Ecosystem:

Defⁿ: Ecology is a science of interrelationship & deals with interrelationship of living organisms & non living components of environment.

The term Ecosystem is coined by British scientist A. G. Tansley in 1935.

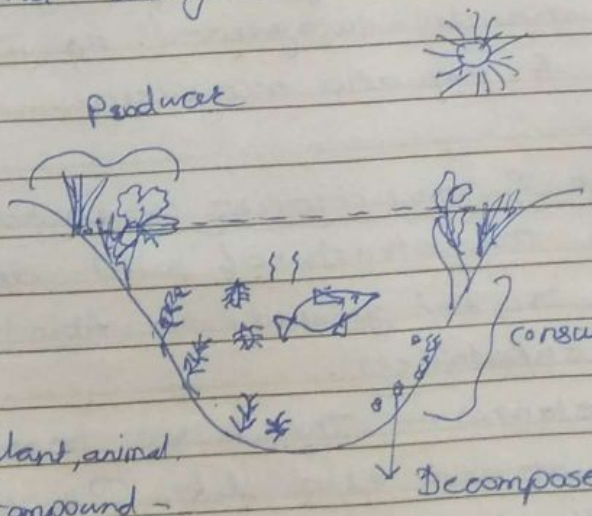
defⁿ - The system resulting from the integration of all the living & nonliving factors of the environment.

Concept of ecosystem is very broad. It shows the interrelationship of all components & their interdependance on each other.

The unique feature of all ecosystem is the interaction betⁿ autotrophic (self nourishing) & heterotrophic (other nourishing) components.

eg - photosynthesis takes place in autotrophs & energy is produced in the form of biomass which is consumed by herbivores organisms (heterotrophs) & produces secondary biomass. In this way the food chain continues.

eg - Pond ecosystem.



Biotic - plant, animal.

abiotic compound -

= organic & inorganic matter.

The basic essential element like C, N, H, O, S & P are recycled & recirculated in biotic & abiotic components with the help of natural

elements like air, water & soil. So the biotic component & the physical environment help to ~~to~~ energy circulation as well as nutrient eg. material cycle.

The organism can't live alone in it's envt. They live in community & are dependent on each other for their good demands. In this way life is maintained on the earth.

There are number of types of ecosystem pr. on earth. There are no sharp boundries in 2 ecosystems. but they contains common area i.e transition zone called as ecotone. The ecotone areas are rich in diversity. The ecotone has it's own diversity but it also shows the characteristics of ~~per~~ neighbouring ecosystems. Therefore conservation of ecotone is of great significance.

The natural ecosystems are those, who are stable & balanced for longer time period.

The natural ecosystem present on earth is mainly catagorised as Terrestrial ecosystem & aquatic ecosystem.

★ Structure & functions of an ecosystem:-

From the structural point of view ecosystem is ~~so~~ grouped as: Abiotic substances & biotic substances.

★ Abiotic Substances – The basic in organic compounds of an area like CO_2, water, N, Ca, Phosphate are involved in material cycles.

The organic components are protein, aminoacids, lipids, carbohydrates which are synthesized by

biotic components of ecosystem.

Biotic components :- They are composed of Producer, consumers & decomposers or reducers.

1. Producers - Autotrophic organism which are able to produce food from simple inorganic components are called as producers.
eg - Chemosynthetic bacteria, photosynthetic bacteria, algae, grass, moss, shrubs, herbs & trees.

2. Consumers - These are heterotrophic organisms like animals who eats an organism or organic matter. They are generally herbivores or carnivores. Consumers are also called as macro consumers.

3. Decomposers or reducers :- They are heterotrophic organisms like bacteria & fungi. They breakdown the complex organic matter of dead organism to simple organic matter. So this simple organic matter can be easily consumed by producers. i.e by plants. They are also called as micro consumers.

* From the functional point of view, ecosystem has two components.

1) Autotrophs (Self nourishing).
They are able to fix light energy using simple inorganic components & makes complex organic matter.
eg - green plants, chemosynthetic bacteria, photosynthetic bacteria
The members of Autotrophic components are known as producers.

2) Heterotrophs (other nourishing).

They utilizes the organic matter produced by Autotrophs or other organ decomposes the organic matter.
eg - all animals & micro organisms.

Pond as an ecosystem:-

A lake or pond is a classical example of the ecosystem.

It can be devided into 4 basic units. Abiotic substances, producers, consumers, & decomposers.

a) Abiotic substances - These are water, CO_2, O_2, Ca, N_2, P, amino acid & humic acids.
These acts as nutrients for an ecosystem.
A part of these [illegible] form which is easily available for organisms. A large no of nutrients is [illegible] in reserved form in particulate matter.

b) Producers - Produces in pond are of 2 types ① rooted or floating plants ② minute floating algae which are distributed in deep water upto where the sunlight penetrates. If they are in large no it gives greenish colour to water. They produce food for pond ecosystem.

c) Consumers - Primary consumer & secondary consumer.
Primary - animals like insects, larvae, crustaceans & fish. They feed directly on plants.
Secondary - carnivore fish which feeds primary consumers.

d) Decomposers - Aquatic bacteria & fungi are distributed.

are developed they decompose the dead organism & releases nutrient for further use.

