

## Ecological Adaption, Succession and Ecological Services

### Very Short Answer Type Questions

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

A: In primary succession soil formation takes longer time. Since soil is already there, the rate of secondary succession is much faster and hence the climax stage is achieved quickly.

2. **Among bryophytes, Lichens and ferns which one is pioneer species in a xeric succession?**

A: Lichens.

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

A: Pioneers -- lichens.

Moss stage – Mosses.

Annual herb stage—Grasses.

Climax stage – Shrubs.

4. **Name the type of land plants that can tolerate the salinities of the sea.**

A: Halophytes. E.g *Rhizophora*.

5. **Define heliophytes and sciophytes. Name a plant from your locality that is either heliophyte or sciophyte.**

A: Plants that can grow in direct sunlight are called as Heliophytes.

Plants grow in shady places are sciophytes.

*Nerium* – heliophyte. *Monstera*—sciophyte.

6. **Define population and community.**

A: Population: A group of similar individuals belonging to the same species found in an area.

Community: An assemblage of all the populations belonging to different species occurring in an area.

7. **Define communities. Who classified plant communities into hydrophytes, mesophytes and xerophytes?**

A: Community: An assemblage of different populations belonging to different species occurring in an area.

Eugen Warming

**8. Hydrophytes show reduced xylem. Why?**

A: Xylem helps in absorption of water and provides mechanical support. As hydrophytes do not covered by cuticle entire body absorbs water and there is no need of well developed xylem.

**Short Answer Type Questions**

**1. What are hydrophytes? Briefly discuss the different kinds of hydrophytes with example.**

A. Hydrophytes are the plants which grow in water or in very wet places. According to their relation to water and air hydrophytes are classified into five categories. They are

**1. Free floating hydrophytes:** They float freely on the surface of the water and have no contact with soil.

E.g.: *Pistia, Eichhornia, Wolffia, Salvinia, Azolla*

**2. Rooted hydrophytes with floating leaves:** They are attached to the muddy soil by roots. Their leaves have long petioles which keep them floating on the surface of water.

E.g. : *Nymphaea, Nelumbo* and *Victoria regia*

**3. Submerged suspended hydrophytes:** They are completely submerged and suspended in water, but not rooted in the mud and have no contact with air.

E.g.: *Hydrilla, Ceratophyllum* and *Utricularia*.

**4. Submerged rooted hydrophytes:** These plants are completely submerged in water. They are attached to the muddy soil by roots.

E.g.: *Vallisnaria, Potamogeton*, etc

**5. Amphibious plants:** These live partly in water and partly in air.

E.g.: *Sagittaria, Ranunculus, Limnophila*

Some amphibious plants grow around water bodies, with water touching them. They will survive in dry periods also.

E.g. : *Typha, Cyperus*, etc

**2. Enumerate the morphological adaptations of hydrophytes.**

A. 1) Roots may be absent or poorly developed. In some plants (*Salvinia*) submerged leaves compensate for roots.

2) Root caps are usually absent. In some amphibious plants which grow in mud, roots are well developed with root caps. In some plants root caps are replaced by root pockets.

E.g. : *Eichornia*

3) Roots if present are generally fibrous, reduced in length, unbranched or poorly branched.

4) Stem is long, slender and flexible.

5) Leaves are thin and either long and ribbon shaped (*Vallisneria*) or long and linear (*Potamogeton*) or finely dissected (*Ceratophyllum*).

6) Floating leaves are large and flat with their upper surfaces coated with wax (*Nymphaea*, *Nelumbium*).

**3. List out the anatomical adaptations of hydrophytes.**

A. 1) Cuticle is totally absent in the submerged parts of the plants. It may be present in the form of a thin film on the surface of parts exposed to atmosphere.

2) The epidermis is composed of thin walled cells. They perform absorption and assimilation as all cells contain chloroplasts.

3) Stomata are totally absent in submerged hydrophytes as the gaseous exchange takes place by diffusion.

4) In *Nymphaea*, *Nelumbium*, the leaves are epistomatous.

