

12-01-20

Q1

Explain the various steps in an ecological succession with an example.

Q2

Describe with neat diagram the Nitrogen cycle along with the effects of human activity on it.

Q3

Explain the Earth's life support system.

A1

## ECOLOGICAL SUCCESSION

Ecosystem is dynamic in nature.

The structure and species composition of communities and ecosystems change in response to changing the environmental conditions through a process called ecological succession.

Orderly process of changes in community structure and function through physical environment modifications ending in stabilized ecosystem (climax).

Primary - life from no ~~life~~ life like conditions - no soil, no bottom sediment - long time.

Secondary - life from life like conditions - begins in an area where ecosystem is disturbed, removed, or destroyed, but some soil or bottom sediment remains.

→ Pioneer community / species - first established community

→ Seral stages - transitional phases.

Types - based on starting types or areas

→ Hydrarch or hydrosere - pond, swamp, bog.

→ Mesarch - adequate moisture

→ Xerarch or Xerosere - dry area

→ Lithosere - bare rock

→ Psammosere - sand

→ Halosere - saline soil

## Process :-

**Nudation** - development of a bare area devoid of any life form.

→ Topographic, climatic, biotic

**Invasion** - Successful establishment of one or more species through dispersal followed by establishment.

→ Migration, ecesis and aggregation.

**Competition and Coaction** - Increased no. of individuals lead to competition (intra and inter)

**Reaction** - Species use nutrients, water etc. influence environment - several seral communities.

**Stabilization** - Stable community in equilibrium with environment (climax) - max. biomass and symbiotic linkages between organisms.

## **HYDROSERE**

**Hydrosere succession** - starts in a water body like pond. Phytoplankton (algae, pioneer species).

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Rooted submerged plants (invasion)

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Rooted floating plants (competition and coaction)

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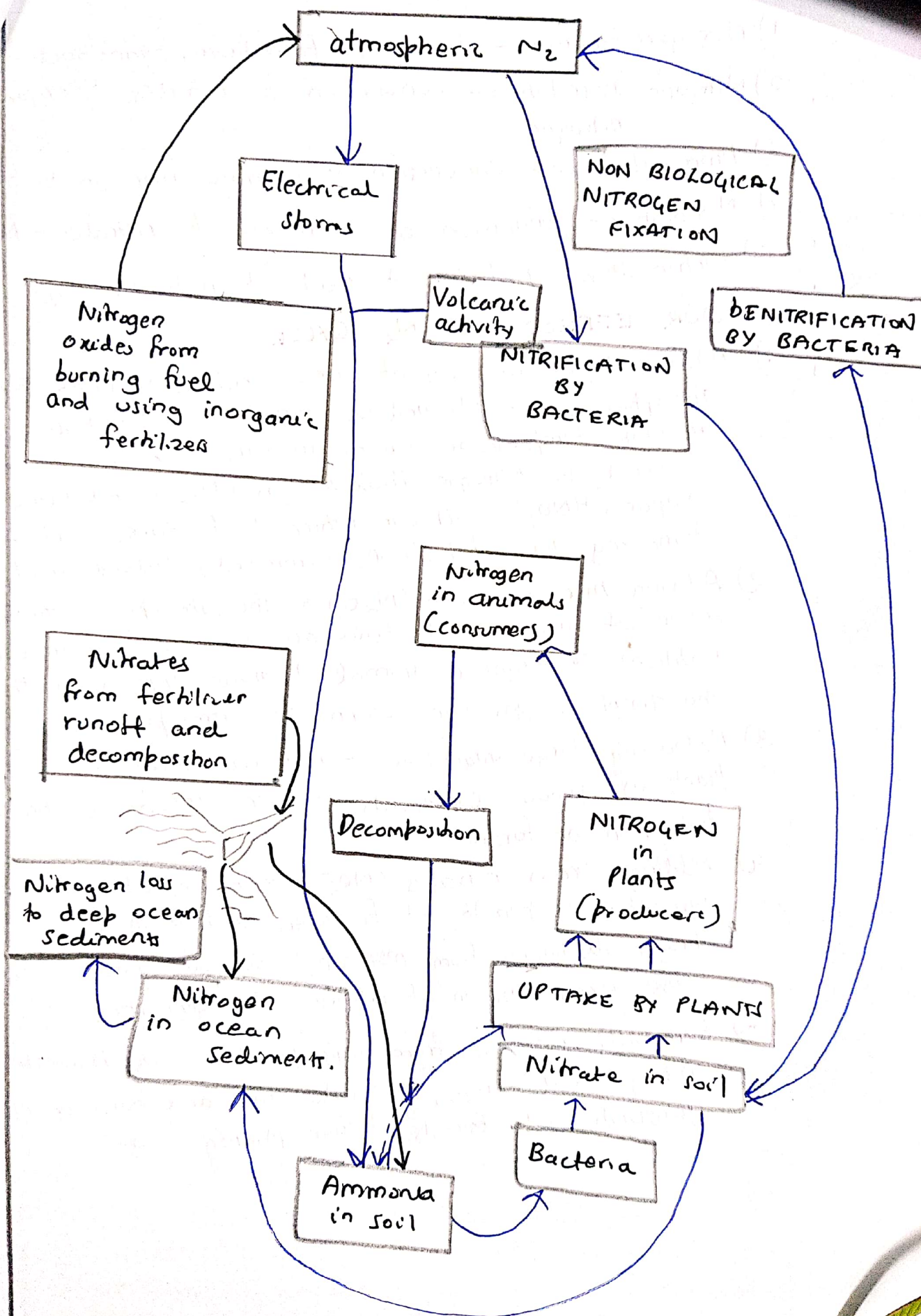
Reed swamp, layer of solid builds up, plants are partly in water and partly on land sedge-meadow stage of grass (reaction).

