FIELD TRIP REPORT

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Questions -

Qus 1 Write a brief introduction about YAMUNA BIODIVERSITY PARK ?

INTRODUCTION -

Living in the 21st century where one is surrounded by concrete walls and loud machinery it is almost impossible to find a peaceful and serene surrounding. The Yamuna Biodiversity park is in total contrast with it's immediate surroundings with cool air constantly flowing and the lush greenery around provides a peacefull environment which is totally different atmosphere from our daily hustle bustle and traffic.

HISTORY -

The Yamuna Biodiversity park achieves this due to it's widely expanded area of lush greenery Small water bodies and the various species of organisms residing in this park of 457 acres.

This park is a home not only for countless number of species on the verge of extinction but also to a variety of medicinal and commercial plants.

The yamuna biodiversity park is divided into two major zones of 300 acres and 157 acre zone. The two zones are linked by a bridge which is Strategically

placed so that the various species of animal can easily traverse to the 157 acre zone as the other zone is a flood active zone due to it's lower elevation as compared to the first zone.

The human consciousness has so evolved that we consider ourselves on the pinnacle of the food chain and do not believe in any sort of natural hierarchy to exist in the environment which has lead to our relentless exploitation of the resources and merciless destruction of the environment and hence disturbing the ecological balance and thus consequently it affects all the species adversely; mainly due to loss their natural habitat.

The Yamuna biodiversity park steps in with an aim to save the natural landscapes.

The two major biodiversity park of north india are the Yamuna and Aravali biodiversity park.

CHARACTERISTICS-

Currently University of Delhi is implementing two DDA funded Biodiversity Park Projects namely Yamuna Biodiversity Park : Establishment and Management, and Aravali Biodiversity Park Establishment and Management with Prof. C.R. Babu as the head officer and Faisal Khudzar as the brains behind this wonderful project and in charge of the

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Yamuna Biodiversity Park.

In order to make better preservation of the environment and to regain the long lost ecological, aesthetical and cultural quality of Biodiversity sites in Delhi, the DDA has set up the **Delhi Biodiversity foundation**. The idea of such biodiversity park are backed by the research work of teams of Scientists who have in depth knowledge in the areas of field biology, ecology, wildlife, taxonomy, Conservation, habitat restoration, natural resource management and nature education.

Other than these experts, there are trained technical supporting Staff who are Conducting research on the development and management of these parks.

The Foundation Consists of two groups; Governing body and Executive Committee

To recaptulate the main goals of Yamuna biodiversity park, which namely are for promotion of Sensitizing the citizens on the need for such parks, creation of wetlands for ecological balance and monitoring the ecology of delhi.

Thus the people behind this beautiful idea to achieve these goals by creating the Yamuna biodiversity park have evidently put in tons of effort and Conducted immense research to make this project such a success. The Yamuna biodiversity park hence is a necessity now to maintain a check on the pollution levels of delhi and restore the long lost ecological balance

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OBSERVATION- [with the help of online resources]

On entrance of biodiversity park, we get a chance to view various species of birds and insects flying around proves that the Yamuna Biodiversity park has achieved their purpose.

The Yamuna biodiversity park's fertile alluvial soil is an eldorado of medical plants.

Plants like katkaranj Caesalpinia Crista Useful for anthelmintic, tonic, for malaria and skin diseases etc.

Patharchatta bryophyllum Calycianum are also found in this park which is used to remove kidney stone etc.

Sankhpushpi Convolvulus microfillus which is used as a brain tonic and as a memory booster, the hadjora cissus quadrangula is used for treatment of broken bones and its paste is used to relieve the stress from asthma attack

These are just few medical plants that are available in this park

The diversity in wetland habitats both natural and man-made supports are found in park which supports a rich diversity of plant and animal.

Approximately 160 bird species are associated with the wetlands and adjoining areas, out of 444 species of birds which reported from the

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Delhi region. Similarly, more than 150 plant species grow in or near wetlands. Yamuna river and the other water bodies present in the delhi region support approximately 87 species of fresh water inland fishes.

The forest is mainly trophical deciduous and the dominant vegetation is thorny shrub. Dominant trees are acacia nilotica, A Catechu, butea monosperma etc.

The Yamuna biodiversity is an example of an artificial forest which enables one to understand the various components of a forest.

