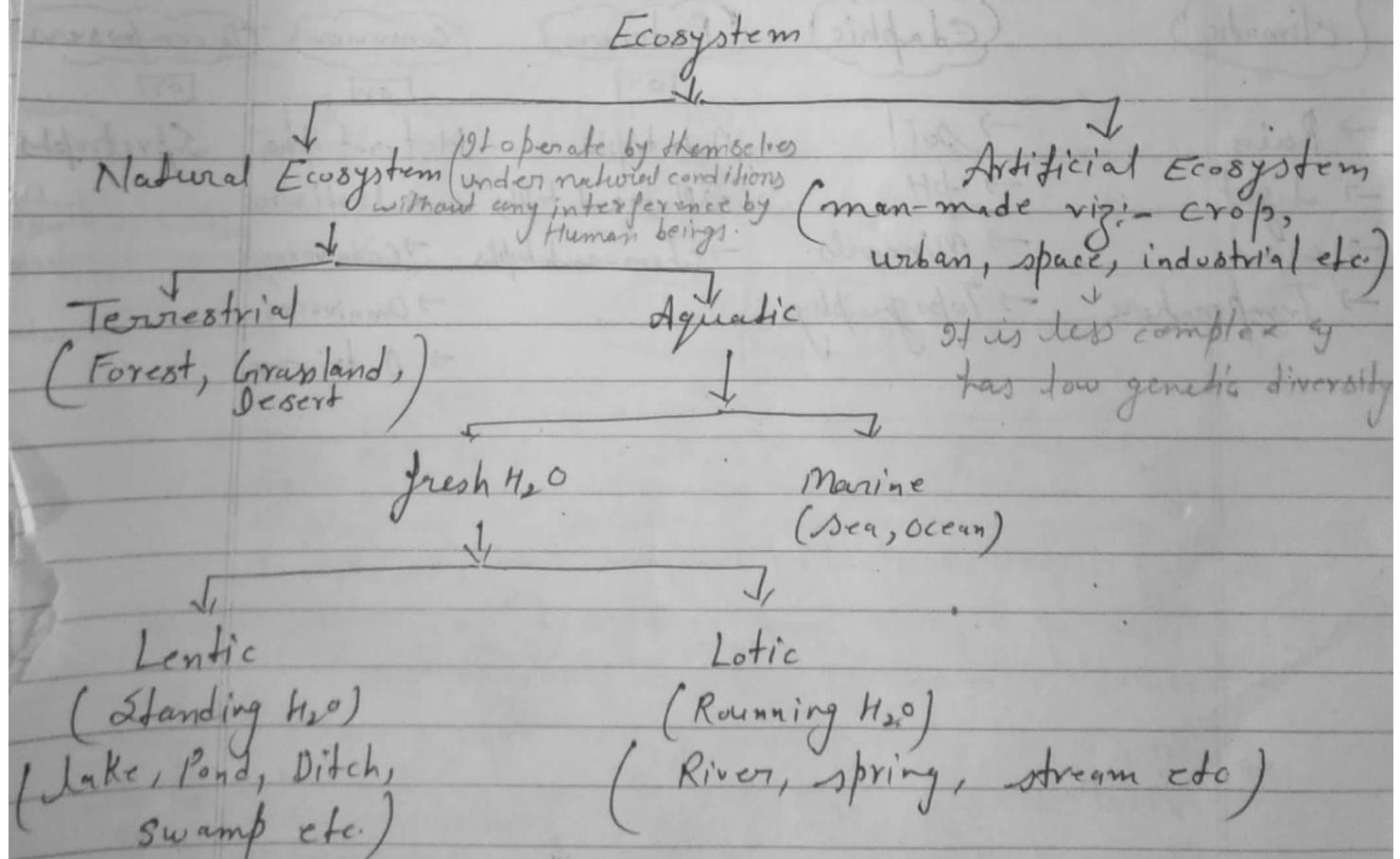


Ecosystem

↓
This term was first introduced by
Sir Arthur Tansely in 1935.

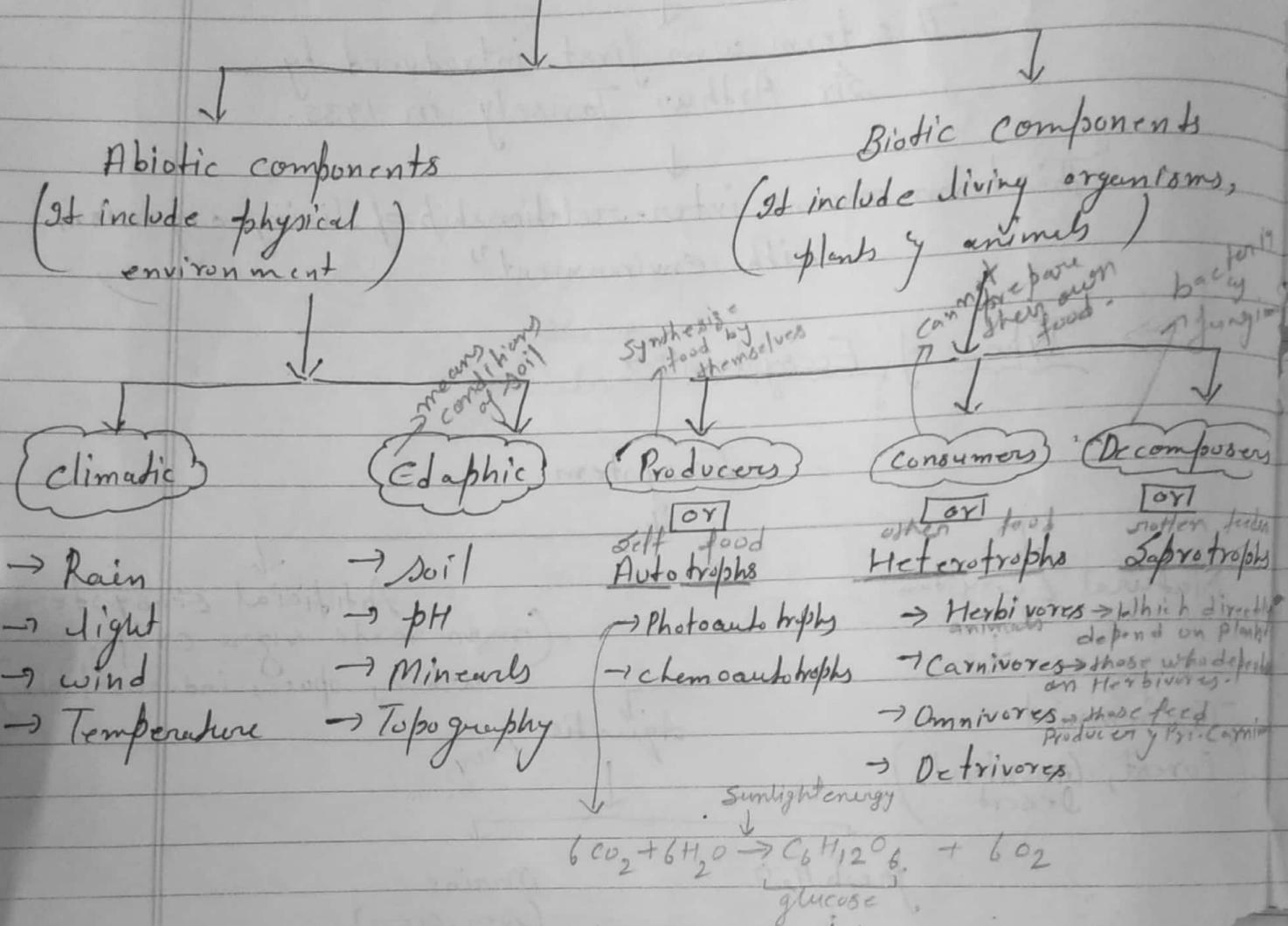
↓
"This term means inter-relationship of living organism
with environment"

⇒ Types of Ecosystem :-



Detritivores → An organism that feeds on & breaks down dead plant or animal matter, returning essential nutrients to the ecosystem. (2)

⇒ Components of Ecosystem :



→ They prepare their food by inorganic comp (CO₂, H₂O) in the form of organic comp (carbohydrate). → with the help of sun light — through a process photosynthesis.

→ Some of the micro-organism produce organic matter to some extent through oxidation of certain chemicals in the absence of sun light. → Known as chemoautotrophs.

