation

I. Choose the most suitable answer from the given four alternatives and write the option code and the corresponding answer.

1. Which of the following is not a abiotic component of the ecosystem?

a) Bacteria
b) Humus
c) Organic compounds
d) Inorganic compounds **Ans:a**

2. Which of the following is / are not a natural ecosystem?

a) Forest ecosystem
b) Rice field
c) Grassland ecosystem
d) Desert ecosystem **Ans:b**

3. Pond is a type of

a) forest ecosystem
b) grassland ecosystem
c) marine ecosystem
d) fresh water ecosystem **Ans:d**

4. Pond ecosystem is

a) not self sufficient and self regulating
b) partially self sufficient and self regulating
c) self sufficient and not self regulating
d) self sufficient and self regulating **Ans:d**

5. Profundal zone is predominated by heterotrophs in a pond ecosystem, because of

a) with effective light penetration
b) no effective light penetration
c) complete absence of light
d) a and b **Ans:b**

6. Solar energy used by green plants for photosynthesis is only

a) 2 – 8% b) 2 – 10%
c) 3 – 10% d) 2 – 9% **Ans:b**

7. Which of the following ecosystem has the highest primary productivity?

a) Pond ecosystem
b) Lake ecosystem
c) Grassland ecosystem
d) Forest ecosystem **Ans:d**

8. Ecosystem consists of

a) decomposers b) producers
c) consumers d) all of the above
Ans:d

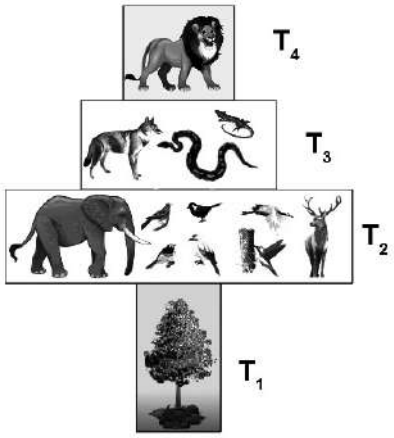
9. Which one is in descending order of a food chain

a) Producers → Secondary consumers → Primary consumers → Tertiary consumers
b) Tertiary consumers → Primary consumers → Secondary consumers → Producers
c) Tertiary consumers → Secondary consumers → Primary consumers → Producers
d) Tertiary consumers → Producers → rimary consumers → Secondary consumers
Ans:c

10. Significance of food web is / are

a) it does not maintain stability in nature
b) it shows patterns of energy transfer
c) it explains species interaction
d) b and c **Ans:d**

11. The following diagram represents T1,T2,T3 and T4



a) pyramid of number in a grassland ecosystem

b) pyramid of number in a pond ecosystem

c) pyramid of number in a forest ecosystem

d) pyramid of biomass in a pond ecosystem **Ans:c**

12. Which of the following is / are not the mechanism of decomposition

a) Eluviation

b) Catabolism

c) Anabolism

d) Fragmentation **Ans:c**

13. Which of the following is not a sedimentary cycle

a) Nitrogen cycle

b) Phosphorous cycle

c) Sulphur cycle

d) Calcium cycle **Ans:d**

14. Which of the following are not regulating services of ecosystem services

i) Genetic resources

ii) Recreation and aesthetic values

iii) Invasion resistance

iv) Climatic regulation

a) i and iii

b) ii and iv

c) i and ii

d) i and iv **Ans:a**

PART – B,C AND D

(2,3 AND 5 MARKS)

15. The productivity of profundal zone will be low. Why?

The productivity of profundal zone will be low because of less penetration of light.

16. Discuss the gross primary productivity is more efficient than net primary productivity.

- Gross primary productivity (GGP) is the total amount of organic matter produced in an ecosystem by photosynthesis.
- But net primary productivity(NPP) is the proportion of energy which remains after respiration loss in the plant.
- So the gross primary productivity is more efficient than net primary productivity

17. Pyramid of energy is always upright. Give reasons

- A graphical representation of energy flow at each successive trophic level in an ecosystem is called pyramids of energy.
- The bottom of the pyramid of energy is occupied by the producers.
- There is a gradual decrease in energy transfer at successive tropic levels from producers to the upper levels.
- Therefore, the pyramid of energy is always upright.

18. What will happen if all producers are removed from ecosystem?

If all producers are removed from the ecosystem, there is no consumers. So the ecosystem is imbalance.

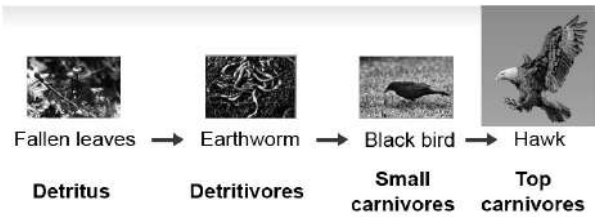
19. Construct the food chain with the following data. Hawk, plants, frog, snake, grasshopper.

Plants → grasshopper → frog → snake → Hawk

20. Name of the food chain which is generally present in all type of ecosystem. Explain and write their significance.

Detritus food chain type of food chain is present in all ecosystems.

The transfer of energy from the dead organic matter, is transferred through a series of organisms called detritus food chain.

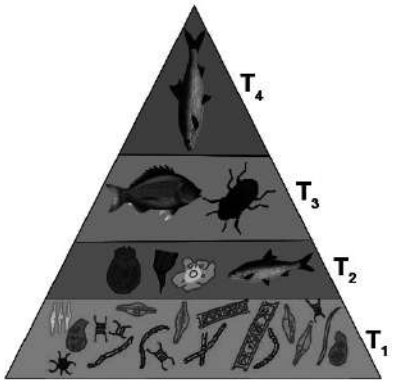


Detritus consumers (detritivores)→ Small carnivores→ Large (top) carnivores with repeated eating

Significance : dead organic matter of plant and animals is broken down by decomposer and then carnivores.

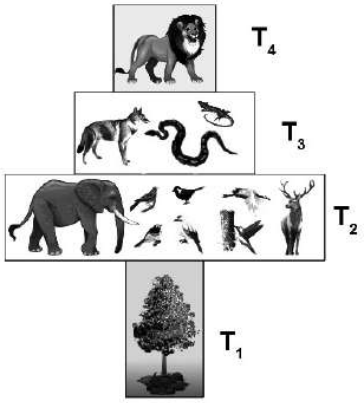
21. Shape of pyramid in a particular ecosystem is always different in shape. Explain with example.

The pyramid of number in grassland and pond ecosystem are always upright.



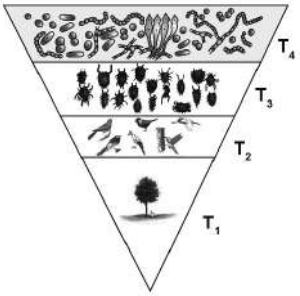
- There is a gradual decrease in the number of organisms in each trophic level.
- From producers to primary consumers and then to secondary consumers, and finally to tertiary consumers.
- Therefore pyramid of number in grassland and pond ecosystem are always upright.

The pyramid of number in forest ecosystem looks spindle shaped



- In a forest ecosystem the pyramid of number is somewhat different in shape.
- (T1) of the pyramid occupies large sized trees (producer) which are lesser in number.
- herbivores (T2) (Fruit eating birds, elephant, deer) occupying second trophic level, are more in number.
- In final trophic level (T4), tertiary consumers (lion) are lesser in number than the secondary consumer (T3) fox and snake.
- Therefore, the pyramid of number in forest ecosystem looks spindle shaped.

The pyramid of number in a parasite ecosystem is always inverted



- It starts with a single tree.
- There is gradual increase in the number of organisms in successive tropic levels from producer to tertiary consumers.
- So The pyramid of number in a parasite ecosystem is always inverted

22. Generally human activities are against to the ecosystem, where as you a student how will you help to protect ecosystem?

If I am a student I will help to protect ecosystem by following methods

- we have to practice the following in our day today life
- Buy and use only eco-friendly products and recycle them.
- Grow more trees
- Choose sustained farm products (vegetables, fruits, greens, etc.)
- Reduce the use of natural resources.
- Recycle the waste and reduce the amount of waste you produce.
- Reduce consumption of water and electricity.
- Reduce or eliminate the use of house-hold chemicals and pesticides.
- Maintain your cars and vehicles properly. (In order to reduce carbon emission)
- Create awareness and educate about ecosystem protection among your friends and family members and ask them to find out solution to minimise this problem.

23. Generally in summer the forest are affected by natural fire. Over a period of time it recovers itself by the process of successions. Find out the types of succession and explain.

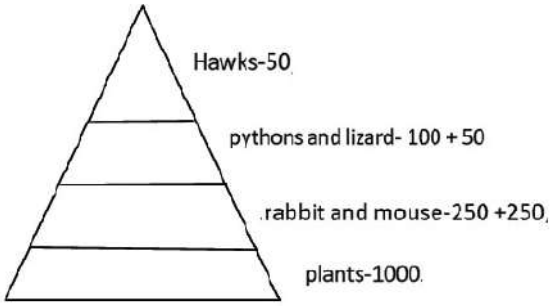
This types of succession is secondary succession

The development of a plant community in an area where an already developed community has been destroyed by fire is known as **secondary succession**.

Generally, This succession takes less time than the time taken for primary succession.

Example: The forest destroyed by fire and excessive lumbering may be re-occupied by herbs over period of times.

24. Draw a pyramid from following details and explain in brief. Quantities of organisms are given-Hawks-50, plants-1000.rabbit and mouse-250 +250, pythons and lizard- 100 + 50 respectively.



- There is a gradual decrease in the number of organisms in each trophic level.
- From producers to primary consumers and then to secondary consumers, and finally to tertiary consumers.
- Therefore pyramid of number in grassland ecosystem is always upright.

25. Various stages of succession are given bellow. From that rearrange them accordingly.

Find out the type of succession and explain in detail.

Reed-swamp stage, phytoplankton stage, shrub stage, submerged plant stage, forest stage, submerged free floating stage, marsh medow stage.

1. Phytoplankton stage
2. Submerged plant stage
3. Submerged free floating stage
4. Reed-swamp stage
5. Marsh meadow stage 6. Shrub stage 7. Forest stage

Hydrosere

- The succession in a freshwater ecosystem is also referred to as hydrosere.
- It begins with colonization of the pioneers like phytoplankton.
- Finally ends with the formation of climax community like forest stage.

1. Phytoplankton stage

- It consisting of the pioneer community like blue green algae, green algae, diatoms, bacteria, etc.,
- The colonization of these organisms enrich the amount of organic matter and nutrients of pond due to their life activities and death.
- This favours the development of the next seral stages.

2. Submerged plant stage

- As the result of death and decomposition of planktons.
- Silt brought from land by rain water.
- It leads to a loose mud formation at the bottom of the pond.
- Hence, the rooted submerged hydrophytes begin to appear on the new substratum.

Example: Chara, Utricularia, Vallisneria and Hydrilla etc.

- The death and decay of these plants will build up the substratum of pond to become shallow.
- Therefore, this habitat now replaces another group of plants which are of floating type.

3. Submerged free floating stage

- During this stage, the depth of the pond will become almost 2-5 feet.
- Hence, the rooted hydrophytic plants and with floating large leaves start colonising the pond.

Example: Rooted floating plants like Nelumbo, Nymphaea and Trapa.

- Some free floating species like Azolla, Lemna, Wolffia and Pistia are also present in this stage.
- By death and decomposition of these plants, further the pond becomes more shallow.
- Due to this reason, floating plant species is gradually replaced by another species which makes new seral stage.

4. Reed-swamp stage –

- It is also called an amphibious stage.
- Rooted floating plants are replaced by plants
- It can live successfully in aquatic as well as aerial.

Example: Typha, Phragmites, Sagittaria and Scirpus etc.

- At the end, water level is very much reduced,
- making it unsuitable for the continuous growth of amphibious plants.

5. Marsh meadow stage

- The pond becomes swallowed due to decreasing water level.
- The species of Cyperaceae and Poaceae such as Carex, Juncus, Cyperus and Eleocharis colonise the area.
- They form a mat-like vegetation with the help of their much branched root system.
- This leads to an absorption and loss of large quantity of water.
- At the end of this stage, the soil becomes dry and the marshy vegetation disappears gradually and leads to shurb stage.

6. Shrub stage

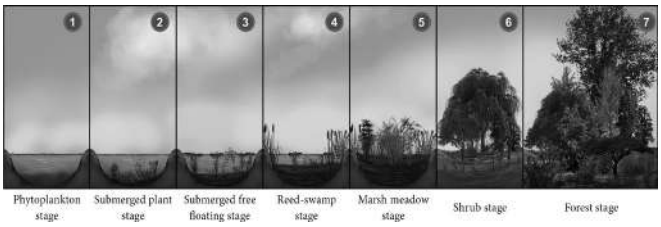
- As the disappearance of marshy vegetation continues, soil becomes dry.
- These areas are now invaded by terrestrial plants like shrubs (Salix and Cornus) and trees (Populus and Alnus). These plants absorb large quantity of water and make the habitat dry.
- Further, the accumulation of humus with a rich flora of microorganisms produce minerals in the soil, ultimately favouring the arrival of new tree species in the area.

7. Forest stage

- It is the climax community of hydrosere.
- A variety of trees invade the area and develop any one of the diverse type of vegetation.

Example:Temperate mixed forest (Ulmus,Acer and Quercus),Tropical rain forest(Artocarpus and Cinnamomum) and Tropical deciduous forest (Bamboo and Tectona).

- In the 7 stages of hydrosere succession,
- stage1 is occupied by pioneer community,
- while the stage 7 is occupied by the climax community.
- The stages 2 to 6 are occupied by seral communities.



PART – A

ADDITIONAL QUESTIONS (1 MARK)

1. Tropical forests occur in India

a) Kerala and Assam
b) Jammu and Kashmir
c) The forests do not occur in India
d) Rajasthan **Ans: a**

2. In a food chain, the largest population is that of

a) secondary consumers
b) producers
c) primary consumers
d) decomposers **Ans: b**

3. The nature of climax community ultimately depends on

a) soil organisms
b) climate
c) pool of available nutrients.
d) bed rock **Ans: b**

4. Which one of the following statements is correct for secondary succession?

a) It follows primary succession
b) It begins on a bare rock
c) It is similar to primary succession except that it has a relatively fast pace
d) It occurs on a deforested site **Ans: d**

5. Pyramid of numbers in a grassland/true ecosystem is
a) both A and B
b) always inverted
c) spindle-shaped
d) always upright **Ans: d**

6. The age pyramid with broad base indicates
a) Low percentage of young individuals
b) High percentage of young individuals
c) A stable population
d) High percentage of old individuals **Ans: b**

7. Benthic organisms are affected most by
a) Surface turbulence of water
b) Water-holding capacity of soil
c) Sediment characteristics of aquatic ecosystems
d) Light reaching the forest floor **Ans: c**

8. Pick up the correct food chain
a) Phytoplankton Zooplankton Fish
b) Grass Chamelion Insect Bird
c) Fallen leaves Bacteria Insect larvae
d) Grass Fox Rabbit Bird **Ans: a**

9. Food chain in which micro-organisms breakdown the food
formed by primary producers is
a) consumer food chain
b) parasitic food chain
c) predator food chain
d) detritus food chain **Ans: d**

10. In grass-deer-tiger food chain, grass biomass is one tonne. The tiger biomass shall be
a) 200 kg
b) 100 kg
c) 1 kg
d) 10 kg **Ans: d**

11. The pyramid which cannot be inverted in a stable ecosystem is that of
a) Energy
b) Biomass
c) All the above
d) Number **Ans: a**

12. Pyramid of numbers in a pond ecosystem is
a) upright
b) irregular
c) spindle shaped
d) inverted **Ans: a**

13. Pyramid of numbers deals with number of
a) individuals in a tropic-level
b) species in an area
c) subspecies in a community
d) individuals in a community **Ans: a**

14. Second most important trophic level in a lake is
a) Benthos
b) Zooplankton
c) Neuston
d) Phytoplankton **Ans: b**

15. Which of the following pairs is a sedimentary type of biogeochemical cycle?
a) phosphorus and nitrogen
b) oxygen and nitrogen
c) phosphorus and carbon dioxide
d) phosphorus and sulphur **Ans: d**

16. In a biotic community, the primary consumers are
a) detritivores
b) carnivores
c) herbivores
d) omnivores **Ans: c**

17. Which of the following is the most stable ecosystem?
a) Mountain
b) Forest
c) Ocean
d) Desert **Ans: c**

18. The primary succession refers to the development of communities on a
a) pond, freshly filled with water after a dry phase
b) fleshly cleared crop field
c) newly-exposed habitat with no record of earlier vegetation
d) forest clearing after devastating fire
Ans: c