The Yamuna biodiversity has wetlands which is the much required living conditions for dragon flies which keeps a population check of mosquitoes and thus preventing diseases like chikungunya and dengue from spreading unlike in cities where there are no wet lands.

- The Yamuna biodiversity park had to face several challenges, one of them being high soil salinity of the marshland that was to be used in the biodiversity park.

The soil's salinity is checked by Phytoremediation which describes the treatment of several issue through the use of plants that prevent the environmental problem without wasting the resources.

Hence the high salinity problem was tackled by using plants that absorb the salt in the soil

The park was started by planting trees that were grown in indoor nurseries, but looking at the progress and the rapid growth of the park serves as an evidence for the fact that auto rehabilitation is taking place in the park.

The park has recieved immense help from neighbouring villages in providing services like maintainence of the park to multitasking with activities like digging, cutting, Collecting etc.

- Polyhouse are used at the biodiversity park to germinate seeds that are usually to grow on their own in the wild. They are used to germinate seeds throughout the year by creating an artificial atmosphere and climate. Another such technique is the net house which is framed structure made of materials like angle iron, wood.

Conclusion -

The Yamuna biodiversity park is thus one of the best examples to look up to, when it comes to Conserving India's beautiful natural landscapes.

The Variety of species found in the biodiversity is an evidence of the fact that the members of the Yamuna project have succeeded.

The Yamuna biodiversity park teaches one about the importance of Symbiotic relationship which is shown by various species.

The Yamuna Biodiversity Park has been made with Ecosystem based management which is an environmental approach that recognizes the full array of interaction within an ecosystem, including humans, rather than considering single issue, species or ecosystem.

In light of significant ecosystem degradation a holistic approach was employed that combines environmental knowledge and coordination with governing agencies to initiate, sustain and enforce habitat and species protection, and include public education and involvement.

Thank you.

Ques 2 Explain functions of an ecosystem?

→ major functional attributes of an ecosystem:

(i) Food chain, food web and trophic structure
(ii) Energy flow
(iii) Nutrient cycles (Biogeochemical cycles)
(iv) Primary and Secondary production
(v) Ecosystem development and regulations

- Trophic structure -

→ The Producers and Consumers are arranged in the ecosystem in a definite manner and their interaction along with population size are expressed together as trophic structure

→ Each food level is known as **trophic level** and the amount of living matter at each trophic level at a given time is known as Standing crop or Standing biomass

- Food chains -

→ The sequence of eating and being eaten in an ecosystem is known as food chain.

OR

→ The flow of energy is mediated through a series of feeding relationships is a definite sequence or pattern known as Food chain.

→ All organisms living or dead are potential food for some other organism

e.g - Catterpillar eats a plant leaf, sparrow eats a Catterpillar, cat or hawk eats sparrow when they all die they are all consumed by microbes like bacteria or fungi which break down the organic matter and convert

it into simple inorganic subs, that can again be used by plants

→ Grass → grasshopper → Frog → Snake → Hawk (grassland ecosystem)

→ Phytoplanktons → Water fleas → Small fish → Tuna (Pond ecosystem)

→ Lichens → reindeer → Man (arctic tundra)

→ Each organism in ecosystem is assigned a feeding level or trophic level depending on its nutritional states.

for example - grasshopper (I st trophic level)
frog (II nd trophic level)
Snake (III rd trophic level)
Hawk (IV th trophic level)
decomposers consume dead matters of all these trophic level.