The pond can be devided into 2 strata.
Upper — production zone
lower — decomposition - regeneration zone
The decomposed organic matter is consumed at the bottom of pond.
In this way the pond ecosystem is considered as a balanced ecosystem.

* Energy flow in the ecosystem: Ecological Energetics

The energy used for plant life process is derived from solar radiation. 1/50 millionth part of total radiation is reaching to earth's surface. atmosphere. the [illegible] space in the form of waves. (0.03 A° to several km). Most of them are lost in space (ranging from 300m to 10m). Above 1 cm (radio waves) enters to earth's atmosphere. (18 mile / 18 km)

The energy reaching to the earth surface is consists of visible light (390 - 760mm) & infrared components.

On a clear day the radiant energy reaching the earth's surface is about 10% UV, 45% visible & 45% infra-red. Plants strongly absorbs blue (400-500mm) & red (600-700 mm) light.

In ecological energetics we study
i) Quantity of solar energy reaching to ecosystem
ii) Quantity of energy used by green plants for photosynthesis &
iii) The quantity & path of energy flow from producer to consumers.

Total = 34 % + 10 % is
100 reflected back held by ozone layer
to atmosphere space. water vapour & atm. gases.

Remaining 56% reaches to earth surface.
Out of this 1 to 5 % used by green plants for photosynthesis & remaining is absorbed as heat by ground or water.
0.02 % of the total energy reaching to surface is used for photosynthesis.

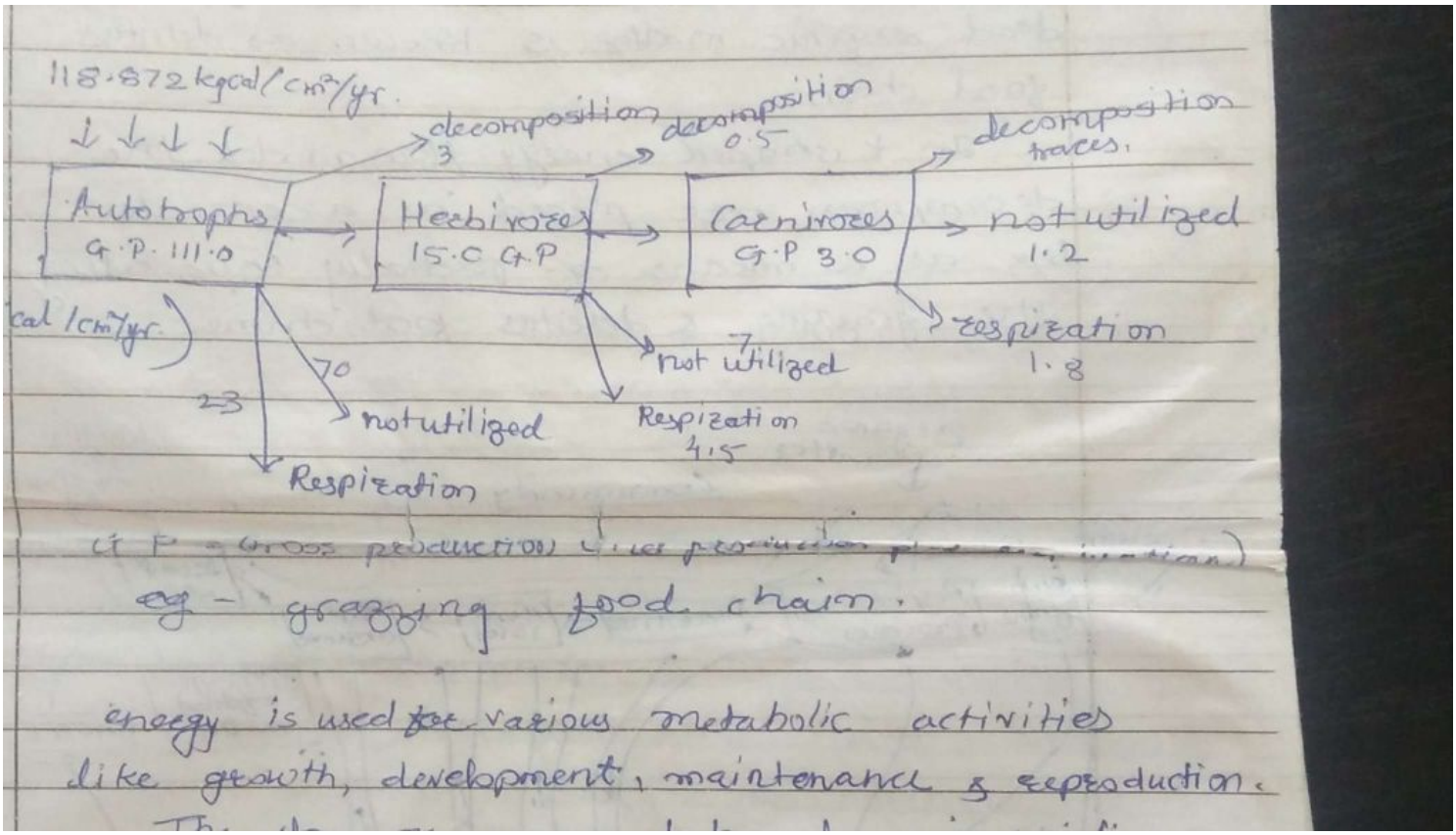
Energy flow in an Ecosystem:-

In an ecosystem the energy flow takes place through food chain. & by ~~energy flow in ecosystem keeps on going~~.
The most important feature of this energy flow is that it is unidirectional or one way flow.