→ Carnivores

- Pri. → Frog, lizards, snake
- Sec. → owl, fox

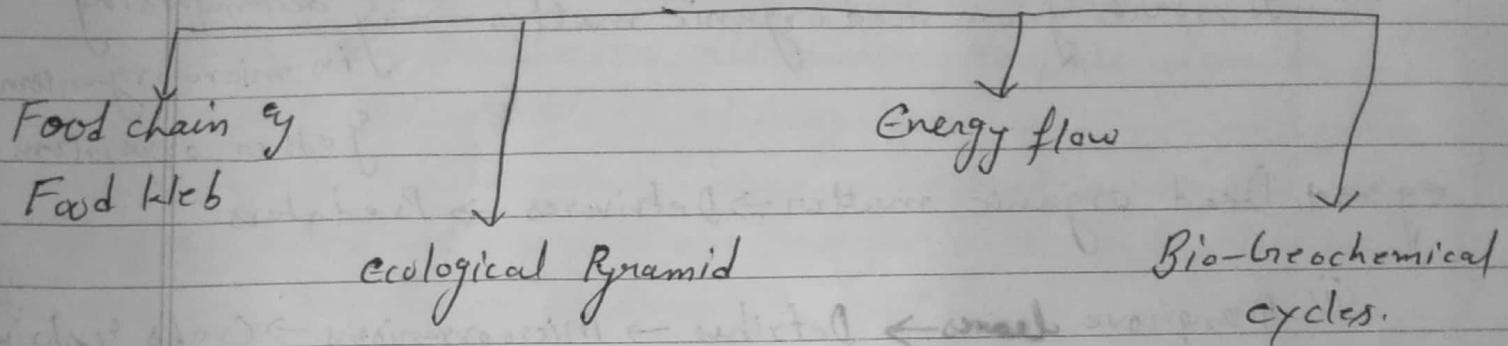
→ Tertiary → Lion, Tigers. → Top consumers of Ecosystem.

→ Decomposers → also known as natural cleaners or scavengers.

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→ Functions of Ecosystem :-

functions of ecosystem can be explained by following ways:



⇒ Food chain & Food Web :-

"Transfer of food energy from producers to various consumers in a definite pattern is termed as food chain."

Food chain

Grazing food chain → it involves Producers, Herbivores & Carnivores.

Detritus food chain

Terrestrial
f-chain

Aquatic food
chain

- eg:-
- Producer → Grasshopper → Shrew → Hawk
 - P → Rabbit → Fox → Wolf → Tiger
 - P + Frog → Snake → Peacock.

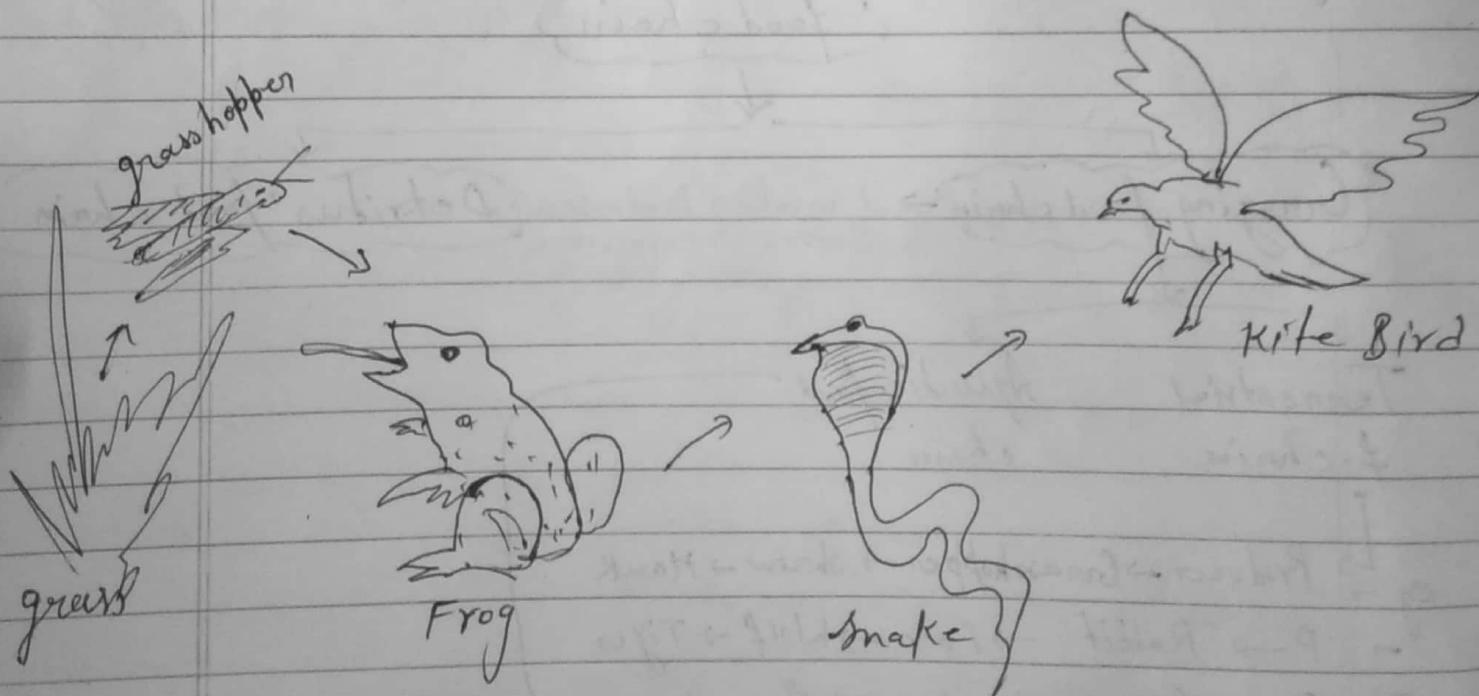
- eg. → Phytoplankton → Zooplankton → small fish → Large fish → shark
- Phyto → Zwp. → Fish → crane → Hawk.

Detritus food chain :-

→ It starts from dead organic matter → by decomposing
in micro-organism
or other organism.

eg:- i) Dead organic matter → Detritivores → Predators

(ii) Mangrove leaves → Detritus → Microorganisms → Crabs & shrimps
↓
small fishes
↓
large fishes



"Fig: A simple food chain of community of animals"

Food Web :-

- In nature, interconnected food chains at various points forming a number of feeding connections b/w diff. organisms are known as food webs.
- Food web provide more alternative trophic levels which ↑ the stability of ecosystem.

Note :- More complex the food chain, more complex will be the ecosystem.

→ Trophic levels — represent a stepwise transfer of nutrition & energy contained in food.