19. Which of the following ecosystems has highest rate of gross primary production?

a) Coral reefs

b) Grasslands

c) Equatorial rain forest

d) Mangroves **Ans: c**

20. In a food chain, the largest population is that of

a) primary consumers

b) decomposers

c) tertiary consumers

d) producers **Ans: d**

21. In an ecosystem, which one shows one-way passage

a) nitrogen b) free energy

c) potassium d) carbon **Ans: b**

22. What is true of ecosystem?

a) Producers are more than primary consumers

b) Primary consumers are least dependent upon producers

c) Secondary consumers are the largest and most powerful

d) Primar y consumers out-number producers **Ans: a**

23. Upper part of sea/aquatic ecosystem contains

a) plankton and nekton b) plankton

c) benthos d) nekto **Ans: b**

24. The rate at which light energy is converted to the chemical energy of organic molecules is the ecosystem's

a) net secondary productivity

b) net primary productivity

c) gross secondary productivity

d) gross primary productivity **Ans: d**

25. Which of the following is expected to have the highest value ($gm/m^2/yr$. in a grassland ecosystem?

a) Gross Production (GP)

b) Secondary Production

c) Net Production (NP)

d) Tertiary Production **Ans: a**

26. Bamboo plant is growing in a fir forest then what will be the trophic level of it?

a) Third trophic level (T3)

b) First trophic level (T1)

c) Fourth trophic level (T4)

d) Second trophic level (T2) **Ans: b**

27. The greatest biomass of autotrophs in the oceans is that of

a) benthic brown algae,coastal red algae and daphnids

b) sea grasses and slime moulds

c) benthic diatoms and marine viruses

d) free floating microalgae, cyanobacteria and nanoplankton **Ans: d**

28. Which one of the following is not used for construction of ecological pyramids?

a) Fresh weight b) Number of individuals

c) Dry weight d) Rate of energy flow **Ans: a**

29. An ecosystem which can be easily damaged but can recover after some time if damaging effect stops will be having

a) low stability and low resilience

b) low stability and high resilience

c) high stability and high resilience

d) high stability and low resilience **Ans: b**

30. Consider the following statements concerning food chains

a) the length of food chains is generally limited to 3-4 trophic levels due to energy loss

b) removal of 80% tigers from an area resulted in greatly increased growth of vegetation

c) the length of food chains may vary from 2 to 8 trophic levels Which two of the above statements are correct?

d) removal of most of the carnivores resulted in an increased population of deers **Ans: b**

31. The slow rate of decomposition of fallen logs in nature is due to their

a) anaerobic environment around them

b) low moisture content

c) low cellulose content

d) poor nitrogen content **Ans: c**

32. About 70% of total global carbon is found in

a) oceans b) grasslands

c) forests d) agroecosystems

Ans: a

33. Which one of the following ecosystem types has the highest annual net primary productivity?

a) temperate deciduous forest

b) tropical deciduous forest

c) tropical rain forest.

d) temperate evergreen forest **Ans: c**

34. Mass of living matter at a trophic level in an area at any time is called

a) humus b) standing crop

c) standing state d) deteritus **Ans: b**

35. The biomass available for consumption by the herbivores and the decomposers is called:

a) standing crop

b) net primary productivity

c) gross primary productivity

d) secondary productivity **Ans: b**

36. Study the four statements (a–d. given below and select the two correct ones out of them:

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

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

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

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

The two correct statements are:

a) (i) and (iv) b) (ii) and (iii)

c) (i) and (ii) d) (iii) and (iv)

Ans: c

37. Which one of the following types of organisms occupy more than one trophic level in a pond ecosystem?

a) Frog b) Fish

c) Phytoplankton d) Zooplankton **Ans: b**

38. The correct sequence of plants in a hydrosere is:

a) Oak□Lantana □Volvox □Hydrilla □ Pistia □Scirpus

b) Volvox □ Hydrilla □ Pistia □Scirpus Lantana □ Oak

c) Oak □Lantana □Scirpus □Pistia □ Hydrilla □Volvox

d) Pistia □Volvox □Scirpus □Hydrilla □ Oak □Lantana **Ans: b**

39. Which one of the following is not a gaseous biogeochemical cycle in ecosystem?

a) Nitrogen cycle b) Sulphur cycle

c) Carbon cycle d) Phosphorus cycle

Ans: d

40. Pheretima and its close relatives derive nourishment from:

a) soil insects

b) sugarcane roots

c) small pieces of fresh fallen leaves of maize, etc.

d) decaying fallen leaves and soil organic matter.

Ans: d

41. Both, hydrarch and xerarch successions lead to:

a) highly dry conditions

b) medium water conditions

c) excessive wet conditions

d) xeric conditions **Ans: b**

42. Which one of the following animals may occupy more than one trophic levels in the same ecosystem at the same time?

a) Goat b) Sparrow

c) Frog d) Lion **Ans: b**

43. Which one of the following statements for pyramid of energy is incorrect, whereas the remaining three are correct?

a) It is inverted in shape

b) Its base is broad

c) It is upright in shape

d) It shows energy content of different trophic level organisms

Ans: a

44. The rate of formation of new organic matter by rabbit in a grassland, is called

a) net primary productivity
b) net productivity
c) gross primary productivity
d) secondary productivity **Ans: d**

45. The upright pyramid of number is absent in

a) Lake b) Pond
c) Grassland d) Forest **Ans: d**

46. Which one of the following is not a function of an ecosystem

a) Productivity b) Energy flow
c) Stratification d) Decomposition **Ans: c**

47. Identify the possible link "A" in the following food chain: Plant insect - frog "A" Eagle

a) Cobra b) Rabbit
c) Parrot d) WoIf **Ans: a**

48. Secondary productivity is rate of formation of new organic matter by

a) Decomposer b) Parasite
c) Producer d) Consumer **Ans: d**

49. Which one of the following processes during decomposition is correctly described?

a) Leaching-Water soluble inorganic nutrients rise to the top layers of soil
b) Humification-Leads to the accumulation of a dark coloured substance humus which undergoes microbial action at every fast rate
c) Fragmentation-Carried out by organisms such as earthworm
d) Catabolism-Last step decomposition under fully anaerobic condition **Ans: c**

50. Natural reservoir of phosphorus is:

a) Fossils b) Animal bones
c) Sea water d) Rock **Ans: d**

51. The second stage of hydrosere is occupied by plants like

a) Salix b) Azolla
c) Vallisneria d) Typha **Ans: c**

52. Deforestation will decrease

a) soil fertility b) soil erosion
c) rainfall d) land slides **Ans: c**

53. Soil conservation is

a) erosion of soil
b) conversion of sterile soil into fertile one
c) protection against loss
d) aeration of soil **Ans: c**

54. When man eats fish which feeds on zooplankton which have eaten small plants, the producer in the chain is

a) Fish b) Zooplankton
c) Man d) Small plants **Ans: d**

55. Which one of the following is a primary consumer in maize field ecosystem?

a) Wolf b) Lion
c) Phytoplankton d) Grasshopper **Ans: d**

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
c) If Assertion is true but Reason is false.
d) If both Assertion and Reason are false.

56. Assertion : A network of food chains existing together in an ecosystem is known as food web.

Reason : An animal like kite cannot be a part of a food web. **Ans: c**

57. Assertion : Pyramid of energy may be upright or inverted.

Reason: Only 20% of energy goes to next trophic level. **Ans: d**

58. Assertion: Insectivorous habitat of plants is to cope up N2 deficiency.

Reason: Insectivorous plants are partly autotrophic and partly heterotrophic. **Ans: a**

59. Assertion : A biotic community has higher position than population in ecological hierarchy.

Reason : Population of similar individuals remains isolated in the community. **Ans: c**

60. Assertion : The pyramid of biomass indicates the decrease in biomass at each trophic level from base to apex.

Reason : Parasites have inverted pyramid for biomass. **Ans: b**

61. The term 'Ecosystem' given by

a) A.G. Transley b) P.Odum
c) Granal d) Robert hook **Ans: a**

62. What makes an ecosystem healthy and maintained?

a) Bio-geo chemical cycle
b) Energy flow
c) Cycling of nutrients
d) All the above **Ans: b**

63. Wheat, rice fields includes in what kind of Ecosystem?

a) Artificial ecosystem
b) Natural ecosystem
c) Nan-engineered ecosystem
d) A and C **Ans: c**

64. The flow of energy begins when.....organism absorb sunlight

a) Producer b) Consumer
c) Decomposer d) A and C **Ans: a**

65. Which aspect being when in organic nutrients are absorbed by producer?

a) Every flow
b) Nutrient cycle
c) Bio-geo chemical cycle
d) B and C **Ans: d**

66. Food chain begins with _____ and ends in _____

a) Carnivores, Producers
b) Produces Carnivores
c) Decomposers, Carnivores
d) Produces, decomposers **Ans: d**

67. 'Detritus' means—

a) Primary source of energy is dead organic matter
b) Secondary source of energy is dead organic matter
c) Primary source of energy is living organic matter
d) Primary source of energy is non-living organic matter **Ans: a**

68. Detritus food chain begins with

a) Produces b) Consumers
c) Carnivores d) Decomposers **Ans: d**

69. Which term is used for indicating inter-dependent food in net form?

a) Food Chain b) Food Web
c) Nutrient Web d) All the above **Ans: b**

70. Which Pyramid always upright?

a) Pyramid of number b) Pyramid of biomass
c) Pyramid of energy d) All of these **Ans: c**

71. In which of the following processes heat is lost

a) Respiration b) Heat
c) Excretion d) All of these **Ans: d**

72. It is measured as grams of dry weight (measured as tons. per hectare $g/m^2/Y^2$

a) GPP b) NPP
c) Primary productivity d) All of these **Ans: c**

73. The total rate of Photosystherus carried out by all Producer organism in an ecosystem is called

a) GPP b) NPP
c) Primary productivity d) All of these **Ans: a**

74. GPP =_____+ Respiration loss

a) NPP b) GPP
c) Primary Productivity d) SPP **Ans: a**

75. In aquatic habitat Productivity _____with the increasing depth

a) Increases b) High
c)Low d) Decreases **Ans: d**

76. The Common decomposers an in Ecosystem is

a) Bacteria, fungi, virus
b) Earth worm,
c) Virus, fungi,
d) Bacteria, fungi, earthworms **Ans: d**

77. In which of the following stage of decomposition size and form of detritus changes

a) Fragmentation b) Absorption
c) Humiliation d) Leaching **Ans: a**

78. Which of the following is the examples of gaseous cycle and sedimentation cycle respectively

a) N Cycle, S Cycle b) P. Cycle, C. Cycle

c) O_2 Cycle, C. Cycle d) S. Cycle, P. Cycle

Ans: a

79)

Column-I		Column-II	
A.	GPP	i	Energy remains after respiration
B.	NPP	ii	Light avail for Photosynthesis
C.	PAR	iii	Biomass produced in an Ecosystem by autotrophs.
D.	Secondary Productivity	iv	Energy stored in the heterotrophs

	A	B	C	D
a	iii	i	ii	iv
b	iii	ii	i	iv
c	iii	iv	i	ii
d	iv	iii	ii	i

Ans: a

80. Out of the total sunlight

Column-I		Column-II	
A	34%	i	Used by Green Plants
B	10%	ii	Reaches the earth Surface
C	2-10%	iii	Reflect back to atmosphere
D	56%	iv	By Ozone

	A	B	C	D
a	ii	iii	i	iv
b	ii	iv	i	iii
c	i	ii	iv	iii
d	iii	iv	i	ii

Ans: d

81.

Column-I		Column-II	
A	Bio system	i	Karl Mobius
B	Holocoen	ii	S.A. Forbes
C	Microcosm	iii	Friederichs
D	Biocoenosis	iv	Thienemann

	A	B	C	D
a	iv	ii	iii	i
b	i	ii	iii	iv
c	iv	iii	ii	i
d	i	i	iii	iv

Ans: c

82.

Column-I		Column-II	
A	Primary Productivity	i	Net Secondary Productivity
B	Secondary Productivity	ii	Net Primary Productivity
C	Community Productivity	iii	Total food energy in ecosystem
D	Gross Primary Productivity	iv	

	A	B	C	D
a	ii	iv	i	iii
b	ii	i	iv	iii
c	iv	iii	ii	i
d	i	ii	iii	iv

Ans: b

83. True of False (T-True F-False)

a) The movement of energy from producers up to top carnivores called food chain

b) Main source of energy for the grazing food chain is sun

c) Detritus food chain begin with living organic Matter

d) Grassland and Pond Ecosystem are always inverted

a) TTFF b) TTTT c) FFTT d) FFFF**Ans: a**

84)

a)	Grassland ecosystem	Upright
b)	Pond Ecosystem	Spindle shaped
c)	Parasite Ecosystem	Upright
d)	Pyramid of Member in forest Ecosystem	Inverted

a) TFFF b) FTTT c) FTFT d) TFTF**Ans: a**

85. Choose the wrong statement

a) Carbon cycle is a gaseous cycle

b) Sulphur cycle is a sedimentary cycle

c) Phosphorus is abundant in the biosphere

d) Carbon is an inevitable part of all biomolecules

Ans: c

86. Oceanography is study of _____ of ocean

a) Biological Components

b) Physical and Chemical Components

c) Geological Components

d) All of these **Ans: d**

87. The deeper region of pond is

a) Littoral Zone b) Limnetic Zone
c) Profundeal Zone d) Epilimnion Zone

Ans: c

88. In 7 stages of Hydro sere succession, which of the following stage is called the climax Community

a) Forest Stage b) Shrub Stage
c) Phytoplankton Stage d) Reed-Swamp Stage

Ans: a

89. Bamboo and *Tectona* is found in

a) Temperate mixed forest
b) Tropical rain forest
c) tropical deciduous forest
d) Evergreen forest **Ans: c**

90. Which of the following Plant succession in initiating on a sand

a) Lithosere b) Halosere
c) Psammosera d) Xerosera **Ans: c**

91. Which of the following island Heterotrophic Components

a) Consumers b) Macro Consumers
c) Micro consumers d) All of these. **Ans: d**

92. Photosynthesis is more efficient in following light

a) Blue and Red b) Red and Green
c) Blue and Green d) Blue and Violet

Ans: a

93)

Column-I		Column-II	
A	Green Carbon	i	Carbon emitted from diesel
B	Grey Carbon	ii	Carbon stores is Biosphone
C	Brown Carbon	iii	Carbon stored in fossil fuel
D	Black Carbon	iv	Carbon stored in Industrialized forest

	A	B	C	D
a	iii	iv	i	ii
b	i	ii	iii	iv
c	ii	iii	iv	i
d	ii	iv	iii	i

Ans: c

94. A T_1 - i Rabbit
B T_2 - ii Eagle
C T_3 - iii Autotrophs
D T_4 - iv Snake

	A	B	C	D
a	iii	i	iv	ii
b	iii	iv	i	ii
c	iv	i	iii	ii
d	i	ii	iii	iv

Ans: : a

95. Ten percent law is an example for

a) Second law of Thermodynamics
b) First law of Thermodynamics
c) Both a and b
d) None of these **Ans: a**

96. The Following one is the example for Lotic (Running water bodies. ecosystem

a) Natural Ecosystem
b) Fresh Water Ecosystem
c) Marine Ecosystem
d) Terrestrial Ecosystem **Ans: b**

PART – B

ADDITIONAL QUESTIONS (2 MARKS)

1. Who proposed the term ecosystem?

The term **'ecosystem'** was proposed by A.G. Tansley (1935)

2. Define ecosystem by A.G. Tansley.

A.G. Tansley (1935), defined ecosystem **'as the system resulting from the integration of all the living and nonliving factors of the environment'**.

3. Define ecosystem by Odum.

Odum (1962) defined ecosystem **'as the structural and functional unit of ecology'.**

4. Write the components in Structure of ecosystem.

Ecosystem comprises of i) **Abiotic (non-living) components** ii) **Biotic (living) components**.

5. List out the abiotic (non-living. components

Abiotic components includes climatic factors, edaphic factors, topography, organic components and inorganic substances.

6. List out the climatic factors

air, water, sunlight, rainfall, temperature and humidity.

7. List out the edaphic factors

soil air, soil water and pH of soil.

8. List out the topography

latitude, altitude.

9. List out the organic components

carbohydrates, proteins, lipids and humic substances.

10. List out the inorganic substances

C, H, O, N and P.

11. Abiotic components play vital role in any ecosystem.

12. Define standing quality (or. standing state.

The total inorganic substances present in any ecosystem at a given time is called **standing quality** (or) **standing state**.

13. List out the Biotic (living. components:

It includes all living organisms like plants, animals, fungi and bacteria.

They form the trophic structures of any ecosystem.

14. Classify two components on the basis of nutritional relationships, trophic levels of an ecosystem.

(1) autotrophic components and (2) heterotrophic components.

15. Define photosynthesis

Autotrophs are organisms which can manufacture the organic compounds from simple inorganic components through a process called photosynthesis.

16. Define producers

green plants are the autotrophs and are also called **producers**.

17. Define consumers

The organisms which consume the producers are called **consumers.**

18. What are the divisions of consumers ?

consumers are divided into macro and micro consumers.

19. Define macroconsumers.

Herbivores, carnivores and omnivores(primary, secondary and tertiary consumers) are called **Macroconsumers**.

20. Define microconsumers

Decomposers are called **microconsumers**.