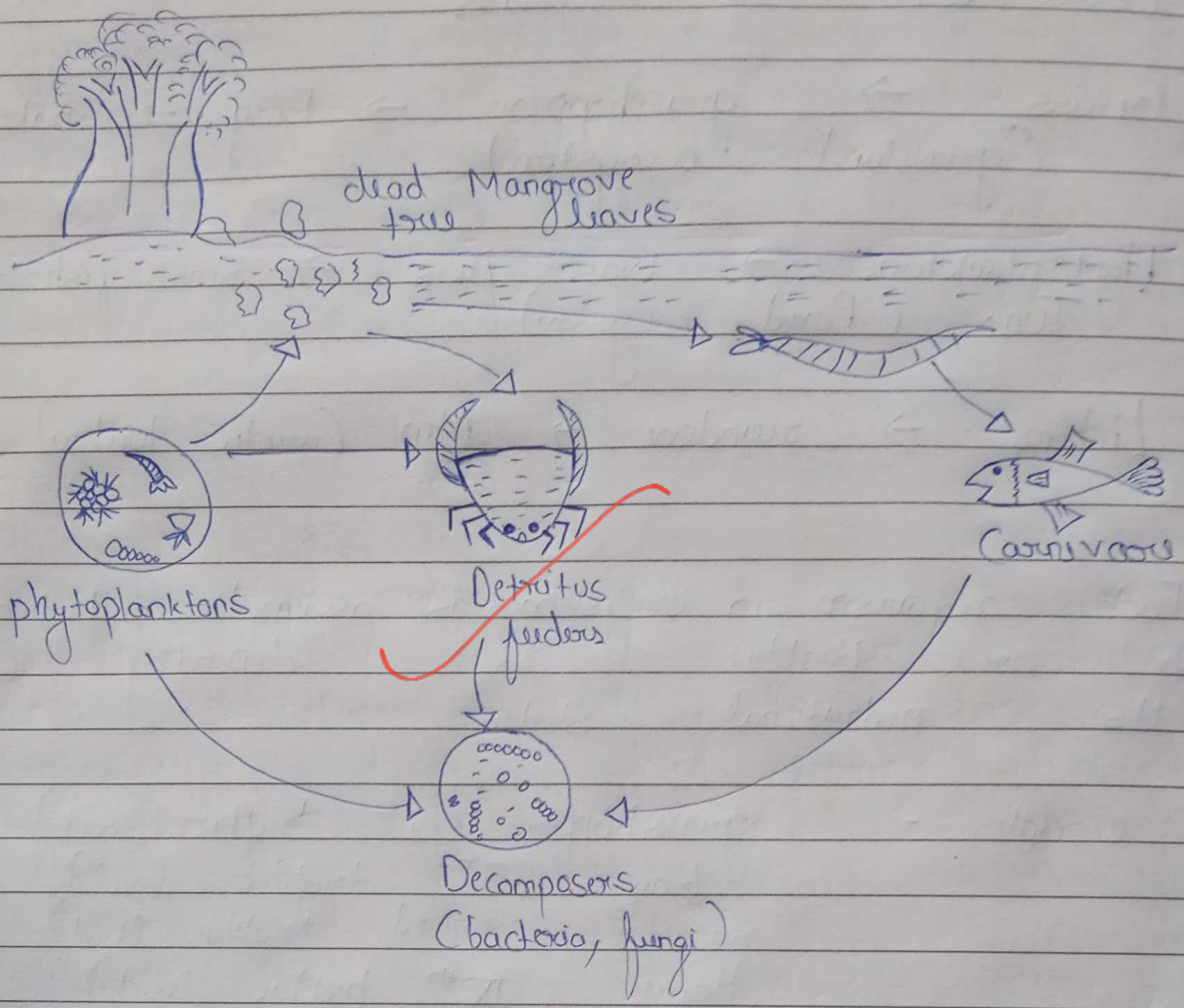
- Two major types of food chain -

1 Grazing food chain -
Starts with green plants and culminates in carnivorous
e.g. Grass → Rabbit → Fox

2 Detritus food chain -
Starts with dead organic matter which detritivores and decomposers consumes

→ Partially decomposed dead organic matter and even the decomposers are consumed by detritivores and their predators.

example - seen in Mangrove (estuary)



→ Leaf litter → algal → Crabs → Small Carnivores fish → large Carnivores fish (Mangrove ecosystem)

→ Dead organic matter → fungi → bacteria (forest E)