like:-

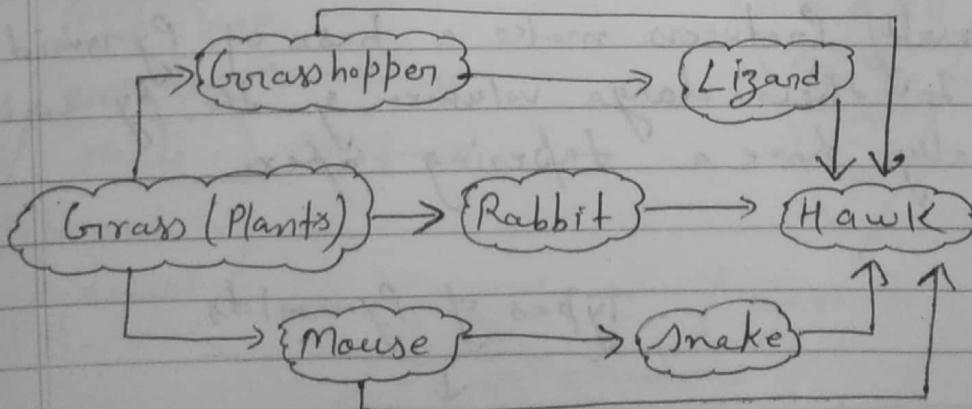
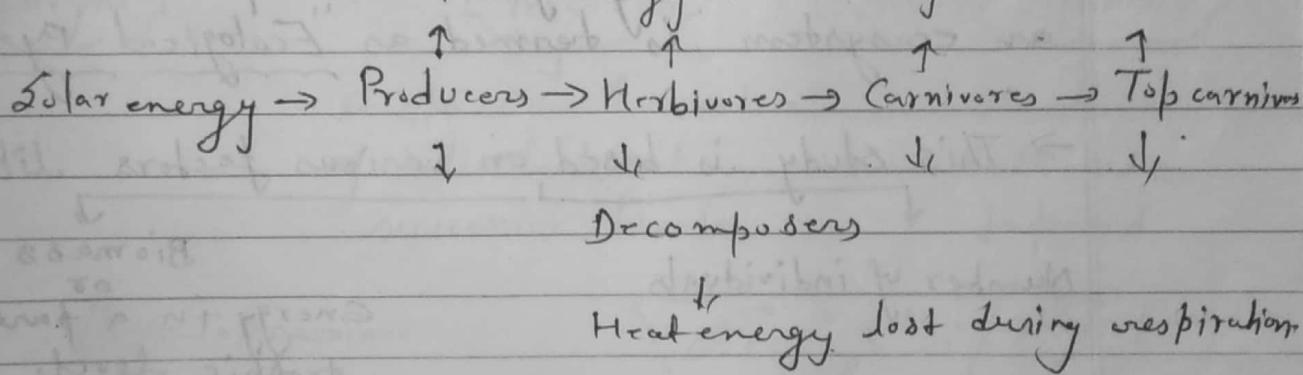
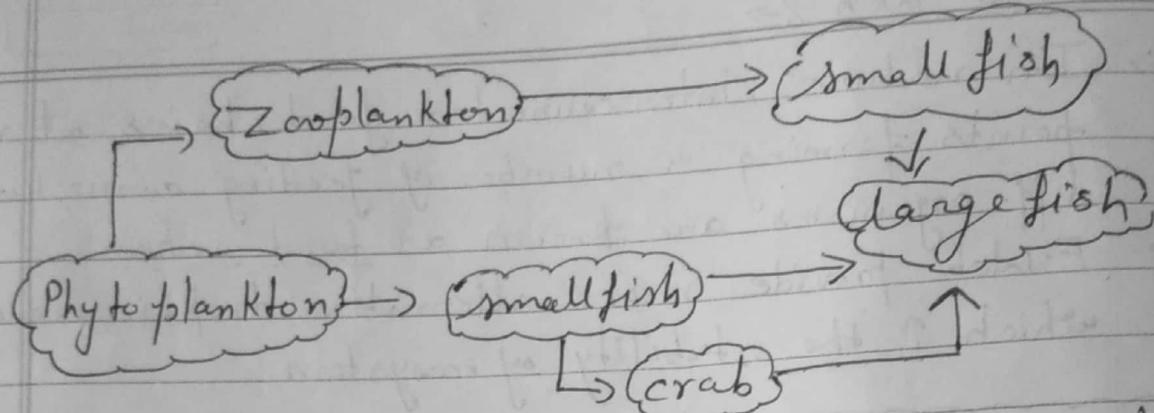


Fig:- Food web in Grass land ecosystem.)



(Fig: A. Food web in Aquatic Ecosystem)

(ii) Ecological Pyramid \rightarrow

\rightarrow "A rational study of various trophic levels in an ecosystem is termed as Ecological Pyramid"

\rightarrow This study is based on various factors like:

Number of individuals

Biomass
or
Energy in a particular trophic level.

\rightarrow Generally Producers make a base of Pyramid due to their large volume. The pyramids generally have a tapering apex.

Types of Pyramids

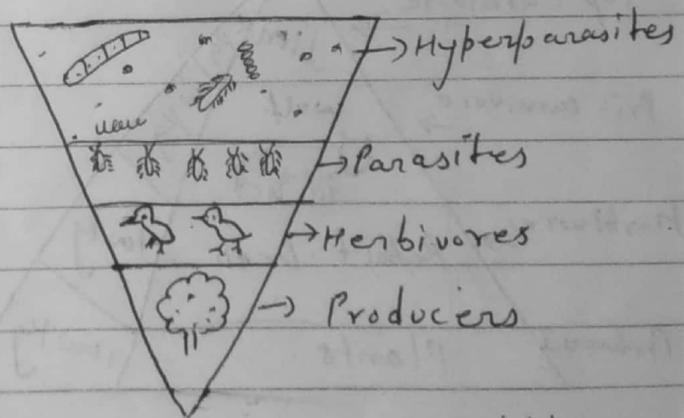
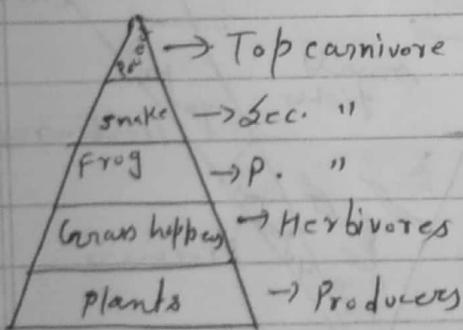
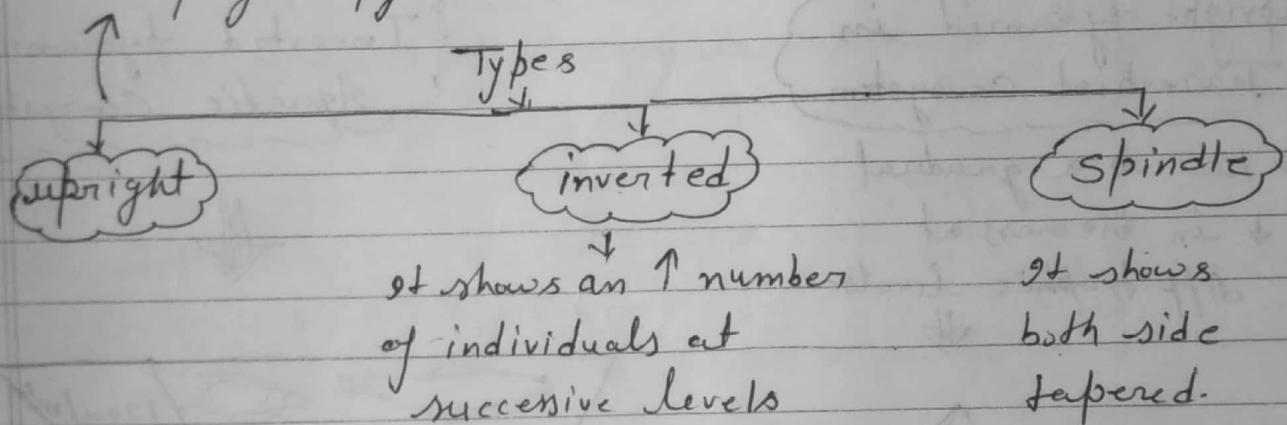
Pyramid of Number

P. of Biomass

P. of Energy

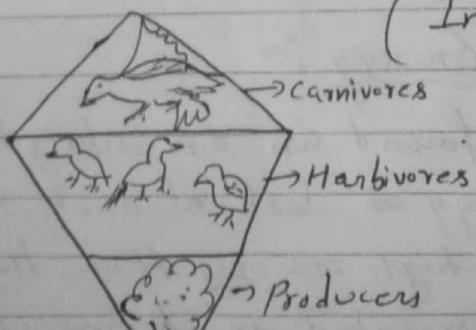
(a) Pyramid of Number :-

- This pyramid is based on the number of individuals per unit area at each trophic level.
- In this type of pyramid, number of individuals ↓ successively & it shows relationship b/w Producers, herbivores & carnivores — & it is also known as upright pyramid.



(i) (Upright Pyramid)

(Inverted Pyramid)



(Spindle - shape Pyramid)

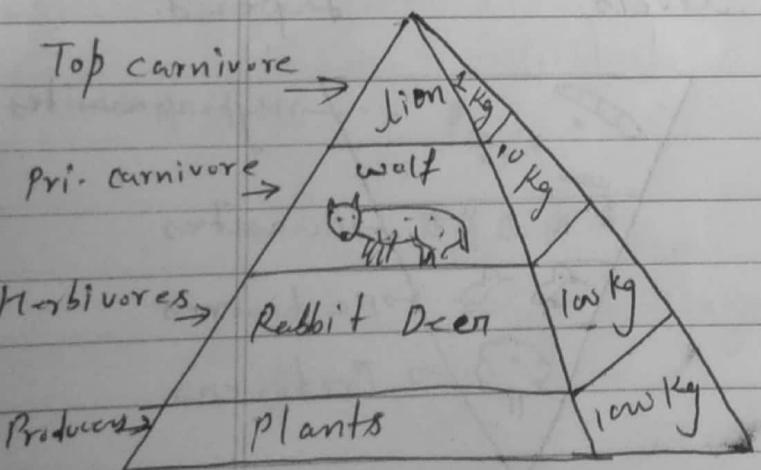
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(ii) Pyramid of Biomass :-

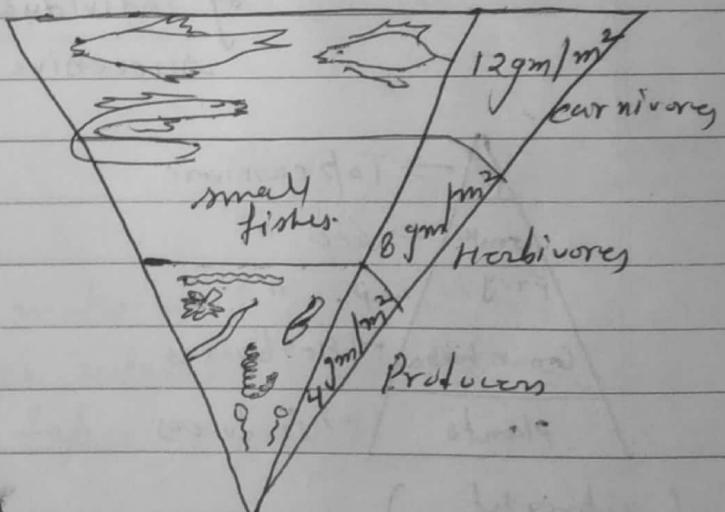
- Total amount of living material in any organism is known as biomass.
- It is measured in terms of dry weight of organisms per unit area.

