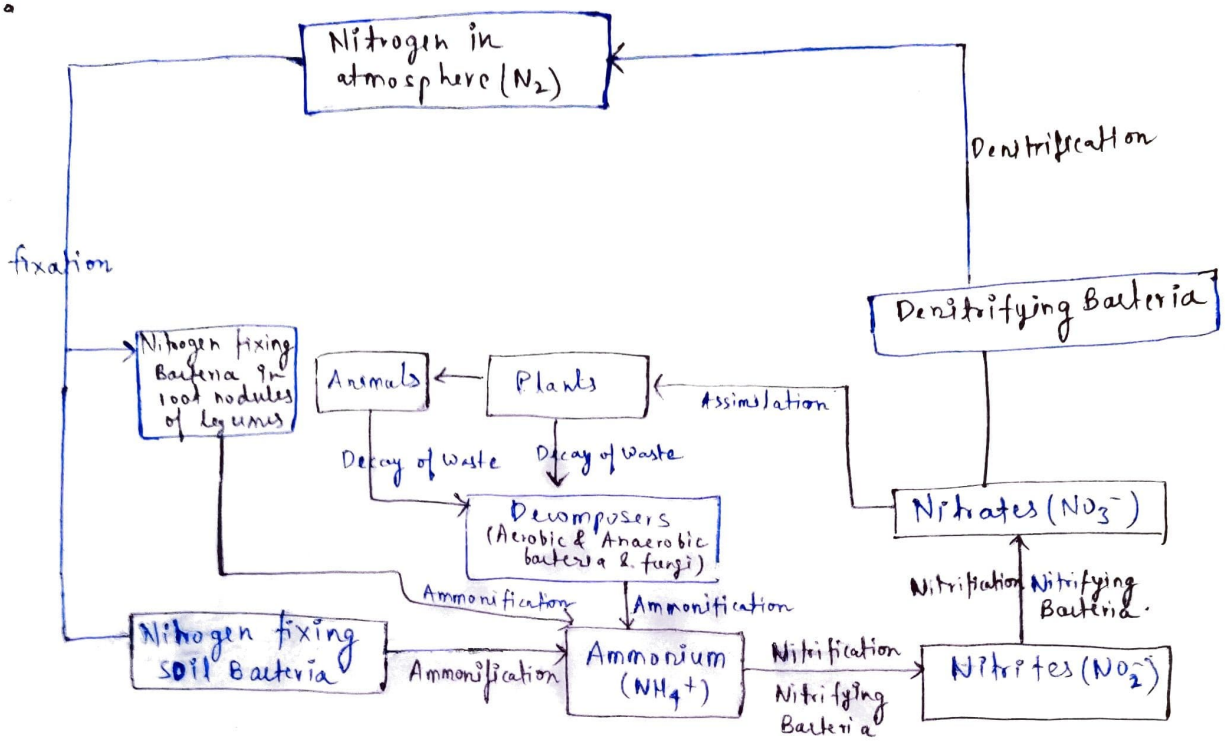
Section - 1 :

Que ① : Describe all the processes involved in the biotic phase of nitrogen cycle. Explain with help of a diagram.

Ans :



→ Nitrogen (N_2) in the atmosphere cannot be directly used as a nutrient by plants or animals. It must be converted into its compounded form of Ammonia (NH_3). This occurs through four steps of fixation, nitrification, ammonification and denitrification. Nitrogen fixing bacteria feed off the root nodules of carbon plant species such as beans, peas of alfalfa, etc. while they fix nitrogen. This nitrogen is then converted into ammonia to be used by those plants. Any unused ammonia undergoes nitrification. In the ammonification step, specialized bacteria and fungi feed & convert dead material into compounds such as ammonia and water-soluble salts containing ammonium (NH_4^+) ions. These compounds are absorbed by plants for growth. In this manner, nutrients are recycled back from animals to plants. Finally, the denitrification step completes the nitrogen cycle as nitrogen leaves the soil and is released into the atmosphere as nitrogen or nitrous oxide gas.

Que ② : What are Biogeographic zones? Name all the Biogeographic zones of India.

Ans : → Biogeography comprises of phytogeography and zoogeography. Geographical regions of India when considered along with the plants and animals form the Biogeographical regions/zones.