The flow of energy follows 2 laws of thermodynamics.

Ist law of Thermodynamics - States that energy can neither be created nor be destroyed, but it can be transformed from one form to another. The solar energy captured by the green plants (producers) gets converted into biochemical energy of plants.

IInd law of thermodynamics - States that energy dissipates or it gets converted from more concentrated form to dispersed or simple form. As energy flows through food chain, there is loss of energy at each tropic level i.e. during running, respiration, locomotion & other activities.



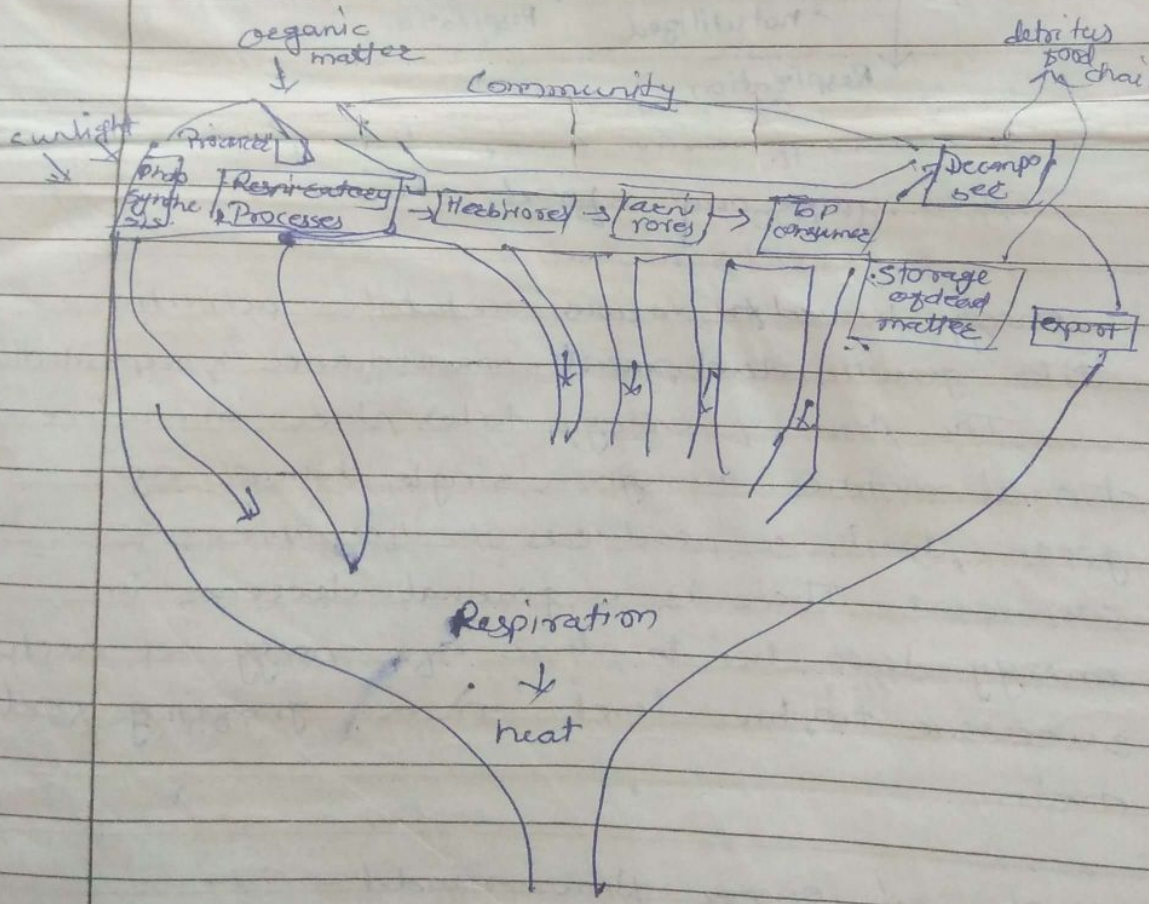
eg - grazing food chain.

energy is used for various metabolic activities like growth, development, maintenance & reproduction.

storage of organic matter are also included Decomposers are expressed seperatly in food chain. ~~The~~ to This model has 2 food chain. — ~~detr~~ grazing food chain & detritus food chain.

The food chain which starts from dead organic matter is known as detritus food chain.

In t shaped energy flow model the decomposers are placed in a separate box as a means of partially seperating the grazing & detritus food chains.



Ecological succession (Community Dynamics)

Ecosystem is dynamic in nature & changes it's structure & function with time & quite intrestingly, these changes are very orderly & can be predicted.

It is observed that one type of community is totally replaced by another type of community over a period of time & simultaneously several changes also occurs. This process is known as Ecological succession.

Def → Ecological succession is defined as an orderly process of changes in the community structure and function with time & modification in the physical environment & ultimetly reaching in a stabilized ecosystem known as climax.

eg ① conversion of pond ecosystem into forest ecosystem
② conversion of bare rock into forest ecosystem

→ This type of succession originates on a bare rock which lacks water & organic matter. But here also the climax community is forest ecosystem although the intermediate stages are very different.