Upright pyramid in Terrestrial Ecosystem

→ Here is a gradual ↓ in biomass at diff trophic levels



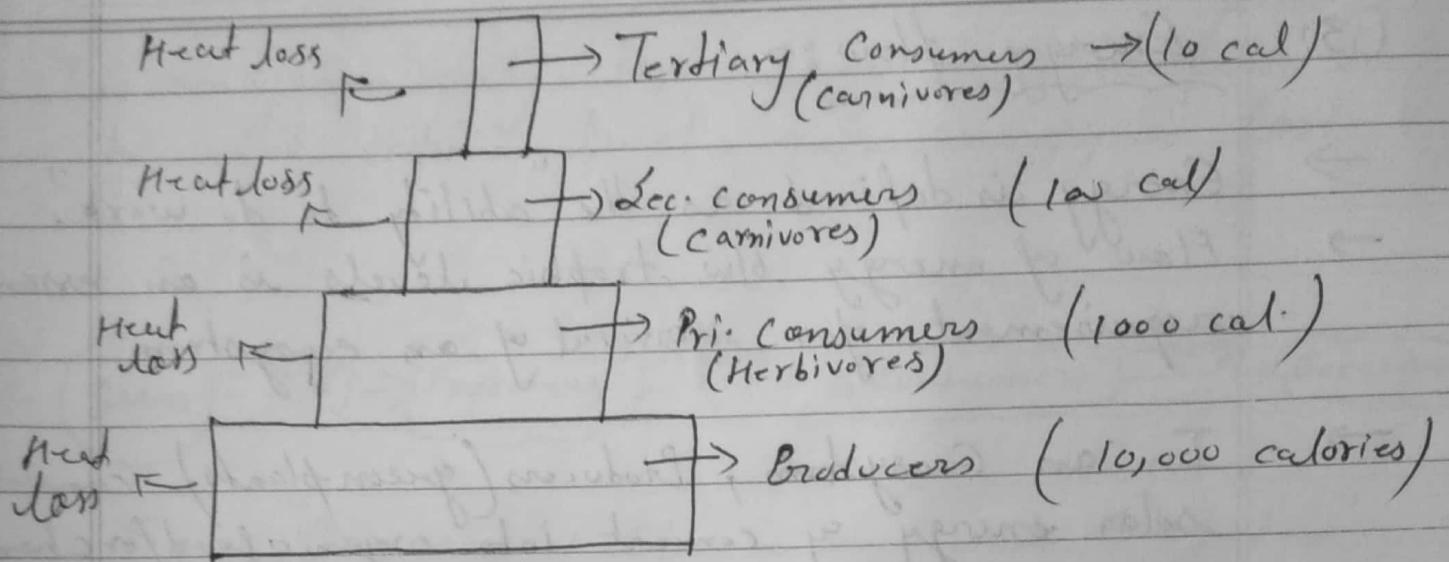
Inverted pyramid in Aquatic Ecosystem



(iii) Pyramid of Energy :-

- It is always found in an upright pattern because about 10% energy is lost at each successive level.
- Producers have high energy than Herbivores & Carnivores.
- Energy is represented in terms of calories.

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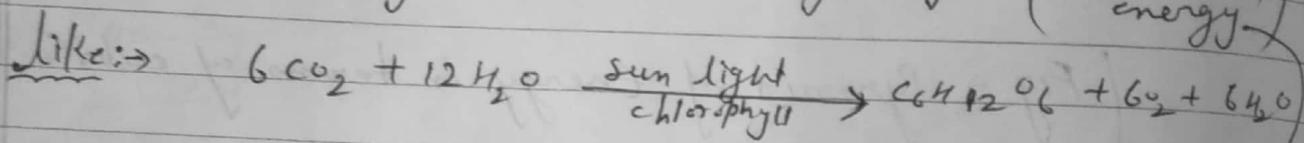


(Fig: → Pyramid of Energy in terms of calories)

(ii) Energy

(3) Energy flow :-

- Energy is defined as the "ability to do work".
- Flow of energy b/w trophic levels is an essential requirement for survival of an ecosystem.
- In an Ecosystem, Producers (green plants) consume solar energy & convert it into organic food (or chemical energy).



This energy is transferred to the next trophic levels with gradual loss of energy through respiration, decomposition etc.

- The flow of energy is always unidirectional.

↓
as it can be explained by two laws of thermodynamics.

First law
deals with "conservation of energy".

↓
It says that energy neither can be produced nor destroyed but it can be transformed from one form to another.

Second law of thermodynamics states that whenever one form of energy is converted into another form, some amount of useful energy is always lost in the transformation is not useful for general purpose.

→ In ecosystem, only 10% energy is transferred to next trophic level, 90% energy is lost.

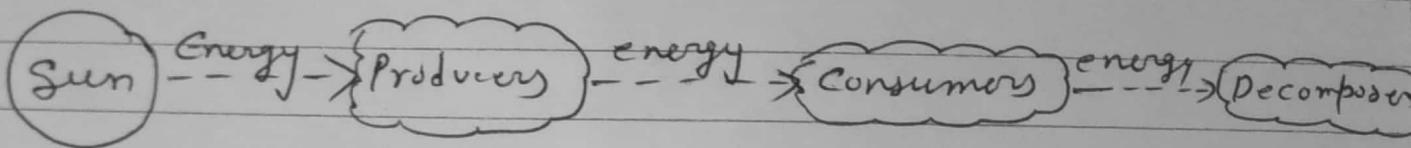
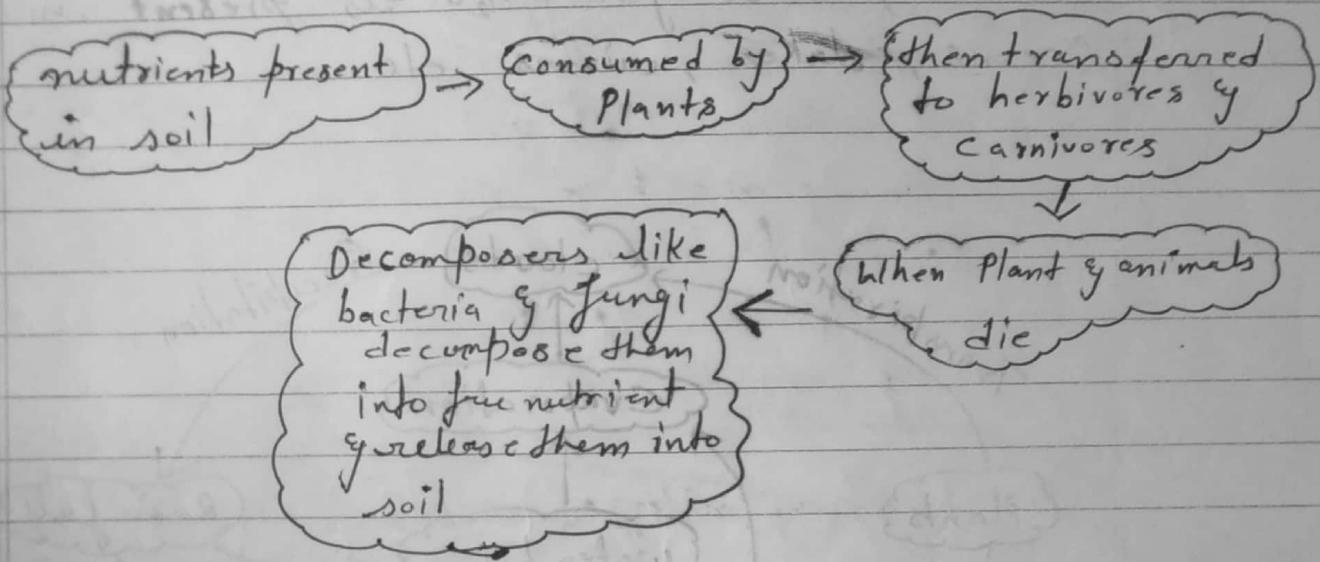


Fig:- "One way of Solar energy into Ecosystem"

(4) Bio-Geochemical cycles :-

"The cyclic exchange of nutrient material b/w the living organisms & their non-living environment is called "Biogeochemical cycle".