→ Earlier there were 12 biogeographic zones but recently the wildlife Institute of India has regrouped them into ten zones:

	Zone	% of geographical area of India
①	Trans-Himalaya	5.6
②	Himalaya	6.4
③	Desert	6.6
④	Semi-Arid	16.6
⑤	Western Ghats	4.0
⑥	Deccan Peninsula	42.0
⑦	Gangetic Plain	10.8
⑧	Coasts	2.5
⑨	North-East	5.2
⑩	Islands	0.3

→ The Biogeographic classification of India recognizes 10 Biogeographic zones ranging from the Trans-Himalaya to the Islands. These zones indicate a unique set of geo-physical and hydro-climatic conditions as well as distinct geological origins. They also have unique floral and faunal elements. The Himalaya and Gangetic plain are examples of two adjacent but extremely different zones.

Que ③ : Give the disadvantages of construction of Dam. Explain how it affects the environment.

Ans : **Disadvantages :**

① The construction of Dams result into inundation of land and wildlife habitat.

② Dam construction affects the quality of reservoir and stream water.

③ Reservoirs behind a dam can lead to higher greenhouse gas emission.

④ Construction of Dams leads to the displacement of local population.

⑤ They also create a flooding risk if they experience a failure

⑥ Dams can have an adverse impact on the groundwater table.

How it affects the environment? :

The flooding of surrounding habitat around dams kills trees and other plant life that then decomposes and releases large amount of carbon into the atmosphere. Because the river is no longer flowing freely, the water becomes stagnant and the bottom of the reservoir becomes depleted of oxygen. This lack of oxygen creates a situation where methane (greenhouse gas) is produced from the decomposition of the plant materials at the bottom of the reservoir that eventually gets released into the atmosphere, contributing to global climate change. It has also a negative impact on local fish population as it leads to habitat fragmentation. The stagnant water in reservoirs creates a situation where the decomposition of organic matter from decaying plants can transform inorganic mercury into methyl-mercury. Unfortunately, methyl-mercury tends to bio-accumulate and cause toxic effects in humans and wildlife that eat the fish in reservoirs.

Que ④: What is an ozone hole and How it is formed?

Ans :→ Ozone (O_3) is a bluish gas that is composed of three atoms of oxygen and is harmful to breathe. Nearly 90% of earth's ozone is in stratosphere and referred to as the ozone layer. Ozone absorbs a band of ultraviolet radiation called UVB.

$$O_2 + \text{sunlight} \longrightarrow O + O$$

$$O + O_2 \longrightarrow O_3.$$

→ Now, Ozone hole is simply the wearing out of the amount of ozone in the atmosphere.

→ It begins to form when CFCs (Chlorofluro carbons) get into the stratosphere. Ultra violet radiation from the sun breaks up these CFCs. This action releases Chlorine atoms. Chlorine reacts with Ozone, starting a chemical cycle that destroys the good ozone in that area. One Chlorine atom can break apart more than 100,000 ozone molecules.

$$CFCs \xrightarrow[\text{radiation}]{UV} Cl^-$$

$$Cl^- + O_3 \longrightarrow ClO + O_2 \quad \text{(Step 1)}$$

$$ClO + O \longrightarrow Cl^- + O_2 \quad \text{(Step 2)}$$

$$O_3 + O \longrightarrow 2O_2. \quad \text{(Overall Reaction)}$$

Thus, it leads to a chain reaction creating a ozone hole in that area.

Que ⑥ : What are the two types of sources of air and water pollution? Explain with Examples.

Ans : Sources of pollution refer to the various locations, activities or factors which are responsible for the releasing of pollutants in the environment.

→ Air Pollution :

SOURCES

- Natural
  (Eg : ① Dust from natural sources, usually large areas of land with little or no vegetation).
  ② methane, emitted by the digestion of food by animals, for example cattle.)
- Man-Made or Anthropogenic
  (Eg : ① "Stationary sources" include smoke stacks of power plants, manufacturing facilities (factories) and waste incinerators.
  "Mobile sources" include motor vehicles, marine vessels, aircraft, etc.)

SOURCES

- Point Source
  (Where pollution emanates from single localized source.
  Eg : Smokestack, drainpipe, etc.)
- Line Source
  (Dispersed source,
  Eg : vehicular pollution, shipping tracks, Aviation route etc.)

→ Water Pollution :

SOURCES

- Point Source
  - Single large source
  - Can localize it to one spot
  - Eg : Industrial plant.
- Non-Point Source
  - Diffused source or many smaller point sources.
  - Eg : Automobiles, fertilizer on fields, etc.