During weathering of rock, some organic matter, humus & soil get dipositedl on the rock. followed by the growth of mosh, then herbs, shrubs & finally the forest trees.

Causes of Succession :-

Initial or initiative causes – These are climatic factors or biotic. Includes – forest fire, wind, volcanic eruption, soil erosion, deposition etc. The cause destroys the existing community & produces bare area.

Continuing causes or Ecesis – Includes the processes like migration, aggregation, competation, reaction etc It will introduce a new community

in new area.

(3) Stabilising cause - The cause stabiliges the community. climate of that area is majorely responsible for stabilizen of community.

The ecological succession takes place by 4 clines. factors responsible for succession.

I An continuous change in the kinds of plants & animals.

II An increase in the diversity of species

III An increase in the organic matter & biomass supported by the available energy flow.

IV Decrease in net community production or annual yield.

Types of succession :-

(1) Primary succession :- It starts from the primitive substratum, where there was no previously any sort of living matter. The first group of organisms establishing there are known as the pioneers or primary community or primary colonisers. eg - bare rock - Leachane.

(2) Secondary succession :- It starts from the previously built up substrate with already existing living matter. such succession is comparatively more rapid.
eg- Due to forest fire.

(3) Autogenic succession - After the succession has began, the community itself modifies it's own environment by some reaction, thus causing it's own replacement by new community. This cause of succession is known as autogenic succession.

(4) Allogenic succession - In some cases, the replacement of the existing community is caused largly by

any other external conditions & not by the existing organisms. Such a cause is referred as allogenic succession.

(5) Autotrophic succession :- It predominantly starts with autotrophic organisms like green plants. It begins in inorganic environment (CO_2, H_2O, N_2, Ca, phosphate, etc.) & energy flow is maintained indefinitely, also there is gradual increase in the organic matter content, & also in the energy content. In this involvement of biotic & abiotic components takes place.

(6) Heterotrophic succession :- It is characterised by the heterotrophs like bacteria, actinomycetes, fungi & animals. It begins in a organic environment (Protein, amino acids, lipids, carbohydrates, fats, etc.) & there is progressive decline in the energy content as they consume

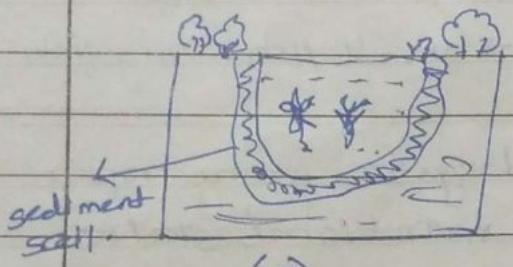
spores, seeds, etc. by is brought about by wind, water, insects or birds. Then the seeds germinates & grow on the land. As growth & reproduction starts, these pioneer species increase in number & form groups or aggregations.

3. Competition & co-action :- As the number of individuals grows, there is competition bet^n both inter-specific (Between different species) & intra-specific (within the same species) for space, water & nutrition. They influence each other in number of ways, known as co-action.

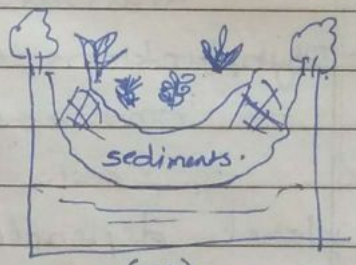
4) Reaction :- The living organisms grow, use water & nutrients from the substratum & in turn, they strongly influence on the environment which gets modified, this is known as reaction. The modifications are such that they become unsuitable for the existing species & favours some new species. These reaction leads to several seral communities. (means different communities are formed.).
eg. species of tea.

5) STABILIZATION :- Finally, there occurs a stage in the process when the terminal community becomes more or less stable for longer period of time & maintains itself in equilibrium; with the climate of the area. This final community is not replaced & is known as climax stage / community.

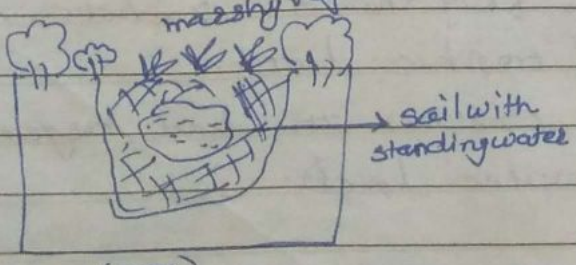
pioneer community consists of phytoplanktons which are free floating algae, diatoms etc. Gradually they are replaced by rooted submerged plants followed by rooted floating plants. Growth of these plants keeps on adding organic matter to the substratum by death & decay & thus a layer of soil builds up & shallowing of water takes place. Then Reed swamp (marshy) stage follows in which the plants are partly in water & partly on land. This is followed by sedge meadow stage of grasses then by a woodland consisting of shrubs & trees & finally by a forest acting as climax.



(I)
open water body
(lake)



(II)
Shrinkage of water body
due to sedimentation.



(III)
Marshy Habitat.

(IV)
climax stage
formation of forest ecosystem.

S.N. Give the importance of food chains & food webs in an ecosystem.