21. Describe decomposers.

Decomposers are organisms that decompose the dead plants and animals to release organic and inorganic nutrients into the environment which are again reused by plants. Example: Bacteria, Actinomycetes and Fungi.

22. Define standing crop

The amount of living materials present in a population at any given time is known as **standing crop**,

23. List any two ways of measuring the Standing crop of a trophic level

Standing crop may be expressed in terms of number or biomass per unit area.

24. Define Biomass

Fresh weight or dry weight or carbon weight of organisms is called **Biomass**.

25. What is the use of biotic components?

Biotic components are essential to construct the food chain, food web and ecological pyramids.

26. Write essential role of sunlight

The essential role of sunlight used by producers of the first trophic level.

The quantity of sunlight is directly proportional to the production of energy by plants.

27. PAR is not always constant-Why

PAR is not always constant because of clouds, tree shades, air, dust particles, seasons, latitudes and length of the daylight availability.

28. Expand PAR

Photosynthetically **A**ctive **R**adiation

29. In which light generally plants absorb more for efficient photosynthesis

Generally plants absorb more blue and red light for efficient photosynthesis.

30. Write the different types of Carbon ?

Green carbon, grey carbon, blue carbon, brown carbon and black carbo**n**

31. What is the green carbon ?

carbon stored in the biosphere (by the process of photosynthesis).

32. What is the grey carbon ?

carbon stored in fossil fuel (coal, oil and biogas deposits in the lithosphere).

33. What is the blue carbon ?

carbon stored in the atmosphere and oceans.

34. What is the brown carbon ?

carbon stored in industrialized forests (wood used in making commercial articles)

35. What is the Black carbon ?

carbon emitted from gas, diesel engine and coal fired power plants.

36. Describe gross primary productivity (GPP.

The total amount of organic matter produced in an ecosystem by photosynthesis is called **gross primary productivity**

37. Write the equation that helps in deriving the net primary productivity of an ecosystem.

NPP = GPP – Respiration

38. Define secondary productivity

The amount of energy stored in the tissues of heterotrophs or consumers is called **secondary productivity**.

39. Define gross secondary productivity

It is equivalent to the total amount of plant material is ingested by the herbivores minus the materials lost as faeces.

40. Define net secondary productivity

Storage of energy or biomass by consumers per unit area per unit time, after respiratory loss is called net secondary productivity.

41. Define community productivity

The rate of net synthesis of organic matter (biomass) by a group of plants per unit area per unit time is known as community productivity.

42. Define trophic level

The position of an organism in the food chain is called trophic level.

The number of trophic levels is equal to the number of steps in the food chain.

43. What are producers ?

- The green plants are called **producers**.
- It occupying the first trophic level (T1)

44. What is ten percent law?

Ten percent law states that only ten percent energy of a trophic level is transferred to the next higher trophic level

45. Name the two types of food chains

There are two types of food chain, 1) Grazing food chain and (2) Detritus food chain.

46. Define ecological pyramid

Graphic representation of the trophic structure and function at successive trophic levels of an ecosystem is

called **ecological pyramid.**

47. Why ecological pyramid also called eltonian pyramids ?

The concept of ecological pyramids was introduced by **Charles Elton 1927)**. Thus they are also called as **Eltonian pyramids**.

48. Name the three types of pyramids

There are three types of pyramids : (1) pyramid of number (2) pyramid of biomass (3) pyramid of energy

49. Define pyramids of number

A graphical representation of the number of organisms present at each successive trophic level in an ecosystem is called **pyramids of number.**

50. What is pyramids of number ?

A graphical representation of the number of organisms present at each successive trophic level in an ecosystem is called **pyramids of number.**

51. What are the three shapes of pyramids ?

There are three different shapes of pyramids upright, spindle an inverted.

52. Why is an earth worm called detrivores ?

This is because earth worm breakdown detritus into smaller particles.

53. Name of some detritivores.

Detritivores are bacteria, fungi and earth worm

54. Name the important steps in the process of decomposition.

Fragmentation, catabolism, leaching or eluviation, humification and mineralisation

55. What are the factors that affecting decomposition?

Decomposition is affected by climatic factors like temperature, soil moisture, soil pH, oxygen and also the chemical quality of detritus.

56. Define biogeochemical cycles

Circulation of nutrients within the ecosystem or biosphere is known as **biogeochemical cycles** and also called as 'cycling of materials.'

57. What is Limnology ?

It is the study of biological, chemical, physical and geological components of inland fresh water aquatic ecosystems (ponds, lakes, etc.).

58. What is Oceanography ?

It is the study of biological, chemical, physical and geological components of ocean.

59. What is benthic ?

The bottom zone of a pond is called as benthic

It is occupied by a community of organisms called benthos (usually decomposers).

60. The primary productivity of littoral and limnetic zone is more than profundal zone-Why ?

The primary productivity through photosynthesis of littoral and limnetic zone is more due to greater penetration of light than the profundal zone.

61. Define flagship species

Some species indicate the health of the ecosystem: such species are called a **flagship species**

62. Define primary succession

The development of plant community on barren area are called primary succession.

63. Define secondary succession

The development of plant community on disturbed area are called secondary succession.

64. Define autogenic succession

The succession is controlled by biotic components of ecosystem are called autogenic succession.

65. Define allogenic succession

Controlled by abiotic components of ecosystem.

66. Where autotrophic succession is occurs.

It occurs in the medium that is rich in inorganic substances.

67. Where heterotrophic succession is occurs.

It occurs in the medium that is rich in organic substances.

68. Define hydrosere

Succession starts in regions where water is plenty are called hydrosere.

Example: Ponds, lakes, stream, swamps.

69. Define mesosere

The succession starts in regions where moisture condition is adequate are called mesosere.

70. Define xerosere

The succession starts in regions where moisture is present in minimal amount with water are called xerosere.

71. Where lithosere is initiating?

The lithosere is initiating on a barren rock

72. Where halosere is initiating?

The halosere is initiating in saline water

73. Where psammosere is initiating?

The psammosere is initiating on a sand

74. Describe plant succession.

The successive replacement of one type of plant community by the other of the same area/ place is known as plant succession.

75. Define pioneers

The first invaded plants in a barren area are called **pioneers**.

76. Define seral communities

A series of transitional developments of plant communities one after another in a given area are called **seral communities**.

77. Define climax community

At the end a final stage and a final plant community gets established which are called as climax and climax community respectively.

78. Define hydrosere

The succession in a freshwater ecosystem is called hydrosere.

PART – C

ADDITIONAL QUESTIONS (3 MARKS)

1. Parallel terms for ecosystem coined by various ecologists

• Biocoenosis	Karl Mobius
• Microcosm	S.A. Forbes
• Geobiocoenosis	V. V. Dokuchaev, G.F. Morozov
• Holocoen	Friederichs
• Biosystem	Thienemann
• Bioenert body	Vernadsky

2. Write the functions of ecosystem

- Energy creation,
- Sharing of energy and
- Cycling of materials between the living and non-living component.

3. Define Photosynthetically Active Radiation.

- The amount of light available for photosynthesis of plants is called **P**hotosynthetically **A**ctive **R**adiation (PAR)
- It is between the range of 400-700 nm wave length.
- It is essential for photosynthesis and plant growth.

4. Describe the unit of PAR ?

- PAR is generally reported as millimoles / square meter / second by using silicon photo voltic detectors.
- It detect only 400 – 700 nm wavelength of light.
- PAR values range from 0 to 3000 millimoles / square meter / second.
- At night PAR is zero.
- During midday in the summer, PAR often reaches 2000 – 3000 millimoles /square meter/ second.

5. Describe productivity of an ecosystem

- The rate of biomass production per unit area in a unit time is called productivity.
- It can be expressed in terms of gm /m_2/year or Kcal/m_2/ year.
- It is classified as given bellow.
- Primary productivity
- Secondary productivity
- Community productivity

6. Describe primary productivity

- The chemical energy generated by autotrophs during the process of photosynthesis and chemosynthesis is called **primary productivity**.
- It is the source of energy for all organisms, from bacteria to human.

7. Differentiate gross primary productivity and net primary productivity

Gross primary productivity(GPP)	Net primary productivity (NPP)
The total amount of organic matter produced in an ecosystem by photosynthesis	The proportion of energy which remains after respiration loss in the plant

8. Describe net primary productivity (NPP. / apparent photosynthesis

- The proportion of energy which remains after respiration loss in the plant is called **net primary productivity**.
- It is also called as apparent photosynthesis.
- NPP = GPP – Respiration
- NPP of whole biosphere is estimated to be about 170 billion tons (dry weight) per year.
- Out of which NPP of oceanic producers is only 55 billion tons per year in unit time.

9. What are the factors that affecting primary productivity

- Primary productivity depends upon the plant species of an area,
- Their photosynthetic capacity,
- Availability of nutrients,
- Solar radiation, precipitation,
- Soil type,
- Topographic factors (altitude, latitude, direction), and
- Other environmental factors.

10. Describe the productivity of different ecosystems

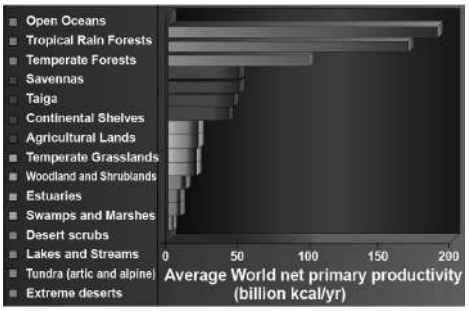
- The primary productivity of an ecosystem is not determined by size and number of population,
- but by the rate of total fixation of radiant energy.

- The average world net primary productivities of open ocean and tropical rain forest are the maximum among aquatic and terrestrial ecosystems respectively.

11. Observe the following graph represents net primary productivity of various ecosystems.

a) In which shows the maximum world net primary productivity.

b) In which shows the minimum world net primary productivity.



12. Describe primary consumers/ Herbivores.

- The plant eaters are called **primary consumers.**
- It also called **Herbivores.**
- It occupies the second trophic level (T2).
- Example : Rabbit

13. Describe secondary consumers/ primary carnivores

- The herbivores are eaten by carnivores are called **secondary consumers.**
- It also called **primary carnivores**.
- It occupies the third trophic level (T3).
- Example : Snake

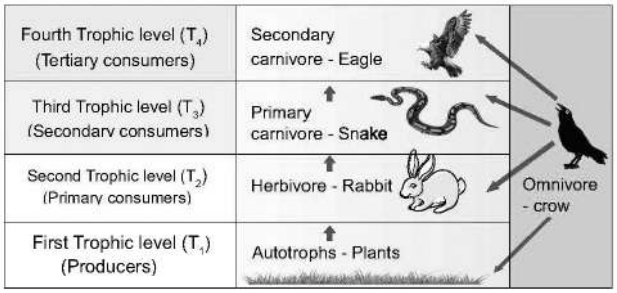
14. Describe tertiary consumers/ secondary carnivores.

- The carnivores are eaten by the other carnivores are called the **tertiary consumers.**
- It also called **secondary carnivores**.
- It occupies the fourth trophic level (T4).
- Example : Eagle

15. Describe omnivores.

- Some organisms which eat both plants and animals are called as **omnivores**
- It occupies more than one trophic level in the food chain.
- Example : Crow

16. Diagramatic representation of various types of trophic levels.



17. Describe energy flow.

- The transfer of energy in an ecosystem between trophic levels are called energy flow.
- It is the key function in an ecosystem.
- The energy obtained from the sun by producer is transferred to consumers and decomposers.
- some amount of energy is dissipated in the form of heat.
- Energy flow is always unidirectional in an ecosystem.

18. Why is meant by saying that energy flow in an ecosystem is unidirectional ?

The energy obtained from the sun by producer is transferred to number of consumers and decomposers which is in one direction i.e energy cannot pass back in a reverse direction.

19. Describe the first law of thermodynamics.Give an example.

- Energy can be transmitted from one system to another in various forms.
- Energy cannot be destroyed or created.
- As a result, the quantity of energy present in the universe is constant.

Example:

- photosynthesis
- The energy stored in starch is acquired from the external sources (light energy)
- There is no gain or loss in total energy.

$$6\,CO_2 + 6\,H_2O \xrightarrow[\text{Chlorophyll}]{\text{light}} C_6H_{12}O_6 + 6\,O_2$$

Light energy $\longrightarrow$ chemical energy

20. Construct a grazing food chain detritus food chain using the following, with four line each.

Earth worm, snake, grass, eagle, Hawk, black bird, fallen leaves, black bird.

Grass → Mouse → Snake → Eagle

Producers | **Primary Consumers** | **Secondary Consumers** | **Tertiary Consumers**

Fallen leaves → Earthworm → Black bird → Hawk

Detritus | **Detritivores** | **Small carnivores** | **Top carnivores**

21. Describe the second law of thermodynamics

- Energy is transferred from one organism to another in the form of food,
- Energy transformation cannot be 100% efficient
- A portion of it is stored as energy in living tissue,
- A large part of energy is dissipated as heat through
- The transfer of energy is irreversible natural process.

  Example: Ten percent law

22. What is Food chain. Give an example.

The movement of energy from produces up to top carnivores is known as **food chain**,

In any food chain, energy flows as follows.

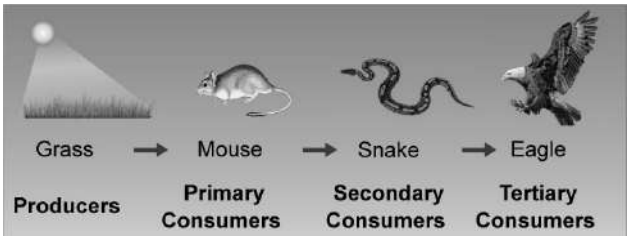
Producers → Primary consumers →

Secondary consumers → Tertiary consumers.

23. Describe the grazing food chain with diagram.

Main source of energy or the grazing food chain is the s**un.**

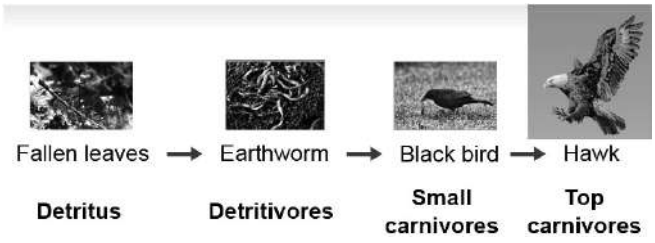
Producers (plants) → Primary consumers (mouse) → (eagle)
Secondary consumers (snake) → Tertiary consumers



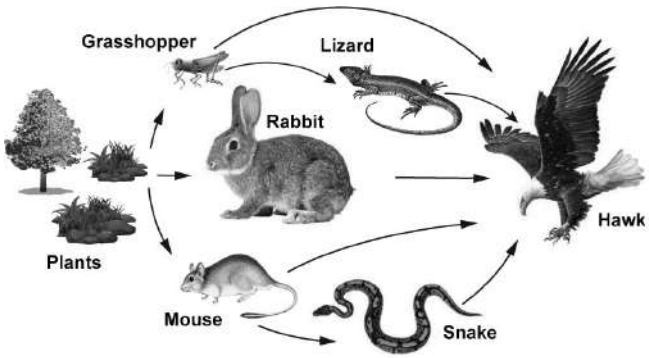
24. Describe the detritus food chain:

- A large amount of organic matter is derived from the dead plants, animals and their excreta.
- Detritus food chain type of food chain is present in all ecosystems.
- The transfer of energy from the dead organic matter, is transferred through a series of organisms called detritus food chain.

Detritus consumers (detritivores) → Small carnivores → Large (top) carnivores with repeated eating



25. Describe food web



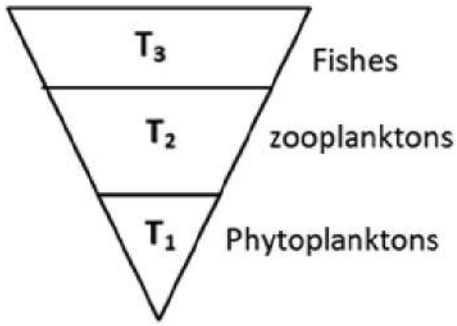
- The inter-locking pattern of a number of food chain form a web like arrangement called food web.
- Food web is the basic unit of an ecosystem.
- It maintain its stability in nature.
- It is called homeostasis.
- **Example:** In a grazing food chain of a grass land, in the absence of a rabbit, a mouse may also eat food grains.
- The mouse in turn may be eaten directly by a hawk or by a snake and the snake may be directly eaten by hawks.

26. Write the significance of food web

- Food web is constructed to describe species interaction called direct interaction.

- It can be used to illustrate indirect interactions among different species.
- It can be used to study bottom- up o top-down control of community structure.
- It can be used to reveal different patterns of energy transfer in terrestrial and aquatic ecosystems.

27. Construct a pyramid of biomass starting with phytoplanktons. Label three trophic levels.Is the pyramid upright or inverted? Why?



The pyramid is inverted. The biomass of the fishes is much more than that of phytoplanktons.