5) All hydrophytes contain aerenchyma that helps in gaseous exchange and buoyancy.

6) Mechanical tissues like collenchymas and sclerenchyma are poorly developed.

7) Xylem is poorly developed.

8) Secondary growth is absent.

**4. Write a brief account on classification of xerophytes.**

A. On the basis of their drought resisting capacity, xerophytes are generally classified into the following three categories.

**1. Ephemerals:** They are called “drought evaders” or “drought escapers”. They are annuals which complete their life cycle within a period of 6 – 8 weeks. They are found in dry zones.

E.g. : *Tribulus*, *Chenopodium*

**2. Succulents:** These are called “drought avoiding plants”. They are fleshy due to storage of water in the form of mucilage. The stored water is sparingly utilized during dry periods.

Examples:

a) Stem succulents: *Opuntia*, *Euphorbia*

b) Leaf succulents: *Bryophyllum*, *Aloe*, *Agave*, etc

c) Root succulents: *Asparagus*, *Ceiba*

**3. Non – succulents:** They are called true xerophytes. These are perennial plants which can withstand prolonged period of drought.

E.g.: *Casuarina, Nerium, Zizyphus, Calotropis, Acacia, etc*

**5. Enumerate the morphological adaptations of xerophytes.**

- A.
- 1) Roots are long with extensive branching spread over wide areas.
  - 2) Root hairs and root caps are very well developed.
  - 3) Mostly the stem is stunted, woody, hard and covered with thick bark.
  - 4) Stems are usually covered by hairs or waxy coatings.
  - 5) Leaves are very much reduced to small, scale like and sometimes modified into spines to reduce the rate of transpiration.
  - 6) Certain xerophytes shed their leaves during the dry period.

Ex: *Capparis*

**6. Give in detail the anatomical adaptations shown by xerophytes.**

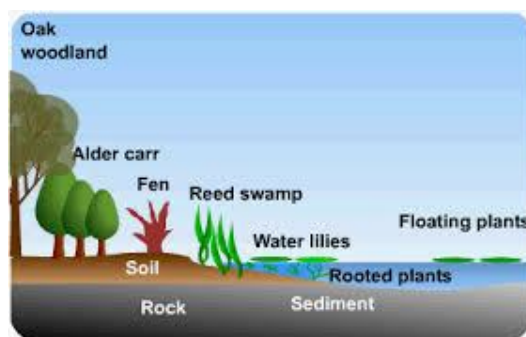
- A.
- 1) Epidermis is covered with thick cuticle to reduce the rate of transpiration.
  - 2) Epidermal cells may have silica crystals.
  - 3) Epidermis may be multilayered as in leaves of *Nerium*.
  - 4) Stomata are generally confined to lower epidermis of leaves called hypostomatous. They are present in pits called sunken stomata.
  - 5) Hypodermis is parenchymatous to check evaporation of water.

Ex : *Calotropis*

- 6) Mechanical tissues are very well developed.
- 7) Vascular tissues are very well developed.

**7. Define plant succession. Differentiate primary and secondary successions.**

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



**Differences:**

<b>Primary succession</b>	<b>Secondary succession</b>
1. It occurs on a primary base area or reservoir  2. It occurs in biologically sterile area 3. It takes a long time to reach the climax stage	1. It occurs in areas where mutual biotic communities have been destroyed such as in abandoned form lands, burned forests 2. It occurs in biologically fertile areas 3. It is quite rapid to reach climax stage because of presence of soil

**8. Define ecosystem / ecological services. Explain in brief with regard to pollination.**

A. The processes by which the environment produces resources that we often take for granted such as clean water, timber and habitat for fisheries and pollination of native and agricultural plants is called Ecosystem / Ecological services.