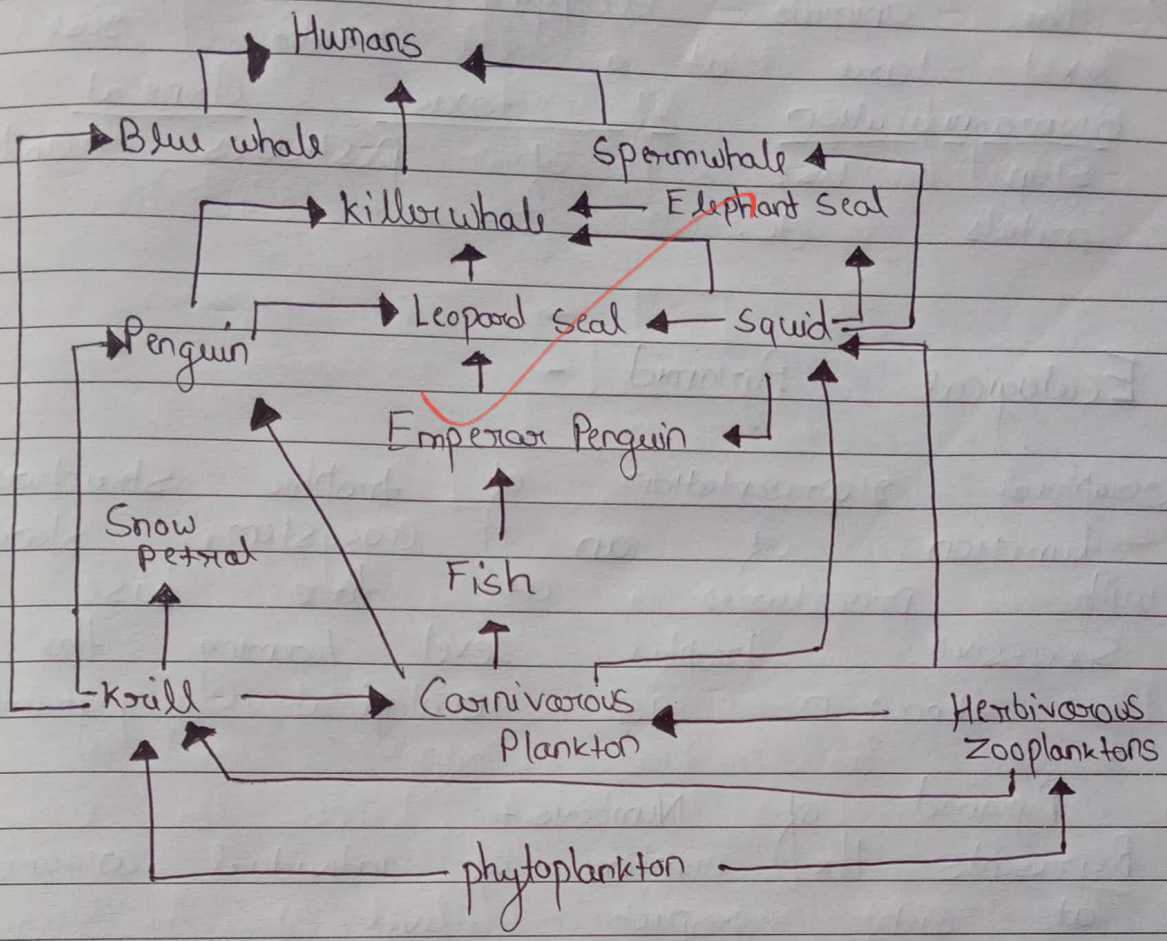
→ Grazing food chain derives its energy mainly from plants while Detritus food chain obtains

→ grazing food chain predominates in natural ecosystem.

Food web -

network of food chain where different types of organisms are connected at different trophic levels, so that there are a number of options of eating and being eaten at each trophic level.

example - food web is Antartic ecosystem representing total ecosystem including the antarctic sea and the Continental land.



CASE STUDY -

- A build of DDT Concentration -

→ Case of biomagnification of DDT (a broad range insecticide) was observed when some birds like Osprey were found to suffer a sharp decline in their population.

→ The young ones of these birds were found to hatch out in premature condition leading to their death. This was later found to be due to biomagnification of DDT through the food chain.

→ DDT was sprayed in less amount but its concentration increased along the food chain through phytoplanktons to zooplanktons and then to fish which was eaten by birds, it caused thinning of

Shells in the bird's eggs causing death of young ones.

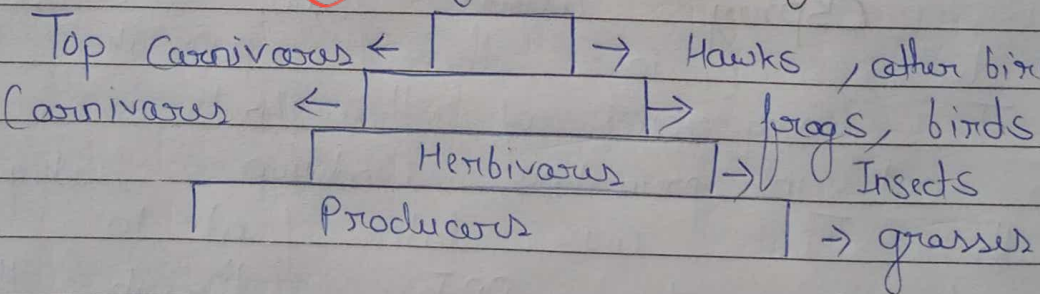
→ The animals occupying the higher trophic level are at a greater risk of Biomagnification of toxic chemical So, Stop use of pesticides and heavy metals etc.