28. Pyramid of biomass of grassland and forest ecosystems are upright-Explain.

- A graphical representation of the amount of organic material (biomass) present at each successive trophic level in an ecosystem is called **pyramid of biomass**.
- In **grassland** and **forest ecosystems**, there is a gradual decrease in biomass of organisms at successive trophic levels from producers to top carnivores (Tertiary consumer).
- Therefore, these two ecosystems show pyramids as **upright** pyramids of biomass.

29. Explain with an example, how the pyramid of biomass can look inverted.

- In **pond ecosystem**, the bottom of the pyramid is occupied by the producers,
- It comprise very small organisms possessing the least biomass.
- so, the value gradually increases towards the tip of the pyramid.
- Therefore, the pyramid of biomass is always **inverted** in shape.

30. Differentiate upright pyramid of biomass and inverted pyramid of biomass with the help of one example each.

Upright pyramid of biomass	Inverted pyramid of biomass
1.The biomass of producers is more than that of consumers. 2.Example : Forest ecosystem	The biomass of producers is less than that of consumers. Example : Aquatic ecosystem

31. Describe decomposition

- The process in which the detritus (dead plants, animals and their excreta) are breakdown in to simple organic matter by the decomposers are called decomposition.
- The process of decomposition varies based on the nature of the organic compounds.
- Some of the compounds like carbohydrate, fat and protein are decomposed rapidly than the cellulose, lignin, chitin, hair and bone.

32. Name the two basic types of biogeochemical cycles.

1. Gaseous cycle – It includes atmospheric Oxygen, Carbon and Nitrogen cycles.
2. Sedimentary cycle – It includes the cycles of Phosphorus, Sulphur and Calcium which are present as sediments of earth**.**

33. Describe the littoral zone

- It is closest to the shore with shallow water region,
- It allows easy penetration of light.
- It is warm and occupied by rooted plant species.

34. Describe the limnetic zone

- It refers the open water of the pond.
- An effective penetration of light and domination of planktons.

35. Describe the profundal zone

- The deeper region of a pond below the limnetic zone.
- No effective light penetration and predominance of heterotrophs.

36. Write the abiotic components of pond ecosystem

- A pond ecosystem consists of dissolved inorganic (CO_2, O_2, Ca, N, Phosphate).
- The organic substances (amino acids and humic acid) formed from the dead organic matter.

37. What are the factors that regulate by the function of pond ecosystem?

A pond ecosystem is regulated by few factors like

- the amount of light,
- temperature,
- pH value of water and
- other climatic conditions.

38. Describe blue carbon ecosystems

- The sea grasses and mangroves of Estuarine and coastal ecosystems are the most efficient in carbon sequestration. Hence, these ecosystems are called as "**Blue carbon ecosystems**".
- They are not properly utilized and maintained all over the world although they have rich bio resources potential.

39. Describe decomposers

- They are also called as microconsumers.
- They help to recycle the nutrients in the ecosystem.
- These are present in mud water and bottom of the ponds.

Example: Bacteria and Fungi

40. Write the benefits of ecosystem

- The ecosystem services are defined as the benefits that people derive from nature.
- "Ecosystem services are the benefits provided to human, through the transformation of resources into a flow of essential goods and services" by Robert Constanza et al (1927).
- An effective tool for gaining knowledge on ecosystem benefits and their sustained use.
- Without such knowledge gain, the fate of any ecosystem will be at stake and the benefits they provide to us in future will become bleak.

41. Write the robert Constanza estimated the value of global ecosystem services based on various parameters.

- According to them in 1997, the average global value of ecosystems services estimated was US $ 33 trillion a year.
- The updated estimate for the total global ecosystem services in 2011 is US $ 125 trillion / year, indicating a four-fold increase in ecosystem services from 1997 to 2011.

42. How to protect the ecosystem?

- It is a practice of protecting ecosystem at individual, organisational and governmental levels for the benefits of both nature and humans.

43. "If we fail to protect environment, we will fail to save posterity"-justify

- Threats to ecosystems are many, like adverse human activities, global warming, pollution, etc.
- Hence, if we change our everyday life style, we can help to protect the planet and its ecosystem.
- "If we fail to protect environment, we will fail to save posterity".

44. Define go green

- It refers to the changing of one's lifestyle for the safety and benefits of the environments (Reduce, Reuse, Recycle)

45. What are the way to go green and save green?

- Close the tap when not in use.
- Switch off the electrical gadgets when not in use.
- Never use plastics and replace them with biodegradable products
- Always use ecofriendly technology and products.

"USE ECOSYSTEM BUT DON'T LOSE ECOSYSTEM; MAKE IT SUSTAINABLE"

46. Describe primary succession

- The development of plant community in a barren area where no community existed before is called primary succession.
- The plants which colonize first in a barren area is called **pioneer species** or **primary community** or **primary colonies**.

- Generally, Primary succession takes a very long time for the occurrence in any region.

Example: Microbes, Lichen, Mosses.

47. Describe secondary succession

- The development of a plant community in an area where an already developed community has been destroyed by some natural disturbance (Fire, flood, human activity) is known as **secondary succession**.
- This succession takes less time than the time taken for primary succession.
- **Example:** The forest destroyed by fire and excessive lumbering may be re-occupied by herbs over period of times.

48. Describe autogenic succession

- The autogenic succession occurs as a result of biotic factors.
- The vegetation reacts with its environment
- It modifies its own environment causing its own replacement by new communities.
- This is known as **autogenic succession**.

Example:

- In forest ecosystem, the larger trees produce broader leaves providing shade to the forest floor area.
- It affects the shrubs and herbs which require more light (heliophytes)
- but supports the shade tolerant species (sciophytes) to grow well.

49. Describe allogenic succession

- It occurs as a result of abiotic factors.
- The replacement of existing community is caused by other external factors (soil erosion, leaching, etc.,) and not by existing organisms.

Example: In a forest ecosystem soil erosion and leaching alter the nutrient value of the soil leading to the change of vegetation in that area.

50. Describe autotrophic succession

- If the autotrophic organisms like green plants are dominant during the early stages of succession
- It is called **autotrophic succession**.
- This occurs in the habitat which is rich in inorganic substances.
- Since, green plants dominate in the beginning of this succession, there is a gradual increase in organic matter and subsequently the energy flow in the ecosystem.

51. Describe heterotrophic succession

- If heterotrophic organisms like bacteria, fungi, actinomycetes, and animals are dominant during the early stages of succession it is called **heterotrophic succession**.
- Such a succession takes place in organic habitats.
- Since heterotrophs dominate in the beginning of such succession, there will be a gradual decrease in the energy content.

52. How do anthropogenic activities affect ecosystem services?

- We all exploit the ecosystem more than that of our needs.
- The Millennium Ecosystem Assessment (2005) found that "over the past 50 years, humans have changed the ecosystem more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, medicine, timber, fiber and fuel."

53. Ecosystem management

- It is a process that integrates ecological, socio economic and institutional factors into a comprehensive strategy in order to sustain and enhance the quality of the ecosystem to meet current and future needs.
- Ecosystem management emphasis on human role in judicious use of ecosystem and for sustained benefits through minimal human impacts on ecosystems.
- Environmental degradation and biodiversity loss will result in depletion of natural resources, ultimately affecting the existence of human

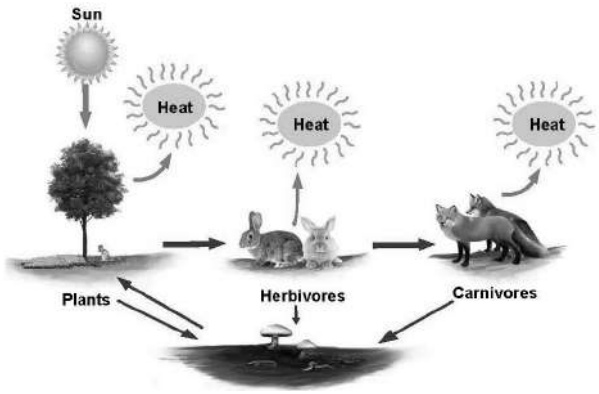
54. What is the IUCN report about water scarcity and forest ?

- By 2025, at least 3.5 billion people, nearly 50% of the world's population are projected to face water scarcity.
- Forests house approximately 50% of global bio-diversity.
- At least 300 million people are dependent on forest's goods and services to sustain their livelihood.

55. Describe ecosystem resilience

- Ecosystem is damaged by disturbances from fire, flood, predation, infection, drought, etc., removing a great amount of biomasss.
- The ecosystem is endowed with the ability to resist the damage and recover quickly.
- This ability of ecosystem is called ecosystem resilience or ecosystem robustness.

56. Draw the diagrammatic representation of energy flow



57. Observe carefully and identify the food chain. Write the schematic representation of the food chain.

The given food chain is a diagrammatic representation of Grazing food chain

The schematic representation of the grazing food chain is

Grass → Mouse → Snake → Eagle

Producers — Primary Consumers — Secondary Consumers — Tertiary Consumers

58. Observe carefully and identify the food chain. Write the schematic representation of the food chain.

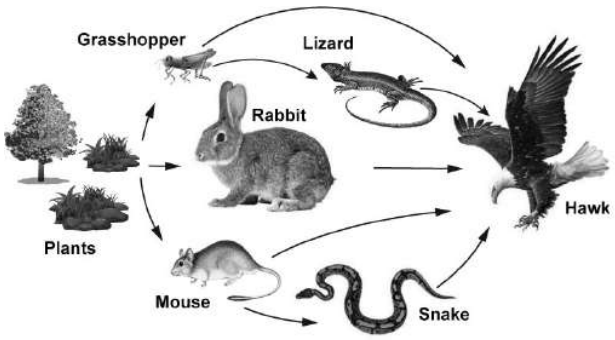
The given food chain is a diagrammatic representation of Detritus food chain.

The schematic representation of the detritus food chain is

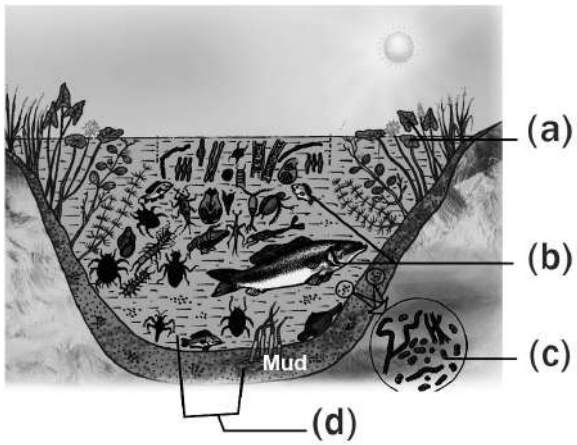
Fallen leaves → Earthworm → Black bird → Hawk

Detritus — Detritivores — Small carnivores — Top carnivores

59. Draw the diagrammatic representation of Food web in a grassland ecosystem



60. Observe carefully and identify the A, B, C and D



A- Producers

B - Consumers

C - Decomposers

D - Abiotic components

61. Explain the distribution of sunlight in the atmosphere.

Of the total sunlight,

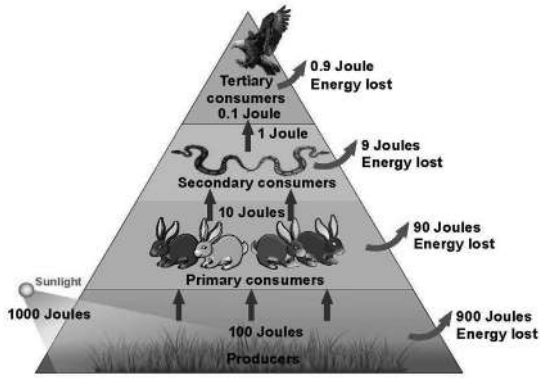
- 34 % that reaching the atmosphere is reflected back into the atmosphere,
- 10% is held by ozone, water vapours and atmospheric gases and the remaining
- 56% reaches the earth's surface.
- Out of this 56%,
- only 2 – 10% of the solar energy is used by green plants for photosynthesis while the remaining portion is dissipated as heat.

PART – D

ADDITIONAL QUESTIONS (5 MARKS)

1. Explain ten percent law with illustration.

- This law was proposed by Lindeman (1942).
- During transfer of food energy from one trophic level to other,
- only about 10% stored at every level.
- The rest of them (90%) is lost in respiration, decomposition and in the form of heat.
- Hence, the law is called **ten percent law.**



- 1000 joules of Solar energy trapped by producers.
- 100 Joules of energy is stored in photosynthesis and the remaining 900 Joules lost in the environment.
- In the next trophic level herbivores, get only 10 Joules of energy and the remaining 90 Joules is lost in the environment.
- In the next trophic level, carnivores, store only 1 joule of energy and the remaining 9 Joule is dissipated.
- Finally tertiary consumes store only 0.1 Joules of energy and the remaining 0.9 Joule is lost in the environment.
- Thus, at the successive trophic level, only ten percent energy is stored.

2. Explain the mechanism of decomposition

Decomposition is a step wise process of degradation mediated by enzymatic reactions.

Detritus acts as a raw material for decomposition.

It occurs in the following steps.

Fragmentation

- The breaking down of detritus into smaller particles by detritivores is known as **fragmentation**.
- These detritivores secrete certain substances to enhance the fragmentation process.
- This increase the surface area of detritus particles.

Catabolism

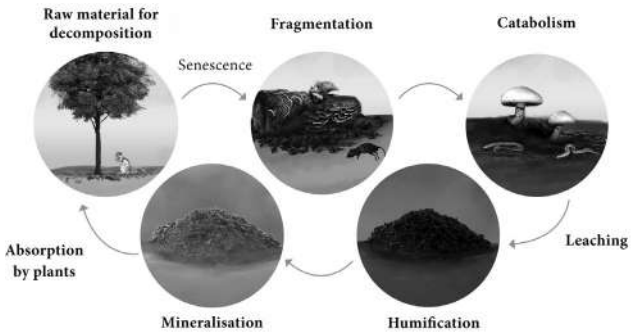
- The decomposers produce some extracellular enzymes in their surroundings to break down complex organic and inorganic compounds in to simpler ones.
- This is called **catabolism**

Leaching or Eluviation

- The movement of decomposed, water soluble organic and inorganic compounds from the surface to the lower layer of soil or the carrying away of the same by water is called **leaching** or **eluviation**.

Humification

- Simplified detritus is changed into dark coloured amorphous substance called **humus**.
- It is highly resistant to microbial action, therefore decomposition is very slow.
- It is the reservoir of nutrients.



Mineralisation

- Some microbes are involved in the release of inorganic nutrients from the humus of the soil, is called **mineralisation**.

Describe fragmentation

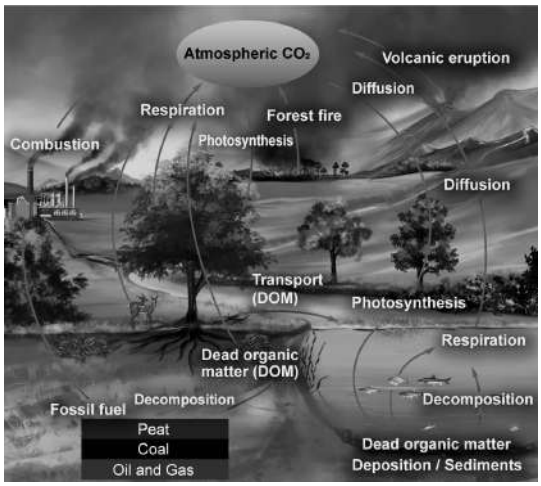
- The breaking down of detritus into smaller particles by detritivores is known as **fragmentation**.
- These detritivores secrete certain substances to enhance the fragmentation process.
- This increase the surface area of detritus particles.

Describe humification

- Simplified detritus is changed into dark coloured amorphous substance called **humus**.
- It is highly resistant to microbial action, therefore decomposition is very slow.
- It is the reservoir of nutrients.

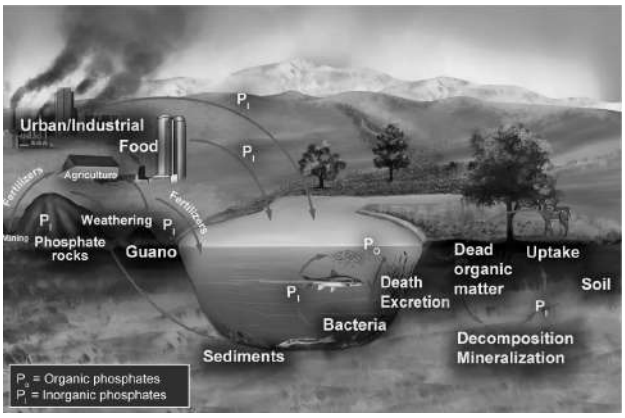
3. Explain carbon cycle

- The circulation of carbon between organisms and environment is known as the **carbon cycle**.
- Carbon is an inevitable part of all biomolecules.
- It is substantially impacted by the change in global climate.
- Cycling of carbon between organisms and atmosphere is a of two reciprocal processes of photosynthesis and respiration.
- The releasing of carbon in the atmosphere increases due to burning of fossile fules, deforestration, forest fire, volcanic eruption and decomposition of dead organic matters.
- The details of carbon cycle are given in the figure.