→ The various nutrient cycles are as follows:-

- (i) Hydrological cycle (Water cycle)
- (ii) Carbon cycle
- (iii) Nitrogen cycle
- (iv) Phosphorus cycle
- (v) Sulphur cycle
- (vi) Oxygen cycle
- ~~(vii)~~

(i) Hydrological Cycle (H₂O cycle) :-

→ H₂O is an essential component of all living beings. It is balanced in nature by the hydrological cycle. On earth, most of the H₂O is present in Oceans, lakes, rivers etc.

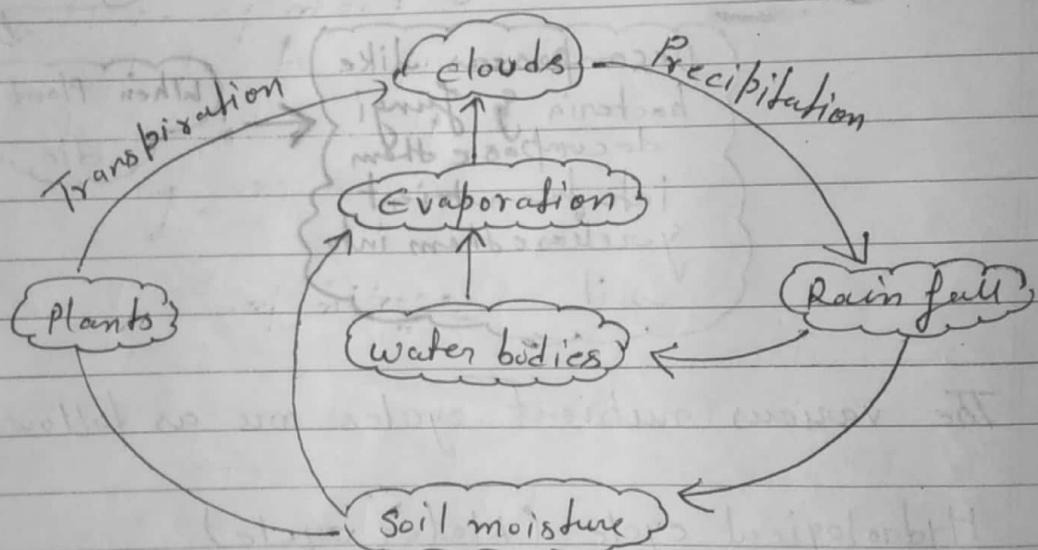


Fig: → "H₂O cycle"

→ The whole cycle can be represented by H₂O balance equation i.e.:-

$$P = N + E + S$$

Here $\rightarrow P$ = precipitation or rainfall

N = Percolation or entrapped in soil by gradual filtration

E = Evaporation

S = storage change in plants

(ii) Carbon cycle :-

C is the basic building block for all organic matter.

Three main sources of C are :-

CO_2 in air dissolved in H_2O rocks containing carbonates fossil fuels like coal & Petroleum.

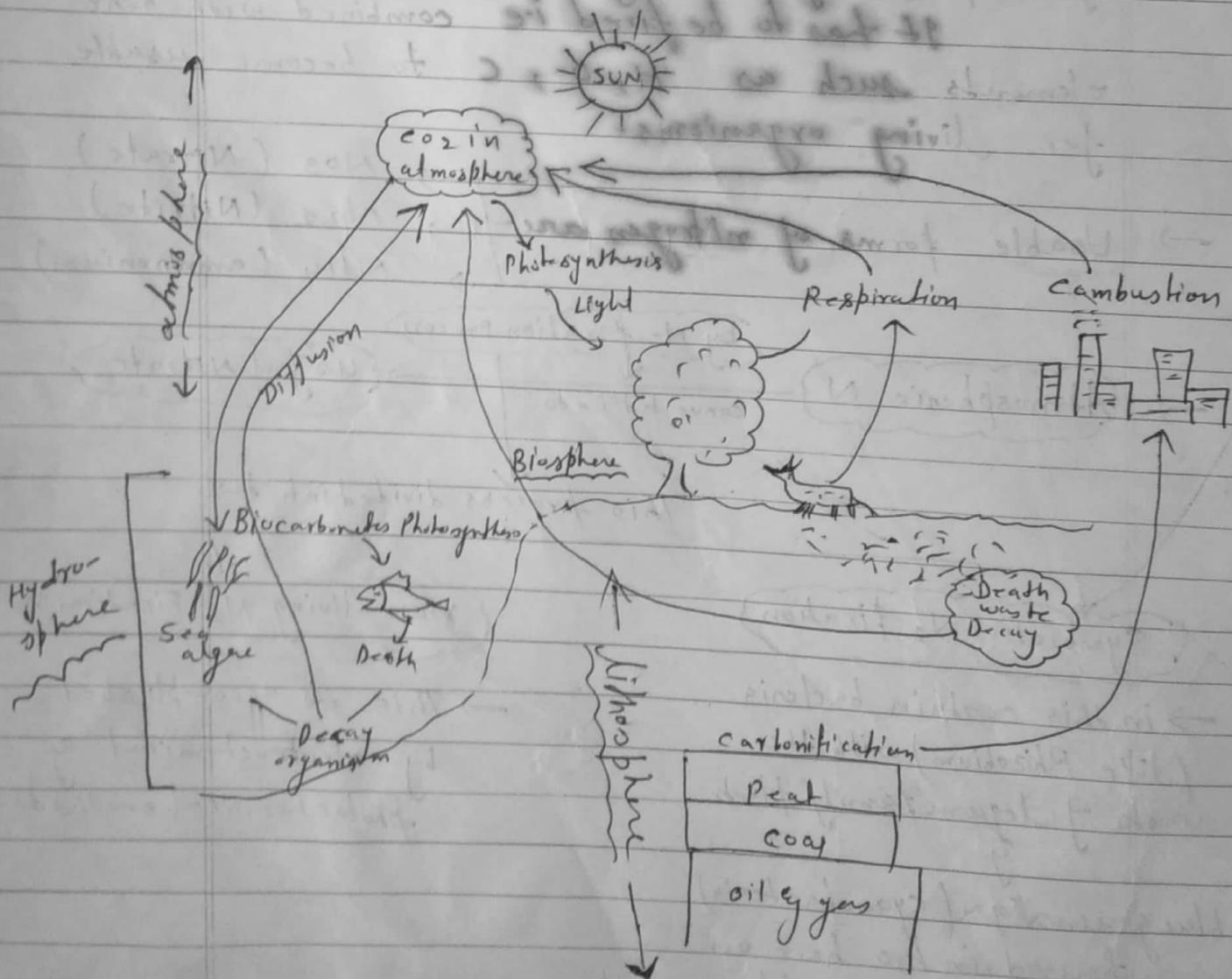


Fig :- "C - cycle"

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(iii)

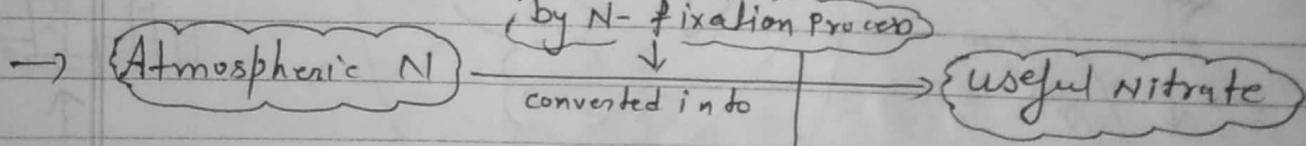
N-cycle: →

Protein, nucleic acids (RNA, DNA), amino acids are most imp. part of life.

- All the metabolic activities are accomplished using the above mentioned substances, which are mainly composed of nitrogen.
- Although 79% earth's atmosphere contains elemental nitrogen (N_2) yet it is entirely unavailable for uptake by most of the plants.