FOOD CHAINS, FOOD WEB & ECOLOGICAL PYRAMIDS

* **FOOD CHAINS:-** The sequence of eating & being eaten in an ecosystem is known as food chain.

All organisms, living or dead, are potential food for some other organism. & thus there is essentially no waste in the functioning of natural ecosystem.

A caterpillar eats a plant leaf, a sparrow eats the caterpillar, cat or a hawk eats the sparrow & when they all die, they are all consumed by micro-organisms like bacteria & fungi (decomposers) which breakdown the organic matter & convert it into simple inorganic substances that can again be used by the plants - the primary producers.

Examples of simple food chain are

1. Grass → Grasshopper → Frog → Snake → Hawk
   Grassland ecosystem.
2. Phytoplanktons → water fleas → small fish → big fish
   Pond ecosystem.

Each organism belongs to some trophic level depending on the nutritional status.

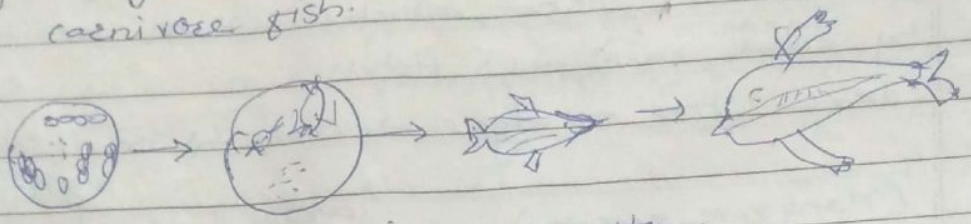
Thus in grassland food chain grass occupies the 1st trophic level, grasshopper occupies the 2nd trophic level, frog the 3rd & snake 4th & hawk the 5th trophic level.

Decomposers consumes the dead organic matter of all these trophic levels.

Ecosystems.

Types of food chains -

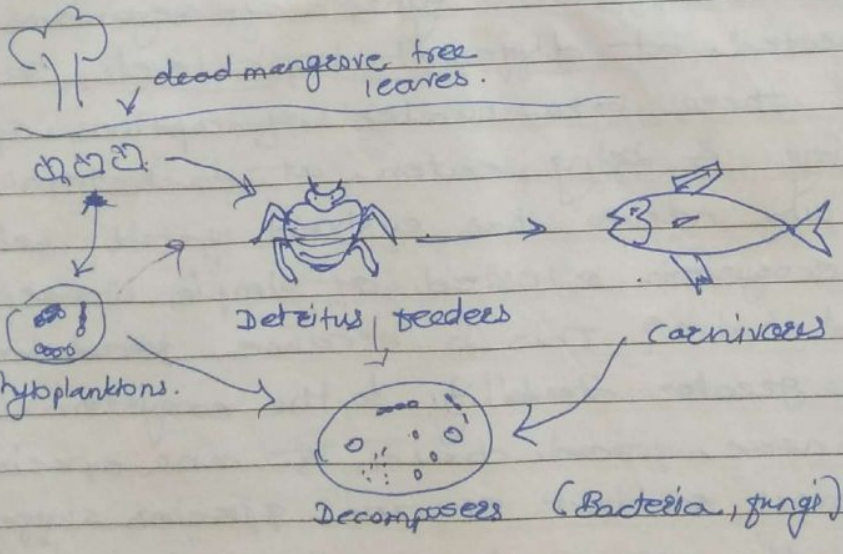
① Grazing food chain - This type of the food chain starts from the living green plants, goes to grazing herbivors & then to carnivores (animal eater). Such type of food chain are directly dependend on solar radiation.
eg - Phytoplankton → zooplankton → small fish → carnivore fish.



Grazing f.c. in pond ecosystem.

② Detritus Food chain - This type of food chain starts from dead organic matter. Such ecosystems are less dependent on direct solar energy but depends chiefly on the influence of organic matter produced in another system.
eg - Detritus food chain in a estuary based on dead leaves of mangroove trees.

Mangroove ecosystem



Here large quantity of leaves leaf material falls in the form of litter into the water.

(Saprophytes are those organisms which feeds on dead organic matter). These fallen leaves are consumed by small algae, which are also consumed by the saprophytes or detrivores consisting of crabs, molluscs, insect larvae, fishes. The detrivores are eaten by carnivorous fishes, which in turn are eaten by large carnivorous fishes.

leaf litter → algae → crabs → small carnivorous fish → large carnivorous fish.

(Mangrove ecosystem).

FOOD WEB:-

Food chain in ecosystems are rarely found to operate as isolated sequences. When these food chains are found to be interconnected & usually forms a complex network with several linkages, they are known as food web. Thus Food web is a network of food chains where different types of organisms are connected at different tropic levels, so that there are number of options of eating & being eaten at each tropic level.

Why nature has evolved food web in ecosystem instead of simple linear food chains? This is because food webs give greater stability to the ecosystem. In a linear food chain, if one species becomes extinct or one species suffers then the se species in the subsequent trophic levels are also affected.

On the other hand, in food web there are no. of options available in number.

at each trophic level. So if one species is affected, it does not affect other trophic levels so seriously

eg — Food web of grassland ecosystem.