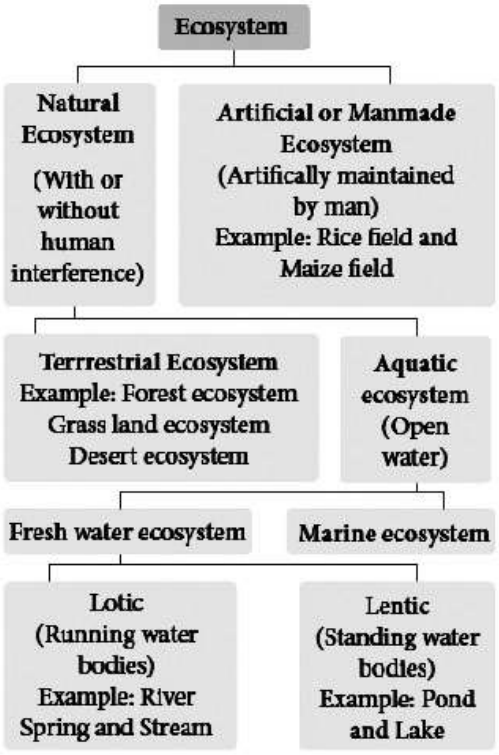
4. Explain phosphorus cycle

- It is a type of sedimentary cycle.
- Phosphorus is found in DNA, RNA, ATP, NADP and phospholipid molecules of living organisms.
- A bulk quantity of phosphorus is present in rock deposits, marine sediments and guano.
- It is released from these deposits by weathering in in phosphorus process.
- After that, it circulates in lithosphere as well as hydrosphere.
- The producers absorb phosphorus in the form of phosphate ions.
- Then it is transferred to each trophic level of food chain through food.
- Again death of the organisms and degradation by the action of decomposers.
- The phosphorus is released back into the lithosphere and hydrosphere to maintain phosphorus cycle.



5. Draw the flow chart of types of ecosystem

Biosphere consists of different types of ecosystems, which are as follows:



6. Give examples of the major producers of a pond ecosystem.

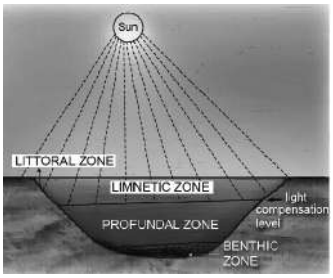
- A variety of phytoplanktons like Oscillatoria, Anabaena, Eudorina, Volvox and Diatoms.
- Filamentous algae such as Ulothrix, Spirogyra, Cladophora and Oedogonium;
- Floating plants Azolla, Salvia, Pistia, Wolffia and Eichhornia;
- Sub-merged plants Potamogeton and Phragmitis;
- Rooted floating plants Nymphaea and Nelumbo; macrophytes like Typha and Ipomoea,

7. Give examples of the major consumers of a pond ecosystem.

- zooplanktons like Paramoecium and Daphnia (primary consumers);
- Benthos (bottom living animals) like mollusces and annelids;
- Secondary consumers like water beetles and frogs; and
- Tertiary consumers (carnivores) like duck, crane and some top carnivores which include large fish, hawk, man, etc.

8. Explain three zones of pond ecosystem

Three zones of pond ecosystem are 1.littoral, 2.limnetic and 3.profundal.



The littoral zone

- It is closest to the shore with shallow water region,
- It allows easy penetration of light.
- It is warm and occupied by rooted plant species.

The limnetic zone

- It refers the open water of the pond.
- An effective penetration of light and domination of planktons.

The profundal zone

- The deeper region of a pond below the limnetic zone.
- No effective light penetration and predominance of heterotrophs.

9. Write the mangrove ecosystem services

- Offers habitat and act as nursery for aquatic plants and animals
- Provides medicine, fuel wood and timber.
- Act as bridge between sea and rivers by balancing sedimentation and soil erosion.
- Help to reduce water force during cyclones, tsunamis and high tide periods.
- Help in wind break, O_2 production, carbon sequestration and prevents salt spray from waves.

10. The varieties of benefits obtained from the ecosystem are generally categorized into the following four types-Explain.

Ecosystem services

Provisoning services	Cultural services	Supporting services	Regulating services
• Food, fiber and fuel	• Spiritual and religious values	• Primary production	• Invasion resistance
• Genetic resources	• Knowledge system	• Provision of habitat	• Herbivory pollination
• Bio-chemicals	• Education and inspiration	• Nutrient cycling	• Seed dispersal
• Fresh water	• Recreation and aesthetic values	• Soil formation and retention	• Climate regulation
• Medicines	• Ecotourism	• Production of atmospherc oxygen	• Pest regulation
		• Water cycling	• Disease regulation
			• Erosion regulation
			• Water purification
			• Natural hazard protection

11. What are the human activities disturb or re-engineer an ecosystem every day?

The following human activities disturb or re-engineer an ecosystem every day.

- Habitat destruction
- Deforestation and over grazing
- Erosion of soils
- Introduction of non-native species
- Over harvesting of plant material
- Pollution of land, water and air
- Run off pesticides, fertilizers and animal wastes

12. Write about the mangrove ecosystem services

- Offers habitat and act as nursery for aquatic plants and animals
- Provides medicine, fuel wood and timber.
- Act as bridge between sea and rivers by balancing sedimentation and soil erosion.
- Help to reduce water force during cyclones, tsunamis and high tide periods.
- Help in wind break, O2 production, carbon sequestration and prevents salt spray from waves.

13. Write the strategy of ecosystem management

- It is used to maintain biodiversity of ecosystems.
- It helps in indicating the damaged ecosystem
- It is used to recognize the inevitability of ecosystem change and plan accordingly.
- It is one of the tools used for achieving sustainability of ecosystem.
- It is also helpful in identifying ecosystems which are in need of rehabilitation.
- It involves collaborative management with government agencies, local population, communities and NGO's.
- It is used to build the capacity of local institutions and community groups to assume responsibility for long term
- implementation of ecosystem management activities even after the completion of the project.

14. Describe urban ecosystem restoration model.

- Adayar Poonga is located in Chennai.
- It covers an area around a total of 358 acres of Adayar creek and estuary.
- 58 acres were taken up for eco restoration under the auspices of Government of Tamil Nadu.
- It is maintained by Chennai Rivers Restoration Trust (CRRT).
- This was a dumping site previously.
- Presently it has 6 species of mangroves, about 170 species of littoral and tropical dry evergreen forests (TDF).
- Restoration of plants species has brought other associated fauna such as butterflies, birds, reptiles, amphibians and other mammals of the ecosystem.
- Adayar Poonga functions as an environmental education Centre for school and college students and the public.
- The entire area stands as one of the best examples for urban eco restoration in the state of Tamil Nadu.

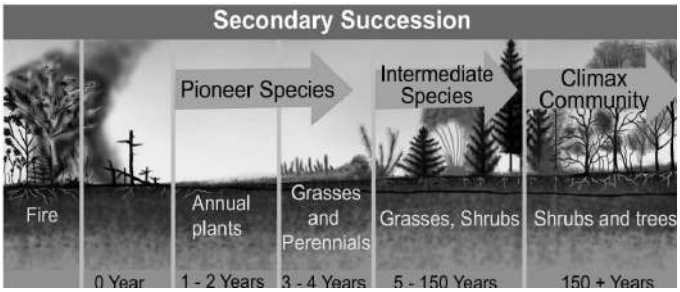
15. Wtite the characteristics of ecological succession

- It is a systematic process which causes changes in specific structure of plant community.
- It is resultant of changes of abiotic and biotic factors.
- It transforms unstable community into a stable community.
- Gradual progression in species diversity, total biomass, niche specialisation, and humus content of soil takes place.
- It progresses from simple food chain to complex food web.
- It modifies the lower and simple life form to the higher life forms.
- It creates inter-dependence of plants and animals.

16. Differences between primary and secondary succession

	Primary succession	Secondary succession
1	Developing in an barren area	Developing in disturbed area
2	Initiated due to a biological or any other external factors	Starts due to external factors only
3	No soil, while primary succession starts	It starts where soil covers is already present
4	Pioneer species come from outside environment	Pioneer species develop from existing environment
5	It takes more time to complete	It takes comparatively less time to complete

17. Draw secondary succession



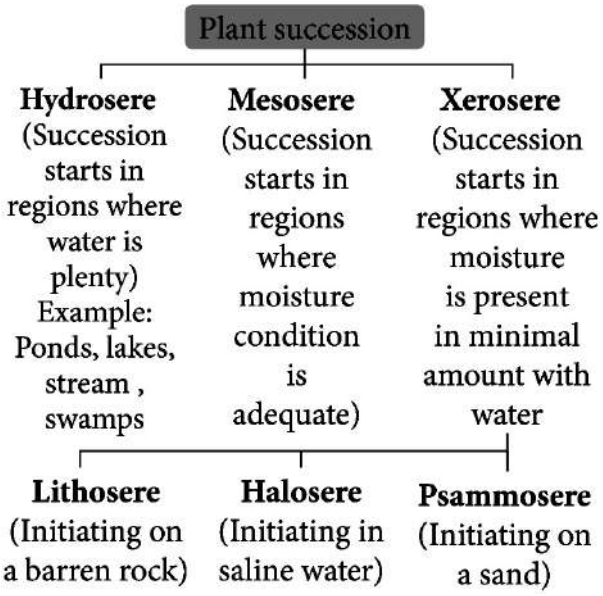
18. Classify briefly about types of succession

v

Types of succession

Primary Succession	Secondary Succession	Autogenic Succession	Allogenic Succession	Autotrophic Succession	Heterotrophic Succession
Development of plant community on barren area.	Development of plant community on disturbed area.	Controlled by biotic components of ecosystem.	Controlled by abiotic components of ecosystem.	It occurs in the medium that is rich in inorganic substances .	It occurs in the medium that is rich in organic substances.

19. Draw the classification of plant succession flow chart.



20. Significance of Plant Succession - List them.

- Succession is a dynamic process.
- An ecologist can access and study the seral stages of a plant community found in a particular area.
- It helps to understand the controlled growth of one or more species in a forest.
- Utilizing the knowledge of succession, even dams can be protected by preventing siltation.
- It gives information about the techniques to be used during reforestation and afforestation.
- It helps in the maintenance of pastures.
- It helps to maintain species diversity in an ecosystem.
- Patterns of diversity during succession are influenced by resource availability and disturbance by various factors.
- Primary succession involves the colonization of habitat of an area devoid of life.
- Secondary succession involves the reestablishment of a plant community in disturbed area or habitat.
- Forests and vegetation that we come across all over the world are the result of plant succession.

UNIT IX : PLANT ECOLOGY

CHAPTER 8

ENVIRONMENTAL ISSUES

POINTS TO REMEMBER

- Environmental issues are the problems and harmful effects created by human's unmindful activity.
- The gases that capture heat are called Green House Gases
- The increasing global temperature due to increased concentration of green house gases is called global warming.
- Methane is 20 times as eff ective as CO_2 at trapping heat in the atomosphere.
- The ozone layer is also called as the ozone shield
- The ozone layer of the troposphere is called bad ozone
- The ozone layer of stratosphere is known as good ozone
- Dobson Unit is the unit of measurement for total ozone
- Total ozone layer over the earth surface is 0.3 centimetres (3 mm) thick and is written as 300 DU.
- The decline in the thickness of the ozone layer over restricted area is called Ozone hole.
- The plant species acts as a measure of environmental conditions are called as plant indicators.
- Agroforestry is an integration of trees, crops and livestock on the same plot of land.
- The production of woody plants combined with pasture is referred to silvopasture system.
- The Tank foreshore plantations have been a major source of firewood in Tamil Nadu.
- The conversion of forested area into a non-forested area is known as deforestation.
- Afforestation is planting of trees where there was no previous tree coverage and the conversion of non-forested lands into forests by planting suitable trees to retrieve the vegetation
- *Eichhornia crassipes* is an invasive weed native to South America.
- *Prosopis juliflora* is an invasive species native to Mexico and South America.
- Chipko Movement by Sundarlal Bahuguna in Mandal village of Chamoli district in 1974.
- Appiko Movement started in Gubbi Gadde a small village near Sirsi in Karnataka by Panduranga Hegde.
- In-situ conservation means conservation and management of genetic resources in their natural habitats.
- Ex-situ conservation is a method of conservation where species are protected outside their natural environment.
- Any species found restricted to a specified geographical area is referred to as endemic.
- There are 3 Megacentres of endemism and 27 microendemic centres in India.
- Carbon capture and storage is a technology of capturing carbon di oxide
- Carbon sequestration occurs naturally by plants and in ocean.
- **Biochar** is another long term method to store carbon.
- Rainwater harvesting is the accumulation and storage of rain water
- Environmental Impact Assessment is an environmental management tool.
- EIA is used to predict the environmental consequences of future proposed developmental projects
- BIA - a decision supporting tool to help biodiversity inclusive of development, planning and implementation.
- GIS is a computer system for capturing, storing, checking and displaying data related to positions on Earth's surface.

PART – A

(1 MARK)

Book Evaluation

1. Which of the following would most likely help to slow down the greenhouse effect.

a) Converting tropical forests into grazing land for cattle.

b) Ensuring that all excess paper packaging is buried to ashes.

c) Redesigning landfill dumps to allow methane to be collected.

d) Promoting the use of private rather than public transport. **Ans :c**

2. With respect to Eichhornia

Statement A: It drains off oxygen from water and is seen growing in standing water.

Statement B: It is an indigenous species of our country.

a) Statement A is correct and Statement B is wrong.

b) Both Statements A and B are correct.

c) Statement A is correct and Statement B is wrong.

d) Both statements A and B are wrong. **Ans :a**

3. Find the wrongly matched pair.

a) Endemism - Species confined to a region and not found anywhere else.

b) Hotspots - Western ghats

c) Ex-situ Conservation - Zoological parks

d) Sacred groves – Saintri hills of Rajasthan

e) Alien sp.Of India - Water hyacinth **Ans :c**

4. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancer?

a) Ammonia b) Methane

c) Nitrous oxide d) Ozone **Ans :d**

5. One green house gas contributes 14% of total global warming and another contributes 6%. These are respectively identified as

a) N20 and CO_2 b) CFCs and N_20

c) CH4 and CO_2 d) CH_4 and CFCS **Ans :b**

6. One of the chief reasons among the following for the depletion in the number of species making endangered is

a) over hunting and poaching

b) green house effect

c) competition and predation

d) habitat destruction **Ans :d**

7. Deforestation means

a) growing plants and trees in an area where there is no forest

b) growing plants and trees in an area where the forest is removed

c) growing plants and trees in a pond

d) removal of plants and trees **Ans :d**

8. Deforestation does not lead to

a) Quick nutrient cycling

b) soil erosion

c) alternation of local weather conditions

d) Destruction of natural habitat weather conditions **Ans :a**

9. The unit for measuring ozone thickness

a) Joule b) Kilos

c) Dobson d) Watt **Ans :c**

10. People's movement for the protection of environment in Sirsi of Karnataka is

a) Chipko movement

b) Amirtha Devi Bishwas movement

c) Appiko movement

d) None of the above **Ans :c**

11. The plants which are grown in silivpasture system are

a) Sesbania and Acacia

b) Solenum and Crotalaria

c) Clitoria and Begonia

d) Teak and sandal **Ans :a**

PART – B,C AND D

TEXTUAL QUESTIONS (2,3 AND 5 MARKS)

12. What is ozone hole?

- The decline in the thickness of the ozone layer over restricted area is called **Ozone** hole.
- This is takes place by chlorofluorocarbons.

13. Give four examples of plants cultivated in commercial agroforestry.

- *Casuarina, Eucalyptus*, Malai Vembu, Teak and Kadambu trees are the plants cultivated in commercial agroforestry.
- They are of great importance to wood-based industries.

14. Expand CCS.

CCS --Carbon Capture and Storage

15. How do forests help in maintaining the climate?

- Forest are a stabilising force for the climate.
- They regulate ecosystems, project biodiversity, play an integral part in carbon cycle , support livelihood and supply goods and services that can drive sustainable growth.
- One third of the carbon di oxide released from burning fossil fuels ,is absorbed by forest every year.
- It reduces the global warming .So forests are most important help in the maintaining the climate.

16. How do sacred groves help in the conservation of biodiversity?

- Sacred groves are the patches of cultivated trees which are community protected.
- They are based on strong religious belief systems.
- They usually have a significant religious connotation for protecting community.
- Each grove is an abode of a deity mostly village God Or Goddesses like Aiyanar or Amman
- Tribals Don't allow anyone to cut even a single branch .
- Sacred groves have been free from all types of exploitation.
- So sacred groves help in the conservation of biodiversity

17. Which one gas is most abundant out of the four commonest greenhouse gases? Discuss the effect of this gas on the growth of plants?

CO_2 (Carbon dioxide) is most abundant greenhouse gases.