Ecological Pyramid -

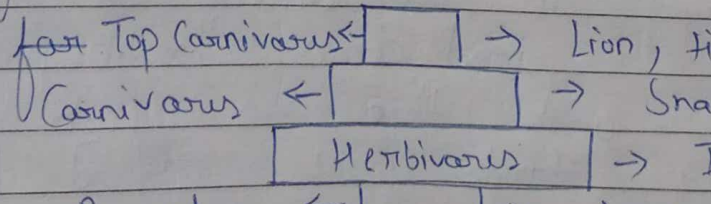
Graphical representation of trophic structure and function of an ecosystem, starting with producers at the base and successive trophic level forming the aper is known as ecological pyramid

① Pyramid of Numbers -
Represents the number of individual organisms at each tropic level.
we may have upright or inverted pyramid of number depending upon the type of ecosystem and food chain.

example a) grassland ecosystem (upright)



b) forest ecosystem - (narrow at both ends)



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c) Parasitic food chain shows an Inverted pyramid of number

Hyper Parasites	→	fleas, microbes
Parasites	→	lice, bugs
Herbivores	→	Birds
Producers	→	Trees

(2) Pyramid of Biomass -
Based upon total biomass (dry matter) at each trophic level in food chain.
→ Can be upright or inverted

(a) Pyramid of biomass in Grassland

Carnivores	→	Snakes, frog, birds
Herbivores	→	Squirrel, rabbit, insects
Producers	→	grasses, herbs

• pyramid of biomass in forest is upright in constranst to its pyramid of numbers because the producers (trees) accumulate a huge biomass while the consumers total biomass feeding on them decline at higher trophic level

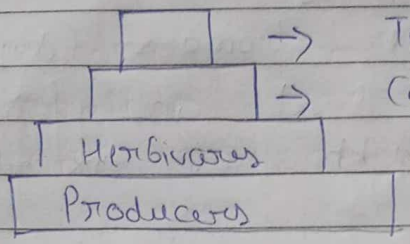
(b) Pond ecosystem : (inverted)

tertiary Carnivores	← Big fish
Carnivores	← Small fish
Herbivores	← Insects
Producers	Phytoplanktons

(3) Pyramid of Energy -
→ The amount of energy present at each trophic level is considered for this type of pyramid
→ gives best representation of trophic relationships

and it is always upright.

→ at every successive trophic level, there is huge loss of energy (about 90%) in the form of heat, respiration etc. Thus, at each next higher level only 10% of the energy passess on, So there is sharp decline in energy level of each successive trophic level.



Energy flow in a Ecosystem-

Flow of energy in an ecosystem take place through the food chain and it is this energy flow which keeps the ecosystem going.

The most important feature of this energy flow is that it is unidirectional or one way flow.

Unlike the nutrients (like carbon, nitrogen etc) which move in a cyclic manner and are reused by the producers after flowing through the food chain, energy is not reused in the food chain.

Also, the flow of energy follows the two laws of Thermodynamics

Ist law of thermodynamics and IInd law of thermodynamics.

Energy flow Models-

The flow of energy through various trophic level in an ecosystem can be explained with the help of various energy flow

models.

(a) Universal energy flow model
(b) Single channel energy flow model
(c) Double channel or Y- shaped energy flow model.

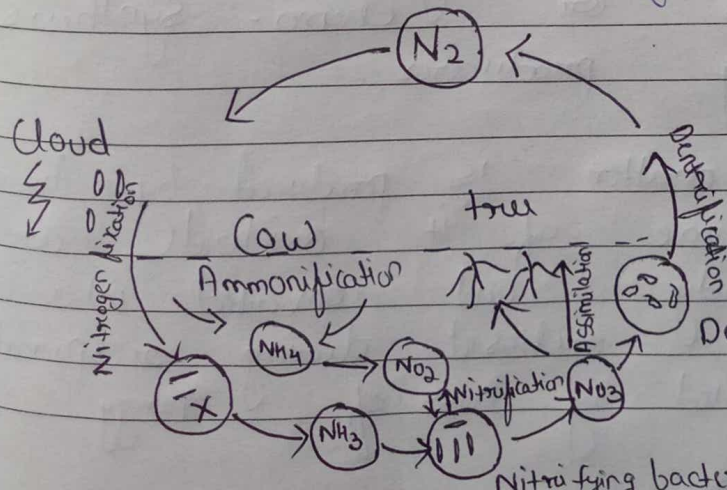
Nutrient Cycling -

Nutrients like Carbon, nitrogen, Sulphur, oxygen hydrogen etc move in circular paths through biotic and abiotic components and are therefore known as biogeochemical cycles