It has to be fixed i.e. combined with other elements such as H, O, C to become usable for living organisms.

- Usable forms of nitrogen are
 - $\rightarrow N_3^-$ (Nitrate)
 - $\rightarrow N_2O$ (Nitrite)
 - $\rightarrow NH_4^+$ (ammonium)



This process divided into two

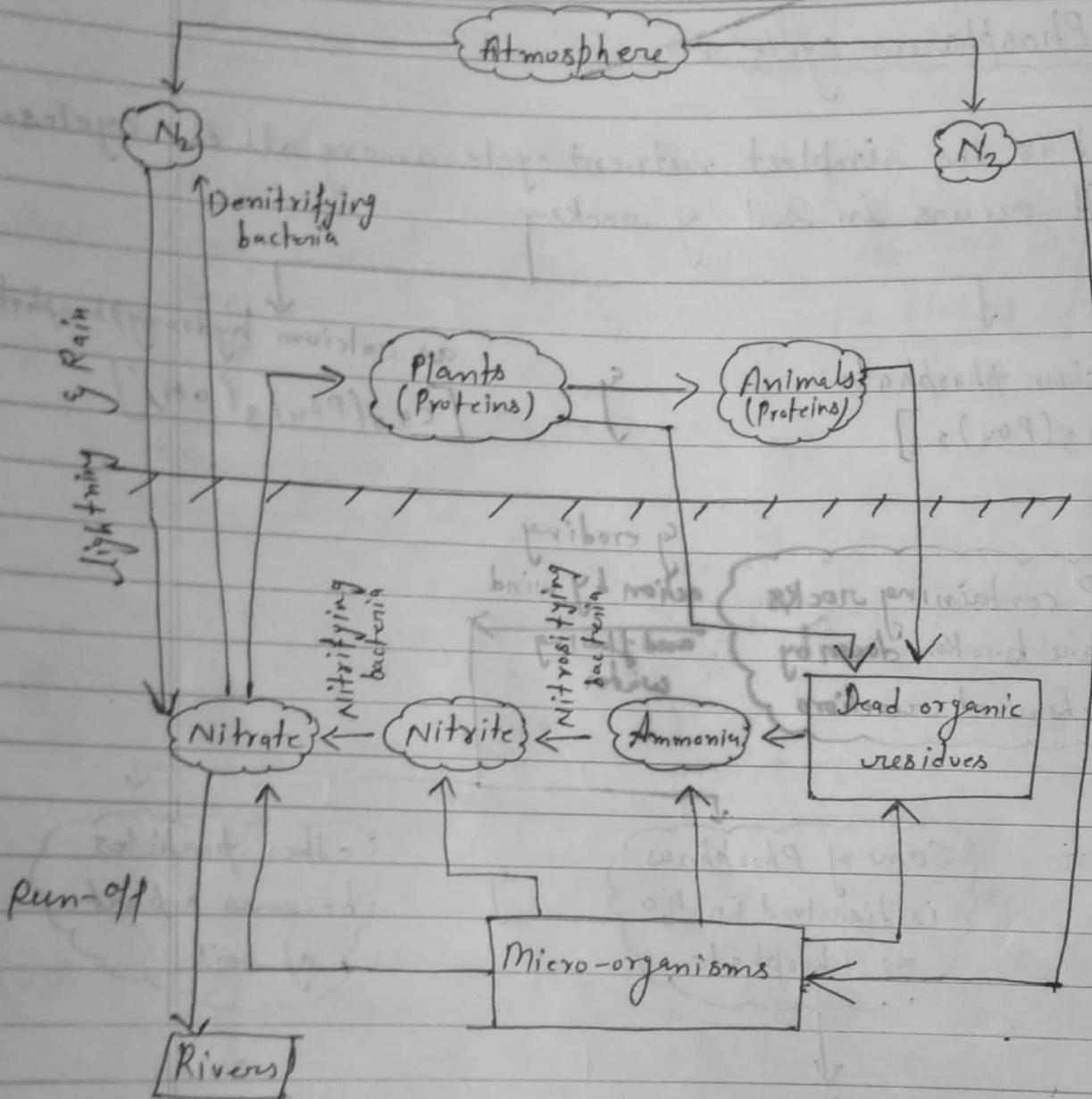
Symbiotic N_2 fixation

- in this certain bacteria (like Rhizobium) with the roots of legume family plants

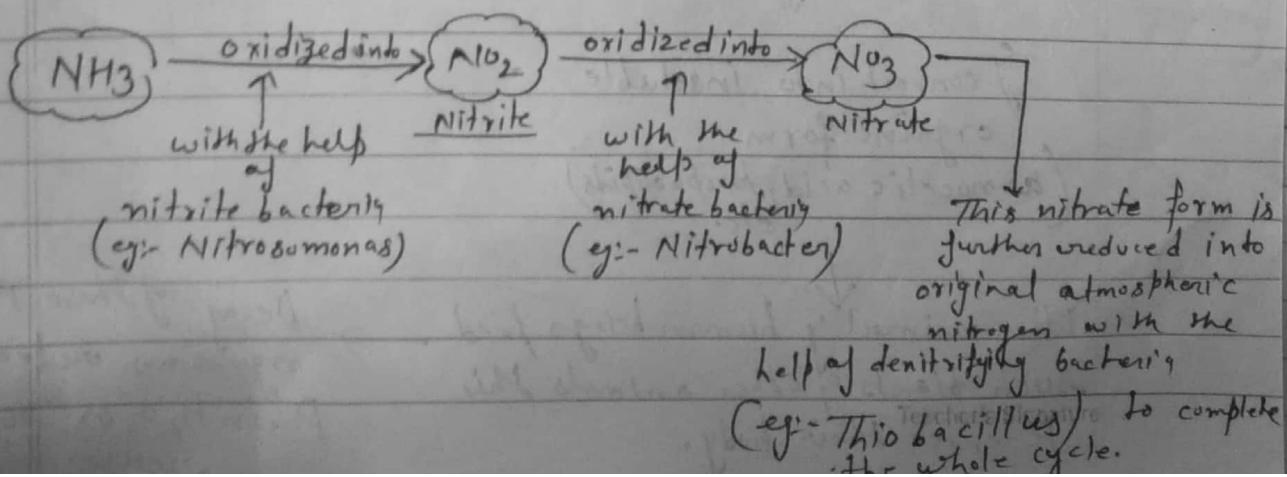
Non-living N_2 Fixation

- This is accomplished by electrochemical or photochemical methods.

blue green algae (cyanobacteria) found in H_2O have an ability to convert atm. N_2 into nitrates.