Effects on Plants

- Low agricultural productivity in tropics
- Frequent heat waves (Weeds, pests, fungi need warmer temperature)
- Increase of vectors and epidemics
- Strong storms and intense flood damage
- Water crisis and decreased irrigation
- Change in flowering seasons and pollinators
- Change in Species distributional ranges • Species extinction

18. Suggest a solution to water crisis and explain its advantages.

- Rain water harvesting is a solution to water crisis.
- Accumulation and storage of rain water for reuse in-site rather than allowing it to run off is called rainwater harvesting.
- Rainwater can be collected from rivers, roof tops and the water collected is directed to a deep pit.
- The water percolates and gets stored in the pit.
- It is a sustainable water management practice implemented not only in urban area but also in agricultural fields,
- It is an important economical cost effective method for the future.

Environmental advantages of Rain water harvesting

- Promotes adequacy of underground water and water conservation.
- Mitigates the effect of drought.
- Reduces soil erosion as surface run-off is reduced.
- Reduces flood hazards.
- Improves groundwater quality and water table/ decreases salinity.

- No land is wasted for storage purpose and no population displacement is involved.
- Storing water underground is an eco-friendly measure.

19. Explain afforestation with case studies.

- The conversion of non-forested lands into forests by planting suitable trees to retrieve the vegetation is called afforestation.
- **Example**: Slopes of dams afforested to reduce water run-off, erosion and siltation.
- It provides a range of environmental services including carbon sequestration, water retention.
- **The Man who Single Handedly Created a Dense Forest**
- **Jadav "Molai" Payeng** (born 1963) is an environmental activist.
- He has single-handedly planted a forest in the middle of a barren wasteland.
- He is called Forest Man of India.
- He transformed the world's largest river island, Majuli, located in Brahmaputra river, into a dense forest.
- It has rhinos, deers, elephants, tigers and birds.
- Today his forest is larger than Central Park.
- Sudhir Kumar Sopory (former vice-chancellor of Jawahar Lal Nehru University) named Jadav Payeng as **Forest Man of India**, in the month of October 2013.
- He was honoured at the Indian Institute of Forest Management during their annual event 'Coalescence'.
- In 2015, he was honoured with Padma Shri, the fourth highest civilian award in India.
- He received honorary doctorate degree from Assam Agricultural University and Kaziranga University for his contributions

20. What are the effects of deforestation and benefits of agro forestry?

Effects of deforestation

- Burning of forest wood release stored carbon, a negative impact just opposite of carbon sequestration.
- Trees and plants bind the soil particles.
- Increases soil erosion and decreases soil fertility.
- Deforestation in dry areas leads to the formation of deserts.
- The amount of runoff water creates flash flooding, thus reducing moisture and humidity.
- It leads to drought conditions in many regions.
- It triggers adverse climatic conditions and alters water cycle in ecosystem.
- It disturbed and disruption of natural cycles.
- Loss of livelihood for forest dwellers and rural people.
- Increased global warming and account for one-third of total CO_2 emission.
- Loss of life support resources, fuel, medicinal herbs and wild edible fruits

Benefits of agroforestry

- It is an answer to the problem of soil and water conservation.
- To stabilise the soil (salinity and water table) reduce landslide and water run-off problem.
- Nutrient cycling between species improves and organic matter is maintained.
- Trees provide micro climate for crops.
- Maintain O_2 – CO_2 balanced, atmospheric temperature and relative humidity.
- Suitable for dry land. (rainfall is minimum)
- It is a good system for alternate land use pattern.
- Multipurpose tree are used for wood pulp, tanning, paper and firewood industries .Ex *Acacia*.

PART – A

ADDITIONAL QUESTIONS (1 MARK)

1. Renewable source of energy is

a) Petroleum b) Biomass
c) Kerosene d) Coal **Ans: b**

2. A non-renewable resource is

a) renewable non-conventional energy source
b) non-renewable non-conventional energy source
c) renewable conventional energy source
d) non-renewable conventional energy source
Ans: d

3. Deforestation does not lead to

a) alteration of local weather conditions

b) quick nutrient cycling

c) destruction of natural habitat of wild animals

d) soil erosion **Ans: b**

4. Wildlife is destroyed most when

a) its natural habitat is destroyed

b) there is lack of proper care

c) natural calamity

d) mass scale hunting for foreign trade **Ans: a**

5. American water plant that has become a troublesome water weed in India is

a) Trapa latifolia b) Cyperus rotundus

c) Trapa bispinosa d) Eichhornia crassipes

Ans: d

6. Water is a resource

a) renewable

b) nondegradable nonmaintainable

c) non-renewable

d) degradable maintainable **Ans: a**

7. Bulk fixation of carbon through photosynthesis takes place in

a) crop plants

b) tropical rain forests

c) oceans

d) tropical rain forest and crop plants **Ans: c**

8. If the forest cover is reduced to half, what is most likely to happen on a long term basis?

a) Large areas will become deserts

b) Tribals living in these areas will starve to death

c) Crop breeding programmes will suffer due to a reduced availability of variety of germplasm

d) Cattle in these and adjoining areas will die due to lack of fodder **Ans: a**

9. Which of the following is the main factor of desertification?

a) Over- grazing b) Tourism

c) All of these d) Irrigated agriculture

Ans: a

10. At present, the most significant cause of dwindling biodiversity is probably

a) niological magnification of DDT

b) the deterioration of ozone layer

c) global warming

d) the destruction of habitat **Ans: d**

11. MAB stands for

a) Mammals and Biosphere Programme

b) Man and Biology Programme

c) Mammals and Biology Programme

d) Man and Biosphere Programme **Ans: d**

12. In your opinion, which is the most effective way to conserve the plant diversity of an area?

a) By creating botanical garden

b) By tissue culture method

c) By developing seed bank

d) By creating biosphere reserve **Ans: c**

13. An institution where valuable plant material likely to become irretrievably lost in the wild or in cultivation is preserved in a viable condition is known as

a) Gene library b) Genome

c) Gene bank d) Herbarium **Ans: c**

14. One of the most important functions of botanical gardens is that

a) they allow ex-situ conservation of germ plasm

b) they provide a beautiful area for recreation

c) they provide the natural habitat for wildlife

d) one can observe tropical plants there **Ans: a**

15. Diversification in plant life appeared

a) suddenly on earth

b) due to long periods of evolutionary changes

c) by seed dispersal

d) due to abrupt mutations **Ans: b**

16. One of endangered species of Indian medicinal plants is that of

a) Nepenthes b) Ocimum

c) Podophyllum d) Garlic **Ans: c**

17. Which of the following is considered a hot-spot of biodiversity in India?

a) Aravalli Hills b) Indo-Gangetic Plain
c) Western Ghats d) Eastern Ghats **Ans: c**

18. Which one of the following is not included under in-situ conservation?

a) National park b) Botanical garden
c) Sanctuary d) Biosphere reserve
Ans: b

19. Quercus species are the dominant component in

a) Scrub forests b) Temperate deciduous forests
c) Tropical rain forests d) Alpine forests
Ans: b

20. Which one of the following is not observed in biodiversity hotspots?

a) Lesser inter-specific competition
b) Endemism
c) Species richness
d) Accelerated species loss **Ans: d**

21. Eutrophication is often seen in

a) ocean b) deserts
c) mountains d) fresh water lakes
Ans: d

22. Which one of the following is an example of Ex situ conservation?

a) Sacred groves b) Wildlife sanctuary
c) National park d) Seed bank **Ans: d**

23. Sacred groves are specially useful in

a) generating environmental awareness.
b) preventing soil erosion.
c) conserving rare and threatened species.
d) year-round flow of water in rivers. **Ans: c**

24. The highest number of species in the world is represented by

a) Algae b) Fungi
c) Lichens d) Mosses **Ans: b**

25. Which one of the following areas in India, is a hotspot of biodiversity

a) Sunderbans b) Eastern Ghats
c) Western Ghats d) Gangetic Plain **Ans: c**

26. Biodiversity of a geographical region represents

a) genetic diversity present in the dominant species of the region.
b) endangered species found in the region.
c) species endemic to the region.
d) the diversity in the organisms living in the region. **Ans: d**

27. Select the correct statement about biodiversity.

a) Conservation of biodiversity is just a fad pursued by the developed countries.
b) Large scale planting of Bt cotton has no adverse effect on biodiversity.
c) The desert areas of Rajasthan and Gujarat have a very high level of desert animal species as well as numerous rare animals.
d) Western Ghats have a very high degree of species richness and endemism. **Ans: d**

28. Domestic waste constitutes

a) Effluents
b) Nonbiodegradable pollution
c) Air pollution
d) Biodegradable pollution **Ans: d**

29. Green house effect is warming due to

a) Increase in temperature due to increase in carbon dioxide concentration of atmosphere
b) Infra-red rays reaching earth
c) Ozone layer of atmosphere
d) Moisture layer in atmosphere **Ans: a**

30. Which gas contributes most to green house effect?

a) CO_2 b) CFC
c) CH_4 d) Freon **Ans: a**

31. Atmosphere of big/metropolitan cities is polluted most by

a) household waste
b) automobile exhausts
c) radio-active fall-out
d) pesticide residue **Ans: b**

32. Ultraviolet radiations from sunlight causes a reaction that produces

a) Sulphur dioxide b) Fluorides
c) Ozone d) Carbon monoxide
Ans: c

33. Most hazardous metal pollutant of automobile exhausts is

a) Lead b) Mercury
c) Copper d) Cadmium **Ans: a**

34. The major contributor of Green House gases to the atmosphere is

a) Germany b) Russia
c) Brazil. d) U.S.A. **Ans: d**

35. When huge amount of sewage is dumped into a river, its B.O.D, will

a) sharply decrease b) increase
c) remain unchanged d) decrease **Ans: b**

36. The most common indicator organism that represents polluted water is

a) C. vibrio b) E. coli
c) Entamoeba d) P. typhi **Ans: b**

37. Formation of ozone hole is maximum over

a) Antarctica b) India
c) Africa d) Europe **Ans: a**

38.In coming years, skin related disorders will be more common due to

a) water pollution
b) pollutants in air
c) depletion of ozone layer
d) use of detergents **Ans: c**

39. The CO_2 content in the atmospheric air is about

a) 3.34% b) 0.034%
c) 6.5% d) 0.34% **Ans: b**

40. Which important green house gas other than methane is being produced from the agricultural fields?

a) Nitrous oxide b) Sulphur dioxide
c) Arsine d) Ammonia **Ans: a**

41. Which one of the following organisms is used as indicator of water quality?

a) Escherichia b) Chlorella
c) Biggiatoa d) Azospirillum **Ans: a)**

41. Green house effect refers to

a) production of cereals b) cooling of earth
c) warming of earth d) trapping of UV rays
Ans: c

42. Which of the following is the use of lichens in case of pollution?

a) They promote pollution
b) They treat the polluted water
c) Lichens are not related with pollution
d) They act as bioindicators of pollution **Ans: d**

43. Identify the correctly matched pair.

a) Montreal Protocol - Global warming
b) Basal Convention - Biodiversity Conservation
c) Ramsar - Ground water Convention pollution
d) Kyoto Protocol - Climatic change **Ans: d**

44. Which one of the following pairs is mismatched?

a) Solar energy - green house effect
b) Fossil fuel burning - release of CO_2
c) Biomass burning - release of CO_2
d) Nuclear power - radioactive wastes **Ans: a**

45. Which one of the following is the correct percentag of the two (out of the total of 4) green house gases that contribute to the total global warming?

a) N_2O 6%, CO_2 86%
b) CFCs 14%, Methane 20%
c) Methane 20%, N_2O 18%
d) CO_2, 40%, CFCs 30% **Ans: b**

46. Steps taken by the Government of India to control air pollution include

a) use of non-polluting Compressed Natural Gas (CNG) only as fuel by all buses and trucks.
b) compulsory PUC (Pollution Under Control) certification of petrol driven vehicles which tests for carbon monoxide and hydrocarbons.
c) compulsory mixing of 20% ethyl alcohol with petrol and 20% biodiesel with diesel.
d) permission to use only pure diesel with a maximum of 500 ppm sulphur as fuel for vehicles. **Ans: b**

47. Global agreement in specific control strategies to reduce the release of ozone depleting substances, was adopted by

a) The Vienna Convention
b) The Montreal Protocol
c) Rio de Janeiro Conference
d) The Koyoto Protocol **Ans: b**

48. Chipko movement was launched for the protection of

a) wet lands b) forests

c) grasslands d) livestock **Ans: b**

49. Montreal protocol aims at

a) Control of CO_2 emission

b) Biodiversity conservation

c) Reduction of ozone de pleting substances

d) Control of water pollution **Ans: c**

50. Which one of following pairs of gases are the major cause of "Greenhouse effect"?

a) CFCs and SO_2 b) CO_2 and O_3

c) CO_2 and N_2O d) CO_2 and CO **Ans: c**

51. dB is a standard abbreviation used for the quantitative expression of

a) the dominant Bacillus in a culture

b) the density of bacteria in a medium

c) a certain pesticide

d) a particular pollutant **Ans: d**

52. "Good ozone " is found in the

a) stratosphere b) mesosphere

c) ionosphere d) troposphere **Ans: a**

53. Which one of the following is a wrong statement?

a) Greenhouse effect is a natural phenomenon.

b) Most of the forests have been lost in tropical areas.

c) Eutrophication is a natural phenomenon in freshwater bodies.

d) Ozone in upper part of atmosphere is harmful to animals.

Ans: d

54. Climate of the world is threatened by

a) Increasing amount of atmospheric carbondioxide

b) Increasing concentration of atmospheric oxygen

c) Decreasing amount of atmospheric carbondioxide

d) Decreasing amount of atmospheric oxygen

Ans: a

Directions: In the following questions, a statement of assertion is followed by a statement of reason.

Mark the correct choice as:

a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

c) If Assertion is true but Reason is false.

d) If both Assertion and Reason are false

55. Assertion : Presently, the global atmosphere is warming up.

Reason : The depletion of stratospheric ozone layer has resulted in increase in ultraviolet radiations reaching the earth. **Ans :b**

56. Assertion : Deforestation is one main factor contributing to global warming.

Reason : Besides CO_2, two other gases methane and CFCs are also included under green house gases. **Ans :b**

57. Assertion : UV radiation causes photo dissociation of ozone into O2 and O, thus

causing damage to the stratospheric ozone layer.

Reason : Ozone hole is resulting in global warming and climate change. **Ans :c**

58. Assertion : The concentration of methane in the atmosphere has more than doubled in the last 250 years.

Reason : Wetlands and rice fields are the major sources of methane. **Ans :a**

59. Assertion : Chlorofluorocarbons are responsible for ozone depletion.

Reason : Ozone level decreases by as much as 67% every year. **Ans :b**

60. Assertion : Methane, component of green house gases, contributing to global warming is about 20 percent.

Reason : Introduction of multi-point fuel injection engines in automobiles has decreased methane content in the exhausts. **Ans :b**

61. Chipko movement in related to

a) Mishra b) Odum

c) Bahuguna d) Swaminathan **Ans: c**

62. Ozone hole is farmed due to

a) Absence of O_3 in troposphere
b) Absence of O_3 in Stratosphere
c) Deficiency of O_3 in Stratosphere
d) Deficiency of O_3 in troposphere **Ans: c**

63. One of the following is not linked with greenhouse effect

a) Co_2 b) CH_4 c) CPC d) So_2

Ans: d

64. Choose the incorrect Statement

a) Coral bleaching observed in gulf of manner, Tamil Nadu
b) Burning fossil fuel, which releases Co_2 and CH_4
c) Dobson units are used to measure oxygen content.
d) Methane is 20 times as effective as Co_2

Ans: c

65. Bad Ozone is found in

a) Troposphere b) Stratosphere
c) Both a and b d) None of these **Ans: a**

66. Total Ozone layer over the earth surface is

a) 0.3 cm b) 0.2 cm
c) 0.33 cm d) 0.32 cm **Ans: a**

67. World Ozone day celebrated on

a) August 16 b) September 16
c) October 16 d) November 16 **Ans: b**

68. Greenhouse gases

a) Absorb large wave radiation from the earth
b) Are transport to both large and short
c) Absorb solar radiations for warming the atmosphere of earth
d) Are transparent to emissions from the earth for passage into outer space

Ans: a

69. The source of Methane is

a) Paddy cultivation b) Cattle rearing
c) Fossil fuel production d) None of these

Ans: d

70. Which one of the following is not a source of N_2O.

a) Use of fertilizers in agriculture
b) Non-Wetland soils and forest
c) Cars with catalytic converter
d) Burning of organic matter **Ans: b**

71. Chooses the correct statements of global warming effect on plants

i) High agricultural Productivity in tropics
ii) Water crisis and decreased irrigation
iii) Change in flowering seasons and Pollinators
iv) Decrease of vectors and epidemics

a) i, ii, iii and iv b) i, ii, and iii
c) i and iv d) ii and iii **Ans: d**

72. Montreal Protocol (1987) was held in

a) Canada b) France
c) Germany d) Doha **Ans: a**

73. Match the following columns

Column I		Column II	
A)	Lichen, Rose	i)	Nitrate
B)	Petunia, Chrysanthemum	ii)	Flowride
C)	Gladiolus	iii)	Indicator of heavy metal condemnation
D)	Robinia Pseudo acacia	iv)	SO_2 Pollution

A B C D

a) iv i ii iii
b) iii i ii iv
c) iv ii i iii
d) ii i iii iv **Ans: a**

74. An integration of trees, crops and livestock on the same plot of land of land in called

a) Social forestry b) Agroforestry
c) Silvo Pasture d) Afforestation

75. The Production of woody plants combined with forage plants and livestock together called

a) Social forestry b) Silvo Pasture
c) Agroforestry d) None of these.