There may be seen as many as 5 linear food chains as —

Grass → Grasshopper → hawk

Grass → Grasshopper → lizard → hawk

Grass → Rabbit → hawk

Grass → mouse → Hawk

Grass → mouse → snake → Hawk.

These 5 chains are interlinked with each other at different points, forming food web.

Decrease in popul^{n} of rabbit would naturally cause an increase in the popul^{n} of alternative herbivore, the mouse.

There is linkage in 2 chains.

Significance of Food chains & food Webs —

Food chain & food web plays a very significant role in the ecosystem because the 2 important functions of energy flow & nutrient cycling take place through them. The food chain also helps in maintaining & regulating the population size of different animals & thus, helps in maintaining the ecological balance.

Graphical representation of trophic structure & function of an ecosystem, starting with producers at the base & successive trophic levels forming the apex is known as ecological pyramid.

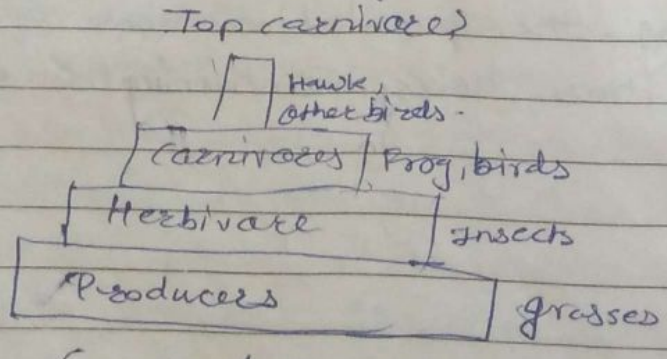
Ecological pyramids are of 3 types -

1. Pyramid of numbers
2. Pyramid of biomass
3. Pyramid of energy.

1- Pyramid of numbers - It represents the number of individual organism at each trophic level. We may have upright or inverted pyramid of numbers depending upon the type of ecosystem & food chain.

Grassland Ecosystem & pond ecosystem shows an upright pyramid of numbers.

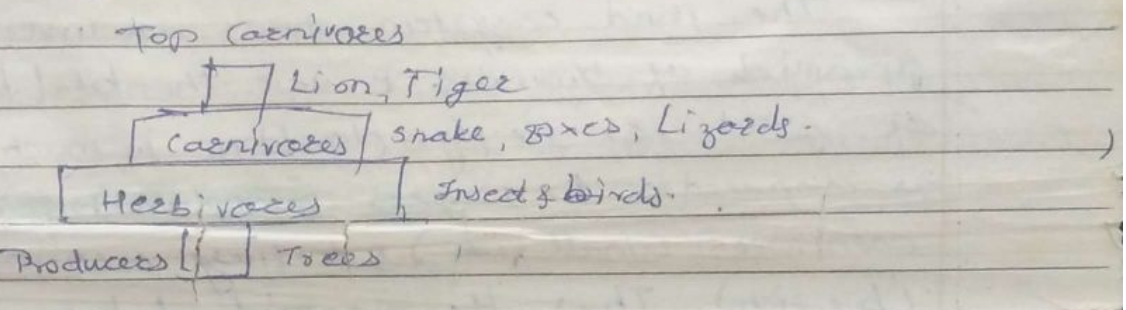
The producer in the grassland ecosystem is grass & in pond it is phytoplankton (i.e algae) They are small is size but very large in numbers. So the producers form a broad base. The herbivore in the grassland are insects while tertiary carnivores are hawk or the birds which are gradually less & less in number & Less hence the pyramid apex becomes gradually narrower forming an upright pyramid.



Grassland ecosystem

Similar in the case of pond ecosystem, i.e herbivores, carnivores & top carnivores in pond which decrease in numbers at higher trophic level.

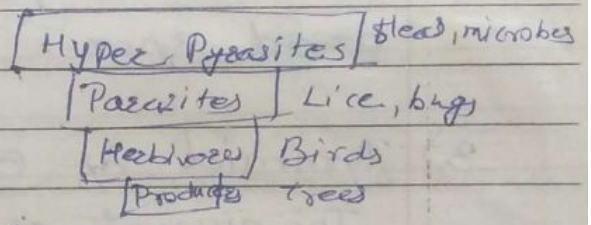
In forest ecosystem, big trees are the producer which are less in number & hence form a narrow base. A large number of herbivores including birds, insects & several species of animal feeds upon the trees (on leaves, fruits & flowers, etc.) & forms a much broader middle tier level. The secondary consumer like fox, snakes, lizards, etc. are less in number than herbivores while top carnivores like lion, tiger, etc. are still less in numbers. So the pyramid is narrow on both sides & broader in the middle.



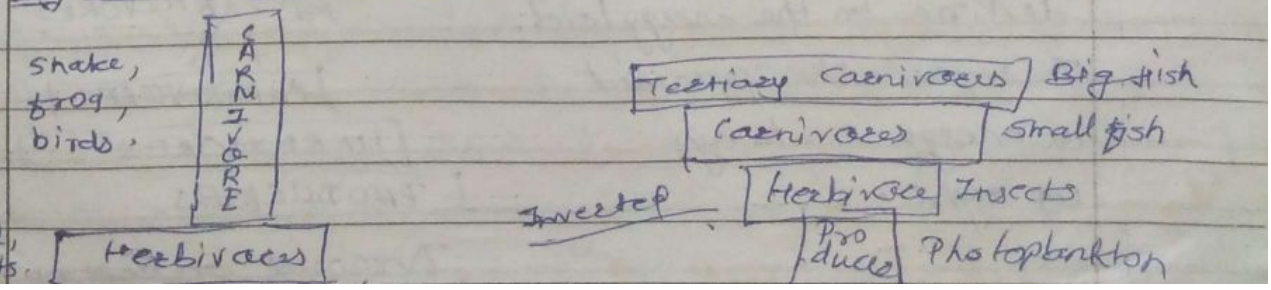
Parasitic food chain.