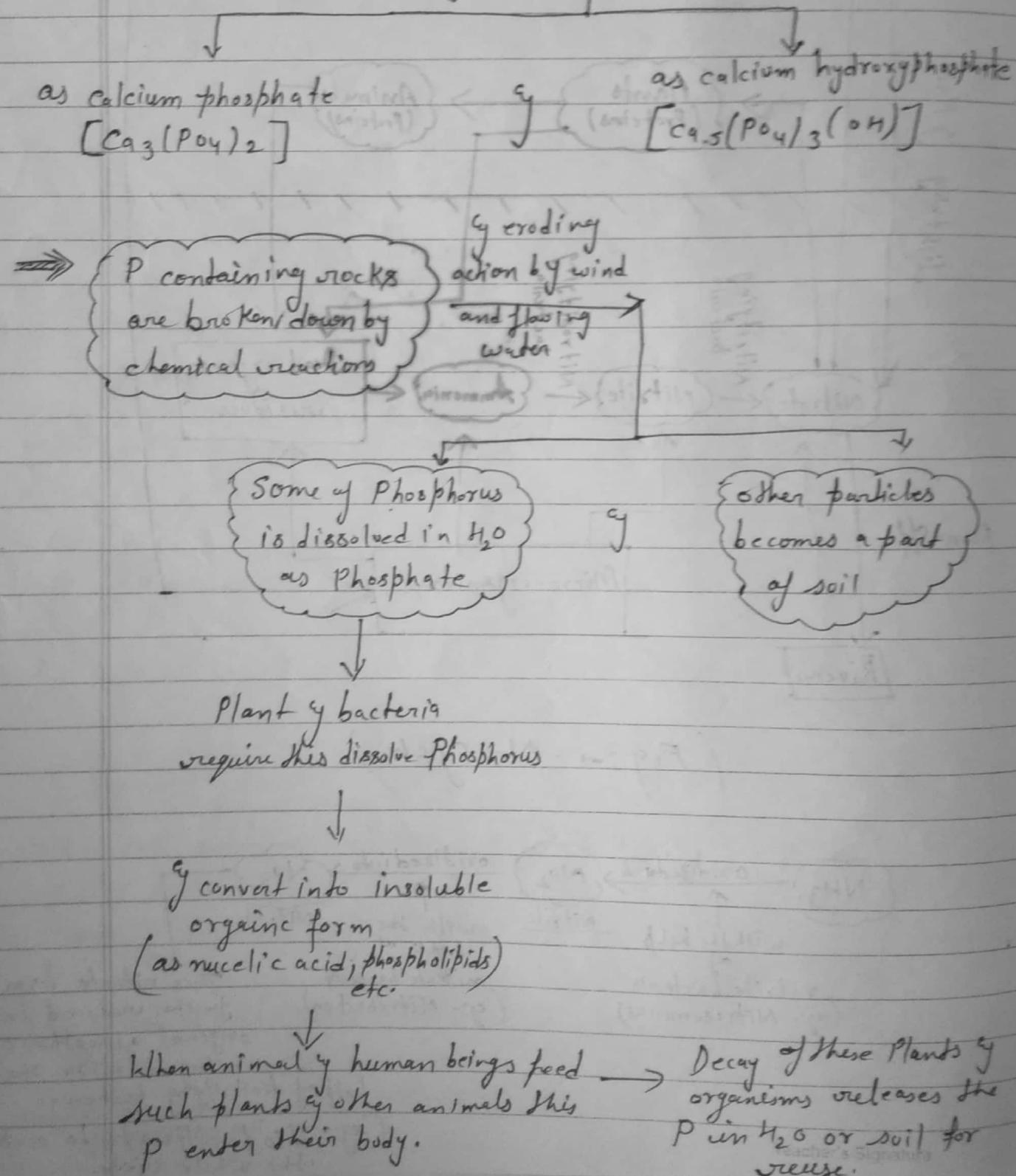
(Fig: - N - cycle)

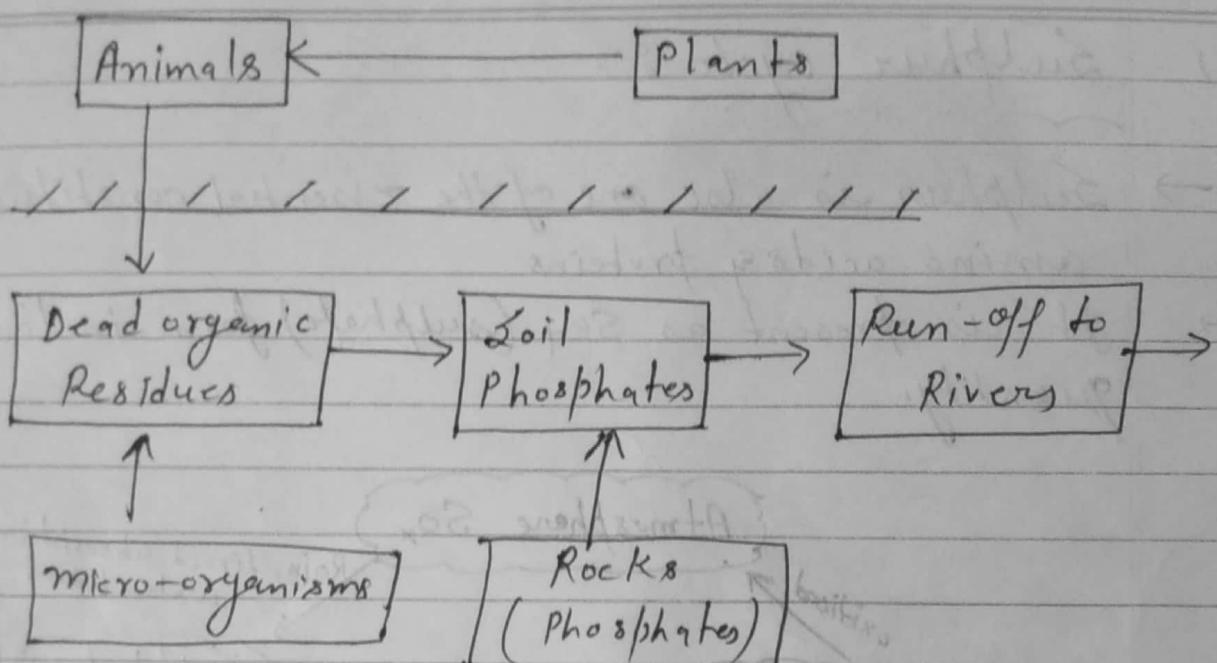


To complete the whole cycle.

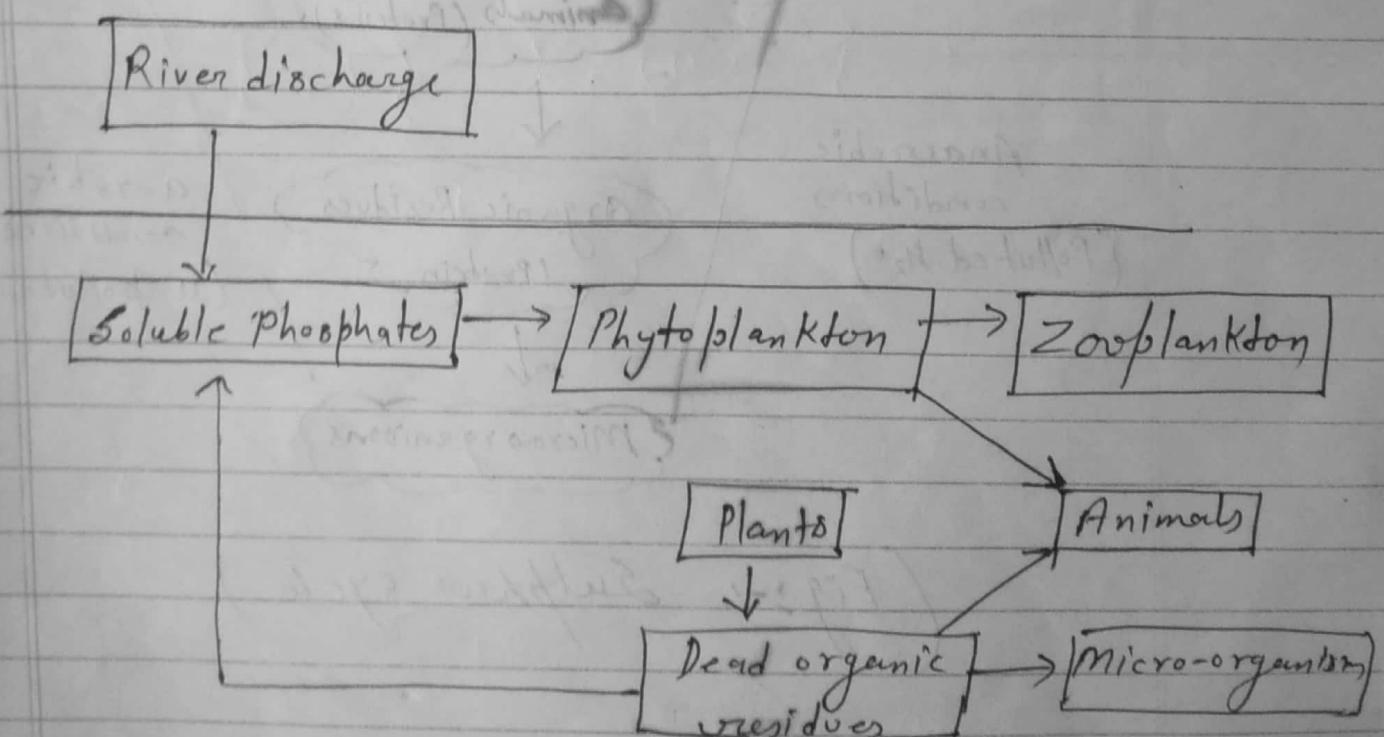
(4) Phosphorus cycle :-

- It is the simplest nutrient cycle among all the cycles.
- It occurs in soil & rocks