Ans: b

76. Which of the following is a Live fence of fodder trees and hedges

a) Causuarina b) Ecucalyptus
c) Acacia sp d) Azadirachta sp

Ans: c

77. How many forestry extension contres in Tamil Nadu

a) 33 b) 32 c) 31 d) 30 **Ans: b**

78. The Commission of forested area into a non-forested area is known as

a) Deforestation b) Afforestation
c) Social forestry d) Agroforestry **Ans: a**

79. Identify the correct statements from the below the effects of deforestation

i. Leads to the formation of deserts
ii. Decreased global warming
iii. The amount of runoff water decreases soil erosion
iv. Alter water cycle in eco system

a) i, ii and iii only b) i and iii only
c) i and iv only d) ii, and iii only **Ans: c**

80. Forest man of India

a) Sudir Kumar Sopany
b) sunder lal bahuguna
c) Panduranga hedge
d) Jadav Payeng **Ans: d**

81. Which of the following creates a breeding habit for disease causing mosquitoes.

a) Eichhornia b) Prosopis
c) Melia d) Bamboo

Ans: a

82. Appiko movement is started in

a) Himalaya b) Karnataka
c) Kerala d) Himachal Pradesh

Ans: b

83. Main aim of chipko movement was to give a slogan of

a) 5 F's b) 4 F's c) 3 F's d) 2 F's

Ans: a

84. Appiko movement started by

a) Sundarlar Bahuguna b) Panduranga hedge
c) Odum d) Mishra **Ans: b**

85. The endemic and threatened species can be protected by

a) Germplasm conservation
b) in situ,
c) in-vitro
d) all of these **Ans: d**

86. The following one is not an in-situ conservation

a) Sathyamangalam wild life
b) Banagudi shola
c) Periyar National Park
d) Agasthyamalai **Ans: b**

87. How many sacred groves were documented throughout Tamil Nadu

a) 446 b) 448 c) 445 d) 443

Ans: b

88. One of the following is not a sacred groves

a) Gulf of Manner b) Thirukarungudi
c) Udaiyankudikadu d) Banagudi shola

Ans: a

89. The Method of conservation where species are produced outside their natural environment

a) In-situ conservation b) Ex-situ conservation
c) Sacred grooves d) Endemic plants

Ans: b

90. Member of Mega centres of endemism and micro endemic centres in India are

a) 3 and 26 b) 3 and 28
c) 3 and 27 d) 3 and 25 **Ans: c**

91. The following is the good examples if endamic plants

a) Hardwickia binata b) Bentinckia Condapanna
c) both a and b d) None of these

Ans: c

92. The large percentage of endemic species are

a) Trees b) Shrubs
c) herbs d) Twinners **Ans: c**

93. A large percentage of endemic species not belongs to the following family

a) Apiaceae b) Asteraceae
c) Orchidaceae d) Apocyanaceae **Ans: d**

94. Which one of the following is not a Co_2 requestration

a) Chlorella b) Chroococcus
c) Chlamydomonas d) Eugenia **Ans: d**

95. Example for the carbon sink is

a) Forest b) Ocean
c) Soil d) all of these **Ans: d**

96. Choose the correct statement regarding the environmental benefits of rain water harvesting

i. Increases flood hazards
ii. Improve ground water
iii. Reduce soil erosion
iv. Reduce the effect of drought

a) i, ii, and iii b) ii,iii and iv
c) ii, iii and I d) i,ii and iii **Ans: b**

97. Match the following

A) INSAT 3 DR	i) Earth Observation
B) CARTOSAT-2	ii) Communication
C) GSAT-6A	iii) Border Surveillance
D) CARTO SAT-2 (100^{th} Satellite)	iv) Diaster Management

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

Ans: c

98. Lichens are the plant indications for

a) Nitrate Pollution
b) Flouride pollution
c) Heavy metal contamination
d) So_2 Pollution **Ans: d**

99. Black locust tree is the indicators for

a) Nitrate Pollution
b) Flouride Pollution
c) Heavy metal contamination
d) So_2 Pollution **Ans: c**

100. Gladiolus is the indicators for

a) Nitrate Pollution
b) Flouride Pollution
c) Heavy metal contamination
d) So_2 Pollution **Ans: b**

101. How many plant species are identified as commercial timbers in agroforestry

a) 20 b) 30 c) 40 d) 50 **Ans: a**

PART – B

ADDITIONAL QUESTIONS (2 MARKS)

1. Define environmental issues

The problems and harmful effects created by human's unmindful activity and over utilisation of valuable resources obtained from the nature (environment) are called Environmental issues.

2. What is meant by greenhouse effect ?

Radiant heat from the sun is captured by gases in the atmosphere that increase the temperature of the earth ultimately called greenhouse effect.

3. What are greenhouse gases ?

The gases that capture heat are called **Green House Gases.**

4. Name the greenhouse gases in the atmosphere

carbon dioxide (CO_2), methane (CH_4), Nitrous Oxide (N_{2O}) and a variety of manufactured chemicals like chlorofluorocarbon (CFC).

5. Define coral bleaching

Coral ecosystem is affected by increase in temperature is called Coral bleaching.

It is observed in Gulf of Mannar, Tamil Nadu.

6. What is global warming?

The increase of global temperature due to increased concentration of greenhouse gases is called **global warming.**

7. Describe the major cause of global warming

Over population which creates growing need for food, fibre and fuel and considered to be the major cause of global warming

8. What is called ozone shield? Write their use.

The ozone layer is called as the **ozone shield**

It acts as a protective shield, cutting the ultra-violet radiation emitted by the sun.

9. Name two layers that just above the atmosphere ?

Just above the atmosphere two layers are

1.troposphere (the lower layer) and

2.stratosphere (the upper layer).

10. What is meant by bad ozone?

The ozone layer of the troposphere is called **bad ozone**

11. What is meant by good ozone?

The ozone layer of stratosphere is known as **good ozone**

12. Define dobson units

The thickness of the ozone column of the atmosphere is measured in terms of **Dobson Units**.

13. Which chemical that damage the ozone shield?

The ozone shield is damaged by chemicals released on the Earth's surface i.e chlorofluorocarbons.

14. Write the source of chlorofluorocarbons

Source of chlorofluorocarbons are refrigeration, aerosols, chemicals used as cleaners in many industries.

15. Define ozone hole

The decline in the thickness of the ozone layer over restricted area is called **Ozone hole.**

16. When is world ozone day celebrated ?

September 16 is World ozone day

17. What is the results of ozone depletion ?

Ozone depletion in the stratosphere results in more UV radiations especially UV B radiations (shortwaves).

18. What are the effects of UV B radiations?

UV B radiation destroys biomolecules (skin ageing) and damages living tissues.

19. What is UV C ?

UV C is the most damaging type of UV radiation.

But it is completely filtered by the atmosphere (ozone layer).

20. Describe UV radiation

- UV – contribute 95% of UV radiation.
- It causes tanning burning of skin and enhancing skin cancer.

Hence the uniform ozone layer is critical for the wellbeing of life on earth.

21. Mention the use of CDM project

The countries to reduce or limit emission and stimulate sustainable development.

22. Define plant indicators

The plant species or plant community acts as a measure of environmental conditions, it is referred as biological indicators or phyto indicators or plant indicators.

23. Define agro forestry

An integration of trees, crops and livestock on the same plot of land are called Agroforestry .

24. Write the benefits of forest

Forests provide us many benefits including goods such as timber, paper, medicine and industrial products.

25. Define afforestation

The conversion of non-forested lands into forests by planting suitable trees to retrieve the vegetation is called afforestation.

26. What is invasive species?

A non-native species to the country under consideration that spreads naturally, interferes with the biology and existence of native species,

27. How is the endemic and threatened species can be protected ?

By employing conservation management strategies like germplasm conservation, in situ, ex-situ, in-vitro methods, the endemic as well as threatened species can be protected.

28. Write the main aim of Chipko movement

- To give a slogan of five F's – Food, Fodder, Fuel, Fibre and Fertilizer.
- To make the communities self-sufficient in all their basic needs.

29. Define In-situ conservation

Conservation and management of genetic resources in their natural habitats are called In-situ conservation

30. Define Ex-situ conservation

The conservation where species are protected outside their natural environment are called Ex-situ conservation.

31. Define endemic plants

Any species found restricted to a specified geographical area is referred to as Endemic plants

32. Name the families contains more endemic species

The endemic species belong to families such as Poaceae. Apiaceae, Asteraceae and Orchidaceae.

33. Name the some micro algae involved in CO_2 sequestration.

The micro algae involved in CO2 sequestration are the species of *Chlorella*, *Scenedesmus*, *Chroococcus* and *Chlamydomonas*.

34. Name the some trees and other plants involved in CO_2 sequestration.

Trees involved in CO_2 sequestration are *Eugenia caryophyllata*, *Tecomastans*, *Cinnamomum verum*.

Macro algae and marine grasses and mangroves are also have ability to reduce carbon-di-oxide.

35. What is rainwater harvesting ?

The accumulation and storage of rain water for reuse in-site rather than allowing it to run off is called rainwater harvesting.

36. What are the point sources of CO_2 ?

The point sources of CO_2 are industries and power plants.

37. What meant by geological sequestration ?

An injecting CO_2 directly into the underground geological formations are called geological sequestration.

38. Define carbon foot print (CFP)

The total amount of greenhouse gases produced by human activities such as agriculture, industries, deforestation, waste disposal, burning fossil fuels directly or indirectly are called **carbon foot print**.

39. If you buy imported fruit like kiwi, indirectly it increases CFP. How?

The fruit has travelled a long distance in shipping or airliner thus emitting tons of CO_2

40. What is meant by biomonitoring?

The observing and assessing the current state and on going changes in ecosystem, biodiversity components, landscape including natural habitats, populations and species are called biomonitoring.

41. What is geographic information system

GIS is a computer system for capturing, storing, checking and displaying data related to positions on Earth's surface.

42. What is remote sensing

The detecting and monitoring the physical characteristics of an area is called Remote Sensing.

43. Define biodiversity impact assessment (BIA)

A decision supporting tool to help biodiversity inclusive of development, planning and implementation are called biodiversity impact assessment.

PART – C

ADDITIONAL QUESTIONS (3 MARKS)

1. Write the human activities lead to produce the greenhouse effect

- The burning fossil fuels, It releases CO_2 and CH_4
- The way of Agriculture and animal husbandry practices
- The chlorofluoro carbons released by refrigerator and air conditioners.
- The fertilizers used in Agriculture these release N_2O
- The emissions from automobiles.

2. Mention the effects of global warming

- Rising sea cause submergence of many coastal cities in many parts of the world.
- Drastic change in weather patterns bringing more floods or droughts in some areas.
- Biological diversity may get modified, some species ranges get redefined.
- Tropics and sub-tropics may face the problem of decreased food production.

3. Describe the sources of green house gases emission (Natural and Anthropogenic) CO_2

- Coal based power plants and fossil fuels for electricity generation.
- Combustion of fuels in the engines of automobiles, commercial vehicles and air planes.
- Agricultural practices like stubble burning result in emission of CO_2.
- Natural from organic matter, volcanoes, warm oceans and sediments.

4. Write the sources of methane.

- Paddy cultivation,
- Cattle rearing,
- Bacteria in water bodies,
- Fossil fuel production,
- Ocean,
- Non-wetland soils and
- Forest / wild fires.

5. Mention the man-made sources of nitrous oxide (N_2O)

- Nylon and nitric acid production,
- Use of fertilizers in agriculture,
- Cars with catalytic converter and
- Burning of organic matter are the man-made sources of nitrous oxide.

6. Write the strategies to deal with Global Warming

- Increasing the vegetation cover, grow more trees
- Reducing the use of fossil fuels and greenhouse gases
- Developing alternate renewable sources of energy
- Minimising uses of nitrogeneous fertilizers, and aerosols.

7. What is meant by good ozone? Write their uses.

- The ozone layer of stratosphere is known as **good ozone**
- This layer acts as a shield for absorbing the UV radiations coming from the sun.
- UV radiations is harmful for living organisms causing DNA damage.

8. Write the main goal of montreal protocol

The main goal of montreal protocol is

- Gradually eliminating the production and consumption of ozone depleting substances
- To limit their damage on the Earth's ozone layer.

9. Describe ozone

- The ozone is a colourless gas, reacts readily with air pollutants.
- It causes rubber to crack, hurt plant life, damages lung tissues.
- But ozone absorbs harmful ultra violet β (uv-β) and UV – α radiation from sunlight.

10. Describe kyoto protocoland write their objectives .

The clean Development Mechanism (CDM) is also defined in the Kyoto protocol (2007)

It provides project based mechanisms.

The two objectives are

1). To prevent dangerous climate change

2). To reduce greenhouse gas emissions.

11. Which helps to reach meeting kyoto targets

- The replacement of conventional electrification projects with solar panels or other energy efficient boilers.
- Such projects can earn Certified Emission Reduction (CER) with credits / scores,
- each equivalent to one tonne of CO_2, which can be counted towards meeting Kyoto targets.

12. Describe agro forestry

- An integration of trees, crops and livestock on the same plot of land are called Agroforestry.
- The main objective is on the interaction among them.
- Example:
- Intercropping of two or more crops, results in higher yielding and reducing the operation costs.
- This intentional combination of agriculture and forestry increased bio-diversity and reduced erosion.

13. Mention the recommendation of agro-forestry.

Agro-forestry is recommended for the following purposes.

- Farm Forestry for the extension of forests,
- mixed forestry,
- shelter belts and
- linear strip plantation.

14. Define deforestation. Which enhance this ?

- The conversion of forested area into a non-forested area is known as deforestation.
- Greenhouse effect and global warming enhance deforestation

15. Enumerate the causes of deforestation

- The conversion of forests into agricultural plantation and livestock ranching.
- Logging for timber
- Developmental activities like road construction, electric tower lines and dams.
- Over population, Industrialisation, urbanisation and increased global needs.

16. Write the effects of alien invasive species

- Invasion of alien or introduced species
- Disrupts ecosystem processes,
- Threaten biodiversity,
- Reduce native herbs and
- Reducing the ecosystem services (benefits).

17. Mention the main features of Chipko movement

- This movement remained non political
- It was a voluntary movement based on Gandhian thought.
- It was concerned with the ecological balance of nature

18. Describe appiko movement

- The famous Chipko Andolen of Uttarakhand in the Himalayas inspired the villagers of Uttar Karnataka to launch a similar movement to save their forests.
- This movement started in Gubbi Gadde a small village near Sirsi in Karnataka by Panduranga Hegde.
- This movement started to protest against felling of trees, monoculture, forest policy and deforestation.

19. Write the biosphere reserves of Tamil Nadu

- Megamalai, Sathyamangalam wildlife, Guindy and Periyar National park, and Western ghats, Nilgiris, Agasthyamalai and Gulf of Mannar are the biosphere reserves of Tamil Nadu.

20. Name the detailed floristic and faunistic regions of sacred groves

- Banagudi shola, Thirukurungudi and Udaiyankudikadu, Sittannnavasal, Puthupet and Devadanam are the 6 groves were detailed floristic and faunistic studies.

21. Describe Ex-situ conservation

- It is a method of conservation where species are protected outside their natural environment.
- This includes establishment of botanical gardens, zoological parks, conservation strategies such as gene, pollen, seed, in-vitro conservation, cryo preservation, seedling, tissue culture and DNA banks.
- These facilities not only provide housing and care for endangered species, but also have educational and recreational values for the society

22. Listout the endemic plants and their mame of endemic centre

Endemic plants	Habit	Name of endemic centre
Baccaurea courtallensis	Tree	Southern Western Ghats
Agasthiyamalaia pauciflora	Tree	Peninsular india
Hardwickia binata	Tree	Peninsular and northern India
Bentinckia condappana	Tree	Western ghats of Tamil Nadu and kerala
Nepenthes khasiyana	Liana	Khasi hills, Meghalaya

23. Describe carbon capture and storage (CCS)

- It is a technology of capturing carbon di oxide.
- Co_2 injects deep into the underground rocks into a depth of 1 km or more.
- It is an approach to reduce global warming.

24. Name the various safe sites of permanent storage in various deep geological formations

The various safe sites of permanent storage in various deep geological formations are

- Liquid storage in the Ocean
- Solid storage by reduction of CO_2 with metal oxide to produce stable carbonates.

25. Write some suggested geological sequestration sites

Some suggested geological sequestration sites are

- Declining oil fields,
- Gas fields saline aquifers and
- Unmineable coal.