It shows an inverted pyramid of numbers.

The producers are trees, which are few in number, so the base is narrow. The birds are herbivores which are large in number. The parasites are much more in number than birds, which still greater number of hyper parasite like fleas & microbes feed upon them, thus making an inverted pyramid.



2) Pyramid of Biomass:-



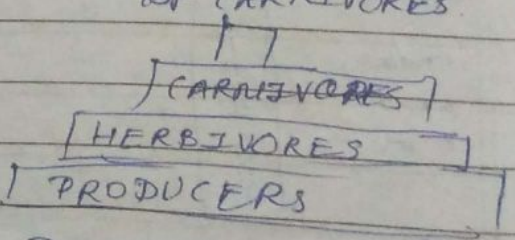
Pyramid of biomass is based upon the total biomass (dry matter) at each trophic level in a food chain. The pyramid of biomass can also be upright or inverted as shown in the figures.

The pyramid of biomass in a forest is upright. This is because the producers (trees) accumulate huge biomass, while the consumers total biomass feeding on them declines at higher trophic levels, resulting in broad base & narrowing top.

The pond ecosystem shows an inverted pyramid of biomass. Because the total biomass of producers i.e phytoplanktons is much less as compared to herbivores (zooplanktons, insects), carnivores (small fish) & tertiary carnivores (big fish). Thus the pyramid takes an inverted shape with narrow base & broad apex.

3) Pyramid of Energy -

The amount of energy present at each trophic level is considered for this type of pyramid. The pyramid of energy is always upright. Because at every sucessive trophic level there is a huge loss of energy (about 90 %) in the form of heat, respiration, etc. Thus at each next step only 10 % of energy passes on. Thus there is sharp decline in the energy level. Therefore the pyramid of energy is always upright.



Pyramid of energy

Major Ecosystems of The World. (11)

1) Forest Ecosystems 2) Grassland Ecosystem 3) Desert Ecosystem 4) Aquatic Ecosystem 5) Ocean Ecosystem.

A) Forest ecosystem.

① Boreal coniferous forest / Evergreen coniferous forest

The coniferous forest biome or great North woods lie between 45°N & 57°N altitude

climate - cool & greater ppt^n in summers.

Soil - acidic & mineral deficient

prominent trees - white spruce & balsam fir, Pine, kedar etc.

having tiny riddle shaped leaves, these leaves fall on the ground & cover the nutrient poor soil. Species diversity is less

② Temperate deciduous forest :- Observed in Eastern North America, entire Europe, part of Japan, Australia & some part of S. America. Abundant & evenly distributed rainfall (30-60 inches)

Deciduous forest are not as extensive as coniferous forest. But they represent one of the most imp biotic regions of the world because "whiteman civiliza^n" has developed in these areas. So these biome is highly modified by man & much of it has been replaced by cultivated & forest edge communities. broad leaf tree oak, maple

These are large no. of plants which produce pulpy fruits & nuts. Animal observed are deer, bears, squirrel, grey foxes, woodpeakers, etc.

③ Temperate evergreen forests - These types of forest have dry summers & cool moist winters, having low evergreen trees with broader leaves or hard needle. However the plants are very well developed & follow quick regenera^n. They are observed in N. America, Spain, Australia etc. The animals are mule deer, brush rabbit, wood rats & lizards.

④ Tropical rain forest :- They are evergreen broad leaf forest found near the equator. These are characterised by high temp high humidity & high rainfall which favours the growth of trees. For whole yr. the climate remains more or less overall same. They are rich in biodiversity (80-90 inches/yr. rainfall).

eg - In India, the Silent valley in Kerala is the only tropical rain forest which is the natural habitat for wide

Type of forest In India
Rain evergreen forest - W.G
Tropical wet evergreen forest - Kerala Assam
Tropical deciduous forest - Gujrat, Rajathan
Broad leaves deciduous forest - Himalaya
Coniferous deciduous forest - U.P H.P J & K
Mangrove forest - eg coastal area.

(5) High altitude or the alpine forest — The characteristics features of high altitude environment are low air density, high O_2 content, low oxygen, & CO_2, high wind velocity, cold & snow. Alpine zone exists at height 3600 Mtrs. & have some animal groups.

→ Invertibrates occures in lake, streams & ponds. Among vertebrates fish, amphibians & reptile are greatly observed. The dominant vertibrates are the crow, snow leopard, Tibetian yak, Tibetan sheep & persian wild goat.