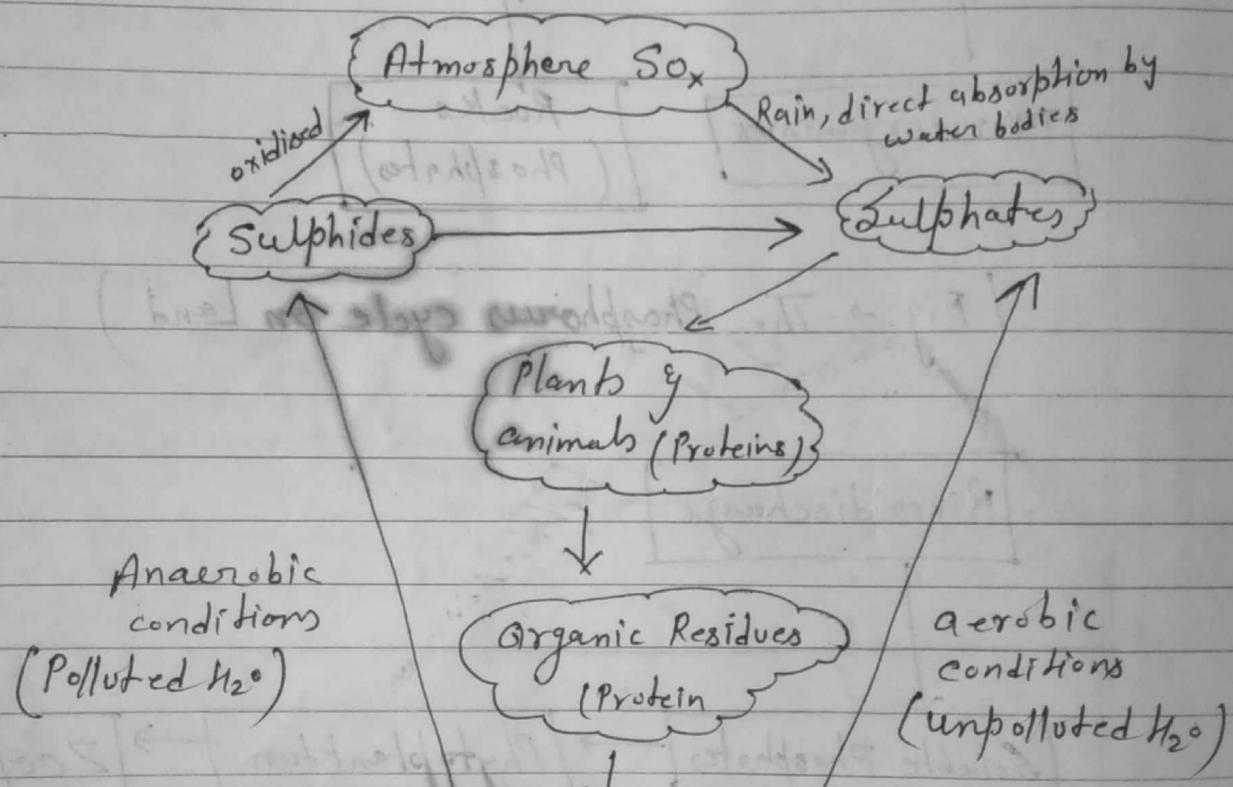
(Fig:- The Phosphorus cycle on Land)



(Fig:- The Phosphorus cycle in Lakes)

(v) Sulphur cycle :-

- Sulphur is also one of the essential constituent of amino acids & proteins.
- It is present as SO₄ (sulphate) form in limited quantity.



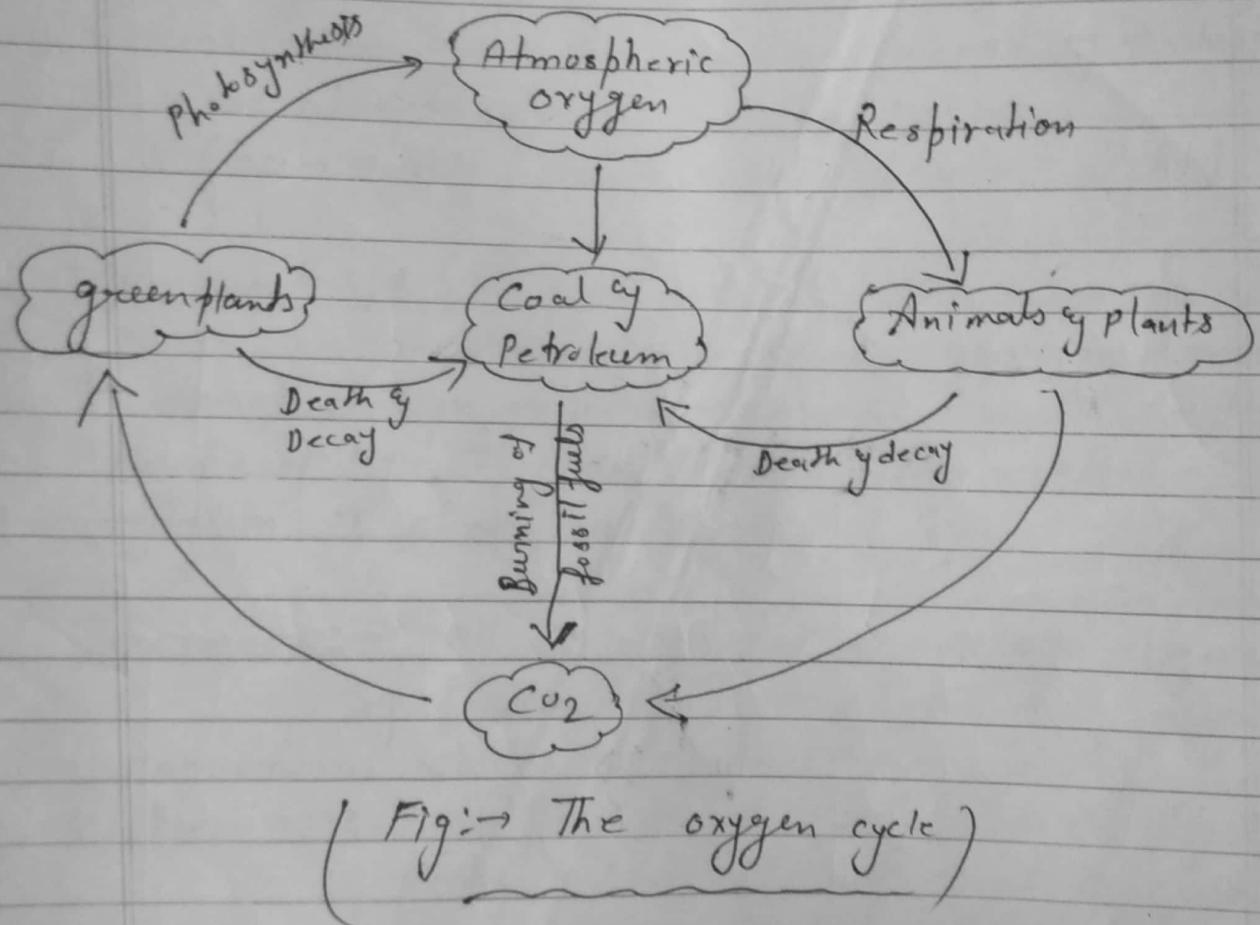
(Fig:- Sulphur cycle)

(20)

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(vii)

Oxygen cycle : It is the major requirement of all living organisms & its supply is necessary for life.



Producers :- They are mainly the green plants, which can synthesize their food themselves by making use of CO_2 present in the air & H_2O in the presence of sunlight by involving chlorophyll the green pigment present in the leaves, through the process of photosynthesis. They are also known as photoautotrophs (auto = self, troph = food, photo = light)

Chemoautotrophs :- There are some microorganisms also which can produce organic matter to some extent through oxidation of certain chemicals in the absence of light. They are known as chemosynthetic organism or chemo-autotrophs.

Consumers :- All organisms which get their organic food by feeding upon other organisms are called consumers, which are of the following type:-

- (i) Herbivores (Plant eaters) :- They feed directly on producers and hence also known as primary consumers. e.g.: - Rabbit, insect, man.
- (ii) Carnivores (Meat eaters) :- They feed on other consumers. If they feed on herbivores they are called secondary consumers (e.g.: - frog) & if they feed on other carnivores (snake, big fish etc.) they are known as tertiary carnivores/consumers.
- (iii) Omnivores :- They feed on both plants & animals. e.g.: - Human, cat, fox, many birds.

(iv) Detritivores (Saprotrophs) \Rightarrow They feed on the parts of dead organisms, wastes of living organisms, their cast-offs & partially decomposed matter e.g:- beetles, termites, ants, crabs, earthworms, vulture.

→ Decomposers \Rightarrow They derive their nutrition by breaking down the complex organic molecules to simpler organic compounds and ultimately into inorganic nutrients. Various bacteria & fungi are Decomposers.