→ Water also moves in a cycle, known as hydrological cycle. The nutrients too move through the food chain and ultimately reach the detritus compartment where various micro-organisms carry out decomposition.

Nitrogen Cycle -

Nitrogen is present in the atmosphere in an elemental form and as such it cannot be utilized by living organisms. This elemental form of nitrogen is converted into combined state with elements such as H, C, O by certain bacteria, so that it can be readily used by the plants



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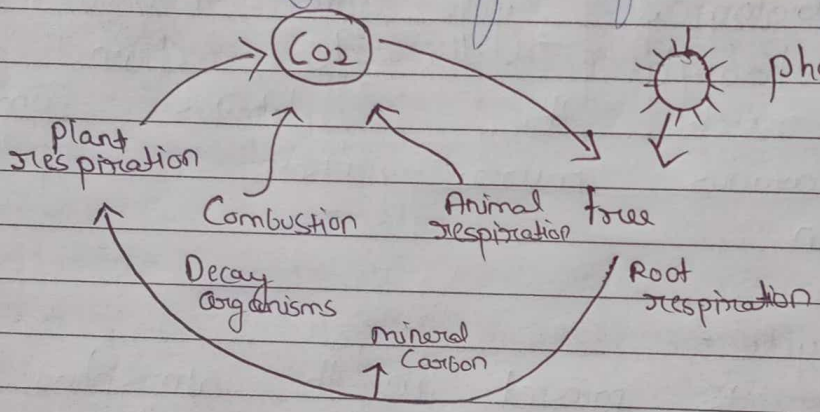
Carbon Cycle -

Carbon enters into the living world in the form of Carbon dioxide through the process of photosynthesis as Carbohydrates. These organic Compounds are then passed from the producers to the Consumers. This Carbon is finally returned to the Surrounding medium by the process of respiration or decomposition of plants and animal by the decomposers.

→ Carbon is also recycled during the burning of fossil fuels.



Primary Production -

Primary productivity of an ecosystem is defined at the rate at which gradient energy is converted into organic substances by photosynthesis or chemo-synthesis by the primary producers.

→ When organic matter is produced by the primary producers, some of it oxidized or burnt inside their body and converted into carbon-dioxide which is released during respiration and is accompanied by loss of energy

Respiratory loss of energy is a must, because it is required for the maintenance of the organism.
Now, the producers are left with a little less organic matter than what was actually produced by them.
This is known as the net primary production (NPP) and the respiratory loss (R) added to it gives the gross primary Production (GPP)
Thus, NPP = GPP - R

Secondary Production.
The food synthesized by green plants through photosynthesis is the primary production which is eaten by herbivores.
The plant energy is used up for producing organic matter of the herbivores which in turn, is used by the carnivores.

The amount of organic matter stored by the herbivores or carnivores is known as Secondary production.

→ The energy stored at Consumer level for use by the next trophic level is thus defined as secondary production.

Ecosystem Regulation.
All ecosystem regulate themselves and maintain themselves under a set of environmental conditions. Any environmental stress tries to disturb the normal ecosystem functions. However, the ecosystem, by itself, tries to resist the change and maintain itself in equilibrium

with the environment due to property known as Homeostasis.
Homeostatsis is the inherent property of all living systems to resist change.

However, the system can show this tolerance or resistance only within a maximum and a minimum range.
Which is its range of tolerance known as homeostatic plateau.

Ques 3 What is eutrophication ?