B) Grass land Ecosystem: Grass lands are dominated by grass species but some times allows the growth of few trees & shrubs. Rainfall is average but erratic. Limited grazing helps to improve the primary production of the grassland, but overgrazing lead to degradation of these grasslands & results in decertification.

erratic means irregular

Man selected the major food plants from grasses namely rice, wheat, maize, etc. Grass land soil contains large amount of humus. Depending upon the height of grass there are 3 types of grasses.

1. Tall grass — Height ranges from 5 to 8 feet. They includes — species like Indian grass, sloagh grass, switch grass, & big bluestem.
2. Mid grasses — Ht. ranges from 2 to 4 feet., They include - needle grass, deep seed, western wheat grass, tune grass. & Indian rice grass & many more.
3. Short grasses - Their ht. goes maximum upto 1.5 feet eg - Buffalo grass, blue grass.

U.S & Canada — Prairies, In Africa - Veldt & Savannah South America — Pampas & in central Europe & Asia they are known as steppes. steppes

N.Am Prairie Europe - steppes Veldt & Savannah in Africa Pampas - S.A mecica India - Pastures.

Apart from grasses different type animals are found in different regions of grass land like zebra, giraffe, etc. Termites are found in colonies forming moulds.

DESERT ECOSYSTEM :-

Generally observed in desert area having annual ppt^n less than 50 cm / year. About 1/3rd of our world's land is covered by deserts. Diversity is less & consist of drought resistant or drought avoiding plants. Depending upon the climatic conditions there are major 3 types of desert.

Tropical deserts - like sahara & Namibia in Africa & Thar desert in Rajasthan.

Temperate desert - like mojave in Southern California where day time temp. is very hot in summer but cold in winters.

Cold deserts like the Gobi desert in china has cold winter & warm summers.

Desert plants & animals are having most typical adoptations for conservation of water. Many desert plants are found to have reduced scaly leaves. So as to cut down loss of water due to transpiration, or have succulent leaves to store water (cactus). Many a time the stem develops & form chlorophyll so that they can take up the functions of photosynthesis. Some plants show very deep roots to tap the ground water.

Desert animals like insects & reptiles have thick outer covering to minimize the loss of water. They usually live inside burrows where humidity is better & heat is less.

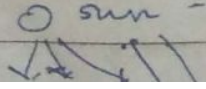
Desert soil is rich in nutrients but efficient in water.

Generally found in water bodies. Divided in 2 catagories - freshwater & marine envt.

The freshwater ecosystem are of 2 types:
standing type — lentic like pond & lake
free flowing water — lotic like river, stream, spring.

1. Pond Ecosystem - Shallow water bodies may be seasonal may a receive water in rainy season. contains algae, aquatic plants, insects fishes & birds. They are quite productive due to accumuln of organic matter. Ponds are often used by humans for washing clothes, bathing, cattle washing, drinking so gets polluted.

2. Lake Ecosystem - They are big in size with standing fresh water. It is devided in 3 zone.
1. Littoral zone — shallow water region where light penetran is upto bottom. occupies rooted plants.
2. Limnetic zone - This is open water zone upto the depth of effective light penetran. Plants are plankitons, ~~nektons~~ ~~zooplanktons~~.
Total area of littoral zone & limnetic zone is called as Euphotic zone.
3. Profundal zone - The bottom of deep water area where light penetran is not possible is known as profundal zone. Such area is absent in pond.



large { — } epilimnion (warm circulating surface)
— } Hypolimnion (cold viscous non circulating)

There are 3 types of lake -
Oligotrophic lakes - Typical oligotrophic lakes are deep with hypolimnion layer i.e (cold, viscous non circulating bottom layer) larger than epilimnion i.e (warm, circulating surface layer) layer. These lakes have less productivity. so low nutrient concentration. Such lakes may change in to eutrophic

Eutrophic lakes - These are shallower & have high nutrient content. They are overnourished by nutrients like, N_2 & Phosphorus. usually because of agri-cultural runoff & municipal sewage discharge. They are covered with algal blooms.
eg - Dal lake in Kashmir, Wular in kashmir.

Impoundment / Reservoirs :- They are artificial water bodies like dams, tanks, reservoirs made by man. They are characterised by fluctuating water level & high turbidity. They are built to store & release water in controlled manner, The released water may be used for hydroelectric project, irrigation, etc.

green plants are much less in number.
The river & stream habit lotic (running water) habitat for communities. The lotic system are represented by springs, streams, rivers & man made chanels & even water falls.
- According to Ministry of Envt. & Forest, Govt. of India, there has been significant increase in the number of human made wetlands. However, the natural wetlands with greater biodiversity are getting decline in size & quality. They are getting contaminated due to drainage, pollution & urbanisation.

D) Estuaries & Marine Ecosystems:
Estuary is a mouth of river where tidal action brings about a mixing of salt & freshwater. Salinity of estuary varies bet^{n} 0.5 to 0.35 %. Estuary are more productive than ocean, due to nutrient trap produced by mixing of water of diff^{n} salinity. & the favourable action of

They regulate ~~earth~~ climate & act as sink for CO_2.

water is ~~salty~~ salt content. - 3-5 ‰. - written as 3.5 ‰.

In fresh water - 0.5 ‰. - salinity

Indias has around 7000 km including eastern & western coasts & Andaman, Nicobar & Lakshdweep islands. Indian marine waters are rich in flora & fauna. It is stable ecosystem & rich in biodiversity.