26. Describe carbon sequestration

- Carbon sequestration is the process of capturing and storing CO_2.
- It reduces the amount of CO_2 in the atmosphere.
- A goal of Carbon sequestration is reducing global climate change.
- Carbon sequestration occurs naturally by plants and in ocean .
- Terrestrially by forest and soil conservation practices.

27. Describe carbon foot print (CFP)

- The total amount of greenhouse gases produced by human activities such as agriculture, industries, deforestation, waste disposal, burning fossil fuels directly or indirectly are called **carbon foot print**.
- It can be measured for an individual, family, organisation like industries, state level or national level.
- It is estimated and expressed in equivalent tons of CO_2 per year.
- The burning of fossil fuels releases CO_2 and other greenhouse gases.

28. Mention the causes of increasing the global temperature

- Ice melting,
- Submerging of low lying areas
- Imbalance in nature like cyclones, tsunamis and extreme weather conditions.

29. What is carbon sink and give an example

- Any system having the capacity to accumulate more atmospheric carbon during a given time interval than releasing CO_2.
- Example: forest, soil, ocean are natural sinks. Landfills are artificial sinks.

30. Describe rain water harvesting

- Accumulation and storage of rain water for reuse in-site rather than allowing it to run off is called rainwater harvesting.
- The rainwater can be collected from rivers, roof tops and the water collected is directed to a deep pit.
- The water percolates and gets stored in the pit.
- It is a sustainable water management practice implemented not only in urban area but also in agricultural fields,
- It is an important economical cost effective method for the future.

31. List out the importance of Lakes

- They strengthen our economy as well as our quality of life like health.
- The provides drinking water, improves ground water level and preserve the fresh water bio-diversity and habitat of the area.
- It offers sustainable solutions of water management and climatic influences.
- Other benefits are nutrient retention, influencing local rainfall, removal of pollutants, phosphorous and nitrogen and carbon sequestration.

32. Write the benefits of Environmental Impact Assessment (EIA) to society

- A healthier environment
- Maintenance of biodiversity
- Decreased resource usage
- Reduction in gas emission and environment damage

33. Enumerate the uses of biodiversity impact assessment (BIA)

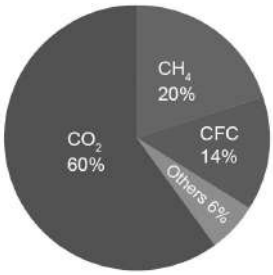
Change in land use and cover

- Fragmentation and isolation
- Extraction
- External inputs such as emissions, effluents and chemicals
- Introduction of invasive, alien or genetically modified species
- Impact on endemic and threatened flora and fauna.

34. Observe the given diagram and answer the question given below

a) Which one of the gas is most abundant greenhouse gases?

b) What is the percentage of CFC?



a) CO_2 gas is most abundant greenhouse gases

b) The percentage of CFC is 14%

PART – D

ADDITIONAL QUESTIONS (5 MARKS)

1. Write some of the environmental issues threatening our biosphere

- Over population
- Ozone depletion
- Climate change
- De-forestation
- Health issues
- Waste disposal
- All types of pollution
- Green House gases
- Water, energy, food scarcity
- Industrialisation and urbanisation impacts

are some of the environmental issues threatening our biosphere.

2. What is Dobson Unit? Explain

- DU is the unit of measurement for total ozone.
- One DU (0.001 atm. cm) is the number of molecules of ozone that would be required to create a layer of pure ozone 0.01 millimetre thick at a temperature of 0° C and a pressure of 1 atmosphere (atm = the air pressure at the surface of earth).
- Total ozone layer over the earth surface is 0.3 centrimetres (3 mm) thick and is written as 300 DU.
- The false colour view of total ozone - The purple and blue colours are where there is the least ozone.
- The yellows and reds are where there is more ozone.

3. Define plant indicators and give any three examples.

The plant species or plant community acts as a measure of environmental conditions, it is referred as biological indicators or phyto indicators or plant indicators. **Examples**

	Plants	Indicator for
1	*Lichens, Ficus, Pinus,* Rose	SO_2 pollution
2.	*Petunia, Chrysanthemum*	Nitrate
3.	*Gladiolus*	Flouride pollution
4.	*Robinia pseudoacacia (Black locust tree)*	Indicator of heavy metal contamination

4. Enumerate the effects of Ozone depletion in animals.

- The main ozone depletion effects are:
- Increases the incidence of cataract,
- Throat and lung irritation and
- Aggravation of asthma or emphysema,
- Skin cancer ,
- Diminishing the functioning of immune system in human beings.
- Juvenile mortality of animals.
- Increased incidence of mutations.

5. List out the effects of Ozone depletion in plants

- Photosynthesis will be inhibited.
- Decreased photosynthesis will increased atmospheric CO_2.
- It results global warming and shortage of food leading to food crisis.
- Increase in temperature changes the climate and rainfall pattern.
- Result in flood / drought, sea water rise, imbalance in ecosystems affecting flora and fauna.

6. Explain about rehabilitation of degraded forests and recreation forestry.

- The production of woody plants combined with pasture is referred to **silvopasture** system.
- The trees and shrubs may be used primarily to produce fodder for livestock.
- They may be grown for timber, fuel wood and fruit or to improve the soil.

This system is classified into following categories.

i. **Protein Bank:**

Various multipurpose trees are planted in and around farm lands. This mainly for fodder production.

Example: *Acacia nilotica, Albizzia lebbek, Azadirachta indica, Gliricidia sepium, Sesbania grandiflora.*

ii. **Livefence of fodder trees and hedges:**

Various fodder trees and hedges are planted as live fence to protect the property from stray animals.

Example: *Gliricidia sepium, Sesbania grandiflora, Erythrina* spp., *Acacia* spp..

7. Mention the goals of social forestry

- Climate carbon sequestration,
- Change mitigation,
- Depollution,
- Deforestation,
- Forest restoration and
- Providing indirect employment opportunity for the youth.

8. Explain social forestry

- Management of forests and afforestation on barren lands.
- It is the purpose of helping the environmental, social and rural development and benefits.
- It is done for the benefit of people.
- Trees grown outside forests by government and public organisation reduce the pressure on forests.
- Tree cultivation in private lands was implemented in the state from 2007-08 to 2011-12.
- It was implemented by carrying out block planting and inter-crop planting.
- The profitable tree species like Teak, *Casuarina, Ailanthus*, Silver Oak, etc. are planting in the farming lands.
- The **Tank foreshore plantations** have been a major source of firewood in Tamil Nadu.
- The 32 **Forestry extension centres** for tree growing in rural areas in Tamil Nadu.
- These centres provide quality tree seedlings like thorn / thornless .
- Example :Bamboo, *casuarinas*, teak, neem, *Melia dubia*, grafted tamarind and nelli, etc.
- To creating awareness among students by training / camps.

9. Write the major activities of forestry extension centres

- Training on tree growing methods
- Publicity and propaganda regarding tree growing
- Formation of demonstration plots
- Raising and supply of seedlings on subsidy
- Awareness creation among school children and youth through training and camps.

10. List out the afforestation Objectives

- increases O_2 production and air quality.
- increase carbon fixation and reducing CO_2 from atmosphere.
- Raising bamboo plantations.
- Mixed plantations of minor forest produce and medicinal plants.
- Regeneration of indigenous herbs / shrubs.
- Awareness creation, monitoring and evaluation.
- To increase the level and availability of ground water.
- To reduce nitrogen leaching in soil.
- It making pure not polluted with nitrogen.
- Nature aided artificial regeneration.

11. Write the achievements of afforestation

- Degraded forests were restored
- Community assets like overhead tanks bore-wells, hand pumps, community halls, libraries, etc were established
- Environmental and ecological stability was maintained.
- Conserved bio-diversity, wildlife and genetic resources.
- Involvement of community especially women in forest management.

12. According to World Conservation Union invasive alien species are the second most significant threat to bio-diversity –Justify your answer.

- During eradication of these species, the chemicals used increases greenhouse gases.
- Slowly the chemicals alter ecosystem, micro climate and nature of soil.
- This make unsuitable for native species.
- Create human health problems like allergy, thus resulting in local environmental degradation and loss of important local species.

- According to World Conservation Union invasive alien species are the second most significant threat to bio-diversity after habitat loss.

13. Explain invasive species?

- A non-native species to the country under consideration that spreads naturally, interferes with the biology and existence of native species,
- It poses a serious threat to the ecosystem and causes economic loss.
- These are accidental introduction through ports via air or sea.
- It gets introduced through import germ plasm.
- Alien species with edible fruits are usually spread by birds.
- Invasive species are fast growing and are more adapted.
- They alter the soil system by changing litter quality thereby affecting the soil community, soil fauna and the ecosystem processes.
- It has a negative impact on decomposition in the soils by causing stress to the neighbouring native species.

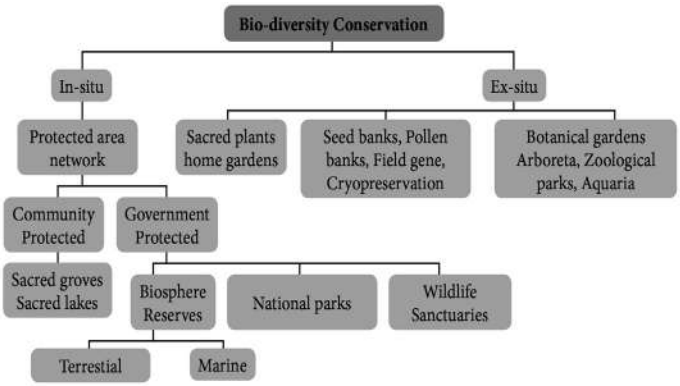
14. Describe an invasive weed Eichhornia crassipes.

- It is an invasive weed native to South America.
- It was introduced as aquatic ornamental plant.
- It grows faster throughout the year.
- Its widespread growth is a major cause of biodiversity loss worldwide.
- It affects the growth of phytoplanktons and finally changing the aquatic ecosystem.
- It also decreases the oxygen content of the water bodies which leads to eutrophication.
- It poses a threat to human health.
- because it creates a breeding habitat for disease causing mosquitoes (particularly Anopheles) and snails
- It also blocks sunlight entering deep and the waterways hampering agriculture, fisheries, recreation and hydropower.

15. Describe an invasive weed Prosopis juliflora

- *It* is an invasive species native to Mexico and South America.
- It was first introduced in Gujarat and later on in Andhra Pradesh, Tamil Nadu as a source of firewood.
- It is an aggressive coloniser and as a consequence the habitats are rapidly covered by this species.
- Its invasion reduced the cover of native medicinal herbaceous species.
- It is used to arrest wind erosion and stabilize sand dunes on coastal and desert areas.
- It can absorb hazardous chemicals from soil and it is the main source of charcoal.

16. Draw the flow chart of Biodiversity conservation.



17. Explain about chipko movement.

- The tribal women of Himalayas protested against the exploitation of forests in 1972.
- 1974 it transformed into **Chipko Movement** by **Sundarlal Bahuguna** in Mandal village of Chamoli district.
- People protested by hugging trees together which were felled by a sports goods company.

Main features of Chipko movement

- This movement remained non political
- It was a voluntary movement based on Gandhian thought.
- It was concerned with the ecological balance of nature

Main aim of Chipko movement

- To give a slogan of five F's – Food, Fodder, Fuel, Fibre and Fertilizer.
- To make the communities self-sufficient in all their basic needs.

18. Describe In-situ conservation

- Conservation and management of genetic resources in their natural habitats are called **In-situ conservation**
- Here the plant or animal species are protected within the existing habitat.
- Forest trees, medicinal and aromatic plants under threat are conserved by this method.

- Biodiversity rich regions are legally protected as wildlife sanctuaries,National parks and Biosphere reserves.
- Megamalai, Sathyamangalam wildlife, Guindy and Periyar National park, and Western ghats, Nilgiris, Agasthyamalai and Gulf of Mannar are the biosphere reserves of Tamil Nadu.

19. Explain about sacred groves

- These are the patches of cultivated trees which are community protected.
- They are based on strong religious belief systems.
- They usually have a significant religious connotation for protecting community.
- Each grove is an abode of a deity mostly village God Or Goddesses like Aiyanar or Amman.
- 448 grooves were documented throughout Tamil Nadu, of which 6 groves were taken up for detailed floristic and faunistic studies.
- Banagudi shola, Thirukurungudi and Udaiyankudikadu, Sittannnavasal, Puthupet and Devadanam are the 6 groves were detailed floristic and faunistic studies.
- These groves provide a number of ecosystem services to the neighbourhood like protecting watershed, fodder, medicinal plants and micro climate control.

20. Enumerate the endemic centres and endemic plants.

- Any species found restricted to a specified geographical area is referred to as ENDEMIC.
- It may be due to various reasons such as isolation, interspecific interactions, seeds dispersal problems, site specificity and many other environmental and ecological problems.
- There are 3 Megacentres of endemism and 27 microendemic centres in India.
- One third of Indian flora have been identified as endemic plants
- They found restricted and distributed in three major phytogeographical regions of india,
- In Peninsular India, Western Ghats has high concentration of endemic plants.
- Example: *Hardwickia binata* and *Bentinckia condapanna*.
- A large percentage of Endemic species are herbs.
- Endemic species belong to families such as Poaceae. Apiaceae, Asteraceae and Orchidaceae.

21. Majority of endemic species are threatened-Why?

Majority of endemic species are threatened

- due to their narrow specific habitat,
- Reduced seed production,
- Low dispersal rate,
- Less viable nature
- and human intereferences.
- Serious efforts need to be undertaken, otherwise these species may become globally extinct.

22. Discuss some of the practices to reduce the carbon foot print

i) Eating indigenous fruits and products
ii) Reduce use of your electronic devices
iii) Reduce travelling
iv) Do not buy fast and preserved, processed, packed foods.
v) Plant a garden
vi) Less consumption of meat and sea food.
vii) reduce use of Laptops when used for 8 hours, it releases nearly 2 kg. of CO_2 annually)
viii) Line dry your clothes.

23. Discribe biochar

- It is a long term method to store carbon.
- To increase plants ability to store more carbon, plants are partly burnt such as crop waste, waste woods to become carbon rich slow decomposing substances of material called Biochar.
- It is a kind of charcoal used as a soil amendment.
- Biochar is a stable solid, rich in carbon and can endure in soil for thousands of years.
- Like most charcoal, biochar is made from biomass via pyrolysis (Heating biomas in low oxygen environment) which arrests wood from complete burning.
- Biochar thus has the potential to help reduce climate change via carbon sequestration.

24. What happened when biochar added to soil

- It increases soil fertility of acidic soils,
- It increases agricultural productivity, and
- It provides protection against some foliar and soil borne diseases.
- It is a good method of preventing waste woods.
- Logs getting decayed instead we can convert them into biochar thus converting them to carbon storage material.

25. Describe environmental impact assessment (EIA)

- It is an environmental management tool.
- It helps to regulate and recommend optimal use of natural resources with minimum impact on ecosystem and biotic communities.
- It is used to predict the environmental consequences of future proposed developmental projects (example: river projects, dams, highway projects) taking into account inter-related socio-economic, cultural and human-health impacts.
- It reduces environmental stress thus helping to shape the projects that may suit local environment by ensuring optimal utilization of natural resources and disposal of wastes to avoid environmental degradation.

26. Describe about the agricultural drone

- It is an unmanned aerial vehicle.
- It helps to increase crop production and monitor crop growth.
- These let farmers see their fields from the sky.
- It reveals many issues such as irrigation problems, soil variation and pest and fungal infestations.
- It is also used for cost effective safe method of spraying pesticides and fertilizers,
- It proves very easy and non-harmful.

27. Explain about geographic information system

- GIS is a computer system for capturing, storing, checking and displaying data related to positions on Earth's surface.
- It also to manipulate, analyse, manage and present spacial or geographic data.
- GPS is a satellite navigation system used to determine the ground position of an object.
- It is a **constellation** of approximately 30 well spaced satellites that orbit the earth.
- It makes possible for the people with ground receivers to pinpoint their geographic location.
- GPS is currently used in Mining, Aviation, Surveying Agricultural and Marine ecosystem.

28. Discuss the importance of GIS

- Environmental impact assessment
- Disaster management
- Zoning of landslide hazard
- Determination of land cover and land use
- Estimation of flood damage
- Management of natural resources
- Soil mapping
- Wetland mapping
- Irrigation management and identification of volcanic hazard
- Vegetation studies and mapping of threatened and endemic species.

29. Describe remote sensing

- Detecting and monitoring the physical characteristics of an area is called Remote Sensing.
- It is measuring by reflected and emitted radiation at a distance from the targeted area.
- It is an tool used in conservation practices .
- Giving exact picture and data on identification of even a single tree to large area of vegetation.
- Wild life for classification of land use patterns and studies.
- Identification of biodiversity rich or less areas for futuristic works on conservation.
- Maintenance of various species including commercial crop, medicinal plants and threatened plants.

30. What are the specific uses of remote sensing

- Helps predicting favourable climate, for the study of spreading of disease and controlling it.
- Mapping of forest fire and species distribution.
- Tracking the patterns of urban area development.
- The changes in Farmland or forests over several years.
- Mapping ocean bottom and its resources.