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Shrubs and trees and finally forest.  
(climax community).



level



- 1) Nitrogen fixation - bacteria - Rhizobium, cyanobacteria
- 2) Nitrogen assimilation - conversion of nitrates to organic nitrogen.
- 3) Ammonification - conversion of organic nitrogen to ammonia.
- 4) Nitrification - conversion of ammonia to nitrates - Nitrosomonas.
- 5) Denitrification - reduction of oxides to molecular  $N_2$ .

### OUR EFFECT ON $N_2$ CYCLE

- 1) Adding large amounts of nitric oxide ( $NO$ ) into the atmosphere when  $N_2$  and  $O_2$  combine as we burn any fuel at high temperatures, such as in car, truck and jet engines - converted to nitrogen dioxide gas ( $NO_2$ ) and nitric acid vapor ( $HNO_3$ ), which can return to the earth's surface as damaging acid deposition, commonly called acid rain.
- 2) Adding nitrous oxide ( $N_2O$ ) to the atmosphere through the action of anaerobic bacteria on commercial inorganic fertilizer or organic animal manure applied to the soil. This greenhouse gas can warm the atmosphere.
- 3) Releasing large quantities of nitrogen stored in soils and plants as gaseous compounds into the atmosphere through destruction of forest.
- 4) Adding excess nitrates ( $NO_3^-$ ) to bodies of water through agricultural runoff of fertilizers and animal manure and through discharges from municipal sewage systems. This can cause excess growth of algae - Eutrophication.
- 5) Removing nitrogen from topsoil when we harvest nitrogen-rich crops, irrigate crops and burn or clear grasslands and forests before planting crops.




## Earth- life support system

Earth's life support system includes :-

Atmosphere  $\begin{cases} \rightarrow \text{Troposphere} \\ \rightarrow \text{Stratosphere} \end{cases}$

Hydrosphere  $\left\{ \begin{array}{l} \rightarrow \text{Vapour} \\ \rightarrow \text{Liquid} \\ \rightarrow \text{Ice} \end{array} \right.$

Geosphere  Hot Core  
Thick Rock Mantle

Part of earth b/w core and crust. Made of magma and rock. Responsible for crust evolution and provides thermal and mechanical driving forces for plate tectonics.

Atmosphere is the blanket of air around the Earth. It is comprised of troposphere and stratosphere on the basis of temperature.

Troposphere Contains about 75% of all the air in the atmosphere, and almost all of the water vapour (which forms cloud and rain). The decrease in temperature with height is a result of the decreasing pressure. If a parcel of air moves upwards it expands (because of the lower pressure). When air expands it cools. So air higher up is cooler than air lower down. This is the lowest part of the atmosphere - the part we live in. It contains most of our weather - clouds, rain, snow. In this part of the atmosphere the temperature gets colder as the distance above the earth increases, by about  $6.5^{\circ}\text{C}$  per kilometre. The actual change of temperature with height varies from day to day, depending on the weather.

Stratosphere extends upwards from the top part of tropopause (tropopause) to about 50 km. It contains much of the ozone in the atmosphere. The increase in temperature with height occurs because of absorption of ultraviolet (UV) radiation from the sun by this ozone. Temperature in the stratosphere are highest over the summer pole, and lowest over the winter pole.

By absorbing dangerous UV radiation, the ozone in the stratosphere protects us from skin cancer, and other health

damage. However chemicals (called CFCs or freons, and halons) which were once used in refrigerators, spray/cans and fire extinguishers have reduced the amount of ozone in the stratosphere, particularly at polar latitudes, leading to the so-called 'Antarctic ozone hole.'

Now, humans have stopped making most of the harmful CFCs we expect the ozone hole will eventually recover over the 21st century, but it is a slow process.

**Hydrosphere** → The hydrosphere is the combined mass of water found on, under, and above the surface of a planet, minor planet or natural satellite.

~~Although~~ It continues to change in size due to seafloor spreading and continental drift.

**Geosphere** → Collective name for lithosphere, hydrosphere, cryosphere, atmosphere. The different collectives of the geosphere are able to exchange different mass and/or energy fluxes (measurable amount of change). The exchange of these fluxes aspects the balance of the different spheres of the geosphere.

**Biosphere** → Total sum of living organisms. It integrates all living beings and their relationships including elements of lithosphere, geosphere, hydrosphere and atmosphere.