The transfer of pollen grains to fertilize the ovaries of flowers is called pollination. It is an essential part of a healthy ecosystem. Most flowering plants require pollinators to produce fruits and seeds. So pollinators play a significant role in the production of more food crops in the world. Declines of pollinator activity could have serious economic repercussions throughout the world. The most important pollinator for agriculture is honeybee. Over 1,00,000 invertebrate species such as bees, moths, butterflies, beetles and flies serve as pollinators worldwide. At least 1035 species of vertebrates including birds, mammals, and reptiles also pollinate many plant species. Continued declines in pollinator activity could mean rising costs for pollinator dependent fruits and vegetables and the disruption of entire ecological systems.

**9. Write about the measure to be taken to sustain ecological functions.**

- A.
- 1) Choose products produced with methods that conserve resources, minimize waste and reduce or eliminate environmental damage.
  - 2) Prefer products made with methods that reduce the use of pesticides and artificial fertilizers.
  - 3) Reduce consumption and waste production.
  - 4) Support usage of renewable energy alternatives.

- 5) Use public transit, cycle or walk to conserve natural resources and to reduce pollution and enjoy the health benefits.
- 6) Participate in developing community garden and tree plantation programmes.
- 7) Avoid the usage of pesticides and follow methods of natural pest control.
- 8) Use native plants in the garden and provide habitat for wild life.

**10. What measure do you suggest to protect the pollinators?**

- A.
- 1) Creating own pollinator friendly garden using a wide variety of native flowering plants.
  - 2) Reducing the use of pesticides used in and around your home.
  - 3) Encouraging local clubs or school groups to build artificial habitats like butterfly gardens, bee boards and bee boxes.
  - 4) Supporting agriculture enterprises with pollinator – friendly practices to minimize pesticide use.
  - 5) Encouraging government agencies to take into account the full economic benefits of wild pollinators when formulating policies for agriculture and other land uses.
  - 6) To develop techniques for cultivating native pollinator for crop pollination.

**LONG ANSWER TYPE QUESTIONS**

**1. Give an account of ecosystem services with reference to carbon fixation and oxygen release.**

- A. Trees are essential to carbon sequestration keeping excess carbon from entering the atmosphere. The main chemical flow between forest and atmosphere is the exchange of  $CO_2$  and  $O_2$ . Forests provide a vast bank for  $CO_2$  and a large amount of  $CO_2$  is deposited in its timber. It plays an essential role in maintaining a dynamic balance between  $CO_2$  and  $O_2$  in atmosphere. According to photosynthesis equation 180gm of glucose and 193gm  $O_2$  are produced by using 264gm of  $CO_2$  and 108gm of water and 677.2 K.cal. of solar energy. 180gm of glucose can be transformed to 162gm of polysaccharide inside the plant. So whenever plant produces, 162gm of dry organic matter, 264gm of  $CO_2$  will be fixed. Then the total amount of the dry organic matter of the reserve forests can be estimated. It provides a foundation for reckoning the total amount of  $CO_2$  fixation by the forests in the reserve.

Natural ecosystems may have helped to stabilize climate and prevent overheating of the earth by removing more of the green house gas,  $CO_2$  from the atmosphere. Many countries have established a carbon tax system to reduce emissions of the green house gases, especially to cut down  $CO_2$  and CO in atmosphere.

**Ecosystem services – oxygen release:**

Trees and plankton play a big role in release of oxygen, which depends on the species of tree, its age, its health, and also on the trees surroundings. “A mature leafy tree produces as much oxygen in a season as 10 people inhale in a year”. or A single mature tree can absorb carbon dioxide at a rate of 48 lb/year and release enough oxygen back into the atmosphere to support 2 human beings.

One acre of trees annually consumes the amount of  $CO_2$  equivalent to that produced by driving an average car for 26,000 miles. That same acre of trees also produces enough oxygen for 18 people to breathe for a year.

Submerged macrophytes release  $O_2$  and enrich dissolved  $O_2$  in water. The plants and planktons are described as “the Lungs of the World”, taking billion of tones of  $CO_2$  and exhaling billions of tones of  $O_2$ .

Micro organism also contributes to the oxygen release in direct and indirect ways.

**Ex:** Cyanobacteria releases  $O_2$  in a direct way. The other supporting services include nutrient cycling through decomposition of fallen logs in forests, soil formation by bacteria and lichens.