Eutrophication is the condition of a gradual increase in the concentration of phosphorus, nitrogen, and other plant nutrients in a water body resulting in excessive plant and algal growth

- Eutrophication is one of the most widespread challenges faced by freshwater systems and also has a long history in terms of water management.
- It is a natural process that occurs in different water sources over centuries, but human activities has accelerated the process by increasing the rate and extend of eutrophication.
- The condition arises as to the productivity or fertility of aquatic ecosystem increased due to the rise in the organic material that can be broken down into simpler usable nutrients

- The most prominent effect of eutrophication of water resources is the formation of blooms of foul-smelling phytoplankton. These microorganisms reduce water clarity and might degrade the water quality.
- The growth of such blooms disturbs light penetration and destroys the growth of plants in coastal zones.
- Eutrophication threatens the ecological stability of the system as the nutrient enhancement can interact with source specific conditions like the presence of other contaminants and infectious agent.
- In the decades, eutrophication has considered an irreversible process, but for last few years, eutrophication in several lakes has been reversed by managing both the human nutrient emission and cutting off nutrient loads to the sources.
- The Eutrophication is an urgent threat as more than 30% of the lakes and reservoirs in the world have been affected by eutrophication.

Causes of eutrophication -

Some of the factors that enhance the process of eutrophication by increasing the nutrient content of the water resource are -

1) Fertilizers

The use of fertilizers containing phosphates and nitrates in order to increase the productivity of crops is one of the primary causes of cultural eutrophication

2) Concentrated animal feeding operations

Concentrated animal feeding operations are agricultural practices where a large numbers of animals are confined to a certain area for a certain period of time in order to increase the productivity and quality of the animals

Operations like these produce millions of tons of manure each year, all of which eventually find their way into water resources.

The manure primarily contains nitrogen and phosphorus both of which are essential elements of algal blooms.

3) Sewage and Industrial waste Discharge

In many developing countries, household sewage, as well as industrial discharge are released into water resources like lakes, ponds and rivers.

The wastewater entering from different sources tend to have high amount of chemical nutrients which stimulate the dense growth of algal blooms in such resources

4) Environmental factors

Different environmental factors like temperature Salinity and atmospheric conditions

play essential roles in eutrophication, but the exact mechanism of their influence is not yet completely understood.

Process / Steps of Eutrophication -

The overall process of eutrophication can be explained in the following steps -

1) Accumulation of nutrients
2) Increase in productivity
3) Algal bloom formation

Eutrophication Types -

Eutrophication can be divided into two types based on the root cause of the process;

1) Natural Eutrophication -

- Natural eutrophication is a process that occurs as a result of a gradual buildup of nutrients and organic matter in water resources over a very long period of time.
- The process of natural eutrophication is enhanced by natural conditions like floods and landslides, where the organic matter from the land is washed off into water resources.
- The process of natural eutrophication begins in an oligotrophic water resource where the productivity increase as the nutrients accumulate to reach a stable state of eutrophy

2) Cultural (Anthropogenic) Eutrophication -

- Cultural eutrophication of anthropogenic eutrophication is the process of accumulation of excess nutrients in water ecosystems as a result of human activities
- Cultural eutrophication is a process that speed up natural eutrophication, resulting in severe conditions with a short period of time.
- The primary cause of cultural eutrophication is the series of human activities that primarily increase the concentration of phosphorus and nitrogen in the ecosystem.

CASE STUDY -

Eutrophication of Potomac river -

- Potomac River in Washington Country in maryland is one of the best classic examples of eutrophication of water resources
- The river was initially identified as being in eutrophic condition based on the analysis of dissolved oxygen values / biological oxygen demand and the health of aquatic life
- Various studies found that the nutrient from the land around the river resulted in the accumulation of chemicals like nitrogen and phosphorus.

- It is believed that the manure from the livestock and the washed of fertilizers from the land are the primarily cause of eutrophication.
- The river still harbours some aquatic life forms like fishes and arthropods, but the biodiversity has been decreasing every year.

Eutrophicated Lake Udaisagar, Udaipur -

- World famous highly eutrophicated lake Udaisagar is approximately 20 km away from Udaipur. Lake Udaisagar receives city sewage, industrial wastes of certain industries of Mewar industrial area and run-off of agricultural field through river Ahar.
- At times heavy algal blooms have been observed which pose serious problem in the water supply of Debari Zinc Smelter, a factory of Hindustan Zinc Ltd.
- The flowering of water in Lake Udaisagar by cyanobacteria, microcystis aeruginosa as one of the dominant plant species indicated the high degree of eutrophication
- agricultural run-off from nearby agricultural fields is a main source of eutrophication in lake Udaisagar.