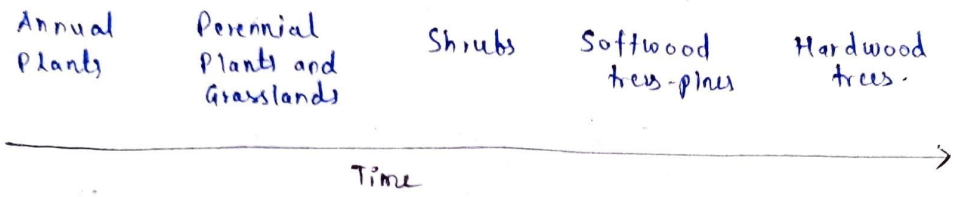
Section-2 :

Que (8) : What is Ecological succession, explain all steps in detail.

Ans : → A gradual process of change and replacement of the types of species in a community, in a given area over a period of time is called Ecological succession. The sequence of changes is somewhat predictable. It may take over hundreds or thousands of years.

→ Each stage / temporary community is called a successional stage.

Eg :



→ STAGES :

① Nudation :

- Nudation is the development of a bare area.
- It is the first step in an ecological succession.
- The causes of Nudation are

(a) Topographic : soil related causes such as soil erosion, sand deposit, landslide results in formation of bare area.

(b) Climatic : Destruction of the community due to glaciers, dry period, & storms.

② Invasion :

- Invasion is the successful establishment of a species in the bare area.
- It is the second step in ecological succession.
- A new species reaches the newly created bare area and they try to establish here.
- The process of invasion is completed in 3 steps.

(a) Migration :
→ Seeds, spores propagules of a species reach the bare area due to migration.
→ This can be achieved through air or water medium.

(b) Ecesis :
→ It is the process of successful establishment of a species in the bare area.
→ The seeds that reached the new area due to migration will germinate & reproduce.

(c) Aggregation :
→ After Ecesis, the individuals of a species—

—increase their number & they stay close to each other.

③ Competition & co-action :

→ Aggregation results in the increase of the member of species within a limited space.

→ This results in competition between individuals for food & space.

→ Individuals of a species affect each other's life in various ways & this is called co-action.

→ Competition & co-action results the survival of fit individuals & the elimination of unfit individuals from the ecosystem.

④ Reaction :

→ It is the most important stage in the ecological succession.

→ It is the modification of the environment through the influences of living organisms present in it.

→ Reaction causes changes in soil, water, etc. & due to these modifications, the present community becomes unsuitable for the the existing environmental conditions.

→ Such communities will be quickly replaced by other communities. The whole sequence of communities that replaces one another in the given area is called sere. (sera).

⑤ Stabilization : (Climax)

→ It is the last stage of ecological succession.

→ The final community becomes more or less stabilized for longer period of time.

→ This community can maintain its equilibrium with the climate of the area.

→ The climax community is not immediately replaced by other communities. It is determined by the other communities.

Que ⑨ ⓐ : How can we control thermal pollution?

Ans : Thermal Pollution can be defined as the presence of waste heat in the water which can cause undesirable changes in the natural environment. The chief causes of thermal pollution are release of cold water and chemical pollutants in water bodies, growing industrial activities, water availed as coolant and ejected back into water bodies, deforestation, soil erosion, natural geo-thermal activities, un awareness among people, etc.

Below are the preventive measures to control thermal pollution,

① Using less electricity
② Using Better-applied sciences.
③ Holding back the water for good.
④ Planting more trees on banks of water bodies.
⑤ Spreading awareness among people.
⑥ Recycling used water.
⑦ Cogeneration : Combined Heat and Power or (CHP) is the simultaneous production of electricity and heat, both of which are used.
⑧ Suitable arrangements in urban areas.
⑨ Heated water from the industries can be treated before discharging directly to the water bodies.
⑩ Cooling Ponds : Heated effluents on the surface of water in cooling ponds maximize dissipation of heat to the atmosphere and minimize the water area and volume. This is the simplest and cheapest method which cools the water to a considerable low temperature.
⑪ Cooling Towers : Using water from water sources for cooling purposes, with subsequent return to the water body after passing through the condenser is termed as cooling process. In order to make the cooling process more effective, cooling towers are designed to control the temperature of water. In fact, cooling towers are used to dissipate the recovered waste heat so as to eliminate the problems of thermal pollution.
⑫ Artificial lake : The heated effluents may be discharged into the lake at one end and the water for cooling purposes may be withdrawn from the other end. The heat is eventually dissipated through evaporation. These man-made lakes have to be rejuvenated continuously.
⑬ Spray ponds : Moving air is used in the cooling process of the warm water.

(b): Explain what is Eutrophication?

Ans: Excessive use of Nitrogen and phosphorus based fertilizers in the agricultural field leads to another problem, which is not related to soil, but relates to water bodies like lakes.

A large proportion of N & P used in crop field is washed off & along with run off water reach the water bodies causing over nourishment of lakes, this process is known as Eutrophication.

Harmful impacts of Eutrophication:

1. Changes physiochemical characteristics of water.
2. Algal blooms (Resulting in poor photosynthetic activity).
3. Loss of bio diversity.
4. Causes dificiency of oxygen due to increased anaerobic decomposition of dead algae and plants.
5. Causes chemical accumulation in food chain.
6. Discolour water. & clog fish gills. Can Even be toxic.
7. Aging of water bodies.

Section 3 :

Que (10) (a) : What is greenhouse effect and global warming?

Ans: Greenhouse Effect :

The greenhouse effect is a natural process that warms the earth's surface. When the sun's energy reaches the earth's atmosphere, some of it is reflected back in space and rest is absorbed and re-radiated by greenhouse gases.

Greenhouse gases include water vapour, CO_2, CH_3, Nitrous oxide, Ozone & some artificial chemicals such as CFCs.

The absorbed energy warms the atmosphere & the surface of earth. This process maintains the earth's temperature around 33° C warmer than it would otherwise be, allowing life on earth to exist.

Steps :

(1) Solar radiation reaches the earth's atmosphere. Some of this is reflected back into the space.
(2) The rest of the sun's energy is absorbed by the land and ocean, heating the earth.
(3) Heat radiates from earth towards space.
(4) Some of this heat is trapped by greenhouse gases in the atmosphere, keeping it warm enough for life to exist.
(5) Human activities such as burning fossil fuels, agriculture & land clearing are increasing the amount of greenhouse gases.
(6) This is trapping extra heat & causing the earth's temperature to rise.

Global Warming :

The gradual heating of earth's surface, oceans, atmosphere caused by human activity, primarily the burning of fossil fuels that pump (CO_2), methane, and other green house gases into the atmosphere. is known as Global Warming.

The term is frequently used interchangeable with term climate change, though the latter refers to both human and naturally produced warming and effects it has on our planet. It is most commonly measured as the average increase in earth's global surface temperature.

Effects of Global warming :

(1) Increase in average temperature & extreme temperature.
(2) Extreme weather events
(3) Ice & Glacier melting.
(4) Sea-levels rising & Ocean - acidification.

Causes of Global Warming:

1. Deforestation
2. Increased vehicles
3. Emission of CFCs, GHG, etc.
4. Huge-scale Industrialization.
5. Emission of CO_2.
6. chemical fertilizers.

Q: What is Climate Change?

Ans: → Climate is the total of all weather occurring over a period of years in a given place. It is the average weather condition of that place. Climate tell us what it's usually like in the place where you live.

→ Weather is what is happening outdoors in a place at a given time. It can change a lot within a very short time. For example, it can be windy at night, and sunny in the morning.

→ The Earth's climate is changing in ways that we can't easily see. It is getting warmer because people are adding heat-trapping gases to the atmosphere, mainly by burning fossil fuels. These gases are called greenhouse gases. Warmer temperatures are causing other changes around the world, such as melting glaciers and stronger storms. This is known as Climate Change.

→ Causes of Climate Change include anthropogenic causes such as chemical fertilizers, Deforestation, Increased Vehicles, Industrialization, etc. as well as natural causes such as sunspot and solar cycle, Ocean currents, forest fire, Volcanic Eruptions, Meteorites, methane emissions from animals, etc.

→ Potential effects of Climate Change include weather related - mortality, infectious diseases, loss of habitat and species, diminishing glaciers, Depletion of water resources, Reduced amount of crop yields & Irrigation demands, forest Fires, Erosion of beaches, etc.

Q: What is carbon footprint and how does an individual contribute to global warming?

Ans: The trace of the greenhouse gases produced by human activities are known as carbon footprints. This environmental indicator measures both direct and indirect emission of compounds like methane, nitrogen oxide, HCFs, PCFs & sulphur hexafluoride and above all the most abundant and important contributor to global warming since 1990's carbon dioxide (CO_2).

- According to the global footprint network so far, the carbon footprint has not stopped growing. In fact it increased elevenfold since 1961 and now account for 60% of man's total impact on the environment.

Individual contribution to reduce Global Warming:

1. Choose responsible consumption based on local products and sustainable production.
2. Choose a 100% renewable energy consumption. Buy energy-saving applianes & control heating and air conditioning to save energy.
3. Reduce waste, Reuse your packing, dispose it off eco-friendly.

Individual contribution to global warming:

1. Using fuels in our vehicles
2. Use of chemical fertilizers in our crop fields.
3. Using CFCs based electrical applianes such as refrigerator, Air conditioner, etc.
4. Cutting Trees (Deforestation).